Airport Master Plan Update

Manchester-Boston Regional Airport

Manchester, New Hampshire

Prepared For:

City of Manchester
Department of Aviation

Prepared By:

URS

In Association With:

JACOBS CONSULTANCY

McFarland Johnson

The Smart Associates
Environmental Consultants, Inc.

September 2011

REPORT

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MANCHESTER-BOSTON REGIONAL AIRPORT

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MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION ONE

Introduction

SECTION 1.0
INTRODUCTION

1.1 AIRPORT OWNERSHIP AND MANAGEMENT

Manchester-Boston Regional Airport (MHT)[1] is owned by the City of Manchester and is operated by the City's Department of Aviation. The Department of Aviation oversees the daily operations, maintenance, planning, design, and construction of the airport.

1.2 PURPOSE OF THE AIRPORT MASTER PLAN UPDATE

An Airport Master Plan is a tool used by airport owners to plan growth and guide development to meet existing and future needs of airport users. The Airport Master Plan Update documents the planning process, and identifies and analyzes key elements of the airport. The Federal Aviation Administration (FAA) recommends that airport owners update their Airport Master Plans periodically to assess the existing and future operational capability of the airport, enhance safety, and identify facility and capital improvements needs. A typical Airport Master Plan represents a 20-year development program for the airport. To remain eligible to received FAA Airport Improvement Program (AIP) funding for needed airport improvement projects, the FAA recommends that an airport's Master Plan be reviewed and updated periodically. The last Airport Master Plan Update was completed for MHT in 1997.

Another product of the Airport Master Plan process is the Airport Layout Plan (ALP) set of drawings. The ALP set graphically depicts existing airport conditions and the future airport development plan. The ALP drawings provides pertinent technical information and data upon which recommendations and decisions for future development are based. The last ALP drawing was completed in August 2007 by Edwards and Kelcey.

1.3 PREVIOUS AIRPORT MASTER PLAN UPDATE

The previous Airport Master Plan Update was completed in 1997, along with an Environmental Assessment and Code of Federal Regulations (CFR) Title 14, Part 150 Noise Update. The primary focus of the 1997 Airport Master Plan was airfield expansion and improvements. A majority of the identified projects in the 1997 Airport Master Plan have been completed. Major projects completed since the last Airport Master Plan Update include:

Airfield

- Taxiway "M" extension/Taxiway overpass/New terminal entrance (2000)
- Runway 17/35 extension (2002)
- Runway 17 Runway Safety Area (RSA) improvements (2003)
- Runway 6/24 extension/S. Willow St. relocation (2007)
- Runway 6 and 24 RSA improvements (2006 and 2007)
- New Airport Traffic Control Tower (ATCT) (2006)
- Terminal apron/Drainage improvements (phased program-ongoing)

[1] A list of Acronyms used throughout this Airport Master Plan Update is provided in **Appendix A**.

Terminal

- Parking garage (1999)
- Pedestrian walkway (2000)
- Security (Transportation Security Administration (TSA)) improvements (2002)
- Terminal expansion (1998 and 2002)
- Concession improvements (2008 and 2009)

Land acquisition

- Noise/Runway Protection Zone (RPZ) land acquisition (1998 and 1999)
- Residential sound installation program (1,200 homes) completed in 2009

Facilities

- New airport maintenance facility (2000)
- Remote parking facilities (Lots F and G) (2005 and 2006)
- Upgrade Aerohex hangars (2007)

1.4 AIRPORT MISSION STATEMENT

The importance of the airport's Mission Statement lies in its message to the airport's users, tenants, and the region's general public. The statement was developed in working with MHT management and formed a basis for the planning goals and objectives that guided this Airport Master Plan Update. The airport's Mission Statement is shown in **Figure 1-1**.

FIGURE 1-1
MANCHESTER-BOSTON REGIONAL AIRPORT'S MISSION STATEMENT

The Mission

To be the premier airport of choice serving the air transportation needs of the Boston-North market. To surpass the expectations of the traveling public by delivering excellence in service and reliable performance based on the supporting principles of:

- Customer Service and Convenience – To deliver a friendly, affordable travel experience to the public, providing easy access and increasing airline services.
- Professional Standards – To maintain the highest levels of professional integrity and ingenuity in managing and operating the airport and to exhibit a sense of pride and ownership in the services we offer.
- Community Service – To partner with area businesses and communities in developing infrastructure that supports economic development while preserving and protecting New Hampshire values.
- Safety and Security – To meet or exceed all federal and state standards to ensure the safest and most secure airport operation possible for our customers.
- Environmental Responsibility – To balance sustainable, responsible airport development with quality of life elements of out neighboring communities.
- Operational and Fiscal Efficiency – To maintain the highest and best use of all our resources, leading to cost-effective and demand-driven decisions.

Source: MHT Management.

1.5 AIRPORT MASTER PLAN UPDATE GOALS AND OBJECTIVES

Early in this planning process, airport management developed the goals and objectives, listed below, to focus the Airport Master Plan Update process and planning.

1.5.1 GOALS

- Provide guidance for the future development and operation of the airport, through the identification of needs which optimize operational capacity, enhance safety, and strengthen the economic aspects of the airport.
- Create a dynamic, decision-making and management tool which addresses the region's future aviation needs.
- Provide a phased, demand-driven implementation plan for development, in an environmentally-sensitive and financially responsible manner.

1.5.2 OBJECTIVES

- Realistically project passenger enplanements and aircraft operations at MHT, consistent with reasonable economic and airline service assumptions, and present future facility requirements based on activity levels.
- Optimize terminal space and passenger processes and flow patterns from curbside to gates.
- Plan for the connectivity of the airport with future multi-modal options.
- Focus on the highest and best use of the airport's landside property.
- Consider environmental factors and constraints throughout the planning process and promote the development of sustainable plans and programs.
- Integrate financial capacity limits into the alternative planning process.
- Foster the exchange of information between airport management and stakeholders, users, neighbors, and the general public.

1.6 AIRPORT MASTER PLAN TEAM

The Airport Master Plan Update's Project Team was led by URS Corporation, serving as Prime Consultant. Three major sub-consultants to URS Corporation, Leigh Fisher (Jacobs Consultancy), McFarland Johnson Inc., and The Smart Associates, participated in the Airport Master Plan Update and performed key assignments. Leigh Fisher developed forecasts of aviation activity, terminal facility requirements, terminal facility planning and prepared the financial capacity, plan of finance, and business plan. McFarland Johnson, Inc., researched and prepared the inventory/existing conditions section, surface transportation demand/capacity and facility requirements section, portions of surface transportation planning section, and portions of implementation program/capital improvement program section. The Smart Associates prepared the environmental constraints mapping presented in the airport inventory/existing conditions section, and identified environmental considerations associated with master plan implementation.

1.7 PUBLIC INVOLVEMENT PROGRAM

The Public Involvement Program for the Airport Master Plan Update was developed and implemented as directed by MHT management throughout the course of the study. Key elements include the following.

1.7.1 STUDY ADVISORY COMMITTEE MEETINGS

An essential part of ongoing review and direction to the Airport Master Plan Update was obtained from the formulation and utilization of a Study Advisory Committee (SAC). The input of the SAC was a vital component toward ensuring the Airport Master Plan Update fully considered the Long-Term planning goals and objectives of MHT management, as well as the interests of airport stakeholders, airport users, and neighbors.

The SAC included representatives from airport management, Airport Authority, FAA, the New Hampshire Department of Transportation (NHDOT), airport tenants and users, airlines, environmental agencies, representatives from Manchester and Londonderry planning agencies, and representatives from surrounding communities. Having representatives from each of these groups involved in the development of the Airport Master Plan Update allowed the Project Team to collect valuable information and opinions, help facilitate discussions among the group, and work toward consensus that will be needed for successful plan implementation. **Appendix B** contains a list of SAC members.

Four SAC Meetings were held during the course of the Airport Master Plan Update study process:

> **Meeting #1** – The Project Team introduced the Airport Master Plan Update process and the roles of MHT, FAA, and the Project Team. In addition, the Project Team solicited comments and information on current operations and future plans of the tenants.
>
> **Meeting #2** – The Project Team presented the findings of the aviation demand forecast and demand/capacity analysis, facility requirements analysis, and preliminary alternatives considerations.
>
> **Meeting #3** – The Project Team presented surface transportation and terminal development alternatives.
>
> **Meeting #4** – The Project Team presented draft airport development plans, preliminary cost estimates, and project funding information.

1.7.2 PUBLIC INFORMATION WORKSHOPS

Three Public Information Workshops (PIW's) were conducted at strategic milestones of the Airport Master Plan Update study process. The PIW's were held in an informal open-house format. The workshops were scheduled in the late afternoon/early evening for a period of up to three hours (i.e., between 5 p.m. and 8 p.m.). Representatives of MHT and the Project Team staffed each PIW and were available to talk individually with the general public about the Airport Master Plan Update. The Project Team prepared workshop handout materials and displayed board-mounted graphics (maps, charts, and tables) so that the general public could become familiar with the goals, objectives and decisions relative to the Airport Master Plan Update. The location, date, and information presented at each PIW is summarized below:

Public Information Workshop #1
August 13, 2009
Manchester Memorial High School

This PIW was conducted at the start of the project and was designed to notify the public that the Airport Master Plan Update had begun and to explain the Airport Master Plan Update process, and the roles of MHT, FAA, and the Project Team. Information about the airport, including the preliminary facility condition assessments and the updated existing environmental inventory, and preliminary forecast results were available at this workshop.

Public Information Workshop #2
December 10, 2009
Londonderry High School

This PIW was conducted about halfway through the Airport Master Plan Update process and provided information to the public about evaluation of airport development options and alternatives.

Public Information Workshop #3
August 26, 2010
Manchester Memorial High/School

This PIW was conducted as the preferred airport development program was being formulated, prior to any final decision by airport management.

1.7.3 AIRPORT'S WEB PAGE

Airport Master Plan Update information presented at the SAC meetings and the three PIWs was also made available to the public on the airport's web page.

1.8 COORDINATION WITH AIRPORT OWNER, AIRPORT AUTHORITY, AND PLANNING ORGANIZATIONS

1.8.1 CITY OF MANCHESTER

During the course of the update, MHT management and the Project Team met with the Special Aldermanic Committee on Airports, where update status was presented, to include forecasts of activity, and updates of noise exposure from existing and projected aircraft operations. Near the conclusion of the study process, MHT management and the Project Team also presented the highlights of the proposed development plan to the Manchester Board of Mayor and Aldermen.

1.8.2 AIRPORT AUTHORITY

As part of regularly scheduled meetings between airport management and the Airport Authority, the Project Team provided a status report of the Airport Master Plan Update process, and presented emerging findings and alternatives.

1.8.3 LOCAL AND REGIONAL PLANNING DEPARTMENT COORDINATION

In addition to SAC interface, the Project Team also held separate meetings with the Manchester Planning Department, the Londonderry Planning and Economic Development Department, and the Southern New Hampshire Planning Commission. Topics of coordination included: land use plans, regional transportation and local access plans, and related initiatives in the airport vicinity.

1.9 AIRPORT MASTER PLAN REFERENCE AND GUIDANCE RESOURCE

The Airport Master Plan Update was developed consistent with airport planning and design guidance prescribed by FAA included in, but not limited to:

FAA Advisory Circulars

- 150/5060-5, Airport Capacity and Delay,
- 150/5070-6B, Airport Master Plans,
- 150/5300-13, Airport Design,
- 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports, and
- 150/5325-4B, Runway Length Requirements for Airport Design.

FAA Orders

- 5050, 4B, NEPA Implementing Instructions for Airport Actions,
- 1050.1E, Environmental Impacts: Policies and Procedures,
- 1000.1A, Policy Statement of the FAA,
- 5300.1F, Modifications to Agency Airport Design, Construction, and Equipment Standards,
- 5100.38A, Airport Improvement Program (AIP) Handbook,
- 5190.6A, Airport Compliance Handbook,
- 5010.4, Airport Safety Data,
- 5200.8, Runway Safety Area Program, and
- 8260.3B, United States Standards for Terminal Instrument Procedures (TERPS).

Other References

- Code of Federal Regulations (CFR) Title 14, Part 77, *Objects Affecting Navigable Airspace*.

1.10 AIRPORT MASTER PLAN DOCUMENT ORGANIZATION

This Airport Master Plan Update report is organized into eleven sections, which are listed and described as follows:

<u>Section 1.0: Introduction</u> – This section presents a brief summary of the purpose of the Airport Master Plan Update, airport ownership and management, study goals and objectives, airport mission statement, document organization, ALP development, project team, and the public involvement program.

Section 2.0: Inventory/Existing Conditions – This section presents the overview of existing physical facilities, operational characteristics, recent and ongoing facility development, and environmental, land use and zoning constraints.

Section 3.0: Forecasts – This section provides an update of aviation activity forecasts for MHT though the year 2028. It is required that the forecasts be reviewed and approved by the FAA (approved June 10, 2010, see **Appendix C**), which will be incorporated into the FAA's National Plan of Integrated Airport Systems (NPIAS) and the FAA's Terminal Area Forecast (TAF).

Section 4.0: Demand/Capacity and Facility Requirements – This section is divided into three parts: airside, landside/surface transportation, and the terminal area. It describes the demand/capacity analysis that yields the capability of existing airport facilities to accommodate existing and future aviation demand as generated by the aviation forecasts.

Section 5.0: Airfield/Airside Planning – This section address a variety of airfield issues, including such factors/elements as taxiway clearances, taxiway configurations, approach lighting systems, runway safety area improvements, service roads, and Aircraft Rescue and Firefighting (ARFF) requirements. These issues are addressed in terms of the actions needed to meet FAA design standards or improve current levels of service for existing and projected levels of airport operations.

Section 6.0: Surface Transportation Planning – This section describes all elements related to surface transportation, including access, parking, Rent-a-Car (RAC), and an intermodal interface.

Section 7.0: Terminal Facility Planning – This section analyses the highest and best use of existing terminal space and presents passenger terminal improvements and modifications over the 20-year planning period.

Section 8.0: Development Plan – This section presents the recommended airport development plan for MHT. This section addresses land use for commercial aviation, air cargo facilities, general aviation facilities, and non-aviation development.

Section 9.0: Implementation Program/Capital Improvement Program – This section describes the 20-year capital improvement program in increments of 5, 10 and 20 years.

Section 10.0: Environmental Considerations – This section provides federal, state and local officials and the public with an understanding of the anticipated environmental considerations for the projects proposed under MHT's resultant Capital Improvement Program (CIP).

Section 11.0: Financial Capacity, Plan of Finance, and Business Plan – This section describes the overall financial capacity of the airport and the plan to finance the recommended capital program.

1.11 THE AIRPORT LAYOUT PLAN

The ALP drawing set is a comprehensive collection of planning drawings, of a pre-design nature. Individual items such as runway coordinates, obstruction survey data, and application of airport design standards must comply with Federal survey standards. The ALP is a key "communication" and "agreement" document between the airport owner and the FAA. It represents an understanding between the airport owner and the

FAA regarding the current and future development and operation of the airport. As part of the ALP drawing set, a single Airport Layout Drawing (ALD) is reviewed and specifically approved by the airport owner and the FAA local Airports District Office (ADO), and serves as a record of aeronautical requirements, both present and future. The ALP also serves as a reference for community deliberations on land use proposals and budget resource planning.

The FAA uses the ALP primarily for the following purposes:

- Aeronautical studies of proposals for the development of nearby airports and objects that may affect the navigable airspace, and proposals for on-airport development;
- Siting of new and relocated FAA facilities and equipment;
- Analysis of operational changes;
- Development of new standard instrument approach procedures; and
- Determination of land needed for aeronautical purposes.

Because the approved ALD and accepted ALP drawing set represents an agreement between the airport owner and the FAA regarding how the airport will develop, and for AIP grant assurance compliance purposes, it is also imperative that the airport owner develop the airport in accordance with the ALP. The FAA requires an airport owner keep their ALP current to remain eligible to receive Federal funding for certain airport improvement projects. The approved ALD and accepted ALP enables the airport sponsor and the FAA to plan for facility improvements at the airport. It also allows the FAA to anticipate budgetary and procedural needs. The approved ALD and accepted ALP also allows the FAA to protect the airspace required for airport facility or approach procedure improvements.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION TWO

Inventory/Existing Conditions

SECTION 2.0
INVENTORY/EXISTING CONDITIONS

2.1 INTRODUCTION

This inventory section of the Airport Master Plan Update for Manchester-Boston Regional Airport (MHT) presents information collected in 2009 on the current configuration, facilities, and use of the airport, as well as a brief overview of selected environmental and land use factors. The data presented provides the basis for determining future aircraft activity and facility requirements of the airport. The data sources include an on-site inspection of the airport, interviews with airport management and local officials, aerial photography and mapping, and secondary sources published on the local, state, and national levels.

2.2 AIRPORT LOCATION AND PROPERTY

Manchester-Boston Regional Airport is strategically situated in the center of northern New England, located less than 50 miles north of Boston, Massachusetts. The airport is three miles south of the City of Manchester's Central Business District. An airport location map is provided on **Figure 2-1.**

An aerial photograph of the airport (dated June 2009) is shown on **Figure 2-2** and depicts the airport's two runways (Runway 6/24 and Runway 17/35), associated taxiway system, apron, terminal, vehicle parking lots and the local roadway system that surrounds and serves the airport. The airport is physically located within two counties, Hillsborough and Rockingham. Airport property encompasses approximately 1,200 acres of land. The Exhibit "A" Property Map for MHT is located in **Appendix D**, and was originally prepared by Hoyle, Tanner & Associates, Inc., in January 21, 2003 and last updated in May 21, 2008.

The airport's published field elevation, which is defined as the highest point on an airport's usable runway, is 266 feet above mean sea level (MSL) and the coordinates of the Airport Reference Point (ARP) are 42° 55' 58.0920" N and 71° 26' 08.6590" W.

2.3 AIRFIELD/NAVAIDS/AIRSPACE

2.3.1 AIRPORT DATA

The following sections provide a description of existing conditions of key airport facilities and buildings. Much of this airport data was collected with the assistance of MHT management, MHT administrative staff, and airport tenants.

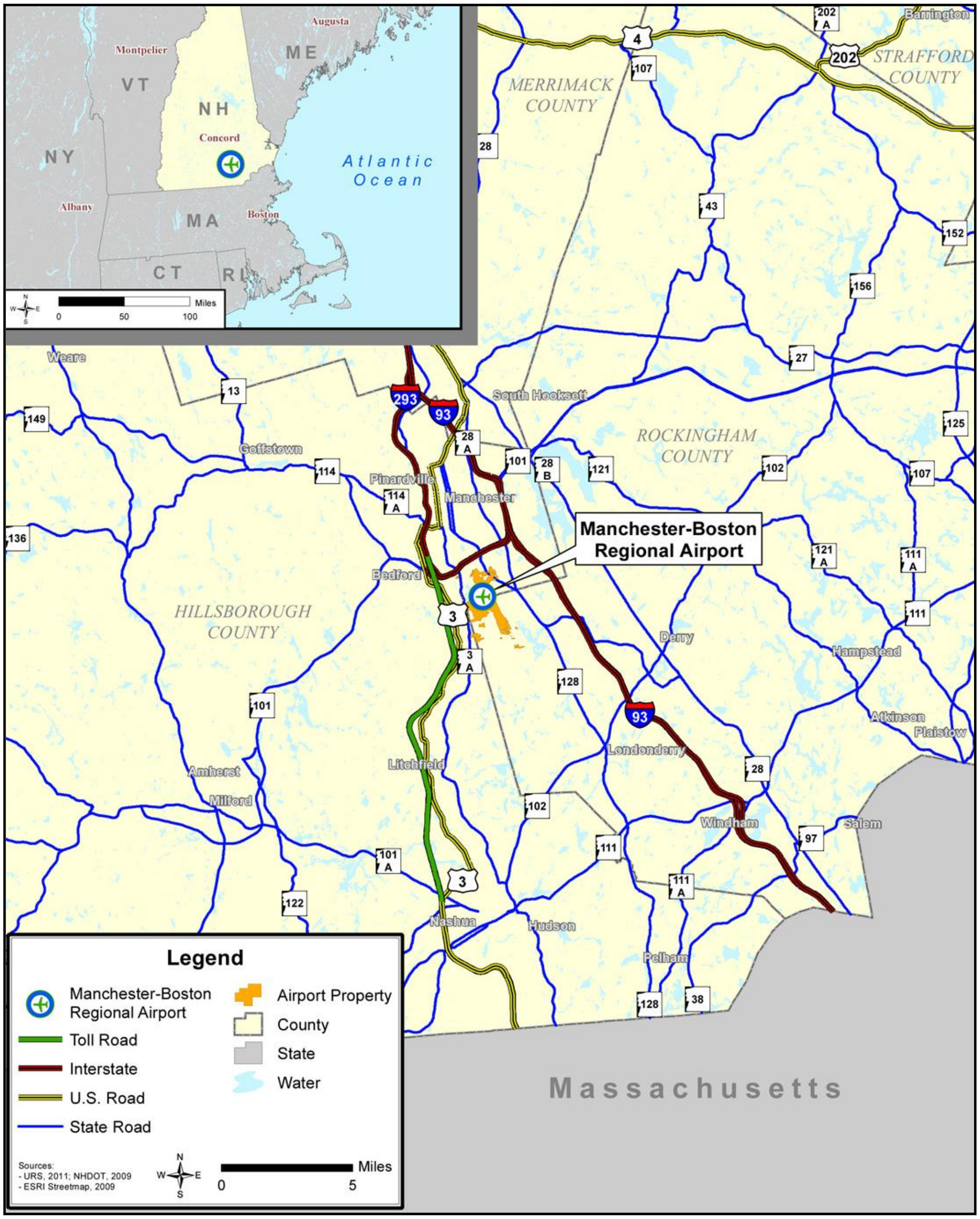
2.3.2 RUNWAYS, TAXIWAYS, AND APRONS

Figure 2-3 depicts the existing facilities for MHT, and provides information for the runways, taxiways, aircraft parking areas, terminal, hangars, and buildings.

2.3.2.1 Runways

The airport has two hard surfaced runways: primary Runway 17/35 and crosswind Runway 6/24.

FIGURE 2-1
AIRPORT LOCATION MAP

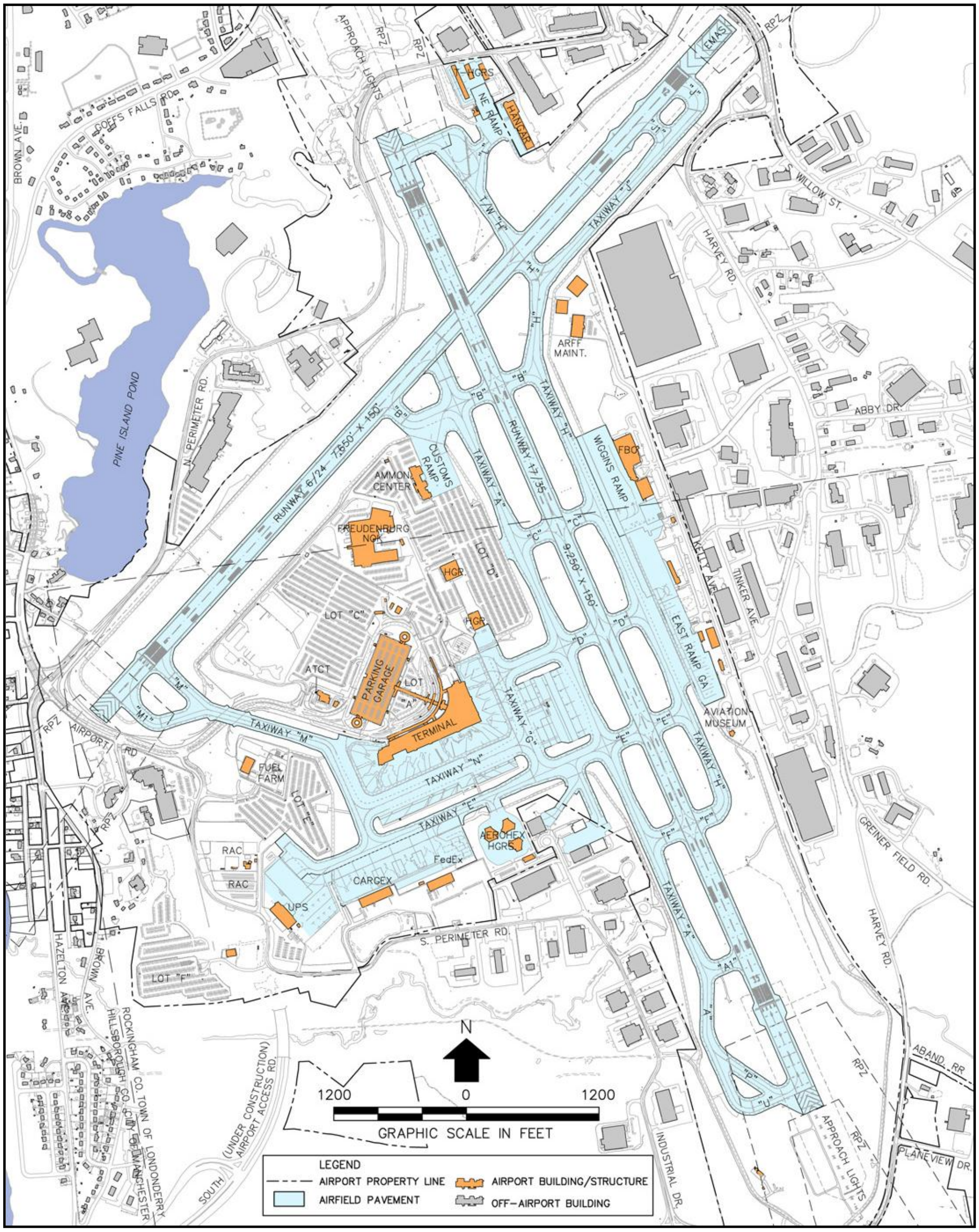


Source: URS Corporation, 2010.

FIGURE 2-2
AIRPORT AERIAL PHOTOGRAPH

Source: URS Corporation, 2010.

FIGURE 2-3
EXISTING FACILITIES



Source: URS Corporation, 2010.

Runway 17/35

The airport's primary runway, Runway 17/35, measures 9,250 feet long and 150 feet wide and is aligned in a north-northwest to south-southeast direction. Runway 17/35 has high intensity runway lights at its edges, centerline lights, and touchdown zone lights. The runway strength is currently rated at 200,000 pounds single wheel, 300,000 pounds dual wheel, and 350,000 pounds dual-tandem. The pavement strength for two single wheels in tandem is 175,000 pounds, which applies to C-130 aircraft. The runway pavement is grooved asphalt with 25-foot wide paved shoulders, and is in very good condition. Blast pads are located at both ends of the runway.

Runway 17 features precision instrument markings that are in good condition and has a runway end elevation of 216.1 feet MSL. The landing threshold is displaced 336 feet. Federal Aviation Administration (FAA) facility data sheets (http://avnwww.jccbi.gov/datasheet/) list the elevation of the displaced threshold as 218.2 feet. A Medium Intensity Approach Lighting System (MALSR) supports landings on Runway 17.

Runway 35 has precision instrument markings that are in good condition and a threshold elevation of 266.4 feet MSL. The landing threshold on Runway 35 is displaced 850 feet and the displaced threshold elevation is listed as 265.4 feet. A High Intensity Approach Lighting System with Sequenced Flashing Lights, Category II configuration (ALSF-2), is located off the approach end of Runway 35.

Runway 6/24

The airport's crosswind runway, Runway 6/24, measures 7,650 feet long by 150 feet wide, and is constructed of grooved asphalt with 25-foot paved shoulders. The elevation of the Runway 6 end is 221.0 feet. The Runway 6 landing threshold is displaced 442 feet and the elevation of the displaced threshold is also 221.4 feet. Runway 24, with a threshold elevation of 241.6 feet, is the only one of the four runway ends at MHT that does not have a displaced landing threshold. The pavement is in good to fair condition, where pavement on both sides the intersection with Runway 17/35 are in need of rehabilitation. The runway is aligned in a northeast-southwest direction. Runway 6/24 has high intensity edge lights, centerline lights, and Runway End Identifier Lights (REILs) outboard of each landing threshold. Neither runway end has an approach light system. This runway also has blast pads on both ends. Runway data is presented in **Table 2-1**.

An Engineered Materials Arresting System (EMAS) approximately 300 feet in length by 170 feet in width is located at the Runway 24 end. The EMAS was installed to mitigate the non-standard Runway Safety Area (RSA) beyond that runway end.

Declared Distances

Declared distances are an important factor in takeoff and landing calculations when the available runway length is less than the actual runway length, and operations are impacted by obstacle clearance or Runway Safety Area considerations. While a displaced threshold indicates where the landing threshold is, the available length on the far (rollout) end of the runway may be restricted due to safety area requirements without special marking. Pilots flying under Federal Aviation Regulation (FAR) parts that require consideration of declared distances should consult the Airport/Facility Directory for the available lengths during their runway length calculations.

TABLE 2-1
AIRSIDE FACILITIES-RUNWAYS

	Runway 17/35	Runway 6/24
Length	9,250’	7,650’
Width	150’	150’
Paved Shoulder	25’	25’
Displaced Threshold	336’/850’	442’/0’
True Bearing	156.5˚/336.5˚	42.4˚/222.4˚
Runway End Elevations	216.1/266.4	221.0/241.6
Effective Runway Gradient	0.54%	0.26%
Pavement Surface	Grooved Asphalt-Concrete	Grooved Asphalt-Concrete
Pavement Condition	Very Good	Very Good to Fair[2]
Pavement Strength (lbs.)	200,000 single wheel 300,000 dual wheel 175,000 two single wheels in tandem[1] 350,000 dual tandem	200,000 single wheel 300,000 dual wheel 175,000 two single wheels in tandem[1] 350,000 dual tandem
EMAS	No/No	Yes/No
Traffic Pattern	Left	Left
Markings	Precision/Precision	Precision/Non-Precision

Sources: FAA AVN Datasheet Systems: http://avnwww.jccbi.gov/datasheet/
Airport/Facility Directory, Northeast U.S., dated July 2, 2009.

Notes: [1] Pavement strength for C-130 aircraft.
[2] A 1,500-foot long Section of Runway 6/24 at the runway intersection has a Pavement Condition Index (PCI) of 63.

Table 2-2 lists the available declared distance runway lengths at MHT for four of the runway length analyses that pilots may have to make prior to taking off or landing at the airport. The Take Off Run Available (TORA), Take Off Distance Available (TODA) and Accelerate-Stop Distance Available (ASDA) are takeoff related declared distances; while the Landing Distance Available (LDA) is a declared distance applicable to aircraft landings.

TABLE 2-2
RUNWAY DECLARED DISTANCES

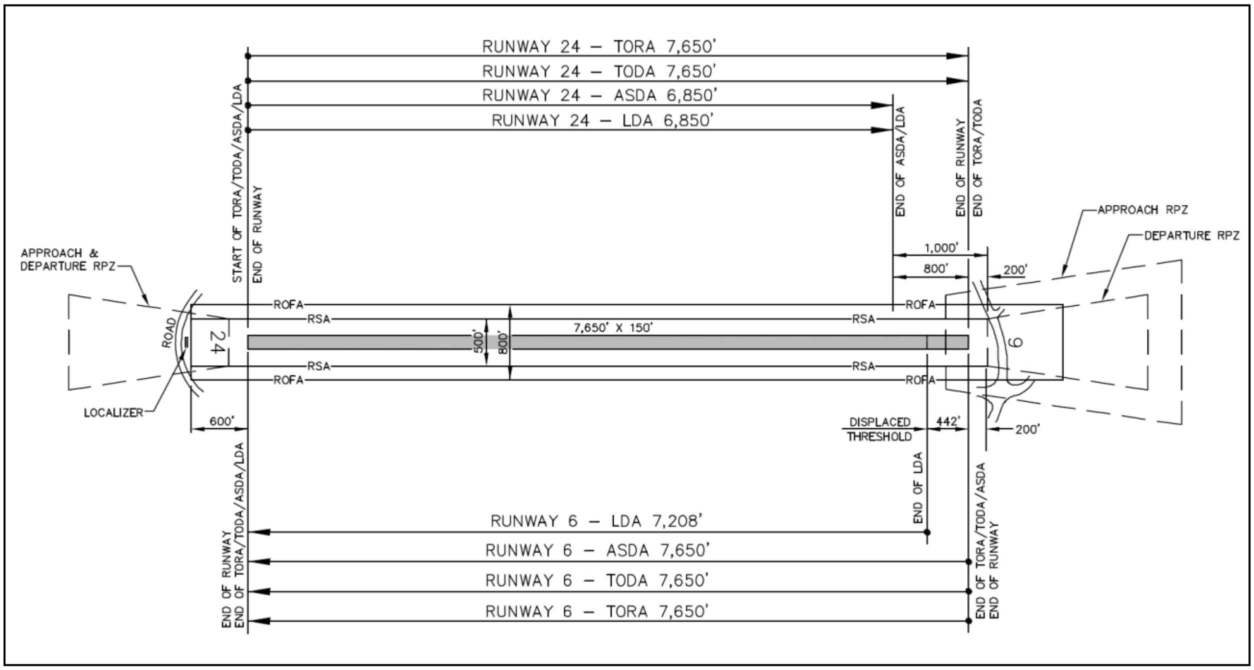
Runway End	TORA	TODA	ASDA	LDA
6	7,650’	7,650’	7,650’	7,208’
24	7,650’	7,650’	6,850’	6,850’
17	9,250’	9,250’	9,250’	8,914’
35	9,250’	9,250’	8,500’	7,650’

Source: Airport/Facility Directory, Northeast U.S., dated July 2, 2009.

Review of the table indicates that the TORA and TODA on both runways are not impacted by safety area or obstruction related considerations, and the entire runway length is available. The ASDA and LDA declared distances are less than the total runway length, which is due to the imposition of safety area and/or obstruction clearance considerations.

Figures 2-4 and 2-5 depict graphically the declared distances for each respective runway.

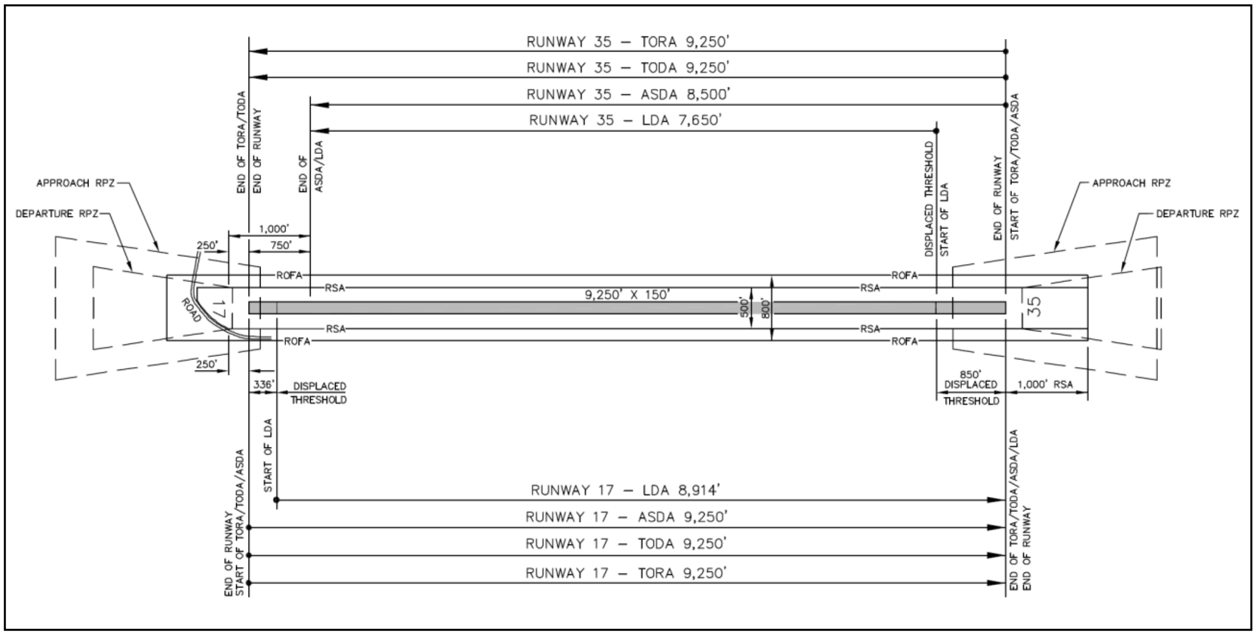
FIGURE 2-4
RUNWAY 6/24 DECLARED DISTANCES



Source: URS Corporation, 2010.

The ASDA is an important factor for many aircraft takeoff calculations, including FAR Part 121 airline operations and FAR Part 135 charter or on-demand air taxi activities. The aircraft must be able to accelerate to the takeoff speed and then come to a complete stop if necessary, within the available distance (ASDA) from the start of its takeoff roll. An ASDA that is less than the runway length indicates that the required safety area beyond the runway end is not present, and, as a result, a portion of the runway must be used to provide the needed safety area, as is the case for Runways 24 and 35. The EMAS located at the end of Runway 6 allows for an ASDA of equivalent length to the entire runway, even though that runway does not have a full safety area.

FIGURE 2-5
RUNWAY 17/35 DECLARED DISTANCES



Source: URS Corporation, 2010.

The LDA is based on two factors when they are less than the full runway length: displaced thresholds for obstacle clearance and runway safety area considerations related to the provision of an adequate overrun area on the far end. Runway 6 has a 442-foot displaced threshold for landings on a 7,650-foot runway, and the 7,208-foot landing length indicates that displacement is the only factor affecting the LDA. For Runway 24 landings, the LDA is 800 feet less than the full length, due to Runway Safety Area considerations beyond the runway end because the runway end is not displaced. The Runway 17 LDA is reduced by 336 feet due to the displaced threshold, and the Runway 35 LDA is reduced by 1600 feet, where 850 feet of the decrease from full length is due to the displaced threshold and 750 feet is reserved to provide the required approved safety area length for overruns.

2.3.2.2 Taxiways

The airport has an extensive system of taxiways, designated with letters from "A" through "P," plus "U," which are described below and summarized in **Tables 2-3 and 2-4**. Figure 2-3 provides a schematic layout of the taxiway system. The taxiways are all 75 feet wide, equipped with Medium Intensity Taxiway Lights (MITL), and have 25-foot shoulders.

> **Taxiway "A"** - Taxiway "A" is a partial parallel taxiway to Runway 17/35. Direct access is provided to the Runway 35 threshold from Taxiway "A" via stub Taxiways "P" and the extension of Taxiway "A" to the end of Runway 35. Access to the Runway 17 end from Taxiway "A" is accomplished by taking the taxiway to Taxiway "B," crossing Runway 17/35 and then utilizing partial parallel taxiway "H." Taxiway "A" is located 400 feet from the centerline of Runway 17/35 for most of its length, and the offset increases to 615 feet at the Runway 35 threshold to meet obstruction clearances for the ILS approach. An extension of Taxiway "A" to the Runway 17 end

has not been constructed due to wetlands, terrain and other factors. The Airport/Facility Directory notes that the Taxiway “A” safety area south of Taxiway “E” to Taxiway “P” is 65 feet wide on the west side, which appears to be due to sloping terrain and is less than the 85.5-foot half-width design standard for Group IV aircraft.

Taxiway “A1” – Taxiway “A1” is a stub taxiway located approximately 470 feet from the Runway 35 landing threshold, which connects Runway 35 to partial parallel Taxiway “A.”

Taxiway “B” - Taxiway “B” is a stub taxiway for both runways, and is located 3,180 feet from the Runway 6 landing threshold and 1,965’ from the Runway 17 landing threshold.

Taxiway “C” - Taxiway “C” is a stub taxiway located approximately 3,359 feet from the Runway 17 threshold. This taxiway also provides access to the east apron and hangar areas.

Taxiway “D” - Stub Taxiway “D” is located approximately 4,350 feet from the Runway 17 threshold. This taxiway also provides access to several aprons and hangars located on the east side of the airport, and to the central terminal area.

Taxiway “E” - Taxiway “E” is a stub and connector taxiway located approximately 2,700 feet from the Runway 35 landing threshold, which provides access to the two partial parallel taxiways, as well as, access to the central terminal area.

Taxiway “F” - Stub Taxiway “F” is located approximately 1,650 feet from the Runway 35 landing threshold, and provides access to Runway 17/35 from two partial parallel taxiways.

Taxiway “G” - Connector Taxiway “G” is located on the air carrier apron and connects it to Taxiway “E” and Taxiways “D” and “N.” The Airport Traffic Control Tower has advised MHT that a section of this taxiway, located between Gates 11 and 15, cannot be seen from the tower due to terminal building interference with the ATCT line of sight.

Taxiway “H” - Taxiway “H” is a partial parallel taxiway for Runway 17/35. The taxiway is located on the east side of the runway and provides direct access to the end of Runway 17. Access to Runway 35 from Taxiway “H” requires that the runway be crossed using Taxiway “F,” which allows access to partial parallel Taxiway “A.” The centerline separation distance from Taxiway “H” to Runway 17/35 is 400’ over most of the length, and increases near the end of Runway 17 to meet navigational aid clearance requirements. The extension of Taxiway “H” to the Runway 35 end was not constructed due to potential impacts upon navigational aids. Large aircraft taxiing westbound from Taxiway “H” near stub Taxiways “C,” “D,” and “E” must use caution and low power settings due to light aircraft parked on the East Ramp.

Taxiway “J” – Taxiway “J” is a partial parallel taxiway which connects Taxiway “H” to the end of Runway 24. The centerline of Taxiway “J” is located 330’ from the Runway 6/24 centerline. Taxiway “J” does not extend the full length of Runway 6/24 to avoid impacts on terminal area development, including Ammon Drive, parking lots “C” and “D,” the Customs facility, the Freudenberg NOK building and parking lot, and other areas.

Taxiway "J1" - Taxiway "J1" is a stub taxiway providing a connection between Taxiway "J" and Runway 6/24.

Taxiway "L" – Connector Taxiway "L" provides access from a hangar and apron area on the northeast side of the airport to Taxiway "H." Air carriers are prohibited from taxiing on Taxiway "L."

Taxiway "M" – Connector Taxiway "M" connects the central terminal area to the Runway 6 threshold. A Section of the taxiway is constructed on a bridge which crosses over Airport Road.

Taxiway "M1" – Stub Taxiway "M1" branches off from Taxiway "M" and connects to the Runway 6 end of pavement. Aircraft holding on Taxiway "M1" may create approach penetrations for the displaced Runway 6 landing threshold.

Taxiway "N" – Taxiway "N" is a connector taxiway located on the air carrier apron which connects to Taxiways "M" and "G."

Taxiway "P" – Taxiway "P" is a stub taxiway between Taxiway "A" and the end of Runway 35.

Taxiway "U" – Taxiway "U" is a stub taxiway between Taxiway "A" and the end of Runway 35.

TABLE 2-3
FULL AND PARTIAL PARALLEL TAXIWAYS

	Taxiway "A"	**Taxiway "H"**	**Taxiway "J"**
Configuration	Partial Parallel	Partial Parallel	Partial Parallel
Runway Served	17/35	17/35	6/24
Length	4,370'	5,250'	2,350'
Width[1]	75'	75'	75'
Paved Shoulder	25'	25'	25'
Surface Condition	Good to Fair[3]	Good to Fair[4]	Satisfactory
Hold Line Distance[2]	N/A and 495'[5]	250' and 490'[5]	250' and 325'[5]
Lighting	MITL	MITL	MITL

Sources: Airport Layout Plan dated August 2007 and August 2008 "As-Built" drawing.
MHT Airport Diagram, U.S. Terminal Procedures, Northeast (NE), Dated July 2, 2009.

Notes:
[1] Taxiway width measured across parallel edges, and may vary due to aircraft turn considerations.
[2] Hold Line Distance is the distance from runway centerline to a hold line centerline.
[3] A 2,100-foot long section south of Runway 6/24 has a Pavement Condition Index of 63.
[4] An 1,100-foot long section adjacent to Taxiway "B" has a PCI of 57.
[5] Distance increased above 250' in approach area to meet obstacle clearances.

TABLE 2-4
STUB AND CONNECTOR TAXIWAYS

Taxiway	Configuration	Length	Width	Paved Shoulder	Surface Condition	Hold Line Distance[1]	Lighting
A1	S	325’	75’	25’	Satisfactory	250’	MITL
B	S	1,000’/325’	75’	25’	Good to Fair	250’	MITL
C	S	325’/325’	75’	25’	Satisfactory	250’	MITL
D	S	870’/325’	75’	25’	Satisfactory	250’	MITL
E	S/C	2,600’/325’	75’	25’	Good to Fair[3]	250’	MITL
F	S	325’/325’	75’	25’	Satisfactory	250’	MITL
G	C	1,900’	75’	25’	Good	--	MITL
J1	S	260’	75’	25’	Satisfactory	250’	MITL
L	C	600’	75’	25’	Satisfactory	610’	MITL
M	S/C	2,600’	75’	25’	Good to Fair	250’	MITL
M1	S	750’	75’	25’	Good to Satisfactory	465’	MITL
N	C	1,700’	75’	25’	Poor to Satisfactory	--	MITL
P	S	700’	75’	25’	Satisfactory	530’	MITL
U	S	530’	75’	25’	Satisfactory	480’	MITL

Source: Airport Layout Plan dated August 2007 and August 2008 “As-Built” drawing.
MHT Airport Diagram, U.S. Terminal Procedures, Northeast (NE), Dated July 2, 2009.

Notes: [1] Hold Line Distance is the distance from runway centerline to a hold line centerline.
[2] A 500-foot long section adjacent to Runway 6/24 has a PCI of 62.
[3] An 850-foot long section from the intersection with Taxiway “E” has a PCI of 56.

2.3.2.3 Aprons

The airport has several apron areas which serve a variety of purposes. The aprons are summarized below:

Terminal Apron – This apron area serves sixteen commercial airline parking positions, and is located on the south and east sides of the terminal. The parking apron is constructed of concrete, with asphalt areas where aircraft taxi.

Northeast Ramp – The Northeast Ramp area is adjacent to the north area hangars, and is located approximately 900 feet east of Runway 17. The ramp pavement around the two smaller hangars is concrete, as is the apron area in front of the Aviation Associates building. The pavement areas adjacent to the two long hangars are asphalt. The ramp area serves general aviation aircraft from the north hangar complex. The ramp areas are in fair condition.

East Ramp – The East Ramp area is located near the mid-point of Runway 17/35 on its east side. The ramp covers an area of approximately 320,000 square feet, and provides parking and tie-downs for general aviation aircraft. The northern ramp area is concrete, makes up about one-third of the total ramp area, and is in good condition, requiring joint maintenance and sealing. The southern ramp area is asphalt, has significant cracking, and is in fair condition.

Wiggins Ramp – The Wiggins ramp is located adjacent to the Wiggins terminal and hangar on the northeast side of the field, approximately 500 feet east of Runway 17/35 and 1,700 feet south of Runway 6/24. The ramp has an area of approximately 263,000 square feet, is constructed of asphalt in fair condition, provides tie-downs, and can accommodate large business jets and charter aircraft.

FedEx Ramp – The FedEx ramp is located in the southwest quadrant of the airport, opposite Apron "A" and directly west of the Hex Hangars. The ramp area covers approximately 239,500 square feet, and has three aircraft parking positions including two concrete hardstands. The pavement is in fair condition. The aircraft which use the ramp are large aircraft such as the DC-10-10, DC-10-30 and Airbus 300. The Airbus 300 is the most common aircraft using the ramp. DC-10s are generally seasonal.

Cargex Ramp – This ramp area covers 111,025 square feet and is located directly west of the Fed-Ex ramp. The asphalt pavement is in fair condition, contains three aircraft parking positions, including one concrete hardstand.

UPS Ramp - The United Parcel Service (UPS) ramp is located in the southwest quadrant of the airport, opposite Apron "E" and directly west of the Cargex building and ramp. The overall ramp area consists of 192,000 square feet of aircraft parking pavement, where the concrete pavement includes two aircraft parking positions on a 225-foot by 400-foot concrete parking apron. The apron areas are in fair condition. The aircraft which use the concrete ramp include large aircraft such as the Boeing 767-300, Airbus 300 and DC-8/73. The UPS ramp area also provides tie-downs for small aircraft flying feeder routes. These tie-down positions are located adjacent to and south of the concrete apron. The asphalt pavement is in fair condition.

BAE and Flight One Aprons – Two small aprons are located in the area where ProStar, BAE and other private hangars are situated on the southwest side of the airport, 1,000 feet west of Runway 17/35 and 1,000 feet south of the terminal building. The BAE hangar has a concrete area in front of the building, and the rest of the apron areas are asphalt. The Flight One apron has an area of approximately 72,000 square feet, and the BAE ramp covers approximately 18,000 square feet. The pavements are in fair condition.

Hex Hangar Apron – Apron areas surround the three hex hangars which are located east of the FedEx cargo area. The pavements are in good condition.

Apron "A" – Apron "A" is adjacent to Taxiway "N" and opposite the south side terminal apron. The apron area is used for Remain Over Night (RON) airline parking for up to five aircraft, and covers an area of 105,834 square feet. The apron construction consists of a 60-foot by 400-foot concrete parking area with an asphalt area adjacent to the taxiway. Both pavements are in fair condition.

Apron "B" – Apron "B" is adjacent to Taxiway "N" and opposite the south side terminal apron. The apron area is used for RON airline parking for up to three aircraft, and covers an area of 53,621 square feet. The apron construction consists of a 60-foot by 790-foot concrete parking area with a 40-foot by 120-foot extension, and an asphalt area on the side leading to the taxiway. Both pavements are in fair condition.

Apron "C" – Apron "C" is adjacent to Taxiway "G" and opposite the north side terminal apron. The apron is used for RON airline parking for up to two aircraft, and covers an area of 53,898 square feet. The construction consists of a 60-foot by 260-foot concrete parking area in the middle of an asphalt ramp, where both pavements are in fair condition.

Apron "D" – Apron "D" is adjacent to Taxiway "G and Apron "C," is opposite the north side terminal apron, and is used for RON airline parking for two aircraft. The apron covers an area of 51,956 square feet. The apron consists of a 60-foot by 250-foot concrete section surrounded by asphalt pavement. Both pavements are in fair condition.

Apron "E" – Apron "E" is located between Aprons "C" and "D" and Taxiway "A." Apron "E" is located on the east side of the terminal and covers an area of 163,295 square feet. The apron is used for up to five RON aircraft, and consists of a 60-foot by 650-foot concrete parking area in the middle of an asphalt ramp. Both pavements are in fair condition.

2.3.2.4 Airfield Pavement Condition Index Scores

The airfield pavement condition index scores specific to the MHT are discussed in details in **Appendix E1** of this Airport Master Plan Update.

2.3.3 AIRFIELD LIGHTING

Table 2-5 provides a summary of the runway lighting at MHT. All of the airport lighting systems are in good condition.

TABLE 2-5
RUNWAY LIGHTING

Runway End	Edge Lights	Centerline Lights	Touchdown Zone Lights	Approach Lights	REILS
17	HIRL	Yes	Yes	MALSR	None
35	HIRL	Yes	Yes	ALSF-2	None
6	HIRL	Yes	None	None	Yes
24	HIRL	Yes	None	None	Yes

Source: Airport/Facility Directory, Northeast U.S., dated July 2, 2009.

2.3.3.1 Runway 17/35 Lighting

Runway 17/35 is the primary instrument runway at the airport and is supported by an extensive system of lights. A High Intensity Runway Lighting System (HIRL) provides the edge lighting and centerline lights are installed on the runway. Both runway ends are equipped with Touchdown Zone Lights (TDZL). Centerline and touchdown zone lights reduce the Category I Instrument Landing System (ILS) visibility from RVR (Runway Visual Range) 24 (2,400 feet) to RVR 18 (1,800 feet) and allow low visibility/ceiling Category II and III ILS landings on Runway 35.

Approach light systems offer pilots important information on distance from threshold, centerline alignment, and roll. Approach lighting systems also reduce visibility minimums. Runway 17 landings are supported by MALSR. A MALSR starts 200 feet from the landing threshold and consists of 1,400 feet of steady burning white lights and 1,000 feet of flashing white strobes, with a 200-foot separation down the centerline between light stations. The 1,000-foot bar on a MALSR consists of three light stations instead of one, is considerably wider than the other light stations, and can be used by pilots to judge aircraft roll, distance from threshold, and centerline alignment.

The ALSF-2 approach light system on Runway 35 is more sophisticated than the Runway 17 MALSR. The ALSF-2 utilizes more lights and rows of steady burning lights than a MALSR. The light stations are located every 100 feet down centerline, with 1,000 feet of steady burning lights following by 1,400 feet of alternating steady burning and flashing strobes. ALSF-2 lights are high intensity. An ALSF-2 system is designed to increase the visible distance of the approach lights during adverse weather conditions. ALSF-2 is the standard approach lighting system for the low visibility Category II and III ILS approaches.

2.3.3.2 Runway 6/24 Lighting

Runway 6/24 is equipped with HIRL and centerline lights but does not have approach lights or touchdown zone lights. REILS, which consist of white flashing strobes placed adjacent to both edges and outboard of the runway end, are located on both ends of the runway and assist pilots in identifying runway ends. REILS provide a benefit in urban areas where the approach environment to a runway has many nearby light sources.

2.3.3.3 Airport Rotating Beacon

The airport rotating beacon is located off-airport, about 2,700 feet east of the Wiggins Aviation hangars. Access to the beacon is by an access easement off Harvey Road. The rotating beacon consists of a clear/green light, with a top elevation of approximately 486 feet MSL which stands about 220 feet above the end of Runway 35. The beacon assists pilots in locating the airport, particularly pilots flying under Visual Flight Rules who may not be using electronic navigational aids.

2.3.3.4 Special Taxiway Low Visibility Guard Lighting at Hold Lines

In accordance the Surface Movement Guidance Control System (SMGCS) plan for the airport, Holding Position Markers and elevated Guard Lights are in place at the hold lines for Taxiways “P,” “A1,” “F,” “E,” “D,” “C,” “B,” “H,” and “A” (hold adjacent to Runway 6/24). Taxiway “H” has in-pavement Guard Lights and standard Holding Position Markers. Guard Lighting is designed to confirm the presence of an active runway and assist in preventing runway incursions.

2.3.4 *ON-AIRPORT NAVAIDS AND EN-ROUTE NAVAIDS*

2.3.4.1 On-Airport NAVAIDS

Manchester-Boston Regional Airport has several of on-airport navigational aids (NAVAIDS) that assist pilots in flying toward and landing at the airport. Runways 6, 17 and 35 have an Instrument Landing System (ILS), which support precision approaches. An ILS provides high accuracy electronic signals which help pilots line up with the runway centerline and follow a defined glide path to the Decision Altitude, where the pilot either sees the runway end environment and can safely land or initiates a missed approach. The ILS consists of a localizer antenna which generates the centerline alignment signal and a glide slope which produces the vertical glide path. At MHT, the glide path angle is 3.0 degrees for Runways 6 and 35 and 3.1 degrees for Runway 17.

All four runway ends at MHT are supported by Precision Approach Path Indicators (PAPI), which are visual navigational aids located adjacent to the runway they serve. PAPIs provide visual glide slope guidance to the runway, which offers pilots a vertical descent course with adequate obstacle clearance and reduces pilot workload during approaches with reduced visual cues such as during Instrument Flight Rules (IFR) weather or at night. All of the PAPI are four-box systems and the Runway 6, 24 and 35 PAPI systems have a 3.00 degree aiming angle with a 50-foot threshold crossing height. The Runway 17 PAPI provides a 3.10 degree aiming angle with a 49-foot threshold crossing height.

The airport has an on-site Distance Measuring Equipment (DME) facility, which can be used by pilots flying DME receiver equipped planes to determine the distance from the DME facility. The airport DME is co-located with the localizer/MALSR building in the Runway 17 Runway Protection Zone. The DME is used to support several instrument approaches at the airport by providing “fix” information (a “fix” is a specific point on an instrument landing approach where changes to the course or altitude are required).

2.3.4.2 En-Route NAVAIDS

Very High Frequency Omni-Directional Radio Range (VOR) transmits radial signals which allow pilots to fly to or from the VOR on a defined bearing. A VOR can also be used in concert with another VOR to determine an aircrafts’ approximate location along a VOR radial, or indicate when an in-flight “fix” has been reached (a point in space where flight altitude or direction should change). Prior to Global Positioning System (GPS) satellite navigation, VOR was the primary navigational aid used for en route navigation, fix generation, and non-precision instrument approaches.

When a VOR is co-located with a DME, the facility is called a VOR-DME and pilots can determine their distance from the VOR by the DME reading in their aircraft. A VOR that is co-located with a Tactical Air Navigation System (TACAN), which is a military version of DME, is identified by a Very High Frequency Omni-Directional Radio Range Tactical Air Navigation Aid (VORTAC) designation.

Table 2-6 displays the location of VOR facilities within 40 nautical miles of the airport.

TABLE 2-6
VOR FACILITIES WITHIN 40 NAUTICAL MILES OF MHT

VOR	Radial/Distance	VOR Type	Frequency
Manchester (MHT)	338/04.8	VOR-DME	114.40
Concord (CON)	175/18.3	VOR-TAC	112.90
Lawrence (LWM)	323/18.9	VOR-DME	112.50
Pease (PSM)	267/28.0	VOR-DME	116.50
Gardner (GDM)	064/35.9	VOR-DME	110.60
Keene (EEN)	092/38.6	VOR-TAC	109.40
Boston (BOS)	346/39.7	VOR-DME	112.70

Source: http://www.airnav.com/
Notes: Distances in nautical miles.
Radial/Distance is measured from VOR to MHT.

The three closest VOR to MHT include the:

- Manchester VOR-DME is 4.8 miles southeast of MHT, and about two miles west of Derry.
- Concord VORTAC is located 18.3 nautical miles north-northwest of the center of the airport, and 3.6 miles northwest of the center of the Concord Municipal airport.
- Lawrence VOR-DME is 18.9 nautical miles west-northwest of MHT, just outside the southwest edge of Haverhill.

An En Route VOR may be used to direct pilots to the MHT instrument approaches. Additionally, the airport has VOR non-precision approaches to Runways 17 and 35.

GPS-based systems are playing a larger role in aircraft navigation since the Wide Area Augmentation System (WAAS) increased the accuracy of the basic signals by providing ground based adjustments. The fixed location of VOR ground stations limited instrument flights and approaches using VOR to certain routings, which were often far from direct, were aligned at a wide angle from runway centerline, and/or suffered from the relatively wide VOR signal spread. In comparison, GPS WAAS navigation offers more flexibility due to the creation of courses which are not tied to ground facilities, have relatively small signal spreads, and offer more direct routes, which saves time and fuel. The greater signal accuracy of WAAS GPS compared to VOR allows closer aircraft spacing and improved airspace capacity, lower instrument approach minimums, and results in a higher percentage of completed instrument approaches.

Required Navigational Precision (RNP) utilizes WAAS-aided GPS signals for horizontal course guidance and a computer generated glide path based on barometric pressure, which allows en-route aircraft spacing to be significantly reduced when signal accuracy attains specified levels. The obstacle clearance surface width for RNP approaches is a constant width, compared to ILS and non-precision approaches, which can be useful for flights near or in between mountains. RNP also offers the potential for curved instrument approaches with a glide path, which is not currently possible with other vertical guidance approaches and may allow an approach to skirt significant obstacles near the extended centerline.

Manchester-Boston Regional Airport has non-precision GPS approaches, as well as WAAS supported Localizer Precision with Vertical guidance (LPV) approaches to Runways 6, 17 and 35 that provide horizontal and vertical approach guidance using high accuracy signals. Non-precision GPS (LNAV/VNAV) approaches that use GPS lateral guidance have been published for MHT, and an RNP approach for Runway 17 has been published as well.

2.3.5 AIRSPACE AND AIR TRAFFIC CONTROL

Airspace and air traffic control specific to the MHT is discussed in details in **Appendix E2** of this Airport Master Plan Update.

2.3.6 EXISTING CFR PART 77 CIVIL AIRPORT IMAGINARY SURFACES

2.3.6.1 Existing Obstructions

The latest FAA 5010 inspection for the airport, which was conducted by FAA Certification personnel on April 22, 2009, indicated that the 50:1 CFR Part 77 Precision Approach surfaces for Runways 6, 17 and 35 contained obstructions. The FAA review also identified obstructions to the 34:1 slope Non-Precision Approach surface for Runway 24. Review of the September 2009 obstruction mapping prepared by Hoyle, Tanner & Associates confirms the general findings of the FAA obstruction analysis.

Based on discussions with airport personnel, the airport has existing easements which apply to a significant portion of the FAR Part 77 surfaces for all four runways, and the tree obstructions in the Approach surface will be trimmed in the near future.

The MHT airport Obstruction Chart (OC 246, dated September 2004) identifies several areas on the east side of Runway 17/35 where trees penetrate the Horizontal and Conical surfaces. Additionally, the Transitional surfaces alongside both runways had charted obstructions at the time of the survey.

2.3.6.2 Terrain Penetration to Primary Surface – Runway 17/35 and Taxiway "H"

The standard precision runway primary surface requirement is 1,000 feet wide for Runway 17/35. The standard requires that no object or terrain penetrate the primary surface, defined as being the same elevation as the nearest point in the runway centerline.

It was proposed that the approximate 1-2 foot pavement elevation penetration was acceptable until the East Ramp is to be completely rehabilitated. As part of that project, the runway primary surface horizontal elevation requirement will be addressed.

The runway was completely rehabilitated and extended in 2002. The rehabilitation and extension of the runway was completed meeting design standards where practical. A section of the existing east ramp pavement area penetrates the horizontal plane of the primary surface by approximately 1-2 feet. Modifying the East Ramp pavement elevation was not part of the Runway 17/35 rehabilitation project. Sections of Taxiway "H" were constructed to match grades of the East Ramp and will need to be reconstructed along with the East Ramp in order to fully comply with the primary surface standards.

The design standard will be reviewed during the future East Ramp rehabilitation project. Taxiway gradient and drainage will be considered as part of the value engineering assessment and cost benefit analysis.

2.3.7 PUBLISHED INSTRUMENT APPROACHES AND TERPS SURFACES

The published instrument approaches and Terminal Instrument Procedures (TERPS) surfaces specific to the MHT are discussed in details in **Appendix E3** of this Airport Master Plan Update.

2.3.8 AIRPORT/AIRFIELD MAINTENANCE

Airfield Operations/Maintenance staff are responsible for day to day operations and maintenance functions on the airfield, including daily Part 139 inspections, record keeping, Notice to Airmen (NOTAM), and repairs. Pavement maintenance duties include crack sealing, seal coating, and striping (including streetside striping). Other responsibilities include safety area repair, mowing, electrical repairs, and snow removal. The first shift at the airport has a total of 10 personnel.

Airport Mechanics are responsible for repair and maintenance of all specialty airport equipment and vehicles, including Aircraft Rescue and Firefighting (ARFF) vehicles, and snow removal equipment. Building Maintenance personnel are responsible for day-to-day maintenance functions at landside facilities, including terminal building, jetway bridges, escalators and elevators, streetside access roads, parking garage and remote parking lots, and snow removal of all entrance and perimeter roadways. Landscaping is also a responsibility of Building Maintenance.

Airport equipment maintenance is primarily conducted out of the facility shared with ARFF. The north half of the building is dedicated to maintenance. This facility is in excellent condition.

The old airport maintenance facility, Airfield Annex, is primarily used for maintenance equipment storage and some equipment repair. The building is in fair condition and is also used for additional ARFF equipment storage.

There are both landside and airside sand and salt storage facilities at the airport. The landside sand and salt storage building is located on the west side of the airport on Woodlawn Drive, which is off Perimeter Road and close to Parking Lot “F.” The building, constructed in 2006, is in very good condition and is a one story wood-framed structure. The approximate building dimensions are 60 feet by 84 feet (5,040 square feet), with approximately 3,600 square feet allocated for sand storage.

Airside sand storage is in a pre-engineered, single-story steel frame building adjacent to the intersection of Taxiways “H” and “J” on the northeast side of the airport. The approximate dimensions of the building are 125 feet by 144 feet and the building was constructed in 2007. The sand storage area takes up 4,800 of the 18,000 square feet floor area, and the building is in very good condition.

The airport currently has two snow melters, which are located on the airline terminal apron between parking aprons “A” & “B” and “C” & “D.” The airport plans to replace the two existing snow melters in the near future with permanent stationary in-ground hydronic melters capable of processing 300 tons per hour under optimum conditions.

Several other buildings on the airport are used for maintenance equipment storage, such as the old Wiggins hangars and two buildings on Kelly Avenue that are directly to the north of the Aviation Museum. The square footage of the maintenance buildings are:

Airfield annex	12,500 square feet
MCI	14,400 square feet
Sand Storage	18,000 square feet
Maintenance shop	14,000 square feet
Wiggins South	15,000 square feet
Wiggins West	10,000 square feet
Salt storage	4,000 square feet

Appendix E7 provides a list of building and airfield maintenance vehicles.

2.3.9 AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Airports with scheduled airline service, such as MHT, must obtain an operating certificate from FAA which requires that the airport meet the certification requirements listed FAR Part 139, which include a section on ARFF facilities and associated equipment. MHT is currently certificated as an ARFF Index C airport under the criteria listed in paragraph 139.315, which is associated with scheduled service by aircraft which are at least 126 feet long but less than 159 feet in length. The ARFF requirements for Index C are identified in paragraph 139.317 and Index C airports may meet the minimum requirements in one of two ways:

- With three vehicles, where one vehicle carries the extinguishing agents specified in paragraph (a)(1) or (a)(2) of Section 139.317, and the other two vehicles carry an amount of water and the commensurate quantity of Aqueous Film Forming Foam Agent (AFFF) so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons.
- With two vehicles, where one carries the extinguishing agents as specified in paragraph (b)(1) of Section 139.317, and the other vehicle carries water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons.

The specified extinguishing agents in paragraphs 139.317(a)(1) and 139.317(a)(2) consist of 500 pounds of sodium-based dry chemical, halon 1211, or clean agent, and 450 pounds of potassium-based dry chemical with a commensurate quantity to total 100 gallons for simultaneous dry chemical and AFFF application. The paragraph 139.317(b)(1) extinguishing agent specification is for 500 pounds of sodium-based dry chemical, halon 1211, or clean agent, and 1,500 gallons of water and the commensurate quantity of AFFF for foam production. The existing airport ARFF vehicles meet the Part 139 standards, and are listed in **Table 2-7**.

TABLE 2-7
AIRPORT ARFF VEHICLES

Vehicle Reference	Description	Year	Manufacturer	Condition
AP-EZ001	1996 Chevrolet Cargo Van	1996	Chevrolet	Good
AP-EZ002	2001 CFR Fire Truck	2001	Oshkosh	Good
AP-EZ003	1989 GMC 4X4 Pickup	1989	GMC	Fair
AP-EZ004	1989 CFR Fire Truck	1989	Oshkosh	Fair
AP-EZ005	1989 CFR Fire Truck	1989	Oshkosh	Fair
AP-EZ006	Ford CFR Rescue Truck	2004	FMC	Good
AP-EZ008	1988 CFR Fire Truck	1988	International	Fair
AP-EZ009	Ford Escape Hybrid Security	2009	FMC	Good

Source: MHT, 2009

Paragraph 139.319 indicates that ARFF vehicles and their systems must be maintained so as to be operationally capable of performing their functions for all air carrier operations and must be provided with cover to ensure equipment operation and discharge under freezing conditions when the airport is subject to prolonged temperatures below 33 degrees Fahrenheit. The ARFF facility at MHT is located in a two story, 27,300 square-foot steel frame and masonry building that is shared with Airport Airfield Maintenance. The building dimensions are approximately 100 feet by 200 feet, and the building is in very good condition. It is located adjacent to Taxiway “H” and near the intersection of Runways 17/35 and 6/24.

The building provides an office for administrative support of ARFF operations and four bays for the storage and maintenance of ARFF equipment. The ARFF facility is staffed twenty four hours a day by contract personnel certified to meet the requirements of FAR 139.319.

2.3.10 AIRPORT TRAFFIC CONTROL TOWER (ATCT)

The Airport Traffic Control Tower (ATCT) at MHT was constructed in 2006 and is located on the southwest side of the terminal area, approximately 250 feet west of the parking garage. The control tower is 165 feet above ground. The facility is operational twenty four hours a day, 365 days a year. The tower was commissioned in October 2006.

Approximately thirty individuals staff the ATCT. There are 20 auto parking spaces, 2 handicap spaces, and 5 service vehicle locations at the facility.

The Airport Surveillance Radar (ASR-9) facility for the airport is located in Chester, NH, covers a 60 nautical mile range and picks up on objects about 150 feet above the ground. ATCT observation of the radar returns is generally focused on the area within ten miles of the airport.

There is a line of sight block from the tower to Taxiway “G” due to the terminal building. This blockage is located in the approximate area between gates 11 and 15.

2.3.11 SURROUNDING SPECIAL AREA AIRSPACE

An area of restricted airspace associated with the Devens Reserve Forces Training Area is located 30 miles south-southwest of MHT. This is the only reserved, restricted, or prohibited airspace in the immediate vicinity of the airport.

2.3.12 AIRFIELD DRAINAGE

Airfield drainage is comprised of standard system components for stormwater collection, retention, and distribution to a system of outfalls. The system includes inlets, underground pipes, above ground drainage swales and other common features.

2.3.13 AIRFIELD SECURITY FENCING

Airfield security fencing at MHT is installed around the aircraft operational areas, except for areas adjacent to the retaining walls on the east and west sides of the airport. Security fencing is located between public access areas and the runways, taxiways, aprons and other areas that are important to aircraft operations, including on-airport navigational aids. The fence line extends for a total of 46,194 feet, and consists of 8-foot high chain-link fencing with three strands of barbed wire. The fencing is in good condition and is inspected daily by airport personnel.

2.4 TERMINAL FACILITIES

2.4.1 TERMINAL BUILDING

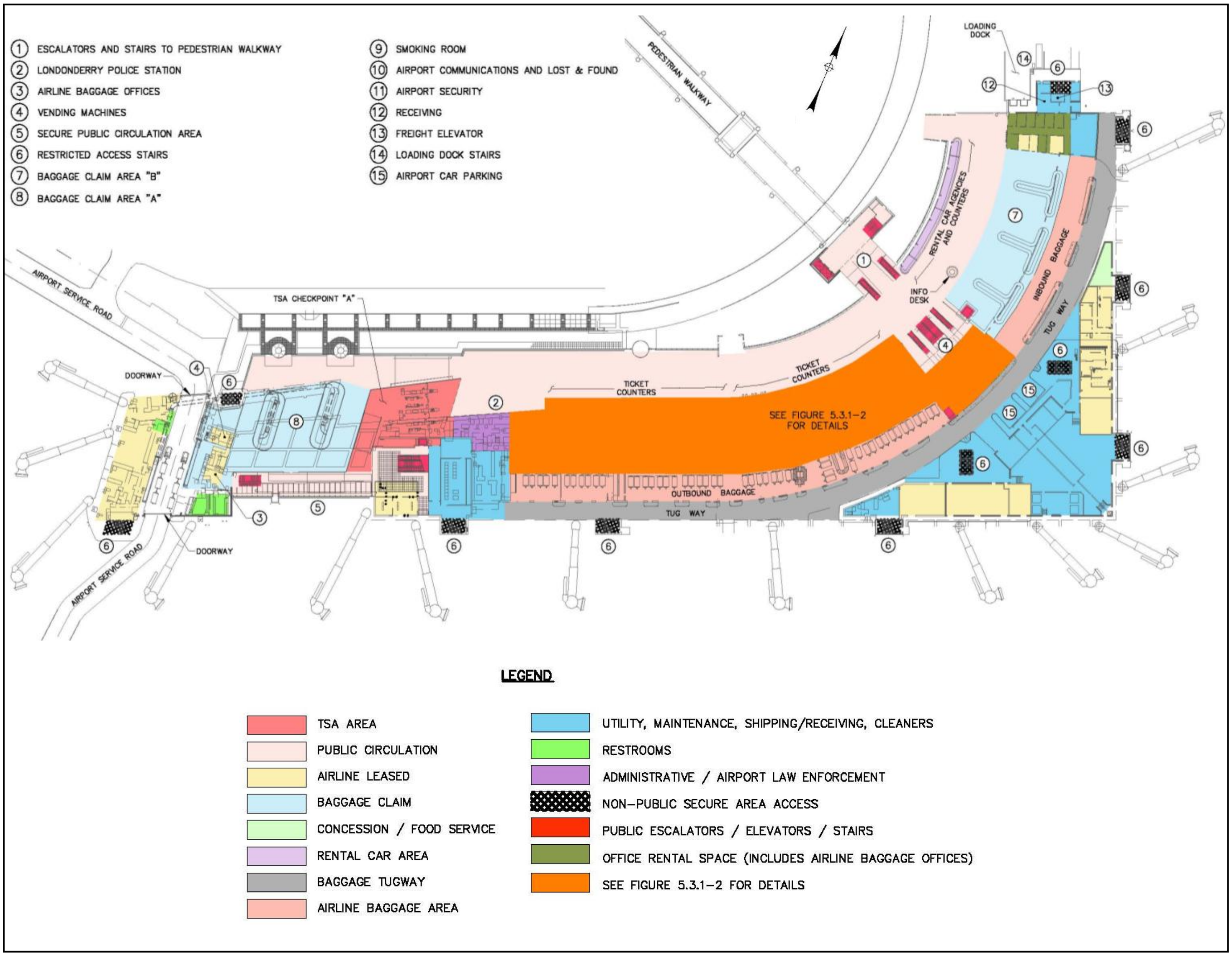
The passenger terminal building at MHT consists of a total of 332,600 square feet; general space break down is shown in **Table 2-8**. The passenger terminal building has three levels: the 1st floor (Arrivals Level) contains airline ticketing areas, baggage claim units, rental car counters, baggage service offices, and a security screening facility. The 2nd Floor (Departures Level) contains airline gates, two security screening areas, and the bulk of the terminal's concessions, along with a lobby area and an atrium. The 3rd level houses airport administrative offices. There is also a Mezzanine Level which serves as a connector to the garage. **Figures 2-6 through 2-9** identify the various uses on each floor of the terminal:

TABLE 2-8
TERMINAL SPACE ALLOCATION

Use	Approximate Space (sq. ft.)
Transportation Security Administration Areas	22,501
Public Circulation	86,186
Airline Leased	53,389
Baggage Claim	22,226
Concession/Food Service	22,353
Baggage Tugway	16,640
Rental Car Area	1,301
Airline Baggage Area	16,387
Restrooms	8,619
Utility, Maintenance, Shipping/Receiving, Cleaners	30,497
Game Room, Smoking Room, Granite Club	852
Administrative. Airport Law Enforcement	13,699
Non-Public Secure Area Access	6,767
Public Escalators, Elevators, Stairs	7,374
Office Rental Space (Includes Airline Baggage Offices)	1,730
Common Area Hallways (Airline/TSA use)	1,008
Frequent Flyer Lounge, Business Facilities	795
Total Area	**312,322**

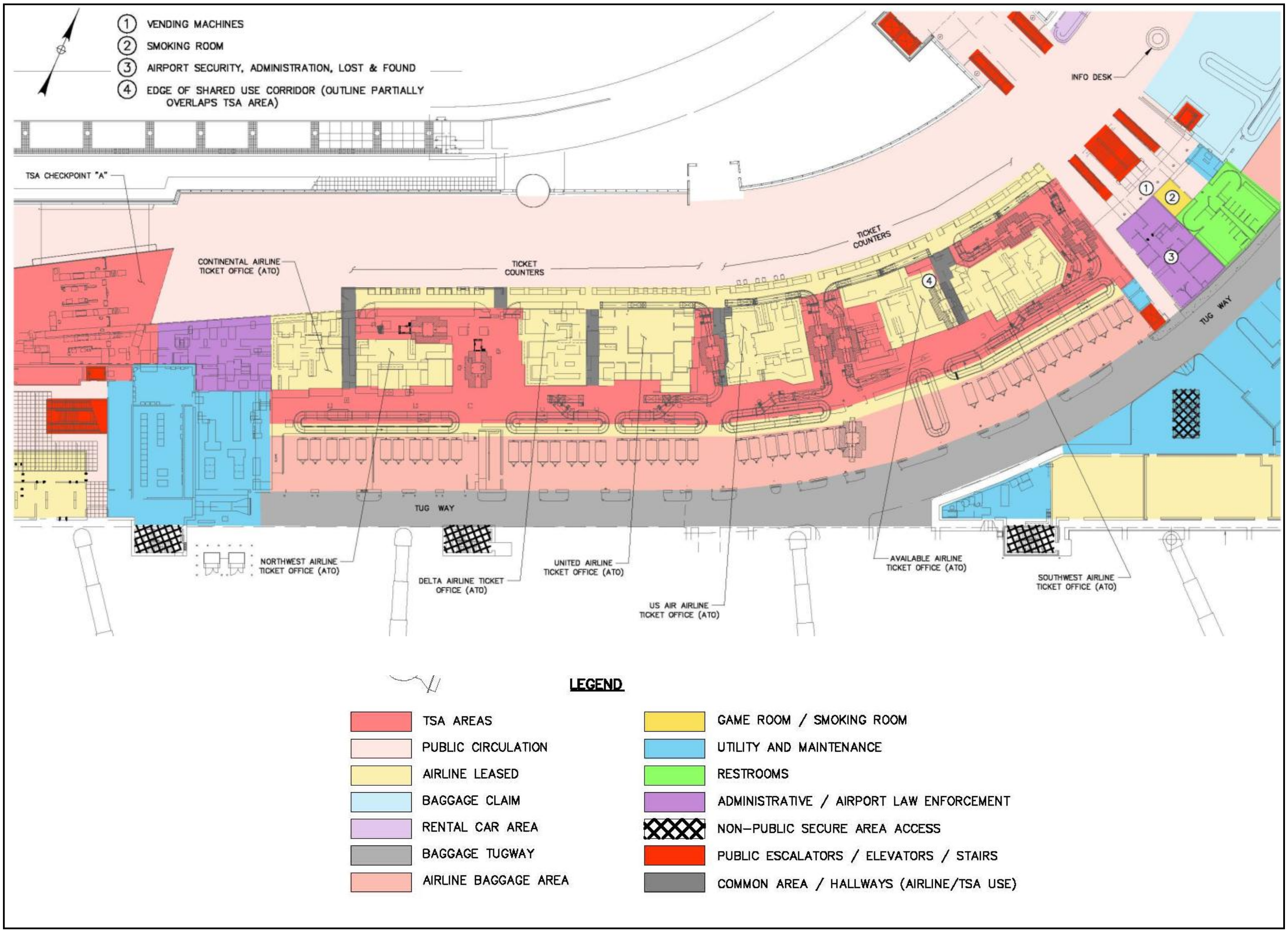
Source: McFarland Johnson, Inc., 2010.
Note that the total does not sum to the total square footage, as much of the space falls into multiple categories.

FIGURE 2-6
AIRPORT TERMINAL BUILDING, FIRST FLOOR



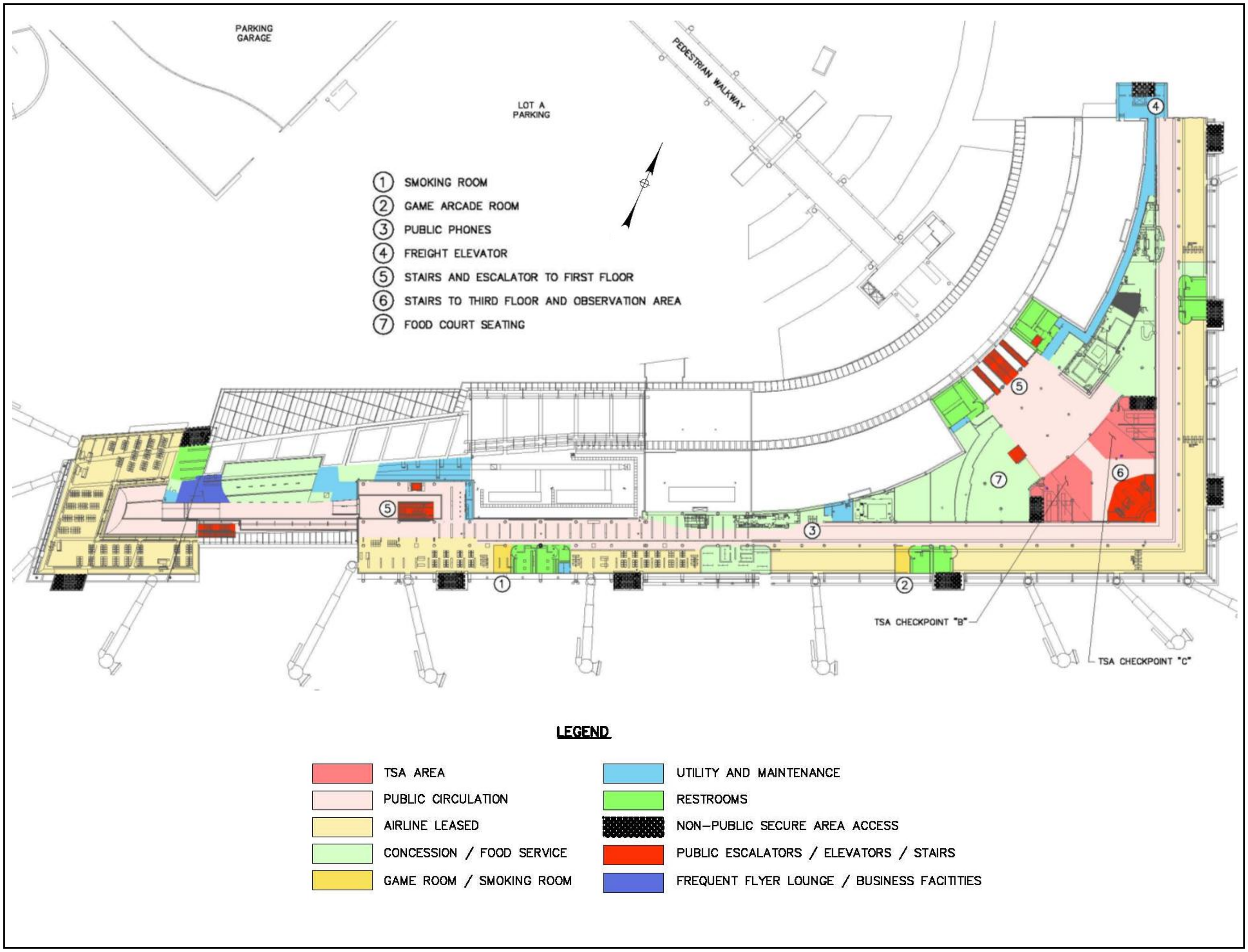
Source: McFarland Johnson, 2010.

FIGURE 2-7
AIRPORT TERMINAL BUILDING, FIRST FLOOR DETAILS



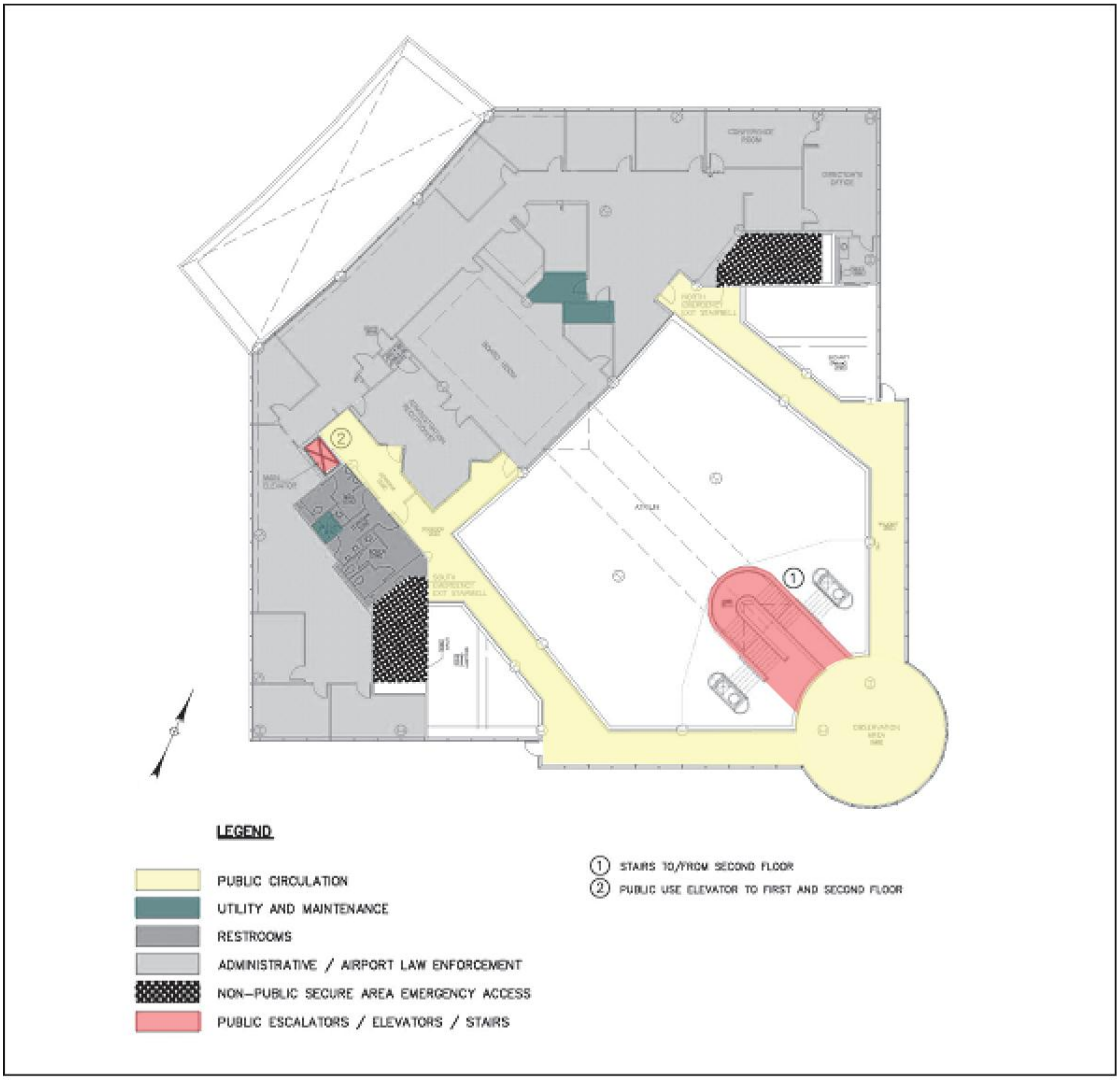
Source: McFarland Johnson, 2010.

FIGURE 2-8
AIRPORT TERMINAL BUILDING, SECOND FLOOR



Source: McFarland Johnson, 2010.

FIGURE 2-9
AIRPORT TERMINAL BUILDING, THIRD FLOOR



Source: McFarland Johnson, 2010.

2.4.1.1 Terminal Area Space – Airlines

Each tenant airline at Manchester-Boston Regional Airport leases space from the airport as shown in **Table 2-9**. In addition to this exclusive use space, each airline pays for a share of common-use space in the terminal, which includes baggage claim and security areas. Each airline pays a fixed share for 36,283.86 square feet of common-use space, as well as a pro-rata share, based on enplanements, of 145,135.42 square feet of space. It should be noted that, while Comair (Delta) and Northwest are currently operating under separate contracts, due to their recent merger, they have consolidated their operations. It is possible that when the current leases expire, they will give up the space under one of the two leases this may not be the case. They may sit on the unused space to keep out competitors. An additional carrier, Air Canada, operates at MHT; however, it does not lease any space directly from the airport and its flights are handled by Continental Airlines.

The counter positions available for each airline are identified in **Table 2-10**.

Figure 2-10 depicts the aircraft parking locations associated with the passenger terminal building apron and RON aircraft parking aprons. The available RON parking apron totals 428,604 square feet, of which 97,977 square feet (three parking spaces) is currently open. The assignment of RON parking locations is as follows:

	Apron "A"	Apron "B"	Apron "C"	Apron "D"	Apron "E"
Comair (Delta)	A1 and A2	--	--	--	--
Northwest	A3	--	--	--	--
Continental	A4	--	--	--	--
United	A5	--	C2	--	--
USAir	--	B1 thru B3	C1	--	E1
Southwest	--	--	--	D1 and D2	E5
Open	--	--	--	--	E2 thru E4

2.4.1.2 Airport Administrative Space

Airport Administrative staff occupies the entire 3rd floor of the passenger terminal building, utilizing approximately 5,880 square feet of space. Offices for the Airport Director and his staff, marketing office, properties and commercial staff, and accounting are located on this level.

TABLE 2-9
AIRLINE TERMINAL/RAMP SPACE

Airline	Gate Locations	Ticketing, ATO, Bag Makeup	Operations Office	Baggage Services Office	Departure Lounge	Total	Apron	RON Apron	Total
Comair (Delta)	7 and 7A (leased, not used[1])	4,993	----	----	1,904	**6,897**	41,680	54,053	**95,733**
Continental	1 and 2	4,977	1,057	261	4,299	**10,594**	55,073	16,810	**71,883**
Northwest	3 and 4	4,831	1,232	241	4,277	**10,581**	60,555	18,239	**78,794**
Southwest	11 – 15A	8,282	4,089	277	7,934	**20,582**	135,438	84,615	**220,053**
United	5 and 6	5,439	1,238	252	2,195	**9,124**	55,372	43,681	**99,053**
USAirways	8, 9, 9A	5,591	2,386	287	4,776	**13,040**	74,590	113,229	**187,819**
Open	10	2,866	704	TBD	1,162	**4,732**	22,874	97,977	**120,851**
	Totals	**36,979**	**10,716**	**1,318+**	**26,548**	**66,050**	**445,582**	**428,604**	**874,186**

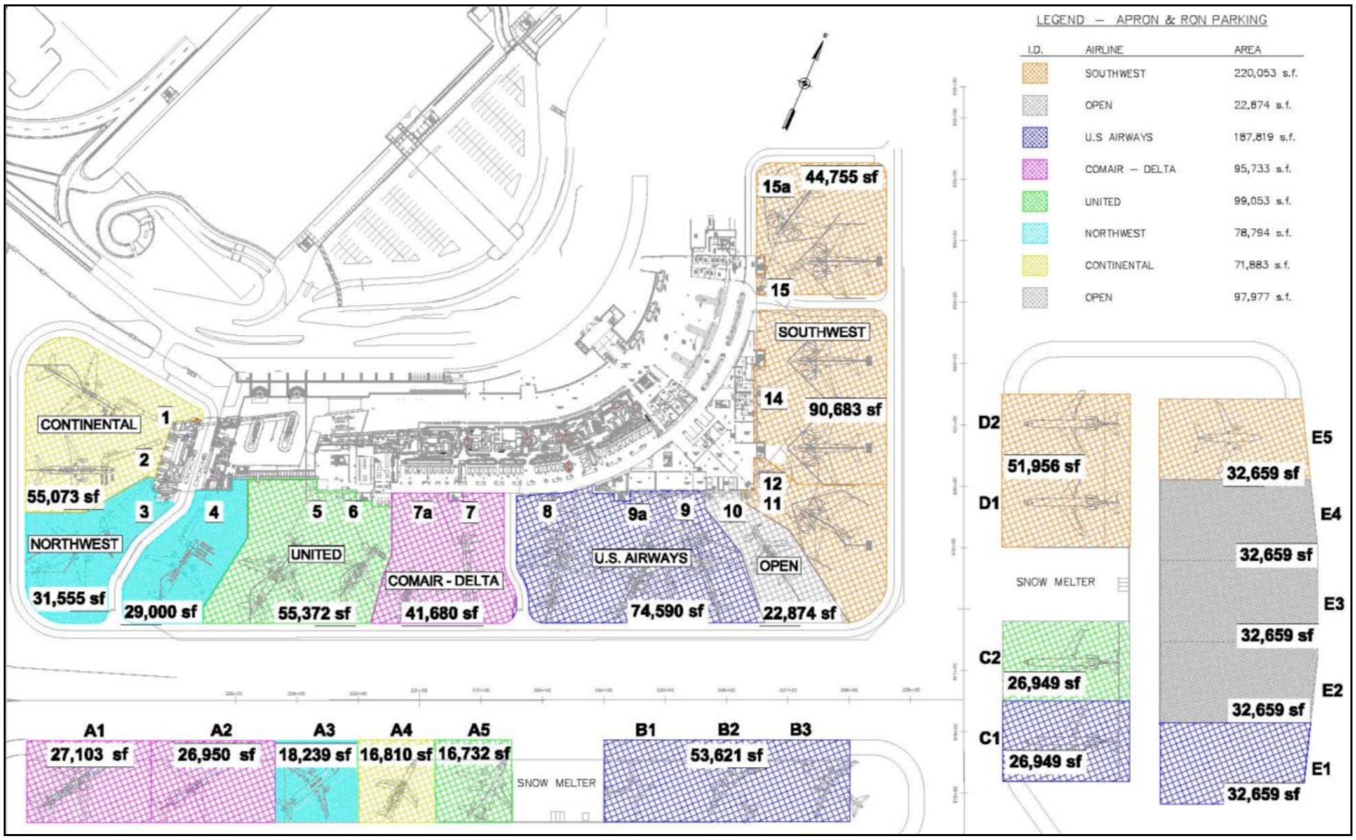
Source: MHT records, 2009.
Note: [1] Comair (Delta) has been using the Northwest locations.

TABLE 2-10
AIRLINE CHECK-IN COUNTER POSITIONS

Airline	First Class	SSK Only	SSK & Bag Drop	Full Service With Agent	Vacant Positions	Total	Curbside Check-in
Southwest	--	2	6	2	3	13	Yes
Vacant	--	--	--	--	6	6	--
Vacant	--	--	--	--	6	6	--
US Airways	Yes	--	4	4	2	10	--
United	Yes	--	6	4	2	12	--
Delta/Comair	--	--	4	2/1 freight	7	14	--
Northwest	--	--	--	--	9	9	--
Continental	--	--	4	4	2	10	--

Source: MHT Records, 2009.

FIGURE 2-10
RAMP APRON AND REMOTE APRON ASSIGNMENTS



Source: MHT; McFarland Johnson, 2010.

2.4.1.3 Concession Space

In order to meet customer expectations and to increase revenue to the airport, there are a number of concessions offering food and retail products to the traveling public, employees, and other visitors to the terminal. Food service concessions are primarily operated by HMS Host, supplemented by local operators for the Milltowne Grille/Smuttynose Café and Dunkin' Donuts. All retail shops in the passenger terminal building are operated by Hudson News. **Table 2-11** displays the areas allocated to concessions at the airport.

TABLE 2-11
AIRPORT CONCESSION SPACE

Concessionaire	Brand	Location	Area (Sq. Ft.)	Secure/ Non-Secure
Dunkin' Donuts	Dunkin' Donuts	Atrium, 2nd Floor	384	Non-Secure
	Dunkin' Donuts	Gate 15	286	Secure
HMSHost	Great American Bagel Bakery	Food Court	275	Non-secure
	Great American Bagel Bakery	Between Gates 8 & 9	1,062	Secure
	Pizza Hut Express	Food Court	304	Non-secure
	Samuel Adams Meetinghouse	Food Court	934	Non-secure
	Quiznos	Between Gates 7 & 8	740	Secure
	Starbucks	Between Gates 7 & 8	800	Secure
	Sam Adams Pub & Café	Between Gates 4 & 5	2,260	Secure
	Host Storage Space	Food Court	335	Non-Secure
	Host Storage Space	Between Gates 7 & 8	526	Secure
Milltowne Grille	Milltowne Grille Restaurant	Gate 14	3,018	Secure
	Smuttynose Café	Between Gates 14 & 15	678	Secure
Hudson News	Hudson News	Atrium, 2nd Floor	1,690	Non-Secure
	Hudson News	Gate 15	340	Secure
	Hudson News	Gate 8	860	Secure
	Hudson News	Between Gates 4 & 5	1,290	Secure
	Hudson Storage Space	Gate 8	410	Secure
	Hudson Storage Space	1st Floor Tugway	215	Secure
Vacant	N/A	Food Court	1,527	Non-Secure

Source: Airport Records.

A total of 12,485 square feet of the concession space (approximately 70%) is located in the secure areas of the passenger terminal building, with the remaining 4,449 square feet located in the non-secure areas. There is very limited storage space available for concession operations. The inability to efficiently warehouse merchandise in a convenient location increases the difficulty of operation and may add to the operator's cost of doing business at the airport.

2.4.2 TERMINAL AIRSIDE/LANDSIDE

2.4.2.1 Airport Law Enforcement and Security

Non-Federal airport law enforcement and security is provided by contract personnel staff, which may be broken down into the following categories:

Airport Security: Responsible for day to day security of airport, ensures compliance with all Transportation Security Administration Regulations (TSARs), acts as liaison with U.S. Department of

2.4.2 *TERMINAL AIRSIDE/LANDSIDE*

2.4.2.1 Airport Law Enforcement and Security

Non-Federal airport law enforcement and security is provided by contract personnel staff, which may be broken down into the following categories:

Airport Security: Responsible for day to day security of airport, ensures compliance with all Transportation Security Administration Regulations (TSARs), acts as liaison with U.S. Department of Homeland Security (DHS) TSA, provides K9 handlers with TSA certified dogs, and maintains and organizes security badging program. The first shift consists of four employees.

Airport Law Enforcement: Provides law enforcement staff to meet the requirements of TSAR 1542. The first shift consists of four employees.

Airport Security (Reliable): Provides curbside and Gate 28 security personnel. There are four employees on the first shift.

Airport Communications Center: Responsible for day-to-day communications and dispatching of Operations/Maintenance, airport security, law enforcement, and ARFF personnel. The center also handles phone and lost and found inquiries. Two personnel are on the first shift.

A list of airport law enforcement and K-9 vehicles are provided in **Tables 2-12 and 2-13**.

TABLE 2-12
AIRPORT LAW ENFORCEMENT VEHICLES

Vehicle ID	Description	Year	Manufacturer	Condition
AP-101	2006 Police Interceptor	2006	FMC	Good
AP-102	2010 Police Crown Victoria	2009	FMC	Good
AP-103	2008 Ford Explorer Police	2008	FMC	Good
AP-104	2006 Police Interceptor Unmarked	2006	FMC	Good

Source: MHT, 2009.

TABLE 2-13
AIRPORT K9 VEHICLES

Vehicle ID	Description	Year	Manufacturer	Condition
AP-046	2007 Explorer Sport Trac	2007	FMC	Good
AP-047	2007 Explorer Sport Trac	2007	FMC	Good
AP-048	2007 Explorer Sport Trac	2007	FMC	Good
AP-049	2007 Explorer Sport Trac	2007	FMC	Good

Source: MHT, 2009.

2.4.3 TERMINAL PARKING FACILITIES

2.4.3.1 Passenger Related Public Parking

Information provided by the company that manages airport parking operations regarding available automobile parking spaces and rates is presented in **Table 2-14**. Parking Lot A has a vehicle height restriction of 6'9." Free shuttle bus service is offered to/from all Long-Term parking lots every 10-15 minutes. Cash and credit cards are accepted for all parking charges.

TABLE 2-14
AIRPORT PARKING PUBLIC

Parking Area	Intended Term	Rates	Available Spaces	Operating Status
Garage	Various	$2.00 per hour $17.00 daily maximum $85.00 weekly maximum	3,985	Open
Lot A	Short-Term	$2.00 per hour	136	Open
Lot B	Short-Term	$2.00 per hour	240	Closed, Employee Parking
Lot C	Long-Term	$10.00 per day	2,292	Open
Lot D	Long-Term	$10.00 per day	2,020	Open (as needed)
Lot E	Long-Term	$10.00 per day	1,410	Open (as needed)
Lot F	Long-Term	$10.00 per day	700	Open (as needed)
Lot G	Long-Term	$10.00 per day	1,311	Open (as needed)
Cell Phone Lot	Temporary	Free	29	Open
		Total	**12,123**	

Source: http://www.flymanchester.com/about/parking.php

Figure 2-3 indicates the location of Parking Lots A through E, the cell phone lot and the parking garage relative to the airport terminal building and on-airport roads.

The parking garage provides covered space, offering a number of advantages over more remote surface parking lots. The parking garage may also be used for short-term parking since the hourly rate is the same as Short-Term Lots A and B. The daily and weekly rates for garage use are higher than the long-term surface parking lots. Overnight parking is not recommended in Lots A and B.

Analysis of airport parking data for August 2009 indicated that 59% of the cars that entered a paid parking lot average stayed for less than three hours, where three hours or less is the generally accepted duration for short-term parking. Airport data also indicated that 85% of the cars which parked for less than three hours used Short-Term Lot A, while 12% entered the garage and 3% used Long-Term Lot C. The data for long-term airport parking during August 2009 (three hours or more) indicates that 51% used the parking garage, 43% used Long-Term Lot C and 6% use in Short-Term Lot A. During August 2009, the maximum occupancy of Long-Term Lot C exceeded 87% of capacity (2000 or more vehicles) during nine of thirty-one days. The maximum capacity of Short-Term Lot A (136) was exceeded on nine days during August 2009, and the maximum occupancy exceeded 87% of capacity (118 vehicles) on fifteen of thirty-one days.

The Cell Phone Lot, located between the parking garage and Lot C, is free of charge and provides a convenient location for drivers to park and wait for a "ready to leave" call from arriving passengers. This amenity has decreased terminal lane traffic because it offers an attractive alternative to repetitive circling of the terminal area.

Off-airport parking for MHT passengers is offered by the Highlander Inn. The Highlander Inn airport parking area is accessed from Brown Avenue, or from Airport Road. The designated parking lots for airport use provide approximately three acres of parking area and an on-demand airport shuttle service for parking patrons. Airport parking at the Inn requires a prior reservation and prepayment. The standard rate for this location is $8 a day.

2.4.3.2 Other Parking Areas

Parking areas which are not associated with enplaning/deplaning passengers are summarized in **Table 2-15**.

TABLE 2-15
OTHER PARKING AREAS

Parking Area	Spaces	Notes
Airport Administration "Green"	18	16 Regular/2 Handicap
Airport Administration "Red"	41	40 Regular/1 Handicap
Contractor Parking	32	--
Bus Maintenance	18	Bus driver parking along fence line
Parcel Delivery	37	Approximate spaces available
Administration Government	5	--
Administration LPD	1	--
Administration Canine	3	--
Airport employee parking	240	In former Lot "B"
Airline flight crew parking	153	Approximate, no marked spaces
Total	**548**	

Sources: MHT, 2010.

The former occupants of the Administration Lot have been reassigned to the 5th level of the garage. A defined number and/or location on that floor has not been set.

2.4.4 RENTAL CAR/GROUND TRANSPORTATION

2.4.4.1 Rental Car Operations

Manchester-Boston Regional Airport is served by eight rental car companies: Alamo, Avis, Budget, Dollar, Enterprise, Hertz, National, and Thrifty. **Table 2-16** shows the current amounts of space leased by the rental car operators at MHT.

TABLE 2-16
RENTAL CAR OPERATOR LEASE AREAS (SQUARE FEET)

Company	Office	Counter	Ready Return	Remote Service/ Parking Area	Total
Alamo	49.68	136.83	16,381.17	--	**16,567.68**
National	69.32	190.94	22,858.56	35,305.00	**58,423.82**
Enterprise	--	137.70	12,007.70	--	**12,145.40**
Avis	--	181.81	21,693.04	41,151.00	**63,025.85**
Budget	124.00	140.51	16,764.80	37,520.00	**54,549.31**
Hertz	115.00	418.62	52,255.07	169,947.00	**222,735.69**
Dollar	--	103.30	7,046.34	[1]	**7,149.64**
Thrifty	--	115.30	8,799.31	[1]	**8,914.61**
Total	**358.00**	**1,425.01**	**157,805.99**	**283,923**	**443,512.00**

Source: MHT, 2009.
Note: [1] Dollar and Thrifty each pay a small monthly fee for remote parking in Parking Lot G.

Figure 2-11 depicts the rental car operating areas in the terminal parking garage.

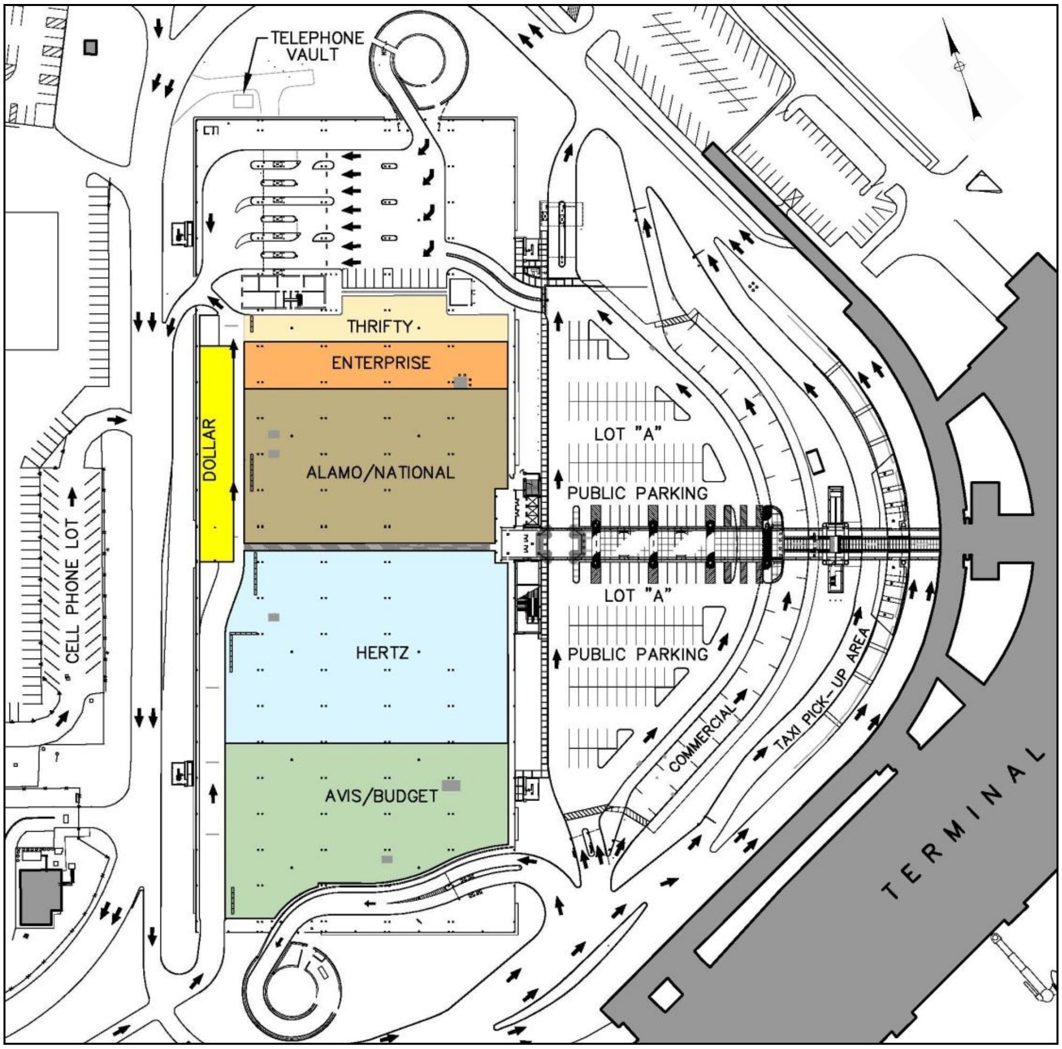
The rental car spaces for each rental car operator within the terminal parking garage are broken down in **Table 2-17** by Ready spaces and Return spaces. **Table 2-18** presents information regarding the average rental car fleet at MHT during the July 2009-June 2010 period, based on statistics compiled by airport management. It should be noted that rental car fleet size at MHT fluctuates throughout the year based on season and customer demand. **Table 2-19** shows the peak rental car fleet size for 2009. Also, in the current economic climate, rental car firms have generally been reducing the size of their fleets at U.S. airports, a trend which is expected to continue until the national local economy begins to recover.

TABLE 2-17
RENTAL CAR SPACES IN TERMINAL PARKING GARAGE

Rental Car Company	Ready Spaces	Return Spaces	Total
Alamo/National	55	32	**87**
Avis	33	32	**65**
Budget	30	32	**62**
Dollar	21	12	**33**
Enterprise	35	25	**60**
Hertz	69	32	**101**
Thrifty	12	10	**22**
Total	**255**	**175**	**430**

Source: MJ Inspection and RAC Interviews, 2010.

FIGURE 2-11
RENTAL CAR OPERATING AREAS IN TERMINAL PARKING GARAGE



Source: MHT; URS Corporation, 2010.

TABLE 2-18
MHT AVERAGE RENTAL CAR FLEET

Rental Car Company	Number of Vehicles
Alamo/National	700
Enterprise	520
Avis/Budget	1,000
Hertz	800
Dollar	130
Thrifty	300
Total	**3,450**

Source: MHT Rental Car Firms, as reported to MHT management, 2010.
Note: Based on data for July 2009 to June 2010.

TABLE 2-19
MHT PEAK RENTAL CAR FLEET

Rental Car Company	Number of Vehicles
Alamo/National	1,300
Enterprise	800
Avis/Budget	1,100
Hertz	1,150
Dollar	280
Thrifty	400
Total	**5,030**

Source: MHT Rental Car Firms, 2010.

The rental car vacuum, wash and fuel area for Hertz is located in the area northwest of the UPS apron. The other facility on the airport is a Quick-Turn-Around (QTA) that is located directly north of parking Lot "B." Rental cars are shuttled to and from the QTA area to the Ready/Return areas in the parking garage. A QTA Area Study was prepared by AECOM in June 2009 to evaluate the projected operational space requirements for this area. The study examined the suitability of using the existing Remote Parking Lots F and G to accommodate the needs of the rental car companies to perform cleaning and fueling services of returned vehicles. The study conducted a survey and compared the findings to a similar study completed in November 2006 when the airport was contemplating the development of a Consolidated Rental Car Facility.

The 2009 QTA study identified the need for increased space for QTA services, and found that lots F and G were not sufficient to address these needs. Since the study was completed, the number of passengers utilizing the airport has decreased due to the impact of the recession on the national and local economies. As a result, the projected needs may have decreased for the present time.

The 2009 QTA study found a significant desire/need for increased facilities based on the number of passenger enplanements occurring at MHT at that time. **Table 2-20** shows the existing and estimated facility need based on 2008 operating levels at MHT.

TABLE 2-20
PROJECTED QTA SPACE REQUIREMENTS

Space	Existing	Needed
Employee Areas (sf)	2,524	4,939
Fueling Positions	13	26
Automated Washer Bays	4	9
Vacuum Stations	15	28
Pre-QTA Parking Stalls	158	335
Post-QTA Parking Stalls	186	342
Overflow Parking Stalls	741	1,070
Peak Daily Rental Operations	2,039	2,039
Peak Daily Return Operations	2,002	2,002

Source: MHT Quick-Turn-Around (QTA) Study Review, June 2009 (draft).
Note: Based on 2008 operational levels experienced at MHT.

Based on the survey details, it appears that the existing rental car facilities were inadequate to handle the then-current level of activity. In the study, several rental car companies reported that they had to turn customers away. The rental car firms also made a number of suggestions for the future development of facilities, including:

- Each operator should have a designated area at the new QTA facility which cannot be accessed by its competitors.
- All utilities should be billed separately by actual usage.
- Overflow lots should provide easy access for delivery or pickup of vehicles via car carrier.
- If additional garage space is constructed, rental operations should be contained within one structure, ideally with one level for rentals and one level for returns.
- Ready cars should be accessed by the walkway bridge, exiting cars in one direction (presumes continued usage of the existing garage).
- Any floor designated for rental car operations should not also house public parking operations.
- The route to and from a remote QTA should not force rental cars onto public roads.
- Any new garage constructed should accommodate the height of a tow truck.

2.4.4.2 Ground Transportation Services

There are a number of ground transportation options available to users of Manchester-Boston Regional Airport. These include taxicab and limousine companies, charter bus access, on-demand shared ride van services, and scheduled van service.

Taxicab, limousine and van services are authorized and operated under Commercial Ground Transportation Services Permits, which allow the holder to provide their services at the airport for a flat fee. There are currently 26 permits issued to taxicab companies and individual operators and six permits issued to van-service operators. A total of 116 permits have been issued to limousine services and eight charter bus companies have permits.

All commercial operators, including taxicabs, must have a permit to pick-up passengers at the airport, while non-permitted operators may only drop off passengers. Operators are charged for each passenger pick-up according to a fee schedule. Permits are enforced visually by airport security personnel who check for windshield decals. Automated Vehicle Identifier (AVI) transponder tags are also required to pass through the gate system allowing access to commercial pick-up lanes at the terminal. There are no scheduled interstate bus services that stop at MHT; however, Greyhound and affiliated bus lines serve the Manchester Transportation Center located in downtown Manchester. The Manchester Transit Authority provides scheduled bus service from downtown Manchester to MHT. The weekday buses run hourly from 5:25 a.m. thru 8:25 a.m. and 1:25 p.m. thru 5:25 p.m. and takes approximately 25 minutes for a one-way journey.

Table 2-21 identifies the number of permits and decals for airport access. There would be one operating permit per company, and one decal for each vehicle in the company that may access the airport under the permit.

TABLE 2-21
GROUND TRANSPORTATION VEHICLE
DECALS AND COMPANY PERMITS (SEPTEMBER 2009)

Company Classification	No. of Decals/Permits
Hotel Courtesy Service	
Hotel (Decals)	62
Limo (Decals)	2
Number of Companies (Permits)	17
Non-Scheduled Bus Service	
Bus (Decals)	633
Limo (Decals)	1
Number of Companies (Permits)	18
Reservation Service	
Limo (Decals)	2,019
Van (Decals)	4
Number of Companies (Permits)	100
Scheduled Bus Service	
Scheduled Bus (Decals)	45
Number of Companies (Permits)	1
Scheduled Shuttle Van Service	
Scheduled Van (Decals)	43
Number of Companies (Permits)	2

TABLE 2-21 (CONTINUED)
GROUND TRANSPORTATION VEHICLE
DECALS AND COMPANY PERMITS (SEPTEMBER 2009)

Company Classification	No. of Decals/Permits
Taxi Service	
Taxi (Decals)	98
Taxi - Limo (Decals)	38
Number of Companies (Permits)	26
Total Vehicle Decals:	2,945
Total Companies (Permits):	208

Source: MHT records, 2009.

Figure 2-12 portrays the ground transportation staging areas in front of the MHT terminal. The gate system allows up to three taxis in the “front” taxi lane, while remaining taxis wait in a remote taxi queue. A gate and light system controls access to the front taxi lane to control curbfront crowding. The number of taxi’s that may wait in the Remote Taxi Staging area varies.

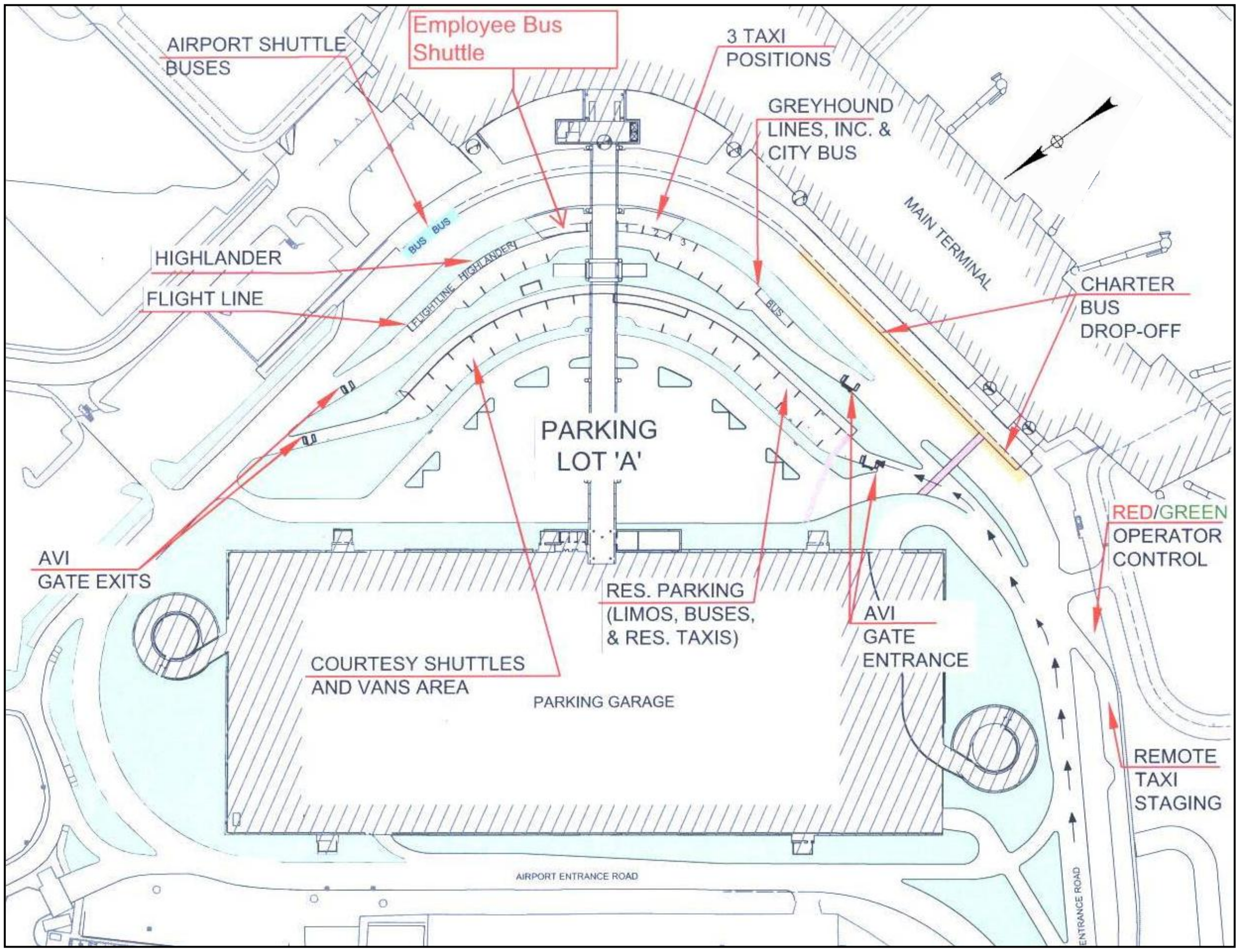
There are thirteen parking spaces within the area reserved for courtesy shuttles and vans, where the spaces are not reserved by vehicle type. The fifteen spaces within the area for limo’s, buses and taxis are not assigned on the basis of vehicle type, and are usable by any limo, bus or taxi. The four spaces opposite the Highlander Inn parking are currently not assigned, and would be made available for additional scheduled van service if the inner curb within the lane were not adequate for the service. The four spaces opposite the three taxi positions were once used by taxi’s to stage “up front,” and are presently not assigned.

2.5 ROADWAYS/ACCESS

Airport Road provides access to the Manchester-Boston Regional Airport Terminal. Airport Road connects to Brown Avenue/New Hampshire Route 3A, which in turn has access to Interstate Route 293/New Hampshire 101. The F. E. Everett Turnpike and Interstate Route 93 are also in close proximity to the airport. The State of New Hampshire DOT is constructing a new main access road to the airport to connect it directly with the F.E. Everett Turnpike. Construction is underway on this new roadway, with completion expected in 2012. **Figure 2-13** displays access to the airport and **Figure 2-14** shows the new access road from the F. E. Everett Turnpike that is currently under construction.

Access to on-airport areas is provided primarily by Airport Road which connects to Brown and Hazelton Avenues. Several other on-airport roads provide for circulation and access to the passenger terminal, parking facilities, and aviation support facilities. Figure 2-13 shows the internal road network, and characteristics of these roads are presented in **Table 2-22.**

FIGURE 2-12
GROUND TRANSPORTATION STAGING AREAS



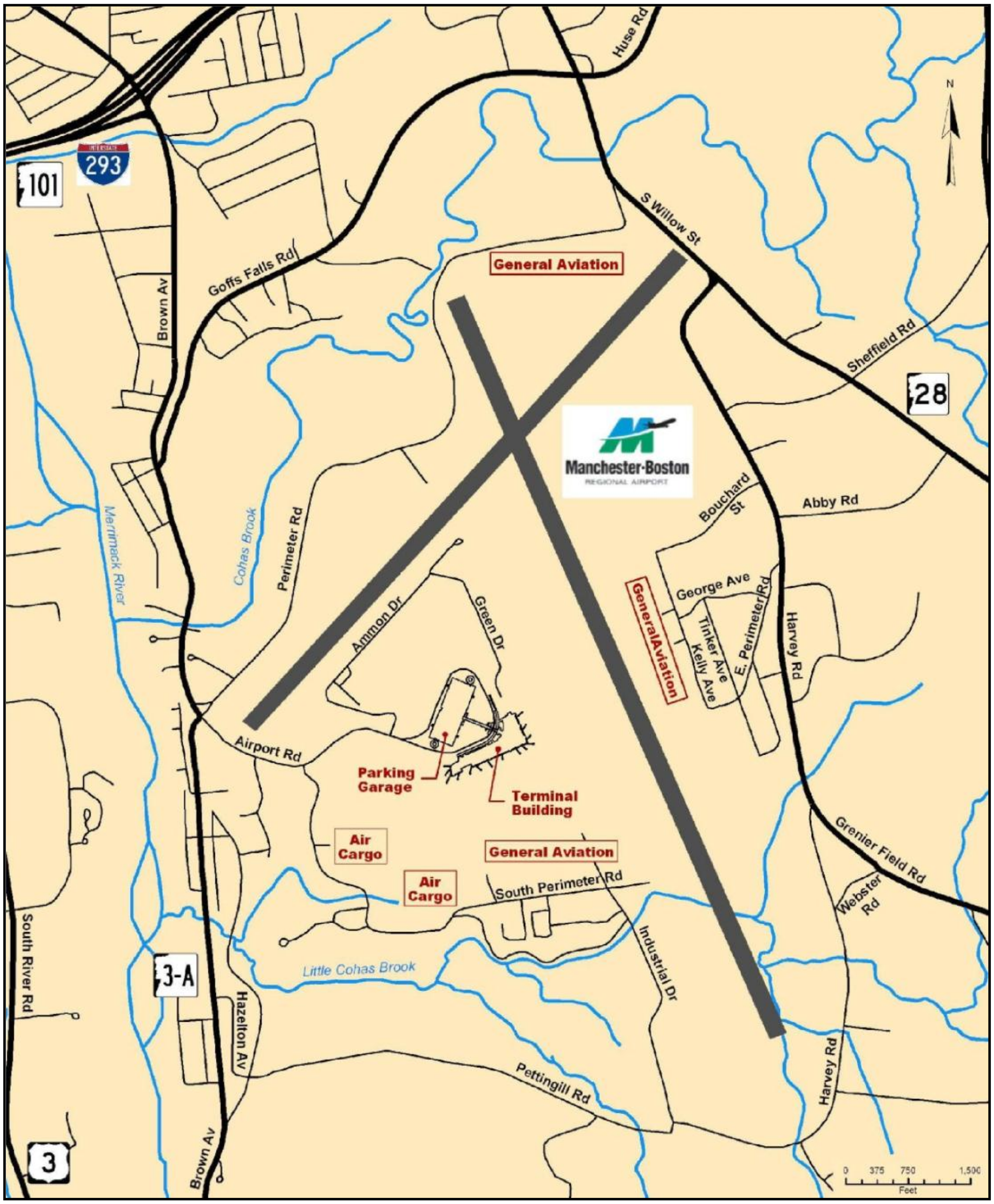
Source: MHT Management, 2008.

TABLE 2-22
INTERNAL AIRPORT ROAD NETWORKS

Road	Length/Width	Surface Pavement	Condition
Ammon Drive	3,500 x 30	Asphalt-Concrete	Good to fair
Green Drive	1,700 x 30	Asphalt-Concrete	Fair
Airport Road	6,000 x 30-100	Asphalt-Concrete	Good to Very Good
South Perimeter Road	6,500 x 30	Asphalt-Concrete	Fair to Good
Industrial Road	3,000 x 30	Asphalt-Concrete	Good
Pettingill Road	1,600 x 30-60	Asphalt-Concrete	Very Good
Harvey Road	3,000 x 30-60	Asphalt-Concrete	Poor to Good
Kelly Avenue	2,000 x 30	Asphalt-Concrete	Good
Garside Way	1,500 x 30	Asphalt-Concrete	Good

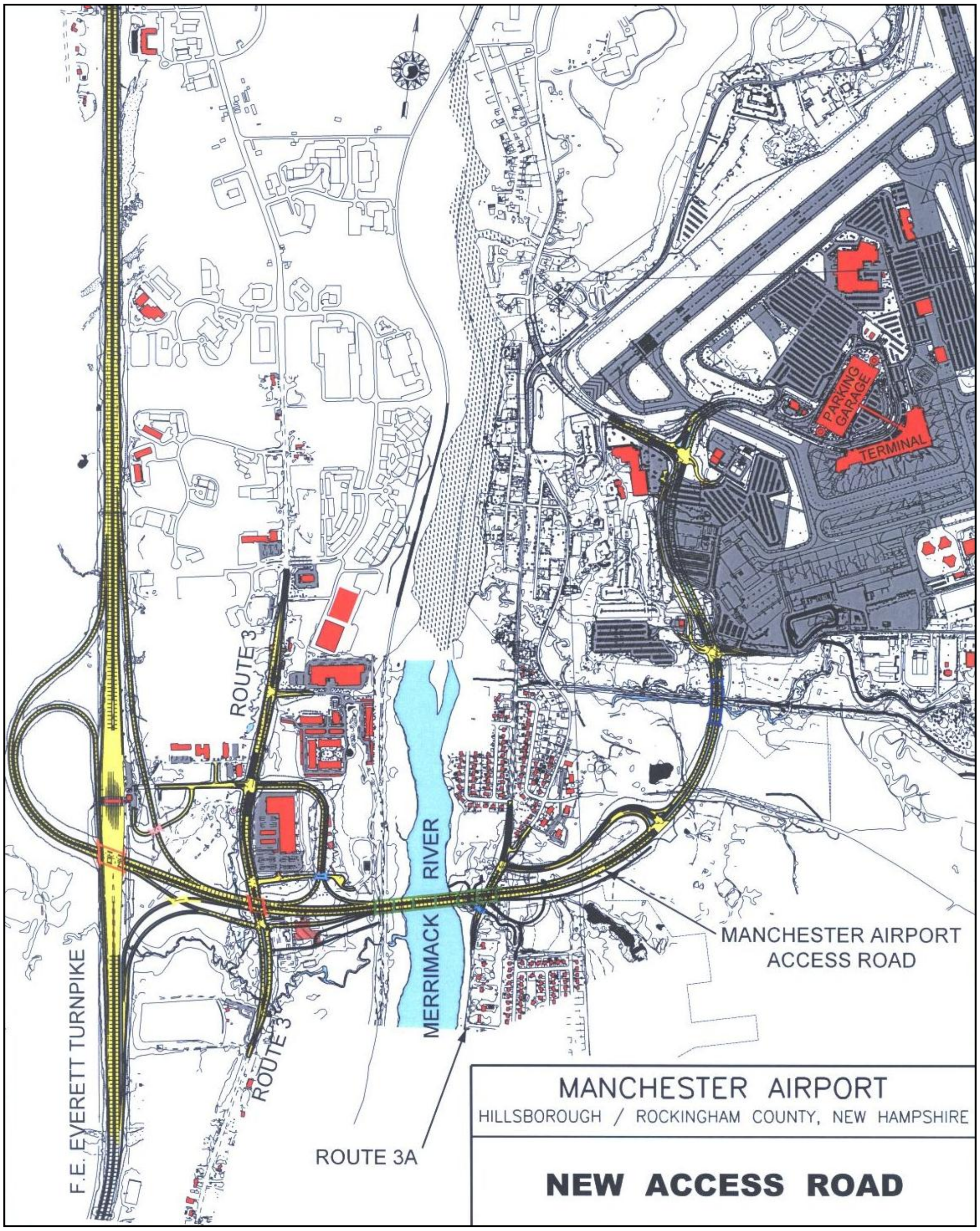
Sources: MHT Facilities Plan; McFarland Johnson, 2009.

FIGURE 2-13
LOCAL ACCESS ROADS AND MHT INTERNAL ROAD NETWORK



Source: McFarland Johnson, 2010.

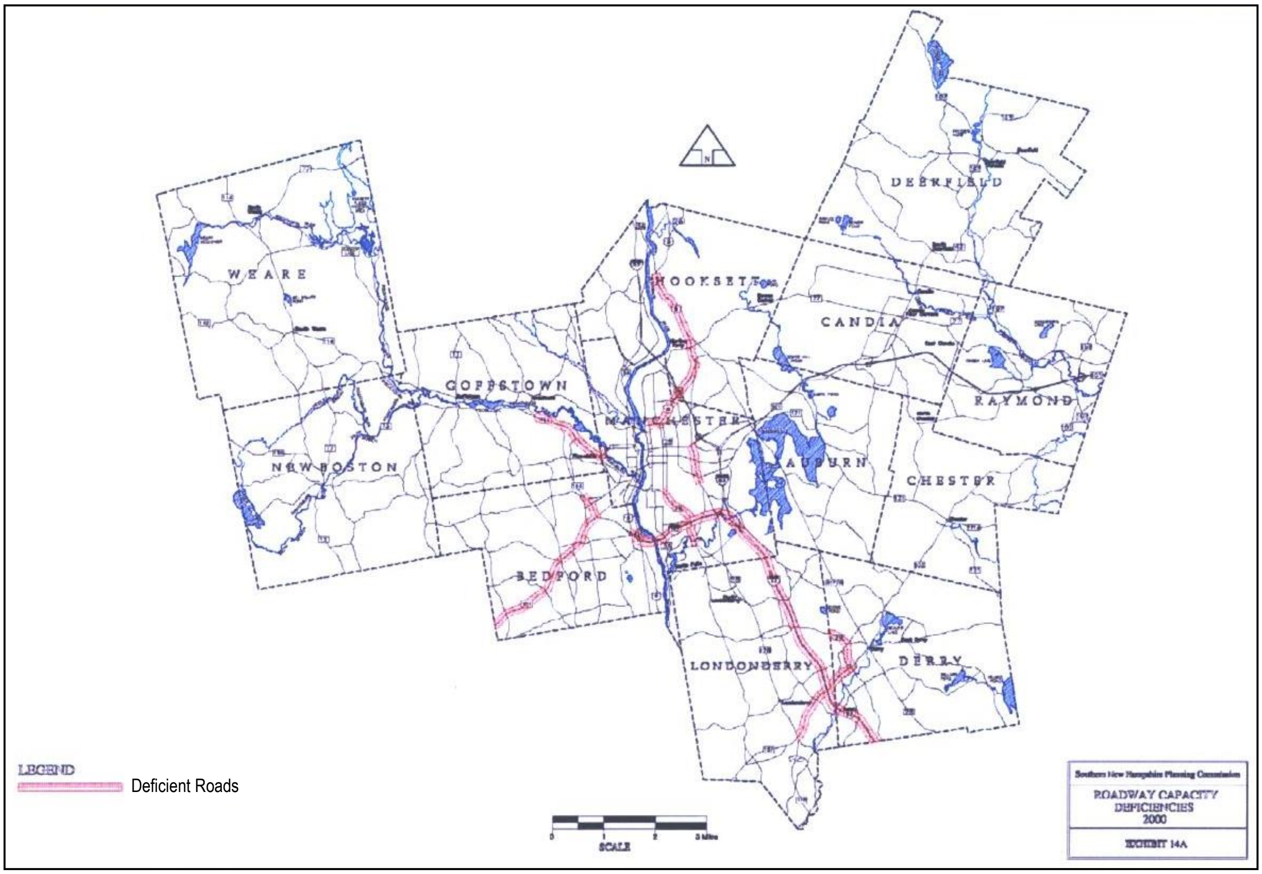
FIGURE 2-14
FUTURE EVERETT TURNPIKE/MHT CONNECTOR ROAD



Source: McFarland Johnson, 2010.

Figure 2-15 shows the Regional Roadway Capacity Deficiencies for the Year 2000 as identified in the Southern New Hampshire Planning Commission study.

FIGURE 2-15
YEAR 2000 REGIONAL ROADWAY CAPACITY DEFICIENCIES



Source: McFarland Johnson, 2010. http://www.snhpc.org/pdf/final_RTP_12-23-08_opt.pdf

2.5.1 INTERMODAL OPPORTUNITY

Intermodal connections to the airport, especially by rail, are a key focus of the NH Department of Transportation and the New Hampshire Rail Transit Authority (NHRTA). There are existing railroad tracks along the western side of the Merrimack River and an appropriate plot of open land located approximately 2 miles from the airport. Commuter service from this station could serve Boston and tie into AMTRAK national rail service, offering an additional connectivity option. Funding is currently being sought by the New Hampshire Rail and Transit Authority through the American Recovery and Reinvestment Act for further studies and planning efforts. Should a train service be offered, connections to the airport, likely via buses initially, could be established.

2.6 AIR CARGO

2.6.1 HISTORICAL CARGO ACTIVITY

Historical cargo activity at MHT is discussed in more detail in **Appendix E4** of this Airport Master Plan Update.

2.6.2 CARGO FACILITIES

The majority of cargo facilities at MHT are leased to Cargex, which, in turn, subleases buildings and ramp space to various cargo operators, including FedEx and Quantem Aviation. In total, Cargex leases just under 16.57 acres of land at the airport. **Figure 2-16** shows the locations of cargo areas operated by FedEx, Cargex, and UPS.

2.6.2.1 Cargex

A number of cargo buildings and support facilities at MHT have been constructed on land leased and developed by Cargex. **Table 2-23** provides data on the various buildings and their characteristics. In addition to the land leases, Cargex also leases approximately 31,000 square feet of building space in the Ammon Terminal.

TABLE 2-23
AIR CARGO LEASE AREAS

Property Address	**28 Perimeter Road**
Tenant(s)	FedEx
Space Leased/ Purpose or Use	Air Cargo
Building Size and Condition	22,040 sf building (expandable to 41,400 sf), good condition
Parking/Lot Condition	87 spaces for cars and 20 truck spaces, good condition
Airside Pavement Condition	Good condition
Site Constraints	None noted
Property Address	**38 Perimeter Road**
Tenant(s)	Quantem Aviation Services and FedEx
Space Leased/ Purpose or Use	Quantem leases 7,200 sf and handles airline cargo. FedEx leases 12,000 sf. 4,402 sf (currently vacant)
Building Size and Condition	24,000 sf building (expandable to 33,202 sf)
Parking/Lot Condition	10 spaces for cars, 10 spaces for trucks, and additional parking along the fence
Airside Pavement Condition	Good
Site Constraints	None noted
Property Address	**The Ammon Center – 175 Ammon Drive**
Tenant(s)	U.S. Customs; Quantem Aviation; and an educational facility
Space Leased/ Purpose or Use	24,885 sf leased with 6,286 sf vacant
Building Size and Condition	31,171 sf (no expansion capability), good condition
Parking/Lot Condition	189 spaces
Airside Pavement Condition	Good
Site Constraints	No expansion capability due to location and adjacent facilities

Source: Cargex, October 2009.

FIGURE 2-16
AIR CARGO AREAS

Source: McFarland Johnson, 2010.

FedEx leases building space, aircraft parking aprons and other support facilities from Cargex. FedEx has not disclosed expansion plans at MHT at this time. Parking spaces are available for 66 employees, 37 trailers and 31 tractors. FedEx aircraft utilize three wide body aircraft positions with hardstands, one narrow body aircraft position, and five feeder aircraft positions.

The number of daily FedEx flights (as of October 2009) include:

- Sunday – one inbound A300 flight, one DC-10 outbound flight
- Monday – One outbound A300 flight
- Tuesday through Thursday – Three inbound flights, three outbound flights with A300
- Friday – Two inbound flights, two outbound flights, with A300
- Saturday – Two inbound flights with A300 or DC-10, one outbound A300 flight

2.6.2.2 United Parcel Service

The United Parcel Service (UPS) operation at the airport is located on the west end of the terminal area, directly west of the Cargex area. The UPS leasehold covers 12.84 acres of land and includes a 23,000 square foot building, ramp space, and truck parking/maneuvering space. Expansion capability exists using DHL hangar and ramp space, although UPS has not disclosed plans at this time to expand operations at MHT. The building is in good condition. The apron is in fair condition. The public parking and truck parking/maneuvering areas are in good condition, with 10 Package Car vehicle parking spaces and 70 personal car parking positions. A 25-year lease for the space, with a five-year extension option, was signed in 1994.

The daily flights conducted by UPS (as of November 2009) include:

- Sunday – one inbound jet flight and one jet departure
- Monday – One jet arrival and two jet departures. Ten arrivals and departures by small aircraft, where eighteen of the operations are conducted by Wiggins and two by Air Now.
- Tuesday through Thursday – Three jet arrivals and departures. Ten arrivals and departures by small aircraft, where Wiggins flights account for eighteen of the operations and Air Now has two operations.
- Friday – Three jet arrivals and two jet departures. Small aircraft account for ten departures and three arrivals, with twelve operations conducted by Wiggins and one by Air Now.
- Saturday – One jet arrival. Three small aircraft departures are conducted by Wiggins.

2.7 GENERAL AVIATION FACILITIES

Manchester-Boston Regional Airport offers numerous facilities for general aviation (GA) aircraft and operators, including Fixed Base Operator (FBO) services, conventional hangars and T-hangars, apron tie-down space, and automobile parking areas. GA users at MHT include individuals flying for business, recreation, and flight training.

An air ambulance operation, by Dartmouth-Hitchcock Advanced Response Team (DHART), is located on the airport. DHART operations started at MHT on September 1, 2009. DHART operations at MHT have averaged 1.5 patient transport flights a day, or 90 operations per month. DHART is based in the DEKA hangar.

2.7.1 MHT FBOs AND OTHER AIRCRAFT/PILOT SERVICES

Manchester-Boston Regional Airport has one company providing Fixed Base Operator (FBO) services to airport users. Other companies offer limited-FBO or training services at MHT. A summary of the FBO and specialized FBO operators at MHT is provided below.

2.7.1.1 Wiggins Airways (Full-Service FBO)

The largest FBO at MHT is Wiggins Airways, which leases approximately 13 acres of land, including approximately 30,033 square yards of apron space. Wiggins has 73,000 square feet of hangar and operations space adjacent to its 3-story, 23,000 square foot general aviation terminal building. The Wiggins leasehold is located along the East Ramp, approximately parallel to Kelly Avenue and adjacent to Bouchard Street in the City of Manchester.

The Wiggins Airways, Inc. facilities include 17 aircraft tie-downs, two aircraft storage hangars that presently hold twelve aircraft, and a maintenance hangar. There are 108 total vehicle parking spaces, with 64 employee spaces and 44 public/customer spaces. The facilities are in very good condition. The location of the Wiggins facilities is shown in **Figure 2-17**.

Wiggins Airways operates 24 hours per day, seven days per week, and offers general aviation users at MHT a full range of services, including:

- Fuel (100LL and Jet-A)
- Airframe Repairs
- Powerplant Repairs
- Bottled Oxygen
- Hangars and Tie-downs
- Passenger Aircraft Charter (Beechcraft King Air A100)
- Aircraft Rental
- Aircraft Washing and Cleaning

- Ground Power
- Deicing Services
- Conference and Meeting Rooms
- In-Flight Catering

Wiggins Airways is an approved TSA DCA Gateway FBO under the TSA's program to restore general aviation at Washington Reagan Airport (DCA). By addressing the special security requirements for flights into DCA, MHT is one of 25 authorized departure airports for GA aircraft which will land at DCA (and one of four in New England). This allows MHT to offer a service that is not available at many other GA facilities.

2.7.1.2 ProStar Aviation (Specialized FBO)

ProStar Aviation, LLC provides corporate aircraft services and is located on the south side of the Airport, adjacent to Taxiways "E" and "A." ProStar occupies a 17,000 square foot hangar, which includes 4,000 square feet of shop and office space. In addition, ProStar also leases 3,500 square feet of office space in the building that houses the MHT Engineering and Planning offices. There are 30 ProStar employee parking spaces, and the facility is reported to be in very good condition. ProStar has access to about 44,000 square feet of apron.

ProStar is a factory authorized service center for Hawker, King Air, Premier and Beechjet aircraft, and is the only authorized TFE-731 engine line maintenance facility in New England. The FBO is a Pilatus PC-12 sales and service center and also provides avionics, airframe and engine maintenance and inspection services.

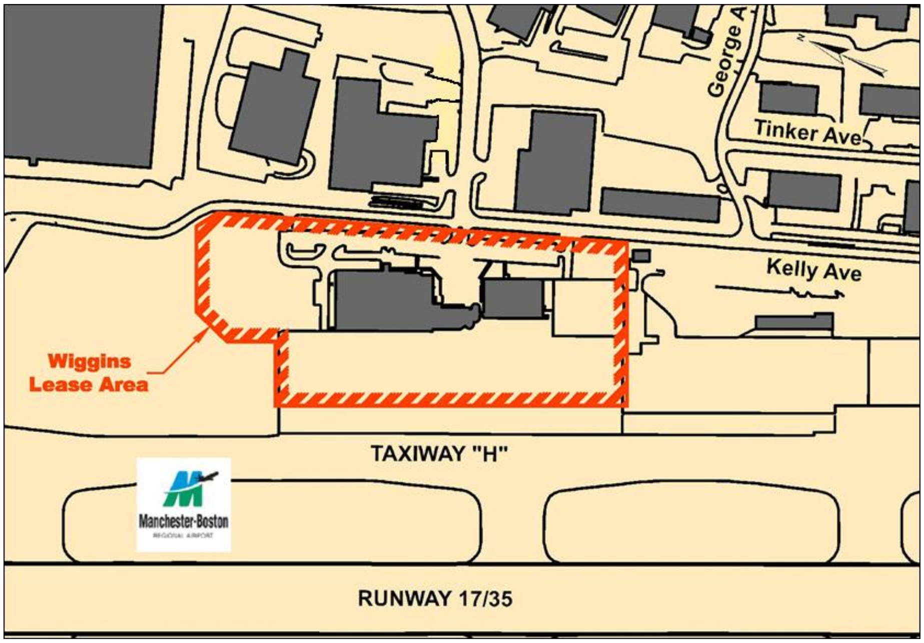
2.7.1.3 Saflite Pilot Training (Specialized FBO)

Saflite Pilot Training, Inc. leases a 3,760 square foot airport building adjacent to the east ramp and north of the Aviation Museum. Saflite offers pilot training, photo flights, aircraft rentals, a pilot lounge and a store.

2.7.1.4 Aviation Associates (Specialized FBO)

Aviation Associates (Manchester Aviation Associates, Inc.) offers limited specialized FBO-type services at MHT. The firm leases a building with an attached hangar within the northeast general aviation area. The FBO provides annual aircraft inspections, aircraft maintenance, power plant, airframe and avionics services.

FIGURE 2-17
FBO LEASEHOLDS



Source: McFarland Johnson, 2010.

2.8 AIRCRAFT FUELING FACILITIES

Wiggins Airways, Inc. manages the airline service facility Jet A fuel farm at MHT and also maintains Jet-A and 100LL AvGas fuel tanks within their FBO lease area for its GA users. The firm leases a 4.23-acre parcel of land from the airport to provide Jet-A fueling and de-icing services to airline and cargo carriers. This lease area includes above-ground fuel and glycol tanks, fuel delivery and dispensing equipment, parking areas for fueling trucks and other ground service equipment vehicles, and a maintenance and operations building with employee parking. The maintenance and operations building for the fuel farm is approximately 11,760 square feet in size and contains office space, parts storage areas, and three vehicle maintenance bays.

The existing Jet-A fuel farm and de-icing fluid storage and dispensing area is located adjacent to Parking Lot E and Taxiway “M” on the west side of the airport. Above-ground storage capacity includes one 12,000-gallon automotive fuel tank (MOGAS), one 12,000-gallon diesel fuel tank, two 12,000-gallon glycol deicing fluid tanks, and two 250,000-gallon Jet-A aviation tanks. The fuel farm layout has space for two additional 250,000-gallon tanks. The existing fuel tanks, installed by Wiggins in 2004, are supported by an underground fuel spillage containment system. Fuel is delivered to the fuel farm by truck from several sources, including suppliers in Boston, Portsmouth and Providence. The 100LL fuel tank and Jet-A tank in the Wiggins FBO area have capacities of 10,000 gallons and 22,000 gallons, respectively.

Full-service aviation fuel for general aviation aircraft is available twenty four hours a day, using a fleet of four fuel trucks that dispense Jet-A or 100LL AvGas. Wiggins provides fueling services to the airlines and cargo carriers operating at MHT, as well as general aviation users. The average daily volume of Jet-A fuel, as of March 2009, was 60,000 gallons. The system has the capacity to dispense up to 200,000 gallons of Jet-A per day. At 60,000 gallons per day usage, the airline Jet-A tank capacity holds an eight day demand. An average of 100 gallons per day of 100LL is currently dispensed.

The airport's fueling services group consists of representatives of Wiggins, MHT, the airlines, and other operators with fueling operations. The group addresses service issues in order to maintain high levels of service.

Figure 2-3 shows the location of the fuel farm complex.

2.9 SECURITY

2.9.1 PASSENGER SCREENING

Manchester-Boston Regional Airport has three checkpoints for screening passengers prior to entering secure areas of the passenger terminal for boarding commercial aircraft. Two of these locations, Checkpoints "B" and "C," are found on the Departures Level of the terminal, and Checkpoint "A" is found on the Arrivals Level west end. The daily hours of operation, number of screening lanes, and the estimated percentage of annual/peak hour use associated with each of the three checkpoints is listed in **Table 2-24**.

TABLE 2-24
PASSENGER SCREENING CHECKPOINTS

Checkpoint Designation	Daily Hours	Number of Active Lanes Bags/Pass.	Percent Use
"B"	24 hours	3/2	70%
"C"	4:30am-7:30am	2/1	7%
"A"	4:30am-5:00pm	2/1	23%

Source: MHT, 2009.

The screening area designations changed prior to Thanksgiving, 2009, where the existing "A" became "B," existing "B" became "C" and existing "C" was designated as "A." The designation changes were made to improve the designations relative to the location of the checkpoints, where the "A" area is on the first floor, and the "B" and "C" is on the second floor.

Discussions were underway with TSA at the time of this inventory, regarding the possible extension of the existing Checkpoint "C" hours to include 10:00am-12:00pm and 4:00pm-5:00pm. Since the peak hours for airport enplanements occur from 4:30am-7:00am, 10:00am-11:30am, and 4:00pm-5:00pm, the additional Checkpoint "C" hours would allow that screening area to be open during all three daily peak periods and provide increased peak hour screening capacity.

The main Departures Level screening area, existing Checkpoint "B," is used for the majority of enplaning passengers. This screening area encompasses two lanes for passenger screening and three for baggage and other carry-on screening. Checkpoint "B" is equipped with metal detectors and X-ray machines. Queues for the Checkpoint "B" bisect the Departures level and create an obstruction to passenger flow in the area.

The secondary departures level screening area Checkpoint "C" has one lane for passenger processing and two for bags and other carry-ons and is equipped with metal detectors and x-ray machines. According to MHT management, this checkpoint is used for peak hour enplaning passengers and is utilized for the screening of goods, produce and merchandise bound for the concessions and food service areas.

Checkpoint "A" is located on the Lower (Arrivals) Level of the terminal near the west Baggage Claim area. This checkpoint has one passenger lane and two lanes for bags and other carry-on items.

2.9.2 CONCESSION MERCHANDISE SCREENING

All merchandise bound for airside concession locations at Manchester-Boston Regional Airport is screened through the passenger screening areas. There are no loading docks or facilities for direct delivery of products to the secure areas of the passenger terminal building. While airport staff has attempted to coordinate deliveries with the concessionaires, to shift deliveries away from peak passenger hours, goods screening sometimes affects passenger screening efforts.

2.9.3 CARGO SCREENING

The TSA Certified Cargo Screening Program (CCSP) is a voluntary program designed to enable vetted, validated, and certified shippers and forwarders to screen air cargo prior to delivering the cargo for carriage on a passenger carrying flight. The CCSP allows a facility to perform piece-level screening before the cargo arrives at the airport, which increases the overall flexibility and capacity of the screening process and reduces the impacts related to piece-level screening after a packed pallet is received at the airport.

Cargo deliveries which require pre-flight screening prior to loading onto passenger carrying flights are screened by Quantum Aviation in the Cargex cargo building. This process uses dogs and inspectors to examine the cargo for explosives and other restricted items. All belly cargo on airline flights is screened before it is enplaned and about 98% of the airline belly cargo at MHT is carried on Southwest Airlines flights. FedEx and UPS also conduct cargo screening.

In accordance with Title 49 of the Code of Federal Regulations, domestic and foreign passenger aircraft operators, all-cargo aircraft carriers, and indirect carriers/freight forwarders which operate under an approved TSA Standard Security Program may tender cargo for transport on passenger aircraft only from shippers that are verified as "known." A known shipper can be shown to have the required business relationship with a freight forwarder, aircraft operator, or an air carrier on the basis of customer records, shipping contracts, business history and a site visit, or Dun and Bradstreet vetting.

2.9.4 *Employee Screening*

All airport employees whose work takes them to the secure side of the passenger terminal building must pass through the passenger screening checkpoints discussed above in Section 2.9.1. There are no facilities designated exclusively for screening employees.

2.9.5 *TSA Guidance on Security Screening Checkpoint (SSCP) Space Requirements*

In accordance with the guidance provided in the TSA report *Recommended Security Guidelines for Airport Planning, Design and Construction*, revision dated June 15, 2006, TSA equations for the estimation of required security screening space are considered to be proprietary and are not published. The guidelines indicate that TSA will provide needed space planning guidance, as appropriate, to airport engineers and planners.

2.10 *UTILITIES/AIRPORT DRAINAGE*

2.10.1 *Utilities*

An important factor for evaluating the development potential of airport property is the availability and capacity of utilities serving MHT. The primary utilities of concern are water, sanitary sewers, electricity, communication and natural gas are discussed as follows. Graphics of the primary utilities systems are shown in **Appendix E8**.

2.10.1.1 Electric

Electric power is supplied to MHT by Public Service of New Hampshire (PSNH). The electrical service originates from 34KV overhead feeds. One of the feeds is from the west of the airfield, off of Old Brown Avenue. The second feed is from the north of the airfield, off of Goffs Falls Road. The electrical power does not completely loop around the airport. There are two overhead termination points on South Perimeter Road, one located near the UPS facility and another near the FedEx facility. The remainder of the airfield has an underground conduit system.

Two main switch panels power MHT. Each of these panels has an automatic switch feature, so that if one panel does not function the other takes over. There is a backup generator that provides standby power to critical areas of the terminal building in the event of an electrical power outage.

Electrical power for the airfield comes from the east side of the airport at the Airfield Electrical Vault, which is located south of the Wiggins Airways lease area. An emergency generator is located within the vault and would power essential airfield systems during a power outage.

2.10.1.2 Water

Potable water is provided to MHT by the Manchester Water Works. The feed for both domestic and firefighting purposes comes from a dual line (an 8-inch and 12-inch) originating at Harvey Road. The water is pumped from a two million gallon storage tank serviced by a three-tank pump station. Pressure in these lines is in excess of 120 psi.

Water to the passenger terminal building is fed by a 12-inch main which services an 8-inch fire loop with four hydrants. A 4-inch service connection provides potable water inside the building. The 12-inch main also connects to a series of 10-inch lines that serve other areas of the airport, including the GA facilities on the east side and the cargo facilities on the west side of the airport.

2.10.1.3 Telephone

Telephone service is furnished to MHT by Fairpoint Communications. The system is looped around the airport by a combination of underground ducts and overhead wire. The remaining portion of overhead cables, located on South Perimeter Road from Parking Lot "E" to UPS, will be placed underground upon completion of the new Airport Access Road project. This will provide an entire underground fiber optic system servicing MHT.

Comcast provides additional telecommunications service to MHT, this system is fed from Londonderry in the vicinity of Industrial Drive and South Perimeter Road.

2.10.1.4 Natural Gas

Natural gas is provided to MHT by Energy North. The main gas line to the airport is a 6-inch line that originates adjacent to the Runway 6 threshold at Brown Avenue. This gas main has a pressure of 60 pounds per square inch (psi). Service is provided to buildings mainly located on the west side of the airport, including the passenger terminal building and buildings in the air cargo area. A second gas main on Harvey Road provides natural gas service to buildings east of Runway 17/35.

2.10.1.5 Sewer

Existing sanitary sewers serve the airport's major functional areas, including the passenger terminal, parking garage, GA facilities, and cargo areas. MHT's sewer system is serviced by the City of Manchester's Environmental Protection Division, a Division of Public Works, and by the Town of Londonderry's Public Works and Environmental Services Division. Regardless of which of the municipality's sewage conveyance system are used, all sanitary waste flows to the City of Manchester's Wastewater Treatment Plant.

2.10.2 AIRPORT DRAINAGE

Stormwater runoff at MHT is collected via a series of swales, ditches, and catch basins. There are 23 specific drainage areas, of various sizes, that make up the airport's drainage system. From these drainage areas there are a system of pipes, culverts, and detention basins that route stormwater to 24 outfalls. MHT discharges stormwater runoff to nearby natural water bodies, including Little Cohas Brook, Pine Island Pond, Cohas Brook, and the Merrimack River. All stormwater ultimately flows to the Merrimack River. In 2010, MHT completed a Drainage Master Plan Update which is on file at the airport.

2.11 ZONING/LAND USE

This section documents information regarding the existing land use and zoning information associated with MHT, both on-site and in the vicinity of the airport.

2.11.1 AIRPORT ZONING

Airport zoning specific to the MHT is presented in detail in **Appendix E5** of this Airport Master Plan Update.

2.11.2 ZONING AND LAND USES ADJACENT TO THE AIRPORT

Zoning and land uses adjacent to the airport is presented in detail in **Appendix E5** of this Airport Master Plan Update.

2.11.2.1 Existing On-Airport Land Use Categories

Categories of existing on-airport land use and their respective acreage areas for regulatory and comparison purposes are presented in **Table 2-25**.

TABLE 2-25
ON-AIRPORT LAND USE CATEGORIES

Airport Land Use Category	Existing Land Use (acres)
Airfield/RPZs	535
Terminal Area	23
Terminal Support	110
General Aviation	47
Air Cargo	32
Operations	17
Light Industrial/Commercial Business Park/Mixed Use	80
Institutional	3
Environmentally Sensitive Land	159
Open Space	159
Open Space Restricted	59
Total	1,224

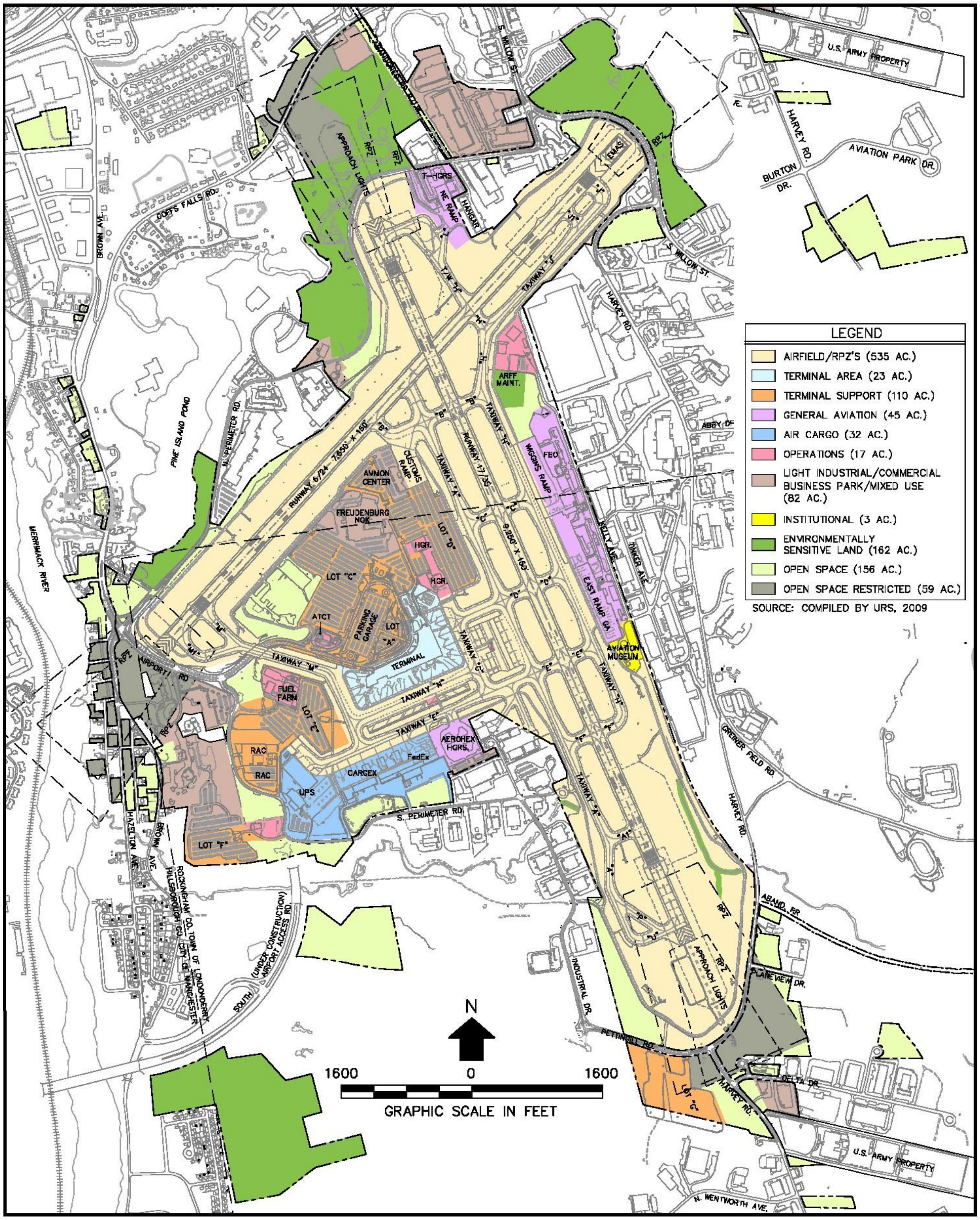
Source: URS Corporation, 2011.

The following paragraphs define each of these categories, and describe where on the airport property these land uses are located.

<u>2.11.2.1.1 Airfield/RPZs</u>

This category includes land that is used for the runway/taxiway pavements, navigational aids and their related critical clearances areas as defined by the FAA including Runway Protection Zones (RPZs) that are located beyond each runway end. As shown on the existing on-airport land use plan, **Figure 2-18**, the airfield/RPZ category currently consists of approximately 535 acres.

FIGURE 2-18
EXISTING ON-AIRPORT LAND USE PLAN



Source: URS Corporation, 2010.

2.11.2.1.2 Terminal Area

This designation encompasses all the facilities needed to serve the air carriers serving MHT. These facilities include, but are not limited to, the passenger terminal building and aircraft apron parking positions adjacent to the terminal building. As shown on the existing land use plan, the Terminal Area category currently consists of approximately 23 acres.

2.11.2.1.3 Terminal Support

This category includes land that is used for facilities associated with terminal area activities. These uses include public parking Lots A, B, C, D, remote Parking Lots "E," "F," and "G," as well as, rental car ready, return, and maintenance areas. Employee parking areas and terminal access roads are also included in this land use designation. As shown on the existing airport land use plan, approximately 110 acres have currently been designated for Terminal Support uses.

2.11.2.1.4 General Aviation

All general aviation activities for MHT are grouped under this land use designation. This includes both general aviation commercial aviation activities (i.e., FBOs) and general aviation non-commercial aviation activities, such as aircraft storage hangars.

The commercial aviation function, by definition, consists of the FBOs and specialized aircraft services. These activities include aircraft maintenance; sale of aircraft; sale of aircraft parts and accessories; sale of fuel, lubricants, and propellants; and operations of non-scheduled and charter transportation services.

The non-commercial aviation function consists primarily of facilities for storage of aircraft for an individual, private organization, or corporation.

GA facilities at MHT are located in three areas: an area east of Runway 17/35, an area north of Runway 6/24, and an area west of Runway 17/35 and south of Taxiway "E." As shown on the existing land use plan, approximately 47 acres have currently been designated for GA uses.

2.11.2.1.5 Air Cargo

An area located south of Taxiway "E" is dedicated largely for air cargo use. Current tenants include United Parcel Service (UPS), FedEx, Telford Aviation, Mountain Air Cargo, and Wiggins Airways. As shown on the existing airport land use plan, the Air Cargo category currently consists of approximately 32 acres.

2.11.2.1.6 Operations

This designation encompasses facilities that serve and support the operation of the airport. These facilities include, but are not limited to the ARFF station; airport maintenance and equipment storage, airport shuttle bus maintenance; ATCT; airline fuel storage/fuel farm; deicing equipment and sand storage as well as areas designated for snow collection and run-off. As shown on the existing land use plan, Operations area encompasses approximately 17 acres.

2.11.2.1.7 Light Industrial/Commercial Business Park/Mixed Use

This category includes land that is used for light industrial, non-aviation commercial, or business park related activities. These areas include, the Ammon Center office building, the Freudenberg NOK manufacturing plant. This category also includes land that is used for auto parking by the Highlander and Health Club employees and customers. As shown on the existing airport land use plan, approximately 80 acres of land are designated for Light Industrial, Commercial, and Business Park mixed use.

2.11.2.1.8 Institutional

This category includes land that contains the Aviation Museum of New Hampshire. This facility is operated and managed by the New Hampshire Aviation Historical Society. As shown on the existing airport land use plan, approximately 3 acres are designated for Institutional use.

2.11.2.1.9 Environmentally Sensitive Land

This category includes environmentally sensitive land areas on the airport that should remain undeveloped through the planning period and beyond. These areas are located on all sides of the airport property. As shown on the land use plan, approximately 159 acres of airport property are designated as Environmentally Sensitive Land.

2.11.2.1.10 Open Space

This classification of Open Space identifies areas of land that are open, have been cleared, and are not designated for any particular aeronautical use. As shown on the existing airport land use plan approximately 159 acres of airport property are designated as Open Space.

2.11.2.1.11 Open Space Restricted

This classification of Open Space Restricted identifies areas of land free of any structure and restricted strictly to protect the RPZs and approaches to Runway 17, 35, and 24 ends. As shown on the existing airport land use plan, approximately 59 acres are currently designated as Open Space Restricted.

2.11.3 LAND DEVELOPMENT RESTRICTIONS

2.11.3.1 City of Manchester

Sections 7.06, 7.07 and 7.08 of the City of Manchester Zoning Ordinance define three airport related regulations, including an Airport Navigational Hazard Overlay, an Airport Approach Overlay District and Noise Overlay Zone Boundaries.

> **Airport Navigational Hazard Overlay (Section 7.06)** – This zoning ordinance restricts land use within 100,000 feet of an airport control tower to uses which will not impact airport operations due to glare, electrical interference, smoke, dust, etc.
>
> **Airport Approach Overlay District (Section 7.07)** – This overlay district states that no structure or tree shall be erected, altered or allow to grow to a height which would exceed imaginary surfaces created by the District, where the limiting height shall not be less than thirty feet above ground. The Zoning Ordinance further states that the Airport Approach Zone “represents the airspace of the Manchester Airport, as most recently defined in accordance with Federal Aviation Regulation Part 77…” The imaginary surfaces also must take into account the ultimate development of the airport, which offers protection for proposed development.

Section 7.07 of the Zoning Ordinance also indicates that when proposed construction appears to be within the Airport Approach District, "the Director of Planning and Development Commissioner shall request of the Airport Director: (1) a determination of the maximum height of the imaginary surface plane of the Airport Approach District at the proposed location of the use, and (2) specific recommendation for additional navigational safety measures that should be required of the use to mitigate any special approach hazards created by such use. The Director of Planning and Development may attach such reasonable conditions as are necessary or prudent to protect navigation safety on the lands within the Airport Approach District."

Noise Overlay Zone Boundaries (Section 7.08) – Regulations applicable to this Section provide for the exclusion of certain land uses, and for soundproofing in the construction of other land uses. Two zones are established based on the latest Part 150 study for MHT, with adjustments as needed to apply the contours in the field. The two zones are N-1 for areas between the 75 DNL and 70 DNL contours, and N-2 for areas within the 70 DNL.

2.11.3.2 Town of Londonderry

Airport Overlay District (AD) – An Airport Overlay District (AD) exists within the Town of Londonderry and is depicted on the town's April 2009 Index and Zoning Districts Map. The AD area applies to about 95% of the land owned by the airport within the Town, as well as a small number of additional parcels which are privately owned but within the airport avigation easement areas. The Airport Overlay District is associated with town review of airport-related development proposals in accordance with intergovernmental review procedures and provides standards for airport uses and structures that do not fit within generally applicable commercial and industrial standards.

Airport Approach Noise Overlay – The overlay establishes Noise Compatibility Zones which the DNL contours, where the N-1 zone generally corresponds to the area between the 65 and 70 DNL contours, the N-2 zone includes the area between the 70 and 75 DNL contours, and the N-3 zone corresponds to areas within the 75 DNL. The DNL contour boundaries between noise overlay zones, while bearing a very close relationship to the DNL contour lines, have been adjusted to facilitate understanding and agreement as to the location of the boundaries.

Prohibited land uses within the noise overlay zones are specified in a Table of Land Use Compatibility Standards, which relate a list to land uses to the three zones based on DNL contour values and indicate the compatibility result and conditions. The overlay criteria requires sound proofing for certain land uses within the noise compatibility zones.

Airport Approach Height Overlay – The airport Approach Height Overlay coincides with the Part 77 precision approach surface for Runways 6 and 35, where the overlay length is limited to 10,000 feet for Runway 35 and the western town boundary for Runway 6. The overlay criteria identifies height limits for objects located within the identified areas and a number of inclined planes, which are indicated for specific runway ends and areas.

2.11.3.3 Town of Bedford

The Town of Bedford is located across the Merrimack River from MHT. A small section of the Runway 24 Runway Protection Zone is within the town's boundary. The Official Zone Map for the Town of Bedford does not identify any special airport related districts, boundaries, or overlays.

2.11.4 DELINEATED WETLANDS AND CONSERVATION LANDS

Wetlands on and adjacent to the airport were identified from National Wetlands Inventory (NWI) information and from wetland boundaries identified in the October 2006 Airport Site Plan. The NWI information on **Figure 2-19** depicts a number of wetlands on and in the vicinity of MHT.

NWI mapping identifies the following existing wetlands on airport property:

- A small wetland is located directly south of the airport ARFF/Operations building, within an infield area between apron and taxilane pavements.
- A number of wetlands exist in the Cohas Brook which runs outside the airport fence line, and are located adjacent to Perimeter Road and situated to the west and north of the Runway 17 landing threshold.

Off-airport, NWI wetlands also exist to the south of South Perimeter Road, primarily on privately owned land. NWI mapped wetlands also exist in the Runway 24 approach area.

Wetlands identified in the 2006 MHT Airport Site Plan are shown in **Figure 2-20**. The 2006 plan provides more detailed information on wetlands on and adjacent to the airport.

NH Conservation Lands identified in the NH Wildlife Action Plan 2005 and conservation easements identified during the 2007 MHT Runway 6/24 Safety Area Improvement Project Plan by FST, Inc. are depicted in **Figure 2-21.**

2.11.5 FOREIGN TRADE ZONE

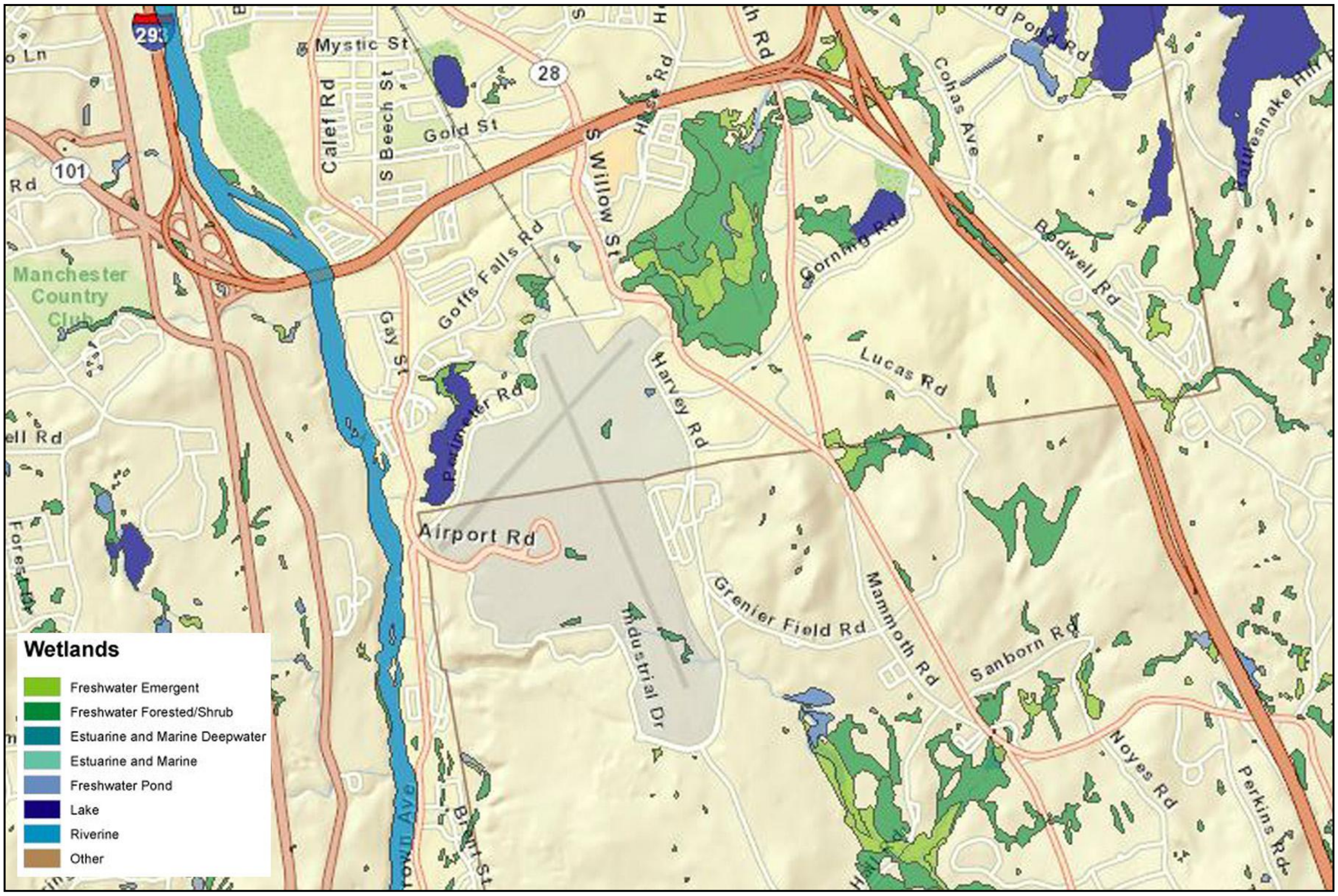
Manchester-Boston Regional Airport serves as the qualifying port of entry for a Foreign Trade Zone (FTZ), which includes 1,469 acres within both the City of Manchester and the Town of Londonderry. Most of MHT's property is included in the FTZ. The FTZ boundary in Londonberry is depicted in **Figure 2-22**.

An FTZ is considered to be outside the normal duty collection area of U.S. Customs, and provides special customs procedures for U.S. companies involved with international trade. Items which are shipped into an FTZ for processing and are then shipped outside the country are duty-free. The duty on items to be sold in the U.S. is deferred until the goods leave the FTZ.

Permitted activities within an FTZ include assembling, testing, sampling, relabeling, storage, salvage, repackaging, mixing, destroying and manipulating goods and products. Activities which may change the tariff status, such as manufacturing or processing, require special approval from the FTZ Board. Several manufacturing firms are currently located within the Manchester FTZ.

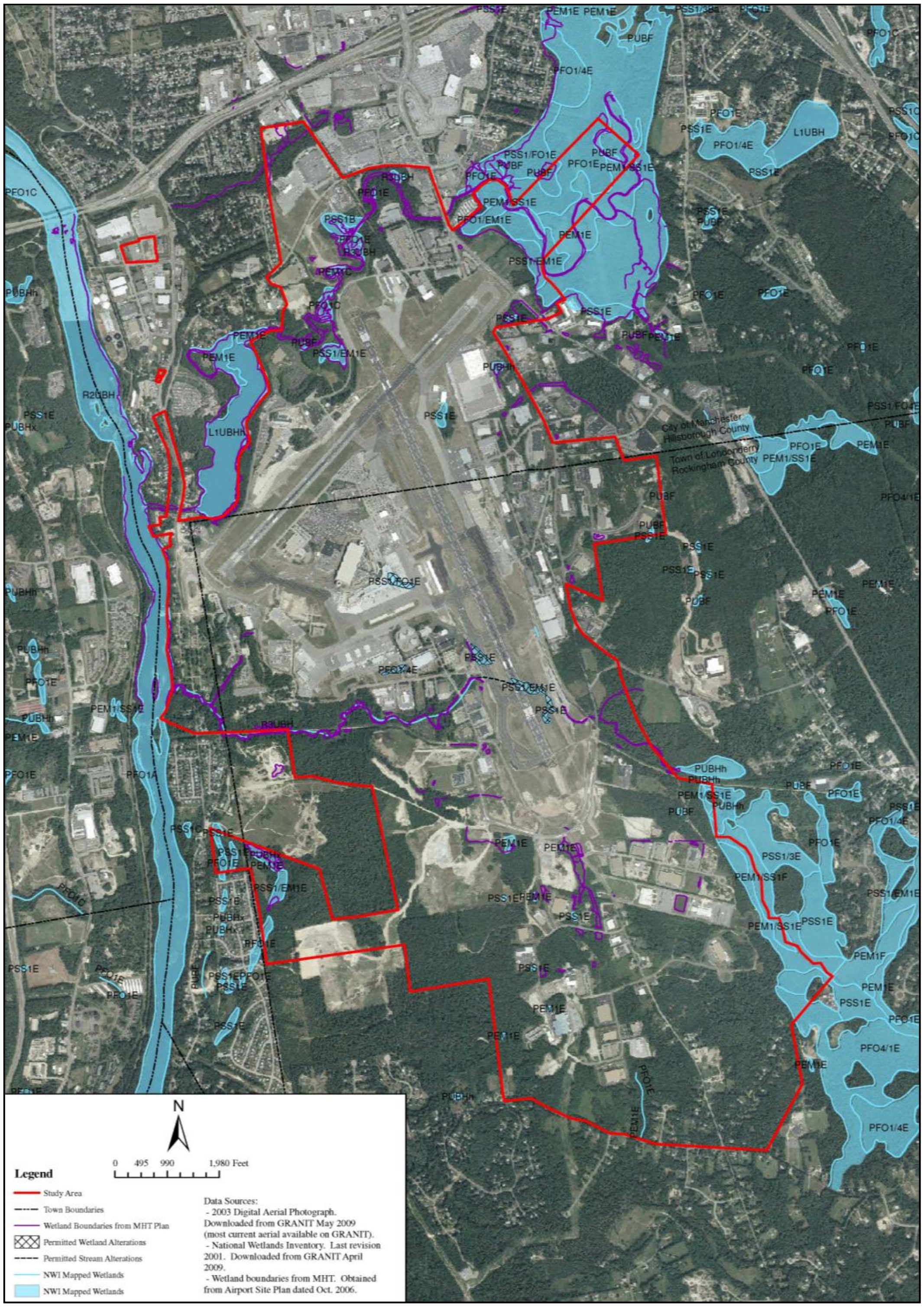
The Manchester FTZ is included in Foreign Trade Zone #81, where the grantee of the FTZ is the Pease Development Authority, Division of Ports & Harbors. The airport is not involved in the management or operation of the FTZ.

FIGURE 2-19
WETLANDS (NATIONAL WETLANDS INVENTORY)



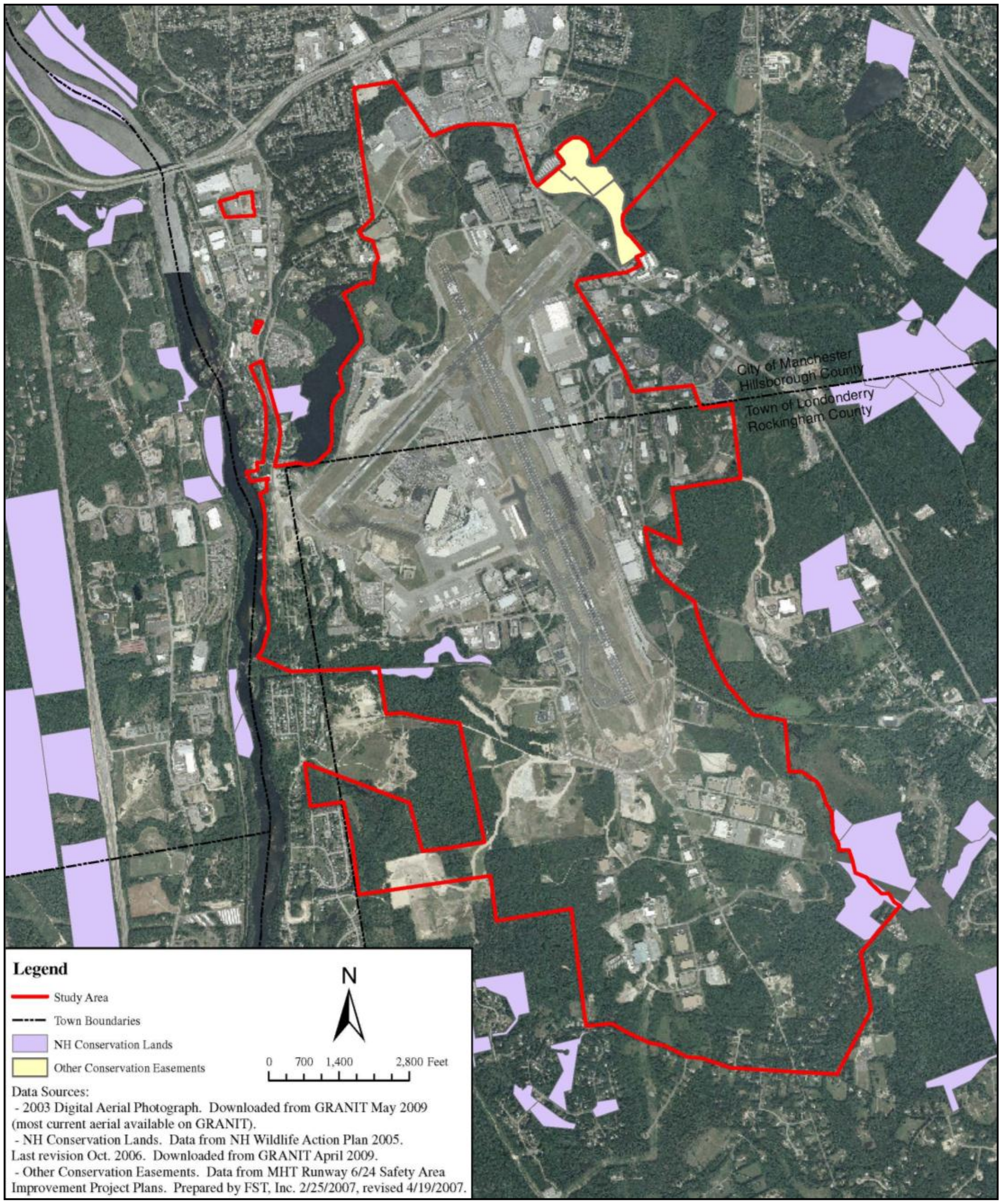
Source: U.S. Fish and Wildlife Service; http://www.fws.gov/wetlands/Data/Mapper.html. The Smart Associates, 2010.

FIGURE 2-20
WETLANDS IDENTIFIED IN 2006 AIRPORT SITE PLAN STUDY



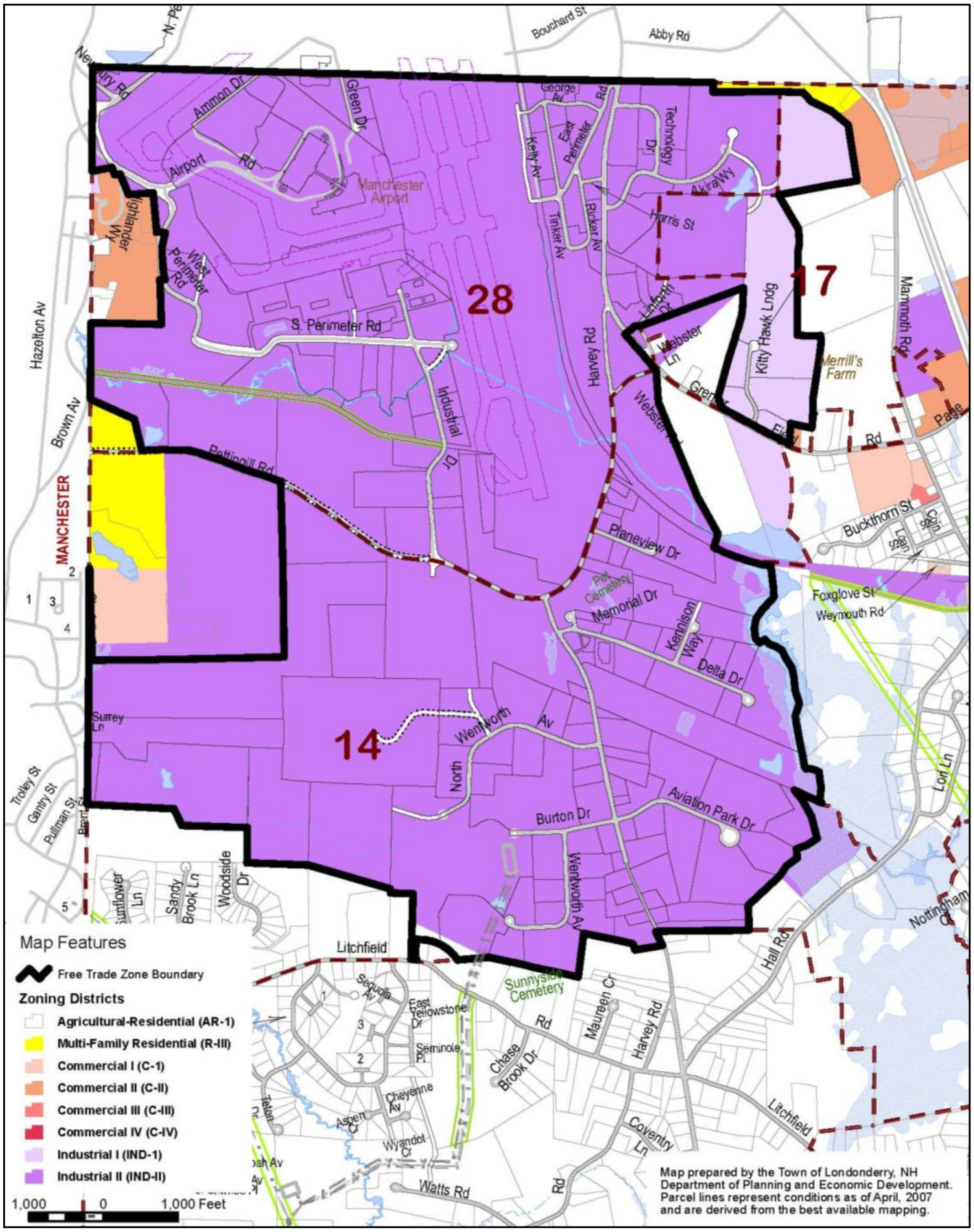
Source: The Smart Associates, 2010.

FIGURE 2-21
NH CONSERVATION LANDS AND CONSERVATION EASEMENTS



Source: The Smart Associates, 2010.

FIGURE 2-22
MHT FOREIGN TRADE ZONE WITHIN TOWN OF LONDONDERRY



Source: http://thriveinlondonderry.com/uploads/documents/foreign-trade-zone.pdf

2.11.6 AIRPORT OWNED PROPERTY LEASED TO OTHERS

Airport owned land and buildings which are leased are listed in **Table 2-26**. **Table 2-27** lists all airport property without structures that are leased.

TABLE 2-26
MHT LAND WITH BUILDINGS LEASED TO OTHERS, OR BUILDING RENTAL

Building	Location	Lease Area (sf)	Building Size and Condition	Building Type	Building Age (years)	Parcel Use	Parcel Actual Use	Tenant(s)
Airport Building T628	Perimeter Road	28,000	55 x 70, one story, fair condition	Steel frame and wood	39	S-1 Storage/ Maint.	Machine shop, hangar and aircraft repair	Aviation Associates
Office Building T608	One Harvey Road	4,000	66 x 80, two story, fair/poor condition	Wood frame masonry	69	B-Business	--	One tenant
Airport Building T438	Kelly Avenue	14,400	180 x 80, one story, fair condition	Steel frame	39	F-1 Factory	K-9 training	State Police
Office Building T439	Kelly Avenue	3,760	94 x 40, 1 1 /2 story, fair condition	Wood frame	62	B-Business	--	Saflite Pilot Training
Aviation Museum	Kelly Avenue	3,636	56 x 44, one story, good condition	Masonry	71	A-3 Public Assembly	Museum	NHAHS
Ammon Center	175 Ammon Drive	50,000	320 x 100, 40,956 sf, two story, good condition	Steel frame and masonry	49	B-Business	Office space	U.S. Customs/ Immigration
Hangars 1, 2 & 3	6 Industrial Drive	12,000 each	9,754 to 10,789 sf each, good condition	Steel frame	24	S-1 storage	Hangar	vacant
Office Building	6 Industrial Drive	9,200	112 x 46, two story, good condition	Steel frame	24	B-Business	Office area	ProStar; MHT Offices
Office Building	30 Bildor Drive	1,782	One story.	Masonry	52	--	Office	Manchester Residential Sound Proofing

Source: Bond Certification Properties and Facilities Review, Jacobs Edwards and Kelcey, October 2007.

TABLE 2-27
AIRPORT PROPERTY LEASES

Tenant	Property Location	Square Feet	Acres
850 Perimeter Road/NA, LLC	848 Perimeter Road, Manchester	70,654	1.62
Autofair Parking LLC	Northeast Corner of Map 872-2 Goffs Falls Rd, Manchester	212,828	4.89
Hoyt Enterprises (Avis/Budget) and Vanguard Car Rental Co.	Shared Quick Turnaround Area Facility, Green Dr, Manchester	51,243	1.18
Avis Rent A Car	Remote Parking Lot Perimeter Rd., Londonderry.	41,151	0.94
Hoyt Enterprises, LLC d/b/a Budget	Remote Parking Lot Perimeter Rd., Londonderry	37,520	0.86
CARGEX Properties (Ammon)	Ammon Center Building 175 Ammon Dr. Manchester	37,406	0.86
CARGEX Properties (Air Cargo I)	FedEx Bldg and Ramp 28 S. Perimeter Rd., Londonderry	379,820	8.72
CARGEX Properties (Air Cargo II)	FedEx Extended Ramp 28 S. Perimeter Rd., Londonderry	93,657	2.15
CARGEX Properties (Air Cargo III)	Multi-tenant Cargo Bldg. 38 S. Perimeter Rd., Londonderry	248,510	5.71
Freudenberg-NOK General Partnership	50 Ammon Dr, Manchester	490,050	11.25
Gael Terra	2 Highlander Way, Londonderry[1]	119,064	2.73
Hangar 5, Inc.	Kelly Ave, Londonderry	14,229	0.33
Hangar Ten Associates	Northeast Ramp - Perimeter Rd., Manchester	52,000	1.19
Harvey Road Airpark, LLC	1 Perimeter Rd, Manchester	178,204	4.09
Kanvas NV	3 Perimeter Rd, Manchester	234,658	5.39
JMT Properties, LLC	5 Perimeter Rd, Manchester	224,421	5.15
Pine Valley Mill, LLC	7 Perimeter Rd, Manchester	400,229	9.19
Hertz Corporation	Remote Parking Area, S. Perimeter Rd., Londonderry.	128,021	2.94
Hertz Corporation	Additional Remote Parking Area S. Perimeter Rd., Londonderry	41,926	0.96
IRA Toyota of Manchester	Auto Storage in Airport Parking Lot "G" 1 Pettingill Rd. , Londonderry.	28,620	0.66
Vanguard Car Rental dba National	Remote Parking Lot Perimeter Rd., Londonderry	35,305	0.81
Mathes Associates	709 Barrette Dr., Manchester	61,685	1.42
Northeast Ramp Hangar, LLC	Northeast Ramp - Perimeter Road, Manchester	35,325	0.81
True Value Company	Trailer Parking - Kelly Ave, Manchester	88,514	2.03
United Parcel Services, Inc.	46 S. Perimeter Rd., Londonderry	559,246	12.84
Wiggins Airways - Fuel Farm	20 Perimeter Rd., Londonderry	184,042	4.23
Wiggins Airways - GA Terminal/FBO	1 Garside Way, Manchester	571,508	13.12
Woodbury Court LLC	4 Delta Dr, Lot #22-1 Londonderry	43,604	1.00
Woodbury Court LLC	8 Delta Dr, Lot #22, Londonderry	109,902	2.52
	TOTAL	**4,773,342**	**109.59**

Source: MHT Records, 2009.
Note: [1] Gael Terra subleases 1 Highlander Way under 2 Highlander Way lease.

2.12 REGIONAL AIRPORT SYSTEM

2.12.1 MHT AND THE NEW ENGLAND AIR CARRIER AIRPORT SYSTEM

There are ten airports located within 200 statute miles of MHT that offered commercial air service in 2008, as noted in **Table 2-28**.

TABLE 2-28
REGIONAL COMMERCIAL SERVICE AIRPORTS WITHIN 200 MILES OF MHT

Airport	Distance From MHT (Miles)	Number of Runways	Runway Length	Number of Airlines	2008 Enplanements	Aircraft Operations
Portsmouth International (Pease)[1]	33	1	11,321		33,384	
Laurence G. Hanscom Field[2]	33	2	7,001 5,106		8,687	
Boston Logan International	45	6[3]	10,005 7,861 10,083 2,557 7,000 5,000		12,784,965	
Worcester Regional[4]	51	2	7,000 5,000		3,184	
Portland International	75	2	7,200 5,001		875,877	
T. F. Green	83	3	7,166 6,081		2,336,815	
Bradley International	94	2	9,510 6,847		2,992,437	
Burlington International	137	2	8,320 3,611		747,591	
New Haven-Tweed	137	2	5,600 3,626		34,014	
Bangor International	184	1	11,440		333,844	

Sources: Airport/Facility Directory, Northeast U.S., July 2, 2009.
U.S. Terminal Procedures, Northeast, July 2, 2009.
FAA Passenger Boarding (Enplanement) Data for U.S. Airports, July 9, 2009.

Notes:
1 Portsmouth International Airport currently has no scheduled air service.
2 Air service at Laurence G. Hanscome Field is offered by Linear, which offers limited seasonal scheduled service to Nantucket.
3 Runway 14/32 at Boston Logan International Airport is a unidirectional commuter runway which adds significant airfield capacity, where takeoffs are limited to Runway 14 and landings occur on Runway 32.
4 Air service at Worcester Regional Airport is offered by DirectAir, a public charter carrier offering less than daily service to vacation destinations.

2.12.2 RECENT AND FUTURE AIRPORT DEVELOPMENT AT MAJOR COMPETING AIRPORTS

The recent and future airport development at major competing airports is discussed in details in **Appendix E6** of this Airport Master Plan Update.

2.13 METEOROLOGICAL DATA

2.13.1 WIND COVERAGE BASIS

A major factor in evaluating the effective orientation of a runway or runway system is the direction and velocity of the prevailing winds during the spectrum of weather conditions under which aircraft will fly. Ideally, all aircraft takeoffs and landings would be conducted into the wind, which reduces approach and takeoff speeds and eliminates the need to adjust the aircraft for winds across the flight path. A runway alignment that does not allow an aircraft to go directly into the wind creates what is known as a crosswind component (i.e. wind velocity component directly across the flight path), which may increase the complexity of takeoffs and landings and limit runway availability.

The commonly used measure to evaluate the degree to which a runway alignment, or a combination of runways, may be used without potentially excessive crosswinds is the wind coverage percentage. Wind coverage percentage is that percent of time crosswind components are below a prescribed wind velocity. The crosswind percentage indicates the percentage of time aircraft within a particular design group should be able to use a runway or airport without exceeding the acceptable crosswind component. Current FAA standards recommend that airfields provide at least 95% wind coverage for all aircraft types that utilize the airport for at least 500 or more annual itinerant operations.

Allowable crosswind components for wind coverage calculations are based on ARC of the aircraft which regularly use the airport, and are defined AC 150/5300-13, *Airport Design*. The ARC consists of a letter representing an Aircraft Approach Category (based on the approach speed, or the stall speed multiplied by 1.3) and a number representing an Airplane Design Group (based on wingspan or tail height, whichever is most demanding). These groupings are presented in **Table 2-29**.

TABLE 2-29
AIRPORT REFERENCE CODE (ARC)

Aircraft Approach Category	Approach Speed	
A	Less than 91 knots	
B	91 knots or more but less than 121 knots	
C	121 knots or more but less than 141 knots	
D	141 knots or more but less than 166 knots	
E	166 knots or more	
Airplane Design Group	**Wingspan**	**Tail Height**
I	Up to but not including 49 ft.	Up to but not including 20 ft.
II	49 ft. up to but not including 79 ft.	20 ft. up to but not including 30 ft.
III	79 ft. up to but not including 118 ft.	30 ft. up to but not including 45 ft.
IV	118 ft. up to but not including 171 ft.	45 ft. up to but not including 60 ft.
V	171 ft. up to but not including 214 ft.	60 ft. up to but not including 66 ft.
VI	214 ft. up to but not including 262 ft.	66 ft. up to but not including 80 ft.

Source: FAA Advisory Circular (AC) 150/5300-13 CHG 16, *Airport Design*.

Allowable crosswind components are shown in **Table 2-30**.

TABLE 2-30
ALLOWABLE CROSSWIND COMPONENTS

ARC	Allowable Crosswind Component (Knots)
A-I and B-I	10.5
A-II and B-II	13
A-III, B-III, C-I through C-III, D-I through D-III	16
A-IV, B-IV, C-IV, D-IV, D-V and D-VI	20

Source: FAA AC 150/5300-13 CHG 16, *Airport Design*.

2.13.2 CROSSWIND COVERAGE

Wind data for MHT was obtained from the National Climatic Data Center (NCDC). The wind data was collected at MHT for the ten-year period 1999 through 2008, based on Automated Surface Observation System (ASOS) readings. This wind data was used to prepare the All Weather, IFR, Category I ILS IFR and Category II/III ILS IFR wind roses presented in **Figures 2-23 through 2-26**. The wind roses show the percentage of time winds originated from different directions, and within defined velocity ranges, during a particular weather condition. The rectangular boxes within each windrose define the winds which present crosswinds equal to or less than 10.5, 13, 16 and 20 knots, where the airport is regularly used by a wide spectrum of aircraft from small single and multi-engine piston planes (10.5 knot allowable crosswind component) to the A-300 and B-767 (20 knot allowable crosswind component).

The calculated crosswind component is based on data from ASOS readings taken at about 30 feet above ground level. From an operational standpoint the actual crosswind component at 500 feet and 1000 feet above ground may be more than twice the calculated value from ASOS data, due to wind velocity variations with elevation[1].

The crosswind coverage for 10.5 through 20 knots is presented in **Table 2-31**. The current runway system at MHT provides excellent wind coverage, and meets the recommended 95% combined runway coverage for all aircraft that regularly use the airport.

TABLE 2-31
MHT WIND COVERAGE

Weather	Runway 17/35			Runway 6/24			Both Runways		
	10.5 Kts	13 Kts	16 Kts	10.5 Kts	13 Kts	16 Kts	10.5 Kts	13 Kts	16 Kts
All-Weather	96.53%	98.48%	99.76%	90.79%	94.61%	98.59%	98.71%	99.70%	99.94%
IFR	96.74%	98.49%	99.67%	96.77%	98.30%	99.55%	99.56%	99.88%	99.96%
CAT I ILS	96.53%	98.38%	99.64%	96.60%	98.22%	99.52%	99.52%	99.87%	99.95%
CAT II/III ILS	98.02%	99.36%	99.91%	97.95%	98.62%	99.36%	99.95%	100%	100%
Weather	**20 Kts**			**20 Kts**			**20 Kts**		
All-Weather	99.97%			99.96%			99.99%		
IFR	99.95%			99.86%			99.99%		
CAT I ILS	99.95%			99.85%			99.99%		
CAT II/III ILS	99.99%			99.91%			100%		

Sources: NCDC Wind Data, 1999-2008.
Notes: The wind rose analysis used the following definitions for each weather condition:
All-Weather: All ceiling and visibility conditions;
IFR: Ceiling below 1000’ or visibility below 3 miles;
CAT I ILS: IFR with ceiling of at least 200’ and visibility of at least ½ mile; and
CAT II/III ILS: IFR with ceiling below 200’ or visibility below ½ mile.

The annual weather condition percentages for each weather category are[2]:

Weather Category	Percentage
All-Weather	100%
IFR	11.3%
CAT I ILS	10.1%
CAT II/III ILS	1.2%

[1] *Physics of the Air* by WJ Humphreys, pgs. 149-150.
[2] Source: National Climatic Data Center Print-out of Annual Hours by Weather.

2.13.3 WIND PERSISTENCY

Figures 2-23 through 2-26 include wind persistency graphs which plot the relative direction of all winds above and below 10 knots, and can be used to identify the primary wind direction during each weather condition. A discussion of wind persistency at MHT is presented below.

2.13.3.1 All-Weather

The highest percentage of All-Weather winds come from the northwest to north direction (true), which is closely aligned with Runway 35 approaches (true bearing of 336.5 degrees). The second most prevalent wind grouping is from the south to south-south southwest, which favors use of Runways 17 (156.37 degree true bearing) or Runway 24 (true bearing of 222.4 degrees).

2.13.3.2 IFR

The IFR winds tend to originate from a north-northwest to east-northeast direction, with a peak at close to a north-northeast bearing. Runway 6 (42.4 bearing true bearing) and Runway 35 (336.5 degree bearing) are closely aligned with the most prevalent IFR wind directions, and IFR winds from the south primarily favor Runway 17.

2.13.3.3 CAT I IFR

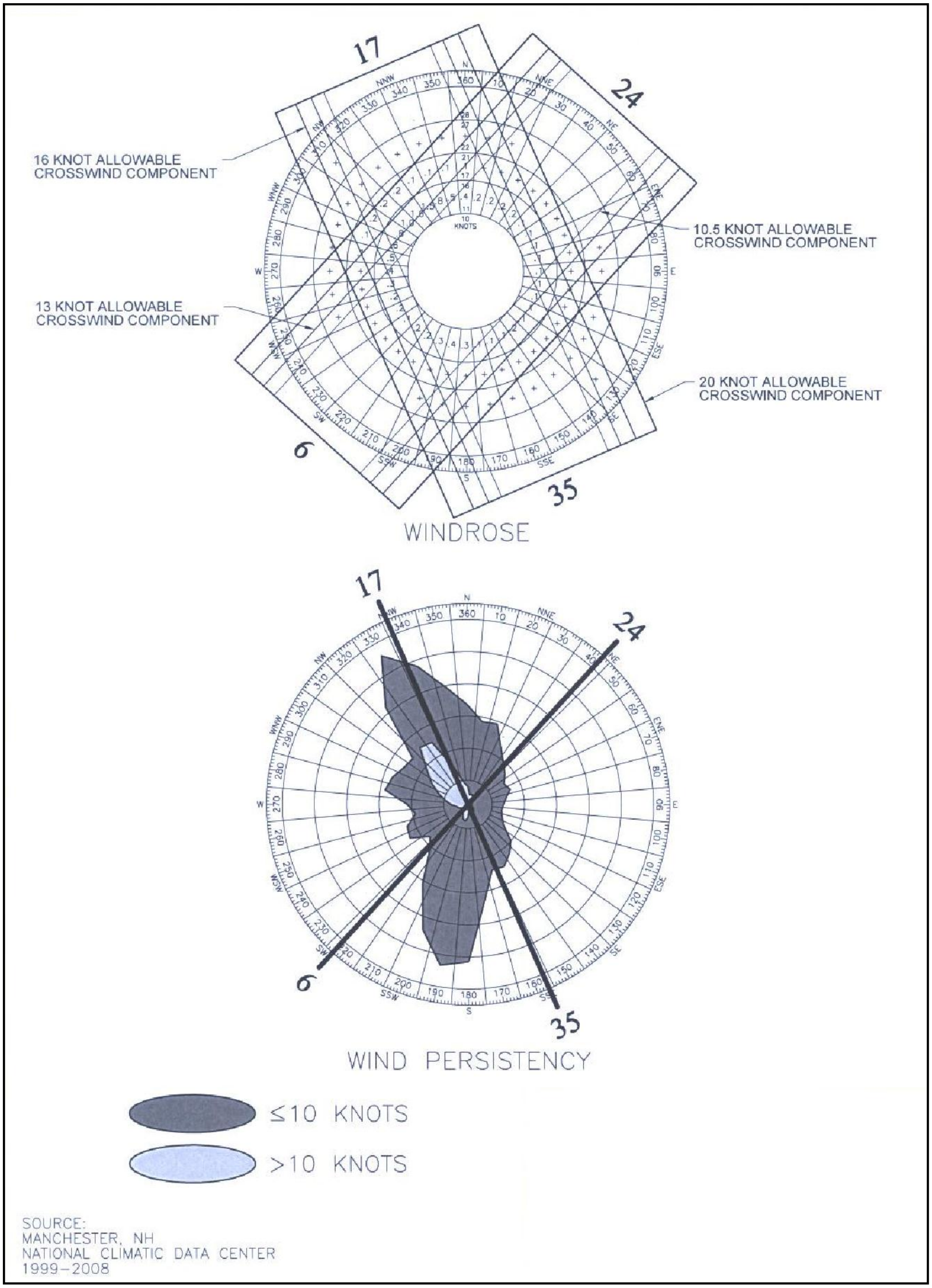
The Category I ILS weather wind persistency peak covers an arc from about 330 degrees (north-northwest) to about 85 degrees (east-northeast), with a peak at approximately 20 degrees true bearing (north-northeast). Runway 6 appears to be most closely aligned with the peak CAT I wind direction, and where a substantial amount of CAT I winds favor Runway 35. The close alignment of Runway 6 with the primary IFR and CAT I ILS IFR wind directions, taken together with the existing ILS minimums on Runway 6, suggests that a possible reduction in the Runway 6 ILS visibility and ceiling minimums should be explored further during this study.

The southerly CAT I IFR winds favor Runways 17.

2.13.3.4 CAT II/III IFR

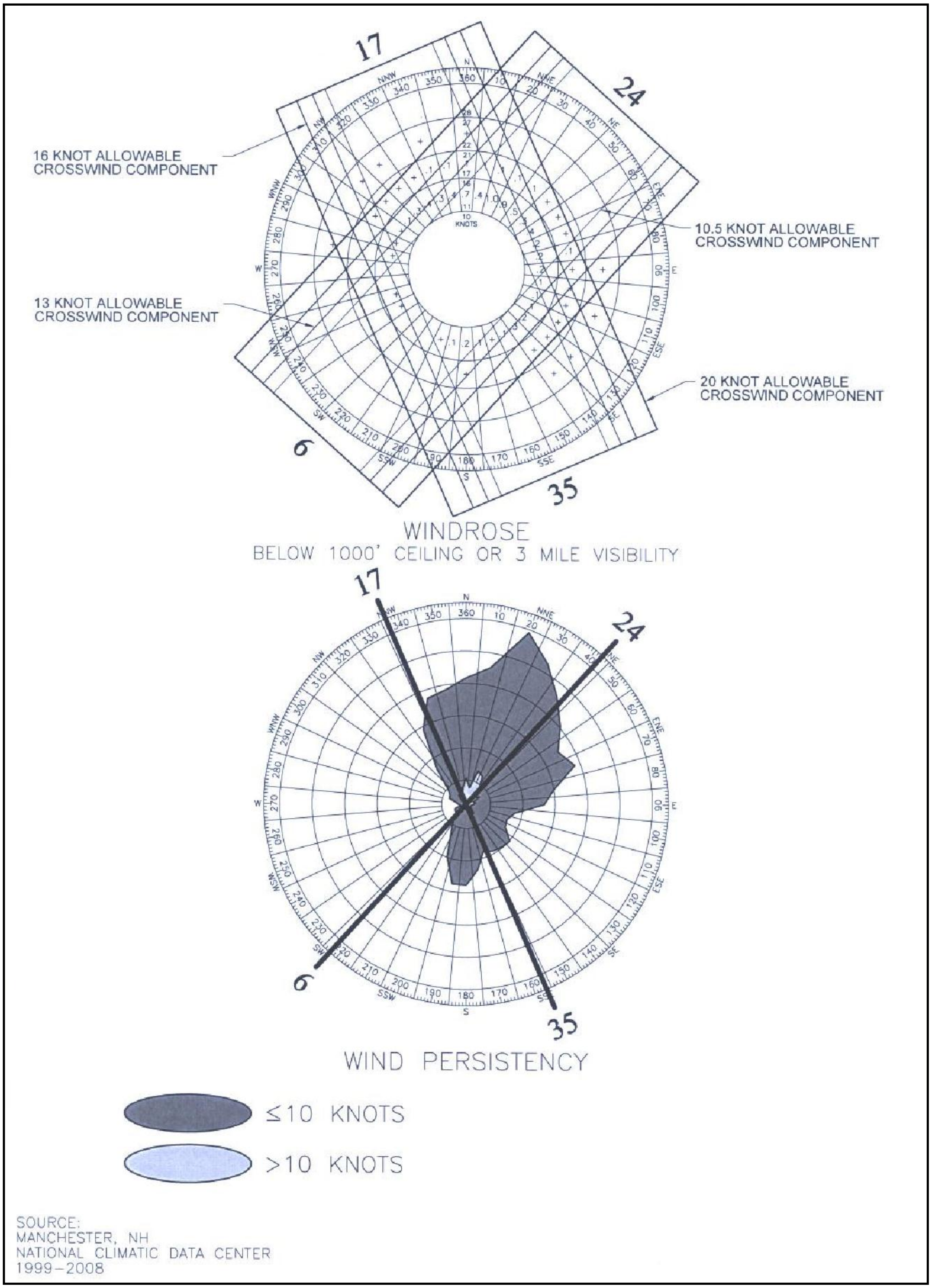
The sharp peak in the CAT II/III ILS wind persistency spans from 340 (north-northwest) to 20 degrees (north-northeast) true bearing, which primarily favors operations on Runway 35, and Runway 6 to a lesser degree.

FIGURE 2-23
ALL WEATHER WINDROSE AND PERSISTENCY GRAPH



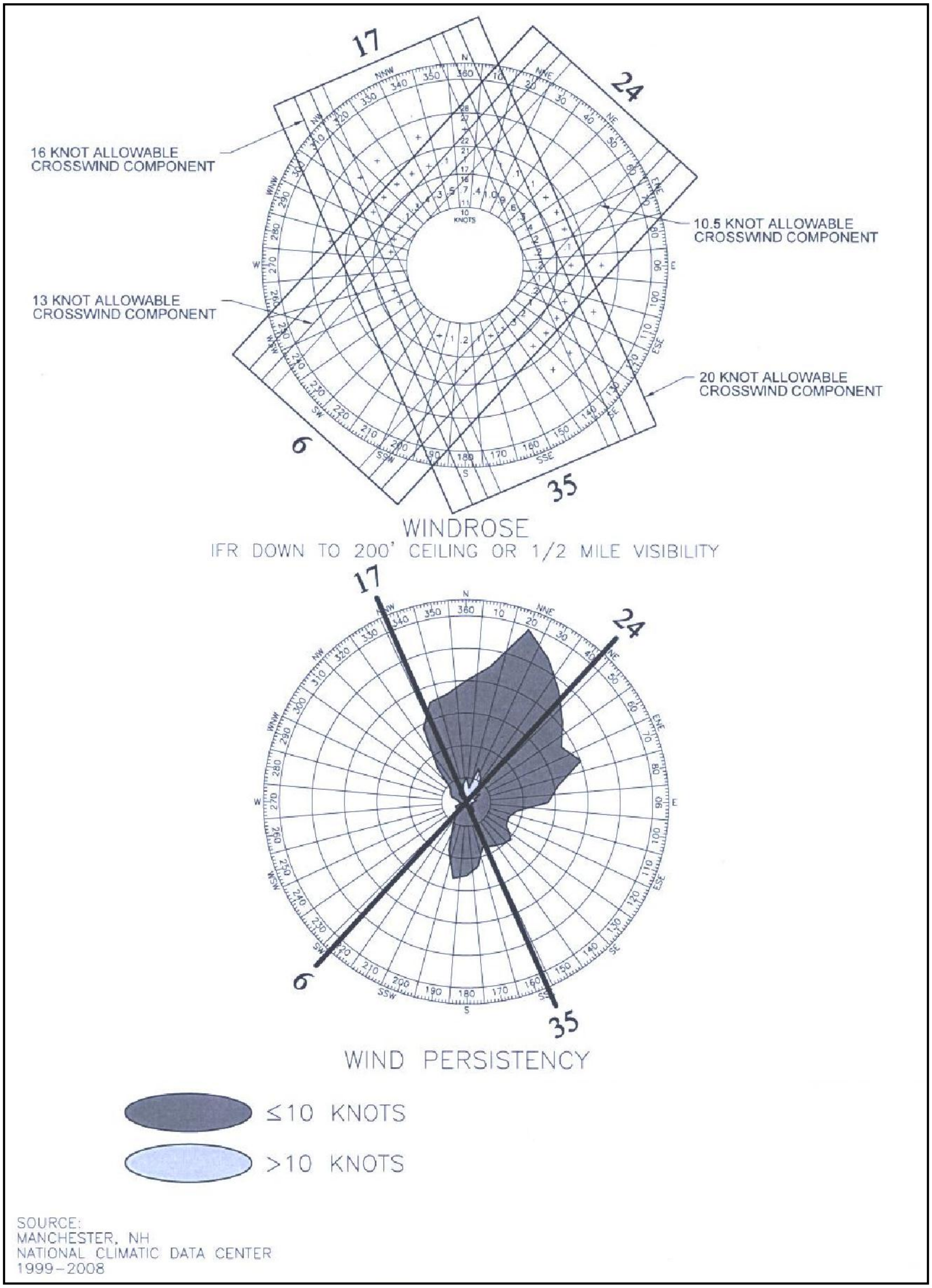
Source: McFarland Johnson analysis of NCDC Data, 2010.

FIGURE 2-24
IFR WINDROSE AND PERSISTENCY GRAPH



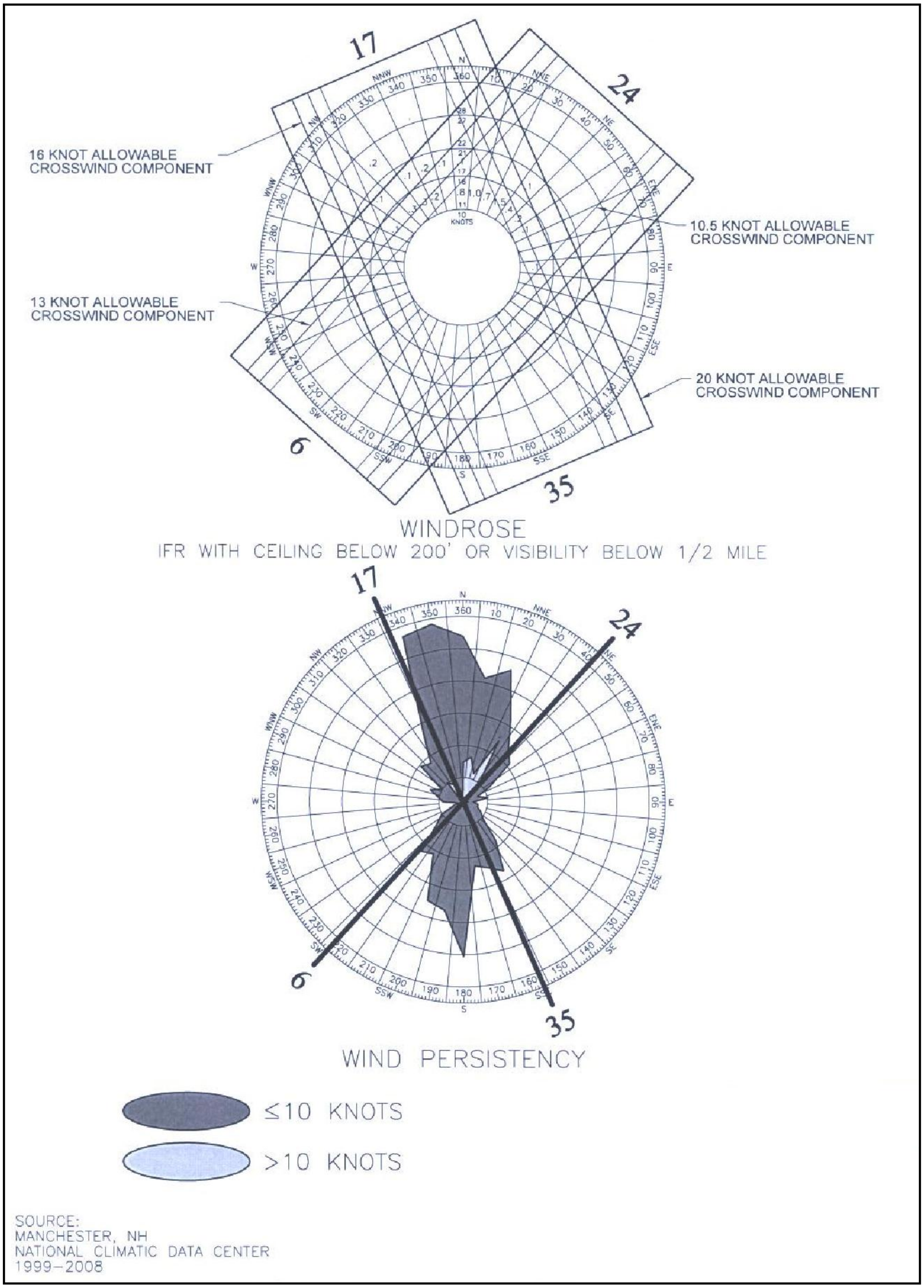
Source: McFarland Johnson analysis of NCDC Data, 2010.

FIGURE 2-25
CAT I ILS WINDROSE AND PERSISTENCY GRAPH



Source: McFarland Johnson analysis of NCDC Data, 2010.

FIGURE 2-26
CAT II/III ILS WINDROSE AND PERSISTENCY GRAPH



Source: McFarland Johnson analysis of NCDC Data, 2010.

2.13.4 *MEAN MAXIMUM TEMPERATURE*

The closest NCDC weather station to MHT is at Massabesic Lake, New Hampshire, about four miles from the airport. **Table 2-32** shows monthly temperature statistics for the station, where the mean maximum temperature for the hottest month is 82.1 degrees.

TABLE 2-32
MHT AREA WEATHER DATA

Month	Mean Max Temperature (° F)	Mean Average Temperature (° F)	Mean Low Temperature (° F)
January	32.3	18.8	5.2
February	35.6	21.9	8.2
March	44.3	31.4	18.4
April	56.0	42.5	29.0
May	68.3	54.3	40.2
June	77.4	63.5	49.5
July	82.1	68.4	54.6
August	80.2	66.5	52.8
September	72.2	57.9	43.5
October	60.9	46.4	31.8
November	49.6	36.6	23.6
December	37.4	24.9	12.3

Source: Climatography of the United States, No. 81.

Temperature data is an important factor for airport planning due to the relationship between aircraft operating requirements and temperature, where aircraft landing and takeoff lengths are sensitive to temperatures (higher temperatures require a longer length). The mean maximum temperature for the hottest month is used in planning calculations for required runway length, and instrument approaches which depend upon in-flight barometric pressure, such as LNAV/VNAV and RNP, are temperature sensitive.

2.14 *EXISTING MODIFICATIONS TO STANDARDS*

A comparison of existing airport conditions with applicable design standards are described in **Table 2-33.**

TABLE 2-33
EXISTING MHT MODIFICATIONS FROM STANDARDS

Description	Existing Condition	Design Standard	Remarks
Taxiway "A" Safety Area Width	65 feet width on west side of taxiway from below Taxiway "E" to Taxiway "P"	85.5 feet each side of centerline	--
Runway Visibility Zone (RVZ)	Ammon Center, Freudenberg NOK, Airfield Sand Storage, ARFF station and Maintenance buildings within RVZ	Clear of Objects	--
Runway 6/24 Object Free Area (OFA)	Ammon Road 275 to 3,320 feet from centerline	No objects within 400' from centerline	--
Runway 6/24 Primary Surface	Triangle Mall is located within Primary Surface and penetrates by 82 feet	No objects should penetrate Primary Surface	--
Grade of first 2312.5 feet from Runway 35 end	Grade changes from +1.19% at ¼ runway length point to 0% at runway end	Grade over end quarter of runway should not vary from preceding grade by more than 0.8%	--
Taxiway "J" offset from Runway 6/24, extending from Taxiway "H" to Runway 24 threshold	330 feet	400 feet	--
Line of Sight Down Runway 17/35	Line of sight between two five feet high points blocked when one point is on or near Runway 35 end	Clear line of sight between two points five feet above the runway	Modification approved by FAA, File #117, dated 2/27/03.
Safety Area Dimensions for Runway 35 Accelerate-Stop Procedures	Existing safety area on north end of runway does provide a 500-foot width over the specified 1,000-foot distance	500 feet wide by 1,000 feet long area with specified grade limits	--

Sources: Approved Airport Layout Plan, August 2007. McFarland Johnson Analysis, 2010.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION THREE

Forecasts

SECTION 3.0
FORECASTS

This section of the Airport Master Plan Update consists of two major subsections as listed below:

- Forecast of Aviation Activity; and
- Surface Traffic Forecasts.

3.1 FORECAST OF AVIATION ACTIVITY

3.1.1 DEFINITION OF THE AIRPORT SERVICE REGION

The Airport Service Region for Manchester-Boston Regional Airport (the Airport or MHT) generally consists of the southeastern part of New Hampshire and the northern section of the Boston metropolitan area. The southern part of New Hampshire, including the cities of Manchester, Nashua, and Concord is contained within the boundaries of the Boston-Worcester-Manchester Combined Statistical Area (CSA), as defined by the U.S. Office of Management and Budget (OMB). For the purpose of this Airport Master Plan Update, the Airport Service Region has been defined as the 5-county area encompassing Hillsborough, Rockingham, and Merrimack counties in New Hampshire, and Essex and Middlesex counties in Massachusetts (see **Figure 3-1**). These counties were selected on the basis of the proportions of resident travelers living there, as determined by the Airport's June 2008 passenger survey.

Figure 3-1 also shows the secondary airport service region, which is generally defined as the area within approximately 2 hours driving time from the Airport.

The share of passengers traveling through MHT who originated their journeys in New Hampshire declined from 40% in 1999 to 26% in 2008, according to the Airport's passenger survey (see **Figure 3-2**). Over the same period, the share of passengers who originated their journeys in Massachusetts doubled, from 11% to 22%. These shifts support the definition of an Airport Service Region which straddles both states.

The limits to any airport's service region are generally determined by the driving distance and travel time to other nearby commercial service airports, as well as the availability, cost, and quality of airline service at those other airports. The major competing airport located within a modest drive for residents of and visitors to the Airport Service Region is Boston Logan International Airport (Logan, or BOS), a large hub airport located 58 miles southeast of the Airport. Logan is a large hub airport with a significant amount of international service and a growing low-cost carrier presence.

As will be discussed in greater depth later in this chapter, past and future growth in passenger numbers at MHT has been driven less by demographic and economic trends in the Airport Service Region than by changes in air service offerings at MHT relative to BOS. Because of the much larger population of the Boston CSA, relative to the Airport Service Region, and because of the proximity of the two airports, future traffic levels at MHT are considered to be primarily "supply-driven" rather than "demand-driven."

This conceptual framework for forecasting is described in greater detail in Section 3.1.4 of this Report: *Traffic Forecast Assumptions and Methodology*.

FIGURE 3-1
AIRPORT SERVICE REGION

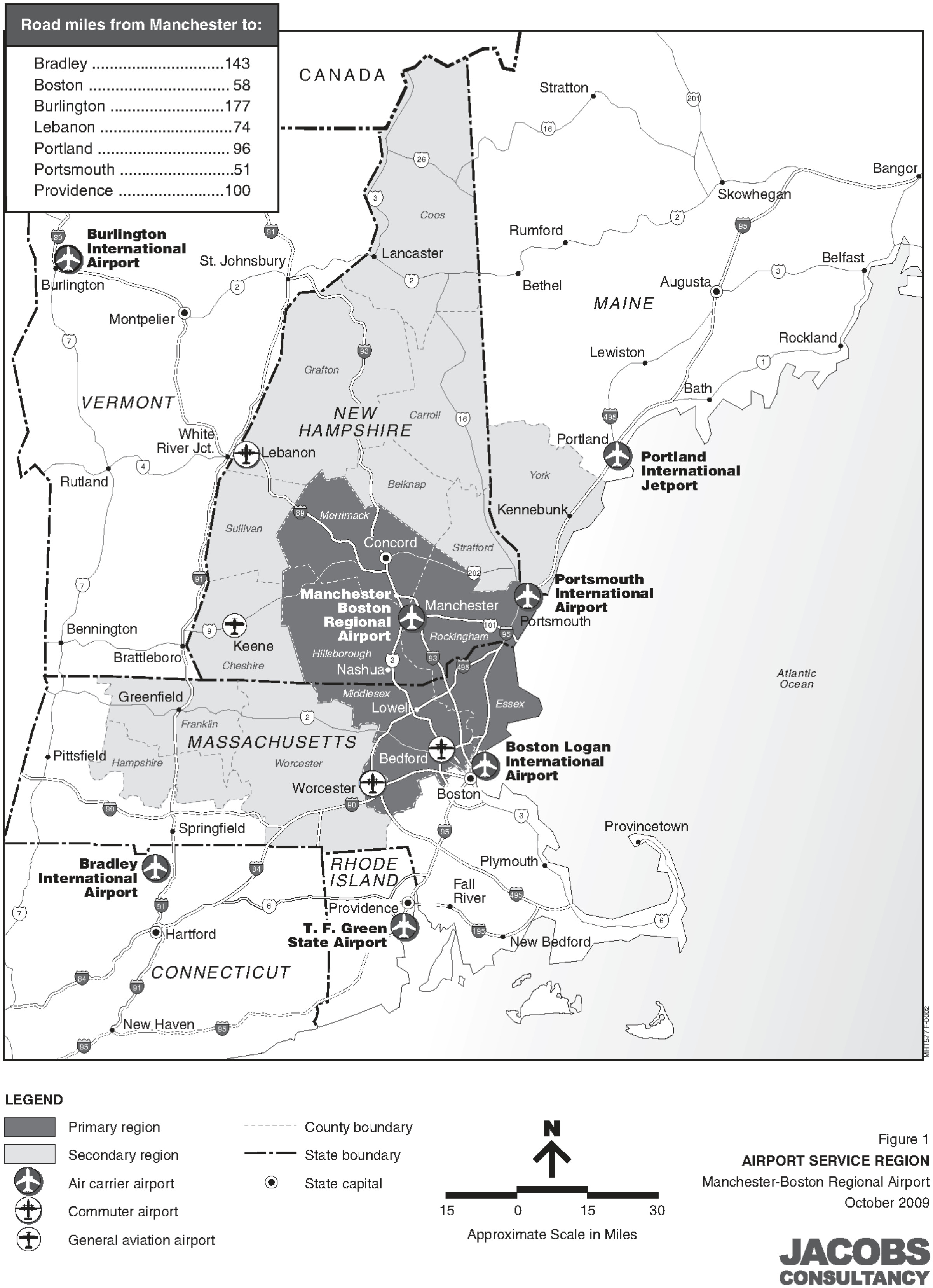
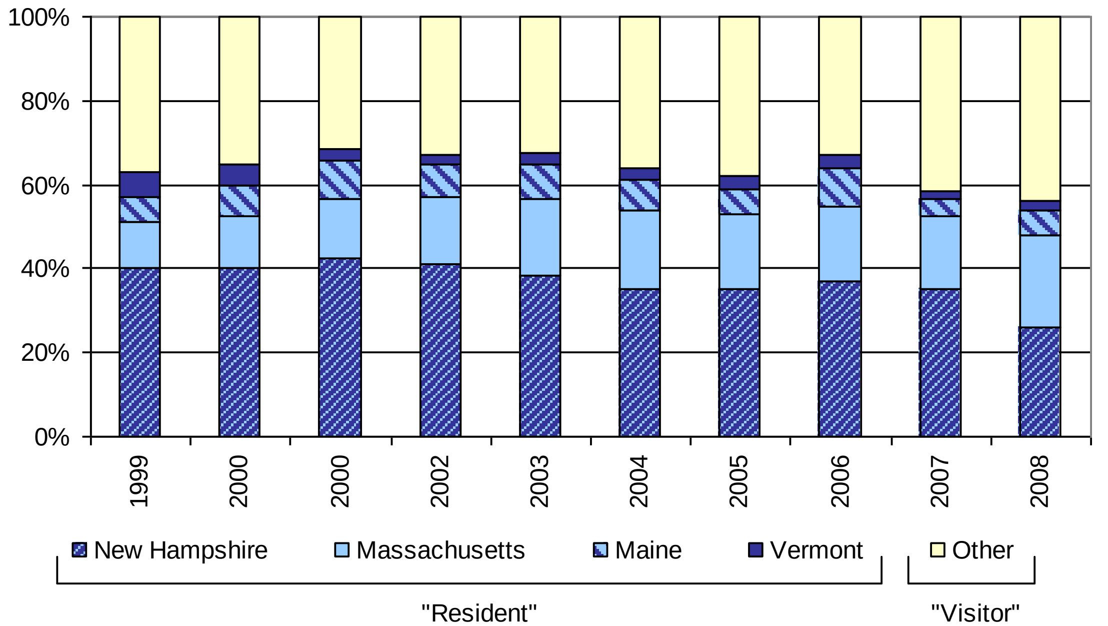


FIGURE 3-2
ORIGIN OF ENPLANED PASSENGERS
(1999-2008)



Source: *Manchester-Boston Regional Airport: Enplaning Passenger Survey*, June 2008, RKM Research and Communications, Inc.

3.1.2 DEMOGRAPHIC AND ECONOMIC PROFILE

The Airport Service Region's demographic and economic profile influences the demand for air travel, and changes in this profile affect the level of passenger traffic at MHT. For example, the amount and nature of business activity in the Airport Service Region affects the level of business travel both from and to MHT, while the level of per capita personal income in the Airport Service Region affects the level of discretionary travel at MHT.

3.1.2.1 Demographic Trends

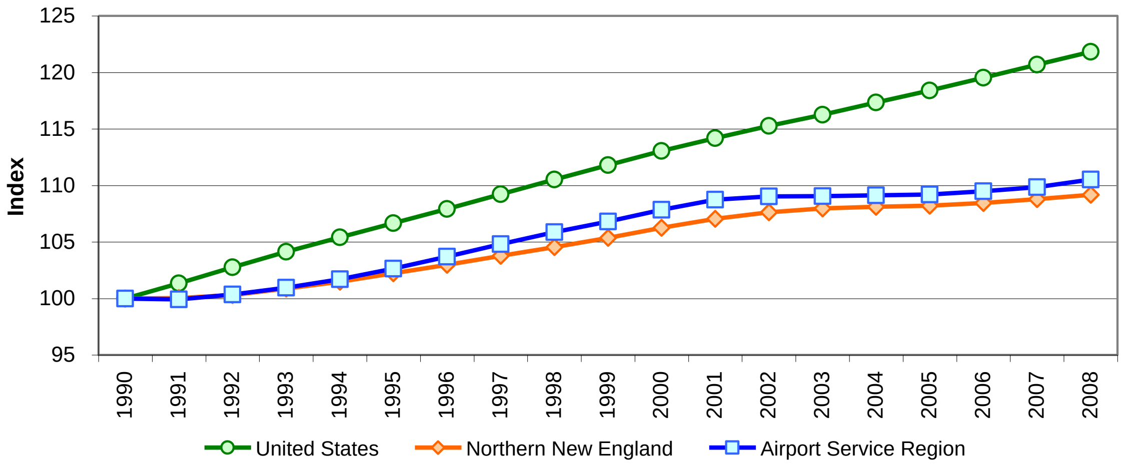
The growth of population and income in any area both results from, and supports, a growing economy.

3.1.2.1.1 Population

The Airport Service Region's 2008 population (3.1 million) represented more than 40% of the total population of the Boston CSA (7.5 million), the nation's fifth-largest metropolitan area by population that trailed only the New York, Los Angeles, Chicago, and Washington, D.C. metropolitan areas.

Between 1990 and 2008, the population of the Airport Service Region increased at a rate approximately half that of the nation, but generally in line with population growth in Northern New England (see **Figure 3-3**).

FIGURE 3-3
COMPARATIVE INDEX OF POPULATION TRENDS
(1990 = 100)



Compound annual growth rate	1990-2000	2000-2003	2003-2008
United States	1.2%	0.9%	0.9%
Northern New England	0.6	0.5	0.2
Airport Service Region	0.8	0.4	0.2

Source: U.S. Department of Commerce, Bureau of the Census website.
Note: Northern New England includes New Hampshire, Massachusetts, Maine and Vermont.

3.1.2.1.2 Per Capita Personal Income

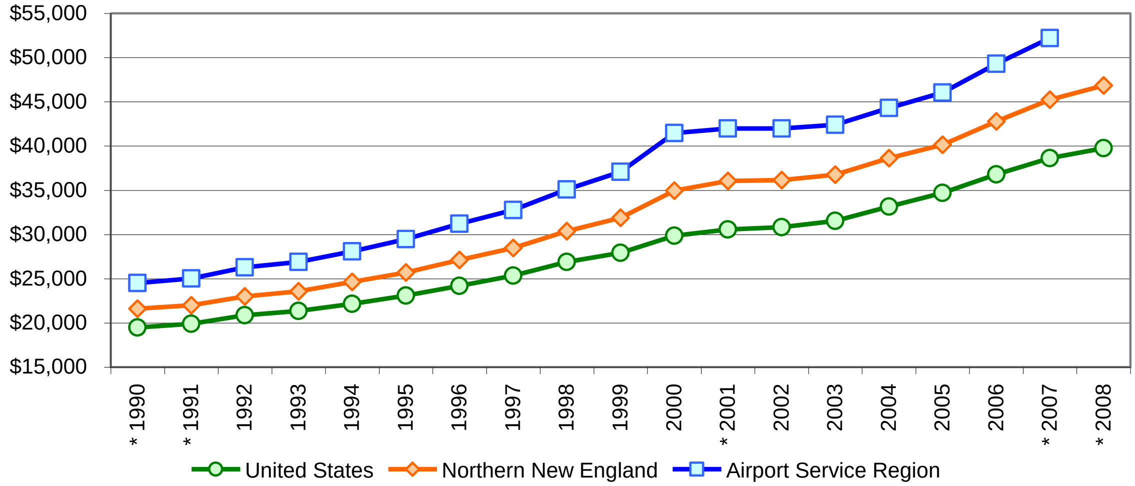
Unlike the pattern of population increases, Per Capita Personal Income (PCPI) growth in the Airport Service Region, on average, has exceeded that for the nation and Northern New England since 1990 (see **Figure 3-4**). In 2007 (the most recent year for which metropolitan-level data were available), PCPI in the Airport Service Region was 35% above the national average.

Growth in PCPI generally correlates with growth in discretionary income (income less taxes and essential expenses) to the extent that tax increases and inflation do not outpace growth in PCPI. Growth in discretionary income, in turn, correlates positively with increasing demand for air travel.

3.1.2.1.3 Economic Trends

Similar to the pattern of population growth, non-agricultural employment growth in the Airport Service Region since 1990 has been in line with growth in Northern New England but has trailed national growth (see **Figure 3-5**). Employment growth in both the Airport Service Region and Northern New England has exhibited a greater degree of volatility than the nationwide trend, notably in the early 1990s and the early part of this decade.

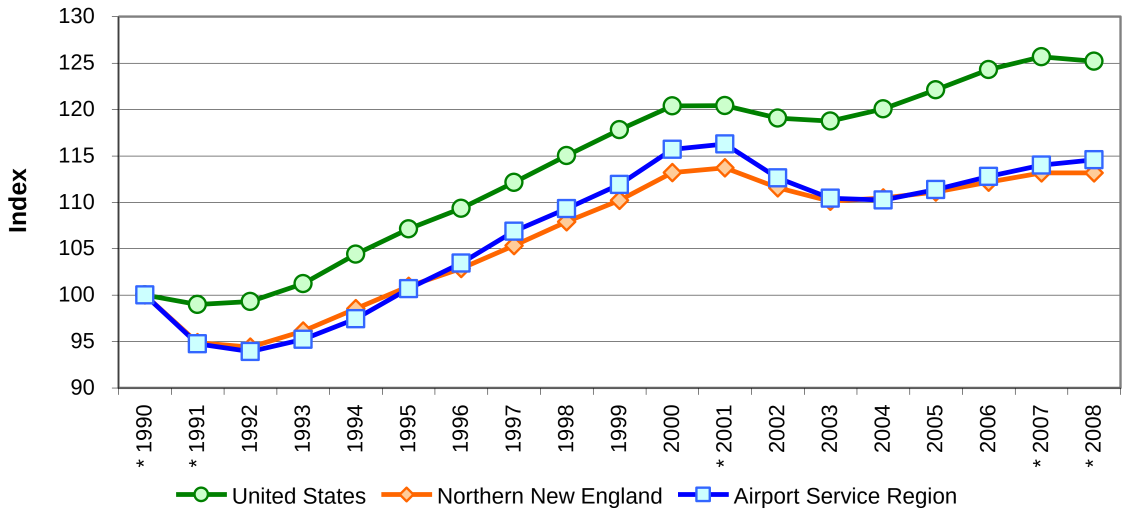
FIGURE 3-4
PER CAPITA PERSONAL INCOME



Compound annual growth rate	1990-2000	2000-2003	2003-2008 *(a)*
United States	4.4%	1.8%	4.7%
Northern New England	4.9	1.7	5.0
Airport Service Region	5.4	0.7	5.3

Source: U.S. Department of Commerce, Bureau of Economic Analysis website.
Notes: Northern New England includes New Hampshire, Massachusetts, Maine and Vermont.
*Indicates national recession during all or part of year, according to the National Bureau of Economic Research.
(a) The percentage shown for the Airport Service Region is for 2003-2007, the most recent data available.

FIGURE 3-5
COMPARATIVE INDEX OF TOTAL NON-AGRICULTURAL EMPLOYMENT
(1990 = 100)



Compound annual growth rate	1990-2000	2000-2003	2003-2008
United States	1.9%	(0.5%)	1.1%
Northern New England	1.2	(0.9)	0.5
Airport Service Region	1.5	(1.5)	0.9

Source: U.S. Department of Labor, Bureau of Labor Statistics website.
Notes: Northern New England includes New Hampshire, Massachusetts, Maine and Vermont.
*Indicates national recession during all or part of year, according to the National Bureau of Economic Research.

Table 3-1 profiles the relative composition of employment in the nation, Northern New England, and New Hampshire. The two largest sectors of the New Hampshire economy are (a) the trade, transportation and utilities sector, and (b) the education and health services sector.

Relative to the nation, New Hampshire has larger proportions of employees working in the trade, transportation and utilities sector, the education and health services sector, and the manufacturing sector, and smaller proportions of employees working in government and the professional/business services sector.

Unemployment rates serve as an indicator of an area's economic health. From 1993 to 2009, the unemployment rate in the Airport Service Region was lower than the national unemployment rate and roughly in line with the Northern New England rate (see **Figure 3-6**).

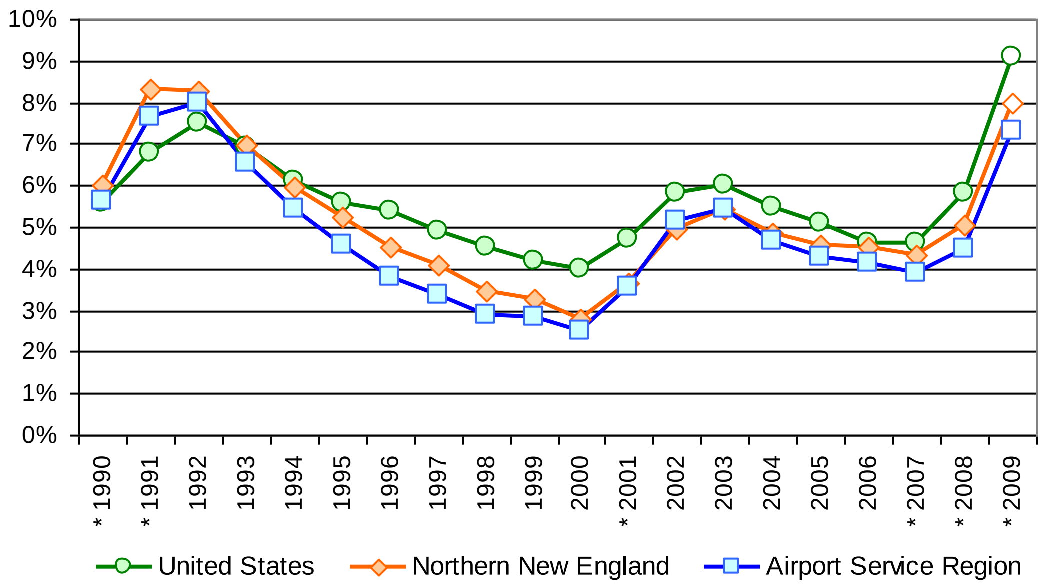
Table 3-2 presents major New Hampshire private-sector employers. Seven of the 20 employers listed are in the healthcare field, previously identified as one of the largest sectors of the state's economy. Not reflected in the table are major Massachusetts employers. (A significant number of New Hampshire residents commute to jobs located in Massachusetts.)

TABLE 3-1
EMPLOYMENT SHARE, BY INDUSTRY
(2008)

Industry	2008 percent of total United States	Northern New England	New Hampshire
Trade, Transportation, Utilities	19.2%	18.4%	21.7%
Education & Health Services	13.8	19.0	16.3
Government	16.4	14.2	14.7
Manufacturing	9.8	9.4	11.7
Professional/Business Services	13.0	13.0	10.3
Leisure & Hospitality	9.8	9.5	9.9
Financial Activities	5.9	6.2	5.9
Natural Resources, Mining, Construction	5.8	4.3	4.2
Other Services	4.0	3.5	3.4
Information	2.2	2.4	1.9
TOTAL	**100.0%**	**100.0%**	**100.0%**

Source: U.S. Department of Labor, Bureau of Labor Statistics website.
Notes: Employment data by Industry is not readily available by county, in this table data for the state of New Hampshire has been used instead.
Northern New England includes New Hampshire, Massachusetts, Maine and Vermont.

FIGURE 3-6
CIVILIAN UNEMPLOYMENT RATE



Source: U.S. Department of Labor, Bureau of Labor Statistics website.
Notes: *Indicates national recession during all or part of year, according to the National Bureau of Economic Research.
2009 represents average for January-July.
Northern New England includes New Hampshire, Massachusetts, Maine and Vermont.

TABLE 3-2
MAJOR NEW HAMPSHIRE PRIVATE SECTOR EMPLOYERS

Company	Employees	Type of business
Wal-Mart	8,631	Retail chain
Dartmouth-Hitchcock Medical Center	7,804	Healthcare
DeMoulas and Market Basket	6,000	Supermarkets
Fidelity Investments	5,700	Financial services
Liberty Mutual - Northern N.E. Division	5,133	Insurance and risk services
Hannaford Brothers	4,629	Supermarkets
Shaw's Supermarkets Inc.	4,500	Supermarkets
Dartmouth College	4,246	Education
BAE Systems	4,100	Aircraft manufacturing
Elliot Hospital	3,060	Healthcare
Home Depot	3,000	Retail chain
Concord Hospital	2,960	Healthcare
Southern New Hampshire Medical Center	2,200	Healthcare
Wentworth-Douglass Hospital	2,067	Healthcare
Catholic Medical Center	1,700	Healthcare
Osram Sylvania	1,680	Lighting manufacturing
Verizon Communications	1,650	Telecommunications
Sunbridge New Hampshire Region	1,600	Healthcare
Target Stores	1,550	Retail chain
New Hampshire Motor Speedway	1,500	Motor sports facility

Source: U.S. Department of Labor, Bureau of Labor Statistics website.

3.1.2.2 Economic Outlook

The near-term economic outlook (i.e., through 2010) remains weak for New Hampshire but, by 2011, positive economic growth is expected to return, according to the New England Economic Partnership (NEEP), a member-supported, non-profit organization providing economic analyses and forecasts.

By late 2008, the effects of the national recession were evident in New Hampshire: unemployment had risen, consumer confidence was down, and residential real estate volume and prices had declined. According to the NEEP May 2009 forecast, job losses are expected to continue into early 2010. Residential construction is forecast to remain near record-low levels in 2010. By 2011, job growth is expected to return, residential construction is expected to accelerate, and housing prices are expected to increase. Even so, house prices are not expected to reach their prior peak until after 2013, according to NEEP. Between 2008 and 2013, NEEP forecasts Gross Domestic Product (GDP) and job growth in New Hampshire to be generally in line with national growth rates, and in excess of New England.

With regard to long-term population growth, the New Hampshire Office of Energy and Planning projects 0.7% average annual population growth for the state of New Hampshire from 2010 to 2030. This is slightly below the 0.8% average annual population growth projected for the nation by the U.S. Census Bureau for the same period, and is generally in line with historical trends. The Bureau of Economic

Analysis does not publish projections of PCPI but, based on historical patterns, it is reasonable to assume that PCPI in the Airport Service Region will continue to exceed national averages.

3.1.3 HISTORICAL AVIATION ACTIVITY

The previous section described factors that affect demand for airline travel to and from the Airport Service Region. This section considers how factors such as air service and fares affect the realization of demand at the Airport in the form of passenger traffic. Air service factors play a key role in determining passenger trends at MHT, given the competition for passenger market share between MHT and Logan, and this will be described in more detail in this section.

3.1.3.1 Trends Relative to Other Airports

MHT is the fourth-largest airport serving New England, after Logan, Bradley International Airport (BDL) in Hartford, Connecticut, and T.F. Green State Airport (PVD) in Providence, Rhode Island (see **Figure 3-7**). MHT and PVD flank Logan; each is located about 60 miles away, MHT to the northwest and PVD to the southwest.

In the 10 years from 1998 to 2008, MHT achieved the most rapid growth in domestic Origin and Destination (O&D) passengers—a near doubling—of any airport in New England. By comparison, domestic O&D passengers enplaned at all New England airports, considered together, increased less than 10% over the same period.

Low-Cost Carriers (LCCs) served a larger share of passengers at MHT (59%) in 2008 than at any other New England airport. Southwest Airlines was the only LCC serving MHT in 2008.

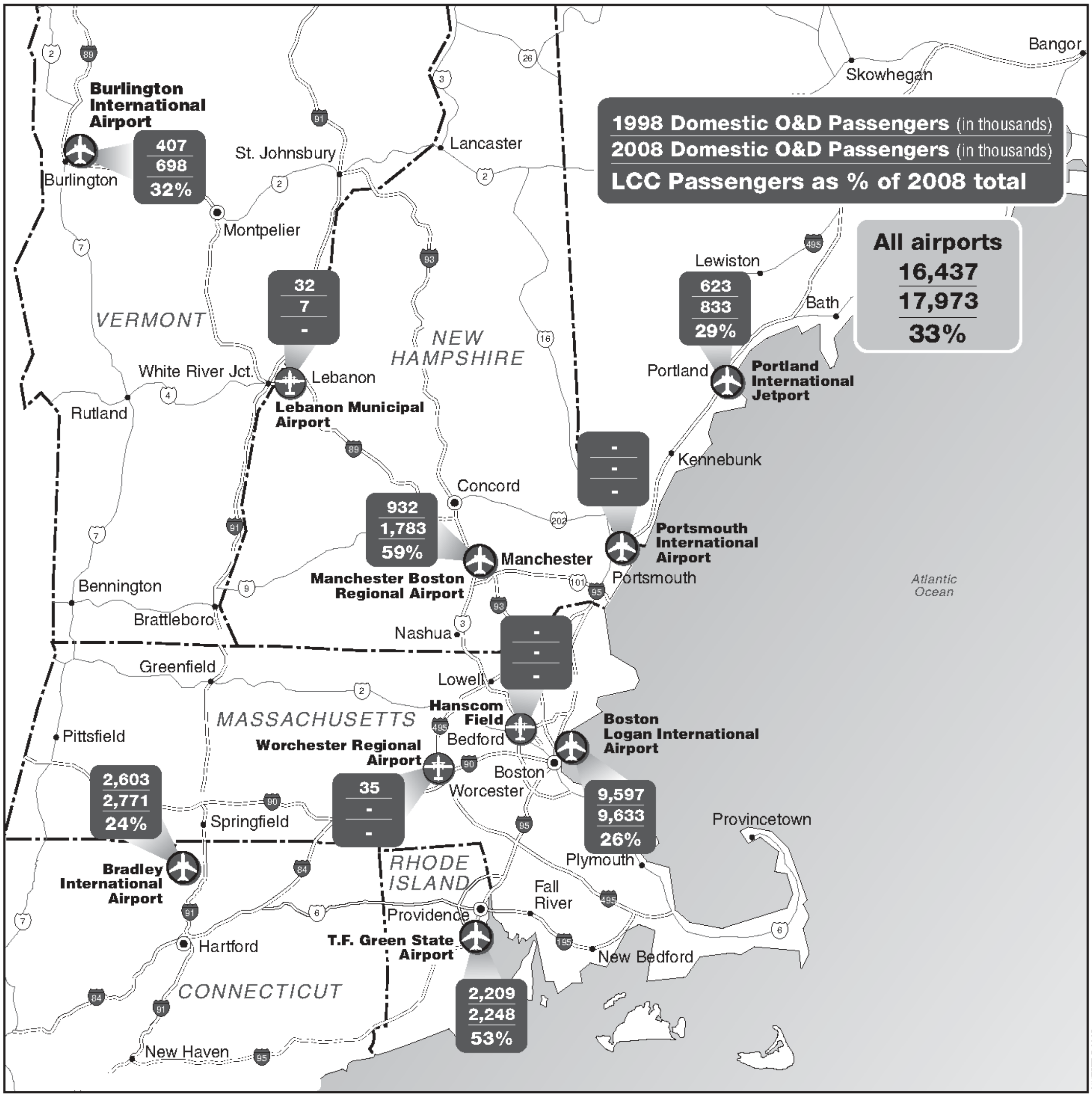
From 1995 to 2003, MHT and PVD captured most of the net increase in domestic O&D passengers in the 3-airport (MHT+BOS+PVD) region (see **Figure 3-8**). In 1995, MHT and PVD together accounted for 14% of the 3-airport passenger total. By 2003, the two regional airports had increased their share of domestic O&D passengers to 34%.

Starting in 2003, however, Logan served an increasing share of domestic O&D passengers among the three airports, at the expense of PVD and, to a lesser extent, MHT. This increase in market share coincided with increasing levels of LCC service and improved ground accessibility at Logan.

Since mid-2008, U.S. airlines have faced weakening travel demand related to the economic recession, and most have made significant and widespread capacity (departing seat) reductions across the country. In late 2009, capacity reductions continued, representing year-over-year "declines on declines." Most U.S. airports have experienced some degree of capacity reduction.

Figure 3-9 presents the year-over-year percentage change in scheduled departing seats among large- and medium-hub U.S. airports in the latter half of 2009. MHT, BDL, and PVD each ranked among the hardest-hit airports nationally in terms of the degree of capacity reduction experienced. BOS, by contrast, recorded a small net gain in capacity over the same period.

FIGURE 3-7
PASSENGER TRENDS (1998 – 2008)



Source: U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to Schedules T100 and 298C T1.

LEGEND

Air carrier airport
Commuter airport
State boundary
State capital

N

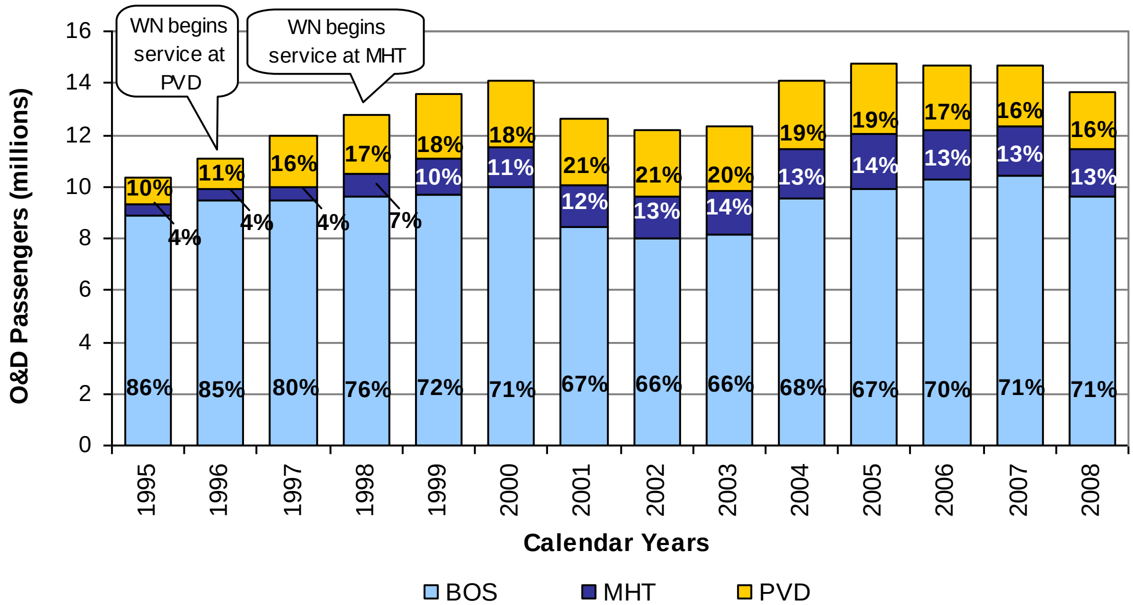
15 0 15 30

Approximate Scale in Miles

Figure 7
AIRPORT SERVICE REGION
Manchester-Boston Regional Airport
October 2009

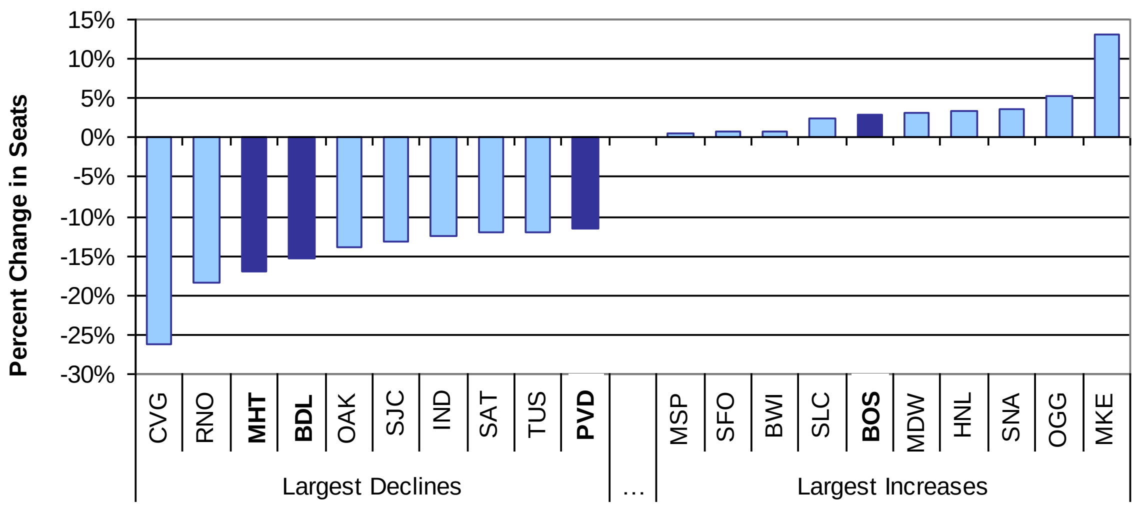
JACOBS CONSULTANCY

FIGURE 3-8
SHARES OF DOMESTIC O&D PASSENGERS
BOSTON LOGAN INTERNATIONAL, MANCHESTER-BOSTON REGIONAL,
AND T.F. GREEN AIRPORTS



Source: U.S. DOT, *Ai r Passenger Origin-Destination Survey*, reconciled to Schedules T100 and 298C T1.

FIGURE 3-9
YEAR-OVER-YEAR PERCENT CHANGE IN SCHEDULED DEPARTING SEATS
AT SELECTED U.S. HUB AIRPORTS*
(JULY-DECEMBER 2009)



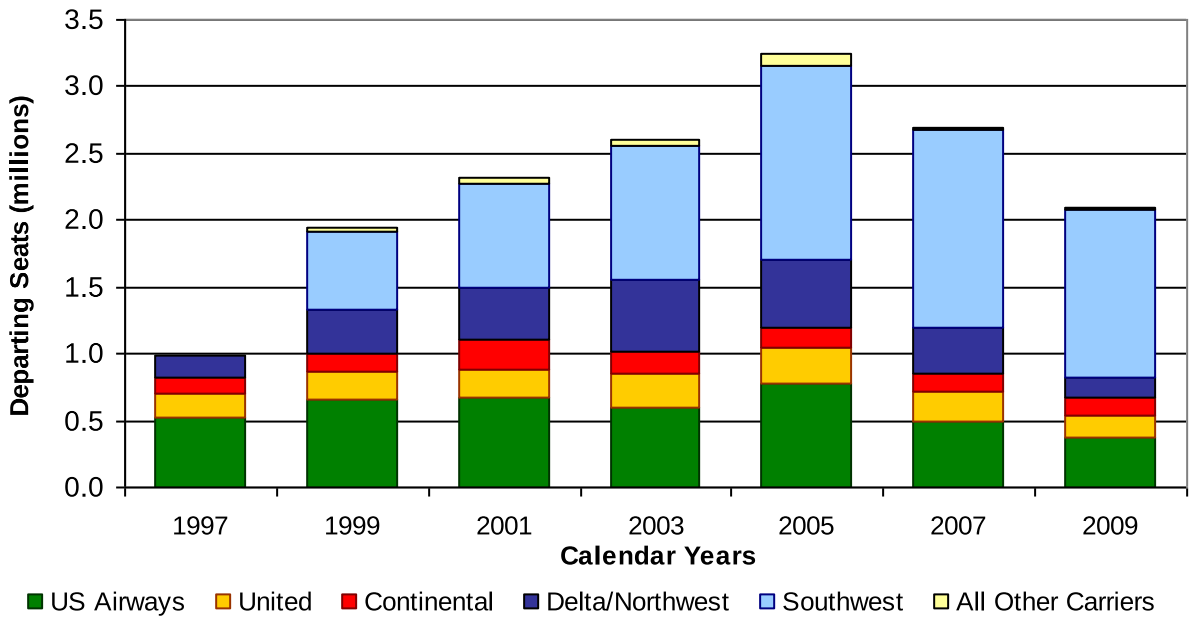
Source: Official Airline Guide.
Notes: * Based on the FAA's 2007 classification of airport hub size.

3.1.3.2 Scheduled Service Trends

Scheduled airline service at MHT can be characterized generally as comprising (1) Southwest service to its major focus cities, (2) Southwest service to airports in Florida, and (3) legacy airline service to their respective hubs. No airline operates a connecting hub at MHT. To the extent that the Airport lacks direct service to a given destination, a passenger generally has two choices: use connecting flights via other airports, or travel from another airport where direct service is available.

Over the 12 years from 1997 to 2009, Southwest accounted for the entire net gain in departing seats at MHT (see **Figure 3-10**). The legacy carriers together nearly doubled their capacity at MHT between 1997 and 2005 but then significantly reduced that capacity over the 4 years that followed. The result over the 12-year period was a doubling of total seats offered at the Airport but a net loss of legacy airline capacity.

FIGURE 3-10
TOTAL SCHEDULED DEPARTING SEATS, BY CARRIER
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Source: *Official Airline Guide*.

The map in **Figure 3-11** graphically displays routes served by scheduled nonstop passenger flights at MHT in October 2009. MHT had nonstop service to 17 airports in 13 cities. (Chicago, New York, and Washington, DC are served by multiple airports.) All but two (Las Vegas and Phoenix) of the airports served were located east of the Mississippi River. All but one (Toronto) of the airports served were in the United States. Among the 10 single-airport destination cities, MHT had competing service to only one—Philadelphia. Since its 2005 air service peak, MHT has lost nonstop scheduled passenger service to seven destinations.

The majority of scheduled departing seats at MHT are on mainline narrow-body jet aircraft. Seats on narrow-body aircraft accounted for nearly three-quarters of all departing seats at the Airport in 2009 (see **Figure 3-12**). Between 2000 and 2009, there was no net increase in capacity at MHT; the number of seats offered on regional jets, however, more than doubled. The number of departing seats provided on narrow-body and turboprop aircraft declined over the same period.

FIGURE 3-11
SCHEDULED NONSTOP DESTINATIONS

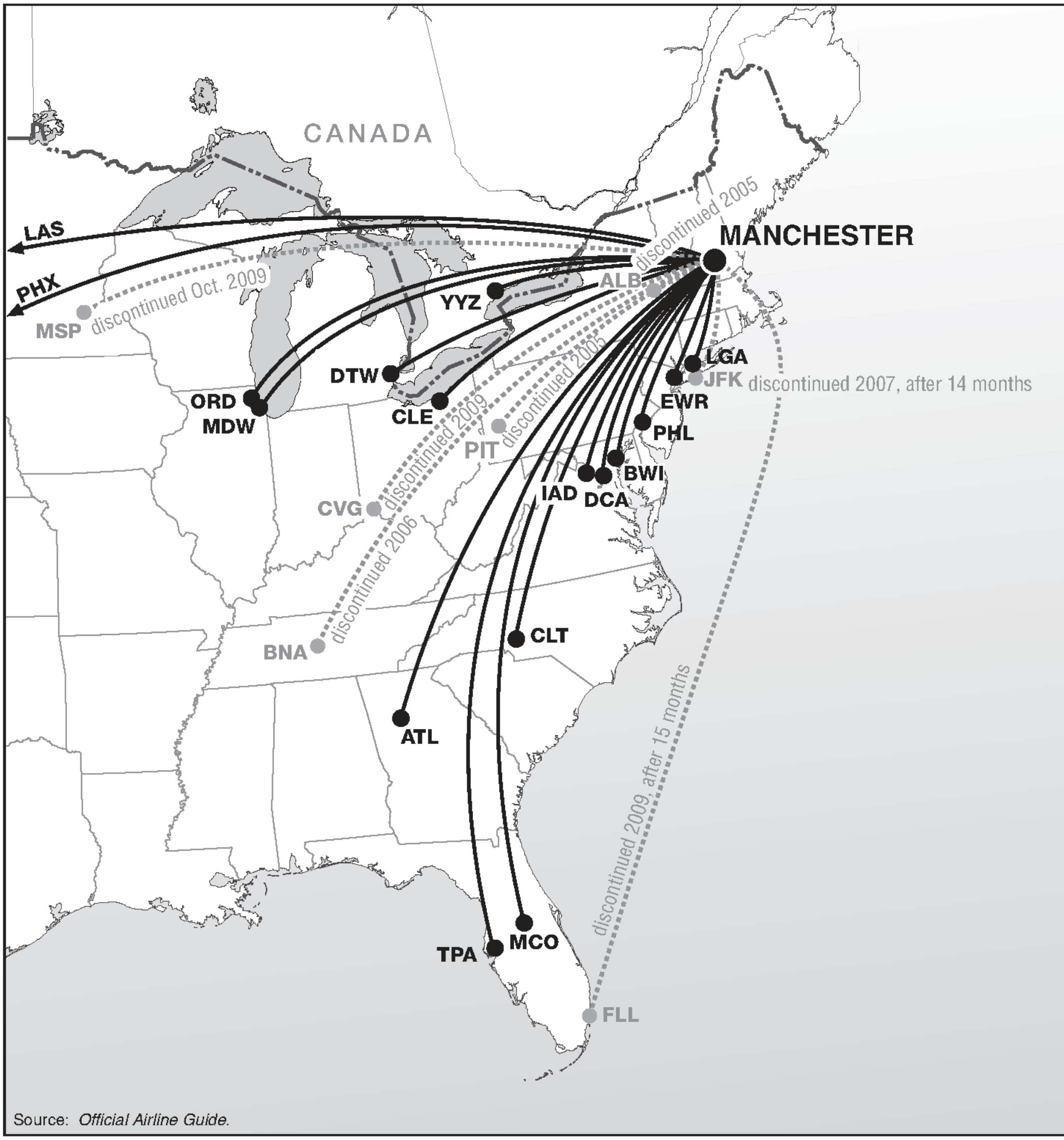
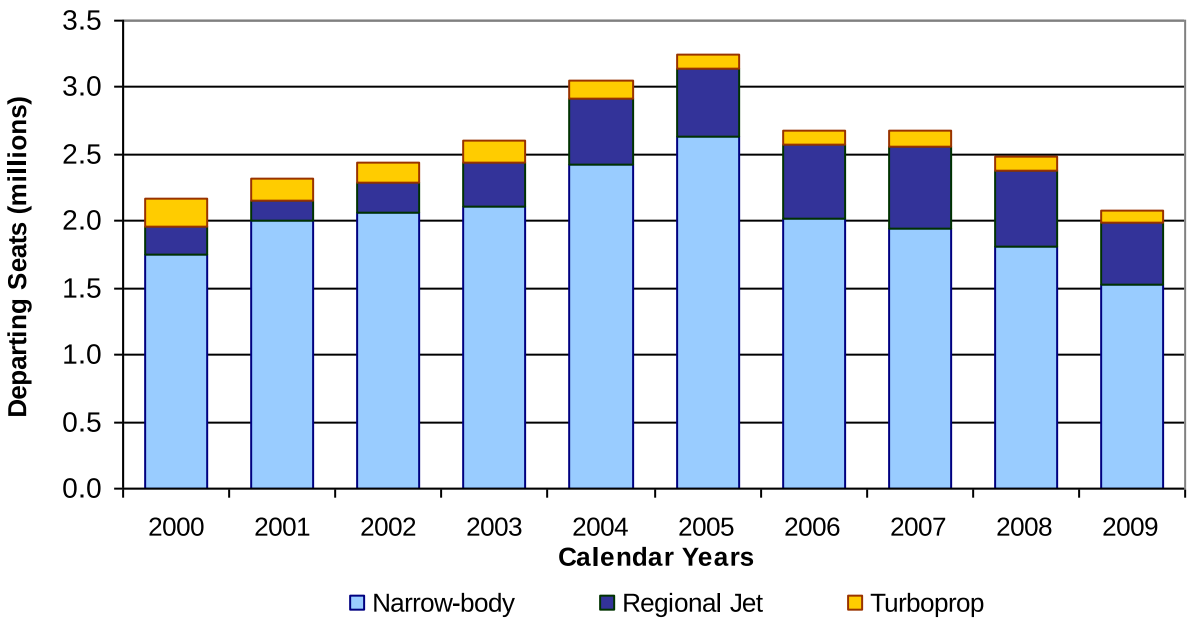


Figure 11
SCHEDULED NONSTOP DESTINATIONS
Manchester-Boston Regional Airport
October 2009

JACOBS CONSULTANCY

FIGURE 3-12
TOTAL SCHEDULED DEPARTING SEATS, BY EQUIPMENT TYPE CATEGORY
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Source: *Official Airline Guide*.

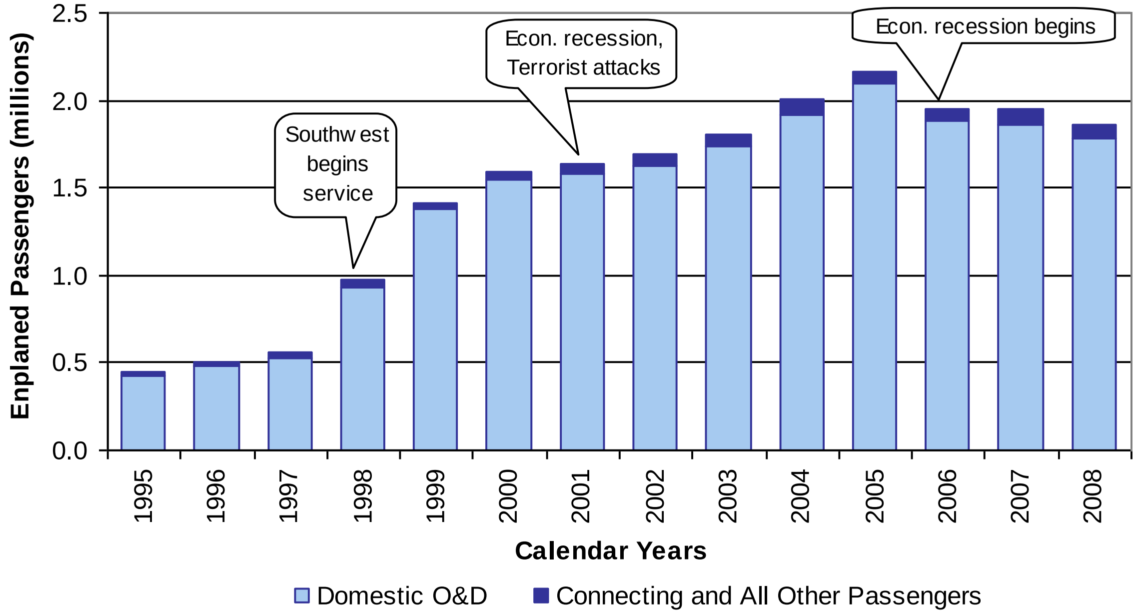
3.1.3.3 Enplaned Passenger Trends

Passengers enplaned at the Airport are virtually all domestic O&D passengers; in 2008, domestic O&D passengers accounted for 96% of all enplaned passengers at the Airport. International O&D passengers, connecting passengers, and passengers on charter (non-scheduled) flights accounted for the remainder.

Figure 3-13 presents a historical record of enplaned passengers at MHT since 1995. The most notable trend was the near-quadrupling of passengers between 1997, before Southwest began serving the Airport, and 2005, when passenger levels at MHT reached their peak. This rapid build-up confirms that market capture driven by air service improvements and lower airfares, rather than demographic and economic trends, has been the key factor influencing traffic growth at MHT. Between 2005 and 2008, the number of enplaned passengers declined 14%, and in the first half of 2009 (not shown) enplaned passengers declined a further 15%, year-over-year. This decline in passenger traffic since 2005 reflects nationwide weakness in travel demand related to the current economic recession, increasingly competitive airline service offerings and improved ground access at Logan, and subsequent changes in air service provided by the airlines serving MHT.

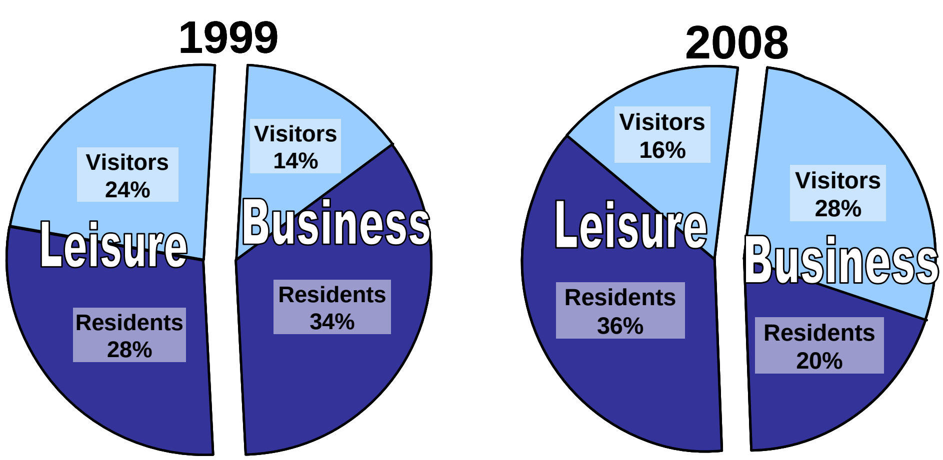
According to passenger surveys conducted at the Airport, higher-yield business travelers accounted for 48% of the MHT passenger base in 2008, the same proportion as in 1999 (see **Figure 3-14**). Typically, business travelers are more concerned with nonstop service and flight timing and frequency, whereas leisure travelers are more concerned with airfare levels.

FIGURE 3-13
TRENDS IN TOTAL ENPLANED PASSENGERS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Sources: City of Manchester Department of Aviation; U.S. DOT, *Air Passenger Origin-Destination Survey,* reconciled to T100 and 298C T1.

FIGURE 3-14
PASSENGER CHARACTERISTICS
MANCHESTER-BOSTON REGIONAL AIRPORT



Source: *Manchester-Boston Regional Airport: Enplaning Passenger Survey*, June 2008, RKM Research and Communications, Inc.

Notes: For the purposes of the survey, "resident" was defined as any traveler residing in New Hampshire, Maine, Massachusetts, or Vermont.
Passengers that reported both business and leisure purposes for a trip were counted as business passengers.

Passenger traffic at MHT exhibits a modest degree of seasonality (see **Figure 3-15**). The number of enplaned passengers tends to peak in the summer (July-August) and reaches its lowest point in the winter (December-January).

3.1.3.4 Domestic O&D Passenger Trends

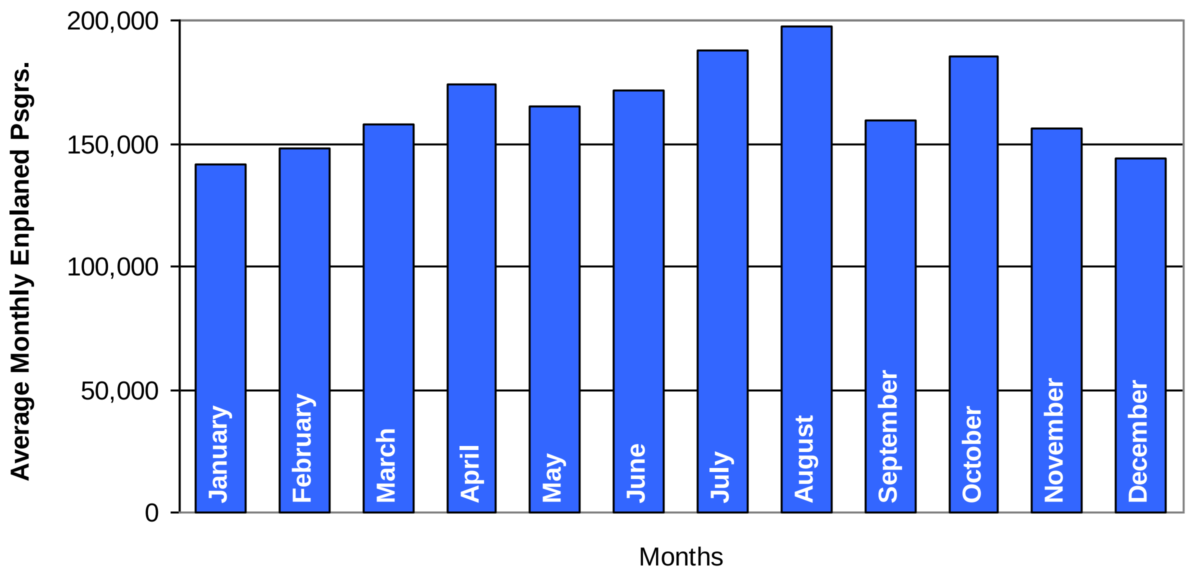
Because passengers at the Airport are nearly all domestic O&D passengers, they are the primary focus of the discussion herein related to passenger trends.

Growth in the number of domestic O&D passengers at the Airport since 1995, relative to Northern New England and national trends, is illustrated in **Figure 3-16**. This figure utilizes indexes, which allows for comparisons of trends in differently-sized markets. The different patterns that emerge, depending upon the index year selected, are particularly striking in the case of MHT.

The upper chart uses a 1995 index year. This chart illustrates the Airport's abrupt break from national and regional trends beginning in 1998, following Southwest's initiation of service at the Airport.

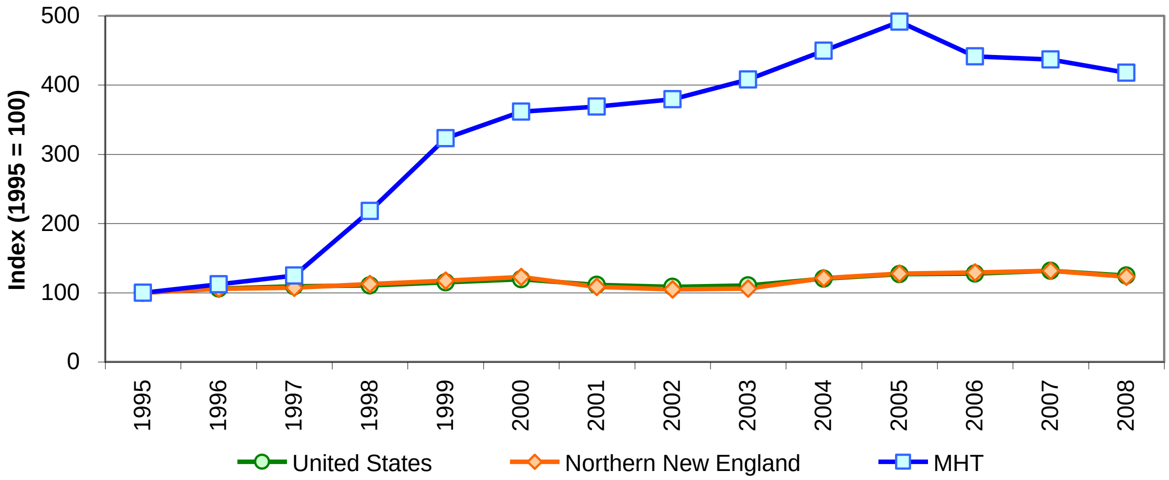
The lower chart uses a 2000 index year, which essentially recalibrates the comparison following the Southwest service ramp-up. Domestic O&D passengers experienced a larger net increase at MHT in the 2000-to-2008 period than at Northern New England airports, taken together, and nationwide. After 2005, however, the decline in domestic O&D passengers at the Airport exceeded the declines experienced in Northern New England overall and nationwide.

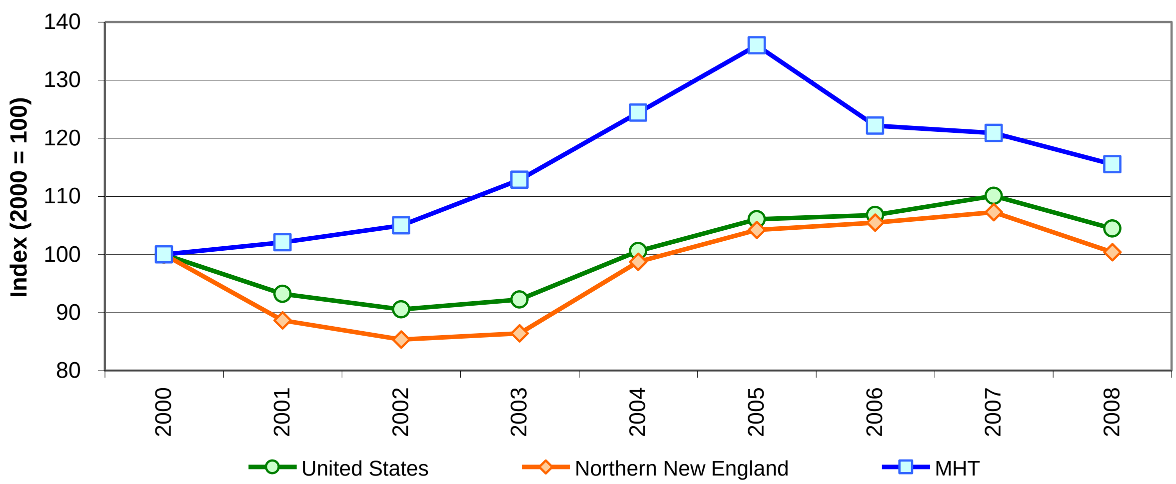
FIGURE 3-15
SEASONALITY OF ENPLANED PASSENGERS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS 2003-2008)



Source: City of Manchester Department of Aviation.

FIGURE 3-16
COMPARATIVE INDEXES OF DOMESTIC O&D PASSENGERS
(1995 = 100 AND 2000 = 100)





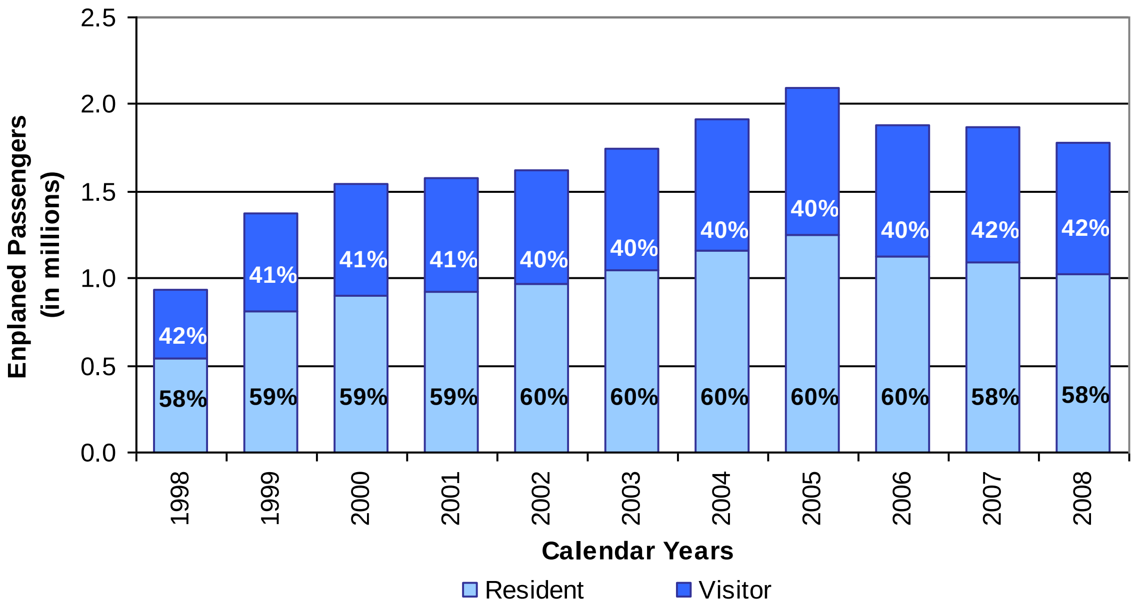
Compound annual growth rate	1997-2000	2000-2005	2005-2008
United States	3.1%	1.2%	(0.5%)
Northern New England	4.6	0.8	(1.2)
MHT	42.6	6.3	(5.3)

Source: U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to Schedules T100 and 298C T1.

The relative proportion of area residents to visitors traveling through MHT has remained at about 58% residents/42% visitors since 1998 (see **Figure 3-17**). Between 1998 and 2008, this ratio varied by no more than two percentage points.[1]

[1] Figure 3-14, presented earlier, indicated a decline in share for area residents; however, that figure was based upon the results of a one-week passenger survey, whereas Figure 3-17 reflects data covering entire years from the DOT *O&D Survey*.

FIGURE 3-17
DOMESTIC O&D PASSENGERS, BY RESIDENT/VISITOR SPLIT
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Sources: City of Manchester Department of Aviation; U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to T100 and 298C T1.

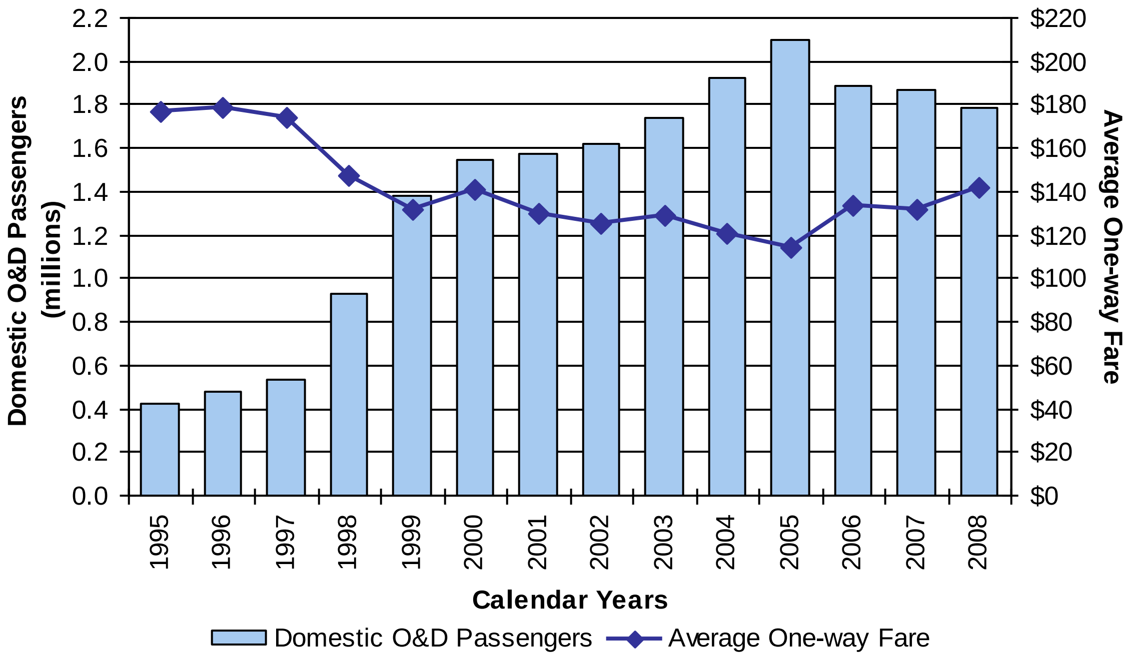
Figure 3-18 overlays the trend in domestic O&D passengers at MHT with the trend in average one-way domestic airfares paid at the Airport over the same period. Average one-way domestic airfares declined more than $40 between 1997 and 1999, the period during which Southwest began operating at the Airport and imposed downward competitive pressure on airfares. Between 1999 and 2007, average airfares showed no net change. In 2008, average airfares increased, but this increase is likely understated to some degree given that ancillary fees (e.g., baggage fees, assigned seat fees, pet fees), which became increasingly widespread among airlines in 2008, are generally not reflected in average airfares. Southwest has been a notable holdout among airlines in the imposition of bag check fees.

Average domestic trip distances remained stable in the 1,000-1,200 mile range at MHT between 1995 and 2008, meaning that changes in average airfares were not the result of a material change in the average length of passenger trips flown.

3.1.3.5 MHT/BOS 2-Airport Market

The Airport and Logan share a large common base of air travelers. The Airport's service region is a part of the larger Boston CSA. Many residents of southern New Hampshire commute to jobs in metropolitan Boston, and vice versa. In addition, MHT and BOS are located just 55 miles apart, making both airports accessible to a large portion of the residents of the greater Boston area.

FIGURE 3-18
TRENDS IN DOMESTIC O&D PASSENGERS AND AIRLINE FARES
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Source: U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to T100 and 298C T1.
Note: Average one-way fares are net of all taxes, ancillary fees (i.e., for checked bags, meals, etc.), and PFCs.

Given this overlap in the two airports' "catchment areas," the relative air service offerings at the airports play a key role in the decision-making of air travelers, and hence, in the resulting traffic trends at the two airports. To the extent that the relative cost and convenience of accessing the two airports is similar, the relative cost (i.e., airfares) and quality (e.g., nonstop service to more destinations, flight frequencies, first- and business-class service) of *air service offerings* becomes a primary airport choice determinant.

Table 3-3 presents the number of domestic O&D passengers at MHT in selected years to destinations having nonstop service from the Airport. Also shown are the total domestic O&D passengers in all other markets which lacked nonstop service in those years. For each destination, the table displays the Airport's share of O&D passengers, calculated as a percentage of all passengers traveling in the *combined* (MHT+BOS) 2-airport market.

The table reveals that, in general, MHT tends to capture a larger share of O&D passengers from the 2-airport market in those city-pairs where it has nonstop flights. Overall, in 2008, MHT served 19.6% of the 2-airport domestic O&D passenger total in the city-pairs in which it had nonstop service. By contrast, MHT served only 11.9% of the domestic O&D passengers in those city-pairs in which it lacked nonstop service.

The conclusion to be drawn is that, to the extent that airlines at MHT offer nonstop service to a given destination, the Airport is better-positioned to compete with Logan to serve air travelers from the combined 2-airport market.

TABLE 3-3
OUTBOUND DOMESTIC O&D PASSENGERS
CITY MARKETS WITH NONSTOP SERVICE
FROM MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

City Market Airport	1997 O&D Psgrs.	1997 Share of MHT+BOS Total	2000 O&D Psgrs.	2000 Share of MHT+BOS Total	2005 O&D Psgrs.	2005 Share of MHT+BOS Total	2008 O&D Psgrs.	2008 Share of MHT+BOS Total
Washington DC/Baltimore	39,370	4.9%	319,430	28.5%	323,890	28.2%	241,170	22.8%
Reagan	28,170	8.7	290,120	69.1	235,300	50.1	216,260	48.5
Dulles	5,520	1.8	26,370	6.4	59,880	20.6	15,270	4.4
Baltimore	5,680	3.4	2,940	1.0	28,710	7.4	9,640	3.7
Orlando	39,920	8.5	98,500	18.9	192,460	26.1	176,000	28.1
Philadelphia	24,910	7.0	29,740	8.9	169,080	35.2	155,210	53.3
Tampa	-	-	-	-	132,500	30.4	103,000	31.3
Chicago	29,160	6.3	105,880	20.9	111,390	21.3	101,050	18.7
O'Hare	28,970	6.5	59,660	14.6	61,650	50.9	63,720	66.2
Midway	190	1.5	46,220	47.0	49,740	12.4	37,330	8.4
Las Vegas	-	-	-	-	53,780	17.3	51,780	20.8
Phoenix	-	-	-	-	-	-	49,800	29.3
Fort Lauderdale	-	-	-	-	44,240	9.4	43,550	11.0
New York	51,360	4.0	58,460	4.3	38,280	4.4	36,810	4.9
LaGuardia	27,410	3.2	32,550	3.2	23,460	3.7	22,730	15.7
Newark	23,760	7.1	25,900	8.6	14,790	8.5	14,060	3.2
Kennedy	190	0.2	10	0.0	30	0.0	20	0.0
Cleveland	-	-	25,680	25.0	24,980	24.9	34,940	35.1
Detroit	-	-	32,760	21.0	29,620	19.8	32,040	21.2
Charlotte	-	-	-	-	20,240	15.2	16,720	9.9
Atlanta	-	-	14,680	3.2	33,240	8.7	15,120	3.7
Minneapolis-St. Paul	-	-	-	-	28,080	15.8	12,640	6.9
Cincinnati	14,880	17.2	12,360	14.0	15,910	17.9	6,460	9.9
Pittsburgh	14,710	11.2	18,550	13.7	28,660	26.5	-	-
Other Markets with Nonstop Service	4,860	100.0	46,850	16.1	37,180	51.2	50	100.0
Total—Mkts. with Nonstop	**219,170**	**6.1%**	**762,890**	**15.0%**	**1,283,530**	**20.8%**	**1,076,340**	**19.6%**
Service from MHT								
All Other Markets	312,480	4.9	780,350	12.1	814,570	14.0	706,410	11.9
Total—All Markets	**531,650**	**5.3%**	**1,543,240**	**13.4%**	**2,098,100**	**17.5%**	**1,782,750**	**15.6%**

Sources: U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to T100 and 298C T1; *Official Airline Guide*.

Table 3-4 presents the Airport's top 25 domestic O&D city-pair markets in 2008, along with an indication of whether each market had nonstop air service from MHT. In 2008, the Airport had nonstop air service in 11 of its top 12 city-pair markets. In the case of Philadelphia, the third-largest city-pair market at MHT and the only one served by airlines competing at the Airport, MHT accommodated over half of the domestic O&D passengers using flights to Philadelphia from MHT and BOS combined.

TABLE 3-4
OUTBOUND DOMESTIC O&D PASSENGERS
TOP 25 O&D CITY MARKETS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEAR 2008)

		Share of		Nonstop Service at MHT	
Rank	**City Market**	**O&D Psgrs.**	**MHT+BOS Total**	**Yes**	**No**
1	Washington DC	241,170	22.8%	X	
2	Orlando	176,000	28.1	X	
3	Philadelphia	155,210	53.3	X	
4	Tampa	103,000	31.3	X	
5	Chicago	101,050	18.7	X	
6	Las Vegas	51,780	20.8	X	
7	Phoenix	49,800	29.3	X	
8	Los Angeles	44,720	8.4		X
9	Fort Lauderdale	43,550	11.0	X	
10	New York	36,810	4.9	LGA,EWR	
11	Cleveland	34,940	35.1	X	
12	Detroit	32,040	21.2	X	
13	San Francisco	31,470	5.6		X
14	Denver	29,100	12.0		X
15	Nashville	27,850	44.3		X
16	Raleigh/Durham	27,460	15.5		X
17	Fort Myers	24,150	9.7		X
18	Dallas/Fort Worth	23,820	10.3		X
19	San Diego	21,430	12.4		X
20	St. Louis	21,060	20.6		X
21	Houston	20,520	12.9		X
22	Jacksonville	18,630	21.5		X
23	Indianapolis	18,550	24.5		X
24	Pittsburgh	17,800	12.2		X
25	Seattle	17,410	9.7		X

Sources: U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to T100 and 298C T1; *Official Airline Guide*.

Los Angeles and the city-pairs beyond the top 12 represent opportunities for MHT to gain share of the combined 2-airport market in the future, to the extent that airlines decide to initiate nonstop service to these destinations from MHT.

3.1.3.6 Airline Market Shares

Southwest is the largest airline at the Airport in terms of enplaned passengers. It accounted for 57.3% of total enplaned passengers in 2008, up from 41.0% in 2004 (see **Table 3-5**).

US Airways and its affiliated commuter airlines ranked second in terms of enplaned passengers in 2008, accounting for 17.6% of total enplaned passengers at the Airport, down from 19.9% in 2004. United and its affiliated airlines ranked third in 2008, accounting for 8.2% of enplaned passengers, down from 11.3% in 2004.

In the first half of 2009, the number of enplaned passengers at MHT declined 15.1% relative to the first half of 2008. Three airlines accounted for virtually the entire decline: Southwest (down 10.6%, year-over-year), US Airways (down 22.6%), and Delta (down 76.0%).

TABLE 3-5
CARRIER MARKET SHARES OF ENPLANED PASSENGERS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS; RANKED ON 2008; PASSENGERS IN THOUSANDS)

Rank	Airline Group *Operator*	2004	2005	2006	2007	2008	Six Months Ended June 2008	Six Months Ended June 2009
1	Southwest	822.6	976.0	1,009.4	1,060.6	1,066.5	545.2	487.5
2	US Airways	399.1	436.3	342.7	317.1	327.4	165.8	128.3
	US Airways	*302.8*	*316.4*	*181.2*	*144.8*	*132.2*	*64.9*	*44.6*
	US Airways Exp.	*96.4*	*119.9*	*161.5*	*172.3*	*195.2*	*100.9*	*83.7*
3	United	226.7	210.1	181.1	184.0	152.4	72.5	67.4
	United	*155.1*	*142.2*	*111.9*	*107.0*	*86.8*	*38.0*	*37.5*
	United Express	*71.6*	*67.9*	*69.2*	*77.0*	*65.6*	*34.5*	*29.8*
4	Northwest	175.0	172.7	161.7	131.7	122.3	56.9	52.2
	Northwest	*162.2*	*163.5*	*155.3*	*122.2*	*82.3*	*44.9*	*42.5*
	Northwest Airlink	*12.8*	*9.1*	*6.4*	*9.5*	*40.0*	*12.0*	*9.7*
5	Continental	116.0	116.6	112.3	105.1	107.8	52.5	52.9
	Continental	*20.8*	*23.3*	*18.4*	*0.3*	*15.5*	*15.5*	*32.4*
	Co. Express/Connection	*95.2*	*93.2*	*93.9*	*104.8*	*92.3*	*37.0*	*20.5*
6	Delta	213.6	199.0	134.6	140.2	76.8	47.1	11.3
	Delta	*148.2*	*141.3*	*0.0*	*0.1*	*0.8*	*0.8*	*0.0*
	Delta Connection	*65.4*	*57.7*	*134.6*	*140.1*	*76.0*	*46.3*	*11.3*
7	Air Canada	8.7	8.4	8.6	8.7	6.9	3.7	2.2
	Air Georgian	*8.6*	*8.4*	*8.6*	*8.7*	*6.9*	*3.7*	*2.2*
	Air Canada Jazz	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
8	Wiggins Airways	1.1	1.2	1.5	1.0	1.6	1.1	0.4
9	Independence Air	29.3	48.0	0.4	0.0	0.0	0	0
10	Boston-Maine Airways	12.0	0.0	0.0	0.0	0.0	0	0
	Grand Total	**2,004.1**	**2,168.3**	**1,952.3**	**1,948.3**	**1,861.7**	**944.9**	**802.3**
Share of Total:								
1	Southwest	41.0%	45.0%	51.7%	54.4%	57.3%	57.7%	60.8%
2	US Airways	19.9	20.1	17.6	16.3	17.6	17.5	16.0
3	United	11.3	9.7	9.3	9.4	8.2	7.7	8.4
4	Northwest	8.7	8.0	8.3	6.8	6.6	6.0	6.5
5	Continental	5.8	5.4	5.8	5.4	5.8	5.6	6.6
6	Delta	10.7	9.2	6.9	7.2	4.1	5.0	1.4
7	Air Canada	0.4	0.4	0.4	0.4	0.4	0.4	0.3
8	Wiggins Airways	0.1	0.1	0.1	0.1	0.1	0.1	0.0
9	Independence Air	1.5	2.2	0.0	0.0	0.0	0.0	0.0
10	Boston-Maine Airways	0.6	0.0	0.0	0.0	0.0	0.0	0.0
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

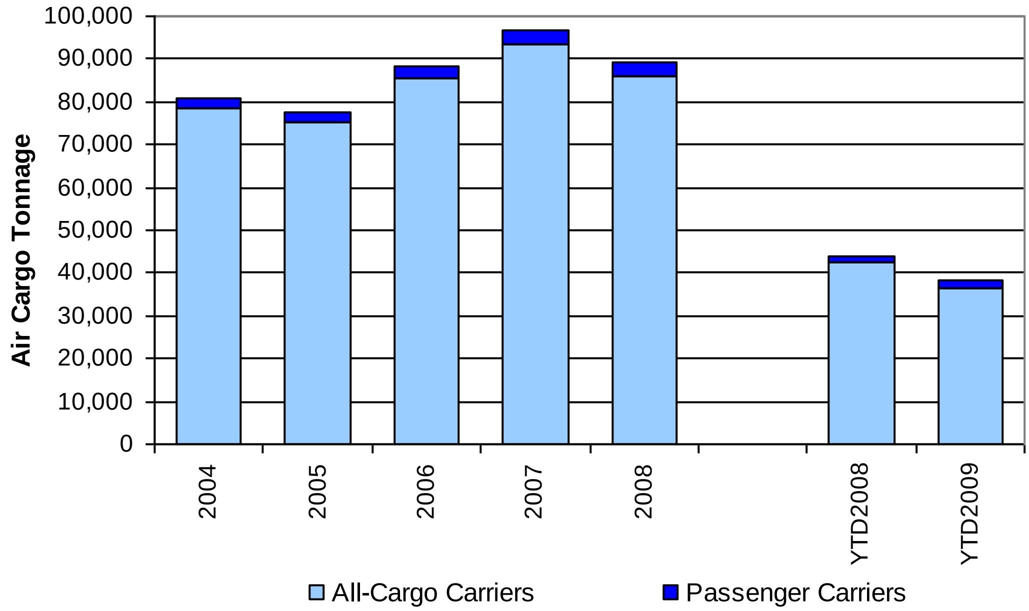
Source: City of Manchester Department of Aviation.
Note: Columns may not add to totals shown because of rounding.

3.1.3.7 Air Cargo Trends

The vast majority of air cargo at the Airport is handled by the integrated all-cargo operators, namely, FedEx and UPS. In 2008, all-cargo carriers together accounted for 96% of the total cargo tonnage handled at the Airport (see **Figure 3-19**). The remainder was carried in the belly compartments of passenger aircraft.

Between 2004 and 2008, cargo tonnage increased 2.4% per year, on average, at MHT. In the first half of 2009, cargo tonnage was down 13.2% relative to the first half of 2008, a decline of roughly the same magnitude as that experienced by enplaned passengers at the Airport during the same period.

FIGURE 3-19
TRENDS IN TOTAL AIR CARGO TONNAGE, BY CARRIER TYPE
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS UNLESS OTHERWISE NOTED; FREIGHT AND MAIL IN TONS)



Source: City of Manchester Department of Aviation.
Notes: Data represent sum of enplaned and deplaned freight and mail.
YTD=Year-to-date, January 1 through June 30.

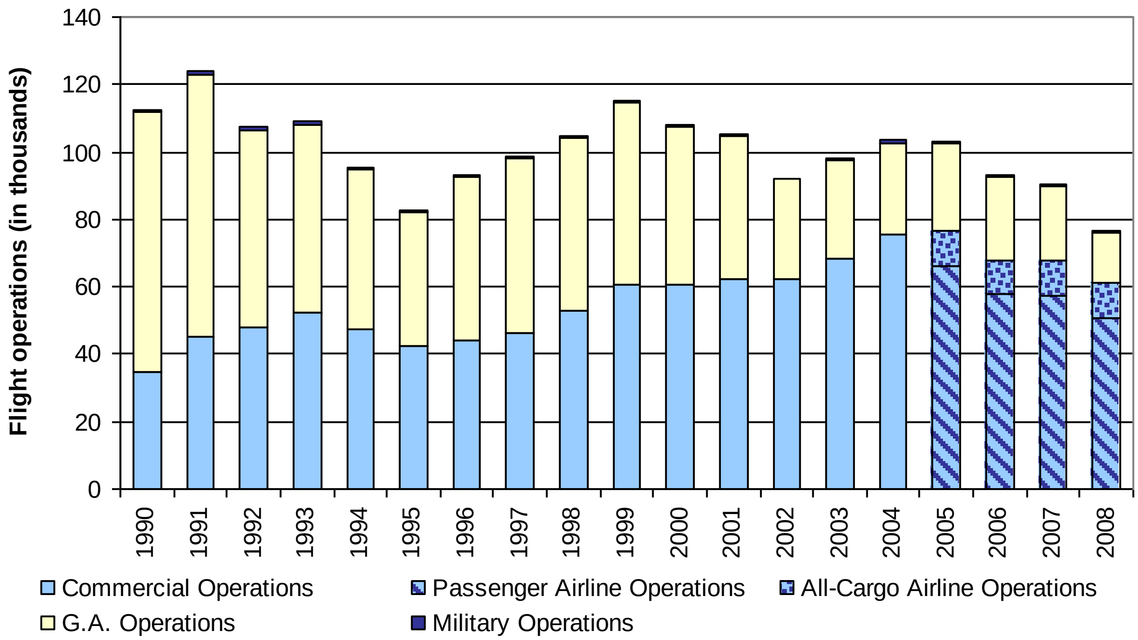
3.1.3.8 Aircraft Operations Trends

Between 1995 and 2008, the number of flight operations at MHT declined only slightly, although they showed considerable volatility during the interim years (see **Figure 3-20**). There was also a material shift away from General Aviation (GA) operations and toward commercial operations.

Between 1995 and 2008, the number of GA operations declined 63%, accounting for just 19% of total flight operations at the Airport in 2008 compared to 48% in 1995. In contrast, commercial operations (representing both passenger and all-cargo flights) increased 44% over the same period, accounting for 80% of total flight operations at the Airport in 2008 compared to 51% in 1995.

In 2008, commercial flights accounted for 80% of the Airport's total operations, GA flights accounted for 19%, and military flights accounted for the remaining 1%. Among commercial operations, passenger airlines accounted for 83% and all-cargo airlines accounted for 17%.

FIGURE 3-20
TRENDS IN AIRCRAFT OPERATIONS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Source: 1995-2001—FAA, Terminal Area Forecast, December 2008; 2002-2008—City of Manchester Department of Aviation.

Notes: Data represent the sum of take-offs and landings. The division of commercial operations into passenger carrier operations and all-cargo carrier operations was not available prior to 2005.

3.1.4 TRAFFIC FORECAST ASSUMPTIONS AND METHODOLOGY

This subsection describes the rationale underlying the long-range forecast of passengers at the Airport. The basic assumptions associated with the Base Forecast and those associated with the High forecast scenario are presented. The methodology used to develop the Base Forecast of enplaned passengers is laid out, followed by the methodology used to develop the forecasts of aircraft operations, cargo tonnage, aircraft fleet mix, and peaking of both passengers and operations.

3.1.4.1 Forecast Rationale

Before addressing the forecast assumptions, the following narrative presents the conceptual framework underlying the forecast.

3.1.4.1.1 Air Travel Demand vs. Air Passenger Traffic

In order to discuss the conceptual approach to the traffic forecast, a distinction in terminology is made here, between “demand” and “traffic”. Essentially, air travel demand represents the need or desire to travel by air between any two points—that is, the *potential* number of air journeys—whereas airline passenger traffic represents the *actual* number of passengers that travel by air.

Air travel demand is fluid and immeasurable. It is a fluid concept because, as an airline trip is made more convenient and the airfare is lowered toward zero, the potential number of passenger journeys increases exponentially. Demand varies depending on a number of parameters. It is immeasurable because, unlike air passenger traffic, it is not observable. In spite of these limitations, however, the concept of air travel demand is a useful and relevant one.

Some of the key factors affecting air travel demand between any two communities (A and B, say) are the following:

- Distance between A and B
- Community of interest between A and B
- Populations of A and B, including their respective catchment areas
- Personal income levels at A and B
- Employment parameters at A and B
- Economic health of A and B and their respective regions
- Tourism appeal between A and B

These factors were discussed in Subsection 3.1.2, *Demographic and Economic Profile*.

It is from the “demand pool” that airlines attract passengers for their flights. However, it is important to keep in mind that air travel demand (as described herein) is independent of the level of airline service and fares offered. These factors do not affect air travel demand per se—rather, they determine the proportion of potential demand that is translated into air passenger traffic.

In contrast to air travel demand, air passenger traffic is both finite and measurable. Passengers represent a subset of air travel demand; they can be counted, and their numbers will always be less than total potential demand.

Air passenger traffic typically lags the GDP cycle. Traffic tends to decline several months after the economy begins to show weakness, in part due to the substantial sale of advance airline tickets and also because of the time it takes for the economic downturn to reveal itself and affect consumer behavior and business travel budgets.

Three key factors determine the degree to which air travel demand is converted into actual passengers: air service, airfares, and airport access.

3.1.4.1.2 Demand vs. Traffic at MHT

The potential base of air travel demand for MHT is considerable. As described earlier, the Airport's Service Region lies completely within the Boston CSA, the nation's fifth largest metropolitan area with 7.5 million residents. In addition, its location to the northwest of Boston gives the Airport more convenient access to areas outside of the Boston CSA, namely, the remainder of New Hampshire and portions of Vermont, Maine, and Massachusetts. With approximately 4.7 million people residing in the primary and secondary parts of the Air Service Region (i.e., within roughly 2 hours driving distance), passenger traffic growth at the Airport is clearly not limited by the number of potential air travelers.

Evidence of the sizable base of potential air travelers is provided by the remarkable growth of traffic at MHT that occurred between 1997 and 2005. PVD is in a comparable situation to MHT with respect to air travel demand, and it experienced similarly rapid traffic growth over the same period as well.

The primary driver of passenger traffic growth at MHT (and at PVD) was the introduction of airline service by Southwest Airlines. The relatively low airfares, nonstop service to both existing and new destinations, and access to the extensive Southwest route network stimulated strong growth in passengers at the Airport. In other words, a greater share of air travel demand was realized in the form of air passenger traffic. That growth derived, in part, from residents of both the Airport Service Region and the rest of the country electing to make air journeys that they might otherwise not have made, and making those journeys from and to MHT. But an arguably larger basis for the traffic growth at the Airport was the benefit that the Southwest service offered to travelers for whom use of services at Logan had long been the only practical air travel option.

The challenges facing air travelers at Logan—a shortage of LCCs, relatively high fares, a high incidence of flight delays, and congested roadway access—were the generator of much of the increased passenger traffic that MHT experienced. Following the initiation of Southwest service, the Airport's Service Region expanded in all directions and, in particular, toward Boston. Travelers increasingly elected to use MHT based on all three of the traffic factors noted above: air service, airfares, and airport access.

Traffic growth at MHT was driven largely by supply rather than demand. In response to Southwest's arrival, other airlines at MHT added service and matched Southwest's fares in competing markets. As long as the levels of cost and inconvenience at Logan remained high, MHT was assured a high volume of passengers.

In recent years, Logan has added a new runway, attracted LCC service (JetBlue and AirTran), and built new roadway access. At least partially as a result, passenger growth at MHT slowed in 2005 and turned negative thereafter. In August 2009, Southwest initiated service at Logan. Southwest has continued to serve MHT and PVD, citing its long-range plan to develop the northeast U.S. market.

An air traveler in the Airport's Service Region has a choice when his/her plans call for travel to a destination not served nonstop from the Airport: Either (a) take a flight from MHT to a hub airport, and connect there to the destination, or (b) travel to Logan using surface transportation (i.e., private car, bus, limousine), and then take a nonstop flight from Logan to the destination. Evidence suggests that airfares currently tend to be lower to many destinations at Logan than at MHT; consequently, since 2005, some travelers who booked away from Logan starting ten years ago have been opting for flights at Logan once again.

Analytical results presented earlier in the chapter demonstrate a key reality: When nonstop service to a passenger's destination is available at MHT as well as at Logan, and when the fare differential is not excessive, MHT will typically capture a larger proportion of travelers to that destination than it will when the destination is not served nonstop from MHT. This inter-airport competition for passenger market share is commonplace in multi-airport metropolitan areas such as Miami/Ft. Lauderdale, Washington D.C./Baltimore, and the San Francisco Bay Area.

The conclusion to be drawn is that <u>future growth in passenger traffic at the Airport is dependent, in large part, on the introduction of nonstop service to new destinations</u>. The key to traffic growth at MHT is largely one of market share capture—and the Airport's primary tool for attaining this is additional, competitively-priced airline service. Lack of service expansion will inhibit passenger traffic growth at MHT.

3.1.4.1.3 Forecast Assumptions and Scenarios

The Base Forecast of enplaned passengers presented herein reflects a set of assumptions about how the economy, energy prices, airfares, airline service levels, and passenger load factors will evolve over the near-term and longer-term. These assumptions are as follows:

The current economic recession will end in the fourth quarter of 2009. The pace of recovery will be gradual, relative to recoveries from recent, less-severe recessions. Long-term rates of economic growth will be moderate, albeit somewhat below historical trends.

- U.S. air travel recovery tends to lag economic recovery. Enplaned passenger numbers will begin to show positive growth nationally by mid-2010, but recovery will be gradual and slow to accelerate.

- Energy prices will continue to show volatility. Long-term increases will be in excess of the Consumer Price Index (CPI). High energy prices depress air travel in two ways: (1) they raise airline fuel prices and these costs are often passed on to consumers, and (2) they restrict the amount of consumer discretionary income available for air travel.

- Airfares will rise somewhat in excess of CPI. For this purpose, airfares are defined broadly to include ancillary fees.

- Airline departing seats at MHT will decline through 2011. Thereafter, moderate capacity growth will resume. Near-term air service assumptions by airline or airline group include:

  - Southwest will reduce service at MHT, from 7 key focus cities to 5 or 6.
  - Another LCC will introduce limited service at the Airport.
  - The other airlines at the Airport will continue to offer a similar level of service in the future; the number of destinations served nonstop will be maintained.
  - International service at MHT will experience no material change.

- Airline passenger load factors (the proportion of departing seats occupied by passengers) at the Airport will remain relatively unchanged at current levels over the forecast period.

The airline traffic forecast environment is highly uncertain. Various factors will likely cause the number of enplaned passengers at the Airport to be higher or lower than those envisaged in the Base Forecast. A High Scenario was developed in order to address the forecast uncertainty and to provide an indication of the potential upside range of variation in traffic at MHT. **Table 3-6** summarizes the assumptions associated with the High Scenario and compares them to the assumptions underlying the Base Forecast. Not all of the assumptions associated with the High Scenario are expected to occur; the assumptions should be regarded, therefore, as illustrative of the more positive conditions that could prevail over the forecast period.

3.1.4.2 Passenger Forecast Methodology

In giving consideration to the appropriate methodology to be used in developing traffic forecasts for the Airport, it was recognized that the standard methodologies were not appropriate. Given the extraordinary trajectory of traffic over the past 10 years, simple extrapolation of past trends would not provide a realistic or useful representation of future traffic. Given that passenger traffic at MHT is primarily driven by the airline service that is provided, and only secondarily influenced by demand factors, use of econometric modeling was considered and rejected. And given the short-term planning horizons used by the airlines, particularly given current industry conditions of weak demand, capacity restraint, and fare competition, basing the forecast on airline plans was regarded as unreliable.

In order to meet the forecasting challenge posed by the dramatic changes in the Airport's traffic over the past decade, a two-phase market-share approach was adopted.

TABLE 3-6
ASSUMPTIONS UNDERLYING TRAFFIC FORECASTS
MANCHESTER-BOSTON REGIONAL AIRPORT

	Base Forecast	High Scenario
Economy		
- Recession	Ends 2009-Q4	Already ended (2009-Q2)
- Recovery	More gradual than following past economic recessions	Similar to past economic recoveries
- Long-term growth	At the rate of growth that most economists are forecasting	Higher than generally being forecast
Energy Prices	Continue to be volatile, with long-term upward trend exceeding CPI	Increase steadily but only gradually
Airline Traffic Recovery	Starts in mid-2010, but gradual and slow to accelerate	Sooner and more robust than Base scenario
Airfares, Including Ancillary Fees	Airfares rise somewhat faster than CPI	Airfares lag CPI
Near-Term Airline Service		
- Overall seats	Seats decline through 2011, moderate growth returns thereafter	Seats grow slightly in 2010, relatively strongly from 2011
- Airlines serving	Another airline introduces limited service	Another airline introduces service
- Airline Destinations	Current destinations maintained	Gradual increase in destinations served
- International	Status quo	+ European LCC service
Passenger Load Factors	Maintain at current levels	Stronger than Base

Source: Jacobs Consultancy.

3.1.4.2.1 Near-Term (i.e., through 2012)

Advance schedule filings by the airlines, published in *Official Airline Guide* and adjusted in a few cases for incomplete filings, were considered reasonably reliable and sufficiently indicative of airline service intentions through June 2010. Using professional judgment, the flight frequencies and numbers of seats represented in those schedules were extrapolated through the end of 2012.

A history of enplaned passenger load factors was developed, through to mid-2009, and those load factors were projected through the end of 2012.

The actual enplaned passengers through June 2009, along with the scheduled seats and estimated load factors for the remainder of the year, provided a reasonably sound basis for estimating 2009 for the Base Forecast of enplaned passengers. The product of projected seats and load factors in subsequent years was used as the Base Forecast of enplaned passengers in the years 2010, 2011, and 2012.

In the case of the High Scenario forecast, future airline capacity and passenger load factors at the Airport were increased based upon the assumptions presented in Table 3-6.

3.1.4.2.2 Longer-Term (i.e., 2013 through 2030)

Because future passenger growth at MHT is contingent, to a large degree, upon capturing market share of the larger regional market, a modeling approach was employed for the longer-term forecasts which simulated this dynamic. For the years 2013 through 2030, enplaned passenger growth was projected for the three airports (MHT + BOS + PVD) combined, and this combined passenger traffic was then allocated among the three airports, as described in more detail below.

First, the December 2008 FAA Terminal Area Forecasts (TAFs) for MHT, BOS, and PVD were reviewed and combined to form an aggregate forecast of passenger traffic growth. The aggregate forecast yielded both a 3-airport combined rate of enplaned passenger growth and shares of enplaned passengers served at each of the three airports.

Next, the published TAFs for the three airports, which were developed by Federal fiscal year, were converted to calendar years, using interpolation, and extended through 2030, using extrapolation. TAF estimated passenger levels for 2008 were replaced with actual passenger numbers sourced from DOT, Schedule T100 data, while forecast passenger levels for 2009 were adjusted based upon advance published airline flight schedules.

These adjusted TAF forecasts served as a guide for the development of the Base Forecasts and the High Scenario forecasts.

The 3-airport combined passenger traffic growth was forecast to be in line with the adjusted TAF forecast, in the case of the Base Forecast. In the High Scenario forecast, the 3-airport combined passenger traffic growth was forecast to exhibit more robust growth, based upon the economic and aviation industry assumptions detailed earlier.

Finally, the share of the 3-airport total enplaned passengers served by MHT was forecast for each of the Base Forecast and the High Scenario forecasts. (The share of passengers served by PVD was held as forecast by FAA, so that any gain in share by MHT came at the expense of BOS, and vice versa.) The forecast share of passenger traffic served at MHT reflects implicit assumptions about future levels of air service at MHT relative to BOS. The 2030 share of 3-airport total traffic served by MHT ranges from 9.5% in the Base Forecast to roughly 11% in the High Scenario forecast.

3.1.5 FORECASTS OF PASSENGERS

Table 3-7 displays the near-term enplaned passenger forecasts (i.e., through 2012) which were developed by sector and by airline grouping. Passenger estimates for 2009 and 2010 were based, in part, upon advance published *Official Airline Guide* flight schedules and assumptions about load factors.

Table 3-8 presents the Base Forecast and the High Scenario forecast and, in each case, the share of the 3-airport enplaned passenger total (MHT + BOS + PVD) for which MHT is forecast to account.

TABLE 3-7
NEAR-TERM ENPLANED PASSENGER FORECASTS, BY AIRLINE GROUP
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS; PASSENGERS IN THOUSANDS)

SCENARIO / Sector / Airline Groupings	Actual 2008	Estimated 2009	Forecast 2010	Forecast 2011	Forecast 2012
BASE FORECAST					
Domestic					
Southwest	1,066	925	850	828	828
Other LCC	-	-	37	79	125
All Other U.S.	788	640	600	590	600
Total Domestic	1,855	1,565	1,487	1,497	1,553
International	7	5	7	8	8
Airport Total	1,862	1,570	1,494	1,505	1,561
% Chg. From Prev. Yr.		*-15.7%*	*-4.8%*	*0.7%*	*3.7%*
HIGH SCENARIO					
Domestic					
Southwest	1,066	925	875	885	910
Other LCC	-	-	51	111	173
All Other U.S.	788	640	650	660	675
Total Domestic	1,855	1,565	1,576	1,656	1,758
International	7	5	30	56	70
Airport Total	1,862	1,570	1,606	1,712	1,828
% Chg. From Prev. Yr.		*-15.7%*	*2.3%*	*6.6%*	*6.8%*

Sources: Actual—City of Manchester Department of Aviation.
Estimate and Forecast—Jacobs Consultancy.
Note: Columns may not add to totals shown because of rounding.

TABLE 3-8
SUMMARY OF ENPLANED PASSENGER FORECASTS, BY SCENARIO
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS; PASSENGERS IN THOUSANDS)

	BASE FORECAST			HIGH SCENARIO		
Year	**Psgrs.**	**% Chg. Prev. Yr.** *(a)*	**% of 3-Airport Total** *(b)*	**Psgrs.**	**% Chg. Prev. Yr.** *(a)*	**% of 3-Airport Total** *(b)*
1990	389		3.1%	389		3.1%
:						
1995	445	2.7%	3.3	445	2.7%	3.3
:						
2000	1,556	28.5	8.7	1,556	28.5	8.7
:						
2005	2,168	6.9	11.9	2,168	6.9	11.9
2006	1,952	-10.0	10.8	1,952	-10.0	10.8
2007	1,948	-0.2	10.8	1,948	-0.2	10.8
2008A	1,862	-4.4	11.0	1,862	-4.4	11.0
2009E	1,570	-15.7	9.7	1,570	-15.7	9.6
2010F	1,494	-4.8	9.3	1,606	2.3	9.7
2011	1,505	0.7	9.2	1,712	6.6	10.2
2012	1,561	3.7	9.5	1,828	6.8	10.6
2013	1,600	2.5	9.5	1,882	3.0	10.7
2014	1,634	2.1	9.5	1,938	3.0	10.8
2015	1,668	2.1	9.5	1,995	2.9	10.9
:						
2020	1,851	2.1	9.5	2,253	2.5	11.0
:						
2025	2,054	2.1	9.5	2,524	2.3	11.1
:						
2030	2,278	2.1	9.5	2,827	2.3	11.1

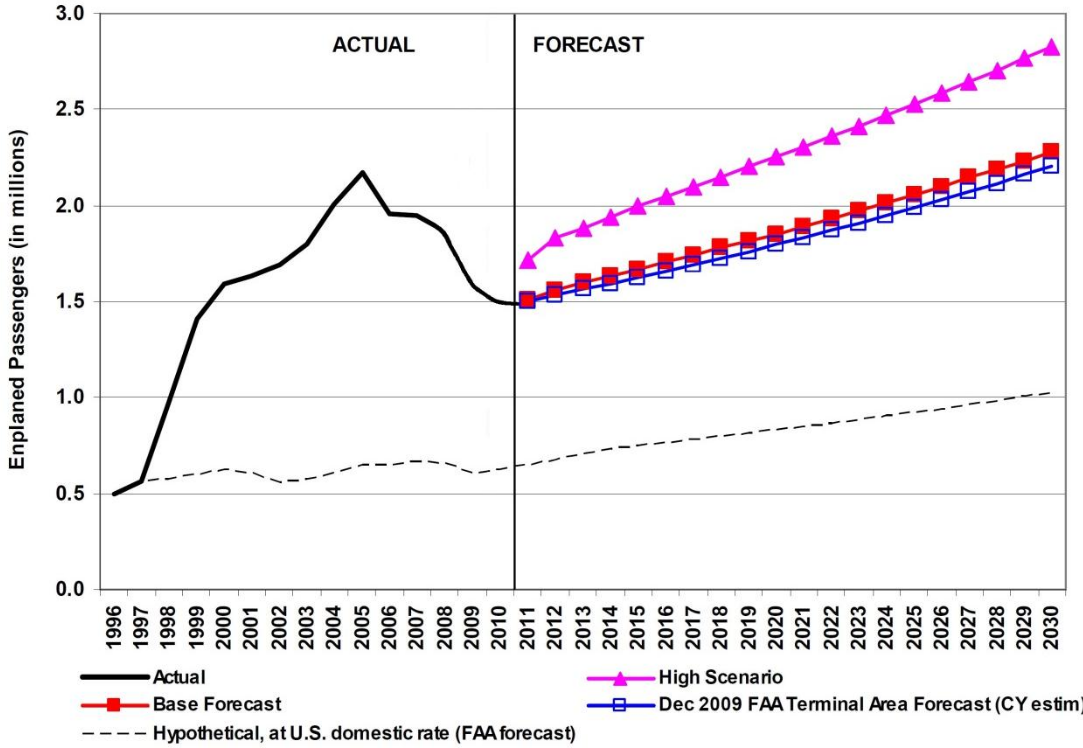
Sources: Actual—City of Manchester Department of Aviation.
Estimate and Forecast—Jacobs Consultancy.
Notes: A=Actual; E=Estimate, based on 6 months of actual data; F=Forecast.
(a) Percent change reflects the compound annual growth rate for the 5-year periods.
(b) "Region" = the total of the three area airports: MHT, BOS and PVD.

The two passenger forecasts are presented graphically in **Figure 3-21**, along with a comparison to the FAA Terminal Area Forecast issued in December 2008. The dashed line represents the hypothetical passenger growth that would have occurred at MHT had Southwest not stimulated traffic at the Airport but, rather, had the number of passengers at MHT grown at the nationwide rate of passenger traffic growth.

A disaggregation of each of the two passenger forecasts by passenger type (i.e., resident O&D, visitor O&D, and connecting) is presented in **Table 3-9**. The share of passenger traffic accounted for by each passenger type was estimated based largely upon historical trends.

Table 3-10 presents the forecast years in which certain specified enplaned passenger thresholds (i.e., planning activity levels) are expected to be reached in both forecast scenarios.

FIGURE 3-21
COMPARISON OF ENPLANED PASSENGER FORECASTS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Sources: Actual—City of Manchester Department of Aviation.
Estimate and Forecast—Jacobs Consultancy.

TABLE 3-9
SUMMARY OF ENPLANED PASSENGER FORECASTS, BY PASSENGER SEGMENT
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS; PASSENGERS IN THOUSANDS)

SCENARIO Passenger Segment	Actual 2008	Estimated 2009	Forecast											
			2010	2011	2012	2013	2014	2015	:	2020	:	2025	:	2030
BASE FORECAST														
Resident O&D	1,080	902	852	852	879	896	912	928		1,030		1,143		1,268
Visitor O&D	772	658	632	643	672	693	711	729		809		898		996
Connecting	10	10	10	10	10	11	11	11		12		13		14
Airport Total	1,862	1,570	1,494	1,505	1,561	1,600	1,634	1,668		1,851		2,054		2,278
% Chg. From Prev. Yr. (a)		-15.7%	-4.8%	0.7%	3.7%	2.5%	2.1%	2.1%		2.1%		2.1%		2.1%
HIGH SCENARIO														
Resident O&D	1,080	897	910	959	1,016	1,040	1,065	1,090		1,224		1,361		1,516
Visitor O&D	772	663	686	742	801	830	861	892		1,014		1,146		1,291
Connecting	10	10	10	11	11	12	12	13		15		17		20
Airport Total	1,862	1,570	1,606	1,712	1,828	1,882	1,938	1,995		2,253		2,524		2,827
% Chg. From Pre. Yr (a)		-15.7%	2.3%	6.6%	6.8%	3.0%	3.0%	2.9%		2.5%		2.3%		2.3%

Sources: Actual—City of Manchester Department of Aviation; U.S. DOT, *Air Passenger Origin-Destination Survey*, reconciled to Schedules T100 and 298C T1.
Estimate and Forecast—Jacobs Consultancy.
Note: Columns may not ass to totals shown because of rounding.
(a) Percent change reflects the compound annual growth rate for the 5-year periods.

TABLE 3-10
PLANNING ACTIVITY LEVELS
MANCHESTER-BOSTON REGIONAL AIRPORT

Enplaned Passengers (millions)	Year when Enplaned Passenger threshold levels are forecast to be reached or exceeded	
	Base Forecast	High Scenario
1.50	n/a	n/a
1.75	2018	2012
2.00	2023	2015
2.25	2030	2020
2.50	After 2030	2025
2.75	After 2030	2029

Source: Jacobs Consultancy.

3.1.6 FORECASTS OF FLIGHT OPERATIONS

Forecasts of flight operations (i.e., the sum of landings and takeoffs) at the Airport were developed by category of operator (passenger airlines, all-cargo carriers, general aviation, and military) for the Base Forecast and the High Scenario forecast.

3.1.6.1 Passenger Flight Operations

Through 2012, departing flights and seats were extrapolated on the basis of advance airline schedule filings, as previously described in Section 3.1.4.2.1, *Near-Term (i.e., through 2012)*.

Beyond 2012, passenger flight operations were derived from the passenger forecasts. Departing seats were calculated from the enplaned passenger forecasts by projecting future enplaned passenger load factors (the proportion of seats occupied by passengers). Passenger flight operations were calculated, in turn, from the projections of departing seats by applying estimates of average seats per flight.

In the Base Forecast, load factors were forecast to increase marginally over the forecast period as shown in **Table 3-11**. Average seats per flight were projected to decline from 96 in 2008 to 91 in 2011, based upon advance published airline flight schedules. Thereafter, average seats per flight were projected to increase, reaching 98 seats per flight in 2030.

Average load factors and average seats per flight were assumed to be higher in the High Scenario forecast than were projected in the Base Forecast.

TABLE 3-11
FLIGHT OPERATIONS DERIVATION
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS; PASSENGERS AND SEATS IN THOUSANDS)

BASE FORECAST											
Calendar Year	Enplaned Passengers	Load Factor	Departing Seats	Avg. Seats per Flight	Passenger Flight Departures	Passenger Flight Operations	All-Cargo Flight Departures	All-Cargo Flight Operations	GA. Flight Operations	Military Flight Operations	Total Flight Operations
2005	2,168	68.2%	3,180	96	33,097	66,194	5,074	10,148	26,369	479	**103,190**
2006	1,952	73.9	2,641	92	28,832	57,664	4,931	9,862	24,874	738	**93,138**
2007	1,948	74.3	2,624	91	28,768	57,536	5,249	10,498	21,608	705	**90,347**
2008A	1,862	76.0	2,448	96	25,457	50,914	5,103	10,207	14,902	762	**76,785**
2009E	1,570	76.1	2,064	97	21,400	42,800	4,415	8,830	12,400	900	**64,930**
2010F	1,494	76.1	1,962	91	21,500	43,000	4,200	8,400	12,350	900	**64,650**
2011	1,505	75.6	1,990	91	21,900	43,800	4,300	8,600	12,475	900	**65,775**
2012	1,561	76.1	2,052	92	22,300	44,600	4,400	8,800	12,600	900	**66,900**
2013	1,600	76.1	2,102	93	22,600	45,200	4,600	9,200	12,725	900	**68,025**
2014	1,634	76.2	2,144	94	22,900	45,800	4,800	9,600	12,850	900	**69,150**
2015	1,668	76.2	2,189	95	23,000	46,000	5,000	10,000	12,915	900	**69,815**
2020	1,851	76.3	2,426	96	25,300	50,600	5,250	10,500	13,240	900	**75,240**
2025	2,054	76.4	2,688	97	27,700	55,400	5,500	11,000	13,575	900	**80,875**
2030	2,278	76.5	2,978	98	30,400	60,800	5,750	11,500	13,920	900	**87,120**

Calendar Year	Enplaned Passengers	Load Factor	Departing Seats	Avg. Seats per Flight	Passenger Flight Departures	Passenger Flight Operations	All-Cargo Flight Departures	All-Cargo Flight Operations	GA. Flight Operations	Military Flight Operations	Total Flight Operations
2005	2,168	68.2%	3,180	96	33,097	66,194	5,074	10,148	26,369	479	**103,190**
2006	1,952	73.9	2,641	92	28,832	57,664	4,931	9,862	24,874	738	**93,138**
2007	1,948	74.3	2,624	91	28,768	57,536	5,249	10,498	21,608	705	**90,347**
2008A	1,862	76.0	2,448	96	25,457	50,914	5,103	10,207	14,902	762	**76,785**
2009E	1,570	76.1	2,064	97	21,400	42,800	4,415	8,830	12,400	900	**64,930**
2010F	1,606	76.3	2,105	91	23,100	46,200	4,500	9,000	12,525	910	**68,635**
2011	1,712	76.3	2,243	93	24,100	48,200	4,750	9,500	12,775	920	**71,395**
2012	1,828	76.6	2,387	95	25,100	50,200	5,000	10,000	13,160	930	**74,290**
2013	1,882	76.7	2,454	96	25,600	51,200	5,200	10,400	13,555	940	**76,095**
2014	1,938	76.8	2,523	97	26,000	52,000	5,350	10,700	13,960	950	**77,610**
2015	1,995	76.9	2,594	98	26,500	53,000	5,500	11,000	14,380	960	**79,340**
2020	2,253	77.0	2,926	100	29,300	58,600	6,000	12,000	16,470	980	**88,050**
2025	2,524	77.5	3,257	101	32,200	64,400	6,500	13,000	18,635	990	**97,025**
2030	2,827	78.0	3,624	102	35,500	71,000	7,000	14,000	20,830	1,000	**106,830**

Sources: City of Manchester Department of Aviation; U.S. DOT, Schedule T100.

3.1.6.2 Other Flight Operations

The 2009 estimate of all-cargo carrier operations was based upon 6 months of actual year-to-date cargo tonnage handled by all-cargo carriers. (All-cargo flight operations are no longer reported in the Airport's monthly traffic reports.) The direction and magnitude of change observed in the first 6 months was applied to the entire year. This incorporated the effect of DHL's cessation of operations at the Airport. Thereafter, all-cargo operations were projected based largely upon historical trends and the anticipated effects of the forecast assumptions upon all-cargo activity at the Airport.

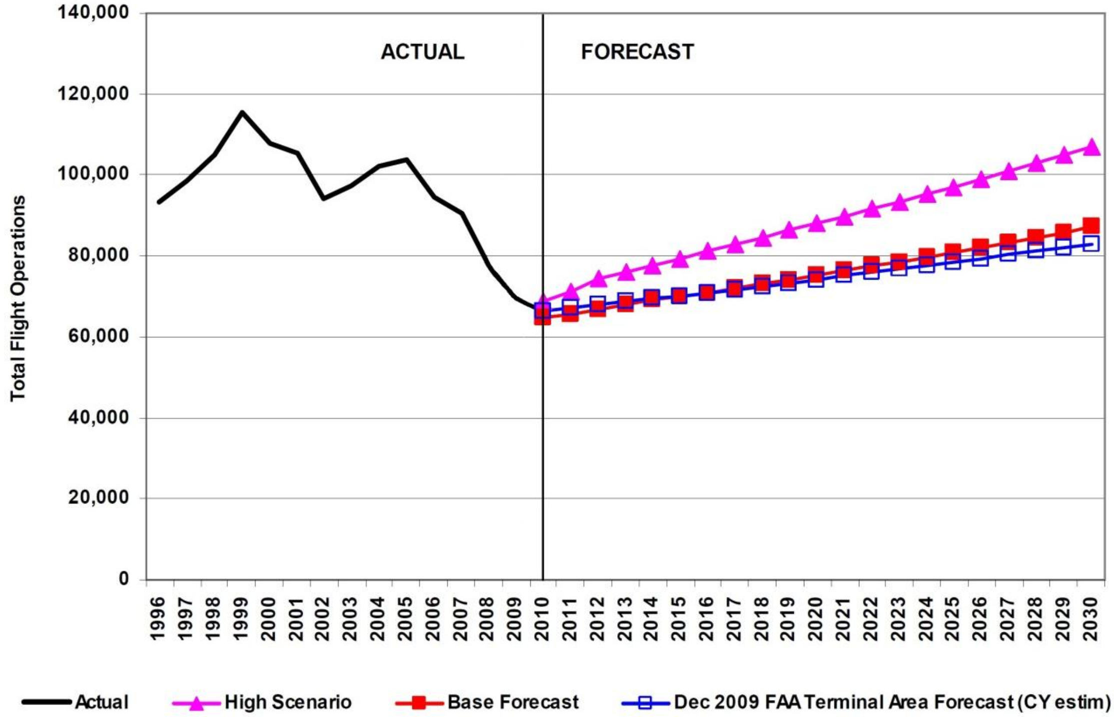
The 2009 estimate of flight operations for GA and military activity was based upon 5 months of actual year-to-date data. The direction and magnitude of change observed in the first 5 months was applied to the entire year. Thereafter, TAF rates of growth of GA and military operations at MHT were applied to the 2009 baseline estimates to produce the Base Forecast. GA and military operations forecasts for the High Scenario forecast were estimated. In the case of the High Scenario forecast, it was assumed that either a charter operator or a Fixed Base Operator (FBO) offering fractional ownership of aircraft will begin operating at the Airport in 2011, leading to a somewhat higher long-term rate of growth in GA operations. (Alpha Air, a company that offered fractional aircraft ownership, terminated operations at MHT in December 2007.)

3.1.6.3 Total Flight Operations

The overall forecast of flight operations at MHT includes passenger flights, all-cargo flights, GA activity, and military operations. Total operations at the Airport are forecast to grow 1.4% per year, on average, between 2009 and 2030, in the Base Forecast. Total operations are forecast to grow 2.5% per year in the High Scenario forecast, on average, over the same period.

The flight operations forecasts are presented graphically in **Figure 3-22**, along with a comparison to the TAF issued by the FAA in December 2009. As shown in the chart, the Base Forecast of flight operations tracks the current TAF very closely.

FIGURE 3-22
COMPARISON OF FLIGHT OPERATIONS FORECASTS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)



Sources: Actual—City of Manchester Department of Aviation.
Estimate and Forecast—Jacobs Consultancy.

3.1.7 FORECASTS OF AIR CARGO TONNAGE

Forecasts of air cargo tonnage at MHT were derived from the passenger flight operations and all-cargo flight operations forecasts. For both categories of cargo operator, historical time-series of cargo tonnage per flight operation were established from 2005 through 2008. These ratios were then projected over the forecast period and applied to the flight operations forecasts previously developed to produce the air cargo tonnage forecasts.

Tables 3-12 and 3-13 present the Base Forecast and High Scenario forecast, respectively, of air cargo tonnage at MHT.

3.1.8 AIRCRAFT FLEET MIX FORECAST

The types of aircraft operating at an airport, referred to herein as the aircraft fleet mix, are an important consideration in planning terminal and airfield improvements. The aircraft fleet mix forecast was derived from the Base Forecast of flight operations by forecasting future shares of operations by aircraft category and, then, by aircraft type.

A base year of operations data by aircraft type for 2008 was developed as follows:

- For passenger carrier flights, the number of 2008 operations by aircraft type was sourced from DOT, Schedule T100 data.

- For all-cargo carrier flight operations, DOT, Schedule T100 data provided only an incomplete record of all-cargo operations at the Airport. (For example, the all-cargo flights reported to the Airport by the FBO, Wiggins Airways, were not reflected in the Schedule T100 data.) For this reason, Airport data were used in the development of the 2008 base-year fleet mix for all-cargo aircraft. Specifically, the MHT Cargo Detail Spreadsheet cited in Inventory Task 5.2 served as the basis for estimating the 2008 fleet mix for all-cargo airlines.

- For GA and military flights, the 2008 fleet mix was estimated using data obtained from the FAA Air Traffic Activity Data System (ATADS) and “Flight Explorer” software. Given the unavailability of fleet mix data for GA and military operations from both DOT and the Airport, the ATADS/”Flight Explorer” data was used to develop the aircraft fleet mix forecast.

Passenger flights were grouped by narrow-body jet, regional jet, or turboprop operations. All-cargo flights were grouped by aircraft size: large (e.g., A300, B-767), medium (e.g., B-727, B-757), or small (e.g., Beech 99). GA operations were grouped by jet, turboprop, single-engine piston, twin-engine piston, or helicopter operations. Military operations were not grouped by aircraft category. The 2008 base-year fleet mix percentages were then applied, either directly or modified to incorporate forecast changes over the years, to the Base Forecast of passenger, all-cargo, GA, and military flight operations developed earlier.

TABLE 3-12
HISTORICAL AND FORECAST AIR CARGO TONNAGE, BY CARRIER TYPE
BASE FORECAST
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Commercial Operations		**76,342**	**67,526**	**68,034**	**61,121**	**51,630**	**51,400**		**56,000**		**61,100**		**66,400**		**72,300**
Passenger Carriers		66,194	57,664	57,536	50,914	42,800	43,000		46,000		50,600		55,400		60,800
All-Cargo Carriers		10,148	9,862	10,498	10,207	8,830	8,400		10,000		10,500		11,000		11,500
Cargo Tonnage per Flight		**1.02**	**1.31**	**1.42**	**1.46**	**1.51**	**1.45**		**1.58**		**1.52**		**1.47**		**1.41**
Passenger Carriers		0.04	0.05	0.06	0.06	0.07	0.07		0.07		0.07		0.07		0.07
All-Cargo Carriers		7.40	8.67	8.91	8.41	8.50	8.50		8.50		8.50		8.50		8.50
Total Cargo Tonnage	**81,043**	**77,754**	**88,191**	**96,744**	**89,078**	**78,050**	**74,410**		**88,220**		**92,790**		**97,380**		**102,005**
Passenger Carriers	2,421	2,630	2,715	3,213	3,235	2,995	3,010		3,220		3,540		3,880		4,255
All-Cargo Carriers	78,622	75,124	85,476	93,531	85,843	75,055	71,400		85,000		89,250		93,500		97,750

Sources: Historical—City of Manchester Department of Aviation.
Forecast—Jacobs Consultancy
Notes: E = Estimate; F = Forecast.

TABLE 3-13
HISTORICAL AND FORECAST AIR CARGO TONNAGE, BY CARRIER TYPE
HIGH SCENARIO
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEAR)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Commercial Operations		**76,342**	**67,526**	**68,034**	**61,121**	**51,630**	**55,200**		**64,000**		**70,600**		**77,400**		**85,000**
Passenger Carriers		66,194	57,664	57,536	50,914	42,800	46,200		53,000		58,600		64,400		71,000
All-Cargo Carriers		10,148	9,862	10,498	10,207	8,830	9,000		11,000		12,000		13,000		14,000
Cargo Tonnage per Flight		**1.02**	**1.31**	**1.42**	**1.46**	**1.51**	**1.46**		**1.56**		**1.56**		**1.57**		**1.57**
Passenger Carriers		0.04	0.05	0.06	0.06	0.07	0.07		0.08		0.08		0.09		0.10
All-Cargo Carriers		7.40	8.67	8.91	8.41	8.50	8.60		8.70		8.80		8.90		9.00
Total Cargo Tonnage	**81,043**	**77,754**	**88,191**	**96,744**	**89,078**	**77,835**	**80,405**		**99,675**		**110,290**		**121,495**		**133,100**
Passenger Carriers	2,421	2,630	2,715	3,213	3,235	2,780	3,005		3,975		4,690		5,795		7,100
All-Cargo Carriers	78,622	75,124	85,476	93,531	85,843	75,055	77,400		95,700		105,600		115,700		126,000

Sources: Historical—City of Manchester Department of Aviation.
Forecast—Jacobs Consultancy
Notes: E = Estimate; F = Forecast.

The aircraft fleet mix forecast was developed, first, by forecasting future shares of operations by aircraft category, and second, by forecasting fleet mix shares by aircraft type within the passenger and all-cargo operations categories. In developing the fleet mix forecast, the following assumptions were made:

- Changes in passenger airline fleet mix through 2010 will occur generally as indicated by advance published airline schedules from *Official Airline Guide*.

- Among passenger airline operations, regional jets will account for a greater share of flights in the future, whereas narrowbody jets and turboprops will lose share. It is anticipated that larger regional jets (greater than 50 seats) will continue to gain market share at the expense of smaller regional jets, due to their relative inefficiency to operate. Among narrowbody aircraft, the aging DC-9 will be phased out by 2015, replaced by Boeing 737s and Airbus 319s and 320s.

- Among all-cargo airline operations, there will be no material shift among the broad aircraft categories over the forecast period. Within the medium-size aircraft category, however, the Boeing 737 will replace the Boeing 727 as the latter reaches the end of its useful life by 2020, again reflecting expectations regarding the useful life of the 727.

- Among GA operations, jet and turboprop flights will increase as a proportion of all GA flights. The number of piston-engine aircraft operations at MHT will decline as the number of such aircraft in use nationally declines and will account for a decreasing share of GA flights. The increased share of flights accounted for by helicopters reflects the summer 2009 relocation to MHT of an air ambulance helicopter service operated by Dartmouth-Hitchcock Advanced Response Team (DHART).

Table 3-14 presents the summary-level fleet mix forecast for all types of operations. **Tables 3-15 and 3-16** present the aircraft-specific fleet mix forecasts for passenger airline and all-cargo carrier operations at MHT, respectively.

TABLE 3-14
FORECAST FLIGHT OPERATIONS, BY CATEGORY OF CARRIER AND AIRCRAFT
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2008	2009E	2010	:	2015	:	2020	:	2025	:	2030
Total operations	**76,785**	**64,930**	**64,650**		**69,815**		**75,240**		**80,875**		**87,120**
Passenger carriers	50,914	42,800	43,000		46,000		50,600		55,400		60,800
Jet aircraft	44,903	37,665	37,840		40,710		45,035		49,585		54,720
Narrow-body	26,939	24,825	23,650		24,610		26,315		27,980		30,400
Regional jet	17,964	12,840	14,190		16,100		18,720		21,605		24,320
Turboprop aircraft	6,012	5,135	5,160		5,290		5,565		5,815		6,080
All-cargo carriers	10,207	8,830	8,400		10,000		10,500		11,000		11,500
Large (e.g., A300, B-676)	2,673	2,295	2,185		2,600		2,730		2,860		2,990
Medium (e.g., B-727, B-757)	778	705	670		800		840		880		920
Small (e.g., Beech 99)	6,755	5,830	5,545		6,600		6,930		7,260		7,590
General Aviation	14,902	12,400	12,350		12,915		13,240		13,575		13,920
Jet	2,987	2,480	2,470		2,840		3,180		3,530		3,900
Turboprop	1,947	1,675	1,730		2,065		2,385		2,715		3,060
Twin-engine piston	8,521	6,945	6,235		6,200		5,955		5,700		5,290
Single-engine piston	1,350	990	925		775		660		545		555
Helicopter	98	310	990		1,035		1,060		1,085		1,115
Military (Lear Jet)	762	900	900		900		900		900		900
Share of Total:											
Total operations	**100.0%**	**100.0%**	**100.0%**		**100.0%**		**100.0%**		**100.0%**		**100.0%**
Passenger carriers	66.3	65.9	66.5		65.9		67.3		68.5		69.8
All-cargo carriers	13.3	13.6	13.0		14.3		14.0		13.6		13.2
General Aviation	19.4	19.1	19.1		18.5		17.6		16.8		16.0
Military (Lear Jet)	1.0	1.4	1.4		1.3		1.2		1.1		1.0

Sources: Actual—City of Manchester Department of Aviation.
Forecast—Jacobs Consultancy.

Notes: 2008 fleet mix breakdown is based on data from FAA ATADS, Flight Explorer, and URS Corp. for the 12 months ended April 30, 2009.
2009 and 2010 passenger carrier fleet mix breakdown is based on advance published *Official Airline Guide* schedules.

TABLE 3-15
FORECAST PASSENGER CARRIER FLIGHT OPERATIONS, BY AIRCRAFT TYPE
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

Aircraft Category Aircraft Type (Model)	**2008**	**2009E**	**2010**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total passenger carrier operations	**50,914**	**42,800**	**43,000**		**46,000**		**50,600**		**55,400**		**60,800**
Jet Aircraft	44,903	37,665	37,840		40,710		45,035		49,585		54,720
Narrow-body	26,939	24,825	23,650		24,610		26,315		27,980		30,400
B-737	24,632	21,350	22,230		23,630		25,000		26,300		28,270
A320	901	1,240	-		490		525		560		610
DC-9	761	1,240	1,420		-		-		-		-
A319	616	995	-		490		790		1,120		1,520
MD-80	17	-	-		-		-		-		-
B-757	12	-	-		-		-		-		-
Regional jet	17,964	12,840	14,190		16,100		18,720		21,605		24,320
Large Regional Jet (more than 50 seats)	8,347	5,135	5,535		8,050		11,605		15,990		20,915
Small Regional Jet (50 seats or fewer)	9,617	7,705	8,655		8,050		7,115		5,615		3,405
Turboprop	6,012	5,135	5,160		5,290		5,565		5,815		6,080
More than 60 seats	139	515	515		690		890		1,105		1,340
30-59 seats	3,982	3,000	2,995		3,015		3,115		3,255		3,525
Less than 30 seats	1,890	1,620	1,650		1,585		1,560		1,455		1,215
Share of Total:											
Total passenger carrier operations	**100.0%**	**100.0%**	**100.0%**		**100.0%**		**100.0%**		**100.0%**		**100.0%**
Jet Aircraft	88.2	88.0	88.0		88.5		89.0		89.5		90.0
Narrow-body	52.9	58.0	55.0		53.5		52.0		50.5		50.0
Regional jet	35.3	30.0	33.0		35.0		37.0		39.0		40.0
Turboprop	11.8	12.0	12.0		11.5		11.0		10.5		10.0

Sources: Actual—City of Manchester Department of Aviation.
Forecast—Jacobs Consultancy.

Notes: 2008 fleet mix breakdown is based on data from FAA ATADS, Flight Explorer, and URS Corp. for the 12 months ended April 30, 2009.
2009 and 2010 passenger carrier fleet mix breakdown is based on advance published *Official Airline Guide* schedules.

TABLE 3-16
FORECAST ALL-CARGO CARRIER FLIGHT OPERATIONS, BY AIRCRAFT TYPE
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

Aircraft Size Category **Aircraft Type (Model)**	**2008**	**2009E**	**2010**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total all-cargo carrier operations	**10,207**	**8,830**	**8,400**		**10,000**		**10,500**		**11,000**		**11,500**
Large	2,673	2,295	2,185		2,600		2,730		2,860		2,990
A300	2,332	2,030	1,990		2,445		2,595		2,715		2,840
DC-10	295	230	130		50		-		-		-
B-767	46	35	65		105		135		145		150
Medium	778	705	670		800		840		880		920
B-757	607	545	530		655		690		720		755
B-727	133	125	120		145		-		-		-
DC-8	39	35	20		-		-		-		-
B-737	-	-	-		-		150		160		165
Small	6,755	5,830	5,545		6,600		6,930		7,260		7,590
Beech 99	4,863	4,200	3,990		4,750		4,990		5,225		5,460
Caravan	899	785	750		890		935		980		1,025
EMB 110	776	670	640		760		795		835		875
King Air	218	175	165		200		210		220		230
Share of Total:											
Total all-cargo carrier operations	**100.0%**	**100.0%**	**100.0%**		**100.0%**		**100.0%**		**100.0%**		**100.0%**
Large	26.2	26.0	26.0		26.0		26.0		26.0		26.0
Medium	7.6	8.0	8.0		8.0		8.0		8.0		8.0
Small	66.2	66.0	66.0		66.0		66.0		66.0		66.0

Sources: Actual—City of Manchester Department of Aviation.
Forecast—Jacobs Consultancy.

Note: 2008 fleet mix breakdown for large and medium aircraft is based on data from FAA ATADS, Flight Explorer, and URS Corp. for the 12 months ended April 30, 2009. 2008 fleet mix breakdown for small aircraft is based on data from the Manchester Cargo Detail Spreadsheet as provided by McFarland Johnson and is for the 12 months ended August 31, 2009.

3.1.9 PEAKING FORECASTS

For airport planners, it is often the peak level, rather than the average level, of activity that is the critical design factor in planning for new or expanded facilities. Forecasts of peak period activity at MHT, for both passengers and flight operations, are presented below.

Table 3-17 provides an overview of the passenger airline peaking forecasts by Planning Activity Level. A detailed description of the approach used in developing the peaking forecasts follows.

TABLE 3-17
PEAK PLANNING ACTIVITY LEVELS FOR PASSENGER CARRIER OPERATIONS
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	Enplaned Passenger Level (millions)				
	1.75	**2.00**	**2.25**	**2.50**	**2.75**
Total Passengers	3,500,000	4,000,000	4,500,000	5,000,000	5,500,000
Peak Month Passengers	342,633	391,581	440,529	489,476	538,424
Average Day Passengers	11,053	12,632	14,211	15,790	17,369
Peak Hour Passengers	1,123	1,283	1,444	1,604	1,765
Enplaned Passengers	1,750,000	2,000,000	2,250,000	2,500,000	2,750,000
Peak Month Passengers	173,806	198,635	223,465	248,294	273,123
Average Day Passengers	5,607	6,408	7,209	8,009	8,810
Peak Hour Passengers	619	707	795	884	972
Deplaned Passengers	1,750,000	2,000,000	2,250,000	2,500,000	2,750,000
Peak Month Passengers	171,560	196,068	220,577	245,085	269,594
Average Day Passengers	5,534	6,325	7,115	7,906	8,697
Peak Hour Passengers	795	909	1,022	1,136	1,250
Passenger Carrier Operations	48,600	53,430	58,600	64,400	69,630
Peak Month Operations	4,280	4,706	5,161	5,672	6,133
Average Day Operations	138	152	166	183	198
Peak Hour Operations	14	15	17	19	20

Source: Jacobs Consultancy.

3.1.9.1 Passenger Peaking Forecasts

Forecasts of peak passenger flows were derived from both the Base Forecast and High Scenario forecast of enplaned passengers.

The analysis of passenger peaking began by obtaining from Airport records a monthly time series of passenger data for each of the years 2004 through 2008. The peak month was determined for both enplaned and deplaned passengers for each year and the percentage of annual enplaned and deplaned passengers was calculated for those months. In virtually all cases, July or August was the peak month of passenger activity at MHT. The averages of the peak-month percentages for the 5 years were used as the Peak Month factors in the forecast of monthly passenger peaks. For this analysis, future total deplaned passenger levels were assumed to be identical to total enplaned passenger levels, although the Peak Month and Peak Hour figures differ due to different peak months and peak hours used for enplanements as opposed to deplanements.

Daily peak passenger flows were calculated by dividing the peak monthly flows by 31 (days in July and August).

Scheduled seat data from *Official Airline Guide* were used to determine Peak Hour factors. The numbers of arriving and departing hourly seats scheduled at MHT in the month of August were used for each of the years 2007, 2008, and 2009. In every case, the average number of total (arriving and departing) seats was calculated for each hour of the day throughout the month, the peak hour identified, and the percentage of average daily seats that occurred in that peak hour calculated. The three-year average of those Peak Hour factors was used in the forecast of hourly passenger peaks. The forecast peak hour values were then calculated by multiplying the forecast passengers on an average day of the peak month by the appropriate Peak Hour factors.

The passenger peaking forecasts for the Base Forecast and High Scenario are presented in **Tables 3-18 and 3-19**, respectively.

3.1.9.2 Operations Peaking Forecasts

As was the case with the peak passenger forecasts, forecasts of flight operations peaks were derived from both the Base Forecast and High Scenario forecast of annual flight operations.

Monthly flight data for the period 2004 through 2008 from DOT, Schedule T100 were used to analyze the monthly peaking pattern for passenger flights. Monthly flight data for the same period from the Airport were used to analyze the monthly peaking pattern for all-cargo, GA, and military flights. The same methodology as that used to analyze monthly passenger peaking was employed to derive the Peak Month factor for flight operations in each year. The Peak Month factors for the 5 years were averaged, and the results were used in forecasting monthly peak passenger operations.

Average daily flight operations were calculated by dividing the peak month operations by either 30 or 31, depending upon the specific peak month for each category of flight operations. (Different categories of flights exhibit different patterns of seasonality at MHT. For instance, GA operations peak in late summer/early autumn, while all-cargo operations peak late in the year, reflecting higher holiday-related cargo volumes.)

The same approach described earlier, for passengers, was used to develop the Peak Hour factors for passenger flights, with the exception that the number of scheduled flight operations, rather than seats, from *Official Airline Guide* was analyzed. Again, the averages of the Peak Hour factors from the months of August 2007, 2008, and 2009 were used in the forecast of Peak Hour passenger flight operations.

Hourly FAA tower counts from the month of September 2009 provided the basis for Peak Hour factors for all-cargo, GA, and military flight operations.

The operations peaking forecasts for the Base Forecast and High Scenario are presented in **Tables 3-20 and 3-21**, respectively.

TABLE 3-18
PEAK PERIOD – TOTAL, ENPLANED, AND DEPLANED PASSENGERS
BASE FORECAST
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Passengers	**4,003,307**	**4,332,707**	**3,896,532**	**3,892,630**	**3,716,393**	**3,140,000**	**2,988,000**		**3,336,000**		**3,702,000**		**4,108,000**		**4,556,000**
Peak Month	402,573	430,358	371,478	390,870	348,747	307,391	292,511		326,579		362,408		402,154		446,011
% of Total	10.1%	9.9%	9.5%	10.0%	9.4%	9.8%	9.8%		9.8%		9.8%		9.8%		9.8%
Average Day	12,986	13,883	11,983	12,609	11,250	9,916	9,436		10,535		11,691		12,973		14,387
Peak Hour				1,342	1,084	1,011	959		1,070		1,188		1,318		1,462
Enplaned Passengers	**2,004,122**	**2,168,258**	**1,952,277**	**1,948,313**	**1,861,695**	**1,570,000**	**1,494,000**		**1,668,000**		**1,851,000**		**2,054,000**		**2,278,000**
Peak Month	206,250	215,073	189,407	199,009	177,458	155,929	148,380		165,662		183,837		203,998		226,245
% of Total	10.3%	9.9%	9.7%	10.2%	9.5%	9.9%	9.9%		9.9%		9.9%		9.9%		9.9%
Average Day	6,653	6,938	6,110	6,420	5,724	5,030	4,786		5,344		5,930		6,581		7,298
Peak Hour				714	632	551	528		590		654		726		805
Deplaned Passengers	**1,999,185**	**2,164,449**	**1,944,255**	**1,944,317**	**1,854,698**	**1,570,000**	**1,494,000**		**1,668,000**		**1,851,000**		**2,054,000**		**2,278,000**
Peak Month	200,383	216,895	182,962	191,861	179,810	153,914	146,463		163,521		181,461		201,362		223,322
% of Total	10.0%	10.0%	9.4%	9.9%	9.7%	9.8%	9.8%		9.8%		9.8%		9.8%		9.8%
Average Day	6,464	6,997	5,902	6,189	5,800	4,965	4,725		5,275		5,854		6,496		7,204
Peak Hour				883	871	686	679		758		841		933		1,035
Peak Hour Seat Factors	**2004**	**2005**	**2006**	**2007**	**2008**	**2009E**	**2010F**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total Seats				10.6%	9.6%	10.2%	10.2%		10.2%		10.2%		10.2%		10.2%
Enplaned Seats				11.1%	11.0%	10.9%	11.0%		11.0%		11.0%		11.0%		11.0%
Deplaned Seats				14.3%	15.0%	13.8%	14.4%		14.4%		14.4%		14.4%		14.4%

Sources: Historical—City of Manchester Department of Aviation; *Official Airline Guide*.
Forecast—Jacobs Consultancy.

Notes: E = Estimate; F = Forecast
Peak Month Factors are based on MHT enplaned passenger data for CY2004 through CY2008.
Peak Hour Factors are based on scheduled seats from the *Official Airline Guide*.
Peak Hour Factors projected for CY2010 through CY2030 represent the average of peak hour factors for the month of August in CY2007, 2008, and 2009.

TABLE 3-19
PEAK PERIOD – TOTAL, ENPLANED, AND DEPLANED PASSENGERS
HIGH SCENARIO
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Passengers	**4,003,307**	**4,332,707**	**3,896,532**	**3,892,630**	**3,716,393**	**3,140,000**	**3,212,000**		**3,990,000**		**4,506,000**		**5,048,000**		**5,654,000**
Peak Month	402,573	430,358	371,478	390,870	348,747	307,391	314,440		390,602		441,116		494,175		553,500
% of Total	10.1%	9.9%	9.5%	10.0%	9.4%	9.8%	9.8%		9.8%		9.8%		9.8%		9.8%
Average Day	12,986	13,883	11,983	12,609	11,250	9,916	10,143		12,600		14,230		15,941		17,855
Peak Hour				1,342	1,084	1,011	1,031		1,280		1,446		1,620		1,814
Enplaned Passengers	**2,004,122**	**2,168,258**	**1,952,277**	**1,948,313**	**1,861,695**	**1,570,000**	**1,606,000**		**1,995,000**		**2,253,000**		**2,524,000**		**2,827,000**
Peak Month	206,250	215,073	189,407	199,009	177,458	155,929	159,504		198,139		223,763		250,678		280,771
% of Total	10.3%	9.9%	9.7%	10.2%	9.5%	9.9%	9.9%		9.9%		9.9%		9.9%		9.9%
Average Day	6,653	6,938	6,110	6,420	5,724	5,030	5,145		6,392		7,218		8,086		9,057
Peak Hour				714	632	551	568		705		796		892		999
Deplaned Passengers	**1,999,185**	**2,164,449**	**1,944,255**	**1,944,317**	**1,854,698**	**1,570,000**	**1,606,000**		**1,995,000**		**2,253,000**		**2,524,000**		**2,827,000**
Peak Month	200,383	216,895	182,962	191,861	179,810	153,914	157,443		195,578		220,871		247,438		277,142
% of Total	10.0%	10.0%	9.4%	9.9%	9.7%	9.8%	9.8%		9.8%		9.8%		9.8%		9.8%
Average Day	6,464	6,997	5,902	6,189	5,800	4,965	5,079		6,309		7,125		7,982		8,940
Peak Hour				883	871	686	730		906		1,024		1,147		1,285
Peak Hour Seat Factors	**2004**	**2005**	**2006**	**2007**	**2008**	**2009E**	**2010F**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total Seats				10.6%	9.6%	10.2%	10.2%		10.2%		10.2%		10.2%		10.2%
Enplaned Seats				11.1%	11.0%	10.9%	11.0%		11.0%		11.0%		11.0%		11.0%
Deplaned Seats				14.3%	15.0%	13.8%	14.4%		14.4%		14.4%		14.4%		14.4%

Sources: Historical—City of Manchester Department of Aviation; *Official Airline Guide*.
Forecast—Jacobs Consultancy.

Notes: E = Estimate; F = Forecast
Peak Month Factors are based on MHT enplaned passenger data for CY2004 through CY2008.
Peak Hour Factors are based on scheduled seats from the *Official Airline Guide*.
Peak Hour Factors projected for CY2010 through CY2030 represent the average of peak hour factors for the month of August in CY2007, 2008, and 2009.

TABLE 3-20
PEAK PERIOD—FLIGHT OPERATIONS
BASE FORECAST
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Operations	**103,547**	**103,190**	**93,138**	**90,347**	**76,785**	**64,930**	**64,650**		**69,815**		**75,240**		**80,875**		**87,120**
Peak Month	9,987	9,314	8,747	8,481	7,204	6,082	6,055		6,539		7,047		7,575		8,160
% of Total	9.6%	9.0%	9.4%	9.4%	9.4%	9.4%	9.4%		9.4%		9.4%		9.4%		9.4%
Average Day	322	300	292	274	240	196	195		211		227		244		263
Peak Hour				33	31	25	24		26		28		30		33
Passenger Carrier Operations	**63,409**	**66,194**	**57,664**	**57,536**	**50,914**	**42,800**	**43,000**		**46,000**		**50,600**		**55,400**		**60,800**
Peak Month	6,014	5,739	4,914	4,900	4,503	3,770	3,787		4,051		4,457		4,879		5,355
% of Total	9.5%	8.7%	8.5%	8.5%	8.8%	8.8%	8.8%		8.8%		8.8%		8.8%		8.8%
Average Day	194	185	159	158	150	122	122		131		144		157		173
Peak Hour				15	16	12	12		13		15		16		18
All-Cargo Operations	**12,312**	**10,148**	**9,862**	**10,498**	**10,207**	**8,830**	**8,400**		**10,000**		**10,500**		**11,000**		**11,500**
Peak Month	1,222	1,151	1,086	1,100	1,105	946	900		1,072		1,125		1,179		1,232
% of Total	9.9%	11.3%	11.0%	10.5%	10.8%	10.7%	10.7%		10.7%		10.7%		10.7%		10.7%
Average Day	39	37	35	35	36	31	29		35		36		38		40
Peak Hour				8	8	7	6		8		8		8		9
General Aviation Operations	**27,067**	**26,369**	**24,874**	**21,608**	**14,902**	**12,400**	**12,350**		**12,915**		**13,240**		**13,575**		**13,920**
Peak Month	3,052	2,789	3,136	2,525	2,086	1,492	1,486		1,554		1,593		1,633		1,674
% of Total	11.3%	10.6%	12.6%	11.7%	14.0%	12.0%	12.0%		12.0%		12.0%		12.0%		12.0%
Average Day	102	93	105	81	70	48	48		50		51		53		54
Peak Hour				10	8	6	6		6		6		6		6
Military Operations	**759**	**479**	**738**	**705**	**762**	**900**	**900**		**900**		**900**		**900**		**900**
Peak Month	125	93	108	99	130	147	147		147		147		147		147
% of Total	16.5%	19.4%	14.6%	14.0%	17.1%	16.3%	16.3%		16.3%		16.3%		16.3%		16.3%
Average Day	4	3	3	3	4	5	5		5		5		5		5
Peak Hour				1	1	1	1		1		1		1		1
Peak Hour Factors	**2004**	**2005**	**2006**	**2007**	**2008**	**2009E**	**2010F**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total Operations				12.0%	12.7%	12.5%	12.4%		12.4%		12.4%		12.4%		12.4%
Passenger Carrier Operations				9.6%	10.7%	10.2%	10.2%		10.2%		10.2%		10.2%		10.2%
All-Cargo Operations				22.0%	22.0%	22.0%	22.0%		22.0%		22.0%		22.0%		22.0%
General Aviation Operations				12.0%	12.0%	12.0%	12.0%		12.0%		12.0%		12.0%		12.0%
Military Operations				16.0%	16.0%	16.0%	16.0%		16.0%		16.0%		16.0%		16.0%

Sources: Historical—City of Manchester Department of Aviation; U.S. DOT, Schedule T100; *Official Airline Guide.*
Forecast—Jacobs Consultancy.

Notes: E=Estimate; F=Forecast.
Peak month factors for passenger carriers are based on U.S. DOT, Schedule T100 data for CY2004 through CY2008.
Peak Month Factors for all other groups are based on MHT enplaned passenger data for CY2004 through CY2008.
Peak Hour Factors for passenger carriers projected for CY2010 through CY2030 represent the average of peak hour factors for the month of August in CY2007, 2008, and 2009 from OAG.
Peak Hour Factors for all all-cargo, general aviation, and military operations are based on hourly tower counts from September 2009.

TABLE 3-21
PEAK PERIOD—FLIGHT OPERATIONS
HIGH SCENARIO
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	2004	2005	2006	2007	2008	2009E	2010F	:	2015	:	2020	:	2025	:	2030
Total Operations	**103,547**	**103,190**	**93,138**	**90,347**	**76,785**	**64,930**	**68,635**		**79,340**		**88,050**		**97,025**		**106,830**
Peak Month	9,987	9,314	8,747	8,481	7,204	6,082	6,429		7,431		8,247		9,088		10,006
% of Total	9.6%	9.0%	9.4%	9.4%	9.4%	9.4%	9.4%		9.4%		9.4%		9.4%		9.4%
Average Day	322	300	292	274	240	196	207		240		266		293		323
Peak Hour				33	31	25	26		30		33		36		40
Passenger Carrier Operations	**63,409**	**66,194**	**57,664**	**57,536**	**50,914**	**42,800**	**46,200**		**53,000**		**58,600**		**64,400**		**71,000**
Peak Month	6,014	5,739	4,914	4,900	4,503	3,770	4,069		4,668		5,161		5,672		6,253
% of Total	9.5%	8.7%	8.5%	8.5%	8.8%	8.8%	8.8%		8.8%		8.8%		8.8%		8.8%
Average Day	194	185	159	158	150	122	131		151		166		183		202
Peak Hour				15	16	12	13		15		17		19		21
All-Cargo Operations	**12,312**	**10,148**	**9,862**	**10,498**	**10,207**	**8,830**	**9,000**		**11,000**		**12,000**		**13,000**		**14,000**
Peak Month	1,222	1,151	1,086	1,100	1,105	946	965		1,179		1,286		1,393		1,500
% of Total	9.9%	11.3%	11.0%	10.5%	10.8%	10.7%	10.7%		10.7%		10.7%		10.7%		10.7%
Average Day	39	37	35	35	36	31	31		38		41		45		48
Peak Hour				8	8	7	7		8		9		10		11
General Aviation Operations	**27,067**	**26,369**	**24,874**	**21,608**	**14,902**	**12,400**	**12,525**		**14,380**		**16,470**		**18,635**		**20,830**
Peak Month	3,052	2,789	3,136	2,525	2,086	1,492	1,507		1,730		1,981		2,242		2,506
% of Total	11.3%	10.6%	12.6%	11.7%	14.0%	12.0%	12.0%		12.0%		12.0%		12.0%		12.0%
Average Day	102	93	105	81	70	48	49		56		64		72		81
Peak Hour				10	8	6	6		7		8		9		10
Military Operations	**759**	**479**	**738**	**705**	**762**	**900**	**910**		**960**		**980**		**990**		**1,000**
Peak Month	125	93	108	99	130	147	149		157		160		162		163
% of Total	16.5%	19.4%	14.6%	14.0%	17.1%	16.3%	16.3%		16.3%		16.3%		16.3%		16.3%
Average Day	4	3	3	3	4	5	5		5		5		5		5
Peak Hour				1	1	1	1		1		1		1		1
Peak Hour Factors	**2004**	**2005**	**2006**	**2007**	**2008**	**2009E**	**2010F**	**:**	**2015**	**:**	**2020**	**:**	**2025**	**:**	**2030**
Total Operations				12.0%	12.7%	12.5%	12.4%		12.4%		12.4%		12.4%		12.4%
Passenger Carrier Operations				9.6%	10.7%	10.2%	10.2%		10.2%		10.2%		10.2%		10.2%
All-Cargo Operations				22.0%	22.0%	22.0%	22.0%		22.0%		22.0%		22.0%		22.0%
General Aviation Operations				12.0%	12.0%	12.0%	12.0%		12.0%		12.0%		12.0%		12.0%
Military Operations				16.0%	16.0%	16.0%	16.0%		16.0%		16.0%		16.0%		16.0%

Sources: Historical—City of Manchester Department of Aviation; U.S. DOT, Schedule T100; *Official Airline Guide.*
Forecast—Jacobs Consultancy.

Notes: E=Estimate; F=Forecast.
Peak month factors for passenger carriers are based on U.S. DOT, Schedule T100 data for CY2004 through CY2008.
Peak Month Factors for all other groups are based on MHT enplaned passenger data for CY2004 through CY2008.
Peak Hour Factors for passenger carriers projected for CY2010 through CY2030 represent the average of peak hour factors for the month of August in CY2007, 2008, and 2009 from OAG.
Peak Hour Factors for all all-cargo, general aviation, and military operations are based on hourly tower counts from September 2009.

3.1.10 COMPARISON TO FAA TERMINAL AREA FORECAST

A summary of the Airport Master Plan Base Forecast and a comparison to the FAA's 2009 TAF are presented in **Tables 3-22 and 3-23**, respectively. The format of the two tables is based on the templates provided by the FAA for presentation of airport planning forecasts for review by the FAA.2 As required, the results are presented for the base year of 2008 and forecast horizon years which are equal to the base year, plus 1, 5, 10 and 15 years (i.e., 2009, 2013, 2018, and 2023). A direct comparison of the Base Forecast to the TAF required the conversion of the Base Forecast's aviation activity categorization of enplaned passengers and flight operations, which reflected the Airport's recording system, into FAA categories, namely, (1) air carrier and (2) regional, for enplaned passengers, and (1) air carrier and (2) commuter/air taxi, for flight operations.

There is one minor difference between the time periods used in the Airport Master Plan forecasts and those reflected in the TAF. The Airport Master Plan forecasts were prepared on a calendar year basis, while the TAF was prepared on the basis of federal fiscal years ending September 30.

In addition, because the Airport Master Plan Base Forecast was developed on the basis of total, rather than air carrier and regional, enplaned passengers, a direct comparison by FAA passenger category was not possible. For the purpose of these comparative tables, the air carrier-regional split of enplaned passengers forecast by FAA was adopted and applied to the Airport Master Plan Base Forecast. The air carrier-commuter/air taxi split of flight operations was derived using the fleet mix forecast described previously. The Airport Master Plan Base Forecast stated in terms of FAA categories in presented in Table 3-22.

Table 3-23 presents a side-by-side comparison of the Airport Master Plan Base Forecast and the TAF released in December 2009. The Airport Master Plan Base Forecast was the more conservative forecast in the near term while the TAF was more conservative over the longer term, for both passengers and operations. The two forecasts exhibited the greatest divergence in 2009 (base year plus 1 year). The Base Forecasts of enplaned passengers and total operations in that year were 4.0% and 8.3% below TAF levels, respectively. Thereafter, the forecasts crossed, for both passengers and operations, owing to somewhat higher long-term rates of growth forecast in the Airport Master Plan Base Forecast.

Notwithstanding these differences, the FAA considers forecasts that differ from the TAF by less than 10% in the five year period and 15% in the ten year period to be consistent. *Therefore, the two forecasts are considered consistent and acceptable for planning purposes.*

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2 U.S. Department of Transportation, Federal Aviation Administration., Forecasting Aviation Activity by Airport, July 2001, and Revision to Guidance on Review and Approval of Aviation Forecasts., Memorandum from Director of Airport Planning and Programming, APP-1, December 23, 2004, http://www.faa.gov.

TABLE 3-22
AIRPORT MASTER PLAN BASE FORECAST BY FAA CATEGORIES
MANCHESTER-BOSTON REGIONAL AIRPORT
(CALENDAR YEARS)

	Base Year	Forecast								Compound Annual Growth Rate				
	2008	2009	2013	:	2018	:	2023	:	2028	2008-2009	2008-2013	2008-2018	2008-2023	2008-2028
Passenger Enplanements														
Air Carrier	1,418,452	1,189,836	1,188,532		1,295,680		1,410,941		1,534,008	-16%	-3.5%	-0.9%	0.0%	0.4%
Regional (a)	443,243	380,164	411,468		480,320		560,059		651,992	-14.2	-1.5	0.8	1.6	1.9
Total	**1,861,695**	**1,570,000**	**1,600,000**		**1,776,000**		**1,971,000**		**2,186,000**	**-15.7%**	**-3.0%**	**-0.5%**	**0.4%**	**0.8%**
Aircraft Operations														
Commercial Operations														
Air Carrier	38,876	33,430	35,400		40,110		45,930		53,480	-14.0%	-1.9%	0.3%	1.1%	1.6%
Commuter/Air Taxi (b)	22,245	18,200	19,000		18,900		18,300		16,400	-18.2	-3.1	-1.6	-1.3	-1.5
Total	**14,902**	**12,400**	**12,725**		**13,100**		**13,450**		**13,780**	**-16.8%**	**-3.1%**	**-1.3%**	**-0.7%**	**-0.4%**
General Aviation														
Itinerant	11,680	9,700	10,025		10,400		10,650		10,980	-16.9%	-3.0%	-1.2%	-0.6%	-0.3%
Local	3,222	2,700	2,700		2,700		2,800		2,800	-16.2	-3.5	-1.8	-0.9	-0.7
Total	**14,902**	**12,400**	**12,725**		**13,100**		**13,450**		**13,780**	**-16.8%**	**-3.1%**	**-1.3%**	**-0.7%**	**-0.4%**
Military														
Itinerant	659	800	800		800		800		800	21.3%	3.9%	2.0%	1.3%	1.0%
Local	103	100	100		100		100		100	-2.4	-0.5	-0.2	-0.2	-0.1
Total	**762**	**900**	**900**		**900**		**900**		**900**	**18.1%**	**3.4%**	**1.7%**	**1.1%**	**0.8%**
Total Aircraft Operations	**76,785**	**64,930**	**68,025**		**73,010**		**78,580**		**84,560**	**-15.4%**	**-2.4%**	**-0.5%**	**0.2%**	**0.5%**

Sources: Historical—City of Manchester Department of Aviation; Forecast—Jacobs Consultancy, October 2009.

(a) Includes passengers enplaned on airlines whose primary function is to provide passenger feeder service to mainline carriers, regardless of aircraft size.

(b) Includes takeoffs and landings by aircraft with 60 or fewer seats that transport passengers on commercial flights.

TABLE 3-23
COMPARISON OF AIRPORT MASTER PLAN BASE FORECAST AND FAA TAF
MANCHESTER-BOSTON REGIONAL AIRPORT

	Year	MHT Master Plan Forecast	2009 FAA TAF	% Variance MHT Airport Master Plan vs. 2009 TAF
Passenger Enplanements				
Base yr.	2008	1,861,695	1,891,272	-1.6%
Base yr. + 1yr.	2009	1,570,000	1,635,750	-4.0
Base yr. + 5yrs.	2013	1,600,000	1,555,860	2.8
Base yr. + 10yrs.	2018	1,776,000	1,716,828	3.4
Base yr. + 15yrs.	2023	1,971,000	1,898,995	3.8
Base yr. + 20yrs.	2028	2,186,000	2,105,351	3.8
Annual Compound Growth Rates:				
2008-2013		-3.0%	-3.8%	
2009-2013		0.5	-1.2	
2013-2018		2.1	2.0	
2018-2028		2.1	2.1	
Commercial Operations				
Base yr.	2008	61,121	63,505	-3.8%
Base yr. + 1yr.	2009	51,630	55,770	-7.4
Base yr. + 5yrs.	2013	54,400	53,052	2.5
Base yr. + 10yrs.	2018	59,010	56,670	4.1
Base yr. + 15yrs.	2023	64,230	60,536	6.1
Base yr. + 20yrs.	2028	69,880	64,668	8.1
Annual Compound Growth Rates:				
2008-2013		-2.3%	-3.5%	
2009-2013		1.3	-1.2	
2013-2018		1.6	1.3	
2018-2028		1.7	1.3	
Total Operations				
Base yr.	2008	76,785	80,543	-4.7%
Base yr. + 1yr.	2009	64,930	70,835	-8.3
Base yr. + 5yrs.	2013	68,025	68,399	-0.5
Base yr. + 10yrs.	2018	73,010	72,370	0.9
Base yr. + 15yrs.	2023	78,580	76,548	2.7
Base yr. + 20yrs.	2028	84,560	80,998	4.4
Annual Compound Growth Rates:				
2008-2013		-2.4%	-3.2%	
2009-2013		1.2	-0.9	
2013-2018		1.4	1.1	
2018-2028		1.5	1.1	

Sources: City of Manchester Department of Aviation; Jacobs Consultancy; FAA, Terminal Area Forecast, December 2009.
Notes: The Airport Master Plan Forecast was prepared on a calendar year basis. The FAA TAF was prepared on a U.S. government fiscal year basis (October-September).

3.2 SURFACE TRAFFIC FORECASTS

3.2.1 INTRODUCTION

The team refined daily and peak hour traffic forecasts for the on-airport roadway network as well as for key nearby roadways and intersections. The team reviewed the auto parking, curbside roadway, access roadway analyses, traffic counts, and forecasts from past studies. The team updated the traffic demand projections and analyzed traffic flows and capacities throughout MHT roadway network, parking areas, and rental cars facilities.

3.2.2 EXISTING CONDITIONS

3.2.2.1 Existing (2009) Roadways and Intersections Data Collection

A traffic data collection/inventory effort was undertaken by the team during October, 2009. The data collection program included traffic counts, video recordings of peak and off peak conditions at the curbside roadway, and an evaluation of peak period occupancy of the parking areas. Daily traffic counts for roadway segments were collected from October 20 (Tuesday) to October 22 (Thursday) and intersection turning movement counts were collected for six peak hours (6:00 am to 9:00 am; 4:00 pm to 7:00 pm) on October 22 (Thursday). Videotaping of curbside roadway operations were conducted on September 30 (Wednesday) from 3:25 pm to 4:35 pm, and October 1 (Thursday) from 7:00 am to 10:00 am.

The existing intersections and roadway segments studied are listed below and identified on **Figure 3-23**. Traffic count data collected is included in **Appendix F1**.

The three intersections within the study area are as follows:

- I-1 – Airport Road at Brown Avenue
- I-2 – Airport Road at Perimeter Road
- I-3 – Airport Road at Garage Drive Exit

The twelve roadway segments within the surface traffic study area are as follows:

- S-1 – Perimeter Road north of Brown Avenue
- S-2 – Brown Avenue north of Perimeter Road
- S-3 – Airport Road from Brown Avenue to Perimeter Road
- S-4 – Airport Road from Perimeter Road to Garage/Lot A Parking Entrance
- S-5 – Airport Road from Garage/Lot A Parking Entrance to Terminal Curbfront
- S-6 – Airport Road from Terminal Curbfront to Garage/Lot A Parking North Exit
- S-7 – Airport Road from Garage/Lot A Parking North to Exit to Lot C Parking Entrance/Exit
- S-8 – Airport Road from Lot C Parking Entrance/Exit to Garage Exit
- S-9 – Airport Road from Garage Exit to Ammon Drive
- S-10 – S. Perimeter Road from Airport Road to Lot E Parking
- S-11 – S. Perimeter Road from Lot E Parking to Lot F Parking
- S-12 – Industrial Drive South of S. Perimeter Road

FIGURE 3-23
TRAFFIC COUNT LOCATION MAP

Source: URS Corporation, 2010.

3.2.2.1.1 Traffic Counts

A review of monthly MHT activity data was used to identify the peak month (August) in order to adjust the traffic counts to reflect an average day of the peak month (ADPM) condition. The daily traffic counts and ADPM traffic counts are presented in **Table 3-24**.

Table 3-24 also summarizes existing 3-day average daily traffic volumes at each individual roadway segment and corresponding daily volumes under the ADPM condition. According to the traffic counts, the airport peak hour takes place between 3:30 pm and 4:30 pm. Traffic volumes during the airport peak hour and during the highest hour for each roadway segment are also provided in Table 3-24.

TABLE 3-24
EXISTING 2009 DAILY AND AVERAGE DAY OF PEAK MONTH SURFACE TRAFFIC

Segment	Roadway	Daily		Airport Peak Hour (3:30-4:30 PM)[1]		Specific Peak Hour[2]		
		3-day Mean[3]	ADPM[4]	3-day Mean[3]	ADPM[4]	3-day Mean[3]	ADPM[4]	Time
S-1	Perimeter Road (NB)	2482	2631	221	234	256	271	(5:00-6:00PM)
	Perimeter Road (SB)	2572	2726	196	208	257	272	(7:00-8:00AM)
	Perimeter Road (2-way)	5054	5357	431	457	429	455	(4:00-5:00PM)
S-2	Brown Avenue (NB)	14626	15504	1207	1279	1277	1354	(4:00-5:00PM)
	Brown Avenue (SB)	15011	15912	1198	1270	1201	1273	(4:00-5:00PM)
	Brown Avenue (2-way)	29637	31415	2405	2549	2478	2627	(4:00-5:00PM)
S-3	Airport Road (WB)	9340	9900	829	879	848	899	(4:00-5:00PM)
	Airport Road (EB)	9465	10033	684	725	710	753	(6:00-7:00AM)
	Airport Road (2-way)	18807	19935	1512	1603	1500	1590	(3:00-4:00PM)
S-4	Airport Road (WB)	6999	7419	624	661	655	694	(4:00-5:00PM)
	Airport Road (EB)	7149	7578	570	604	576	611	(3:00-4:00PM)
	Airport Road (2-way)	14148	14997	1194	1266	1216	1289	(3:00-4:00PM)
S-5	Airport Road (One-Way)	6804	7212	546	579	539	571	(3:00-4:00PM)
S-6	Airport Road (One-Way)	3625	3843	314	333	312	331	(3:00-4:00PM)
S-7	Airport Road (One-Way)	4446	4713	363	385	364	386	(3:00-4:00PM)
S-8	Airport Road (One-Way)	3661	3881	314	333	319	338	(3:00-4:00PM)
S-9	Airport Road (One-Way)	8286	8783	734	778	775	822	(4:00-5:00PM)
S-10	S. Perimeter Road (NB)	3637	3855	345	366	314	333	(4:00-5:00PM)
	S. Perimeter Road (SB)	3565	3779	211	224	306	324	(7:00-8:00AM)
	S. Perimeter Road (2-way)	7202	7634	556	589	545	578	(7:00-8:00AM)
S-11	S. Perimeter Road (NB)	3489	3698	331	351	303	321	(4:00-5:00PM)
	S. Perimeter Road (SB)	3341	3541	191	202	285	302	(7:00-8:00AM)
	S. Perimeter Road (2-way)	6830	7240	522	553	521	552	(7:00-8:00AM)
S-12	Industrial Drive (NB)	2178	2309	191	202	205	217	(4:00-5:00PM)
	Industrial Drive (SB)	2129	2257	154	163	193	205	(7:00-8:00AM)
	Industrial Drive (2-way)	4307	4565	345	366	373	395	(7:00-8:00AM)

Source: URS Corporation, 2010.
1 Highest hour of the day for the sum of the inbound and outbound vehicles at the Terminal.
2 Highest hour of the day during for the traffic count at the specific roadway segment.
3 Average of three (3) days count conducted Tuesday through Thursday (10/20/2009 – 10/22/2009).
4 The 3-day count adjusted to peak month (August) to represent average day of peak month. An adjustment factor of 1.06 was applied based on historical August to October Ratio.

3.2.2.1.2 Roadways in the Airport Area

The following is a description of key roadways in and around the airport:

- Airport Road is a four-lane arterial with a posted speed limit of 30 mph. The speed limit of Ammon Drive and roads around the terminal is 15 mph;
- Perimeter Road, a two-lane roadway north of Airport Road has a posted speed limit of 30 mph;
- South Perimeter Road and Industrial Drive are both two-lane undivided collectors south of the Airport Road, with a posted speed limited of 25 mph.

Level of Service (LOS) analysis for key airport roads was conducted for the Airport Master Plan Update. LOS is a quality measure used in traffic engineering to determine the effectiveness of the operating conditions of roadways and intersections. Several variables that affect the quality of traffic flow include speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Generally, there are six levels-of-service ranging from A to F. LOS A represents the best operating conditions (free flow) with minimal or no delays. LOS F represents the worst conditions (grid lock) when extreme delays, necessitating mitigation, may be encountered. Typically, the LOS D is the adopted standard for urban surface roadways.

Tables 3-25 and 3-26 provide summaries of existing peak hour volumes under ADPM conditions for the key roadways and intersections at MHT. As shown in Table 3-25, all roadway segments are operating at LOS B. Table 3-26 shows that the study intersections are operating at LOS D or better, with the exception of the intersection of Airport Road at South Perimeter Road (I-2). The results of the analysis for I-2 indicate that this intersection operates at unacceptable levels of service (LOS E or F) for the minor street approach (S. Perimeter Road) in both the a.m. and p.m. peak hours. LOS F for the minor approach occurs as there are not enough vehicular gaps on the major street (Airport Road) to allow the traffic from the minor street (S. Perimeter Road) to safely cross or turn onto the major street.

TABLE 3-25
ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

Roadway	Segment	No. of Lanes[1]	Maximum Service Volume	Peak Hour Traffic		
				Peak Hour (vph)	V/C[2] Ratio	LOS
Airport Road	S-4	4D	3,200	1,270	0.40	B
	S-5	2O	2,140	580	0.27	B
	S-6	2O	2,140	330	0.15	B
	S-7	2O	2,140	380	0.18	B
	S-8	2O	2,140	330	0.15	B
	S-9	2O	2,140	780	0.36	B

Source: URS Corporation, 2010.
[1] 4D=4-lane divided; 2O=2-lane one-way
[2] V/C = Volume to Capacity ratio

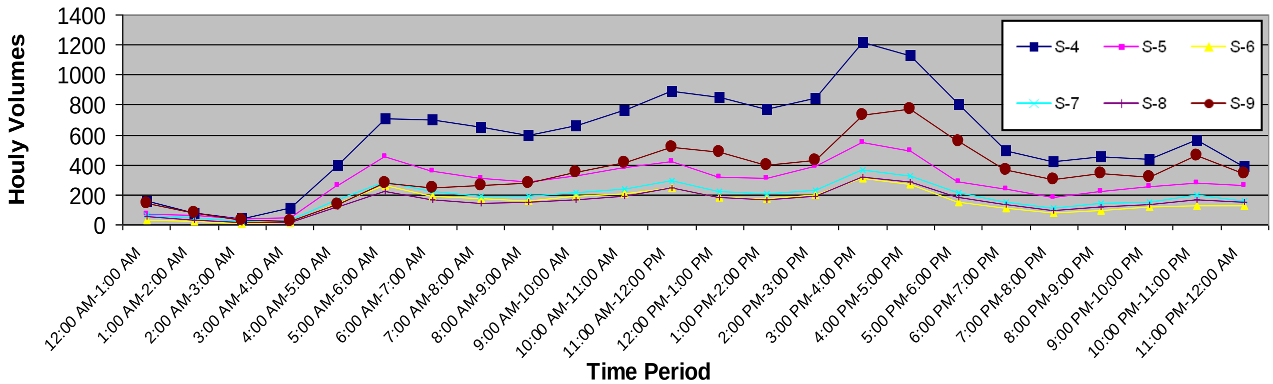
TABLE 3-26
ROADWAY INTERSECTION LEVEL OF SERVICE SUMMARY

Roadway	Intersection	Control Type	AM Peak		PM Peak	
			Delay (Seconds)	LOS	Delay (Seconds)	LOS
Airport Road	I-1	Signalized	45.7	D	34.9	C
	I-2	Stop Sign	10.2/42.7	B/E[1]	9.5/68.7	A/F
	I-3	Stop Sign	8.0/9.1	A/A[1]	9.2/11.0	A/B

Source: URS Corporation, 2010.
[1] For unsignalized intersections, LOS and delay reported are for major street/minor street worst case approach, based on the Unsignalized Module of the Highway Capacity Software (HCS).

A summary of hourly traffic volumes was compiled for the MHT roadways study area. **Figure 3-24** illustrates this summary. As seen from Figure 3-24, peak periods on key roadways generally match the airport passenger activity peak hour (3:30pm to 4:30pm). Traffic counts detailing the hourly distribution are included in **Appendix F1**.

FIGURE 3-24
AIRPORT ROAD SEGMENT HOURLY TRAFFIC DISTRIBUTION



Source: URS Corporation, 2010.

3.2.2.1.3 Terminal Curbside Roadway

A field review of existing conditions for the passenger terminal building curbside roadway was conducted in September and October 2009. The effort included an assessment of curbside roadway operations by a traffic engineer during peak and non-peak hours of travel. The evaluation included:

1. Field measurements of existing physical configuration of the curbside roadway features and observations of vehicular movements and operations;
2. Data collection, including daily and peak hour traffic counts, classification of counts, and measurements of vehicle dwell times;
3. Adjustment of traffic count data to Average Day of Peak Month (ADPM) conditions; and

4. Evaluation of existing curbside roadway conditions using *CURB_PLAN*, an analytical tool developed by URS that evaluates curbside roadway transportation operations.

This section provides a description of the configuration and geometrics of MHT passenger terminal roadways. Lane usage is defined as follows for this study:

***Load/Unload Lanes*:** Lanes where vehicles are allowed to temporarily stop to either load or unload passengers and luggage.

Circulation Lanes: Lanes adjacent to a load/unload lane that allow vehicles to enter/exit a load/unload lane. Circulation lanes may also be used for loading and unloading of passengers and luggage during peak conditions.

Through Lanes: Lanes adjacent to circulation lanes, where vehicles are able to bypass pick-up and drop-off lanes without interfering with the load/unload process. Loading and unloading operations are prohibited in through lanes, although during peak conditions some level of stopping may take place.

To analyze the traffic operations at the passenger terminal curb roadways, the team applied computer model *CURB_PLAN* for the evaluation of the passenger terminal curbside operations. This computer model provides a standardized analytical approach to the calculation of several key measurements of curbside roadway operations. *CURB_PLAN* provides analysis of LOS, lane requirements, and potential solutions for demand/capacity scenarios.

CURB_PLAN also estimates queue lengths that may extend beyond the terminal building's curb front area. Queue lengths are estimated using a Poisson distribution to estimate the 95th percentile queue length based on the number of arrivals, dwell time, and configuration of the approach to the curb roadways.

In addition to the passenger terminal curbside roadway LOS, *CURB_PLAN* also calculates a "circulation" LOS, which accounts for the number of travel lanes available at the curbfront area besides those specifically used for loading and unloading passengers.

The levels of service for the passenger terminal curb roadways were calculated according to the methodology contained in the report *Airport Curbside Planning and Design* (Peter Mandle, E.M. Whitlock and Frank LaMagna, Transportation Research Record 840, 1982). The level of service criteria is based on the ratio of effective curb length (length of curb roadways occupied by dwelling and maneuvering vehicles versus actual usable terminal curb length):

LOS A: 0.0 to 1.0
LOS B: 1.0 to 1.1
LOS C: 1.1 to 1.3
LOS D: 1.3 to 1.7
LOS E: 1.7 to 2.0
LOS F: Greater than 2.0

Typically, curbside roadway conditions up to level of service "C" are considered acceptable. Ratios greater than 2.0 indicate that the curbside lanes are not adequate and vehicles frequently load/unload passengers in the through lanes.

Figure 3-25 provides a schematic of the existing passenger terminal building's curbside roadway configuration at MHT. The curbside at MHT consists of a single level, three-roadway system. The inner roadway has three lanes, with the closest lane to the terminal being used as a load/unload lane and the second lane being used partially for loading and unloading but generally as a bypass lane. The third lane from the terminal is used as a through lane. The middle and outer roadways are reserved for taxi/limo/shuttle services. Based on field observation, congestion on the middle and outer roadways do not appear to be an issue; therefore, no detailed analysis is needed on the middle and outer roadways.

Overall, traffic at the inner curbside roadway was operating satisfactorily based on the on-site observations. This is primarily a result of traffic management by law enforcement, ensuring drivers engage only in active loading and unloading operations. One factor which results in unnecessary congestion is the predominance of passenger loading and unloading activity at the terminal entrance leading into the main lobby of the terminal. Most of the sporadic congestion observed took place at or near this location. Never was the congestion observed severe enough to cause undue delays.

Table 3-27 provides an evaluation of the LOS of the inner curbside roadway. It shows that the curbside roadway is operating at LOS C during the p.m. peak hour. **Appendix F2** provides a summary of vehicular dwell times (time duration a vehicle remains on the curb side while unloading or loading), mode splits, and traffic volumes at the inner curbside roadway.

Appendix F3 provides detailed output of the CURB_PLAN model.

3.2.2.2 Public Access Parking Existing Conditions

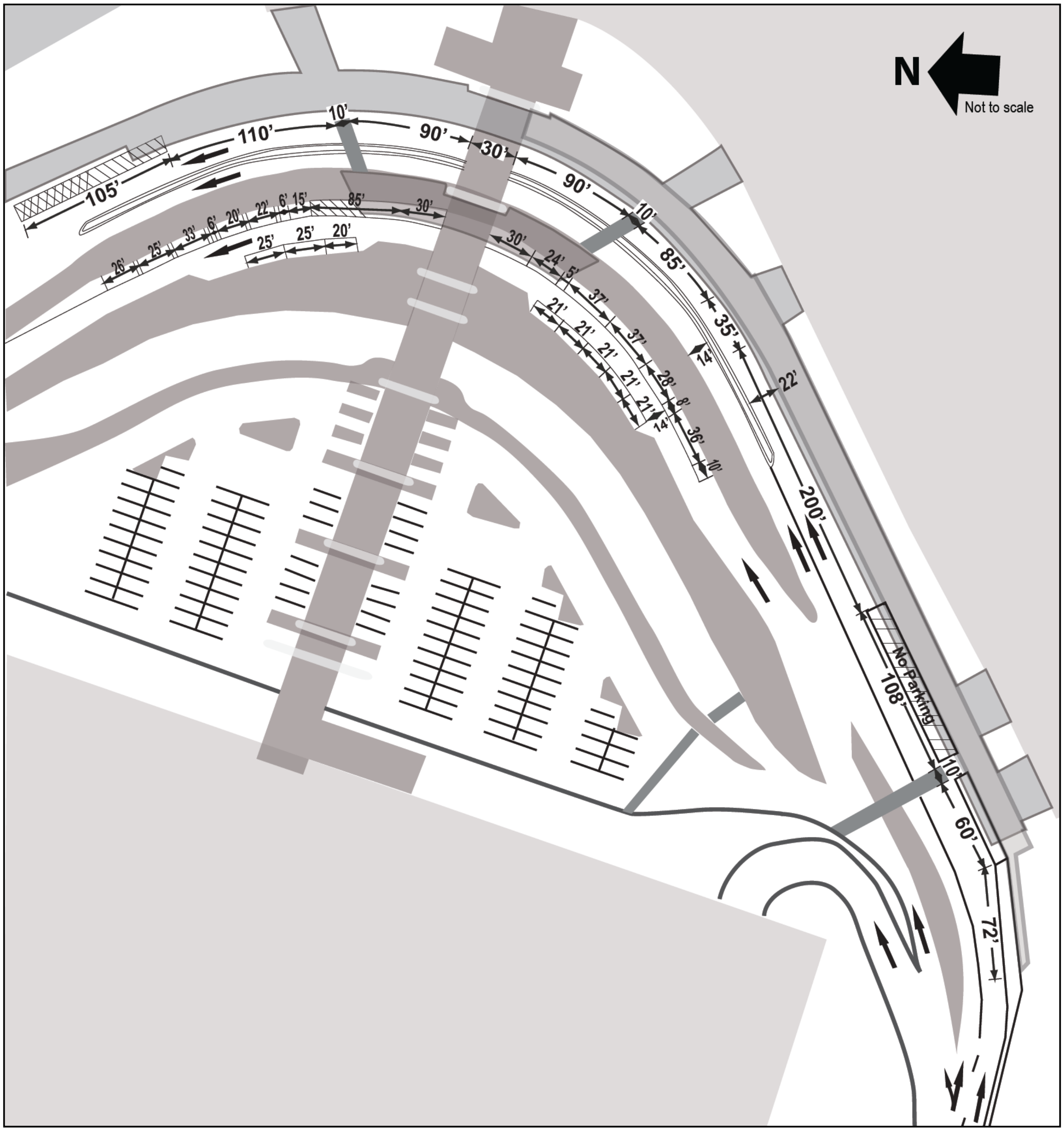
Another key component of the surface transportation network is the location and operation of parking garage and the parking lots serving the airport. MHT is served by a main parking garage with capacity for almost 4,000 spaces and a system of surface vehicle parking lots. **Table 3-28** provides a summary of existing parking capacity and utilization.

Also depicted in Table 3-28 is a summary of the occupancy (in terms of occupied spaces) for each parking component when the field survey was performed. It should be noted that Lots D, E, and F were closed when the field survey was performed. The level of the 27th busiest day of the year (93rd percentile) for a parking lot is designated for planning and design purposes. **Table 3-29** provides this 93rd percentile condition, which was derived from the data collected in October 2009 and also is based upon subsequent field reviews conducted in May 2010 and/or peak occupancy data provided by MHT. As seen in Table 3-29, there is sufficient available capacity for the current MHT passenger activity levels.

Table 3-30 summarizes the parking demand on the busiest day of the year (the worst condition). According to the parking data provided by MHT, the parking demand for the garage on the busiest day of 2009 was 2,935 spaces. The demand for lots C and D during the busiest day of the year was 3,636 spaces.

As displayed in Table 3-30, the overall current parking capacity appears to be capable to accommodate the demand on the busiest day based on existing passenger activity levels.

FIGURE 3-25
EXISTING TERMINAL CURBSIDE CONFIGURATION



Source: URS Corporation, 2010.

TABLE 3-27
OCTOBER 2009 INNER CURBSIDE ROADWAY CONDITIONS

Criteria	Results
Curbside Roadway	
Existing Length	1,015 ft
Effective Frontage Required Curb Length	275 ft[1] 222 ft[2]
Curbside Traffic Volume	
Average Day of Peak Month	3,843
Peak Period Hour Volume	333
AM/PM Peak Period 15 Min. Surge Factor	1.10
Vehicle Composition (%)	
Passenger	86.0
Vans	12.0
Buses	0.0
Taxis	2.0
Other	0.0
Curbside Roadway Level of Service (LOS)	
PM Peak Period	C

Source: URS CURB_PLAN, 2010.
[1] Total effective frontage(ft)=Physical Existing Length x Gate Concentration Factor – (Crosswalks + Doors + Other)
[2] Required curb length according to URS CURB_PLAN

TABLE 3-28
OCTOBER 2009 PUBLIC ACCESS PARKING CONDITIONS SUMMARY

Parking Location	Occupied Spaces	Empty Spaces	Capacity[1] (Total Spaces)	Description
Garage	1,753	2,232	3,985	Short-Term Daily
Lot A	75	61	136	Short-Term Hourly
Lot B	75	165	240	Employee Lot
Lot C	1,604	688	2,292	Long-Term Daily
Lot D	0	2,020	2,020	Long-Term Daily
Lot E	0	1,410	1,410	Long-Term Daily
Lot F	0	700	700	Long-Term Daily
Lot G	0	1,311	1,311	Long-Term Daily
Cell Phone Lot	5	24	29	Cell Phone Lot
		Total Spaces	**12,123**	

Source: URS Corporation, 2010.
[1] Based on peak occupancy measured on October 1, 2009

TABLE 3-29
2009 PEAK PERIOD (27TH BUSIEST) PARKING CONDITIONS SUMMARY

Parking Location	Occupied Spaces	Empty Spaces	Capacity (Total Spaces)	Description
Garage	2,560[1]	1,425	3,985	Short-Term Daily
Lot A	140	-4	136	Short-Term Hourly
Lot B	80	160	240	Employee Lot
Lot C & D	2,651[2]	1,661	4,312	Long-Term Daily
Lot E	0	1,410	1,140	Long-Term Daily
Lot F	0	700	700	Long-Term Daily
Lot G	0	1,311	1,311	Long-Term Daily
Cell Phone Lot	22	7	29	Cell Phone Lot
Overall	**5,431**	**6,670**	**12,123**	

Source: Manchester-Boston Regional Airport parking report.
1 The demand of the garage on the 27th busiest day is 2,560 spaces
2 The demand of lots C and D on the 27th busiest day is 2,651 spaces

TABLE 3-30
2009 BUSIEST DAY PARKING CONDITIONS SUMMARY

Parking Location	Occupied Spaces	Empty Spaces	Capacity (Total Spaces)	Description
Garage	2,935[1]	1,050	3,985	Short-Term Daily
Lot A	140	-4	136	Short-Term Hourly
Lot B	90	150	240	Employee Lot
Lot C & D	3,636[2]	676	4,312	Long-Term Daily
Lot E	0	1,410	1,140	Long-Term Daily
Lot F	0	700	700	Long-Term Daily
Lot G	0	1,311	1,311	Long-Term Daily
Cell Phone Lot	22	7	29	Cell Phone Lot
Overall	**6,823**	**5,300**	**12,123**	

Source: Manchester-Boston Regional Airport parking report.
1 The demand of the garage on the busiest day is 2,935 spaces
2 The demand of lots C and D on the busiest day is 3,636 spaces

3.2.2.3 Existing Rental Car Ready/Return Operations

Rental car areas at the airport are currently located in several different locations, based on function. Customers first check in at the rental car counters on the first floor of the passenger terminal building. Rental car pickups and returns for each company are conducted on the southwestern side of the parking garage's first floor. Rental car ready and return activities take up about 75 percent of the first floor garage space. A common-use Quick-Turn-Around (QTA) facility that provides washing, fueling, and other services is located near the parking garage with access from Green Drive via Ammon Drive. All rental car companies at MHT except Hertz use this QTA. Hertz has their own QTA facility located at their off-site rental car storage lot adjacent to Perimeter Road.

An inventory of the ready/return spaces for each company is summarized in **Table 3-31**. Also, the total ready and return spaces are converted to “equivalent rental car spaces” in the table.

TABLE 3-31
EXISTING READY/RETURN RENTAL CAR SPACES

Rental Car Company	Ready Spaces	Return Spaces	Equivalent Rental Spaces
Alamo/National	55	32	87
Avis	33	32	65
Budget	30	32	62
Dollar	21	12	33
Enterprise	35	25	60
Hertz	69	32	101
Thrifty	12	10	22
Totals	**255**	**175**	**430**

Source: McFarland-Johnson, Inc.

The designated spaces shown in Table 3-31 represent suitably marked locations which may, when the occasion demands, be used for either ready or return cars. Based on the count, there are currently 430 equivalent ready/return spaces in the garage.

3.2.3 FORECASTS

The methodology to develop surface traffic forecasts is summarized in this section. This section also includes an evaluation of on-airport roadway network traffic, auto parking, curbside roadway operations, and rental car demand.

3.2.3.1 Surface Traffic Forecasts

Traffic forecasts for all surface transportation components at MHT (roadways, curbside roadway, and parking areas) have been developed using traffic counts conducted in 2009 as a base and projecting those counts by applying growth factors developed from the passenger forecasts contained in **Appendix F4**. Future trip generation for MHT was calculated using a methodology consistent with the publication “Airport Trip Generation” contained in the *Institute of Transportation Engineers Journal*, May 1998, which is included in **Appendix F5**.

Table 3-32 details the development of surface traffic projections using the above referenced sources. As displayed in Table 3-32, the airport currently accommodates approximately 20,000 vehicles per day as identified by the counts conducted at Airport Road, just east of Perimeter Road. Based on the applied methodology, the future vehicular activity is anticipated to grow approximately 35% in the period between 2010 and 2030. **Table 3-33** and **Figure 3-26** provide projected daily and peak hour traffic volumes for all airport related roadways.

TABLE 3-32
AVERAGE DAY OF PEAK MONTH SUMMARY[1] OF TRAFFIC VOLUMES

Month	Year 2008 Enplanements
January	143,376
February	143,450
March	152,815
April	171,869
May	164,258
June	162,818
July	169,669
August (Peak)	177,458
September	142,556
October (Count)	167,356
November	130,838
December	128,935
12 Month Total	1,855,398
12 Month Average	154,617
Peak Month/Count Month Ration	1.06

Growth Factors	
2009 – 2015	1.05
2009 – 2020	1.15
2009 – 2025	1.26
2009 – 2030	1.37

Enplanements	Existing Enplanements 2009E[1]		Forecasted Enplanements[1] 2010	2015	2020	2025	2030
Annual Enplanements (Baseline Scenario)	1,570,000		1,494,000	1,668,000	1,851,000	2,054,000	2,278,000
Peak Month Enplanements	153,696		146,256	163,290	181,204	201,077	223,006
Average Day Peak Month (ADPM)	4,958		4,718	5,267	5,845	6,486	7,194
Vehicular Traffic	**Existing (2009) Trip Generation[4]**		**Projected Trip Generation[6]**				
ADT ADPM[2]	18,889[4]	19,935[5]	19,100	21,000	22,900	25,100	27,400
Peak Hour Traffic, ADPM[3]	n/a	1,611	1,500	1,700	1,900	2,000	2,200
Peak Hour/Peak Direction Traffic	n/a	332	300	350	390	410	450

Source: URS Corporation, 2010.

1 Assumed base scenario for total passenger estimate (2009E) and forecast (2010-2030) analysis conducted by Jacobs Consultancy, March 2010(table 18).

2 Average daily traffic at Airport Road E. of Perimeter Road (2-way)

3 Peak hour traffic for an average day of the peak month (2-way).

4 Based on ITE Journal's Airport Trip Generation curve - Ruhl & Trnavskis.

5 Based on 2009 traffic counts, adjusted to peak-month to count-month ratio.

6 Projected Trip Generation after calibration based on existing traffic counts.

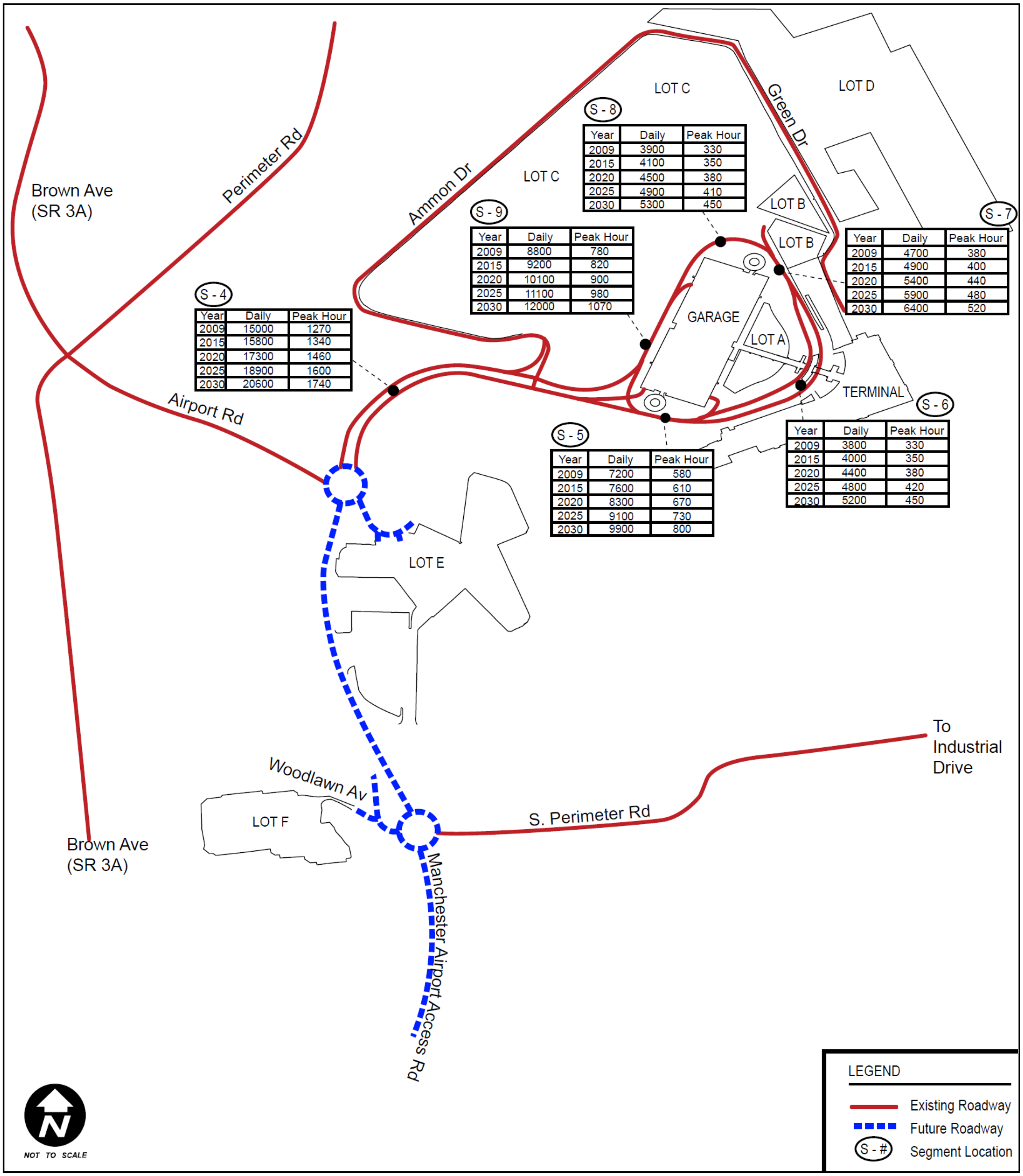
TABLE 3-33
FUTURE VEHICULAR TRAFFIC

Roadway	Segment	No. of Lanes[1]	Projected Vehicular Traffic 2015 Daily	2015 Peak Hour	2015 LOS	2020 Daily	2020 Peak Hour	2020 LOS	2025 Daily	2025 Peak Hour	2025 LOS	2030 Daily	2030 Peak Hour	2030 LOS
Airport Road	S-4	4D	15,800	1,340	B	17,300	1,460	B	18,900	1,600	B	20,600	1,740	B
	S-5	2O	7,600	610	B	8,300	670	B	9,100	730	B	9,900	800	B
	S-6	2O	4,000	350	B	4,400	380	B	4,800	420	B	5,200	450	B
	S-7	2O	4,900	400	B	5,400	440	B	5,900	480	B	6,400	520	B
	S-8	2O	4,100	350	B	4,500	380	B	4,900	410	B	5,300	450	B
	S-9	2O	9,200	820	B	10,100	900	B	11,100	980	B	12,100	1,070	B

Source: URS Corporation, 2010.

1 4D=4-lane divided; 2O=2-lane one-way

FIGURE 3-26
FUTURE VEHICULAR TRAFFIC



Source: URS Corporation, 2010.

3.2.3.2 MHT Auto Parking Forecasts

Section 3.2.2.2, *Public Access Parking Existing Conditions*, provides an assessment of existing capacity and demand for all parking components at MHT. In this section, the future years parking demand has been calculated using growth factors developed using the trip generation methodology described in the Vehicular Traffic Forecasts section. **Table 3-34** illustrates the projected parking demand reflecting the 27th -busiest-day conditions for each of the components based on the future years enplanement levels.

TABLE 3-34
PROJECTED (27TH BUSIEST) PARKING DEMAND EVALUATION

Year:	**2015**	**2020**	**2025**	**2030**
Growth Factor:	**1.05**	**1.15**	**1.26**	**1.37**
Enplanements:	**1,668,000**	**1,851,000**	**2,054,000**	**2,278,000**
Parking Location	**Demand**	**Demand**	**Demand**	**Demand**
Garage	2,688	2,944	3,226	3,507
Lot A	124	136	149	162
Long Term Daily[1]	2,784	3,049	3,340	3,632
Overall	**5,596**	**6,129**	**6,715**	**7,301**

Source: URS Corporation, 2010.
[1] Long term daily parking includes lots C thru G.

Also provided is **Table 3-35**, which illustrates the projected parking demand reflecting the busiest-day (the worst) condition.

TABLE 3-35
PROJECTED (BUSIEST DAY) PARKING DEMAND EVALUATION

Year:	**2015**	**2020**	**2025**	**2030**
Growth Factor:	**1.05**	**1.15**	**1.26**	**1.37**
Enplanements:	**1,668,000**	**1,851,000**	**2,054,000**	**2,278,000**
Parking Location	**Demand**	**Demand**	**Demand**	**Demand**
Garage	3,082	3,375	3,698	4,021
Lot A	147	161	176	192
Long Term Daily[1]	3,818	4,181	4,581	4,981
Overall	**7,047**	**7,717**	**8,455**	**9,194**

Source: URS Corporation, 2010.
[1] Long term daily parking includes lots C thru G.

3.2.3.3 Curbside Peak Hour Projections

Table 3-36 provides an assessment of future traffic volumes for the curbside roadway. The volumes are broken down by mode of transportation, such as passenger cars, taxis, limos and buses.

TABLE 3-36
PROJECTED PEAK HOUR TRAFFIC BY MODE OF TRANSPORTATION

Year	Base Forecast Million Enplanements	Curb Front Traffic (vph)			
		Passenger	Taxi	Shuttle Vans	Total
2015	1.668	301	7	42	350
2020	1.851	335	8	47	380
2025	2.054	353	8	49	420
2030	2.278	387	9	54	450

Source: URS Corporation, 2010.

As shown in Table 3-36, passenger terminal building curbside traffic is anticipated to grow to 450 vehicles per hour by year 2030, assuming the existing mode splits remain unchanged.

The analysis of future peak hour traffic conditions for the curbside roadway was performed using *CURB_PLAN*. **Table 3-37** provides a summary of the *CURB_PLAN* results. Based on the results, the passenger terminal curbside roadway is anticipated to reach capacity (LOS D) by 2030 if no modifications to the curbside roadway are introduced. However, the analysis also shows that the projected vehicular demand can be accommodated with minimal operational modifications to the curbside operations. Improvements such as the redistribution of passenger activity to a more balanced utilization of the entire curb roadway should be sufficient to maintain acceptable levels of service up (LOS C) to the year 2030. **Appendix F6** provides the *CURB_PLAN* runs for future conditions.

TABLE 3-37
PROJECTED INNER CURBSIDE ROADWAY CONDITIONS

Year	Base Forecast Million Enplanements	Curb Front Traffic (vph)	Effective/Usable Curb Length Ratio	LOS
2015	1.668	350	1.11	C
2020	1.851	380	1.23	C
2025	2.054	420	1.29	C
2030	2.278	450	1.42	D/C[1]

Source: URS CURB_PLAN.
[1] LOS D with existing terminal entrance configuration. LOS C with balanced terminal entrance configuration.

3.2.3.4 Rental Car Forecasts

Projections of rental car ready/return demand are usually based on a ratio of total spaces per million annual enplaned passengers, and the ratios tend to vary by airport. The character of airport enplanements, which includes such factors as the transient/local makeup of the enplanements, and airport proximity to tourist locations, influences the relative use of rental cars. A review of existing and proposed ratios for other air carrier airports across the nation resulted in a range of figures, with as low as 40 spaces per million enplanements in one case, and an upper limit of 320 at several airports. The existing ratio of spaces per million enplanements at MHT is 274, however, that number is inflated by the recent downturn in passenger levels. Dividing the existing spaces by the 2005 enplanement figure in millions (2.141), which represents the peak airport passenger activity, results in a ratio of 200 spaces per million enplanements. After consideration of existing and past enplanement levels and the functionality of the rental car areas during 2005, a range of ratios appears to be warranted. For planning purposes, rental car ready/return space demand is assumed to be within a range of 200 to 230 spaces per million enplanements for the Airport Master Plan study period.

The location and current adequacy of the existing QTA was addressed in Section 2.4.4.1, *Rental Car Operations* of the Inventory/Existing Conditions. According to the June 2009 Draft Manchester-Boston Regional Airport Quick-Turn-Around (QTA) Study Review, the existing QTA area did not provide a sufficient number of fueling positions, automated washer bays, service bays or vacuum stations to meet the 2008 demand. Furthermore, the existing QTA will be impacted by the new Airport Access Road. The Draft QTA Study Review describes alternatives for the relocated QTA. **Table 3-38** presents the forecast of required rental car ready/return spaces through the 20-year horizon, where the surplus or deficit in ready/return spaces is based on the midpoint of the projected need range:

TABLE 3-38
PROJECTED READY/RETURN RENTAL SPACE REQUIREMENTS

Year	Base Forecast Million Enplanements	Projected Need for Rental Car Ready/ Return Spaces	Existing Read/Return Spaces	Average Demand Surplus (+)/ Deficit (-)	Range of Demand Surplus (+) and Deficit (-)
2010	1.494	299 to 344	430	109	86 to 131
2015	1.668	334 to 384	430	71	46 to 96
2020	1.851	370 to 426	430	32	4 to 60
2025	2.054	411 to 472	430	-12	19 to -42
2030	2.278	456 to 524	430	-60	-26 to -94

Sources: McFarland-Johnson, Inc.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION FOUR

DEMAND/CAPACITY AND FACILITY REQUIREMENTS

SECTION 4.0
DEMAND/CAPACITY AND FACILITY REQUIREMENTS

This section of the Airport Master Plan Update consists of three major subsections as listed below:

- Airfield Demand/Capacity and Facility Requirements,
- Terminal Facility Requirements, and
- Surface Transportation Demand/Capacity and Facility Requirements.

4.1 AIRFIELD DEMAND/CAPACITY AND FACILITY REQUIREMENTS

4.1.1 AIRFIELD CAPACITY

A demand/capacity analysis for the existing airfield configuration was conducted using the methodology contained in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, commonly referred to as the FAA's "handbook" methodology. This methodology uses a series of tables and equations to calculate an airfield's hourly and annual capacity. The following subsections provide a discussion of the handbook methodology and the results derived.

The handbook methodology describes how to measure an airfield's hourly capacity and its annual capacity, which is referred to as Annual Service Volume (ASV). Hourly capacity is defined as the maximum number of aircraft operations that can be accommodated by the airfield system in one hour. It is used to assess the airfield's ability to accommodate peak hour operations.

ASV is defined as a reasonable estimate of an airport's annual capacity. As the number of annual operations increases and approaches the airport's ASV, the average delay incurred by each operation increases. When annual operations are equal to the ASV, average delay per aircraft operation can be up to 4 minutes depending upon the mix of aircraft using the airport. When the number of annual aircraft operations exceeds the ASV, moderate to severe congestion will occur and average delay per aircraft operation will increase exponentially. ASV is used to assess the adequacy of the airfield design, including the number and orientation of runways.

Calculation of an airfield's hourly capacity and ASV depends upon a number of factors including the following items:

- Meteorological Conditions - The percentage of time that visibility or cloud cover is below certain minimums.
- Aircraft Fleet Mix - The percentage of operations conducted by different categories of aircraft.
- Runway Use - The percentage of time each runway, or combinations of runways, is used.
- Percent Touch-and-Go - The percent of touch-and-go operations in relation to total aircraft operations.

- Percent Arrivals - The percent of arrivals in relation to departures during peak hours.
- Exit Taxiway Locations - The number and locations of exit taxiways for landing aircraft.

4.1.2 METEOROLOGICAL CONDITIONS

Meteorological conditions have a significant effect upon runway use, which, in turn, affects an airfield's capacity. During Visual Meteorological Conditions (VMC), runway use is greatly influenced by the direction of prevailing winds. During Instrument Meteorological Conditions (IMC), runway use is dictated by a combination of prevailing winds and the type and availability of instrument approach procedures. Operational factors, such as runway length, and noise abatement considerations may also affect runway use. Consequently, airfield capacity is typically higher during periods of VMC than during periods of IMC. Therefore, it is important to properly identify the percent of time that an airfield operates under each condition.

Historical data regarding the percentage of time that Manchester-Boston Regional Airport (MHT) operates under VMC versus IMC was obtained from two sources: meteorological data (previously presented in the Inventory section) and operational data obtained from the FAA's Aviation System Performance Metrics (ASPM) web site. Neither of these sources directly indicate the percentage of time that the Airport operates in VMC versus IMC. However, they do provide excellent guidance, from which, an educated estimate can be made.

Meteorological data reviewed for this Airport Master Plan Update, indicates that VMC conditions occur approximately 89 percent of the time and IMC the remaining 11 percent of the time. Cloud ceilings and horizontal visibility are below Category I approach criteria (i.e., a ceiling height of 200 feet and horizontal visibility of 1/2-mile) approximately 1.2 percent of the time.

ASPM data is derived from actual aircraft operational data for 29 major and commuter airlines including cargo carriers such as FedEx and UPS. ASPM data does not include most general aviation (GA) and military flights. Consequently, ASPM data does not include approximately 22 percent of the aircraft operations that occurred at MHT in 2009. Nonetheless, a review of ASPM data from the FAA's web site indicates that from 2004 through 2009 aircraft operations during IMC averaged 22 percent of total aircraft operations. An important consideration to note is that aircraft operations may be operated under Instrument Flight Rules (IFR) even though the actual ceiling and horizontal visibilities meets the FAA definition of VMC. This may occur, for example, when there is a broken ceiling that is at 4,000 feet and horizontal visibility is greater than 3 miles, but aircraft on approach to Runway 35 at MHT may still be flying an Instrument Landing System (ILS) approach because they cannot see the airport or runway while farther out on the approach. Thus, the flight would be classified in ASPM data as an IMC operation even though the prevailing conditions at the airport would be classified as VFR by weather data.

ASPM data includes only air carrier and commuter aircraft operations. Therefore, it is logical that ASPM data would indicate a higher percent of operations during IMC than the weather data. Aircraft operations by GA aircraft are more likely to occur during VMC due to the fact that some of the pilots operating these aircraft are not instrument rated or choose not to fly during IMC. Applying the percentages from the meteorological data and the ASPM data by the proportion of aircraft operations they account for results in an estimate of 20 percent of aircraft operations at MHT occurring during IMC with the remaining 80 percent occurring during VMC. These percentages were used for the demand-capacity analysis.

4.1.3 AIRCRAFT FLEET MIX

Variations in aircraft weights and approach speeds affect an aircraft's wake turbulence generation, which, in turn, affects the spacing of aircraft on final approach. Greater spacing requirements between aircraft lower the arrival capacity of a runway system. Therefore, if an airport is serving an aircraft fleet mix that has a high percentage of aircraft with greater separation requirements, it will have a lower capacity.

The airport capacity handbook defines aircraft fleet mix as the percentage of operations conducted by four classes of aircraft. **Table 4-1** summarizes representative types of aircraft found in each classification.

TABLE 4-1
AIRCRAFT CLASSIFICATIONS

Class	Aircraft Type	
Class A	Small, Single-Engine (Gross weight 12,500 pounds or less)	
Typical Aircraft	Cessna 172/182	Mooney 201
	Beech, Bonanza	Piper Cherokee/Warrior
Class B	Small, Twin-Engine (Gross weight 12,500 pounds or less)	
Typical Aircraft	Beech Baron	Mitsubishi MU-2
	Cessna 402	Piper Navajo
	Rockwell Shrike	Cessna Citation I
	Beechcraft 99	Beech King Air
Class C	Large Aircraft (Gross weight 12,500 pounds to 300,000 pounds)	
Typical Aircraft	Douglas DC-9	MD-80
	Boeing 737	Boeing 757
	A-319	A-320
	CRJ-700	Embraer 145
	DASH-8	Saab 340
Class D	Large Aircraft (Gross weight more than 300,000 pounds)	
Typical Aircraft	Boeing 767	Airbus A-300
	DC-10/MD-11	Boeing 747

Source: URS Corporation, 2010.

Aircraft fleet mix for 2009 at MHT was determined through a compilation of flight plan data from Flight Explorer™ (a proprietary program that logs all aircraft operations for which flight plans were filed). Based on Flight Explorer™ data for 2009, it is estimated that Class A and Class B comprise 13.4 percent of aircraft operations, Class C aircraft comprises 83 percent of aircraft operations, and Class D aircraft comprises 3.6 percent of aircraft operations at MHT. The complete list of Flight Explorer™ data for 2009 is presented in **Appendix G**.

The FAA's handbook methodology uses the term "Mix Index" to describe an airport's fleet mix. The FAA defines the Mix Index as the percentage of Class C operations plus three times the percentage of Class D operations. By applying this calculation to the fleet mix percentages for MHT, a Mix Index of 93 percent is obtained per the following equation:

Class C Operations (83) + (3 * Class D Operations (3.6)) = Mix Index (93)

The number of aircraft operations by small GA aircraft that comprise Classes A and B are significantly lower during instrument conditions. Therefore, it is estimated that the percentage of operations by Class C aircraft increases to 95 percent during instrument conditions from 83 percent during visual conditions. Thus, the Mix Index during IMC would increase to 106.

4.1.4 RUNWAY USE

Runway use data for MHT was obtained from the FAA's ASPM web site. The top 10 most common runway use configurations (on the basis of ASPM recorded aircraft operations during 2007 through 2009) and the percent of time each configuration was used is presented in **Table 4-2**. Three years of data was assembled because runway use can vary from year to year on the basis of prevailing weather patterns.

TABLE 4-2
TOP 10 RUNWAY OPERATIONAL CONFIGURATIONS AND USE
(CALENDAR YEAR 2007 THROUGH 2009)

Operational Configuration (Arrivals/Departures)	Number of Aircraft Operations	Percentage of Aircraft Operations
35/35	72,032	43.0%
17/17	25,120	15.0%
35/6	17,908	10.7%
6, 35/6, 35	14,302	8.5%
6/6	12,103	7.2%
24/24	5,452	3.3%
6, 35/6	5,416	3.2%
35/17	1,654	1.0%
35/6, 35	1,598	1.0%
17/6	1,348	0.8%

Sources: FAA ASPM web site (http://aspm.faa.gov), 2007 to 2009 data. Compiled by URS Corporation.

The data indicates that MHT operates in a single runway configuration (with both arrivals and departures on Runway 35) approximately 43 percent of the time. This is the most common operational configuration because Runway 35 is aligned with the prevailing winds, it is longer than the crosswind runway, and it is equipped with an ILS. The next most common operational configuration is arrivals and departures on Runway 17. This configuration is used approximately 15 percent of the time. The third most common operational configuration is arrivals on Runway 35 and departures on Runway 6 at nearly 11 percent of the time. All other operational configurations are used smaller percentages of the time, as indicated in **Table 4-2**.

Runway use has a significant effect on airport capacity, especially at airports where one operational configuration provides greater or less capacity than another. However, in instances where runway operational configurations are similar, it is reasonable to group them together for analysis purposes. The FAA handbook methodology recommends that operational configurations used less than 2 percent of the time be credited to another runway use configuration. This recommendation was observed for this capacity analysis.

For the purpose of this capacity analysis, three operational configurations were used and assessed. They include a single-runway configuration with arrivals and departures on the same runway; a two-runway, crossing configuration with mixed operations (i.e., arrivals and departures) on both runways; and a two-runway, crossing configuration with segregated operations on each runway (i.e., arrivals on one runway and departures on the other runway). These three operational configurations account for the majority of aircraft operations that occur at MHT.

4.1.5 TOUCH-AND-GO OPERATIONS

A touch-and-go operation occurs when an aircraft lands and takes-off without making a full stop. These operations are usually conducted by student pilots for the purpose of practicing landings. Touch-and-go operations do not occupy a runway for as much time as a full-stop landing or an aircraft departure. Therefore, airfields handling a high percentage of touch-and-go's can normally accommodate a greater number of aircraft operations within a given period. Touch-and-go operations have been declining at MHT for many years and accounted for only 5 percent of total aircraft operations in 2009. Since touch-and-go operations comprise such a small share of total aircraft operations at MHT, it is not likely that this percentage will decrease much further and was used for the capacity analysis.

4.1.6 PERCENTAGE ARRIVALS

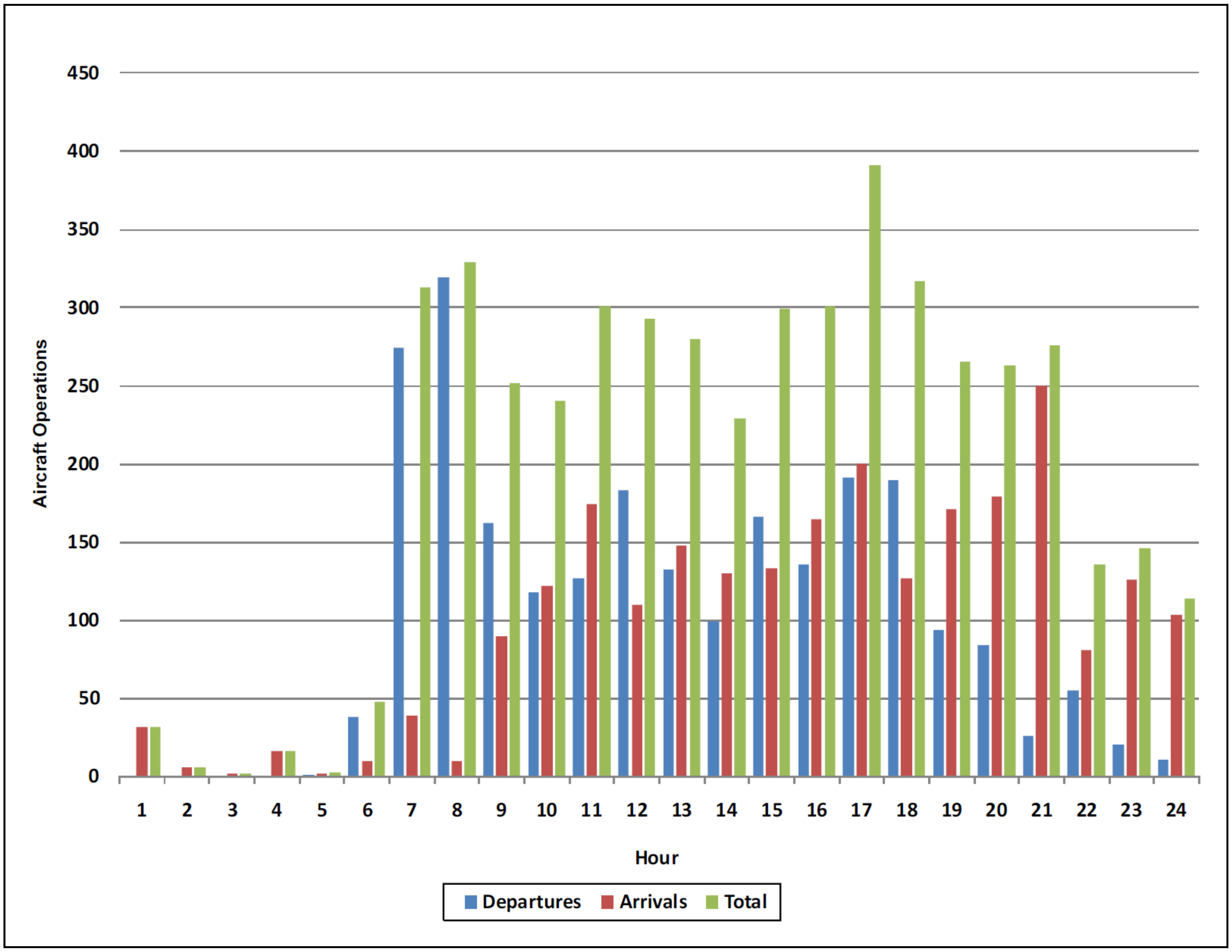
The number of arrivals as a percentage of total aircraft operations has an important influence on a runway's hourly capacity. For example, a runway used exclusively for arrivals has a different capacity than a runway used exclusively for departures or a runway used for a mixture of arrivals and departures. In general, the higher the percentage of arrivals, the lower the hourly capacity of a runway. This is because arrivals usually have greater separations between aircraft and longer runway occupancy times than departures.

The FAA's handbook methodology presents three choices for the percentage of arrivals during the peak hour. The choices are 40, 50, or 60 percent. Before selecting one or more of these percentages, a review of hourly operations at MHT was conducted. This review consisted of compiling hourly aircraft operational data for the peak month of September. **Figure 4-1** depicts the total number of hourly aircraft operations at MHT during September 2009 as derived from ASPM data. It should be noted that there is some skew of the data since GA and military operations as well as non-ASPM carrier data are not reflected. Nonetheless, the hourly data reveals that MHT experiences a large number of departures in the early morning between the hours of 7:00 a.m. to 9:00 a.m. Aircraft operations during those hours consist of 90 percent or more departures.

Arrivals are slightly more balanced throughout the day with the highest peaks occurring between 5:00 p.m. and 6:00 p.m. and again between 9:00 p.m. and 10:00 p.m. The percentage of arrivals during the 5:00 p.m. to 6:00 p.m. peak is approximately 50 percent. The percentage of arrivals during the 9:00 p.m. and 10:00 p.m. peak is approximately 90 percent.

Total aircraft operations peak between 5:00 p.m. and 6:00 p.m. The distribution between departures and arrivals during this hour is nearly equal at 50 percent each. Consequently, a peak hour distribution of 50 percent arrivals was used for the airfield capacity analysis.

FIGURE 4-1
TOTAL HOURLY AIRCRAFT OPERATIONS AT MHT DURING SEPTEMBER 2009



Source: URS Corporation, 2010.

4.1.7 *EXIT TAXIWAY LOCATIONS*

Exit taxiways affect airfield capacity because their location influences runway occupancy times for aircraft. The longer an aircraft remains on a runway, the lower the runway's capacity. When exit taxiways are properly located, landing aircraft can quickly exit the runway, thereby lowering occupancy times and increasing the runway's capacity.

According to FAA criteria, exit taxiways for a runway having a Mix Index of between 81 and 120 percent should be in the range of 5,000 to 7,000 feet from the runway's threshold for maximum effectiveness at reducing runway occupancy time. As noted previously, the Mix Index for MHT is estimated to range from 93 percent during visual conditions to 106 percent during instrument conditions. **Table 4-3** presents information on the number of exit taxiways in optimal locations at MHT.

TABLE 4-3
NUMBER OF EXIT TAXIWAYS IN OPTIMAL LOCATIONS

Runway	Number of Exit Taxiways Between 5,000 and 7,0000 feet
17	2
35	1
6	1
24	0

Source: URS Corporation, 2010.

4.1.8 *HANDBOOK METHODOLOGY CAPACITIES*

4.1.8.1 Hourly Airfield Capacity

The hourly and annual capacities of the MHT airfield were calculated using the preceding information and the FAA's handbook methodology. Hourly capacity values were determined using the following equation:

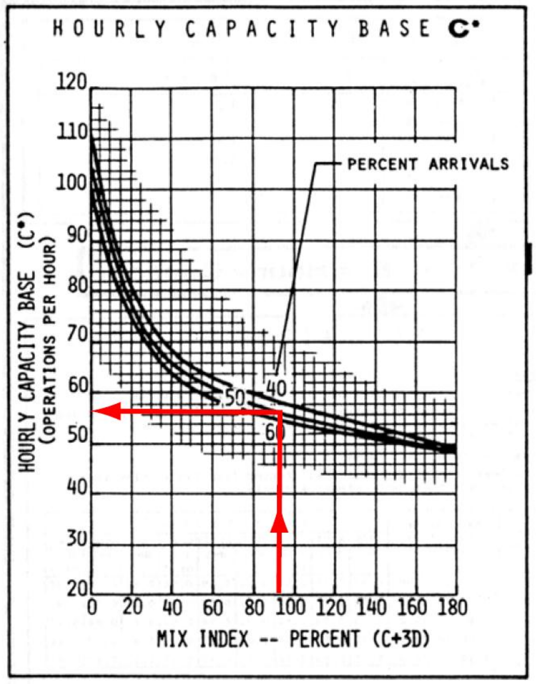
Hourly capacity of the runway component = C * T * E
Where: C = Base Capacity,
T = Touch-and-Go Factor, and
E = Exit Factor.

The base capacity value (C), the touch-and-go factor (T), and the exit factor (E) are derived from the hourly airfield capacity graphs contained in the FAA's AC. Graphs for the three airfield configurations considered (i.e., single-runway, crossing runways with segregated operations and crossing runway with mixed operations) are shown on **Figures 4-2**, **4-3 and 4-4**.

Using the data presented in the preceding sections and the graphs, it was determined the existing airfield's hourly capacity ranges from 51 to 59 operations during VMC and from 45 to 55 operations during IMC, depending upon the runway configuration being used.

FIGURE 4-2
CAPACITY GRAPHS - SINGLE RUNWAY CONFIGURATION

HOURLY CAPACITY BASE C*



TOUCH & GO FACTOR T

Percent Touch & Go	Mix Index--Percent (C+3D)	TOUCH & GO FACTOR T
0	0 to 180	1.00
1 to 10	0 to 70	1.04
11 to 20	0 to 70	1.10
21 to 30	0 to 40	1.20
31 to 40	0 to 10	1.31
41 to 50	0 to 10	1.40

C* x T x E = Hourly Capacity

EXIT FACTOR E

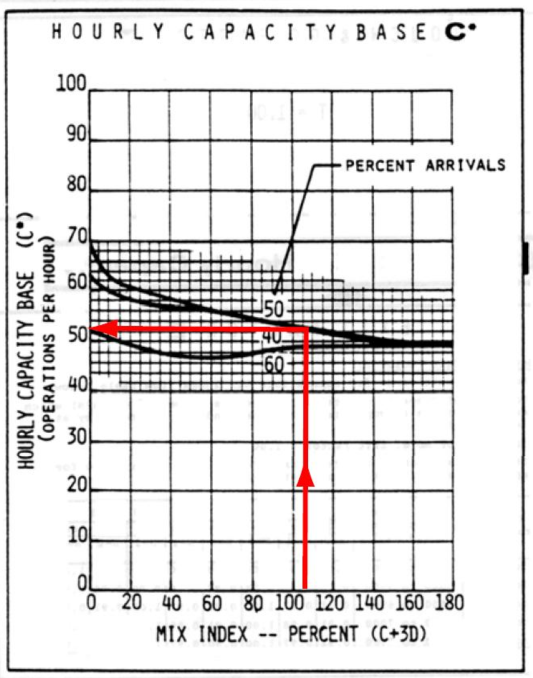
To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E 40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.72	0.87	0.94	0.70	0.86	0.94	0.67	0.84	0.92
21 to 50	3000 to 5500	0.79	0.86	0.94	0.76	0.84	0.93	0.72	0.81	0.90
51 to 80	3500 to 6500	0.79	0.86	0.92	0.76	0.83	0.91	0.73	0.81	0.90
81 to 120	5000 to 7000	0.82	0.89	0.93	0.80	0.88	0.94	0.77	0.86	0.93
121 to 180	5500 to 7500	0.86	0.94	0.98	0.82	0.91	0.96	0.79	0.91	0.97

FIGURE 3-3. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 1,54 FOR VFR CONDITIONS.

HOURLY CAPACITY BASE C*



TOUCH & GO FACTOR T

T = 1.00

C* x T x E = Hourly Capacity

EXIT FACTOR E

To determine Exit Factor E:

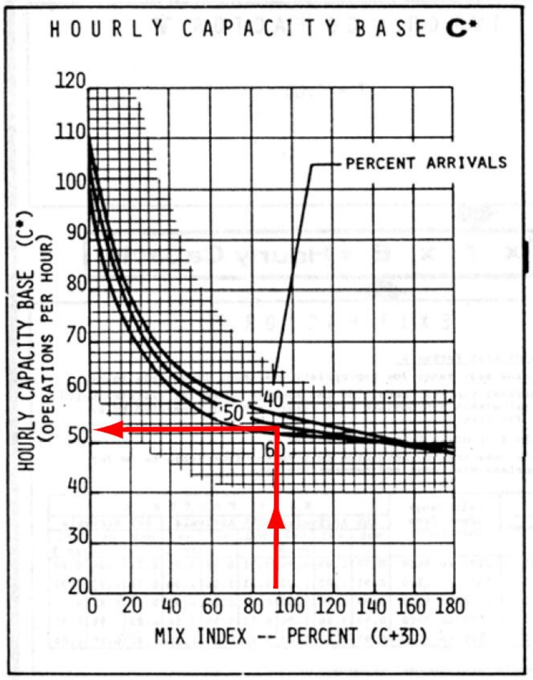
1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D) 2-43, 2-50	Exit Range (Feet from threshold)	EXIT FACTOR E 40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.81	0.91	0.96	0.83	0.95	0.99	0.92	1.00	1.00
21 to 50	3000 to 5500	0.79	0.86	0.92	0.77	0.85	0.92	0.89	0.98	1.00
51 to 80	3500 to 6500	0.81	0.87	0.93	0.77	0.83	0.91	0.90	0.98	1.00
81 to 120	5000 to 7000	0.83	0.89	0.94	0.80	0.86	0.92	0.83	0.91	0.97
121 to 180	5500 to 7500	0.86	0.94	0.98	0.83	0.91	0.96	0.79	0.89	0.95

FIGURE 3-43. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS. 1, 54 FOR IFR CONDITIONS.

Source: URS Corporation, 2010.

FIGURE 4-3
CROSSING RUNWAY CONFIGURATION (SEGREGATED OPERATIONS)



TOUCH & GO FACTOR **T**

T = 1.00

C* x T x E = Hourly Capacity

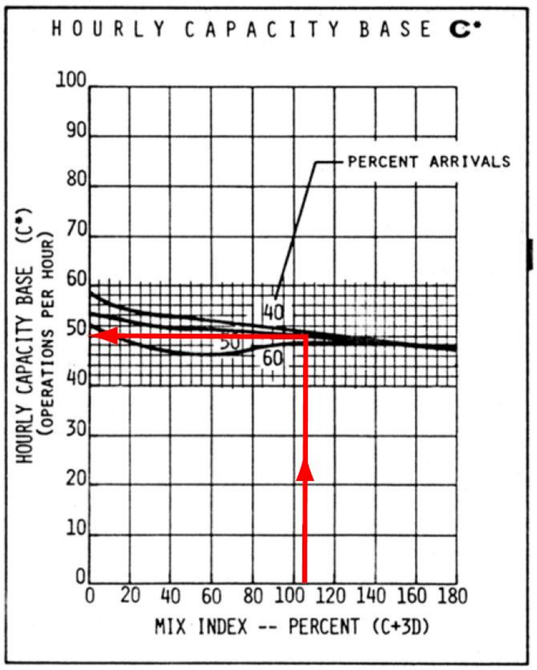
EXIT FACTOR **E**

To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.74	0.88	0.95	0.72	0.87	0.94	0.69	0.85	0.93
21 to 50	3000 to 5500	0.90	0.93	0.97	0.88	0.91	0.95	0.86	0.90	0.95
51 to 80	3500 to 6500	0.97	0.98	1.00	0.95	0.96	0.98	0.92	0.97	0.99
81 to 120	5000 to 7000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
121 to 180	5500 to 7500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

FIGURE 3-32. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NO. 48 FOR VFR CONDITIONS.



TOUCH & GO FACTOR **T**

T = 1.00

C* x T x E = Hourly Capacity

EXIT FACTOR **E**

To determine Exit Factor E:

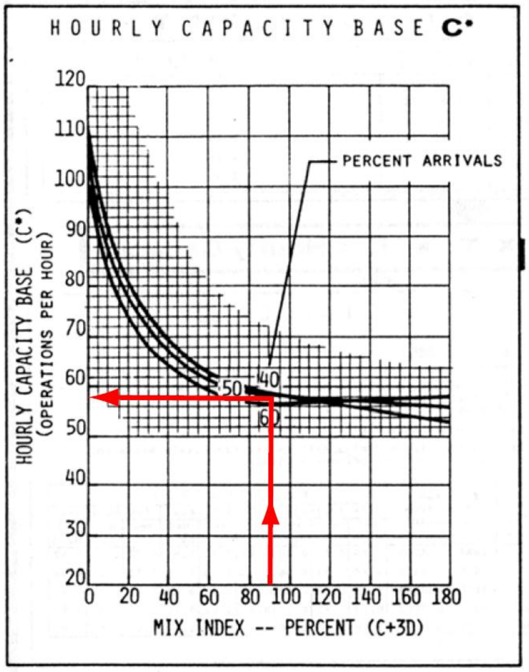
1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00
21 to 50	3000 to 5500	1.00	1.00	1.00	0.97	1.00	1.00	0.91	1.00	1.00
51 to 80	3500 to 6500	1.00	1.00	1.00	0.94	1.00	1.00	0.92	0.99	1.00
81 to 120	5000 to 7000	1.00	1.00	1.00	0.98	1.00	1.00	0.91	0.97	1.00
121 to 180	5500 to 7500	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.99	1.00

FIGURE 3-64. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 48,60 FOR IFR CONDITIONS.

Source: URS Corporation, 2010.

FIGURE 4-4
EXISTING RUNWAY CONFIGURATION (MIXED OPERATIONS)



TOUCH & GO FACTOR T

Percent Touch & Go	Mix Index--Percent (C+3D)	TOUCH & GO FACTOR T
0	0 to 180	1.00
1 to 10	0 to 70	1.03
11 to 20	0 to 70	1.10
21 to 30	0 to 40	1.19
31 to 40	0 to 10	1.31
41 to 50	0 to 10	1.40

C* x T x E = Hourly Capacity

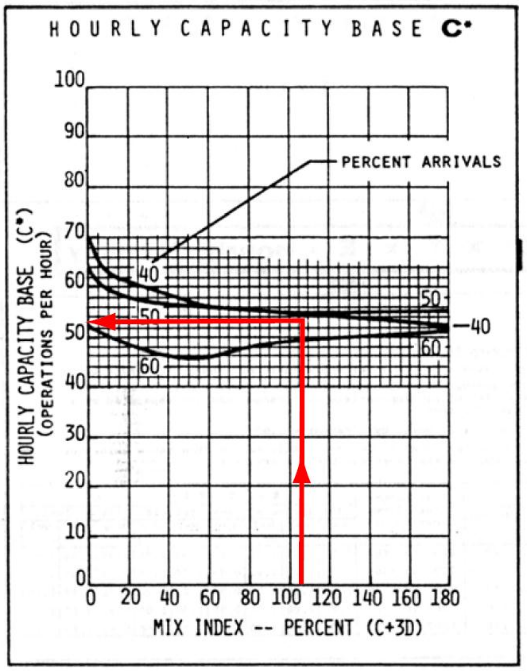
EXIT FACTOR E

To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.73	0.88	0.95	0.71	0.87	0.94	0.68	0.85	0.93
21 to 50	3000 to 5500	0.89	0.92	0.95	0.87	0.90	0.94	0.84	0.89	0.94
51 to 80	3500 to 6500	0.96	0.97	0.99	0.95	0.96	0.98	0.89	0.94	0.97
81 to 120	5000 to 7000	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.97	1.00
121 to 180	5500 to 7500	1.00	1.00	1.00	1.00	1.00	1.00	0.84	0.94	0.98

FIGURE 3-31. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 47,53 FOR VFR CONDITIONS.



TOUCH & GO FACTOR T

T = 1.00

C* x T x E = Hourly Capacity

EXIT FACTOR E

To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent (C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E								
		40% Arrivals			50% Arrivals			60% Arrivals		
		N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3	N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.81	0.91	0.96	0.83	0.95	0.99	0.92	1.00	1.00
21 to 50	3000 to 5500	0.79	0.86	0.92	0.77	0.85	0.92	0.89	0.98	1.00
51 to 80	3500 to 6500	0.81	0.87	0.93	0.77	0.83	0.91	0.90	0.98	1.00
81 to 120	5000 to 7000	1.00	1.00	1.00	0.98	1.00	1.00	0.91	0.97	1.00
121 to 180	5500 to 7500	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.99	1.00

FIGURE 3-65. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NO. 53 FOR IFR CONDITIONS.

Source: URS Corporation, 2010.

Table 4-4 provides a comparison of these hourly capacities to the projected number of peak hour operations. As the table indicates, forecasted peak hour operations will not exceed the airfield's capacity during the study period. Thus, it can be concluded that the existing airfield will have sufficient capacity to accommodate average peak hour operations without incurring delay.

It should be noted that the peak hour estimates provided in Section 3.0 represent average peak hour operations during the peak month (September). Absolute peaks can, and do, exceed this value. For example, during September 2009 the absolute peak hour was 38 operations the next two highest peak hours had 30 operations each. These peaks occur less frequently, but are also less than the airfield's hourly capacities, even during IMC.

TABLE 4-4
HOURLY AIRFIELD CAPACITIES

Year	Hourly Capacity		Estimated Peak Hour Aircraft Operations
	VMC	IMC	
2010	51 to 59	45 to 55	24
2015	51 to 59	45 to 55	26
2020	51 to 59	45 to 55	28
2025	51 to 59	45 to 55	30
2030	51 to 59	45 to 55	33

Sources: URS Corporation, 2010 and FAA AC 150/5060-5, Airport Capacity and Delay.
Note: Estimated peak hour operations were obtained from the Peaking Forecast contained in Section 3.0.

Further examination of historical aircraft operations revealed that 2005 was a peak year with over 106,000 annual operations. Monthly data for 2005 reveals that May and August were peak months for activity that year. A review of hourly aircraft operations during August 2005 reveals that the high peak hour consisted of 45 aircraft operations. The next highest hourly peaks were 43 and 39 aircraft operations. These peaks are associated with VMC and are therefore, still less than the hourly capacity of the airfield. Thus, it can be concluded that the airfield will have sufficient hourly capacity to accommodate average and absolute peak hour aircraft operations during the study period.

Aircraft delays that occur at MHT are not due to lack of airfield capacity at the Airport. Delays that occur at MHT are usually due to a variety of other factors including poor weather conditions, aircraft mechanical problems or, more commonly, ground holds instituted by the FAA due to capacity problems en-route or at the destination airport. The FAA commonly institutes ground holds to prevent overloads of aircraft operations at the destination airport during peak periods and during poor weather conditions that limit capacity at destination airports. This is a common problem at busy airports in the Northeast that account for many departures from MHT.

4.1.8.2 Annual Airfield Capacity

An airfield's annual capacity, or ASV, is calculated by determining the following three items:

- The airfield's weighted hourly capacity: Cw,
- The daily demand ratio: D, and
- The hourly demand ratio: H.

The airfield's weighted hourly capacity (Cw) is calculated via a formula that considers the hourly capacity values during VMC and IMC, as well as the percentage of time that each weather condition occurs. The weighted hourly capacity of MHT's airfield is calculated to be 49 operations. This capacity is only used for calculating ASV. They do not have any other use and should not be compared to hourly levels of demand.

The daily demand ratio (D) is calculated by dividing the annual number of aircraft operations by the average daily operations during the peak month. This calculation used data for calendar year 2009 and results in a daily demand factor of 334 (69,853 annual operations/209 average daily demand during the peak month). This value is within the range of demand ratios (i.e., 310 to 350) listed in the FAA's AC as being typical for an airport with a Mix Index between 51 and 180. As noted previously, the Mix Index for MHT is estimated to be 93 during VMC and 106 during IMC.

The hourly demand ratio (H) is calculated by dividing the average daily operations during the peak month by the average peak hour operations during the peak month. This calculation also used operational data for 2009 and results in a daily demand factor of approximately 9 (209 average daily demand/23 average peak hour demand). This ratio is below the 11 to 15 range of demand ratios listed in the FAA's AC as being typical for an airport with a Mix Index between 51 and 180. This low ratio is caused by the fact that MHT has a relatively high percentage of aircraft operations during the peak hour. Airports with a Mix Index in the 51 to 180 range typically experience a more even distribution of aircraft operations throughout the day.

The use of an unusually low hourly demand ratio would result in the calculation of an unusually low ASV for MHT and would not present an accurate measure of the airfield's annual capacity. Therefore, a more realistic hourly demand ratio of 12 was used for the analysis. This value is still at the low end of the typical 11 to 15 range, but provides a more realistic assessment of MHT's airfield capacity if the airport experienced greater levels of aircraft operations with a greater spread of aircraft operations throughout the day. **Table 4-5** presents the calculated ASV for MHT. The calculated ASV of approximately 200,000 annual operations is the same value calculated in the last Airport Master Plan Update published in 1997.

TABLE 4-5
ESTIMATED ASV

Weighted Hourly Airfield Capacity (Cw)	Daily Demand Ratio (D)	Hourly Demand Ratio (H)	ASV
58	334	12	198,000

Sources: URS Corporation, 2010 and FAA AC 150/5060-5, Airport Capacity and Delay.
Note: The Cw is a weighted value that considers hourly capacities during VMC and IMC. Therefore, it should not be compared to the hourly capacities presented in Table 4.9.1-1.

Tables 4-6 and 4-7 provide a comparison of the Base Forecast and the High Scenario Forecast of aircraft operations to the existing airfield's ASV. As the tables indicate, current levels of demand consume approximately one-third of available capacity. Projected levels of demand at the end of the study period will consume 45 to 55 percent of capacity.

TABLE 4-6
COMPARISON OF BASE FORECAST TO ASV

Year	Baseline Forecast of Aircraft Operations	Estimated ASV	Base Forecast as a Percentage of ASV
2010	64,650	198,000	33%
2015	69,815	198,000	35%
2020	75,240	198,000	38%
2025	80,875	198,000	41%
2030	87,120	198,000	44%

Sources: URS Corporation, 2010 and FAA AC 150/5060-5, Airport Capacity and Delay.

TABLE 4-7
COMPARISON OF HIGH SCENARIO FORECAST TO ASV

Year	High-Growth Forecast of Aircraft Operations	Estimated ASV	High Scenario Forecast as a Percentage of ASV
2010	64,650	198,000	33%
2015	79,340	198,000	40%
2020	88,050	198,000	45%
2025	97,025	198,000	49%
2030	106,830	198,000	54%

Sources: URS Corporation, 2010 and FAA AC 150/5060-5, Airport Capacity and Delay.

FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), specifies that airport sponsors should recommend capacity improvements when annual aircraft operations approach 60 to 75 percent of the calculated ASV. The preceding tables indicate that MHT is not projected to reach 60 percent of capacity during the study period. Therefore, airfield capacity improvements such as new runways are not recommended. However, operational improvements such as new and improved instrument approach procedures, approach lighting or other actions that would improve the safety and operational efficiency of the airfield should, and will be, considered in subsequent sections of this Airport Master Plan Update.

4.2 TERMINAL FACILITY REQUIREMENTS

4.2.1 METHODOLOGY

The Comprehensive Airport Simulation Technology (CAST™) simulation tool was used for the development of terminal facility requirements. CAST™ allows detailed modeling of complex passenger and baggage processing facilities in airport terminals. The major advantages and benefits of CAST™ are:

- Accuracy of simulation;
- Facility requirements based on individual passenger processing results and demand profiles for the whole day (not just average peak-hour values) derived from gated flight schedules; and
- Sizing of facilities based on required level of service, maximum wait time, and maximum queue length.

Facility requirements for the following areas of the terminal were evaluated in this Airport Master Plan Update:

- Airline check-in;
- Passenger and employee screening;
- Checked baggage screening;
- Outbound baggage makeup;
- Restrooms;
- Holdrooms;
- Federal Inspection Services facilities for processing international arrivals;
- Inbound baggage off-load belts; and
- Baggage claim units.

This approach provides for more detailed and accurate results – including estimates of queue lengths and wait times – at the same level of effort as spreadsheet analyses. It is however, more data intensive as it is based on modeling of stochastic processes.

4.2.2 ASSUMPTIONS

This section presents the model assumptions for the facility requirements analysis related to (a) layouts, (b) flight schedules, (c) terminal usage and operations, and (d) passenger characteristics, preferences, routing, and behavior.

4.2.2.1 Terminal Layouts

The layout of facilities used for the analysis is based on existing terminal building floor plans. The floor plans were reviewed and updated in August 2009 based on site visit data.

4.2.2.2 Flight Schedules and Passenger Activity Levels

The flight schedules used for this analysis are as follows:

- Base Year Design Day—August 1, 2008, was identified as the Average Day Peak Month (ADPM) based on departing and arriving seats and operations. The ADPM flight schedule was obtained from the Official Airline Guide (OAG).
- Future Design Days—Future design day flight schedules were developed using the base year design day schedule, fleet mix, and other assumptions derived from the annual passenger forecast. Four future design day flight schedules were developed for the following Passenger Activity Levels (PAL): 2.0 (PAL 1), 2.25 (PAL 2), 2.5 (PAL 3), and 2.75 (PAL 4) million annual enplanements.

4.2.2.3 Percentage of Originating Passengers and Load Factors

The percentage of originating passengers was derived from the U.S. Department of Transportation, Origin-Destination Survey, which is based on a 10% sample of tickets. These data were adjusted using the U.S. DOT T100 database to account for the activity of U.S. flag and foreign flag carriers (who do not report data for the Origin-Destination Survey). Based on these data, it was estimated that originating passengers account for approximately 99% of enplaned passengers at the Airport. The originating passenger percent determines the direct passengers who go through check-in and security screening and affects the facility requirements.

Typically, load factors for the peak month and the ADPM are greater than the annual averages, reflecting increased demand during seasonal peak travel. The ADPM load factor assumptions used for this analysis were as follows:

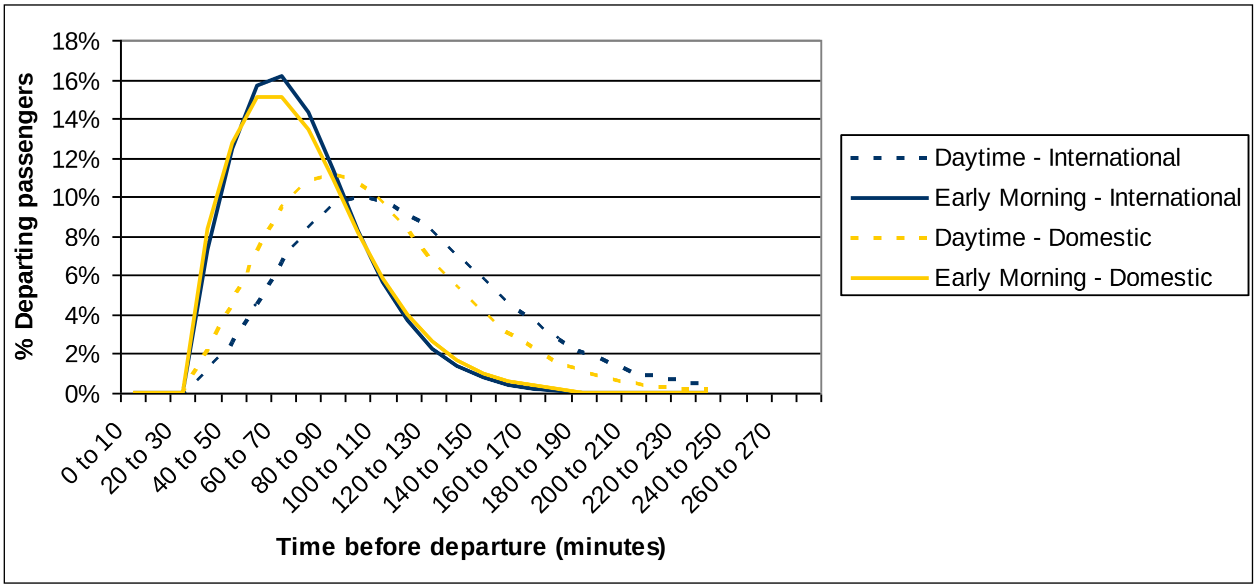
- 2008 – 78%
- PAL 1 – 86%
- PAL 2 – 86%
- PAL 3 – 87%
- PAL 4 – 89%

The base year ADPM load factor was based on the actual peak month and ADPM enplaned passengers in August 2008 and a matched flight schedule for the design day from OAG, which reflects the 2008 fleet mix of the airlines serving the Airport. The load factors for future years were estimated based on the annual number of enplaned passengers for each planning activity level, the assumed peak month percent of the year, and the future fleet mix.

4.2.2.4 Earliness Distribution

The earliness profiles are used to model the passengers' arriving pattern at the terminal prior to their flight departure times. The earliness profiles shown in **Figure 4-5** below are based on previous data collection efforts by Jacobs Consultancy at several U.S. airports and the *Manchester-Boston Regional Airport: Enplaning Passenger Survey, June 2008*.

FIGURE 4-5
PASSENGER EARLINESS PROFILES



Source: Jacobs Consultancy, 2010.

4.2.2.5 Airline Check-In

Airline-specific curbside and lobby-based check-in processes were modeled to determine check-in requirements. To guarantee an acceptable level of service it was assumed that the maximum wait time would be 15 minutes and that the airlines would staff their counters to attain this target. The transaction times at the counters are variable depending on the type of check-in process. Passenger check-in preferences and their corresponding transaction time assumptions are shown in **Table 4-8**.

TABLE 4-8
PASSENGER CHECK-IN PREFERENCES AND TRANSACTION TIMES

Check-in Type	Percent Originating Passengers – Southwest Airlines	Percent Originating Passengers – All Other Airlines	Average Transaction Time (minutes)
Off-site check-in with no bag to check	18%	18%	n/a
Terminal check-in:			
First class	0%	5%	1.3
Bag drop only[1]	44%	21%	1.3
Self-service kiosk and bag drop[2]	4%	12%	2.8
Main class with agent[3]	11%	25%	3.5
Self-service kiosk with no bag to check	19%	19%	1.5
Curbside check-in	4%	0%	2.0
Terminal total	82%	82%	

[1] Passengers would have already printed their boarding pass remotely before dropping their bags.
[2] Passengers would print their boarding pass at a kiosk in the check-in area before dropping their bags.
[3] An agent would assist the passengers with the entire check-in process.

Sources: Estimated based on previous Jacobs Consultancy data collection and projects at other airports, airline input, and *Manchester-Boston Regional Airport: Enplaning Passenger Survey, June 2008*.

4.2.2.6 Airline Ticket Offices

Airlines utilize offices located adjacent to ticket counters to conduct daily functions in support of the ticketing operation. Traditionally, required space was a calculation based on linear frontage of ticket counters. In recent years, airlines have started requesting less space to reduce financial obligations. For planning purposes, a conservative estimate was assumed of airline ticket office will be required based on the number of ticket counters, with recognition that less space may be requested through individual discussions with each airline. The airline ticket office requirement only includes the offices adjacent to the ticketing area and does not include other airline support spaces such as gates offices, airline operations offices or baggage service.

4.2.2.7 Passenger and Employee Screening

An average security screening processing rate of 180 passengers per hour per lane was assumed. This throughput is currently achieved by airports with efficient lane configuration. Transportation Security Administration (TSA) is developing new screening technologies that are more efficient and are estimated to give higher throughputs (200 passengers per hour per lane). To plan adequately for future demand, a more conservative throughput of 180 passengers per hour was used for the Security Screening Check Point (SSCP) requirements analysis. To guarantee an acceptable level of service it was assumed that the maximum wait time would be 10 minutes in the queue.

Passengers are processed currently at one of three SSCPs based on the allocations shown in **Table 4-9**. It is assumed that employees would constitute about 5% of the traffic passing through the SSCPs. For future year analyses, a total of 2 checkpoints were simulated: (a) checkpoints B and C combined into one, and (b) checkpoint A.

TABLE 4-9
PASSENGER SECURITY SCREENING CHECKPOINTS

Passenger Security Screening Checkpoint	Number of Lanes	Usage
A	2	Delta Air Lines, Northwest Airlines, United Airlines, Continental Airlines and Air Canada passengers
B and C	5	Southwest Airlines and US Airways passengers and employee screening

Sources: Jacobs Consultancy and URS, August 2009.

4.2.2.8 Checked Baggage Screening

The baggage screening demand for the Level 1 Explosion Detection System (EDS) screening was estimated based on the simulation model output of the check-in process. As bags are checked in, they are loaded on conveyor belts that convey them to airline-specific, mini in-line Level 1 EDS machines. The peak-hour baggage screening demand for each screening zone was compared to the maximum hourly screening machine throughput which is assumed to be 325 bags per hour per EDS machine. The typical throughput for a mini in-line setup with L3-6000 EDS machines is 375 bags per hour, but given some of the existing limitations in the conveyor layout, the throughput was reduced to 325 bags per hour. Average number of checked bags per originating passenger was assumed to be 0.9 for all airlines. **Table 4-10** shows the bag distribution used in the analysis.

TABLE 4-10
CHECKED BAG DISTRIBUTION

Number of Checked Bags per Originating Passenger	Percentage of Passengers
0	37%
1	44%
2	17%
3	2%

Note: Estimated based on previous Jacobs Consultancy data collection and projects at other airports, including airline input.
Source: Jacobs Consultancy, 2009.

4.2.2.9 Outbound Baggage Makeup

Outbound baggage makeup requirements were based on the number of departing flights in the peak 2-hour time period per baggage makeup device, since this is the time needed on average to make-up a flight. The number of checked bags for these specific flights in the peak 2-hour time period was obtained from the CAST^{TM} simulation model. Outbound baggage makeup requirements were estimated by baggage makeup device and were based on the following assumptions:

- Each cart can accommodate approximately 44 bags;
- Carts are parked perpendicular to the baggage makeup belt for all airlines;
- Each cart occupies 8 feet of linear frontage on the belt (plus 3-foot buffer between two adjacent carts), when parked perpendicularly to the baggage makeup belt; and
- For future year simulations, the baggage makeup requirements for Delta and Northwest Airlines are combined.

4.2.2.10 Holdrooms

A range of space requirements were estimated for each holdroom based on: (a) High - the largest aircraft that can be parked at each gate, and (b) Low - the largest aircraft that can be parked at each gate and is also present in the future schedules.

It was then assumed that seating capacity for 80% and standing space for 20% of passengers would be provided. Planning factors of 17 square feet per seated passenger and 12 square feet per standing passenger were used. Space requirement of 350 square feet for check-in podium and queuing area and 175 square feet for the boarding queue was assumed. A reduction of 10% was applied to shared holdroom space.

4.2.2.11 Restrooms

Restroom requirements were estimated separately for:

- Check-in lobby (non-secure side): based on the peak 20-minute originating passengers and well-wishers derived from the simulation model;
- Arrivals lobby (non-secure side): based on the peak 20-minute terminating passengers and meeter/greeters derived from the simulation model; and
- Boarding area (secure side): based on the peak 20-minute of the total number of passengers, arriving and departing, dwelling in the boarding area derived from the simulation model.

An average of 0.2 well-wishers per originating passenger and 0.2 meeters/greeters per terminating passenger was assumed. The restroom fixtures were then estimated based on 1 fixture per 10 peak 20-minute passengers as defined above. An average of 50 square feet per fixture was used to estimate space requirements including circulation. In addition, for every 16 fixtures 50 square feet of space was allocated for janitor's closets. Three family restrooms are recommended – 100 square feet each and one in each area.

4.2.2.12 Baggage Claim

The CAST™ simulation models the passengers arriving at a bag claim unit and bags off-loaded on the inbound belt. The model matches individual bags to passengers and estimates the maximum number of passengers claiming bags at any time. The off-load rate on the bag claim was assumed to be 12 bags per minute. Passengers were assumed to occupy 2 linear feet along the bag claim frontage. The time taken from block time to the time when the first bag reaches the belt was assumed to be 15 minutes. The deplaning rate (the rate at which passengers exit from the aircraft onto the jet bridge) was assumed at 20 passengers per minute per door based on industry standards. The passenger travel time from gate to baggage claim was assumed to be 5 minutes on average. **Table 4-11** shows the bag claim allocation assumptions:

TABLE 4-11
BAG CLAIM ALLOCATION ASSUMPTIONS

Bag Claim Area	Number of Units	Usage
Bag claim A units	2	Delta Air Lines, Northwest Airlines, United Airlines, Continental Airlines and Air Canada
Bag claim B units	3	Southwest Airlines and US Airways

Source: URS, August 2009.

4.2.2.13 Inbound Baggage Off-Load

The linear frontage required to off-load inbound bags is based on the assumption that each baggage claim unit has one off-load conveyor with a direct feed to the baggage claim unit. The peak 20-minute number of arriving flights was calculated for each off-load belt, based on the flight schedule and the bag claim allocation assumptions. Depending on the aircraft type, the number of carts per flight to be dispatched in a 20-minute interval was assumed as follow:

- Narrowbody – 3 carts plus tug; and
- Regional jet – 2 carts plus tug.

To estimate linear frontage requirements, it was assumed that a tug is approximately 8 feet long and a cart is approximately 10 feet long. Cart and tugs are parked parallel to the off-load belt.

4.2.2.14 Gate Allocation

The design day flight schedules were gated using the Jacobs Consultancy's proprietary Gate Model computer software. Gate Model takes into account the matched flight schedule, turn-times, buffer times, remote towing times, allocation criteria, exclusive and common use gates. The following **Table 4-12** shows the largest aircraft type that can be parked at any gate along with airline usage assumptions.

TABLE 4-12
GATE ALLOCATION ASSUMPTIONS

Gate Number	Airline Usage	Maximum Wingspan	Maximum Length
1	Continental Airlines	B-757-300	B-757-300
2	Continental Airlines, Air Canada	B-737-800	MD-80
3	Northwest Airlines, Air Canada	B-757-300	B-757-300
4	Northwest Airlines	B-737-800	MD-80
5	United Airlines	B-757-300	B-757-300
6	United Airlines	CRJ-700	CRJ-700
7A	Delta Air Lines	CRJ-200	CRJ-200
7	Delta Air Lines	B-737-800	MD-80
8	US Airways	B-757-300	B-757-300
9A	US Airways	A-321	A-321
9	US Airways	A-321	A-321
10	Common Use	CRJ-700	CRJ-700
11	Southwest Airlines	B-737-700	B-737-700
12	Southwest Airlines	B-737-700	B-737-700
14	Southwest Airlines	B-737-700	B-737-700
15A	Southwest Airlines	B-737-700	B-737-700
15	Southwest Airlines	B-737-700	B-737-700

Source: URS, August 2009.

A gate dependency was assumed as follows: when Gate 9 is occupied, the largest aircraft that can be parked at Gate 9A is a CRJ-700.

4.2.2.15 Federal Inspection Services Facilities

The following components were modeled in the simulations:

- Primary immigration counters—Arriving passengers on international flights that are non-preclear are processed through primary inspection. The U.S. and non-U.S. specific counters, transaction times and queuing were modeled. The average transaction time is based on data collected from airports.

- Form check counters—After claiming their bags, international passengers proceed to form check counters where their customs forms are checked. Passengers are then either directed to the exit or diverted to agriculture check or detailed customs check facilities. These passengers are metered through the baggage claim process in the simulation model before they proceed to the form check counters. The average transaction time is based on previous data collection efforts by Jacobs Consultancy.

- Agriculture and customs check facilities—These facilities were modeled based on distributions of transaction times to estimate the number of lanes/counters. The average transaction times and percentage splits is based on previous data collection efforts by Jacobs Consultancy.

4.2.2.16 Level of Service Standards

As mentioned in previous paragraphs, level of service standards/targets were used in the facility requirements analysis in the form of passenger wait time, passenger queue length and passenger densities. Our assumptions are summarized below:

- Airline check-in – 15 minutes maximum wait time;

- Passenger and employee screening – 10 minutes maximum wait time in the queue;

- Passenger queuing area for check-in – 15 square feet per passenger (based on input from URS);

- Passenger queuing area for passenger security screening and immigration check – 15 square feet per passenger (equivalent to LOS A as defined in *IATA Airport Development Reference Manual, 9th Edition, effective January 2004*);

- Passenger circulation in departure area – 24.8 square feet per passenger based on LOS C (*IATA Airport Development Reference Manual, 9th Edition, effective January 2004*);

- Primary immigration counters – Maximum passenger wait time of 60 minutes;

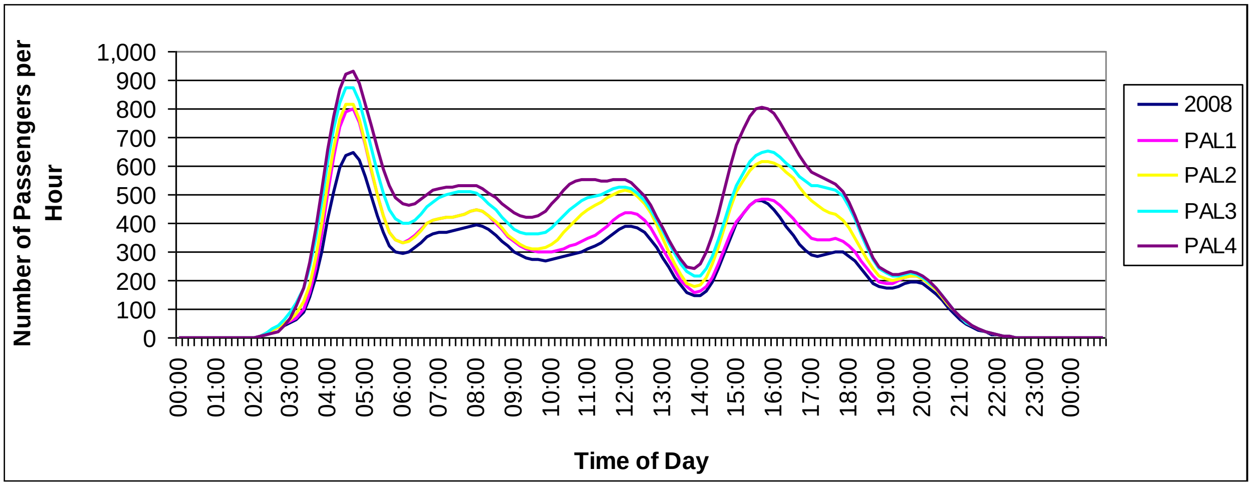
- Form check counters – Maximum passenger wait time of 5 minutes; and

- Agriculture check lanes – Maximum passenger queue length of 5 passengers per lane.

4.2.2.17 Facility Requirement Results

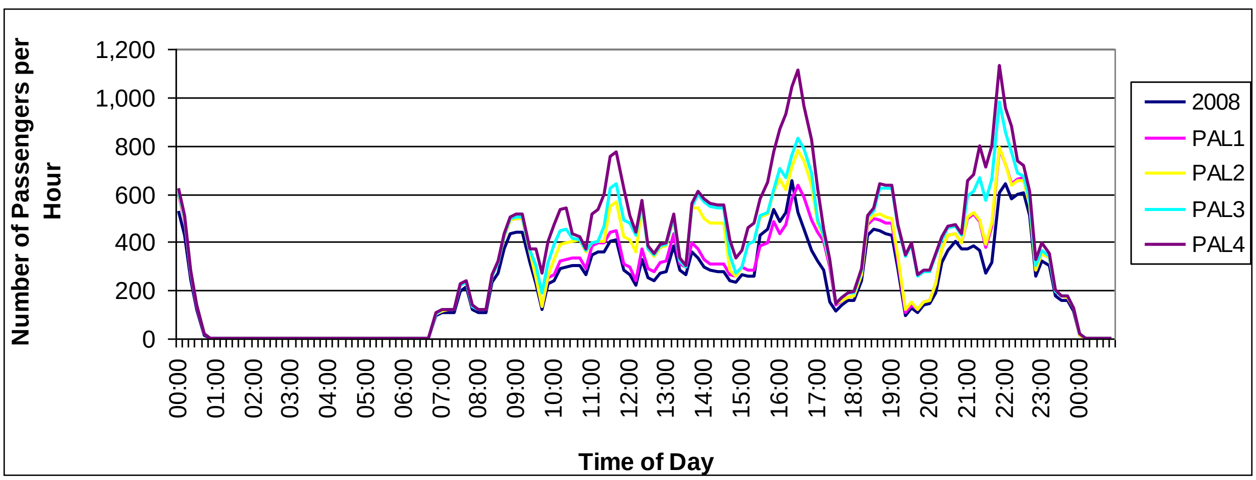
The CAST™ simulation tool was used for identifying facility requirements analysis for the Airport Master Plan Update. Sizing of facilities was based on desired level of service, maximum passenger wait time, and maximum passenger queue length. The requirements were passenger demand driven and were estimated for the baseline scenario (2008 schedule) and four future activity levels (2, 2.25, 2.5, and 2.75 million annual enplanements). The passenger demand profiles for originating and terminating passengers by time of day is shown in **Figures 4-6 and 4-7**.

FIGURE 4-6
ROLLING HOURLY ORIGINATING PASSENGER FLOWS



Source: Jacobs Consultancy, 2011.

FIGURE 4-7
ROLLING HOURLY TERMINATING PASSENGER FLOWS



Source: Jacobs Consultancy, 2011.

The facility requirement results are organized by area in the tables listed below.

- Airline Check-in (**Table 4-13**);
- Airline Ticket Offices (**Table 4-14**);
- Passenger Security Screening Checkpoint (**Table 4-15**);
- Mini-Inline Baggage Screening (**Table 4-16**);
- Outbound Baggage Makeup (**Table 4-17**);
- Restrooms (**Table 4-18**);
- Holdrooms (**Table 4-19**);
- Inbound Baggage Off-Load (**Table 4-20**);
- Baggage Claim (**Table 4-21**);
- Federal Inspection Services (**Table 4-22**); and
- Gates (**Table 4-23**).

TABLE 4-13
AIRLINE CHECK-IN – NUMBER OF TICKET COUNTERS

Airline	Counter Type	Existing[1]	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Air Canada and United Airlines	First class	Yes	1	2	2	2	2
	Main agent	4	3	3	3	3	3
	Kiosk	--	2	2	2	2	2
	Kiosk with bagdrop	6	3	3	3	3	3
	Vacant	2	--	--	--	--	--
	Subtotal	**12**	**9**	**10**	**10**	**10**	**10**
Continental Airlines	First class	--		--	--	--	--
	Main agent	4	1	1	1	1	1
	Kiosk	--	1	1	1	1	1
	Kiosk with bagdrop	4	1	1	1	2	2
	Vacant	2	--	--	--	--	--
	Subtotal	**10**	**3**	**3**	**3**	**4**	**4**
Delta Air Lines[2]	First class	--	1	1	1	1	1
	Main agent	3	1	3	3	3	3
	Kiosk	--	1	1	1	1	1
	Kiosk with bagdrop	4	1	2	2	2	2
	Vacant	7	--	--	--	--	--
	Subtotal	**14**	**4**	**7**	**7**	**7**	**7**

TABLE 4-13 (CONTINUED)
AIRLINE CHECK-IN – NUMBER OF TICKET COUNTERS

Airline	Counter Type	Existing[1]	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Northwest Airlines[2]	First class	--	1	0	0	0	0
	Main agent	--	2	0	0	0	0
	Kiosk	--	1	0	0	0	0
	Kiosk with bagdrop	--	1	0	0	0	0
	Vacant	9	--	--	--	--	--
	Subtotal	**9**	**5**	**0**	**0**	**0**	**0**
US Airways	First class	Yes	1	1	1	1	1
	Main agent	4	3	4	4	4	4
	Kiosk	--	1	1	1	1	1
	Kiosk with bagdrop	4		2	3	3	3
	Vacant	2	--	--	--	--	--
	Subtotal	**10**	**5**	**8**	**9**	**9**	**9**
Southwest	Main agent	2	3	3	4	4	5
	Kiosk	2	2	2	3	3	4
	Kiosk with bagdrop	6	4	5	6	6	8
	Curbside	Yes	1	1	1	1	1
	Vacant	3	--	--	--	--	--
	Subtotal	**13**	**10**	**11**	**14**	**14**	**18**
Other	First class	--	--	--	1	1	1
	Main agent	--	--	--	3	3	3
	Kiosk	--	--	--	1	1	1
	Kiosk with bagdrop	--	--	--	2	2	2
	Vacant	--	--	--	--	--	--
	Subtotal	**0**	**0**	**0**	**7**	**7**	**7**
	Vacant	25	--	--	--	--	--
	Non-Vacant	43	37	39	50	51	55
Total		**68**	**36**	**39**	**50**	**51**	**55**

Notes: [1] Existing ticket counter allocation provided by URS, August 2009.
[2] NW and DL merged in 2009, but were still operating as two separate airlines in 2008, the Airport Master Plan Base Year. For future PALs, facility requirements are reported under DL.
[3] Minimum queuing area of 2,190 square feet (equivalent to LOS B) is recommended.
[4] Minimum circulation area of 3,630 square feet (equivalent to LOS C) is recommended.

Source: Jacobs Consultancy, 2010.

TABLE 4-14
AIRLINE TICKET OFFICES (ATO) –
AIRLINE OFFICE SQUARE FOOTAGE REQUIREMENTS

Area	Existing	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Ticket Counter Linear Footage	310	234	254	325	332	358
ATO Space	8,173	3,510	3,803	4,875	4,973	5,363

Notes: [1] Based on the assumption that airlines will require a typical amount of office space per ticket counter and that a new entrant will begin service during PAL 2 requiring ticket counters and ATO space.
[2] Individual airline requests for office space may be less than expected due to financial considerations.
[3] Airline Ticket Offices only include those office located adjacent to the ticketing area and does not include other support spaces required by airlines such as gate office, baggage service office or operations offices.

Source: Jacobs Consultancy, 2010.

TABLE 4-15
PASSENGER SECURITY SCREENING CHECKPOINT (SSCP) –
NUMBER OF CHECKPOINT LANES

Security Checkpoint	Existing Number of Lanes	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
A	2	2	2	2	2	2
B	2	1	--	--	--	--
C	3	2	3	4	4	5
Total	**7**	**5**	**5**	**6**	**6**	**7**

Notes: [1] Based on the assumption that there is no dedicated lane for employee screening.
[2] Based on a throughput of 180 passengers per hour per lane. Lanes are based on number of x-ray machines. Magnetometers are usually shared between two x-ray machines.
[3] Two checkpoints were simulated for future years: (1) checkpoint C, and (2). checkpoints B and C combined into one.
[4] Employees represent 5% of the departing passengers.
[5] Minimum queuing area of 720 square feet for C and 2,390 square feet for A/B is recommended.

Source: Jacobs Consultancy, 2010.

TABLE 4-16
MINI IN-LINE BAGGAGE SCREENING –
NUMBER OF MINI IN-LINE EDS MACHINES

Screening Zone	Existing[1]	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Air Canada and United Airlines	1	1	1	1	1	1
Continental Airlines	1	1	1	1	1	1
Northwest Airlines[2]	1	1	--	--	--	--
Delta Air Lines[2]	1	1	1	1	1	1
US Airways	1	1	1	1	1	1
Southwest	2	2	2	2	2	2
Other	--	--	--	1	1	1
Vacant	1	--	--	--	--	--
Total	**8**	**7**	**6**	**7**	**7**	**7**

Notes: [1] Does not include the two existing stand-alone EDS machines, which are considered redundant.
[2] NW and DL merged in 2009, but were still operating as two separate airlines in 2008, the Airport Master Plan Base Year. For future PALs, facility requirements are reported under DL.
Source: Jacobs Consultancy, 2010.

TABLE 4-17
OUTBOUND BAGGAGE MAKEUP –
LINEAR FEET OF BAGGAGE MAKEUP BELT

Makeup Unit	Existing	2008 Required	Makeup Unit (Re-allocated)	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Air Canada and United Airlines	50	33	AC + UA	44	44	55	55
Continental airlines and Northwest Airlines[2]	85	44	CO	22	22	33	33
Delta Air Lines[2]	55	22	DL	55	55	55	55
US Airways	60	77	US	66	77	77	77
Southwest	100	143	WN	143	165	176	231
Other	--	--	XX	--	44	44	44
Total	**350**	**319**		**330**	**407**	**440**	**495**

Notes: [1] The carts are assumed to be parked perpendicular to the baggage makeup belt for all airlines.
[2] NW and DL merged in 2009, but were still operating as two separate airlines in 2008, the Airport Master Plan Base Year. For future PALs, facility requirements are reported under DL.
Source: Jacobs Consultancy, 2010.

TABLE 4-18
RESTROOMS – RESTROOM SQUARE FOOTAGE REQUIREMENTS[1]

Area	Existing[2]	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
Check-in Lobby/Mezzanine (pre-SSCP)	1,650	1,500	1,850	1,950	2,100	2,050
Mezzanine (pre-SSCP)/ Arrivals Lobby	1,650	2,550	2,900	2,900	2,950	3,700
Boarding Area	2,843	2,800	2,800	2,900	3,150	4,000
Total	**6,142**	**6,850**	**7,550**	**7,750**	**8,200**	**9,750**

Notes: [1] Includes requirements for men and women's restrooms, janitor's closets and circulation. Does not include family restrooms and nursery rooms.
[2] The existing pre-security restroom area on the mezzanine is used by both arriving and departing passengers.
[3] In addition to the requirements above, we recommend provision of 3 family restrooms - 100 square feet each and one in each area.
Source: Jacobs Consultancy, 2010.

TABLE 4-19
HOLDROOMS – HOLDROOM SPACE REQUIREMENTS (SQUARE FEET)

Gate Number	Holdroom Designation	Existing	Future - High	Future - Low
1	1 & 2	4,299	5,843	2,947
2	--	--	--	--
3	3 & 4	4,277	5,843	4,895
4	--	--	--	--
5	5 & 6	2,195	4,818	3,870
6	--	--	--	--
7A	--	--	--	--
7	7	1,904	3,613	3,613
8	8	2,668	3,715	2,661
9A	--	--	--	--
9	9	2,108	4,292	3,870
10	10	1,162	1,522	1,522
11	11 & 12	3,192	4,562	4,562
12	--	--	--	--
14	14	2,220	2,476	2,476
15A	--	--	--	--
15	15	2,522	4,562	4,562
Total		**26,547**	**41,246**	**34,976**

Notes: [1] The high range of holdroom requirements is based on maximum aircraft size that can be parked at a gate. The low range is based on maximum aircraft size that can be parked at a gate in the future flight schedules.
[2] Holdroom requirements account for gate dependency on Gate 9 & 9A.
[3] Based on 80% seated and 20% standing passengers.
[4] International flights are assumed to be parked at Gate 1.
Source: Jacobs Consultancy, 2010.

TABLE 4-20
INBOUND BAGGAGE OFF-LOAD – PEAK 20 MINUTE ARRIVALS

Baggage Claim	Existing Number of Off-Load Belts	PAL 1 Required Off-Load Belts	PAL 2 Required Off-Load Belts	PAL 3 Required Off-Load Belts	PAL 4 Required Off-Load Belts
A					
RJ	-	2	2	1	2
NB	-	-	-	1	1
Total	**2**	**2**	**2**	**2**	**3**
B					
RJ	-	1	-	3	3
NB	-	2	3	1	2
Total	**3**	**3**	**3**	**4**	**5**

Source: Jacobs Consultancy, 2010.

TABLE 4-21
BAGGAGE CLAIM – LINEAR FRONTAGE REQUIREMENTS (FEET)

Baggage Claim	Airlines	Existing	2008 Required	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
A1	All other airlines	160	138	144	160	162	182
A2	All other airlines	140	90	94	154	178	178
B1	Southwest and US Airways	105	158	172	174	216	232
B2	Southwest and US Airways	105	146	162	164	174	228
B3	Southwest and US Airways	105	156	162	164	302	302

Notes: [1] For PAL2, PAL3 and PAL4, there is an international flight with about 175 passengers. Since these passengers spend time in FIS facilities before arriving at the bag claim, their bags remain on the belt for a longer time. It may be desirable to have a larger bag claim belt or have the bags ported on the floor to ease the makeup area.

Source: Jacobs Consultancy, 2010.

TABLE 4-22
FEDERAL INSPECTION SERVICES

FIS Process	Simulation	CBP Guidelines
Number of Primary Immigration Counters	12	4
Queuing Area for Primary Immigration (square feet)	2,490	2,640

Notes: [1] Assumes an international flight (B767).
[2] Simulation result is based on passenger level of service of 60 minutes maximum wait time.
[3] CBP guidelines estimate is based on planning factors for a small airport (Airport Technical Design Standards, Passenger Processing Facilities, U.S. Customs and Border Protection, August 2006).
[4] In addition, 1 form check counter, 1 agriculture check lane, and 2 customs check counters are recommended.

Source: Jacobs Consultancy, 2010.

TABLE 4-23
GATES – ADDITIONAL GATE REQUIREMENTS

Existing	PAL 1 Required	PAL 2 Required	PAL 3 Required	PAL 4 Required
0	0	2	3	5

Notes: [1] The gating for future activity levels is based on the same airline usage/sharing as existing condition. These usage assumptions are described in the assumptions section in the report.
[2] At PAL2 two additional RJ gates are needed.
[3] At PAL3 two additional RJ gates and one additional NB gate is needed.
[4] At PAL4 two additional RJ gates and three additional NB gates are needed.
[5] There are sufficient remote gate positions.
Source: Jacobs Consultancy, 2010.

4.3 SURFACE TRANSPORTATION DEMAND/CAPACITY AND FACILITY REQUIREMENTS

4.3.1 INTRODUCTION

Surface Transportation is essential to the successful operation of the Manchester-Boston Regional Airport (MHT). Whether arriving by personal vehicle, rental car, city bus, or drop off, patrons expect a safe, convenient, and efficient system to get them to the airport terminal. Employees also need adequate parking that provides access to their work place. The Surface Transportation system at MHT consists of the following components:

- Roadways
  - Access roadway
  - Terminal loop roadway
- Parking
  - Short-Term Surface parking
  - Long-Term Surface parking
  - Long and Short-Term Garage parking
  - Employee parking
  - Cell Phone parking
- Curbside Roadways
  - Taxi/ Limousine parking
  - Shuttle bus parking
  - Parking lot shuttle bus parking
- Rental Cars
  - Rental Car Returns
  - Ready Rental Cars
  - Rental Car storage and service

- Ground Transportation
    - Transit
    - Taxicabs
    - Limousines
    - Shuttles

The transportation system supporting MHT begins at the regional level with the highways that lead to the airport. Two north-south corridors, Interstate 93 and the F.E. Everett Turnpike (Everett Turnpike) are located east and west of the airport respectively and provide connections between northern and southern New England. In addition, Interstate 293 (I-293) connects both routes just north of MHT. Exit 2 on I-293 is the primary interchange providing airport access via NH Route 3A (Brown Avenue). Access can also be obtained via Exit 1, South Willow Street, Harvey Road, and Perimeter Road. **Figure 4-8** depicts these existing airport access points.

Brown Avenue and Perimeter Road lead directly to Airport Road, which is the only means to access the terminal and parking garage and lots. Airport Road passes under Taxiway M and is the only road in or out of the airport's terminal area. **Figure 4-9** depicts the roadway system near the airport.

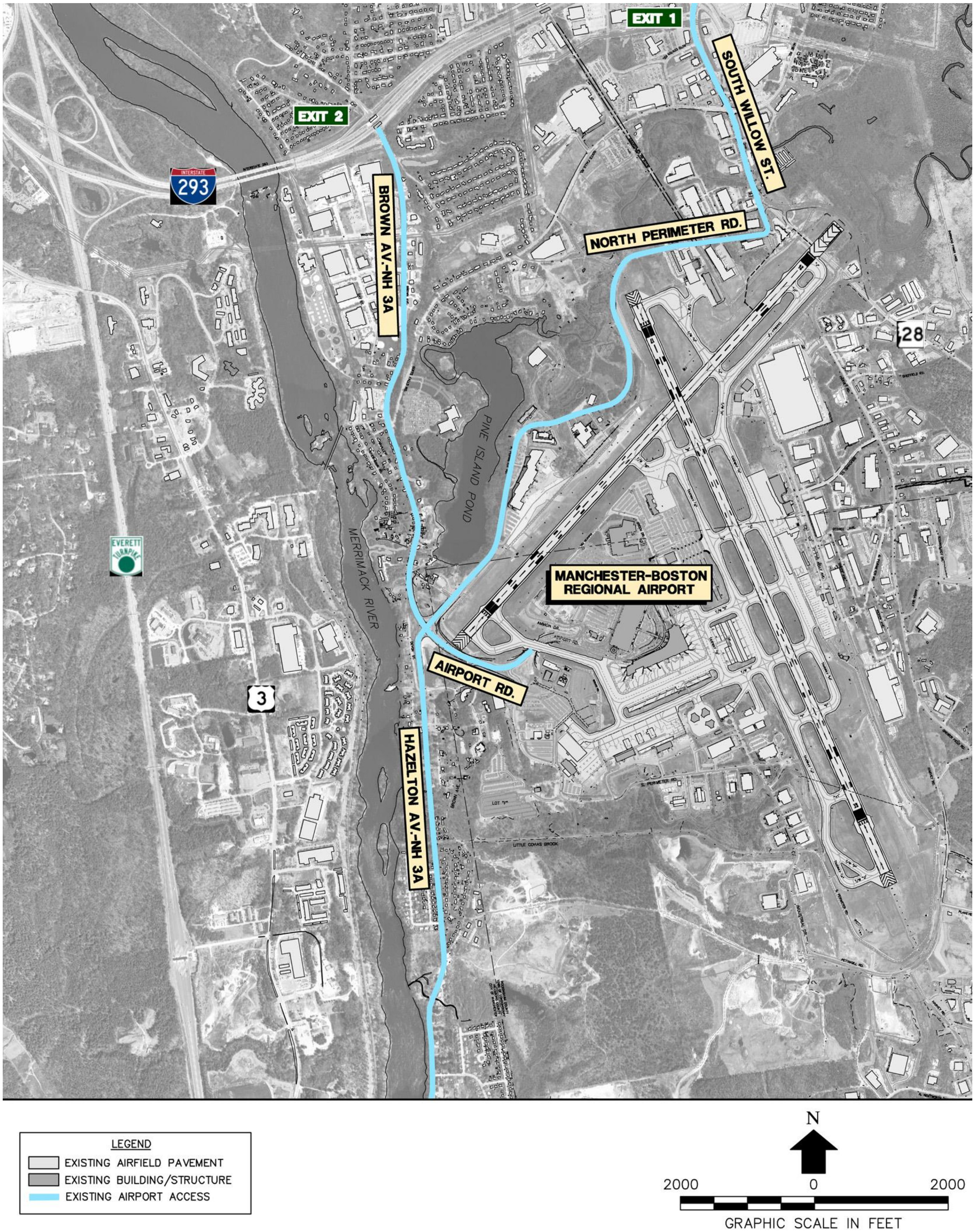
A new Airport Access Road is currently under construction and is scheduled for completion in 2013. It will provide an additional regional connection to the airport. The new road will connect directly to the Everett Turnpike. The Everett Turnpike is an interstate type primary north-south highway connecting Massachusetts, Nashua, Manchester, and Concord. The trip to or from the airport for passengers originating from/returning to the south will be shortened by 3 miles. The new Airport Access Road will connect to Airport Road just south of its passage under Taxiway M. New roundabouts will be created at the intersections with Airport Road and South Perimeter Road. **Figure 4-10** depicts the new Airport Access Road.

Airport Road is a two-way roadway until it reaches a point just east of Ammon Drive near the parking garage. The road then splits to become a one-way loop that runs parallel to the terminal and then circles around the parking garage. Traffic may make a complete circle to return to the terminal if desired. Ammon Drive provides access to Long-Term parking, employee parking, the cell phone lot, private businesses, and the airport loading dock.

As departing passengers enter the airport via Airport Road, there are decisions to be made depending upon the vehicle they are driving or riding in, and how long they will be at the airport. Patrons driving personal vehicles may access Long-Term parking lots from Ammon Drive (Lots C & D) or the Terminal Loop Roadway (Lot C). Shuttle buses carry passengers from the Long-Term parking lots to the Terminal drop-off at the outer curbside. Patrons on arriving flights reverse this course.

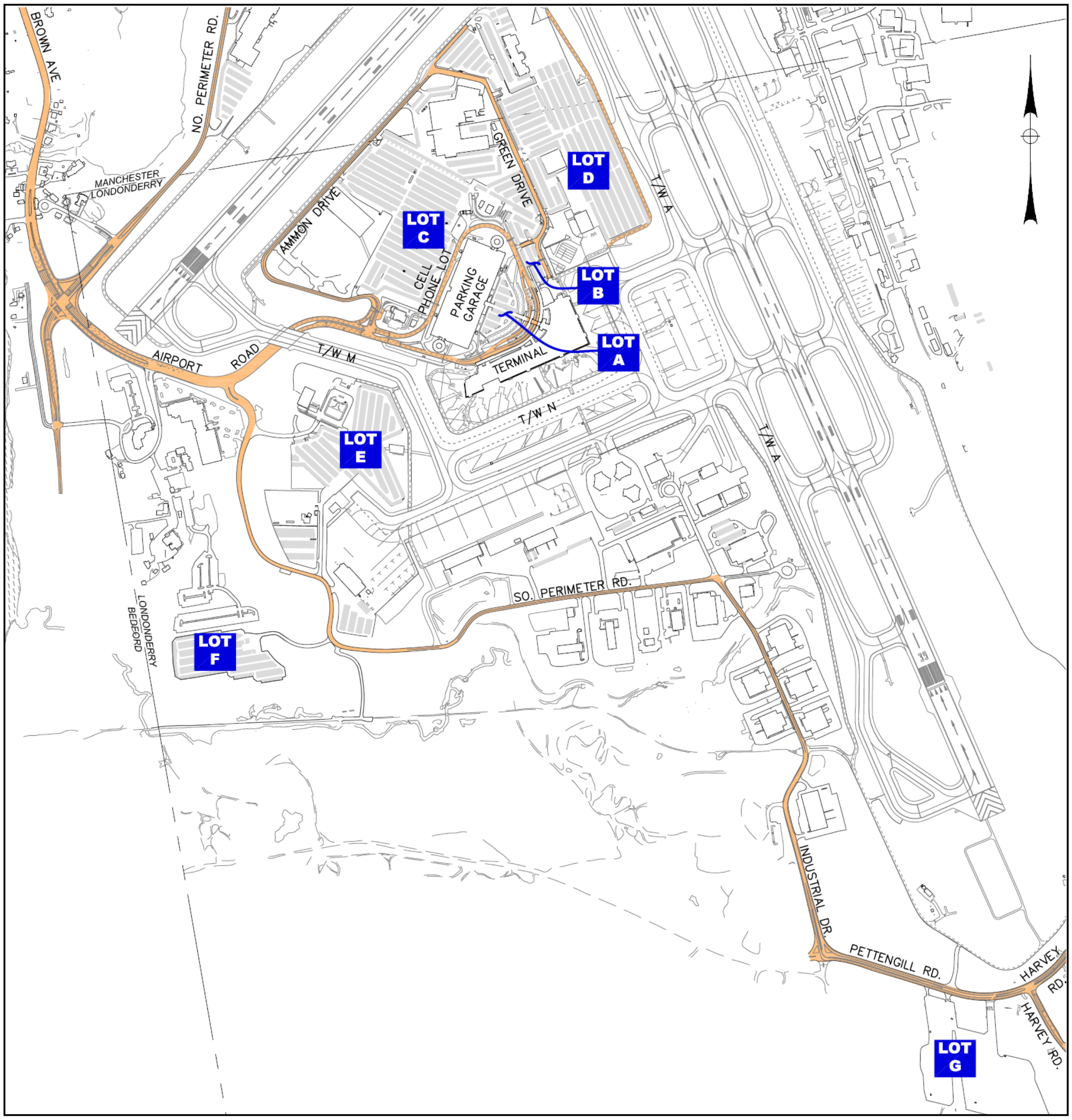
Patrons driving personal vehicles who have a shorter stay may choose to use the garage or Lot A. Access to the garage and Lot A are also provided from the Terminal Loop Roadway. From the garage, patrons may access the terminal directly via the pedestrian bridge on the second floor of the garage. Parking fees at the garage and Lot A are higher than at the Long-Term lots for stays over five hours.

FIGURE 4-8
EXISTING AIRPORT ACCESS



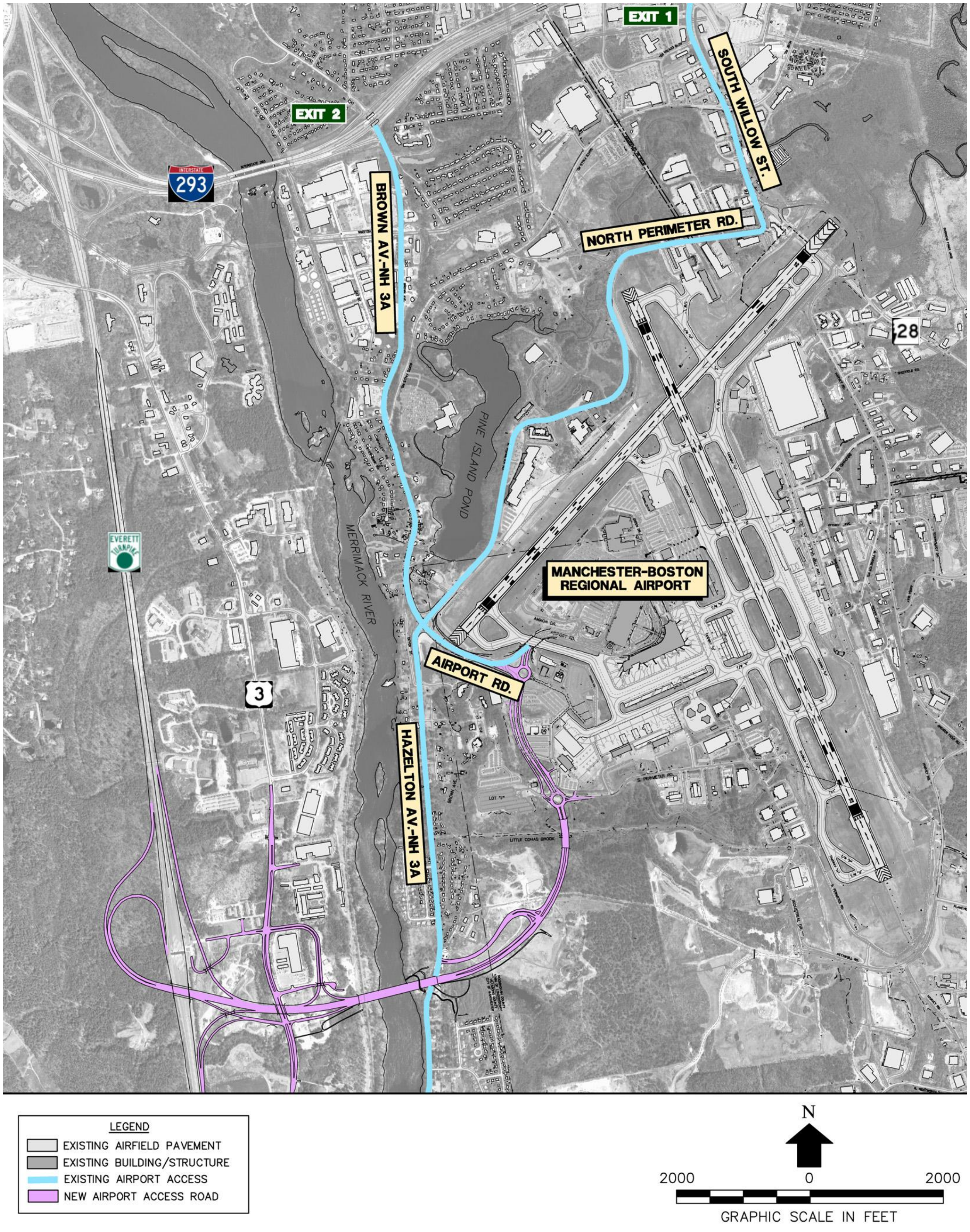
Source: McFarland Johnson, URS Corporation, 2010.

FIGURE 4-9
TERMINAL AREA ROADWAY SYSTEM



Source: McFarland Johnson, 2010.

FIGURE 4-10
NEW AIRPORT ACCESS ROAD



Source: McFarland Johnson, URS Corporation, 2010.

Patrons returning rental cars access the rental return area, located on the ground floor of the garage, via a designated entrance located directly off Airport Road. Once the rental car is returned, the patron may access the terminal via the pedestrian bridge on the second floor of the garage or at the ground level. Arriving patrons that wish to rent cars use the rental car counters located on the ground floor of the terminal. Rental cars for arriving patrons (ready cars) are located on the ground floor of the garage. The various rental car agencies have on and off-site facilities for additional storage and maintenance of vehicles.

Patrons arriving and departing the airport on buses, shuttles, limousines, or with friends or family in personal vehicles, utilize the various curbs along the terminal frontage. The inner curb (the one closest to the terminal) is used for dropping off departing passengers. The inner roadway curb may also be used by friends and family for picking up arriving passengers. Friends and family may wait at the Cell Phone Lot until the arriving passenger is ready for pick up at the curb. Buses and taxis must use the second roadway curb for pick up and limousines must use the third roadway curb for picking up arriving passengers.

4.3.2 SURFACE ROADWAY SYSTEM

The regional roadway system serving MHT is currently operating at acceptable levels of service. Patrons using Brown Avenue and Perimeter Road have minimal delays heading to the terminal and airport parking, except during typical morning and afternoon peak periods as well as holidays. During these peak periods Brown Avenue experiences congestion due to commuters heading for I-293. With no crossings of the Merrimack River south of the I-293/NH Route 101 Bridge, Brown Avenue becomes the only means for traffic to access I-93, I-293, and the Everett Turnpike.

This regional roadway system will receive a significant increase in capacity once the new Airport Access Road is completed and opened. Access from the south will be greatly enhanced while Brown Avenue and Perimeter Road will operate more effectively with reduced traffic. Along with the enhanced access to the airport, the new Airport Access Road includes a new crossing of the Merrimack River and direct access to the Everett Turnpike. Many commuters currently using Brown Avenue will divert to the new Airport Access Road, which will reduce congestion on Brown Avenue.

As described in Section 4.3.1, all regional roadways lead airport users to Airport Road in order to access the terminal and airport parking. As determined in Section 3, Surface Transportation Forecasts, Airport Road has, and will continue to have, the capacity to accommodate current and forecasted traffic demand. Section 3 presents the forecasts and level of service for the key airport intersections. The peak volumes and the associated levels of service through the planning horizon are at acceptable levels. All of the intersections are projected to be at Level of Service (LOS) B through 2030, which indicates minimal delay for patrons with reasonably free flowing traffic.

4.3.3 PARKING

MHT provides a variety of parking options for airport users, those transporting passengers to/from MHT, and employees. These facilities are generally classified in the following categories:

- Short-Term Hourly Surface parking
- Short/Long-Term Garage parking
- Long-Term Daily Surface Parking
- Cell Phone
- Employee

In order to determine the capacity requirements for parking at MHT it is necessary to evaluate not only a "design peak period", but the highest demand as well. During peak holiday periods, airport users expect to experience some delay on the roadways, but they expect a parking space will be available once they arrive at the airport, no matter how busy it is. For this reason, the evaluation of parking includes a typical design peak period, in this case the 27th Busiest Day for parking, as well as the overall Busiest Day. The 27th Busiest Day was chosen because it represents the 93rd percentile demand, which is a reasonable basis for planning. This approach provides the evaluation of design period peak, while determining the ultimate demand for parking.

4.3.3.1 Short-Term Hourly Surface Parking

Short-Term hourly parking is primarily for those parking while dropping off or picking up passengers. Currently this parking demand is accommodated by Lot A located directly in front of the terminal. This is a convenient lot as it is at the ground level and allows direct access into the terminal. The average stay in Lot A is approximately 1.4 hours. There are currently 136 spaces in Lot A and based on *Surface Transportation Forecasts*, the demand for Short-Term hourly parking currently exceeds Lot A's capacity during peak periods. This occurred in about 10% of the days in 2009.

The future demand for Short-Term hourly parking will exceed Lot A's capacity by as many as 56 spaces during the busiest day of the year. Lot A is constrained because of its proximity to the terminal. There is additional space in Lot A, however, for security requirements, it is within the 300-foot clear zone area of the terminal and cannot be used at this time. During the peak enplanement levels in 2005, Lot B was used for short-term hourly parking and employee parking. A portion of Lot B could be re-opened in the future, as needed, to address the deficiency of Short-Term hourly parking.

4.3.3.2 Short/Long-Term Garage Parking

The Parking Garage at MHT accommodates Short-Term hourly parking and Long-Term parking. The Garage is not as convenient as Lot A for Short-Term parking while picking up and dropping off passengers, but it is used for Short-Term parking by those who may prefer covered parking. For a stay up to 5 hours, the Parking Garage has the same cost as Short-Term Lot A. The Parking Garage is also used for Long-Term parking (stays lasting a day or longer) by those patrons who are willing to pay more to be closer to the terminal or be in covered parking. The average stay in the Garage is approximately 2.5 days, based on an increment of days, not hours.

MHT's Parking Garage has six levels, including the roof level. The ground floor is used for rental cars and the toll booths for both the garage and Lot A. The Parking Garage has 3,985 spaces available on Floors Two through Six. Currently, the roof level is not open.

Based on Surface Transportation Forecasts, the Parking Garage has sufficient capacity through the 2030 horizon to accommodate the design peak demand. However, there is a slight deficiency during the busiest day. Based on the parking data from 2009, this would only occur for two days of the year. The future demand also requires that the roof level be used.

4.3.3.3 Long-Term Daily Surface Parking

Long-Term daily parking is for passengers who will be leaving their vehicles for a longer period of time. The Long-Term parking rates are less for these lots, but the lots are further from the terminal. The average stay in Lot C is approximately 4.7 days. Regularly scheduled shuttle buses carry passengers from the Long-Term lots to the terminal curb. MHT has several Long-Term parking lots, including Lots C, D, E, F, and G. Lot C is the primary Long-Term parking lot and currently has 2,292 parking spaces. Lot D has 2,020 parking spaces and is only opened when parking demand warrants. Both Lots C and D are relatively close to the terminal and are convenient for airport users.

Long-Term Lots E and F are located on South Perimeter Road and currently are not being used by the airport. Lot E has 1,410 spaces and Lot F has 700 spaces. Both lots are complete and can be used if demand warrants. Lot G is located on Industrial Drive approximately 2 miles from the terminal. It has 1,311 spaces but is not currently equipped to handle airport user parking. The total number of Long-Term parking spaces that exist at Lots C through G is 7,733.

The Surface Transportation Forecasts indicates that the current number of Long-Term spaces is more than sufficient through the 2030 horizon for both the design peak demand and the busiest day demand. However, several concepts currently under consideration, or projects under construction, will impact the future capacities of several of the existing Long-Term parking lots. Some of these concepts will result in additional parking spaces for Lot C, while others will reduce the number in Lot E.

Table 4-24 contains the Long-Term parking demand based on Surface Transportation Forecasts section.

TABLE 4-24
PROJECTED LONG-TERM PARKING DEMAND EVALUATION

	2010	2015	2020	2025	2030
Growth Factor	**--**	**1.05**	**1.15**	**1.26**	**1.37**
Enplanements	**1,494,000**	**1,668,000**	**1,851,000**	**2,054,000**	**2,278,000**
27th Busiest Day Demand	2,651	2,784	3,049	3,340	3,632
Busiest Day Demand	3,636	3,818	4,181	4,581	4,981

Source: McFarland Johnson, 2010.

The total number of Long-Term parking spaces in the future is dependent on factors including: demand, existing leases, relocation of roadways, future parking garage, etc. However, for the Airport Master Plan horizon year of 2030, there are modifications that can be quantified, these include:

- The new Airport Access Road will eliminate approximately 200 parking spaces in Lot E.
- The relocation of Ammon Drive will eliminate approximately 380 parking spaces in Lots C and D.
- Available land could expand Lot C by approximately 1,327 spaces.
- Potential air cargo expansion could eliminate up to 750 spaces in Lot E.
- Expiration of Freudenberg NOK lease could allow Lot C to expand by approximately 1,070 spaces.

In summary, the total number of Long-Term parking spaces at MHT should be sufficient for both the Design Peak demand and the Busiest Day demand. The forecasted demand through 2030 for Long-Term parking indicates that the airport has an adequate number of parking spaces and the ability to expand parking facilities to meet demand projected though the planning period. The demand for Long-Term parking can be met using only Lots C and D at their future capacities. With the expansion of Lot C using currently available land only, Lots C and D would have a total of at least 5,200 Long-Term parking spaces. The 5,200 total spaces would be sufficient for Long-Term demand thru 2030.

Beyond 2030, the quantity and ratio of parking near the terminal will likely change in the ultimate plan for MHT. A second parking garage adjacent to the north side of the existing parking garages would increase the overall number of parking spaces. However, there would be a higher percentage of Short-Term spaces and lower percentage of Long-Term spaces.

4.3.3.4 Cell Phone Parking

The cell phone lot at MHT is used as a free-of-charge parking area for drivers waiting to pick up arriving passengers. Vehicles park in the lot until arriving passengers call and are ready to be picked up at the terminal curbside. The lot eliminates the need for vehicles to circle the airport roadways until passengers are ready to be picked up or park in non-designated areas while drivers wait for a call. The existing cell phone lot is located between the parking garage and Lot C, northeast of the Control Tower, and provides 29 marked parking spaces. Access to the lot is from Ammon Drive.

Use of the cell phone lot is not monitored, so detailed parking data is not available. To provide a basis for demand/capacity considerations, a number of visual counts were conducted during May, 2010. Counts were taken on several days at different times of the day corresponding to peak arrival periods. The highest number of vehicles observed in the lot at one time was 22. On average, 12 vehicles were observed in the lot several times over several different days.

The highest one time count of 22 represents 76% of the cell phone lot capacity, which is a relatively high demand/capacity ratio for current conditions. The existing peak lot demand of 22 vehicles and 2010 enplanements results in a demand ratio of one cell phone parking space per about 68,000 annual enplanements. For demand purposes, a planning ratio of one cell phone parking space per 60,000 enplanements was used. The resulting lot demand would exceed capacity by 2020 without increasing the number of parking spaces in the cell phone parking lot. An additional ten cell phone parking spaces will be needed by 2030. The current lot could be expanded into Long-Term Lot C or consideration given to relocating the cell phone lot to free up additional spaces in Lot C for Long-Term parking.

Thirty-minute counts were used to determine the total number of cars that parked in the lot during the peak periods and the maximum number parked at any one time. The likely peak period was based on analysis of airline arrival schedules. **Table 4-25** indicates the survey results for the thirty-minute counts.

TABLE 4-25
CELL PHONE PARKING LOT USAGE

Extended Survey Period	Maximum Use at One Time	Total Peak Half Hour Lot Usage
May 13th	6	14
May 14th	7	17
May 16th	12	25
May 17th	12	27
May 19th	14	24
May 20th	12	25

Source: McFarland Johnson, 2010.

4.3.3.5 Employee Parking

Parking for airport employees is provided at several locations depending upon the nature of the employment and whether the person is an airport employee or employed by a private company. Several parking areas are provided north of the terminal, these include flight crew, airport administration, deliveries, maintenance, contractor, and general employee parking. There are approximately 550 spaces in this area. Also, airport employees can pay a fee to park in the garage. The fee varies by season, with higher rates in the winter. This practice is viable because the current demand for garage spaces is below the garage's capacity. There are no statistics on the number of employees who park in the garage.

The FAA guidelines indicate that employee parking requirements range between 250 and 400 spaces per million enplanements. The current MHT ratio is approximately 370 employee parking spaces per million enplanements, not including the number who park in the parking garage. It appears that the current number of employee spaces is more than sufficient for the current demand. Therefore, for demand purposes, a ratio of 300 employee parking spaces per million enplanements will be used. This demand range suggests that by 2020 the demand for employee parking spaces will exceed the current capacity.

As stated in Section 4.3.3.1, the current employee parking lot nearest the terminal was previously Short-Term Lot B and may need to be re-opened as Lot B to address current and projected Short-Term parking deficiencies. This would require that, in the future, replacement employee parking be found. One option is to use a section of Lot D as was previously done. As stated in Section 4.3.3.3, there is a surplus of Long-Term daily parking lots at MHT located along Perimeter Road (Lots E, F and G). Some of this surplus long-term parking area could be used for employee parking; however, this would require employees to take a shuttle from the parking lots to the terminal.

4.3.3.6 Parking Summary

Table 4-26 contains the additional parking spaces required during the Airport Master Plan Update horizon.

TABLE 4-26
PARKING SPACE REQUIREMENTS

Parking Type	Parking Requirement			
	2015	2020	2025	2030
Short-Term Hourly (Lot A)	0 to 11	0 to 25	13 to 40	26 to 56
Short-Term Daily (Garage)	0	0	0	0 to 36
Long-Term Daily (Lots C, D, E F)	0	0	0	0
Cell Phone	0	2	6	10
Employee	0	5	70	135

Source: McFarland Johnson, 2010.

4.3.4 TERMINAL CURBSIDE ROADWAYS

MHT has a terminal curbside that consists of a single level, three roadway system. The inner roadway has a total of three lanes. The lane closest to the curb is for loading and unloading of passengers. The middle lane is primarily a through lane but is also used for loading and unloading during peak periods. The third lane furthest from the curb is a through lane. This inner roadway is also used by the MHT parking shuttle and for unloading only by taxis and other shuttles.

The second roadway has one through lane and one or two parking lanes depending on the location. The one or two curbside lanes are used for bus parking and taxi loading. There is only the one through lane directly in front of the main terminal entrance. Taxis can park on both curbs south of the main terminal entrance cross walk. A taxi staging area is located about 700 feet west on Airport Road where the taxis wait until a space on the curb is available.

The third roadway has one through lane and two curb lanes for parking. Reserved limousines use both curbs south of the main terminal entrance cross walk. Hotel shuttle buses and airline crew shuttle buses use both curbs north of the cross walk.

As determined in Surface Transportation Forecasts section, the curbside roadways will continue to operate at acceptable Levels of Service (LOS C) until 2025. Beyond 2025, the passenger curbside drop-off begins to experience further delay and the Level of Service drops to LOS D. The analysis indicates that the reduced level of service would be caused in part by the congestion, referred to as bunching, that occurs at the terminal's main entrance., where most of the curbside check-in counters and airline signage are located adjacent to the main entrance. Observations made of the area confirm that most vehicles cluster at the main entrance and even double park near the main entrance rather than use other portions of the curb.

In order to determine how this bunching impacts the level of service of the curbside, an additional analysis of the curbside was conducted in Surface Transportation Forecasts section. The analysis of the curbside includes a bunching factor. This factor was adjusted to determine whether less bunching could improve the level of service in 2030. The analysis did confirm that the level of service could be improved to LOS C in 2030 if the bunching were reduced by utilizing more of the available curb frontage.

Ways to reduce the bunching at the curbside include revised signage location to direct airport users to other portions of the curb, adding new entrances to the terminal to balance the movement of patrons from the curb into the terminal, and distributing the curbside check-in counters to encourage drop off to other portions of the curb. The concept is discussed in Section 7.0, Terminal Planning.

4.3.5 RENTAL CARS

Renting cars at the airport currently includes stopping at the rental car counters located on the ground floor of the terminal near the baggage claim carousels. Once a passenger has their paperwork, they proceed to the ground floor of the parking garage where the ready cars are waiting. On returning to the airport, patrons enter the ground floor of the parking garage from Airport Road through a designated entrance. The rental agencies provide a receipt at their designated return areas and the patrons may proceed directly to the terminal. Storage of additional rental cars is accommodated approximately ½ mile from the parking garage on Perimeter Road. A Quick-Turn-Around (QTA) Area that provides washing, fueling, and other services is located near the parking garage with access from Green Drive via Ammon Drive. All but Hertz use this QTA. Hertz has their own QTA located adjacent to their off-site storage on Perimeter Road.

As determined in Surface Transportation Forecasts section, additional rental car spaces for ready/return use will be needed within the long range planning period (2025-2030). The number of required new spaces is also influenced by any future changes to the existing rental car area in the parking garage. If rental car counters are moved into the parking garage, as opposed to a location adjacent to the existing parking garage structure, any first floor losses in rental car spaces would have to be made up.

The future demand for public parking spaces in the parking garage is expected to approach the capacity of the garage by 2030 for the design peak and surpass its capacity for the busiest time of the year. If more of the garage is needed for rental car operations, this could create capacity issues earlier than 2030.

The rental car agencies would all prefer to have their own QTA. The airport recently conducted a study of QTA facilities and their future requirements. This study included questionnaires that each rental car agency filled out to specify their preferences. It was clear that additional and individual QTA space is preferred by the agencies. The Study reviewed two possible sites for a new QTA facility, Parking Lots F and G. Neither of these sites was found to be large enough to accommodate the stated combined demands of each rental car company. The desire for individual QTA facilities may not be possible or reduced car storage may be required to accommodate the QTA somewhere along Perimeter Road. Lot E has restrictions that make it more costly and complicated should it be used for anything but airport related activities.

The examination of future demand/capacity factors for the parking garage and rental car facilities did not consider future development and space requirements needed to support electric car use by rental car companies and the general public. Electric car use, which is expected to significantly increase during the study period, must be taken into consideration for future space needs. The possible use of solar panels on the parking garage roof level to provide the power for the garage will need to allow for continued parking, as the roof level will be needed for future parking demand. A flat canopy type roof over the sixth level may be an option, as would a canopy system or "solar trees." Other areas to consider for possible solar panels include the terminal roof, the roofs of the maintenance buildings along Green Street, or any other under-utilized area at the airport.

4.3.6 GROUND TRANSPORTATION

4.3.6.1 Transit

The Manchester Transit Authority (MTA) provides city bus service to the airport on its Route Number 3. There are four morning and five afternoon trips made on weekdays only. The route begins at the Manchester Transportation Center in Downtown Manchester, heads south on Elm Street and Brown Avenue, and then circles the airport before returning downtown. The MTA bus stops at the terminal on the inner roadway curbside just south of the main terminal entrance. The two other stops near the airport are Perimeter Road at South Willow Street and South Perimeter Road at Airport Road. The MTA fare is currently $1.50 for a one-way trip.

The majority of riders on the MTA bus are local residents who work at the airport. Few bus riders are passengers traveling to the terminal. The buses that are used on Route Number 3 have a capacity of approximately 40 passengers and there are seldom more than a few employees or passengers on the buses. The future demand at the airport for transit service will likely be driven by the departure and arrival schedule. If the peak for departures and arrivals expands beyond the current hours, additional service may be warranted. However, service to the airport was reduced in 2008 due to budget constraints at the City of Manchester.

Greyhound Bus Line currently provides limited interstate bus service to MHT. There are three northbound and three southbound trips per day. The northbound buses stop at MHT at 11:05 AM, 3:00 PM, and 12:45 AM. The southbound buses stop at MHT at 5:30 AM, 3:40 PM, and 5:30 PM. Each of the buses has a different schedule and may include stops at the Manchester Transportation Center in Downtown Manchester, Concord and Hanover, NH, Boston's South Station, and White River Junction, Montpelier, and Burlington, Vermont. There are few passengers using the bus stop at MHT. Some travelers use the Greyhound bus on weekends, but there is little use during the week. The designated area for the Greyhound buses is on the second roadway curb south of the main terminal entrance.

4.3.6.2 Taxicabs

Taxicabs at MHT operate on a permit basis and are charged for every pick up at the terminal. There are currently 26 taxicab companies or individual owners with permits to operate at the airport. Arriving passengers may access a taxi on the second roadway curb where taxi spaces are provided on both curbs, some under a protective canopy. There are a total of nine taxicab spaces along the curbs. Additional taxicabs are queued in a staging area parallel to Airport Road west of the terminal. A gate and signal system controls when taxicabs leave the staging area to access the curb front. The staging area can accommodate up to 17 taxicabs.

The total taxicab parking capacity of 26 is sufficient for current enplanement levels. The future need for taxicabs can best be determined by reviewing the level of service during MHT's peak enplanements of 2005. At that time the number of spaces was adequate and it appears it will be adequate for the enplanement levels projected for 2030.

4.3.6.3 Limousines

Limousines at MHT also operate on a permit basis and are charged for every pick up. Many limousines operate as taxicabs and use the taxicab spaces as described above. Limousines that are reserved for specific arriving passengers use the designated area at the southern portion of the third roadway curb located down the stairs adjacent to Parking Lot A. There are 17 spaces adjacent to both curbs. There are currently 116 limousine companies with permits to operate at the airport

The total parking capacity of 17 is sufficient for current enplanement levels and appears adequate for the enplanement levels projected for 2030.

4.3.6.4 Shuttles

A variety of shuttle services operate at the airport, including many hotels that provide rides for their guests. There are currently 17 hotels with permits to pick up and drop off guest. The designated area for shuttles is the northern portion of the third roadway curb located down the stairs adjacent to Parking Lot A. There are 14 spaces adjacent to both curbs and these are sufficient for current and future enplanement levels.

The Highlander Inn and Flightline operate shuttle services at the airport. The Highlander Inn provides a shuttle for its guests, but it also provides off airport parking with shuttle service to the terminal. The Highlander Inn shuttle has a designated space on the northernmost portion of the second roadway curb. Flightline provides door to door shuttle service to the airport and has a designated space along the second roadway curb just north of the main terminal entrance.

The MHT parking lot shuttles use the inner roadway curb. There are two designated spaces located at the far northern and southern ends of the curb. The two spaces are sufficient for current enplanement levels and appear adequate for the enplanement levels projected for 2030.

SECTION FIVE

Airfield/Airside Planning

SECTION 5.0
AIRFIELD/AIRSIDE PLANNING

5.1 INTRODUCTION

The following subsections address a variety of airfield issues including taxiway clearances, taxiway configurations, approach lighting systems, runway safety area improvements, and service roads and Aircraft Rescue and Firefighting (ARFF) requirements. These issues are addressed in terms of the actions needed to meet Federal Aviation Administration (FAA) design standards or improve current levels of service for existing and projected levels of airport operations. Where appropriate, alternatives are presented for consideration along with a recommendation regarding a preferred alternative for implementation. Preferred alternatives are carried forward to the Airport Layout Plan, Capital Improvement Program, and the Financial Feasibility Analysis.

5.2 GROUPS IV AND V AIRCRAFT PARKING/TAXIWAY STUDY

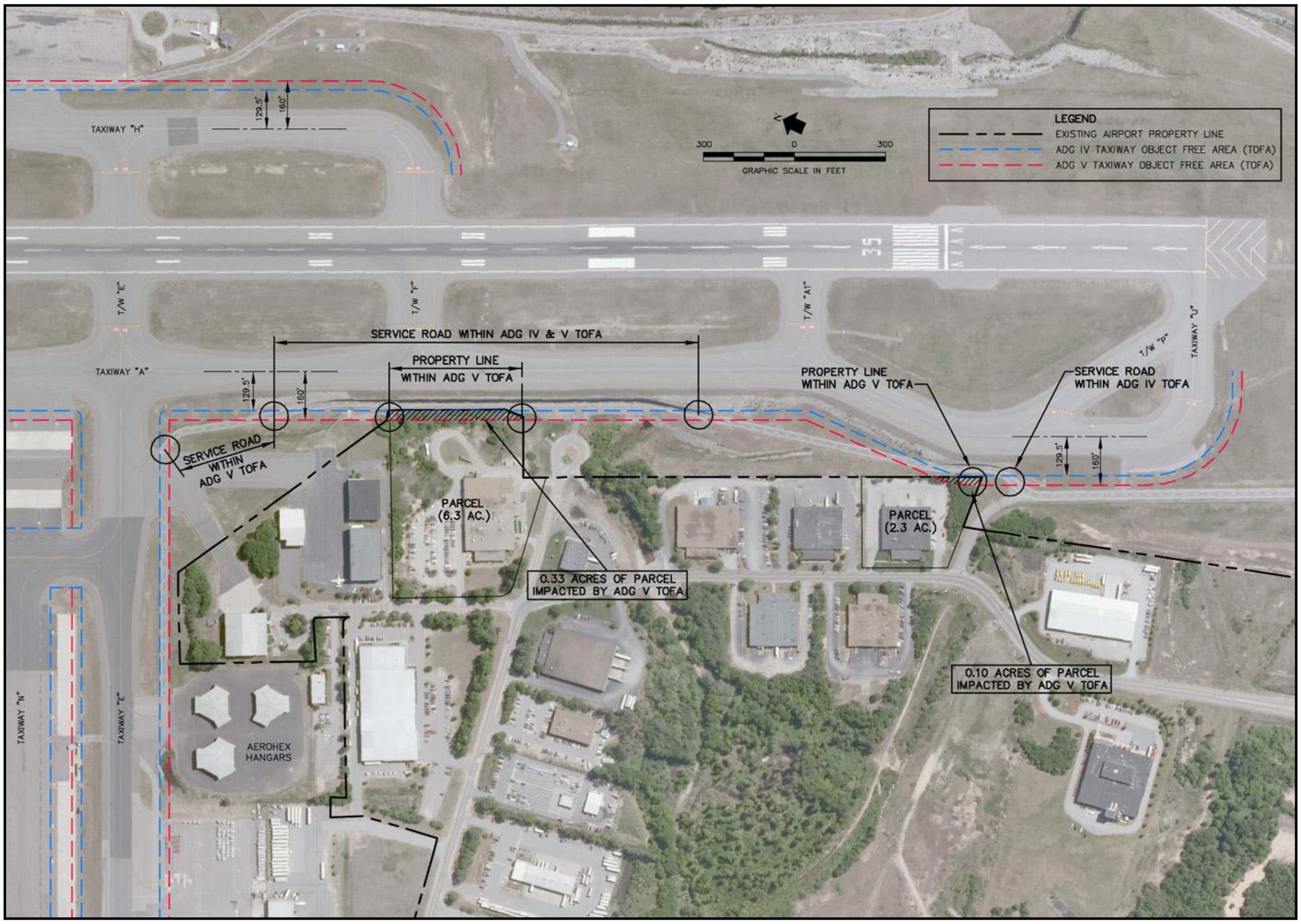
Aircraft operations at Manchester-Boston Regional Airport (MHT) currently consist of aircraft up to Airplane Design Group (ADG) IV (e.g., A-300, B-757, B-767, MD-11). These include scheduled cargo operations presently conducted with B-767, A-300, and MD-10 aircraft. Although the forecast does not project regular operations by Design Group V aircraft (e.g., A-330/-340, B-777, B-747), the airfield infrequently experiences operations by an ADG V aircraft, including Air Force One. This section examines the ability to taxi ADG IV and ADG V aircraft on all taxiways at MHT. It identifies conflicts and proposes methods of resolving conflicts where needed and appropriate. The assessment used Taxiway Object Free Area (TOFA) criteria for ADG IV aircraft (a clearance of 129.5 feet) and ADG V aircraft (a clearance of 160 feet). The application of these dimensions to taxiways at MHT is depicted on **Figures 5-1** through **5-4**.

Figure 5-1 shows the TOFA clearances along the southern portion of Taxiway “A”. The existing airport service road is within the ADG IV TOFA clearance of 129.5 feet at two points along Taxiway “A”. The first location is near the intersection with Taxiway “F”. The second location is near the intersection with Taxiway “P”. The elevation of Taxiway “A” at both of these locations is significantly higher than the service road and provides adequate vertical clearance for a vehicle to traverse the service road without penetrating the TOFA elevation. Therefore, no actions are needed to address these two locations.

Conflicts with the ADG V TOFA would exist at a few locations including the portion of the service road along Taxiway “E” and Taxiway “A”. The service road along Taxiway “E” would penetrate the ADG V TOFA from the Aerohex hangars to the point where the service road bends southward along Taxiway “A”. The service road is also within the ADG V TOFA near Taxiway “P”. Two adjoining off-airport properties are also within the ADG V TOFA, although elevation differences between Taxiway “A” and these parcels provide adequate vertical clearance unless vegetation at the eastern edge of the adjoining parcels is allowed to grow higher than the respective TOFA elevations.

In summary, the TOFA associated with the southern portion of Taxiway “A”, meets FAA requirements for ADG IV aircraft, but does not fully meet requirements for ADG V aircraft unless a portion of the service road (near the intersections with Taxiways “E”) is relocated farther away from the taxiway centerline. Furthermore, tree trimming may be needed to ensure that vegetative growth on adjoining parcels remains beneath the respective TOFA elevations.

FIGURE 5-1
AIRPLANE DESIGN GROUPS IV AND V
TAXIWAY OBJECT FREE AREAS

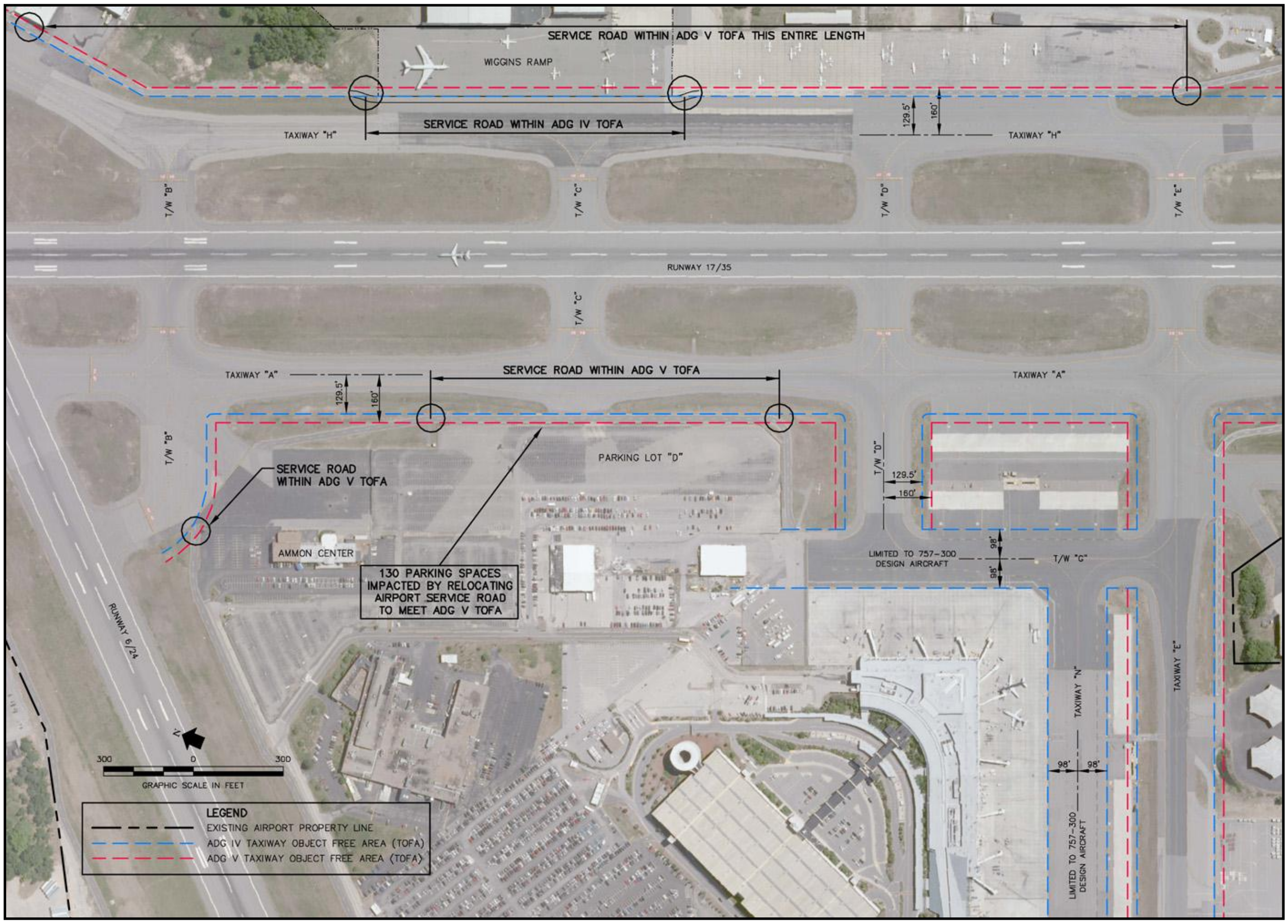


Source: URS Corporation, 2010.

Figure 5-2 depicts the ADG IV and ADG V TOFA clearances along Taxiways “A” and “H” north of Taxiway “E”. The airport service road along Taxiway “A” is located outside of the ADG IV TOFA, but penetrates the ADG V TOFA north of the Ammon Center and along the east side of Parking Lot “D”. It is estimated that 130 parking spaces would be eliminated in Parking Lot “D” if this portion of the service road were to be relocated outside the ADG V TOFA. A small area of Ammon Center parking lot would also be lost in order to resolve the conflict at the Ammon Center. The airport service road located east of Taxiway “H” is outside of the ADG IV TOFA. At times aircraft parked on the Wiggins Ramp make it difficult for vehicles to travel freely across their ramp. A LOA was created to allow vehicles to circumnavigate around wingtips while giving way to aircraft which may be taxiing on Taxiway H. This portion of the service road is operated under a Letter-of-Agreement with the MHT Airport Traffic Control Tower (ATCT). The Letter-of-Agreement requires vehicles to yield right-of-way to aircraft at all times. The airport service road east of Taxiway “H” penetrates the ADG V TOFA from Taxiway “E” northward to the figure’s northern limit. Compliance with the larger ADG V TOFA would require the service road to be relocated farther east thereby reducing the amount of general aviation ramp.

Figure 5-2 also depicts a modified ADG IV TOFA along Taxiway “G” and Taxiway “N” near the passenger terminal. These clearances are based on the B-757 rather than on full ADG IV standards. The required TOFA for the B-757 is 98 feet. No objects penetrate the modified ADG IV TOFA along Taxiways “G” and “N”.

FIGURE 5-2
AIRPLANE DESIGN GROUPS IV AND V
TAXIWAY OBJECT FREE AREAS



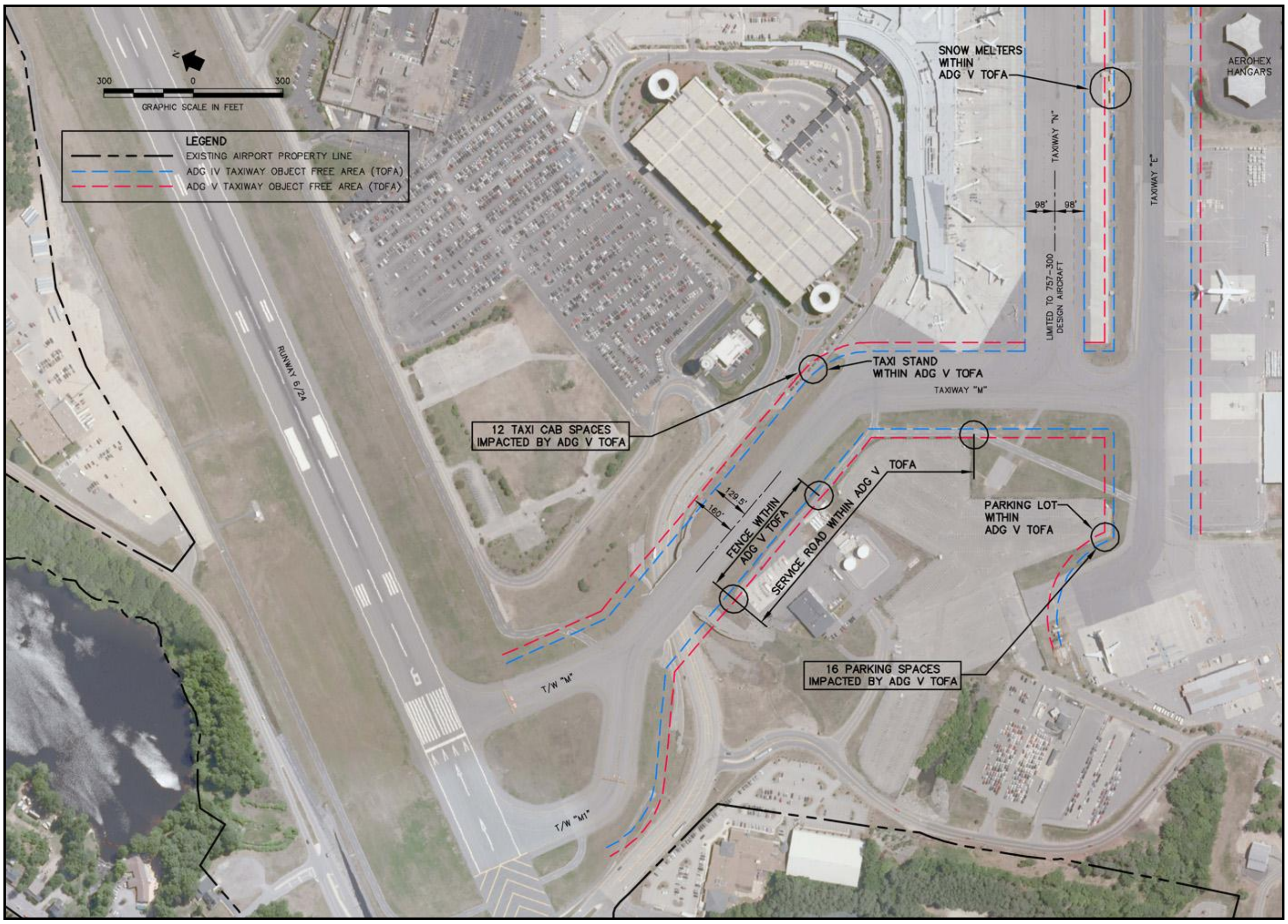
Source: URS Corporation, 2010.

Figure 5-3 illustrates ADG IV and ADG V TOFAs along the taxiways extending from the passenger terminal and cargo area to the landing threshold of Runway 6. No objects penetrate the ADG IV TOFA along Taxiways “M”, “M1” or “E”. Four objects penetrate the ADG V TOFA along Taxiway “M”. These objects include a small portion of Parking Lot “E”, a section of fence along the fuel farm area, a portion of service road leading to the fuel farm, and a portion of the taxi stand along the passenger terminal access road. All of these items would require relocation to meet the ADG V TOFA.

Existing snow melting facilities located across from the Aerohex hangars also penetrate the ADG V TOFA along Taxiway "E". These facilities include the snow melters, mast lighting, and a control building. All of these facilities would require relocation to provide a clear TOFA for ADG V aircraft.

It should be noted that access to the cargo area depicted in Figure 5-3 would typically occur via Taxiway "E" and that the only penetrations to the ADG V TOFA along this route would be the service road previously described and the snow melting facilities.

FIGURE 5-3
AIRPLANE DESIGN GROUPS IV AND V
TAXIWAY OBJECT FREE AREAS



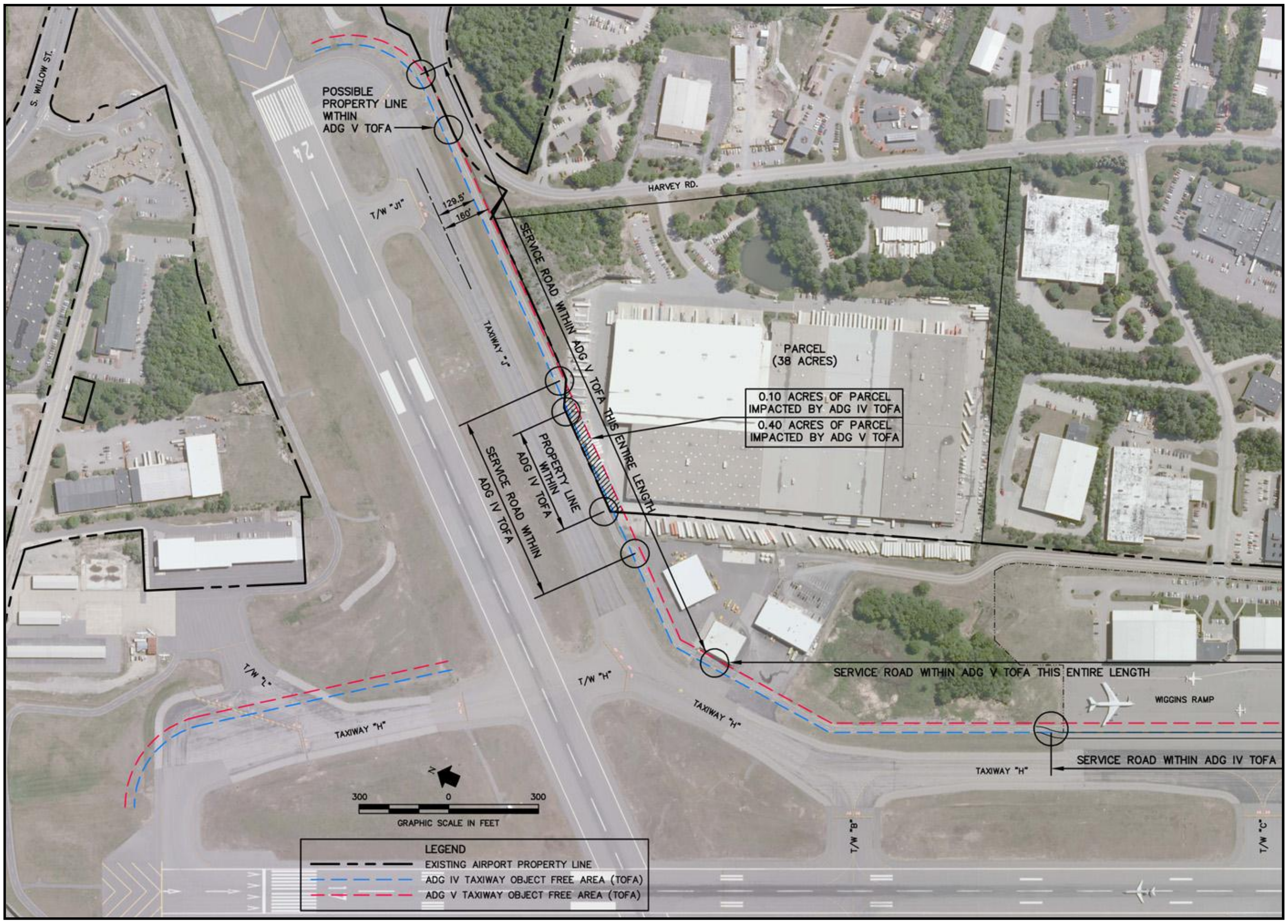
Source: URS Corporation, 2010.

Figure 5-4 illustrates ADG IV and ADG V TOFAs along Taxiway "J" and the northern portion of Taxiway "H". No objects penetrate the TOFAs along the portion of Taxiway "H" located north of Runway 6/24. The portion of Taxiway "H" located south of Runway 6/24 was previously described with Figure 5-2. The airport service road and a portion of the airport perimeter fence penetrate the ADG IV TOFA along a portion of Taxiway "J" between Taxiways "H" and "J1". These penetrations are because the airport property line is located very close to the taxiway and the adjoining property contains a large warehouse.

Resolution of these penetrations does not appear possible without substantial modification of the warehouse operation or acquisition of the property.

Nearly the entire service road from Taxiway "H" to the approach end of Runway 24 penetrates the ADG V TOFA. Furthermore, the airport perimeter fence may penetrate the ADG V TOFA just east of Taxiway "J1". Confirmation of this issue is not possible through a review of aerial photography; field survey would be required. Resolution of the items that penetrate the ADG V TOFA is not possible without acquisition of adjoining property and the relocation of the service road and the airport perimeter fence.

FIGURE 5-4
AIRPLANE DESIGN GROUPS IV AND V
TAXIWAY OBJECT FREE AREAS



Source: URS Corporation, 2010.

5.3 TAXIWAY CONFIGURATION AT TAXIWAYS "H" AND "L"

The existing intersection of Taxiways "H" and "L" is located east of the approach end of Runway 17. This intersection contains a long and irregular shaped taxiway hold line with associated in-pavement runway guard lights that extends across a wide area of taxiway pavement. This hold line delineates where taxiing aircraft must hold until receiving appropriate air traffic ground control clearance to proceed to Runway 17 for departure. The hold line's current placement keeps aircraft clear of the Runway 17 Precision Object Free Zone, as well as the Precision Obstacle Clearance Areas and glide slope antenna critical area associated with the Category I Instrument Landing System (ILS) serving Runway 17/35. **Figure 5-5** illustrates the taxiway hold line in relation to these clearances and depicts how the hold line keeps aircraft, such as a B-737-700, outside of the glide slope antenna's critical area. The illustration also shows the location of Runway Safety Areas (RSA) and the Runway Object Free Areas (ROFA) in relation to Taxiway "H".

Ordinarily the taxiway hold line would be located where the Runway Safety Area crosses Taxiway "H" (i.e., distance of 250 feet from the runway centerline).[1] This "typical" distance is exceeded on the approach end of Runway 17 due to the presence of the ILS glide slope on the same side of the runway as Taxiway "H" and because the landing threshold on Runway 17 is displaced. This brings the associated Precision Obstacle Clearance Areas farther south than they would be located if there were no threshold displacement. Consequently, the taxiway hold line at the approach end of Runway 17 is located farther away from the runway centerline and significantly farther away from the approach end of Runway 17. This had led to problems with some pilots inadvertently taxiing aircraft beyond the hold line prior to receiving clearance from ATCT personnel. Such deviations are classified as runway incursions and are a safety concern.

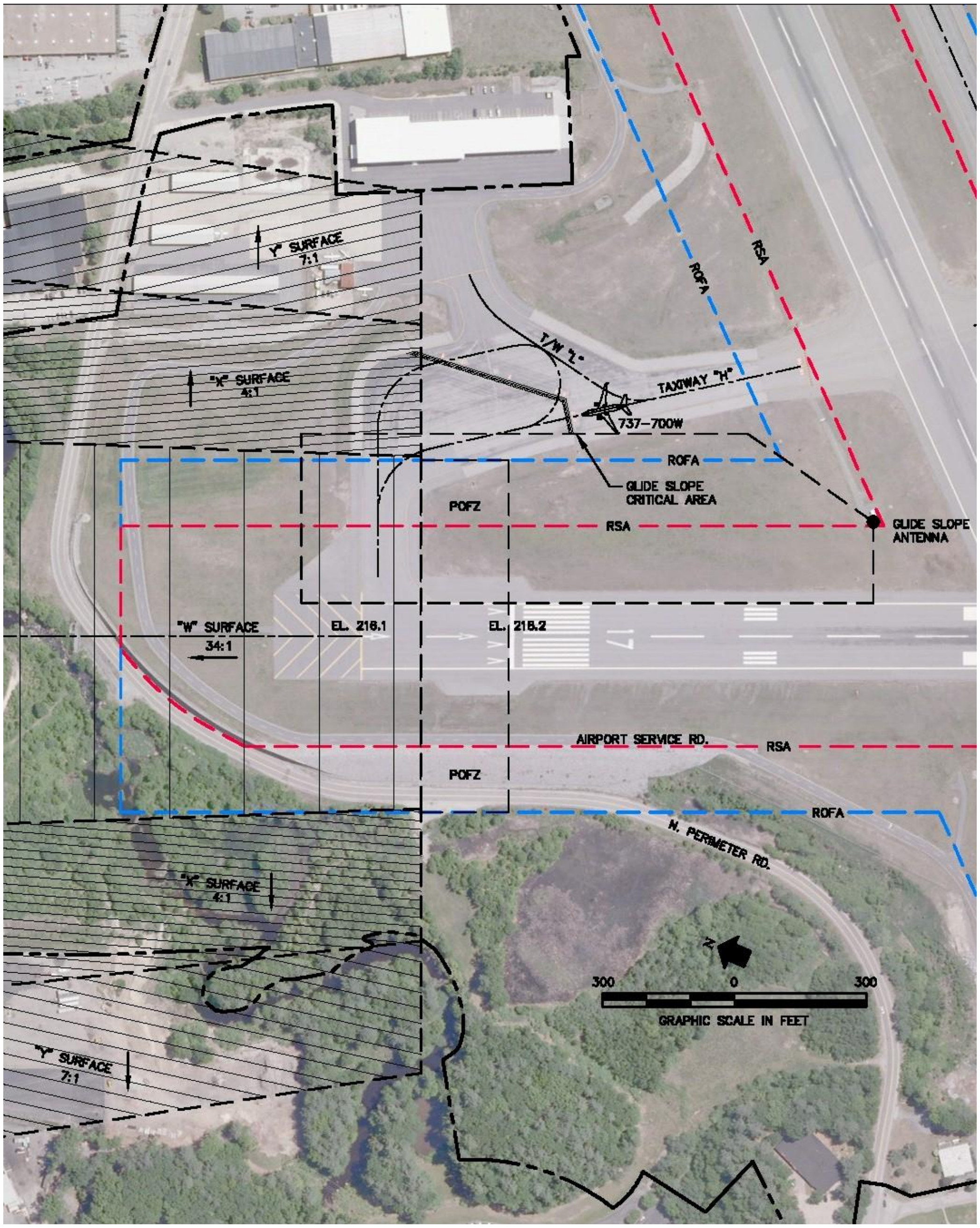
In response to this concern, airport management and the FAA instituted a number of actions to prevent runway incursions at this location. The actions included of the application of enhanced taxiway markings and signage. Additional information is also provided to pilots on charts and in verbal instruction during Airport Traffic Control (ATC) communications. These actions resulted from the recommendations of a Runway Safety Action Team (RSAT).

This Airport Master Plan Update examined what further actions could be undertaken, in terms of capital improvements, to further address the Taxiway "H" hold line not being in a typical location or configuration. The only actions that would completely resolve this issue would be to eliminate the existing displaced threshold on the approach end of Runway 17 and to relocate the ILS glide slope antenna from the east side of Runway 17/35 to the west side of the runway. These actions would require significant capital improvements in terms of roadway relocation, stream and wetland relocations, and site regarding work.

The threshold on the approach end of Runway 17 is currently displaced because insufficient land exists for an RSA that fully meets FAA design standards. This issue was previously resolved by displacing the Runway 17 landing threshold to its present location. The ILS glide slope antenna is located on the east side of the runway because insufficient land that is properly graded and free of roadway and other features does not exist on the west side of the runway.

[1] The criteria for taxiway hold lines were revised on December 31, 2009 with the FAA's publication of Change 15 to FAA Advisory Circular 150/5300-13, Airport Design. This change increases taxiway hold line distances by 1 foot per 100 feet of airport elevation above sea level for runways accommodating aircraft in Approach Category C.

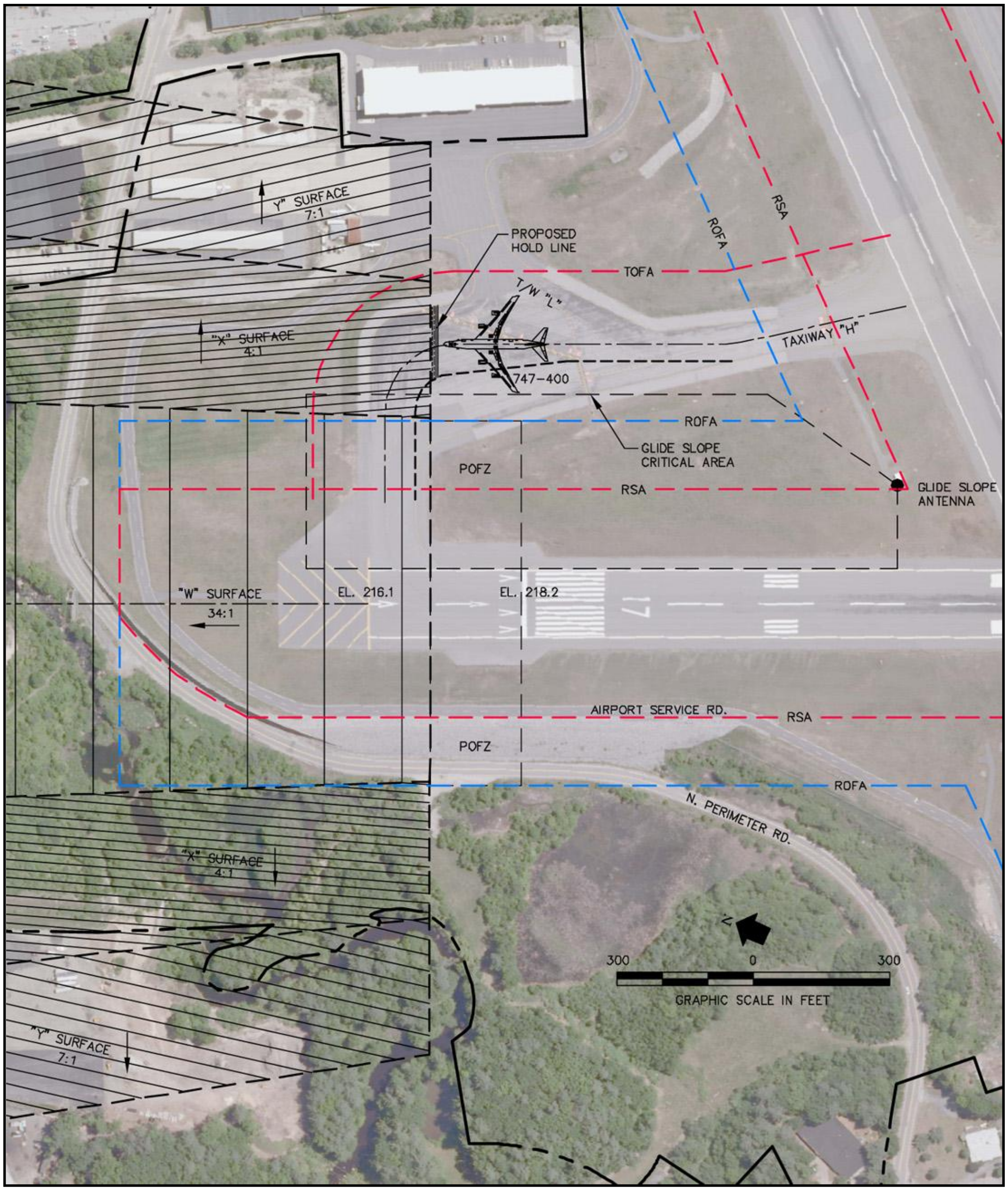
FIGURE 5-5
EXISTING INTERSECTION OF TAXIWAYS "H" AND "L"
WITH APPLICABLE CLEARANCES



Source: URS Corporation, 2010.

Other capital improvements that could address this issue in a more cost-effective manner include narrowing existing width and realigning a section of Taxiway "H" to a more parallel configuration. This would shift the centerline of Taxiway "H" farther away from the centerline of Runway 17, thereby keeping aircraft outside of the runway and navigational aid clearance areas and allow aircraft to taxi closer to the approach end of Runway 17. **Figure 5-6** depicts this alternative. It would also allow ADG V aircraft, such as the B-747, to taxi on Taxiway "H" and remain outside of the clearance areas associated with the precision instrument approach to Runway 17 and the ILS glide slope antenna critical area.

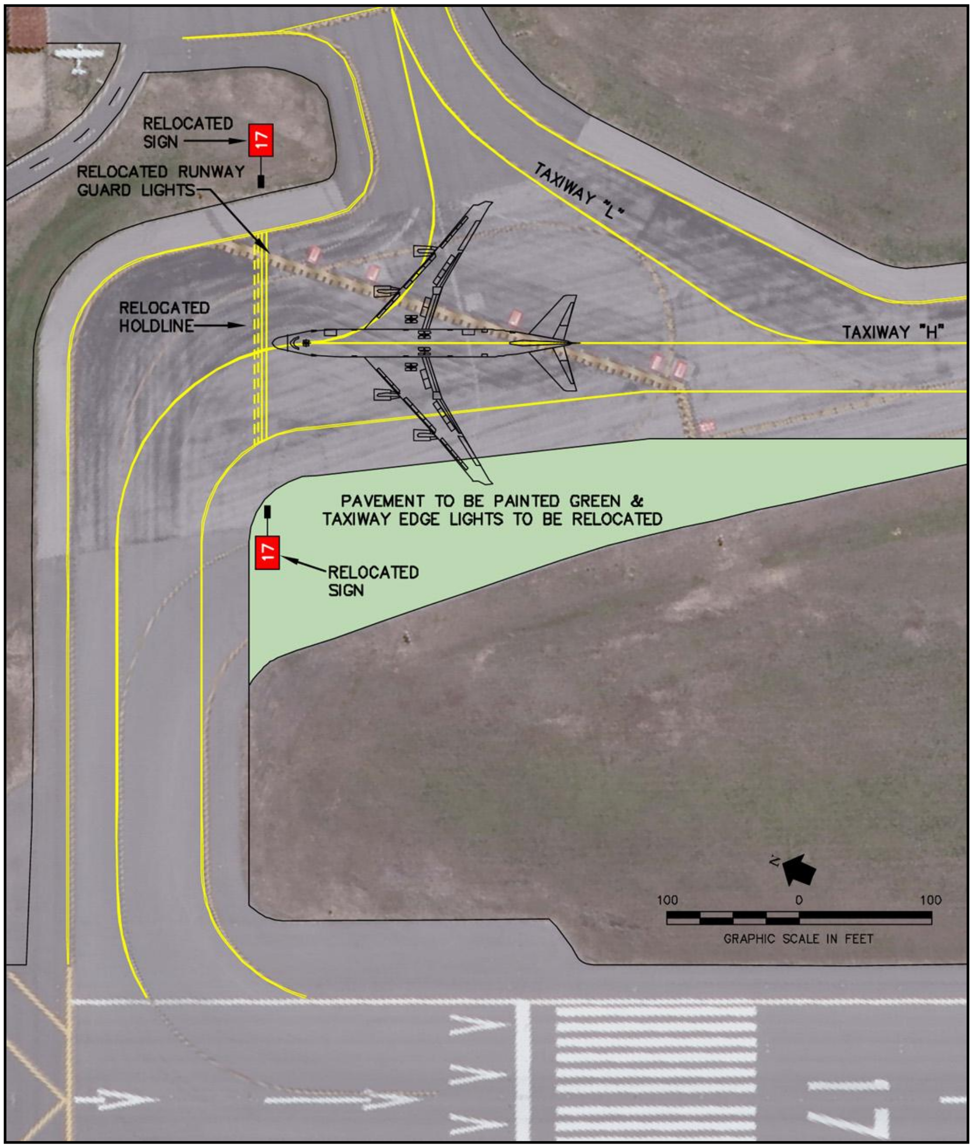
FIGURE 5-6
POTENTIAL RE-ALIGNMENT OF
TAXIWAYS "H" AND "L" INTERSECTION



Source: URS Corporation, 2010.

Figure 5-7 illustrates details of this alternative. The west side of Taxiway "H" would be narrowed either by removing the pavement or by leaving it in place and painting it green. Taxiway edge lighting on the west side of the taxiway would be relocated, and signage on both sides of the runway would be relocated. Runway guard lights would be relocated to the new hold line location along with the elevated runway guard lights on each side of the taxiway.[2]

FIGURE 5-7
DETAILS OF POTENTIAL RE-ALIGNMENT OF
TAXIWAYS "H" AND "L" INTERSECTION



Source: URS Corporation, 2010.

2 According to FAA design standards, as specified in Advisory Circular 150/5340-30D, Design and Installation Details for Airport Visual Aids, taxiway width is not a factor in determining the need for elevated runway guard lights in addition to in-pavement runway guard lights. The need for elevated runway guard lights is based upon the possibility of snow obscuring in-pavement lights and the existence of an acute angle between the holding position and the approach to the holding position.

Advantages of this alternative include relocating the taxiway hold line closer to the departure end of Runway 17 and reducing the taxiway hold line pavement marking to a simple straight line that would not extend across a wide expanse of taxiway pavement. The disadvantages of this alternative are that it would still not place the hold line where pilots expect it to be (i.e., approximately 250 feet from the runway centerline) and it would reduce operational flexibility. The existing wide portion of Taxiway "H" serves two operational purposes. First, it enables ATC personnel to by-pass aircraft holding for departure on Runway 17. This provides ATC with the flexibility to operate around an aircraft that is either not ready to depart or is being held for other reasons. Second, the wide area of pavement is used by airport operations personnel as a staging area for snow removal vehicles when winter operations are occurring. Loss of this area would reduce the ability to stage snow removal vehicles in a manner that minimizes the time required for vehicles to reach Runway 17/35.

Consultation with ATC personnel regarding the Taxiway "H"/"L" intersection revealed that the existing actions taken by airport management and ATC personnel (i.e., enhanced taxiway marking and signage as well as additional information to pilots in charts and ATC clearances) have minimized runway incursions associated with the hold line. ATC personnel indicated that narrowing Taxiway "H" to further address this issue would reduce their operational flexibility. Considering that the potential capital improvement would not place the taxiway hold line where pilots intuitively expect it to be, it is not known whether the alternative would lead to any further reduction of runway incursions. However, the alternative would reduce operational flexibility for ATC and airport operations. Because the benefits of the alternative are not assured or quantifiable, but the disadvantages of the alternative are known, it is not recommended that this alternative be implemented at this time. If runway incursions again become a problem at this location, this action should be further evaluated.

5.4 APPROACH LIGHTING ASSESSMENT

The feasibility of installing approach lighting systems on each end of Runway 6/24 was evaluated on the basis of operational and physical factors. The evaluation began with a review of operational factors since FAA funding eligibility is a precursor to examining the physical requirements of installing a system on either runway end.

The first step in the process was a review of historical runway use during Instrument Meteorological Conditions (IMC) and a review of prevailing wind direction during IMC. The review of historical runway use during IMC focused on aircraft arrivals. The goal was to determine the actual runway use for arrivals versus the runway use that could occur on the basis of prevailing wind directions if all other factors (i.e., runway length, instrumentation, proximity to gates, etc.) were equal. **Table 5-1** presents historical data for runway use by arrivals from 2007 through 2009. This period was selected because it represents the most recent years for which runway use data are available and appears to be complete and accurate in the FAA database. Earlier years of FAA data include a significant number of aircraft operations that were not classified by runway and, therefore, introduce less certainty to the results.

TABLE 5-1
ACTUAL USE OF RUNWAYS 6 AND 24 FOR AIRCRAFT ARRIVALS
DURING INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)
(HISTORICAL DATA FOR 2007 THROUGH 2009)

Runway	Exclusive Use	Use With Another Runway
6	11%	28%
24	0.7%	1%

Source: FAA, Aviation System Performance Metrics, 2010.

Table 5-1 indicates that Runway 6 is used exclusively for 11 percent of aircraft arrivals during IMC. When examining periods that Runway 6 is used for arrivals in conjunction with other runways, the percentage increases to 28 percent. In contrast, Runway 24 is used for less than 1 percent of aircraft arrivals, and this percent increases to only 1 percent when considering periods when the runway is used simultaneously with other runways.

The data presented in Table 5-1 reflects the actual percentage of aircraft arrivals on each runway and are influenced by the fact that Runway 6/24 has a shorter length than Runway 17/35, has higher instrument approach minimums, and lacks approach lighting. All of these factors likely decrease the percentage of time that Runway 6 is used for aircraft arrivals during IMC.

Therefore, an additional analysis was performed to see what the use of Runway 6 and Runway 24 could be for arrivals if operational factors such as runway length, instrument approach minimums, and all other factors that influence runway selection were equal and runway selection was decided solely on the basis of favorable wind direction. **Table 5-2** presents an analysis of likely runway use on the basis of prevailing wind direction during IMC down to CAT I minimums (ceiling of 200 feet and horizontal visibility of 0.5 mile). Winds were deemed favorable to a runway end if they were closer to the runway heading than the next closest runway end.

TABLE 5-2
PERCENT OF TIME THAT PREVAILING WINDS FAVOR
AIRCRAFT OPERATIONS ON EACH RUNWAY DURING IMC

Runway	Percent of Time that Prevailing Winds Favor Each Runway
6	33%
24	4%
17	18%
35	30%
Calms (No Runway Favored)	15%
Total	100%

Source: National Climatic Data Center, Historical Data for Weather Station 74394 MHT, 1999 to 2008. Compiled by URS, 2010.

The wind data suggests that Runway 6 would be used up to 33 percent of the time while Runway 24 would be used 4 percent of the time if all other operational factors were equal. Thus, the wind data supports the conclusion that if runway selection were being made solely on the basis of favorable winds, Runway 6 would be used a greater percentage of time than it currently is. Interestingly, the percentage indicated by Table 5-2 for use of Runway 6 (33%) is very close to the percent of time that Runway 6 is actually used in conjunction with other runways for arrivals (28%). The analysis also suggests that Runway 24 would be used up to 4 percent of the time versus its current 0.7 percent on an exclusive basis and 1 percent in combination with use of other runways.

The results of the two analyses indicate that Runway 24 is unlikely to be used by a significant number of arrivals during instrument conditions. Therefore, it does not appear that the installation of an approach lighting system would meet FAA cost/benefit criteria for eligibility.

An approach lighting system on Runway 6 could be used a substantial amount of time and would be eligible under FAA benefit cost criteria, because the runway already has an ILS approach and the BCA criteria are the same for both items. Installation of a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) would reduce horizontal visibility approach minimums on Runway 6 from the current 0.75 mile to 0.5 mile. However, the length of a MALSR (2,400 feet) would extend from the threshold of Runway 6 to across the Merrimack River. Furthermore, ground elevations decrease sharply from the Runway 6 threshold down to the river. Both of these factors and the resulting cost of an engineering solution to resolve them make the feasibility of installing a MALSR on Runway 6 highly questionable.

The installation of a shorter approach lighting system on Runway 6 such as a Medium Intensity Approach Lighting System with Sequenced Flashing Lights (MALSF) could be considered. A MALSF has a length of 1,400 feet (one thousand feet shorter than a MALSR) and therefore, would eliminate a portion of the installation challenges associated with a MALSR. However, a MALSF is not the FAA standard for approach lighting on a runway with a precision instrument approach and would not provide any reduction in approach minimums for the existing ILS precision approach.

In conclusion, this Airport Master Plan Update depicts future ALS's on both ends of Runway 6/24. For the Runway 6 end, a MALSR would be desirable, but due to the construction cost and environmental impacts to install a structural lighting system in the Merrimack River, it is not considered feasible at this time. However, a MALSF system would not extend into the river and would be feasible from a construction standpoint. The current approved ALP shows a future MALSF on Runway 6 and this Airport Master Plan Update will continue to show the future installation of a MALSF. Any improvement to enhance the visual approach alignment to Runway 6 is safety-related and is supported by Airport Management.

For Runway 24 end, the operational justification requirements, along with environmental wetland issues, associated with the installation of a MALSR on the Runway 24 end could impact the future implementation of this project. The current approved ALP shows a future MALSR on Runway 24 and for planning purposes this Airport Master Plan Update will reserve the capability for the future installation of a MALSR on the Runway 24 end.

5.5 *RUNWAY SAFETY AREA (RSA) IMPROVEMENTS/ENGINEERED MATERIAL ARRESTING SYSTEM (EMAS)*

The required RSA dimensions for runways serving aircraft in Approach Categories C and D is a width of 500 feet and a length that extends 600 feet prior to the landing threshold and 1,000 feet beyond the end of pavement. Except for the south end of Runway 17/35, the existing RSAs at MHT do not have adequate land to meet these dimensional requirements. Therefore, compliance with FAA design standards is currently provided through the application of declared distances and the use of an Engineered Material Arresting System (EMAS)[3] on the northeast end of Runway 6/24. FAA guidance allows for the application of declared distances at existing constrained airports where it is impracticable to meet design standards by other means. The declared distances for Runway 17/35 and Runway 6/24 are presented in **Table 5-3**.

TABLE 5-3
EXISTING DECLARED DISTANCES

Runway	Takeoff Run Available (TORA)	Takeoff Distance Available (TODA)	Accelerate-Stop Distance Available (ASDA)	Landing Distance Available (LDA)
6	7,650	7,650	7,650	7,208
24	7,650	7,650	6,850	6,850
17	9,250	9,250	9,250	8,914
35	9,250	9,250	8,500	7,650

Source: FAA, Airport Facility Directory, Northeast, 2010.

An evaluation was conducted of what further improvements could be made to the existing RSAs at MHT; specifically, an evaluation was conducted of installing EMAS on the southwest end of Runway 6/24 and the north end of Runway 17/35. The evaluation was conducted in two steps. The first step involved modeling the performance capabilities of EMAS within the existing land envelope available beyond these runway ends. The second step involved determining what EMAS bed length would be required to provide 70-knot exit speed stopping capability for the critical aircraft (an A-300-600) regardless of whether sufficient land exists to accommodate the construction and installation of an EMAS. Engineered Arresting Systems Corporation, an EMAS manufacturer, was contacted to conduct the required modeling and provide the results. **Table 5-4** presents the modeling results.

The modeling revealed that an EMAS with a length of 185 feet and a setback of 35 feet from the runway threshold could be installed at the southwest end of Runway 6/24. This system would fit within the existing 220-foot land envelope prior to the large retaining walls that drop to a lower elevation at Airport Road (see **Figure 5-8**). This EMAS would not be capable of providing 70-knot exit speed stopping capability for air carrier or regional jet aircraft that use Runway 24 for departures (see Table 5-4). The modeled bed length would provide aircraft stopping capability in the mid 50-knot range for regional jets and 43 knots for a B-737-800. It would provide stopping capability for an A-300-600 at a runway exit speed of 38 knots.

[3] The FAA defines EMAS as "high energy absorbing materials of select strength, which will reliably and predictably crush under the weight of an aircraft."

TABLE 5-4
EMAS EVALUATION

Item	Southwest End of Runway 6/24	North End of Runway 17/35
EMAS Installation within Existing Available Land Envelope		
Bed Length	185 Feet	325 Feet
Setback Distance	35 Feet	35 Feet
Total Land Envelope	220 Feet	360 Feet
Resulting Stopping Capability By Aircraft Exit Speed		
A-300-600	38 Knots	50 Knots
B-737-800	43 Knots	65 Knots
CRJ-700	53 Knots	70 Knots
CRJ-200	55 Knots	70 Knots
EMAS Installation Required to Provide 70-Knot Stopping Capability for Critical Aircraft (A300-600)		
Bed Length	445 Feet	425 Feet
Setback Distance	35 Feet	35 Feet
Total Land Envelope	480 Feet	460 Feet

Source: Engineered Arresting Systems Corporation.

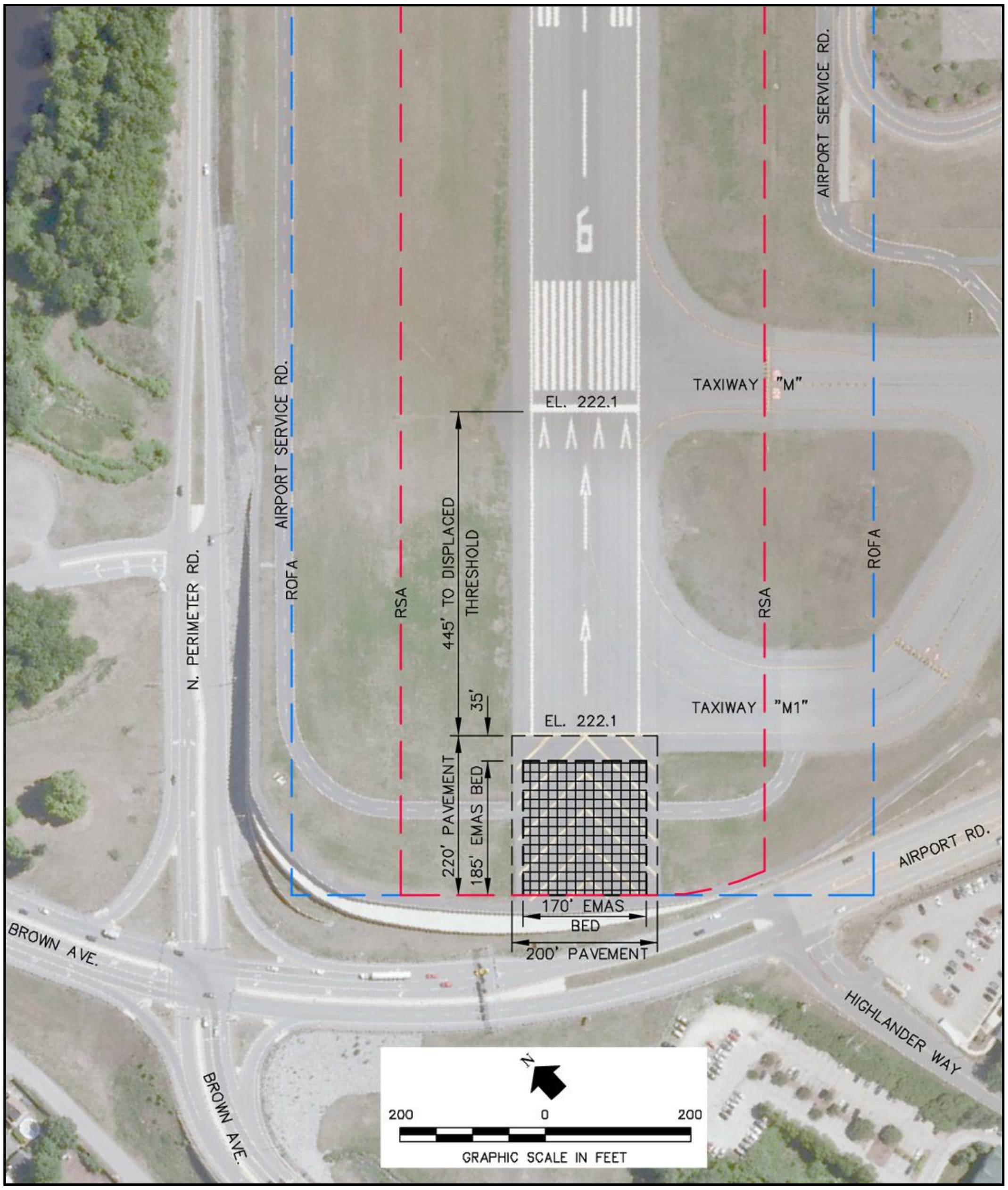
For an EMAS to be considered a standard installation and provide a generally equivalent level of safety as a standard RSA, it must provide stopping capability for the critical aircraft exiting the runway at 70 knots (among other criteria). FAA design standards also indicate that an EMAS must provide at least a 40-knot exit speed stopping capability to be considered a cost-effective safety enhancement.

The modeling results for an EMAS on the north end of Runway 17/35 revealed that an EMAS with a length of 325 feet and a setback of 35 feet could be installed within the available 360-foot land envelope (see **Figure 5-9**). This system would be capable of providing a 70-knot aircraft exit speed stopping capability for regional jets such as the Bombardier CRJ-200 and CRJ-700 aircraft, but only 65-knot aircraft exit speed stopping capability for the B-737-800 and 50-knot aircraft exit speed stopping capability for the A-300-600.

The bottom portion of Table 5-4 presents the results of the second step of the modeling effort. It presents the EMAS bed length and setbacks required to provide a 70-knot exit speed stopping capability for the critical aircraft (an A-300-600). The table indicates that the required EMAS bed and setback distance would require a land envelope of 480-feet at the southwest end of Runway 6/24 and 460 feet at the north end of Runway 17/35. **Figure 5-10** and **Figure 5-11** provide illustrations of these required areas in relation to existing conditions.

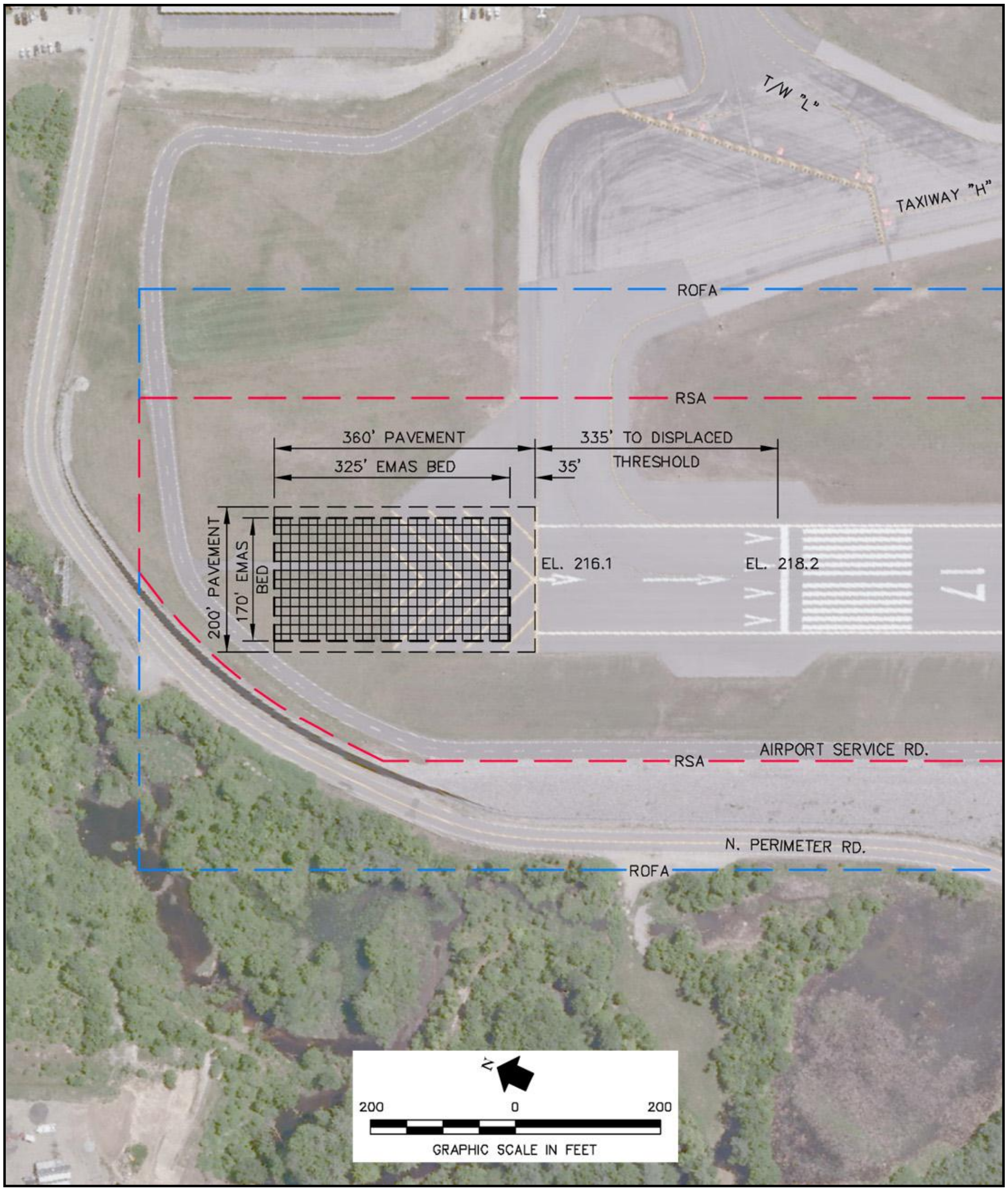
In conclusion, the airport meets FAA RSA design standards with the use of Declared Distances on Runways 17/35 and 6/24. These declared distances were determined and implemented in the 2003-2006 time frame by the FAA in conjunction with Runways 17/35 and 6/24 improvement projects. To eliminate any of the Declared Distances, the installation of a full EMAS on Runway 6 end and or Runway 17 end would require extensive site work as described in this section. The full EMAS construction cost for either Runway 6 end or Runway 17 end is greater than $15 million. At this time, the cost exceeds the FAA funding feasibility threshold for RSA improvement and, therefore, federal funds are not available to finance either EMAS project.

FIGURE 5-8
POTENTIAL EMAS ON
SOUTHWEST END OF RUNWAY 6/24



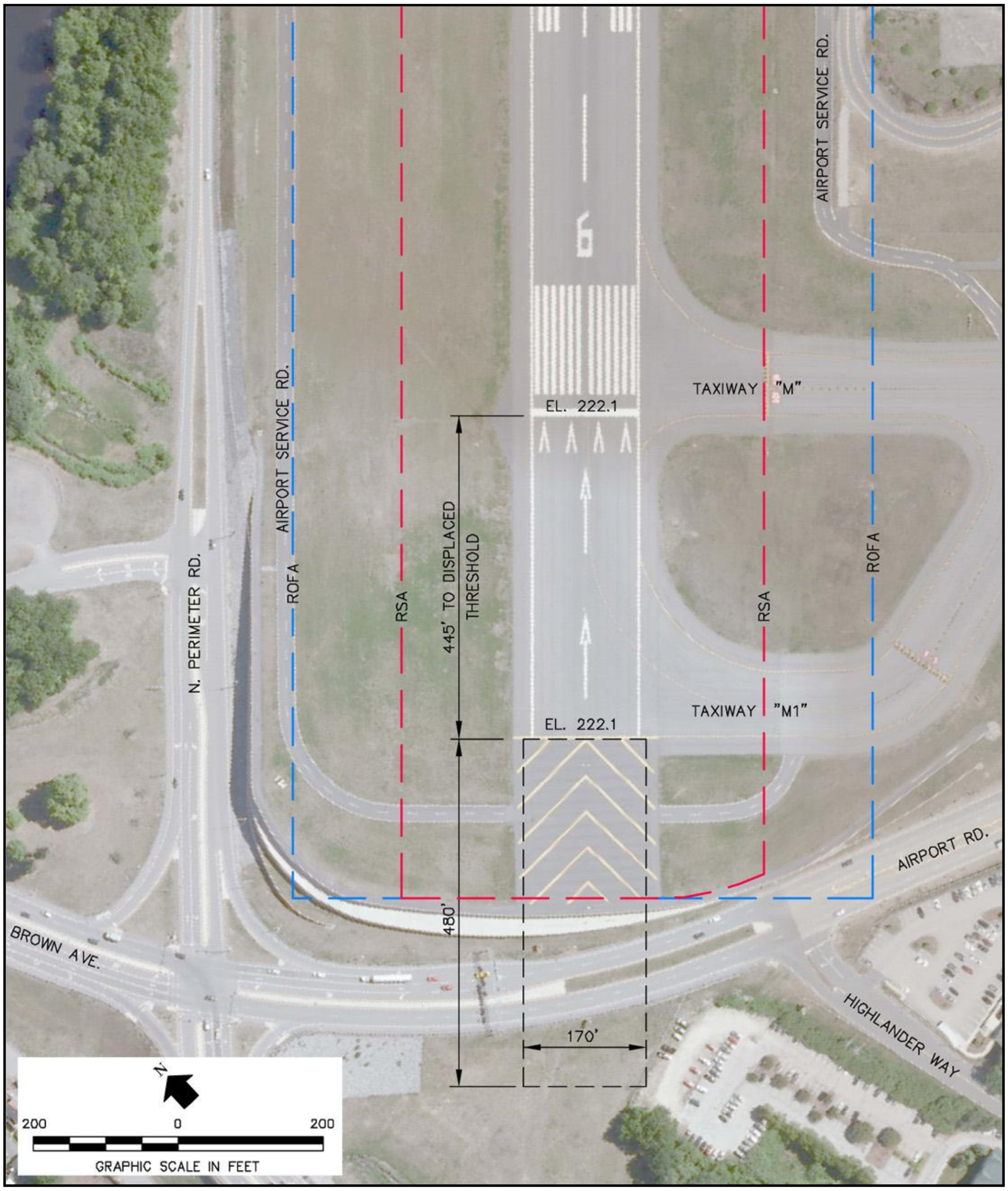
Source: URS Corporation, 2010.

FIGURE 5-9
POTENTIAL EMAS ON
NORTH END OF RUNWAY 17/35



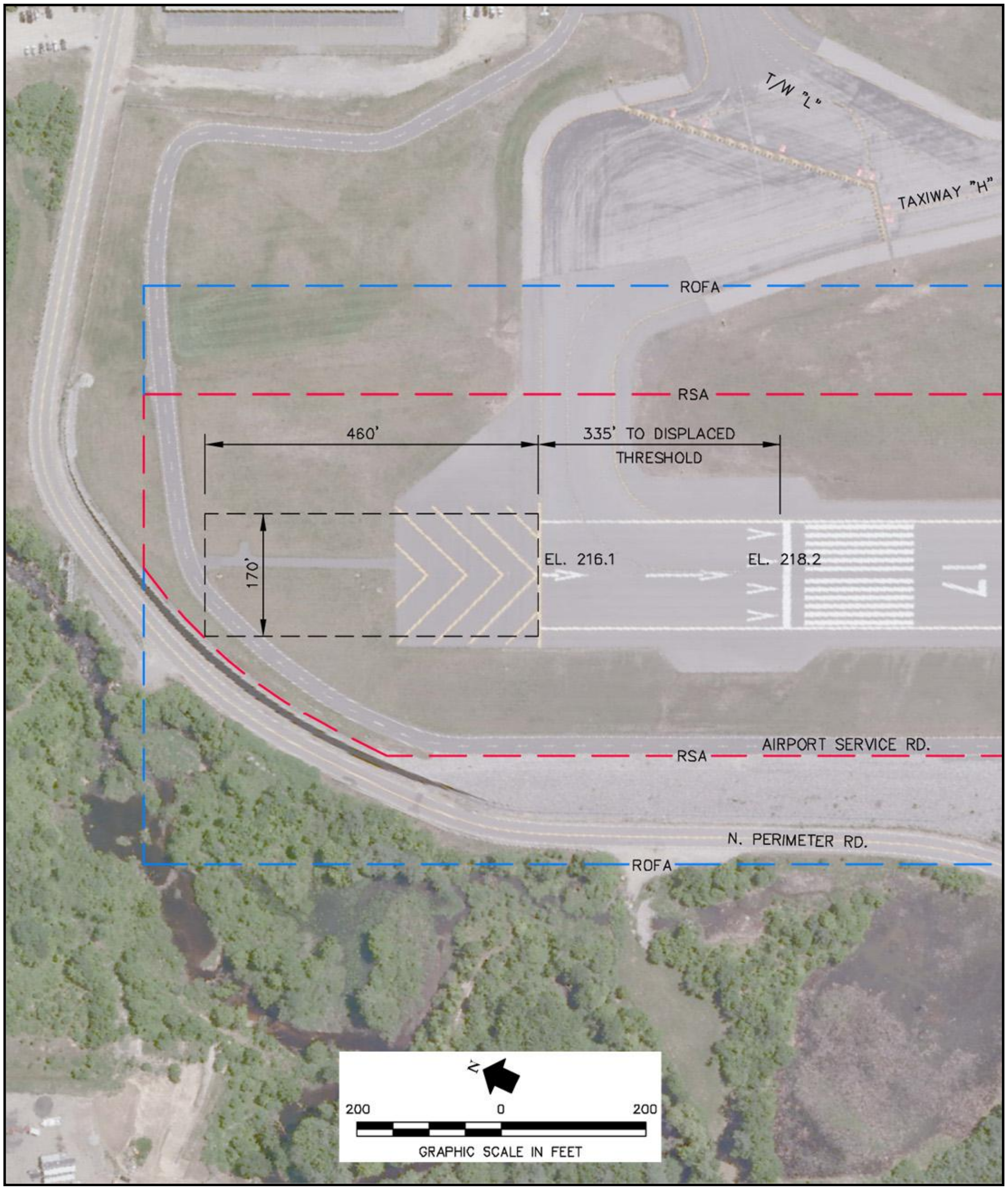
Source: URS Corporation, 2010.

FIGURE 5-10
LAND ENVELOPE REQUIRED FOR 70-KNOTS EMAS INSTALLATION ON SOUTHWEST END OF RUNWAY 6/24



Source: URS Corporation, 2010.

FIGURE 5-11
LAND ENVELOPE REQUIRED FOR 70-KNOTS EMAS
INSTALLATION ON NORTH END OF RUNWAY 17/35



Source: URS Corporation, 2010.

5.6 SERVICE ROAD ISSUES

This section addresses the existing service road around the airfield in terms of its compliance with runway clearance requirements. The service road's clearances from taxiways were previously addressed in Section 5.2.

The airport service road does not meet clearance requirements along the north side of Runway 6/24 near Jewell Instruments. Airport vehicles that traverse this portion of the service road must yield to aircraft operations in accordance with a letter-of-agreement established with the MHT ATCT.

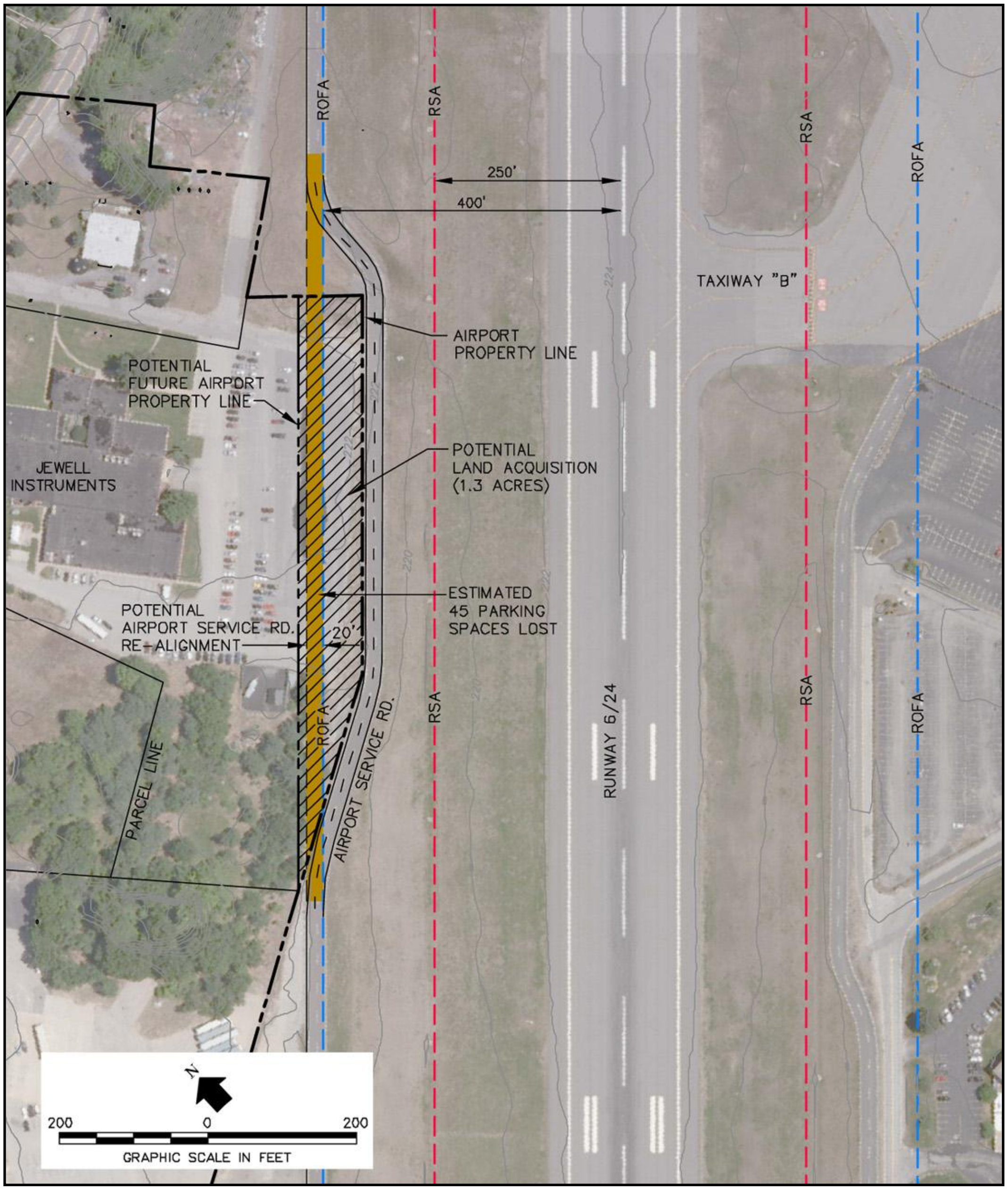
The service road on the north side of Runway 6/24 bends toward the runway and is located within the ROFA. This bend occurs because the airport does not own sufficient property to keep the road outside of the ROFA. There are two potential solutions for removing the service road from the ROFA in this location. The first alternative consists of acquiring the land needed to relocate the road outside of the ROFA. **Figure 5-12** illustrates a potential re-alignment of the service road assuming the necessary land could be acquired. The amount of land acquisition needed amounts to approximately 1.3 acres and is currently used for employee parking at Jewell Instruments. It is estimated that the property acquisition would affect approximately 45 parking spaces. However, the actual number of parking spaces that would be affected is difficult to ascertain since the pavement area is not marked in a traditional manner. The length of roadway that would be realigned outside of the ROFA with this alternative is approximately 1,000 feet.

A second alternative for addressing this issue would be to depress the service road so that it is below the ROFA. Unlike the RSA, which has a physical requirement, the ROFA is simply a clearance requirement. Therefore, the service road could be depressed such that the road and any vehicles traversing the road would remain below the ROFA. The clearance elevation of the ROFA is the same as the elevation at the edge of the RSA at the corresponding location. Thus, the service road would need to be depressed to an elevation that would provide 10 feet of clearance for vehicles traveling the road.

Figure 5-13 illustrates a potential depression of the service road to an elevation that would allow a vehicle with a height of 10 feet to remain below the ROFA. This alternative would require a vertical wall on the northwest side of the road to remain clear of the Jewell Instruments property. The construction of this alternative would present several challenges including maintaining proper drainage of the roadway and snow removal. In addition, this alternative, while meeting ROFA clearance standards, would create a significant ditch just outside of the RSA that presently does not exist. Although the alternative would meet FAA design standards, it introduces a hazard that is not desirable in a runway environment. For this reason and because of the drainage and plowing issues, this alternative is not recommended for implementation.

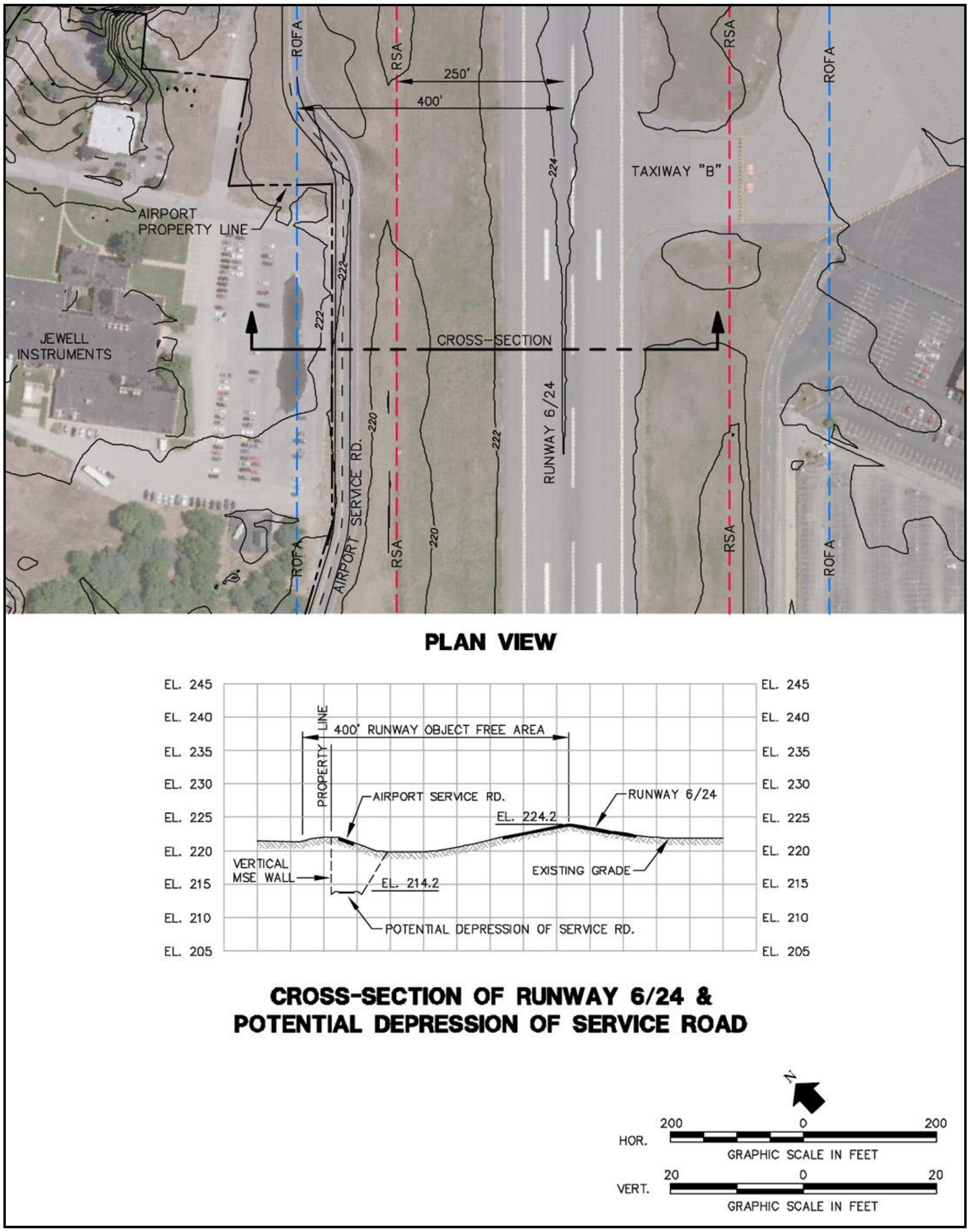
The alternative of relocating the service road outside of the ROFA is the preferred course of action. Implementation of this action should be pursued at such time the required property can be obtained from the adjoining property owner.

FIGURE 5-12
POTENTIAL RE-ALIGNMENT OF
AIRPORT SERVICE ROAD



Source: URS Corporation, 2010.

FIGURE 5-13
POTENTIAL DEPRESSION OF
AIRPORT SERVICE ROAD



Source: URS Corporation, 2010.

The service road in front of the Wiggins ramp on the east side of Runway 17/35 required modifications to the current LOA for vehicle operations, to allow vehicles to operate safely around wingtips. Attempts to renegotiate the lease to allow the service road to exclusively occupy the ramp have not been successful.

5.7 AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) INDEX

The FAA has established specific requirements for ARFF equipment. These requirements vary depending upon the frequency and size of aircraft that regularly serve the airport. **Table 5-5** summarizes the requirements, which are stated in terms of "Indexes" that begin with the letter "A" for airports serving small aircraft and extend to Index "E" for airports serving large aircraft. Each Index letter corresponds to aircraft size based on a range of aircraft lengths. Typical aircraft within each range are provided for guidance. The largest air carrier aircraft, with an average of five or more daily departures, is the index required for MHT.

TABLE 5-5
SUMMARY OF ARFF EQUIPMENT REQUIREMENTS

Airport Index	Length[1] of Aircraft (Representative Aircraft)	Vehicles		Extinguishing Agents	
		Light-Weight	Self-Propelled	Dry Chemicals (pounds)	Water (gallons)
A	Less than 90' (DASH-8)	1	0	500 Sodium or 450 Potassium	0 100
B	90' to less than 126' (CRJ-700)	1	1	500 Sodium or Halon	1,500
C	126' to less than 159' (B-737/A-320)	1	2	500	3,000
D	159' to less than 199' (B-767/A-300)	1	2	500	4,000
E	200' and greater (B-747)	1	2	500	6,000

[1] Length of largest aircraft providing an average of five scheduled departures per day. If there is less than an average of five daily departures by aircraft in a particular index, then the next lower index applies.

Sources: FAR Part 139, § 139.315, *Aircraft Rescue and Firefighting: Index Determination,* 2007 Edition.
FAR Part 139, § 139.317, *Aircraft Rescue and Firefighting: Equipment and Agents*, 2007 Edition.

As of 2010, aircraft with fuselage lengths in the 126 to 158-foot range are the largest aircraft that regularly serve (i.e., more than five daily departures) MHT. Consequently, for 2010, MHT falls within the Index C classification.

ARFF services at MHT are provided from a modern ARFF station located on the northeast side of the airfield adjacent to Taxiway "H". Services provided from this facility meet the requirements of Index C as specified by the FAA.

Projections of future aircraft operations at MHT indicate that aircraft with lengths in the 150 to 199-foot range (Index D) will continue to occur and will primarily be related to air cargo activity. Although the forecast does not indicate an average of five daily departures by this size aircraft, there is a potential for air cargo activity to reach this level should an expansion or relocation occur. Consequently, the airport could experience a volume of aircraft operations that ultimately fall within Index D. However, the existing ARFF station could accommodate the requirements of Index D. Therefore, no capital improvements are required to meet an increase from Index C to Index D.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION SIX

Surface Transportation Planning

SECTION 6.0
SURFACE TRANSPORTATION PLANNING

6.1 INTRODUCTION

Surface transportation is essential to the operational success of Manchester-Boston Regional Airport (MHT). The transportation system analyzed herein consists of the roadways, parking facilities, rental car facilities, and ground transportation options that bring airport users to and from the airport. The local roadway system is the primary surface transportation element serving MHT and it consists of the regional highways, local roadways, as well as on-airport roadways. Existing and forecast surface transportation demand is outlined in Section 3.2, Surface Transportation Forecasts of this Airport Master Plan Update. Section 4.3, Surface Transportation Demand/Capacity and Facility Requirements of the Airport Master Plan Update, outlines the impact that future aviation demand would have on MHT's transportation system. These two sections provides the foundation for surface transportation planning during the Airport Master Plan Update's 20-year planning horizon. Modifications and improvements to the surface transportation system should be implemented as demand dictates the need. However, to the extent possible, proposed modifications and improvements have been specified in planning periods of 0-5 years (Short-Term), 6-10 years (Intermediate-Term), and 11-20 years (Long-Term).

Currently, Interstate 93 (I-93), Interstate 293 (I-293), the F.E. Everett Turnpike (Everett Turnpike), NH Route 3A (Brown Avenue), and NH Route 28 (South Willow Street) are the primary existing regional highways serving the airport. The new Manchester-Boston Regional Airport Access Road is currently under construction and will provide direct access to MHT from the Everett Turnpike and US Route 3. These regional highways are shown on **Figure 6-1**. No other improvements are anticipated for the regional highway system during the Airport Master Plan's 20-year planning horizon.

The roadway system at or near the airport includes Airport Road, Perimeter Road, South Perimeter Road, Industrial Drive, Pettengill Road, Harvey Road, Ammon Drive, and the new Airport Access Road. While most of these roadways will remain in their current configurations during the planning horizon, a few modifications and improvements are planned as identified and discussed in the following sections.

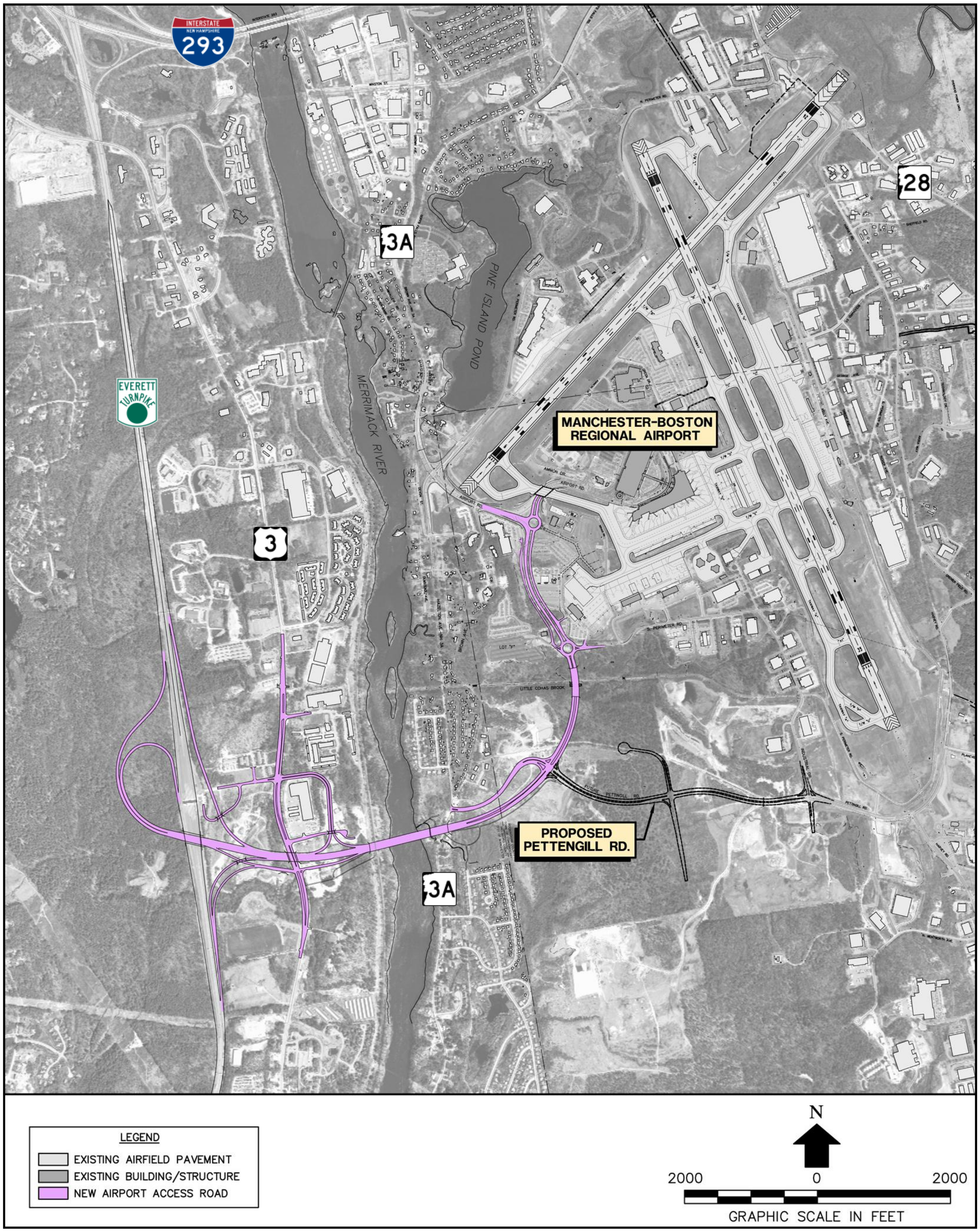
6.2 SURFACE TRANSPORTATION ROADWAY SYSTEM

The regional access routes to MHT will experience a significant upgrade when the new Airport Access Road is completed by 2012. Many airport users who now use Airport Road will use the new access road reducing their travel time to the airport. The effects of this new access road on access and circulation patterns are discussed in the following sections.

6.2.1 SOUTH ACCESS ROAD/SIGNALIZATION

The new Airport Access Road consists of a limited-access roadway linking the airport to the Everett Turnpike. Access is also provided to US Route 3, NH Route 3A/Future Pettengill Road, South Perimeter Road, and Airport Road. An interchange is planned at US Route 3, while a signalized intersection with a connector roadway is planned for NH Route 3A/Future Pettingill Road. Originally, signalized intersections were planned at South Perimeter Road and Airport Road.

FIGURE 6-1
NEW AIRPORT ACCESS ROAD



Source: URS Corporation, 2010.

As part of this planning process, eliminating the two closest signalized intersections was evaluated to reduce travel times to the airport and improve passenger convenience. The results of the evaluation retained the signal at NH Route 3A/Pettengill Road because the high volume of through traffic on the access road conflicted with the high volume of turning traffic for Pettengill Road. However, two-lane roundabouts were recommended at South Perimeter Road and Airport Road because the roundabouts would reduce delay and increase the Level of Service at these intersections. New Hampshire Department of Transportation (NHDOT) concurred with the recommendations and the plans for the new Airport Access Road are being revised to include the two roundabouts. **Figure 6-2** shows the two proposed roundabouts at the south access to the airport.

6.2.2 PROPOSED PETTINGILL ROAD

The new Airport Access Road will also provide a new connection to Pettengill Road in Londonderry. The proposed extension of Pettengill Road will provide access to existing and undeveloped land in northern Londonderry via the new Airport Access Road. See Figure 6-1 depicts the proposed Pettengill Road and the improved access it provides to New Hampshire (NH) Route 3A and the Everett Turnpike.

6.2.3 REGIONAL SIGNAGE/TRAILBLAZING (WAY FINDING)

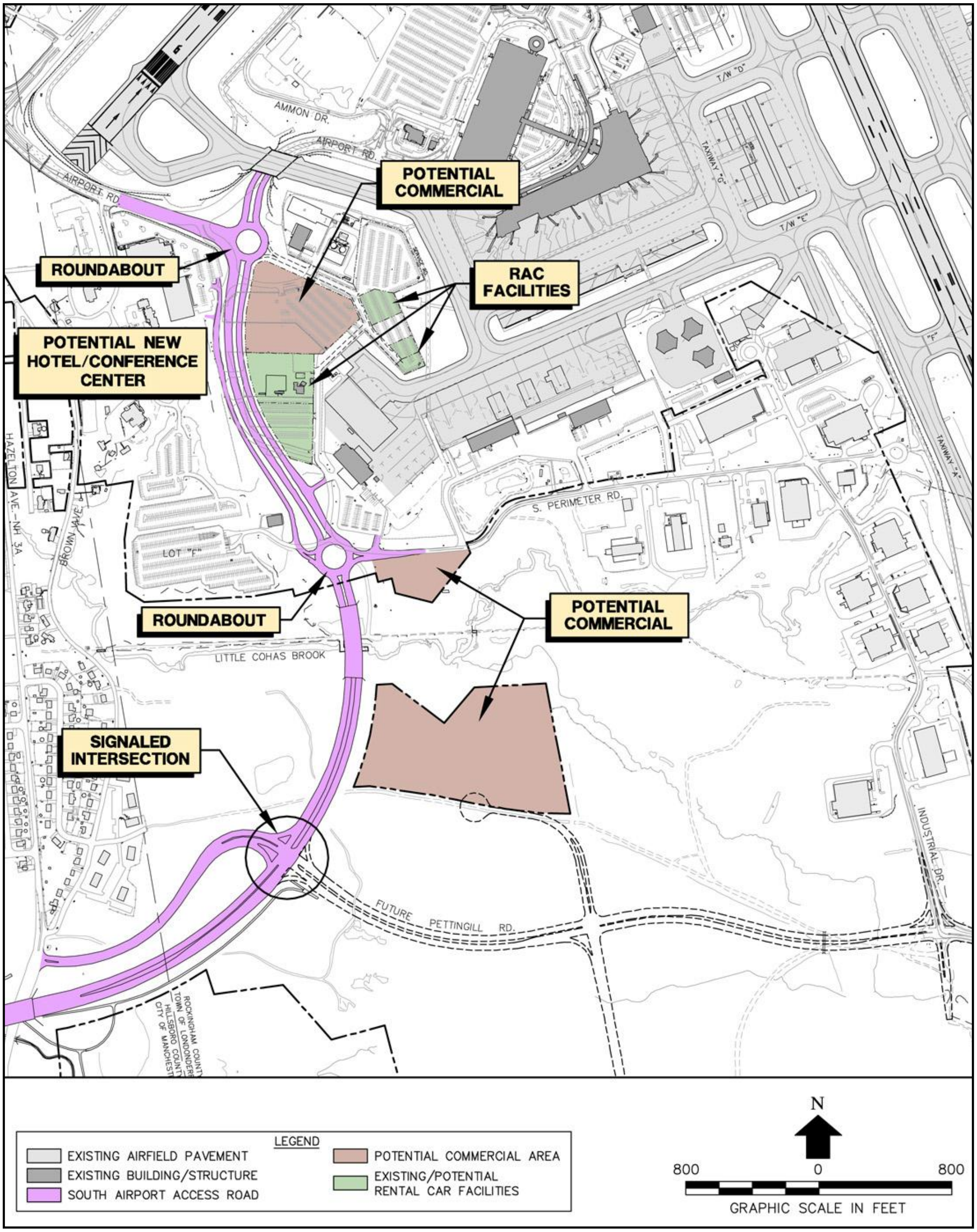
By 2012, the primary access to MHT will be the new Airport Access Road as the construction is completed and the roadway is opened. The signs to the airport will, therefore, need to be modified and updated to direct traffic bound for the airport to the Airport Access Road. NHDOT will include many of the new signs in the construction of the Airport Access Road. These new signs have an enhanced format that includes the airport logo. The logo represents an easily identifiable cue for drivers heading to the airport. The logo will be used on all road signs to provide a consistent guide to drivers that takes them directly to the airport.

Existing signs on I-293 and Route 101 will need to be updated to direct traffic to the new Airport Access Road, when it is opened. It is recommended that other existing signs be updated to include the airport's logo for consistency. Signs on I-93 and Route 101 East that currently read "Manchester Airport" should have the airport's logo added. **Figures 6-3A, 6-3B, and 6-4** show the proposed new signs that would be in place once the Airport Access Road is opened.

It is also recommended that trailblazing signs be provided to broaden the road sign coverage for MHT for two reasons. First, many of the airport users are from out of state and additional signs will be of assistance. Second, the signs will reinforce how close the airport is for users in potential markets. Seeing a sign for the airport may influence a person's choice of airports for their next trip.

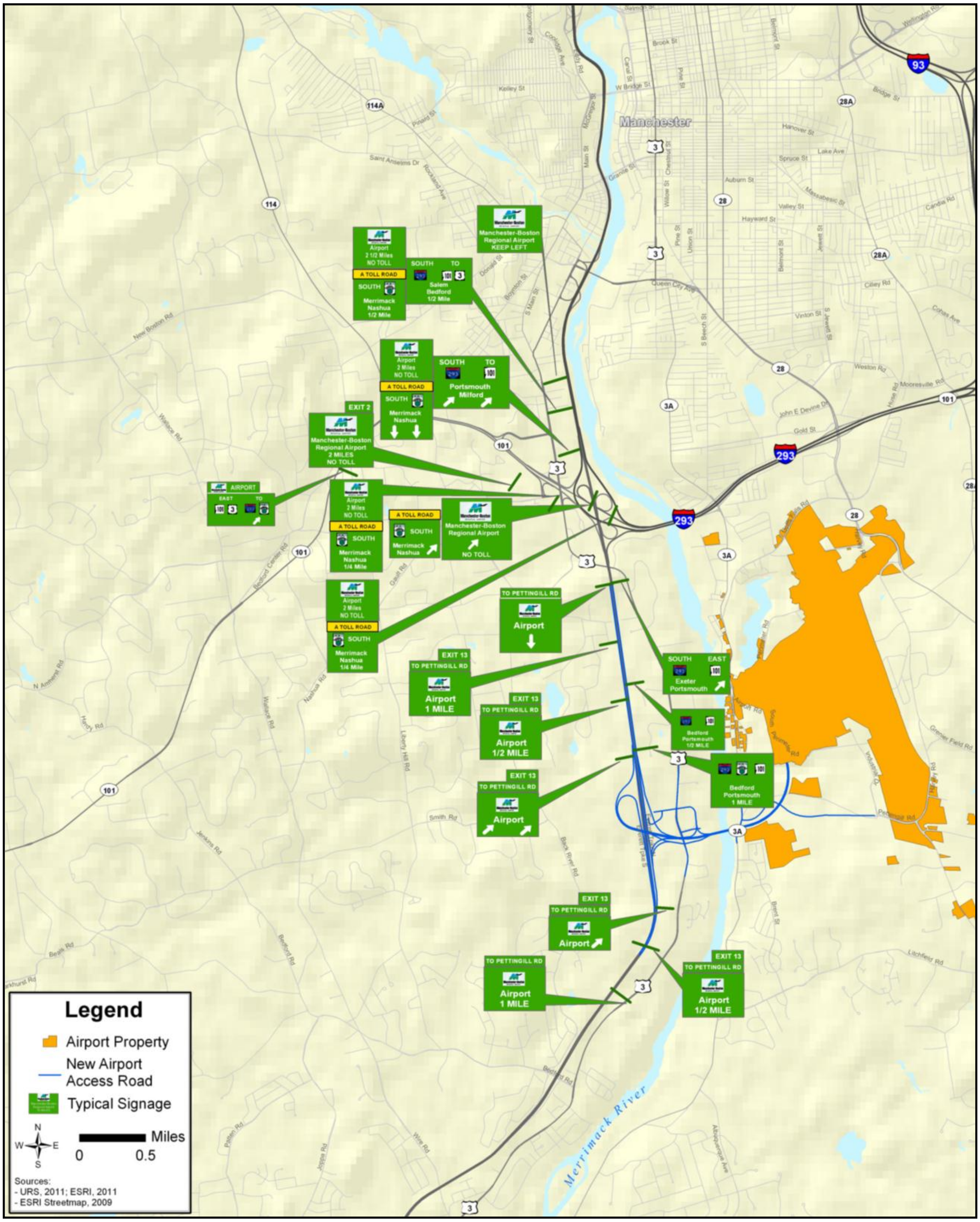
Most of these signs do not currently exist and the recommendations are meant to enhance way finding and recognition of the airport. The locations were chosen to address 1) the distribution of airport users and 2) to target potential regional markets. The proposed signs are placed at key geographic, jurisdictional, and market boundaries in the region. Signs are placed at the primary points of entry into New Hampshire from Massachusetts, Vermont, and Maine. Signs are also provided where drivers would have to change routes to get to the airport. Where drivers would travel a great distance on one route, i.e., Interstate 89, a sign is placed mid-point along the route to confirm they are on the correct route. The mid-point also direct those who enter these routes. **Figure 6-5** shows the recommended trailblazing sign locations.

FIGURE 6-2
SOUTH AIRPORT ACCESS ROAD



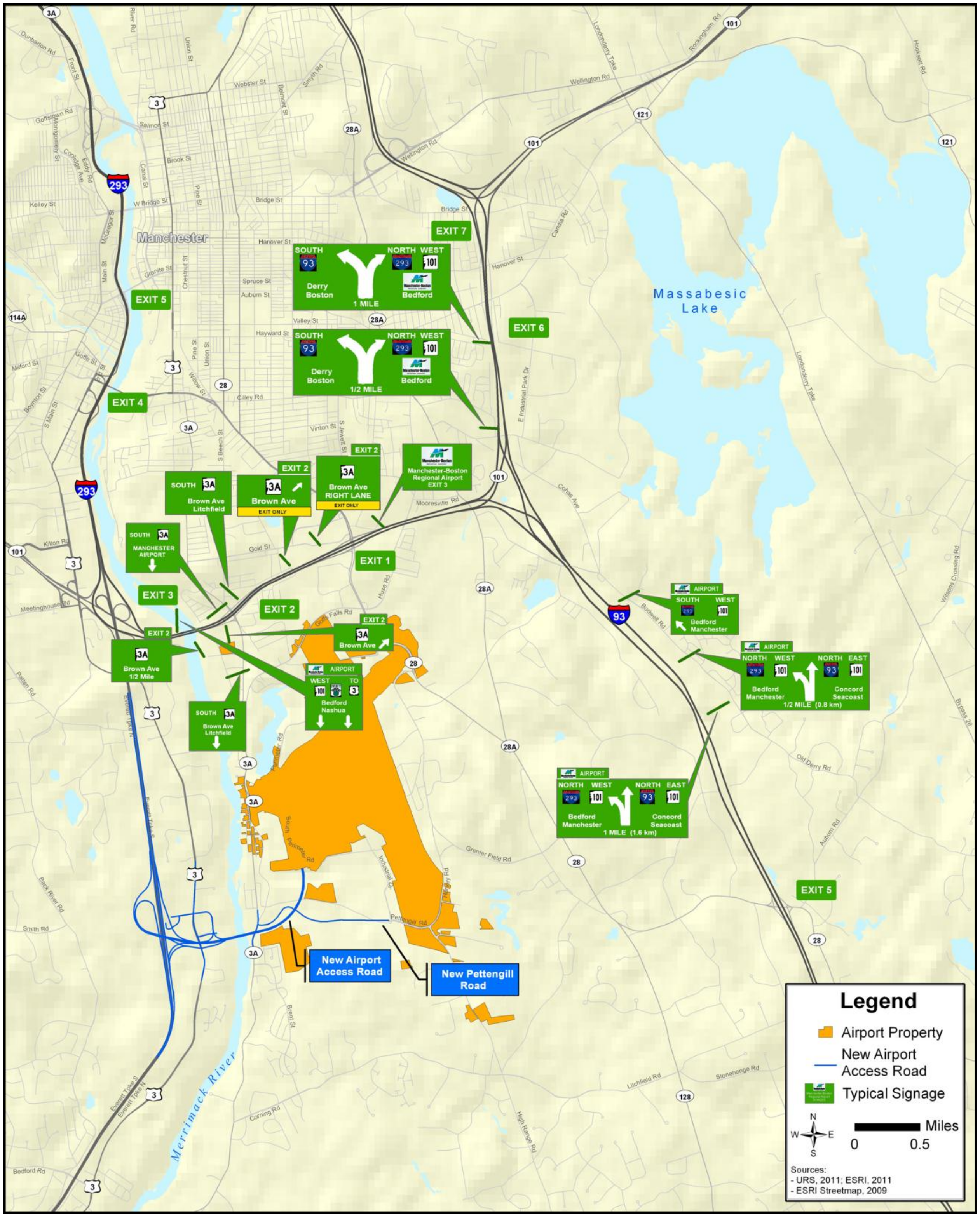
Source: URS Corporation, 2010.

FIGURE 6-3A
PROPOSED AIRPORT SIGNAGE



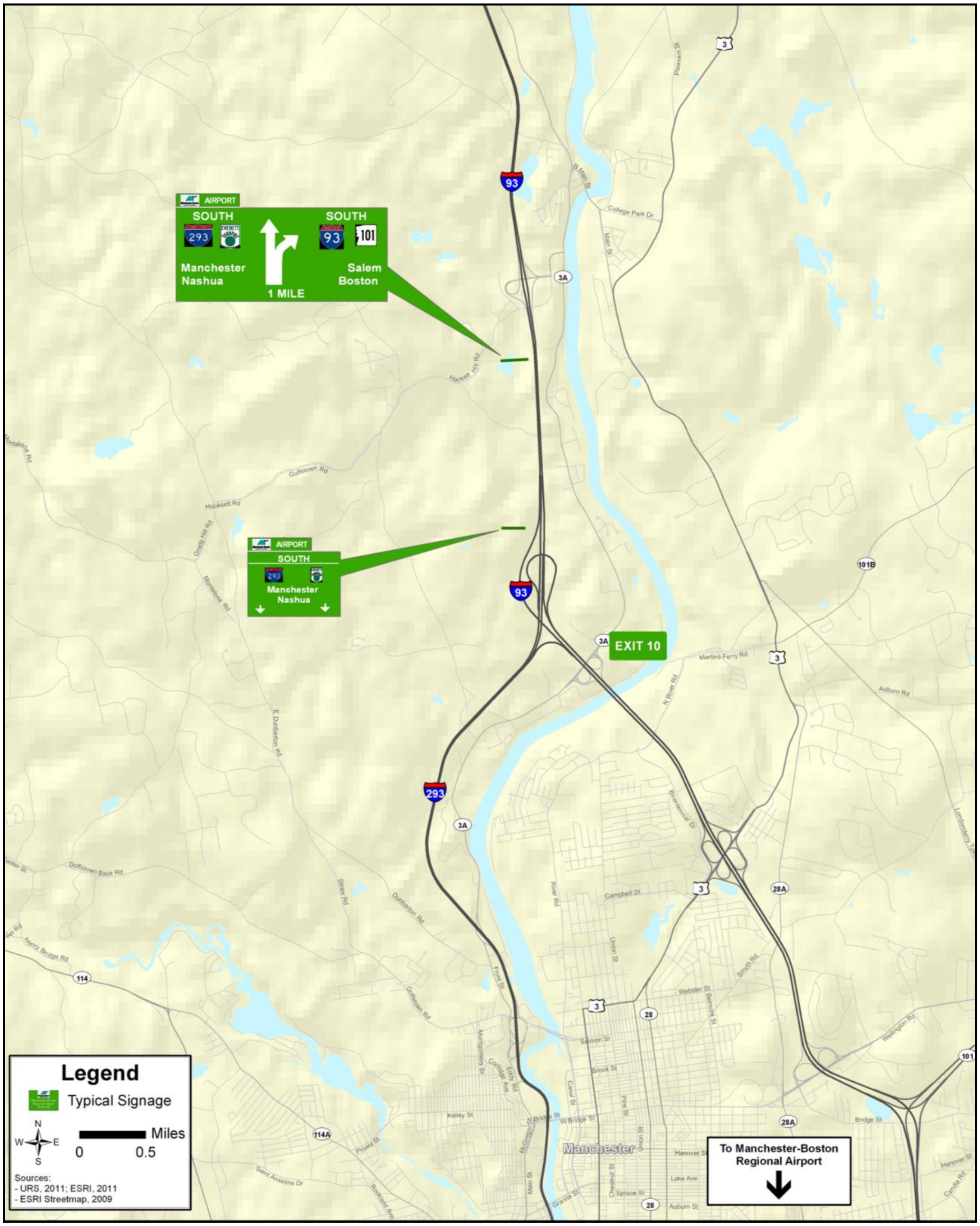
Source: URS Corporation, 2010.

FIGURE 6-3B
PROPOSED AIRPORT SIGNAGE



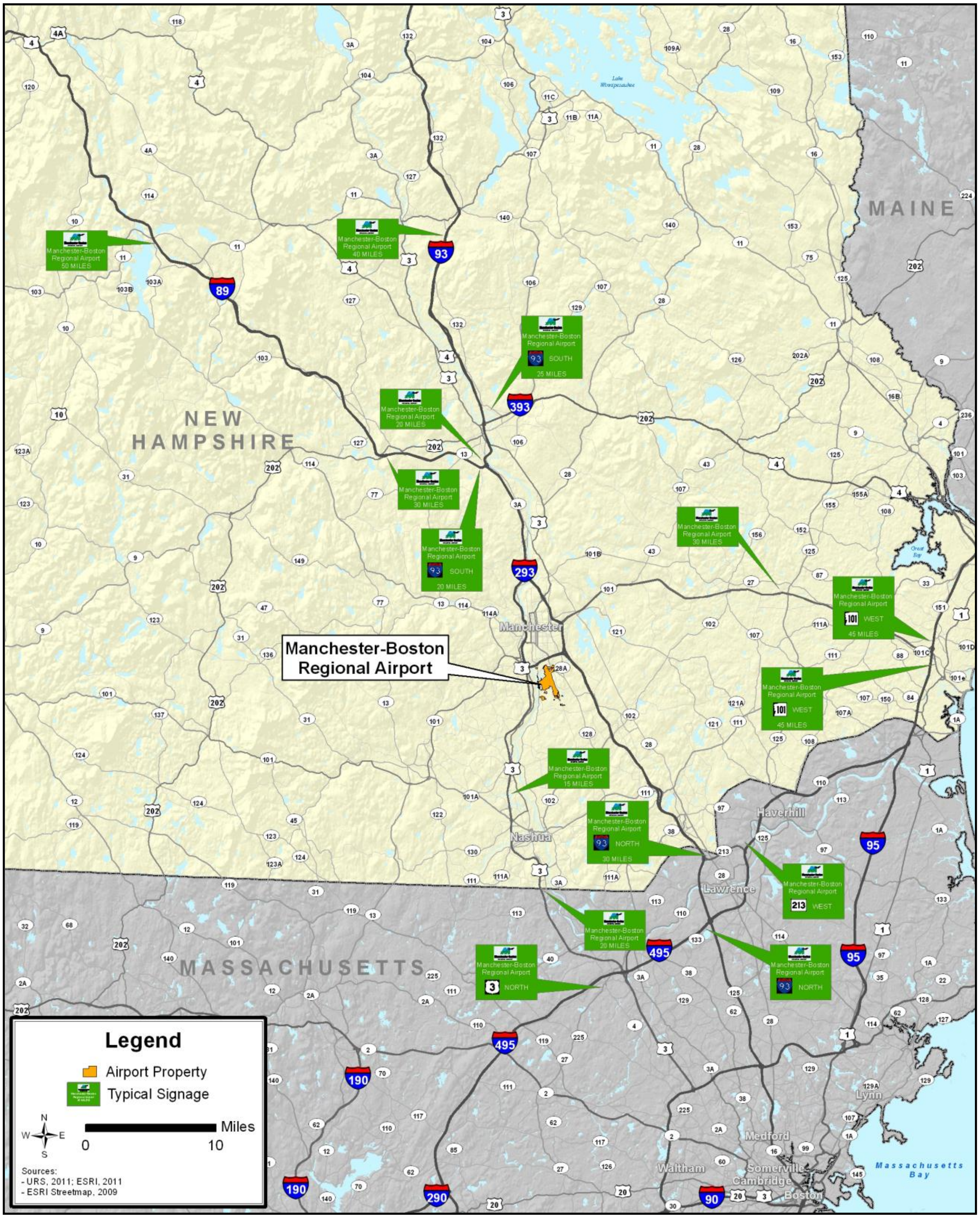
Source: URS Corporation, 2010.

FIGURE 6-4
PROPOSED AIRPORT SIGNAGE



Source: URS Corporation, 2010.

FIGURE 6-5
REGIONAL TRAILBLAZING SIGNAGE LOCATIONS



Source: URS Corporation, 2010.

6.3 TERMINAL MIDFIELD ROADWAY SYSTEM

6.3.1 AIRPORT ROAD/TERMINAL ACCESS

Airport Road provides access to the passenger terminal building, parking garage, Short-Term Lot A, Long-Term Lots C & D, the cell phone lot, the Ammon Center, and the Freudenberg-NOK facility. The new Manchester-Boston Regional Airport Access Road will tie into existing Airport Road with a new roundabout. Although traffic will use both the Airport Access Road and Brown Avenue in the future, all traffic would still use Airport Road to pass under Taxiway M and access the passenger terminal facilities. Figure 6-2 depicts the configuration of Airport Road, which is under construction.

Modifications are proposed for Airport Road as it approaches the terminal. The divergence of lanes approaching the parking garage and Lot A will be improved. The ramp to the parking garage will be separated from the ramp to Lot A so that it is more clear which lane is for which facility. The parking access roadway lanes are shown on **Figure 6-6**. With this improved configuration, vehicles will continue to exit left to access the parking garage, Lot A and the third roadway curb. However, a separate lanes would be provided and signed for airport users heading to Lot A or commercial vehicles heading to the terminal.

6.3.2 TERMINAL CURBSIDE/LANES

Although there are no substantial modifications proposed for the physical layout of the curbside, modifications at the terminal frontage would have the potential to impact the operations at the curb. New signage and new entrance doors into the terminal could encourage the use of more of the existing curbside frontage and reduce congestion. **Figure 6-7** shows the modifications to the terminal curbside and the new terminal entrances treatments.

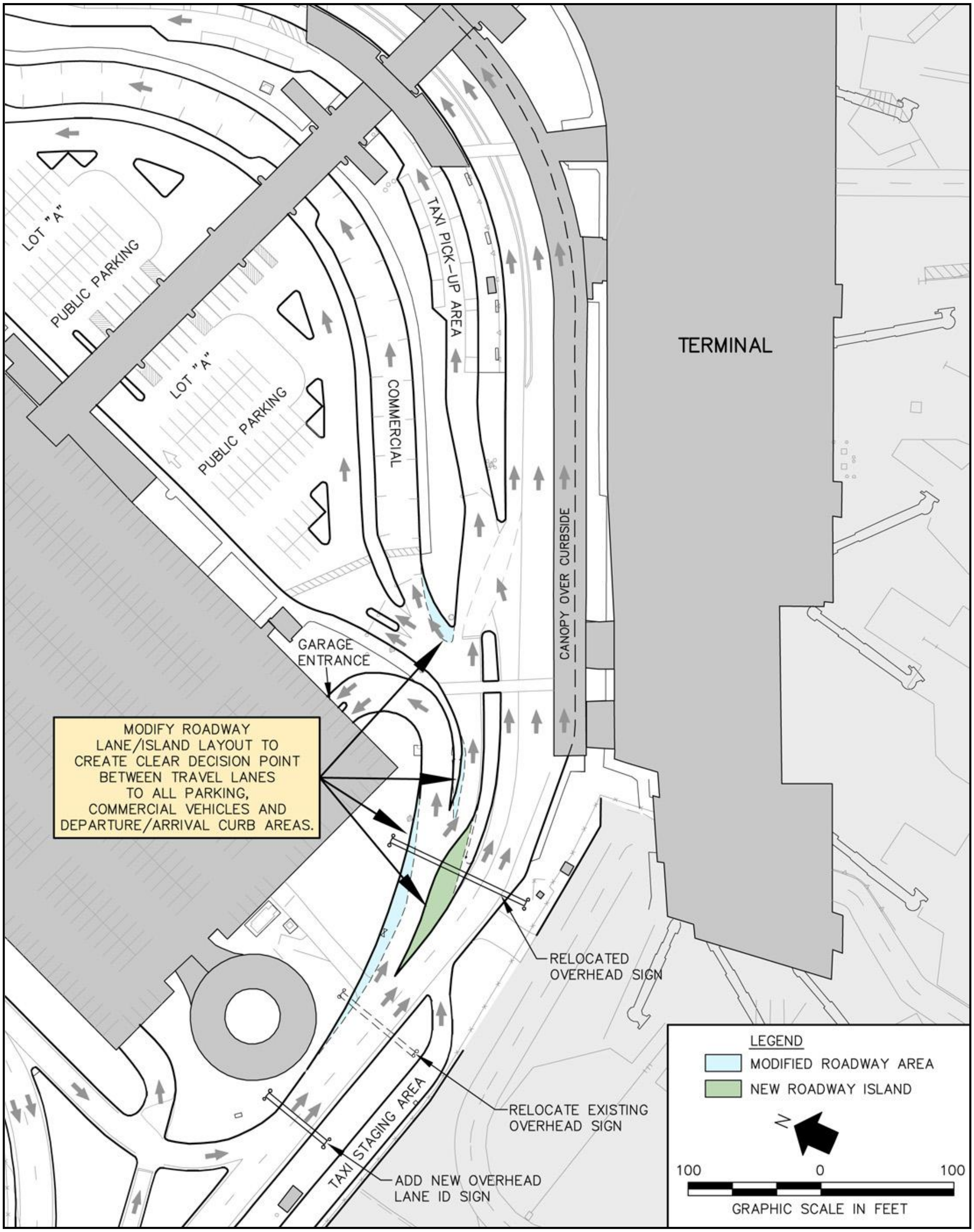
6.3.3 AMMON DRIVE

Ammon Drive and the vehicle service road along Runway 6/24 are currently located within the Runway Object Free Area (ROFA) for that runway. To move the roadways completely out of ROFA, they would need to be realigned approximately 112 feet to the south. This realignment will displace parking spaces in Long-Term Lots C and D, the Ammon Center, and Freudenberg-NOK. The parking can be replaced as described below.

Long-Term Lot C will lose approximately 151 spaces and Long-Term Lot D will lose approximately 229 spaces. There is space available to expand Lot C and Lot D to replace these lost spaces. The entrance and exit for Lot D will be relocated as well. The Ammon Center will lose 235 spaces. These 235 spaces could be replaced by re-configuring the parking lot layout at the Ammon Center. However, the current demand at the Ammon Center does not require 250+ spaces. The minimum parking requirement for office space of this size in the City of Manchester is approximately 102 spaces. The Freudenberg-NOK facility will lose 87 spaces, but only 47 of these can be replaced on-site.

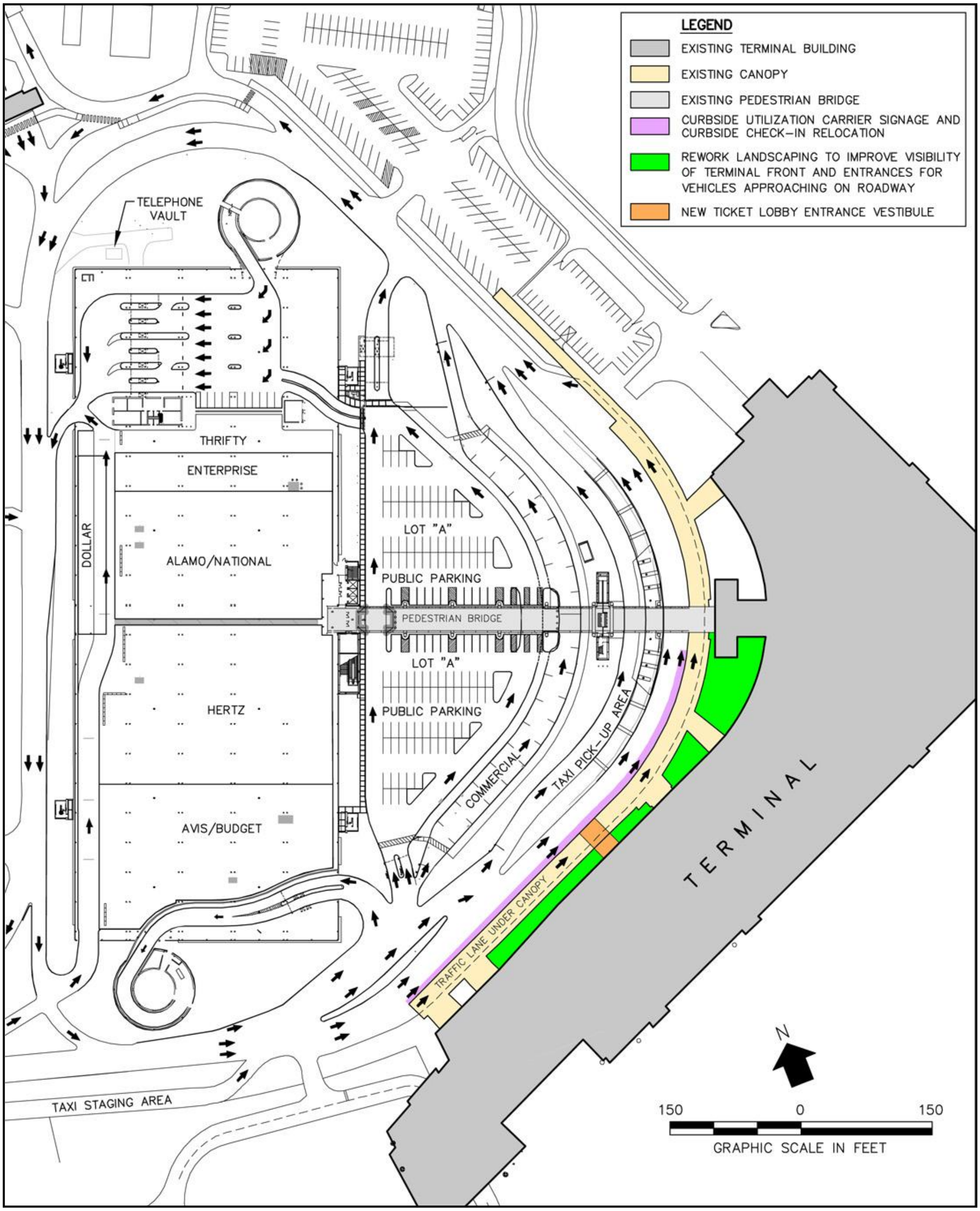
Figure 6-8 depicts a potential configuration of Ammon Drive, the vehicle service road along Runway 6/24, and conceptual parking lot modifications.

FIGURE 6-6
MODIFIED TERMINAL ROADWAY LANES/ISLANDS



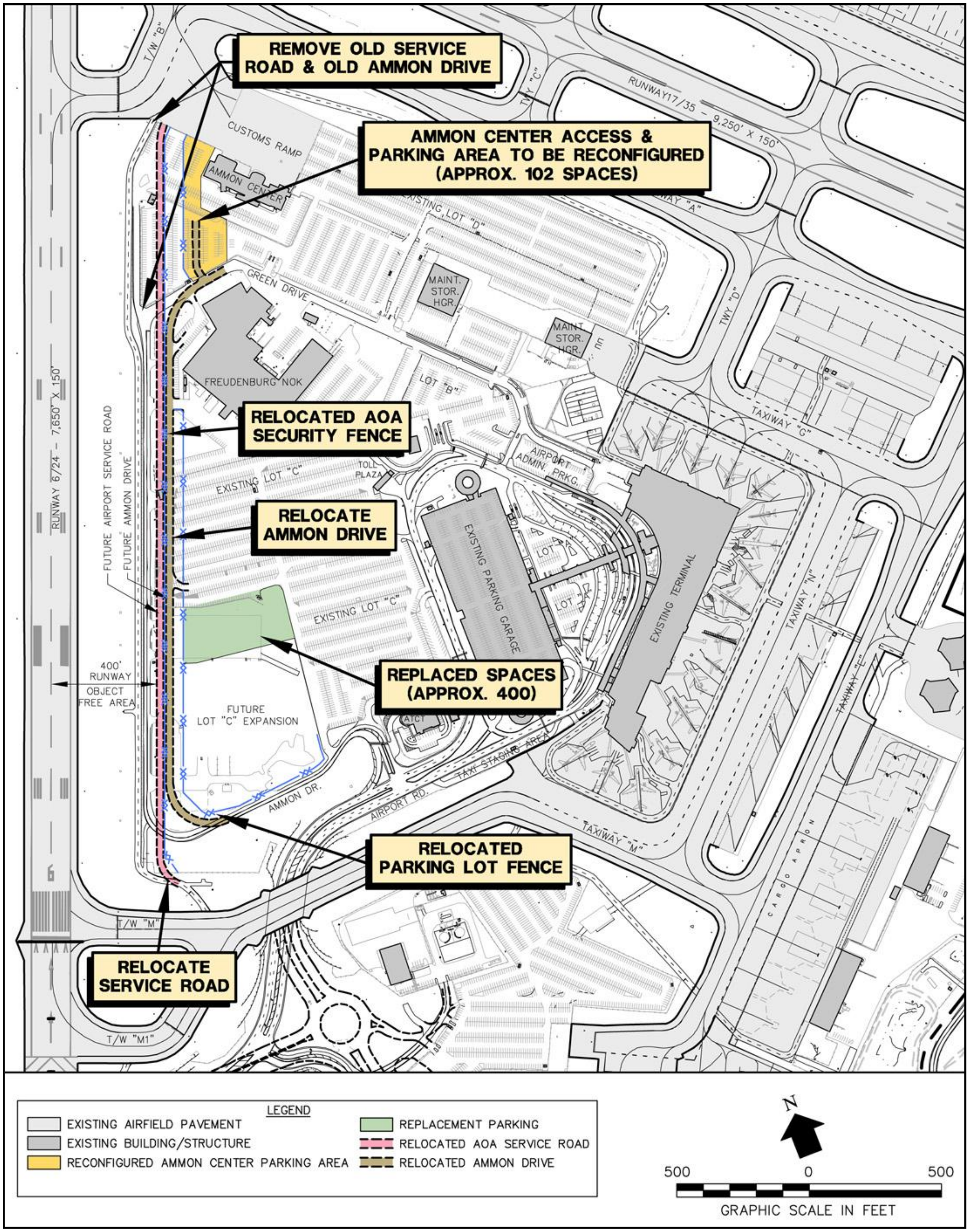
Source: URS Corporation, 2010.

FIGURE 6-7
SHORT-TERM TERMINAL CURBSIDE IMPROVEMENTS



Source: URS Corporation, 2010.

FIGURE 6-8
AMMON DRIVE/SERVICE ROAD IMPROVEMENTS

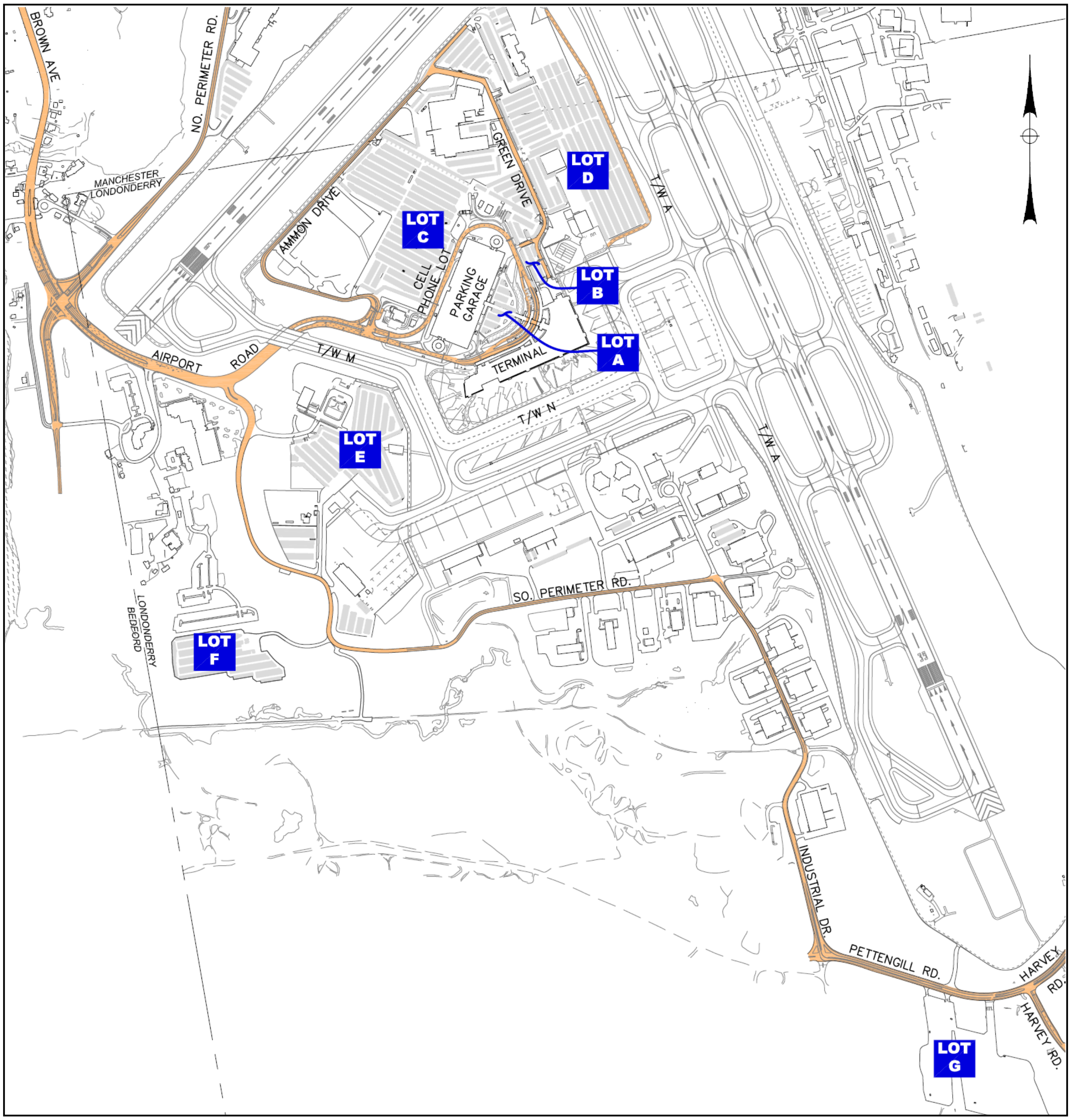


Source: URS Corporation, 2010.

6.4 PARKING

Parking at MHT will continue to be a key element in the successful operation of the airport. The recommendations for each parking component are discussed in the following sections. Airport parking facilities are depicted on **Figure 6-9**.

FIGURE 6-9
AIRPORT PARKING FACILITIES



Source: McFarland Johnson, 2010.

6.4.1 *SHORT-TERM HOURLY SURFACE PARKING*

Parking Lot A currently provides 136 Short-Term hourly spaces available for those dropping off and picking up passengers. The demand for Short-Term hourly spaces currently exceeds the capacity of Lot A on the busiest 10% of days. During the 20-year planning horizon of the Airport Master Plan Update, additional spaces will be required. The additional spaces required to accommodate the demand for Short-Term hourly parking are shown in **Table 6-1**.

TABLE 6-1
SHORT-TERM HOURLY SURFACE PARKING
SUMMARY OF ADDITIONAL SPACES REQUIREMENTS

Airport Master Plan Update Planning Periods	Number of Additional Spaces Needed
Short-Term (0-5 years)	11
Intermediate-Term (6-10 years)	25
Long-Term (11-20 years)	56

Source: LeighFisher, 2010.

In the Short-Term, the additional spaces for short-term hourly parking can be accommodated in the parking garage. The pay structure in the parking garage currently is the same for stays less than 4.5 hours and Short-Term parking Lot A currently uses the garage pay booths. However, in the Long-Term time frame, the garage will not have the capacity to accommodate the Short-Term hourly parking demand. It is recommended that a portion of Parking Lot B be converted for Short-Term hourly parking as it was during previous years of high airport activity.

6.4.2 *SHORT/LONG-TERM GARAGE PARKING*

The parking garage at MHT currently provides 3,985 spaces for Short-Term and Long-Term parking on five parking levels, including the roof. The garage is used for Short-Term hourly parking for those dropping off and picking up passengers, as well as Long-Term parking for those who prefer covered parking. The garage currently has sufficient capacity to address the design and peak demand projected for the Airport Master Plan Update planning period. The 797 parking spaces on the roof level of the garage are not currently utilized because they are not needed. The total Long-Term parking garage spaces required for each planning period to accommodate the demand on the busiest days are shown in **Table 6-2**.

TABLE 6-2
SHORT- AND LONG-TERM GARAGE PARKING
SUMMARY OF ADDITIONAL SPACES REQUIREMENTS

Airport Master Plan Update Planning Periods	Number of Total Spaces Needed
Short-Term (0-5 years)	3,082
Intermediate-Term (6-10 years)	3,375
Long-Term (11-20 years)	4,021

Source: LeighFisher, 2010.

During the Long-Term planning period, the demand for garage parking spaces will approach its capacity. By 2025, the roof level parking spaces will be required. Using the roof level for parking creates additional operational issues during winter months because of snow accumulation. There are several options to address these issues. Snow melting equipment could be installed to remove the melted snow through the roof drains and storm water system. A roof could be installed to provide a cover for the fifth parking level to reduce the impact of snow accumulation on parked vehicles. This would be a canopy type roof covering only and would not impact any line of sight from the ATCT.

By 2030, the demand during the busiest days of the year will exceed the parking garage’s capacity by approximately 30 to 40 spaces.

6.4.3 LONG-TERM DAILY SURFACE PARKING

Parking Lots C, D, E, F, and G provide approximately 7,733 Long-Term parking spaces at MHT. Lots C and D are the primary Long-Term parking lots, providing 4,312 spaces. Lots E and F are available, but seldom used, while Lot G is not currently equipped to handle public parking. The number of Long-Term parking spaces currently available at MHT greatly exceeds the demand during the 20-year planning horizon of the AMPU. The total Long-Term spaces required for each planning period to accommodate the demand on the busiest days are shown in **Table 6-3.**

TABLE 6-3
LONG-TERM DAILY SURFACE PARKING
SUMMARY OF ADDITIONAL SPACES REQUIREMENTS

Airport Master Plan Update Planning Periods	Number of Total Spaces Needed
Short-Term 0-5 years)	3,818
Intermediate-Term (6-10 years)	4,181
Long-Term (11-20 years)	4,981

Source: LeighFisher, 2010.

Given the base forecast of future activity, Parking Lots E, F, and G will not be needed during the 20-year planning horizon. The parking capacities of Lots C and D will change in the future as other elements of the Airport Master Plan Update, such as the Ammon Drive relocation project, impact the size of these facilities. The Ammon Drive relocation project will remove 151 spaces from Lot C and 229 spaces from Lot D for a combined loss of 380 spaces. Lots C and D existing capacities would be reduced as follows: Lot C (2,292 -151) 2,141 spaces and Lot D (2,020 -229) 1,791 spaces. However, there is available land to increase the size of Lot C as part of the Ammon Drive relocation project and replace the 380 spaces (see Figure 6-8). This would bring the Lot C overall capacity to 2,521 spaces.

In the long term, Lot C could be expanded and provide approximately 947 additional spaces. The capacity of Lot C would increase to 3,468 spaces. With the Lot C 3,468 parking spaces and Lot D 1,791 parking spaces this would have a combined capacity of at least 5,200 spaces. This would be sufficient for the demand within the 20-year planning horizon.

The lease for Freudenburg NOK expires during the Long-Term planning period and if this area becomes available for parking, an additional 1,000 spaces can be provided. Also, other structures within the runway visibility zone (Ammon Center building and two old hangars) could be removed, which would provide the opportunity to add another 500 to 600 Long-Term parking spaces. The demolition of these facilities could provide a total capacity of approximately 6,800 Long-Term parking spaces which is well above the projected 20 year demand. Another potential capacity enhancement is a second parking garage, which is still considered as an ultimate capability and retained as a long range development planning strategy.

Lot D area is adjacent to the airfield and was at one time utilized as airside. However, Lot D is within the runway visibility zone and no new buildings or structures can be constructed in this area. With no substantial airside needs within the 20-year planning horizon, the best use of Lot D area is for parking. The current demand for Long-Term parking is Lot D’s highest and best use through the AMPU’s 20-year planning horizon. When additional terminal area land becomes available for Long-Term parking, a portion of Lot D would be available for employee parking as it was previously used several years ago.

6.4.4 CELL PHONE PARKING

The existing Cell Phone Lot is located adjacent to Parking Lot C. The Cell Phone Parking Lot provides 29 spaces for those coming to the airport to pick up arriving passengers. Comprehensive data is not available for the use of the Cell Phone Lot. However, due to projected demand and the expected increased use of the lot, it is recommended that ten additional spaces be provided during the 20-year planning horizon.

There are preliminary discussions that the Cell Phone Parking Lot be relocated to an area planned for a convenience store/gas station near the existing fuel farm. The estimated required 40 spaces could be provided at this location and it would have more convenient access to the terminal via the proposed roundabout at the intersection of Airport Road and the new Airport Access Road. Those waiting in the lot will have the benefit of a convenience store and restrooms while they wait. Lot C can absorb the existing Cell Phone Lot parking spaces.

6.4.5 EMPLOYEE PARKING

Employee parking at MHT is currently provided north of the terminal in several lots along Green Drive as well as in the parking garage for those employees willing to pay parking fees. These lots accommodate parking for airline crews, airport administration, and general employee parking. The employee lots currently have sufficient capacity to accommodate the Short-Term and Intermediate-Term demand. However, the Long-Term demand results in the need for additional employee parking spaces. As the demand for public parking near the terminal increases in the Long-Term, consideration should also be given to relocating the general employee parking away from the terminal. This would require the use of shuttle buses to carry employees to the terminal and other airport facilities. The airport administration and airline crew lots would remain at their existing locations within the 20-year planning period.

6.4.6 TERMINAL DELIVERY SERVICE VEHICLE DROP OFF/PICK UP/PARKING

Deliveries to the passenger terminal building are made through the loading dock at the northernmost point of the terminal building at the end of Green Drive. Large trucks have a turn-around area that provides access to a loading dock. Smaller delivery vehicles (i.e., FedEx and UPS) drop off packages at the loading dock and then park at a designated delivery parking lot along Green Drive. The drivers then walk to the loading dock to retrieve the packages and deliver them to the terminal. No changes to the delivery operation are planned during the 20-year planning horizon.

6.4.7 CONTRACTOR PARKING

Contractor parking is provided in a lot along Green Drive north of the airline crew parking lot. This designated lot is for private contractors performing service, repairs, construction, or other activities at the airport. No changes to the contractor parking location are planned during the 20-year planning horizon.

6.4.8 IMPOUNDED VEHICLE STORAGE LOT

Vehicles that are parked illegally on airport property are towed to a storage lot located on Green Drive, south of the airline crew parking lot. Owners must retrieve their vehicles at this location. No changes to the impounded vehicle storage lot are planned during the 20-year planning horizon.

6.5 RENTAL CARS

Several rental car agencies operate at MHT. Currently, each agency has counter space within the passenger terminal building. The counters are planned to be relocated to a new facility to be constructed adjacent to the parking garage. Passengers would exit the terminal and walk to the counters using the pedestrian bridge or the covered ground-level walkway. The following sections describe the rental car operations and planning considerations for the 20-year planning horizon.

6.5.1 READY/RETURN (GARAGE)

Rental cars that are ready for customers are staged on the ground floor of the parking garage. Rental car customers also return cars to the ground floor of the parking garage. The ground floor of the garage currently has sufficient capacity to accommodate the Ready/Return demand. The surplus Ready/Return capacity is expected to last through 2020. By 2030, a deficit of nearly 100 Ready/Return spaces could be expected.

As stated in Section 6.4.2, the parking garage will be at capacity by 2030. Therefore, using existing garage parking space on the second through sixth levels for rental car Ready/Return is not proposed. The best use of the garage ground floor is for rental car Ready/Return. It is, therefore, recommended that the additional Ready/Return space be accommodated on the ground floor of the garage.

Existing facilities located on the ground floor of the garage would need to be relocated in the future to accommodate the additional space needed for rental car Ready/Return. Option 1, shown on **Figure 6-10**, would provide a minimal expansion that eliminates one toll booth and relocates the existing toll plaza support building. Two areas within the existing garage were identified for possible relocation of the toll plaza support building. Option 1, would provide approximately 9,074 square feet of additional Ready/Return space, which could accommodated up to approximately 25 to 30 vehicles depending on the tenant operational layout preferences. Option 1 would provide sufficient capacity through 2025.

The loss of the toll booth could be offset by using a more automated system whereby users pay their fee before they exit the garage. Users would be instructed to take their parking tickets with them and use pay stations before they return to the garage. Fewer booths would be needed since the users would only need to insert their pre-paid tickets.

Option 2, shown on **Figure 6-11**, offers the greatest opportunity to expand the Ready/Return space on the existing ground level of the parking garage. It is also the highest and best use of the Level 1 parking garage. This option relocates all toll booths outside the parking garage to the area adjacent to the existing two toll booths that serve Lot A. In addition, the toll plaza support facility would be relocated to the northeast corner of the parking garage. The parking garage exit lanes would be redirected to the north and exit into Lot A. A portion of the existing Thrifty's lease area is needed for the relocated exit lanes. Thrifty's lease area would be replaced and reconfigured in the parking garage under this concept.

This option provides approximately 33,918 SF of additional Ready/Return space, which could accommodate approximately 100 vehicles. Option 2 offers the best opportunity for several rental car agencies to expand and reorganize their Ready/Return facilities.

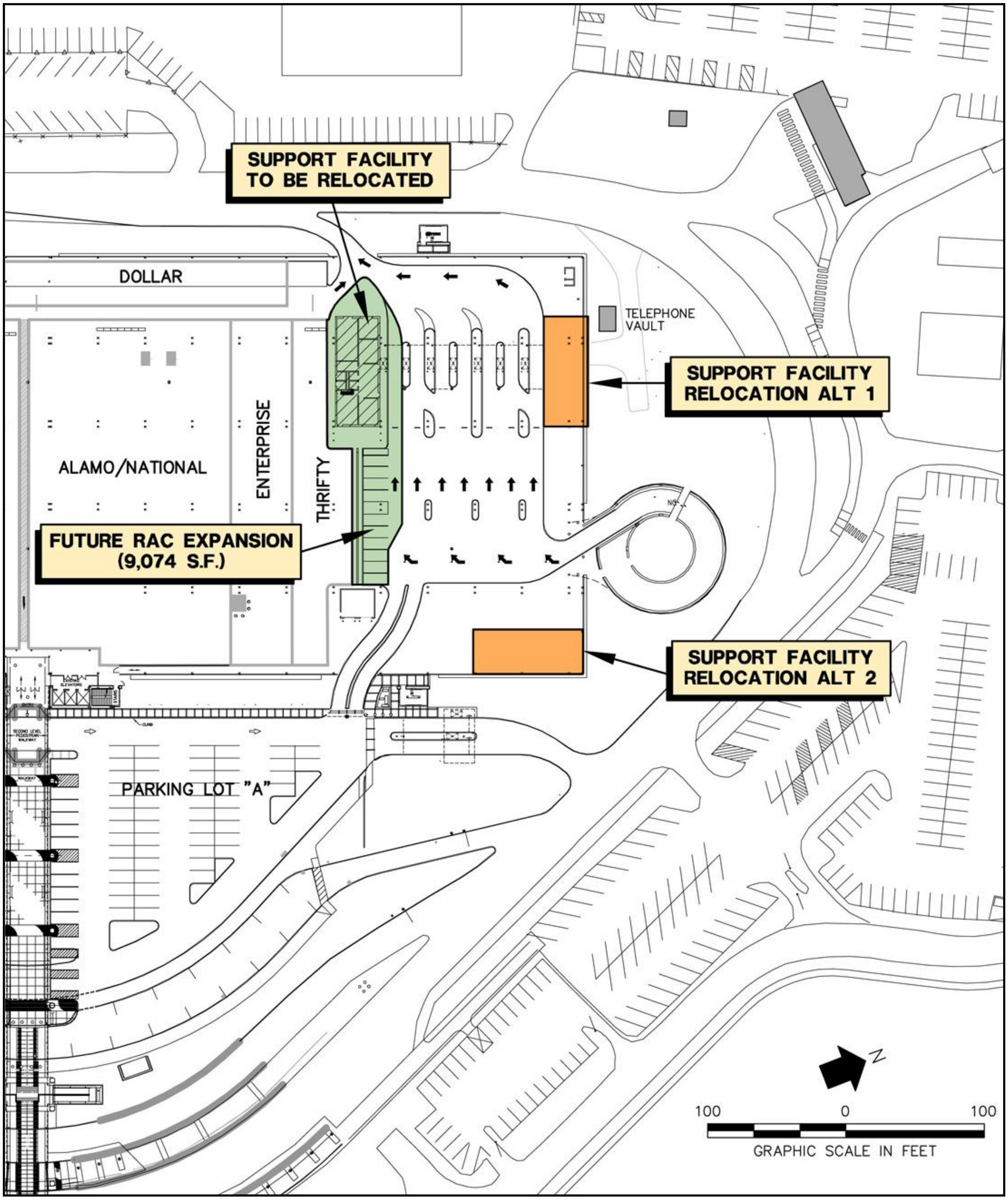
6.5.2 QUICK-TURN-AROUND FACILITY (SERVICING)

All but two rental car agencies, Hertz and Enterprise, at MHT use a Quick-Turn-Around (QTA) facility located off Green Drive to clean, fuel, and maintain their vehicles. No changes to the QTA facility at MHT are planned during the 20-year planning horizon. Hertz uses their own QTA, which is located adjacent to South Perimeter Road. The Hertz QTA/storage lot will be re-configured as its facility will be impacted by construction of the new Airport Access Road. Enterprise currently uses an off-airport QTA facility and currently plans to continue this operation.

6.5.3 RENTAL CAR STORAGE LOT

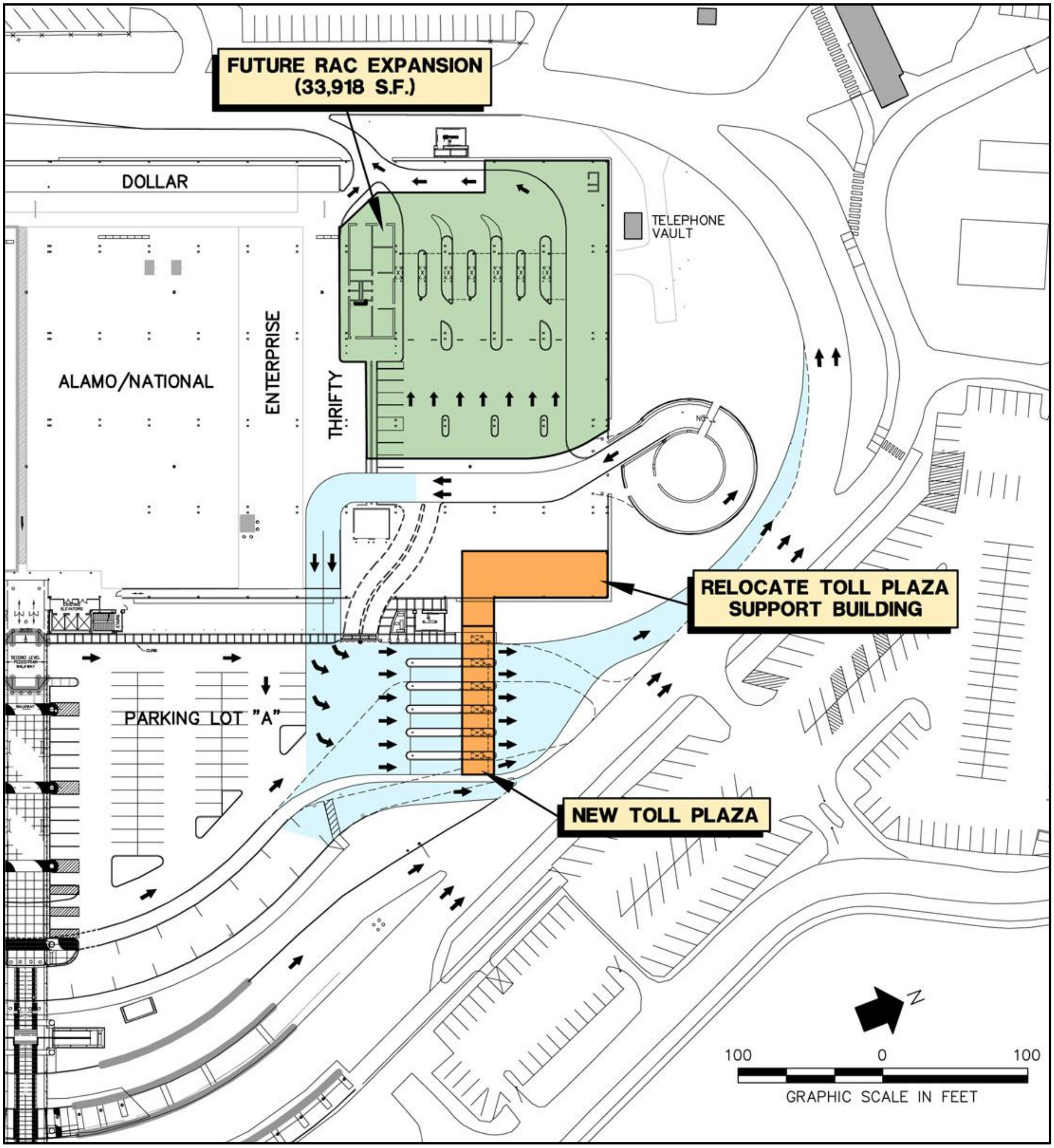
Rental car vehicle storage is currently provided adjacent to South Perimeter Road. The existing rental car storage lots will be impacted by the new Airport Access Road and potential future cargo facilities. This area will be re-configured to provide adequate vehicle storage for two of the rental car agencies (Hertz and Avis/Budget) for the foreseeable future. The three other rental car agency groups (Enterprise/National/ Alamo, Thrifty and Dollar) will be provided with new vehicle storage space as part of the potential Lot E redevelopment plan. For the Long-Term planning period, additional space that is currently part of Parking Lot E redevelopment plan has been identified for potential rental car storage expansion, if needed. See **Figure 6-12** for a conceptual plan of the proposed modified and additional rental car storage areas.

FIGURE 6-10
RAC EXPANSION – OPTION 1



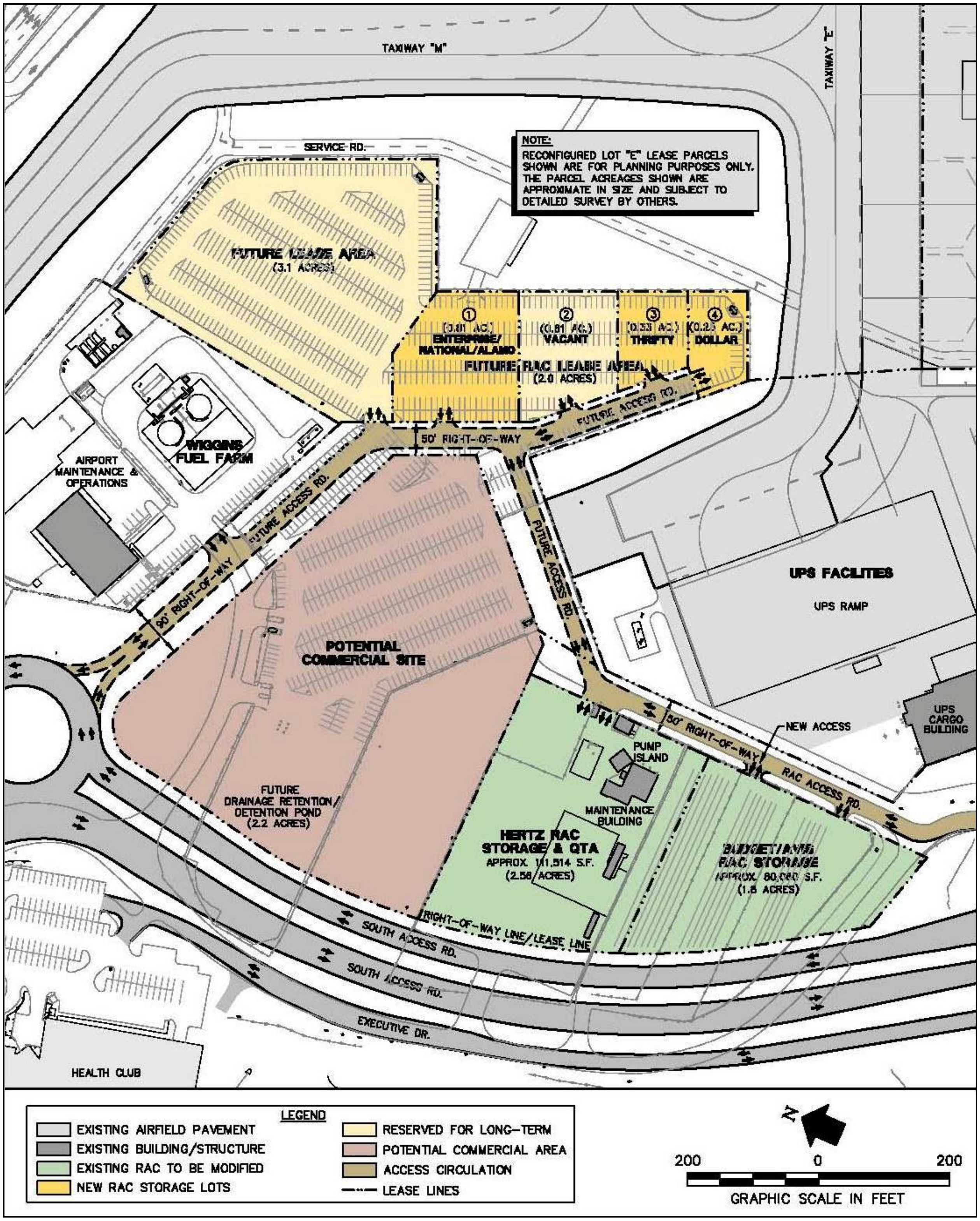
Source: URS Corporation, 2010.

FIGURE 6-11
RAC EXPANSION – OPTION 2



Source: URS Corporation, 2010.

FIGURE 6-12
LOT "E" REDEVELOPMENT PLAN RAC STORAGE LOTS



Source: URS Corporation, 2010.

6.5.4 CONSOLIDATED RENTAL CAR FACILITY

A potential Consolidated Rental Car Facility (CONRAC) could be developed on the south side of the airport on one of the sites identified on MHT's Airport Layout Plan for future rental car use. Access to the passenger terminal building would be provided via the proposed Pettingill Road. However, the rental car demand projections for the 20-year planning horizon do not support the need for a CONRAC facility. Beyond 20 years, the concept of a CONRAC facility should still be considered a part of a long range planning strategy.

6.6 GROUND TRANSPORTATION

The following sections describe the various ground transportation components that are provided at MHT and the recommendations for future opportunities.

6.6.1 TRANSIT

The current transit service that exists at MHT includes Manchester Transit Authority (MTA) city bus service and a limited Greyhound bus service. There are nine MTA trips per day that connect the airport to the Manchester Transportation Center in Downtown Manchester. From the Center, users can access other Greyhound and bus services. There are three northbound and three southbound Greyhound trips per day that provide access to Boston; Concord and Hanover, New Hampshire; White River Junction, Montpelier, and Burlington, Vermont. Service may expand as demand increases.

6.6.2 TAXICABS

Taxicabs park at the second roadway curb where nine spaces are provided near the main terminal entrance. There are an additional 17 spaces in a designated taxi staging area parallel to Airport Road. The total of 26 spaces is sufficient for current demand and no additional spaces are recommended during the 20-year planning horizon.

6.6.3 LIMOUSINES

Limousines park at the third roadway curb south of the stairs from the main terminal entrance where a total of 17 spaces are provided. These spaces are sufficient for current demand and no additional spaces are recommended during the 20-year planning horizon.

6.6.4 SHUTTLES

A variety of shuttle buses utilize the various frontage curbs along the terminal. The MHT parking shuttle has two designated spaces along the inner curb for airport user loading and unloading. The two spaces are sufficient and no additional spaces are recommended during the 20-year planning horizon. Hotel shuttles park at the third roadway curb north of the stairs from the main terminal entrance where a total of 14 spaces are provided. These spaces are sufficient for current demand and no additional spaces are recommended. The Highlander Inn and Flightline each have a designated space along the second roadway curb north of the main terminal entrance. These shuttles are private entities and will be accommodated on a case by case basis in the future.

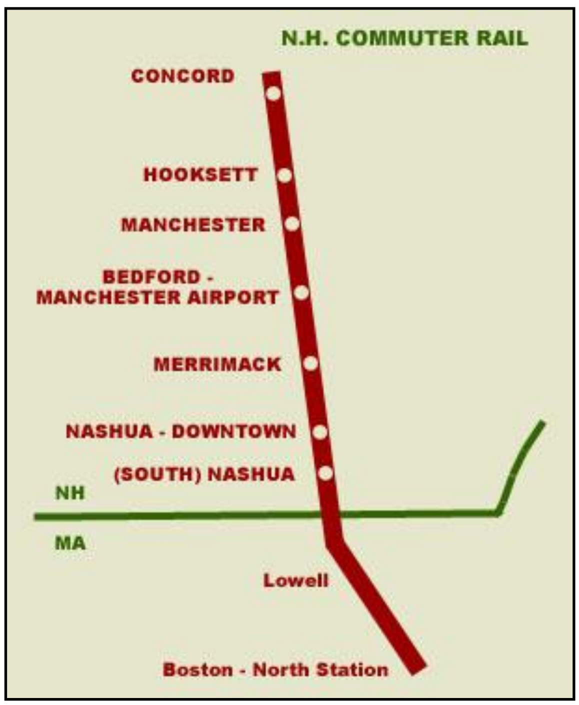
6.7 INTERMODAL FACILITY PLANNING CONSIDERATIONS

Preliminary plans for a new passenger rail service between the Massachusetts Bay Transit Authority (MBTA) Lowell station and Concord include a new station in the vicinity of the Airport (the Bedford-Manchester Airport Station). This section provides an overview of the proposed rail service, describes the station components and how airline passengers could be transported between the rail station and the Airport.

6.7.1 OVERVIEW

The New Hampshire Rail Transit Authority (NHRTA) is studying the potential for passenger rail service in southern New Hampshire using an existing north-south rail corridor now controlled by Pan Am Railways, known as the Capital Corridor. It is envisioned by the NHRTA that commuter service could be provided by the MBTA and long-distance service could be provided by Amtrak on behalf of the NHRTA. The proposed route for the rail service is shown in **Figure 6-13**.

FIGURE 6-13
PROPOSED ROUTE FOR THE NEW HAMPSHIRE CAPITAL CORRIDOR EXTENSION



Source: NHRTA data

6.7.2 ANTICIPATED START OF SERVICE AND SERVICE FREQUENCIES

The date when passenger rail service would commence in the Capital Corridor is not yet known. When the NHRTA was created in 2007, the NHRTA estimated rail service would commence in 2012. However, staff from NHRTA and the Southern New Hampshire Planning Commission (SNHPC) now believes that 2017 is a more realistic date for service commencement. Other planners feel that this date is optimistic because (1) planning and environmental studies for the rail line and stations have not yet been completed, (2) funding for design and construction has not yet been obtained, and (3) Pan Am Railways, which owns the existing rail right-of-way and controls rail operations in the Capital Corridor, has been resistant to the use of the corridor for passenger service. Construction would not begin until an agreement with Pan Am has been completed and all other issues are resolved.

The NHRTA and SNHPC indicated that the Bedford-Manchester Airport station could initially (2017-2020) be served by four round-trip trains per day (4 daily stops per-direction at the station). It is expected that by 2030, the route could have expanded to 8 round-trip trains. The long-term goal of NHRTA and SNHPC is to reach 16 round-trip trains per day.

6.7.3 PROPOSED STATION LOCATION

The locations and layouts of the Capital Corridor stations have not yet been finalized. In 2010, the preferred site for the Bedford-Manchester Airport station is on the west side of the Merrimack River, in the Town of Merrimack, approximately 1,800 feet south of the new Airport Access Road. This site is about 1.5 miles southwest of the airport passenger terminal building. **Figure 6-14** shows the 2010 proposed airport station site. The proposed airport rail station would serve as an intermodal transfer point for passengers traveling by bus (local and regional) and rail. It would also provide parking for "park-and-ride" commuters. Immediate access to the station would be provided via State Route 3. Regional access to Route 3 would be provided by the Everett Turnpike and the new Airport Access Road.

6.7.4 ANTICIPATED BENEFITS TO THE AIRPORT

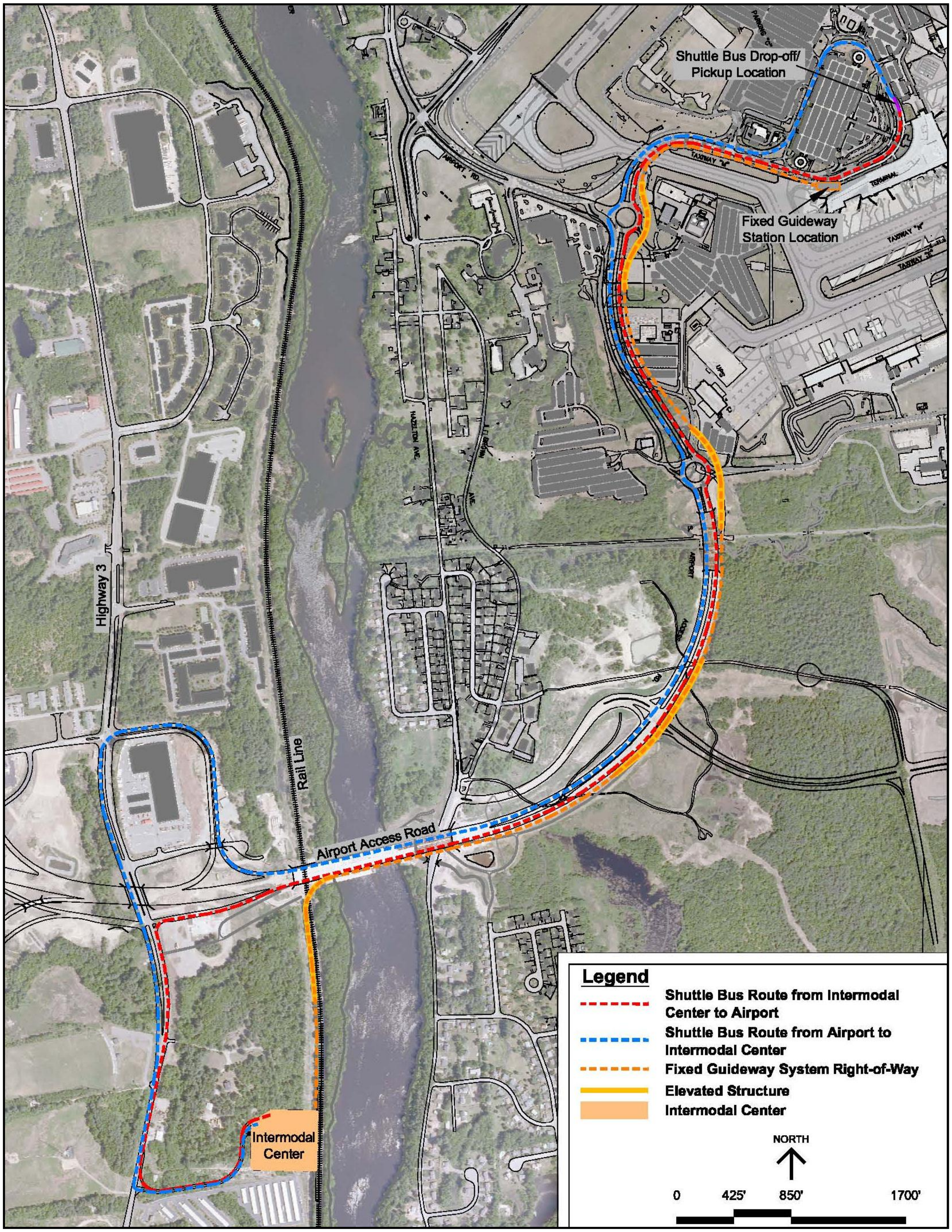
The rail station and the corresponding airport connector would provide several benefits to the airport and passengers served by the airport. The anticipated benefits include:

- *Provides an additional public transport service for airport passengers and employees*. The proposed rail service would provide improved public transportation for airport passengers and employees. Rail access would provide airport passengers and employees an alternative to private vehicles and bus service. Demand for rail service by airport passengers and employees may increase (and concurrently demand for private vehicles may decrease) as a result of increasing fuel costs, regional roadway congestion, and community measures to reduce carbon emissions and encourage sustainable solutions.

- *Forms the nucleus for a regional transportation center or intermodal facility*. A rail station or intermodal hub would provide the traveling public (both airport and non-airport passengers) access to a wide range of public transportation services. These services could include (1) scheduled passenger rail service; (2) interstate, regional, and municipal bus service; (3) taxicabs; (4) rental car services; and (5) access to the airport terminal via a new dedicated link. The intermodal facility could also encourage car/van-pooling by providing parking for "park-and-ride" customers. An intermodal station would facilitate connections among all these travel services.

- *Expands the airport's market area*. Rail service could potentially expand the market area the airport serves by attracting airline passengers who prefer to use transit, don't have access to an automobile, or prefer not to park their vehicle at the airport for long durations (e.g., single vehicle households).

FIGURE 6-14
INTERMODAL CENTER AND POTENTIAL ROUTES FOR INTERMODAL CONNECTOR



Source: LeighFisher, 2010.

6.8 INTERMODAL HUB

It is possible that the selected station location will vary from the currently preferred station location. The actual location will be selected based upon further planning and environmental studies and decisions by several agencies and authorities including the NHRTA, the SNHPC, the Nashua Regional Planning Commission, the Towns of Bedford and Merrimack, and potentially the City of Manchester. In addition to these agencies, the airport, the New Hampshire Department of Transportation, the Manchester Transit Authority, Amtrak, MBTA, and Pan Am Railways may also participate in the planning and design of the intermodal hub.

6.8.1 INTERMODAL STATION COMPONENTS

As currently proposed, the Bedford-Manchester Airport intermodal station will include the following elements:

- *Station Platform*. It is anticipated that a single elevated platform would accommodate the future rail service. It is assumed, based on MBTA and Amtrak standards, the platform would be 20 feet wide and about 850 feet long with a shelter covering 200 to 250 feet of the platform.

- *Station Parking*. In order to serve regional commuters, the SNHPC has projected that 400 to 500 parking spaces are required at the intermodal station.

- *Station Building*. Depending on the forecasted rail passenger volumes, it is anticipated the rail operator would provide an enclosed automated ticketing machine — not a staffed station office or ticket counter. In the Long-Term, a rail station could serve as the nucleus for an intermodal center, with customer service facilities provided (i.e., seating, restrooms, vending machines, etc).

- *Regional Bus Center*. To provide for the needs of bus passengers, the intermodal transportation center could provide dedicated bus berths (spaces assigned to specific routes), adjacent heated passenger waiting shelters and benches, current schedule and route information, and potentially dynamic signs indicating the waiting time until the next departure. The development of a bus center could occur in phases responding to the needs of the MTA and other bus operators who may use this facility.

- *Airport Connection*. The connection between the airport and the rail station should provide rail and bus passengers with reliable, comfortable, and efficient service. It should provide adequate capacity to accommodate the ridership volumes expected initially as well as those expected over the Long-Term.

Figure 6-15 depicts the station components described above and a potential layout for the intermodal center. The layout shows a bus center containing dedicated bus berths (spaces assigned to specific routes) arranged to allow riders to circulate between the bus stops and rail platform without crossing traffic. This configuration uses shallow-sawtooth bus berths to facilitate bus maneuvering; however, alternative configurations could also be used. The layout also contains a park-and-ride lot with 465 public parking stalls. The layout also provides for a rail platform and shelter.

Development of this rail station as an intermodal center could be phased. The rail station could first be used as a park-and-ride lot, with subsequent development of a regional bus center, later the development of an advanced rail station, and eventually the inclusion of an airport fixed-guideway service (described below) could occur. This phased approach to development of an intermodal center is expected to offer opportunities to attract funding from numerous sources and, more importantly, generate regional support.

6.8.2 ENVIRONMENTAL/LAND

Several environmentally sensitive areas (wetlands and eagle nesting areas) have been identified in the vicinity of the station site. The site's impact on these areas will be addressed in future environmental studies and their corresponding documentation conducted by the NHRTA. Several private land-owners and businesses are in the immediate area of the site. The impact on their properties will also be identified and documented at a later date by the NHRTA. Until those studies have been conducted, it is not clear how environmental issues and land negotiations will affect the station layout.

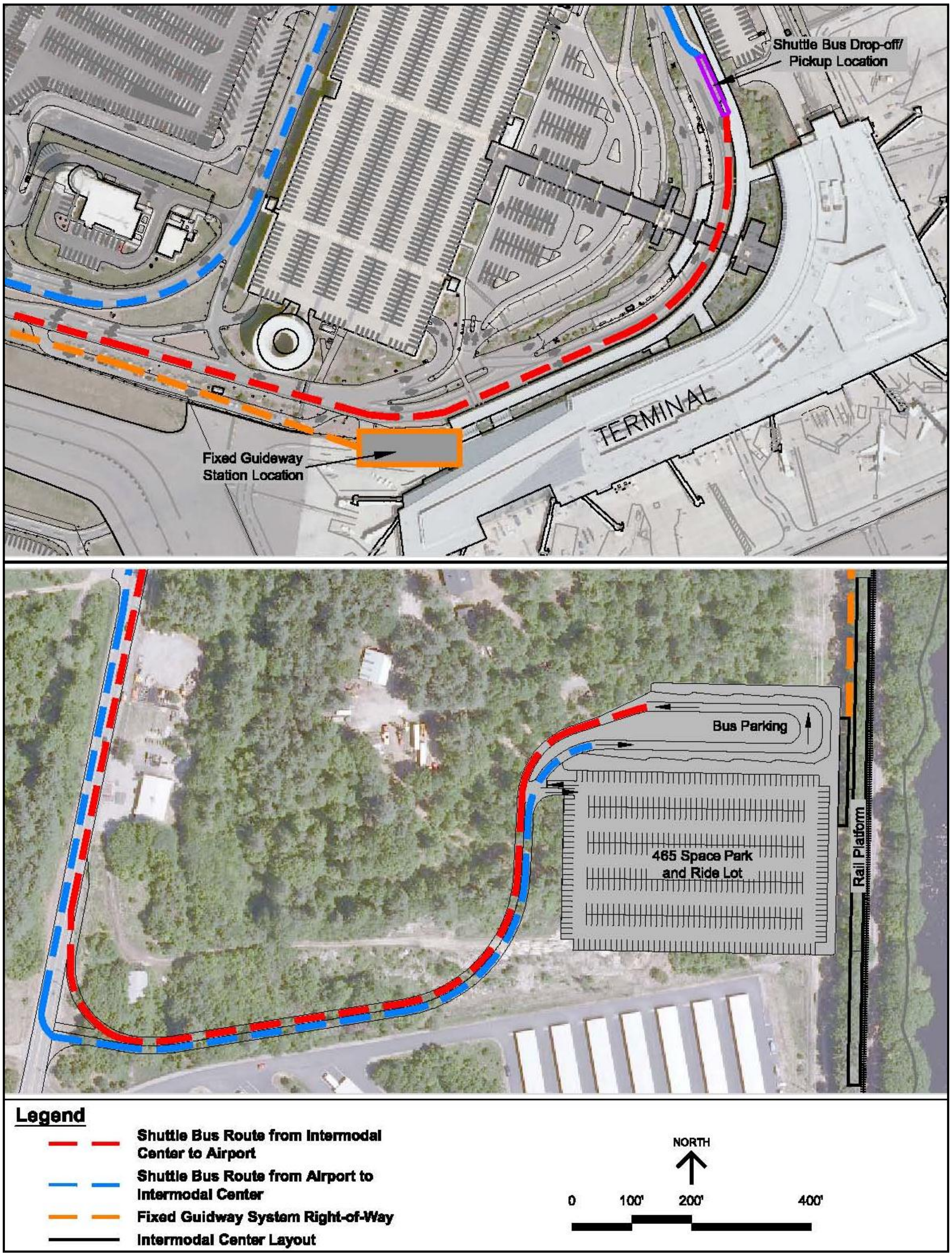
6.9 RIDERSHIP

Currently eleven U.S. airports have direct rail service (i.e., a station located within the airport terminal building). Another ten airports have rail service that requires passengers to use an airport-rail connection of varying lengths. At the airports with direct rail service fewer than six percent of all airport passengers use rail with few exceptions. Those exceptions are in large markets with major hub operations (e.g., Hartsfield-Jackson Atlanta, Reagan-National, Portland, and Chicago-Midway). At airports with airport-rail connections, fewer than three percent of all passengers use rail service. The only two exceptions are at Boston-Logan and Oakland.

6.9.1 SHORT-TERM

Initially, the anticipated infrequent rail service (four round-trip trains), the single track rail line, and the required transfer between commuter rail and the airport connector (transfers have been shown to significantly reduce potential transit ridership) are expected to discourage use of rail by airport passengers and employees. As a result, initially it is expected that less than two percent of all airline passengers and airport employees would use the airport rail station.

FIGURE 6-15
POTENTIAL AIRPORT CONNECTOR STATIONS AND
POTENTIAL LAYOUT OF INTERMODAL CENTER



Source: LeighFisher, 2010.

Estimates of rail ridership by airport customers and employees are shown in **Table 6-4**. When the airport serves 3.5 Million Annual Passengers (MAP), the baseline forecast for 2017, it is estimated that an average of less than 200 riders per day will use the airport connection, half of which will be arriving at the airport, and the other half of which will be departing the airport. As a result, each of the eight train arrivals (each round-trip arrives at the airport twice) will transport an average of 12 airport customers and/or employees.

TABLE 6-4
FORECASTED RIDERSHIP FOR AIRPORT CONNECTOR

	Short-Term (2020)	Mid-Term (2030)	Long-Term (N/A)
MAP	3.7	4.6	10.0
Transit Use	2%	4%	6%
Annual Ridership	74,000	182,000	600,000
Daily Ridership	200	500	1,650
Per Direction	100	250	825
Est. R/T Trains	4	8	16
Per Train	13	16	26

Source: LeighFisher, 2010.

6.9.2 LONG-TERM

It is anticipated that potentially, as fuel prices rise, regional congestion increases, and rail service frequencies improve, the airport rail station and corresponding airport connector could attract four percent of all airline passengers and airport employees in the Mid-Term and as high as six percent in the Long-Term. This aggressive estimate of future transit use is shown in Table 6-4. As shown, it is anticipated that in the Mid-Term, as many as 500 passengers per day might use the airport connector. If train frequency is increased to 8 round-trips per day, each arriving and departing train might transport 16 airport customers. The Long-Term estimate assumes 10.0 MAP and 16 daily round-trip trains, resulting in about 1,650 daily riders or 26 airport passengers on each arriving and departing train.

It should be noted that these estimated ridership volumes are only representative of the volume of passengers connecting between the rail service and the airport. If the airport-rail connector were to be utilized for other functions, such as transfers from public bus service, a consolidated rental car center, a transfer point for resort shuttle vehicles, and/or for taxicab operations, then the estimated ridership for the airport connector would change.

6.10 AIRPORT CONNECTION

Phased development of an airport connection is proposed, allowing the capacity of the service to expand in response to passenger demand, available funding, and other objectives of the community. Each phase of the development should afford reliable, comfortable, and efficient transportation responding to the expectations of the airport passengers and employees using the service.

6.10.1 *SHUTTLE BUS (SHORT-TERM)*

It is proposed that initially a shuttle bus or van operating on a fixed-route (see Figure 6-14) be used to provide transportation between the airport rail station and the terminal. As shown in Figures 6-14 and 6-15, the route would primarily utilize the new Airport Access Road and the existing curbside pickup/drop-off stalls used by other airport shuttle buses at the terminal. The estimated route length and travel-times are shown in **Table 6-5**. The one-way travel time is estimated to be approximately eight to ten minutes, depending on the direction.

TABLE 6-5
CONNECTOR DISTANCE AND TRAVEL TIME

	One-Way		Round-Trip	
Connector	**Miles**	**Travel-time (min:sec)**	**Miles**	**Travel-Time (min:sec)**
Shuttle Bus from the Airport to the Rail Station	3.25	9:45	5.85	17:30
Shuttle Bus from the Rail Station to the Airport	2.65	7:45		
Fixed Guideway System	2.00	4:00	4.00	8:00

Source: LeighFisher, 2010.

A van or mini-bus providing 15 to 20 seats, with ample room for baggage, is expected to provide adequate capacity to accommodate the estimated passenger demands. Alternatively, the same 20-passenger buses or shuttle vehicles used to serve the airport Long-Term parking lots could be used for the airport connector. Use of a common vehicle could simplify vehicle maintenance and operating requirements. Potentially, the vehicle used on this route could have a distinctive appearance of colors supporting future branding or marketing efforts.

Costs for operating a fixed-route would include the purchase price for a shuttle vehicle, fuel and maintenance for the vehicle, drivers' salaries and benefits, signage indicating the locations of the route's stops, and any necessary advertisement and public awareness programs.

Alternatively, given the low ridership and infrequent train arrivals (eight times per day) expected during the initial years of the operation, a less expensive and more flexible operation could result from combining the airport connector with a pre-existing parking lot shuttle bus route. For example, the airport connector could be an extension of a bus route already serving public parking Lots E, F, or G, if Lot F or G was designated for employees, or if a new employee lot was built southwest of the terminal.

6.10.2 *AUTOMATIC PEOPLE MOVER (LONG-TERM)*

As demand for the service between the rail station and airport increases, additional system capacity may be necessary. This could justify consideration of special-purpose vehicles and/or a fixed guideway transportation system.

Use of special-purpose vehicles would allow passengers to walk directly between the rail platform and waiting bus without changing levels or climbing stairs when entering/exiting a bus. This is known as a cross-platform transfer and would increase customer level-of-service, which in turn would increase the attractiveness of the service. It would involve the use of high-platform buses, commonly used to operate Bus Rapid Transit (BRT) vehicles, and/or raising the pavement elevation at a dedicated bus stop at the rail station. Similar accommodations would need to be made for a dedicated bus stop at the terminal. A potential location for such a specialized bus stop is indicated in Figure 6-15.

In the Long-Term, a fixed guideway system could be considered. The least expensive fixed guideway system would likely be a BRT. A BRT is a busing system which operates on its own isolated guideway. BRTs are operated by bus drivers and primarily operated on exclusive guideways but can cross or mix with standard surface traffic. If a BRT system was selected, it is likely that passenger demand will warrant the use of standard 35- to 40-seat transit buses as well as raised platforms at the bus stops.

Another fixed guideway system used at several airports is an Automated People Mover (APM). APMs are driverless vehicles operated on exclusive guideways propelled by electrical motors, cable traction, or electrical traction motors. APM trains normally consist of two to four cars, with each car capable of accommodating 60 or more passengers. APMs operate with 2-5 minute headways and have top speeds ranging from 30 to 50 miles per hour. Large parcels of land are required to provide adequate space for an APM maintenance and storage facility in addition to the APM stations. Additionally, due to the inclement of weather in the region, weather protection and/or heated guideways may be required.

A potential route for a fixed guideway system is shown in Figure 6-14. It would separate the airport connector from traffic on the Airport Access Road, thus avoiding future traffic flow delays and congestion. Compared to a bus operating on public streets, and APM would allow for faster travel times between the rail station and airport terminal, decreased wait times for connecting passengers, and would dramatically increase the attractiveness of the rail service to airport passengers and employees. The projected travel time for the route shown in Figure 6-14 is about four minutes each-way, as shown in Table 6-5.

The route shown in Figure 6-14 presents several major challenges as it potentially requires: (a) widening of the airport access bridge over the Merrimack River, (b) three elevated grade-separated segments, (c) the widening of the tunnel underneath the western airfield taxi-way, and (d) providing an area for a station at the terminal. The elevated guideway segments are shown in Figure 6-14 while the recommended location for the terminal station is shown in Figure 6-15. These challenges would contribute to the likely high costs of constructing an APM system.

Through the period when the airport serves 5.0 million enplaned passengers, the forecast ridership for a fixed-guideway system does not justify development of such a system. However, it is suggested the Long-Term potential for a fixed guideway system be considered when the airport evaluates plans for future terminal expansion or construction of other large multi-level buildings. It is recommended that no funds or effort be expended for the planning or design of a fixed guideway system at this time.

6.11 MOVING FORWARD

While it is projected that airport customer and employee use of an Airport-Rail connector would initially be relatively small, such a connection would clearly be beneficial to the community and the airport. The airport does not have direct control over the development of the New Hampshire Capital Corridor, but it is recommended that the airport work cooperatively with local planning commissions and the NHRTA regarding the proposed rail development. As the project nears completion, the airport should decide if there is an existing shuttle bus route that could be logically extended to serve the airport rail station.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION SEVEN

Terminal Planning

SECTION 7.0
TERMINAL PLANNING

7.1 INTRODUCTION

This section of the Airport Master Plan Update identifies specific terminal areas that were analyzed and presented, illustrated through the development of conceptual plans and recommendations. The information required to conduct the analysis and offer recommendations was collected through a series of meetings and discussions with senior Airport staff, as well as information gathered from the Passenger Forecast. Results of this analysis were documented as part of scope of work Task 7.2, Terminal Capacity/Facility Requirements, and presented in a Working Paper. The data presented therein formed the basis of concept development and recommendations within this section.

7.2 EVALUATE EXISTING SPACE UTILIZATION

Prior to the development of the terminal planning concepts and alternatives, the Airport Master Plan team conducted a terminal walk-through and visual survey of the facility. The team documented the current terminal's space utilization and allocation versus the As-Built documentation provided to the Airport Master Plan team during the initial data collection portion of the Airport Master Plan Update. This verification of the existing conditions was a key component in the development of terminal alternatives and optimization of the terminal program elements, which is discussed in greater detail in the following pages.

During those initial walk-through surveys, the Airport Master Plan team noted several areas throughout the terminal which were not being utilized as the As-Built documents indicated. Observed changes included program areas which where either vacant, currently occupied by a different tenant/function, underutilized by its current function, or were accommodating two functions simultaneously. The following describes the first and second level terminal areas that were analyzed.

Terminal Level 1

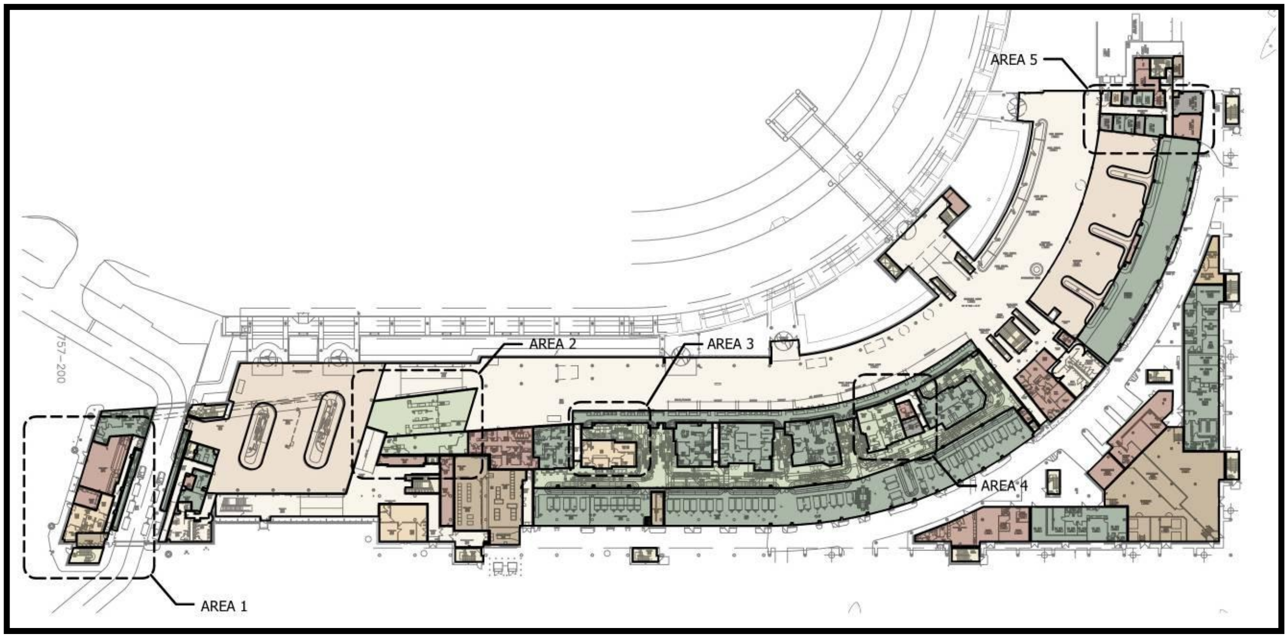
As shown in **Figure 7.2-1**, Level 1 has five areas which were highlighted by the Airport Master Plan team during the on-site walk-through survey as noted above.

The terminal areas currently vacant include the former Northwest baggage make-up and ramp operations (OPS) areas (Area 1) on the west end of the terminal building (see **Figure 7.2-2**) and Ticket Counter and airline ticket office (ATO) space (Area 3) (see **Figure 7.2-3**).

Terminal space originally planned for airline use (Area 2) is currently occupied by non-related functions, including the Transportation Security Administration (TSA) Training area located adjacent to Checkpoint A (see **Figure 7.2-4**) and the TSA Staff area (Area 4) located in the old Wiggins Air ATO space and the Police Canine Office (see **Figure 7.2-5**).

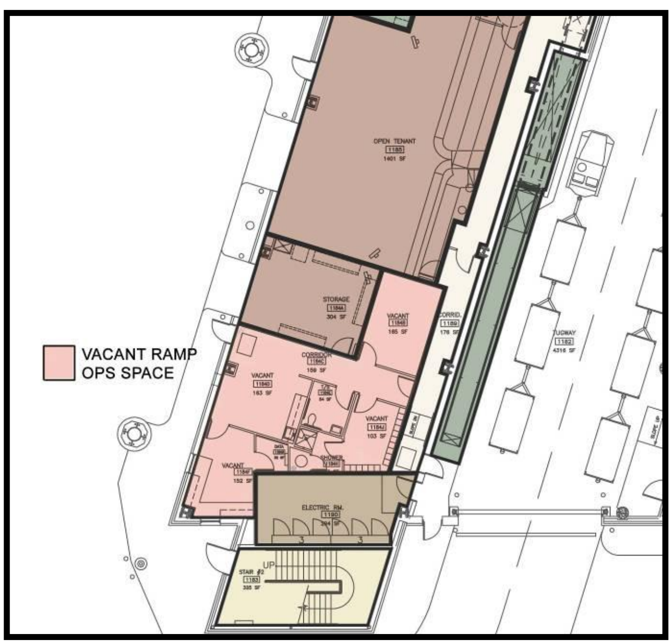
Terminal space, which the Airport Master Plan team identifies as currently underutilized, includes the Airport's file storage area (Area 5) located on the north end of the terminal, adjacent to in-bound baggage drive isle (see **Figure 7.2-6**)

FIGURE 7.2-1
TERMINAL LEVEL 1 –OVERALL PLAN



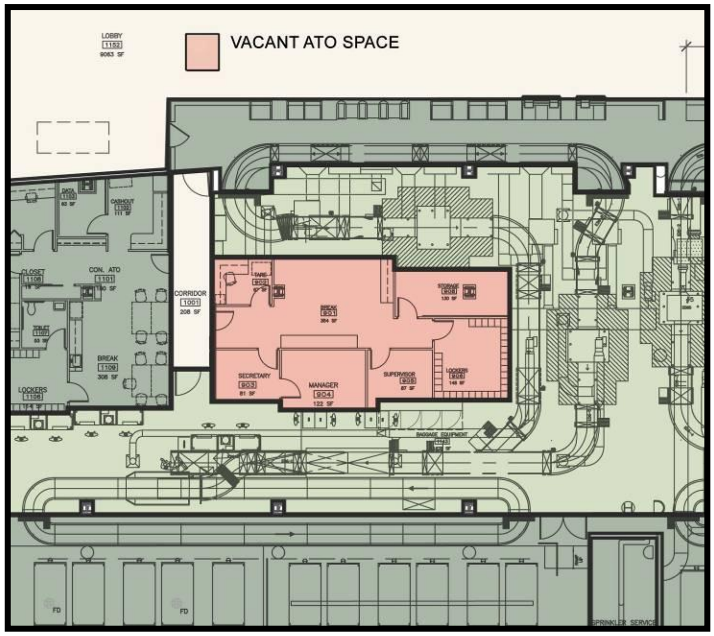
Source: URS Corporation, 2010.

FIGURE 7.2-2
TERMINAL LEVEL 1 – AREA 1



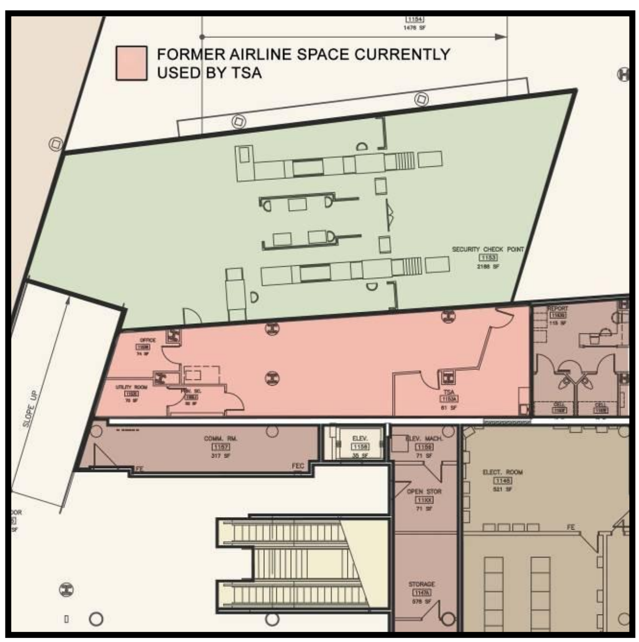
Source: URS Corporation, 2010.

FIGURE 7.2-3
TERMINAL LEVEL 1 – AREA 3



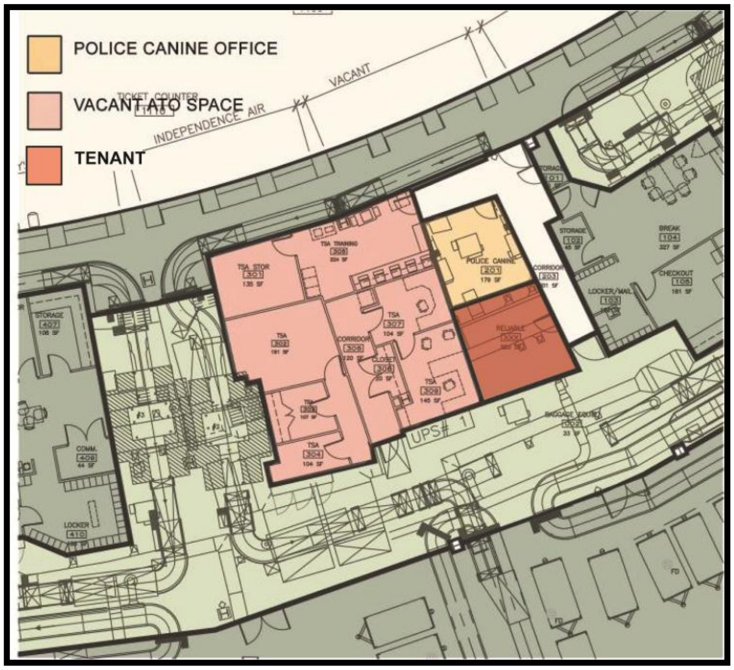
Source: URS Corporation, 2010.

FIGURE 7.2-4
TERMINAL LEVEL 1 –AREA 2



Source: URS Corporation, 2010.

FIGURE 7.2-5
TERMINAL LEVEL 1 – AREA 4



Source: URS Corporation, 2010.

FIGURE 7.2-6
TERMINAL LEVEL 1 – AREA 5

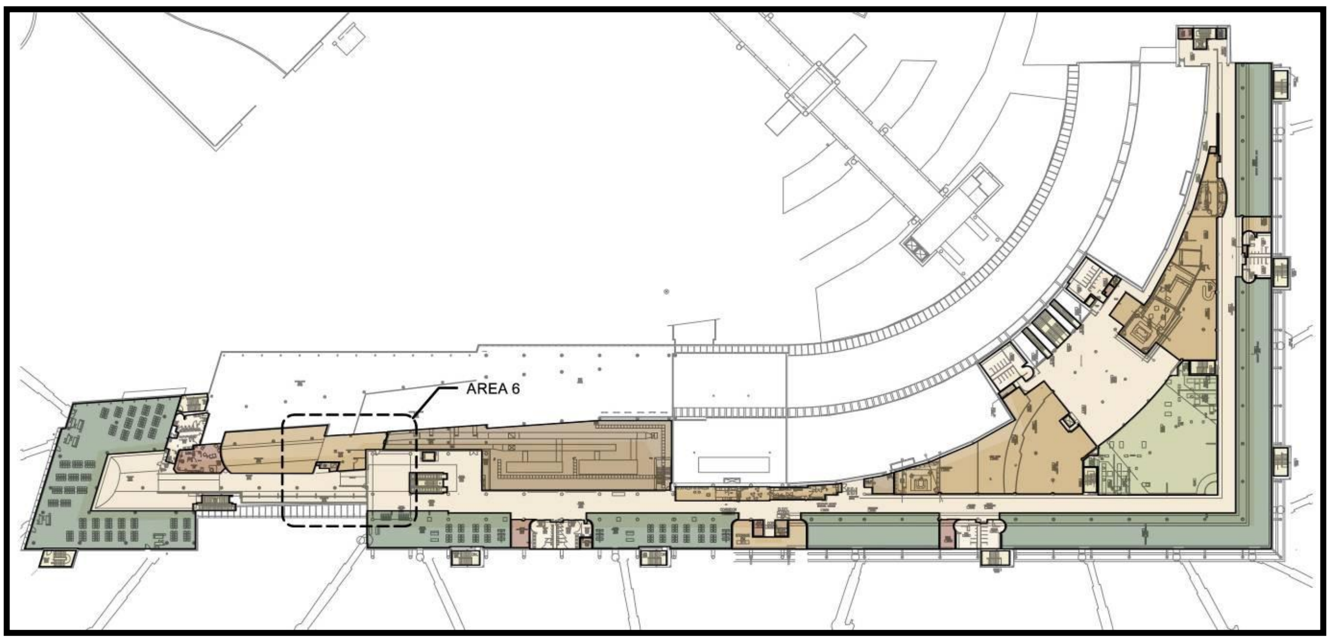
Source: URS Corporation, 2010.

Terminal Level 2

Level 2 has one area (Area 6), shown in **Figure 7.2-7**, which was highlighted by the Airport Master Plan team during the on-site survey.

Lack of sufficient concession storage was a common concern during the Airport staff interviews, which the Airport Master Plan team conducted. It was noted during the survey that additional concessions storage had been carved out of a portion of the existing mechanical room adjacent to the Samuel Adams Brew House located at the west end of Level 2 as highlighted in **Figure 7.2-8**, and as indicated from these site photos shown in **Figures 7.2-9 and 7.2-10**.

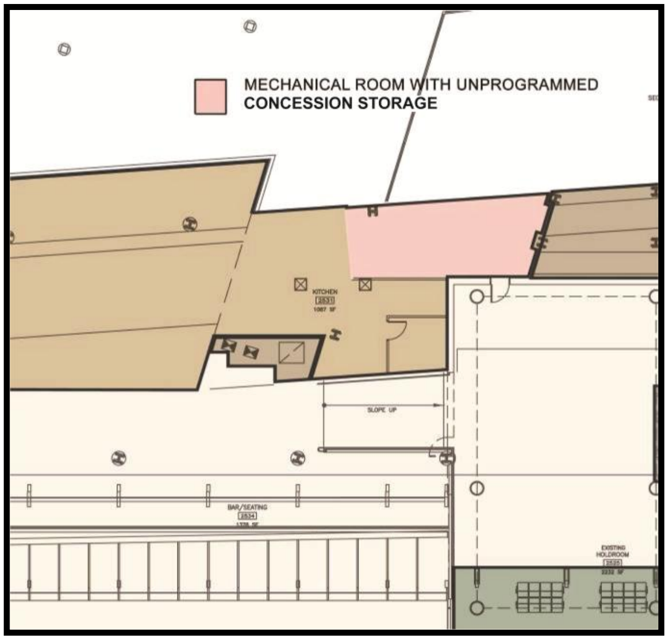
FIGURE 7.2-7
TERMINAL LEVEL 2 – OVERALL PLAN



Source: URS Corporation, 2010.

The Airport Master Plan team reviewed the terminal's current Processing Capacity/Level-of-Service (LOS) as a first step in the development of the terminal alternatives. These terminal alternatives focused on improving the passenger LOS standards by addressing issues such as passenger wait times, queue lengths, and densities at key terminal elements such as the ticket lobby, security checkpoints, holdrooms, and baggage claim lobby.

FIGURE 7.2-8
TERMINAL LEVEL 2 –AREA 6



Source: URS Corporation, 2010.

FIGURE 7.2-9
MECHANICAL ROOM USED FOR CONCESSION STORAGE

Photo Date: January 2010
Source: URS Corporation, 2010.

FIGURE 7.2-10
MECHANICAL ROOM USED FOR CONCESSION STORAGE

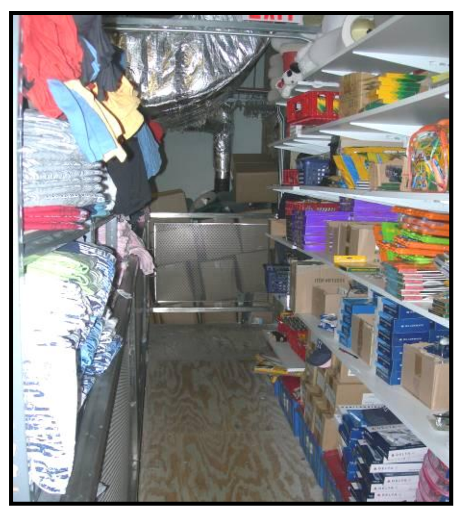


Photo Date: January 2010
Source: URS Corporation, 2010.

Using the current forecasts' base growth scenario[1], the general design approach was to optimize the existing space within the current terminal footprint. To achieve this optimization and an acceptable LOS, various terminal functions were assessed to be reconfigured, consolidated, or expanded. Key elements included:

- Curbfront – Create visual nodes to extend passenger usage along the entire curb, extend various airline curbside check-in along the entire curb, and provide enhanced signage and way-finding.
- Terminal wide – Consolidate existing functions or space and introduction of common use terminal (CUTE) devices.
- Ticket lobby – Introduce common use self-service devices and accommodate well-wishers and enplaning passengers with kiosk concessions.
- Security Checkpoint – Consolidate checkpoint and expand queuing, relocate key concessions to mitigate congestion, and develop an architectural feature.
- Holdrooms and Concessions – Integrate holdroom area and concessions to mitigate shortfalls in holdroom seating capacity, enhance concessions for passengers, and increase revenue generating opportunities.
- Baggage Claim – Relocate rental car counters to provide more space and increase the passenger experience in the lobby; increase concessions opportunities to service meeter/greeters, while enhancing revenue generating opportunities; and refurbish the existing flat plate baggage claim carousels, with the possibility of replacing with sloped plate carousels in the long-term for expanded capacity when passenger activity levels (PAL) 2 are reached.

7.3 CURBFRONT UTILIZATION AND TERMINAL OPTIMIZATION

7.3.1 CURBFRONT UTILIZATION

The terminal curbfront is a single-level arrangement with private vehicles at the innermost lanes, taxis and shuttles/vans on the middle lanes, and limos and courtesy vans on the outer lanes. The projected demand for the curbfront is not expected to exceed the linear frontage capacity. However, there are three main trouble spots along the curbfront. The entrance to the airport is complicated by multiple decision points in a short distance. In peak periods, this causes confusion to passengers, in turn, leading to congestion by people slowing or needing to re-circulate because they missed the appropriate lane. In combination with the short approach, the architecture of the exterior canopy and the landscaping does not allow for a good visual connection with the terminal entrances for ticketing and baggage claim. The result is congestion at the main focal point of the building, the entrance below the pedestrian bridge, and underutilized space for the majority of the curbfront. Curbside check-in stations that are grouped together near this main entrance also lead to focused congestion.

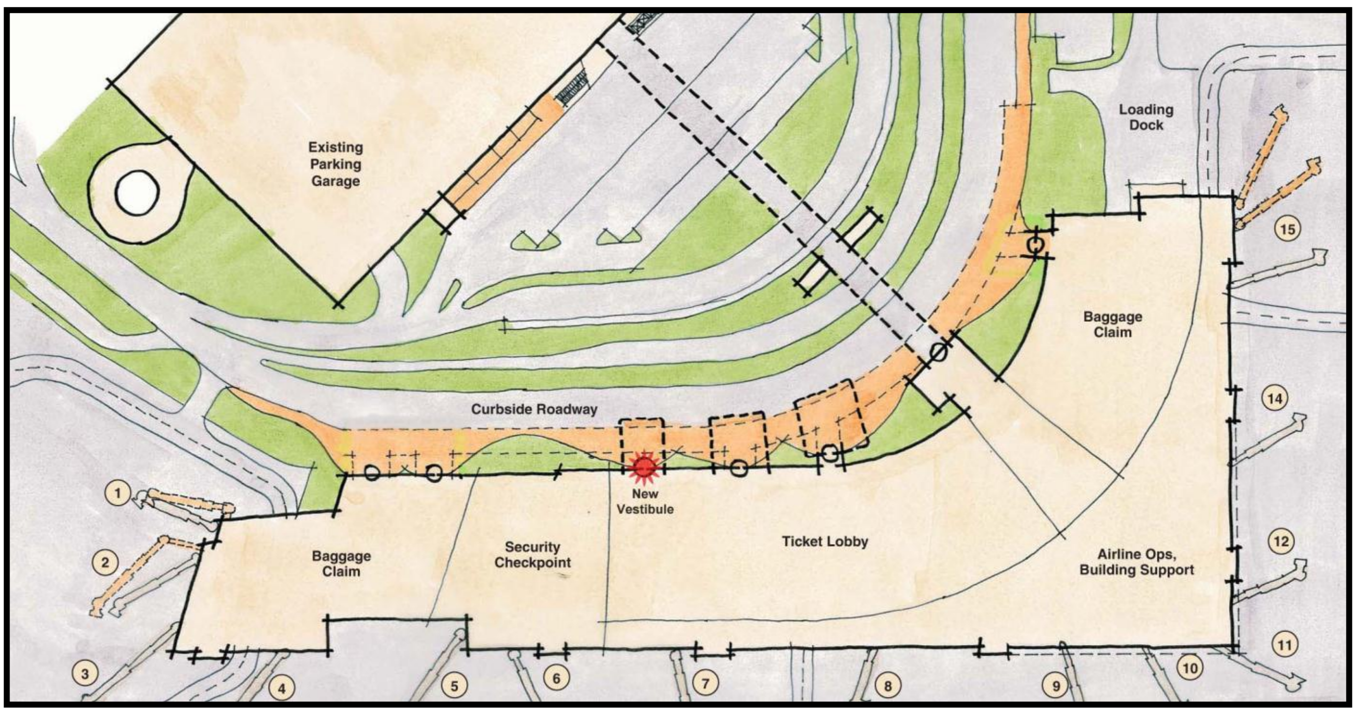
[1] See Section 3.0 of this Master Plan for information on the forecast and a discussion of the base growth scenario.

Roadway improvements addressing vehicular approach to the terminal are recommended as part of the Short-Term Program. Proposed improvements include clear separation and earlier indentification of decision points for access or parking, utilizing new signage to mark each lane's destination(s).

A number of opportunities were explored to improve curbfront utilization. Construction of a new entrance vestibule located opposite the west end of the ticket lobby, modifications of the landscaping across the terminal front, and re-spacing of airline signs and curbside check-in stations are recommended as part of the Short-Term Program. The new vestibule will improve terminal access from the curbfront while landscaping modifications are recommended to eliminate visual obstruction of terminal entrances from the roadway. An additional improvement for curbfront utilization is recommended at PAL 2, which includes modification to the curbfront canopies to provide additional visual queues to ticket lobby entrance locations for the departing passengers being dropped off at the curb (see **Figures 7.3.1-1 and 7.3.1-2**).

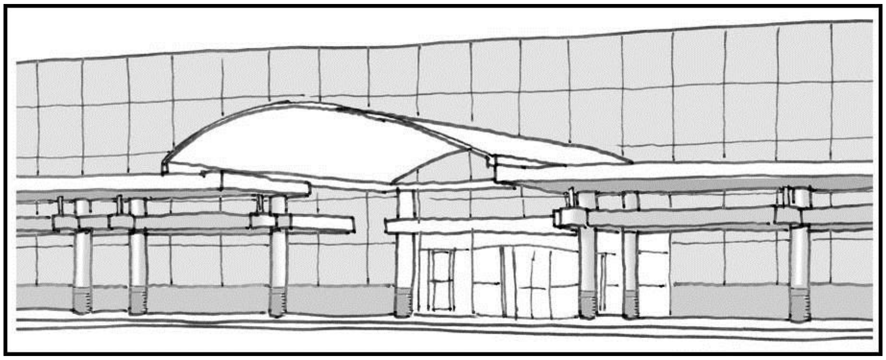
Re-spacing of curbside check-in stations away from the terminal entrance under the pedestrian bridge is recommended in the Short-Term Program to relieve curbfront congestion currently focused in that section of curb. A similar redistribution of airline signage away from the congested area is also recommended.

FIGURE 7.3.1-1
ROADWAY AND CURBFRONT CONCEPT



Source: URS Corporation, 2010.

FIGURE 7.3.1-2
PROPOSED CANOPY REVISION AT ENTRANCE



Source: URS Corporation, 2010.

7.3.2 COMMON USE FACILITIES

"Common use facilities" have been integrated into airport planning for approximately 25 years, but have not been as widely accepted in the U.S. as abroad. Because of the recent economic downturn, and the desire of airport operators and airlines to cut costs and operate facilities more efficiently, common use facilities have become more visible. Throughout history in the U.S., many airports were developed with one initial, primary carrier. This resulted in lengthy contracts and the creation of "hub" airports. Recently, many of these leases have expired, which has given airports the ability to rethink management strategy. Also, geography often plays a big part in common use management because airports around the world with higher international airline traffic are more inclined to implement common use systems.

For an airport operator and airline user, there are several advantages and disadvantages to the implementation of a common use system. Some key advantages of a common use facility include:

- More efficient use of existing airport space,
- Improved traveling options and convenience for passengers, and
- Reduced longer-term capital expenditures for airports and airlines, resulting from reduced need for additional preferential/exclusive use facilities.

Despite advantages to common use system, there are some disadvantages. One of these is the initial system costs. One reason for the high cost is the technology needed to implement and maintain these systems. If an airport is considering moving to a common use management system, major technology renovations must occur. Other disadvantages include:

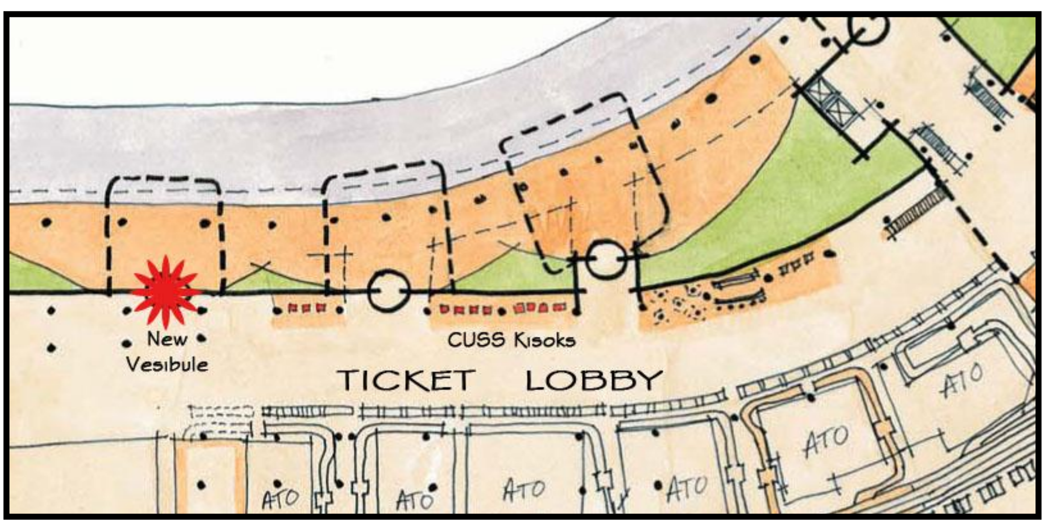
- Loss of airline quality control and direct control over cost primarily because the systems are set up and managed by the airport or a third party operator,
- Initial perceived loss of flexibility for incumbent airlines during start-up period,
- Potential breach of security to an individual airline's network, and
- Perceived loss of branding for airlines.

Whether or not common use facilities are implemented can also be determined by the characteristics of an airport. At Manchester-Boston Regional Airport (MHT), characteristics that will impact common use implementation are facility capacity, small hub status, airline scheduling (i.e., distinct peak periods), and airline use agreements. At the time of this study, MHT was in the process of amending their airline use agreement. The agreement amends a 2005 contract and will carry the Airport through 2015. Therefore, in the short-term, common use implementation is not likely to occur. Projected enplaned passenger levels, in this same time frame, also do not lend support to common use implementation. Within the existing airline use agreement, there is a preferential use clause that states the Airport can reallocate gates or apron lease by an airline to another airline if there is a reasonable need for such space. Beyond 2015, as PAL 1 enplanements are realized, this language, written in the use agreement, could be implemented acting as a surrogate for a completely integrated common use system. At the PAL 2 time frame, from a use and lease agreement viewpoint, a fully integrated common use system could be a viable alternative to major capital improvements, such as terminal or concourse expansion.

Development alternatives focused on the PAL 2 enplanement levels explore various terminal elements for common use implementation. Several common use opportunities were considered as part of this task including common use ticketing counter positions, common use self-service kiosks in the ticket lobby, and common use holdrooms.

The analysis prepared in Section 4.1, Terminal Capacity/Facility Requirements, has illustrated that the ticket lobby has sufficient ticket counter capacity to accommodate up to PAL 4 demand. Therefore, systems such as common use counter positions or common use self-service kiosks are not necessary and the airlines may not want to implement them. However, if the Airport wishes to provide the kiosks, there is sufficient space along the exterior curtain wall (see **Figure 7.3.2-1**).

FIGURE 7.3.2-1
NEW ENTRANCE VESTIBULE AND
POTENTIAL COMMON USE SELF-SERVICE KIOSK LOCATIONS



Source: URS Corporation, 2010.

A fourth baggage claim device is required between the early and mid-point of the PAL 2 planning period and it is recommended that the addition of this device be addressed as part of the PAL 2 Program. With the addition of the fourth claim device, there is no compelling reason to change the current basis upon which the airlines use the system. Alternatives for baggage claim improvements are discussed further in Section 7.3.7.

While holdrooms on Level 2 may require expansion to provide additional seating to accommodate changes in the future aircraft mix by PAL 2, the implementation of common use is not needed or desired by the airlines. As an alternative to mitigate holdroom seating deficiencies, future development of concession opportunities across the concourse from holdrooms should supplement existing holdroom seating capacity and reduce holdroom congestion. This is discussed further in Section 7.3.5.

7.3.3 TICKETING AND CHECK-IN

Over the past decade, there have been distinct changes in how passengers check-in for their flights. As facilities have been modified to accommodate these changes over time, airports are finding that less space is actually required to serve passenger check-in functions. At many airports, passengers check-in remotely and bypass the ticket lobby completely. Those that do use the ticket lobby often use the self service devices set up by the airlines or the airport, not the traditional ticket counters. With the recent advent of airline baggage fees, people check fewer bags. Also, with the implementation of in-line or semi-in-line baggage screening systems, many airports have reclaimed unused ticket lobby space. Demand for ATO space is also expected to decrease as check-in becomes more automated, which offers the opportunity to consolidate and reorganize ticket counter and ATO space with the goal of capturing this surplus area. The ultimate goal would be to reorganize this area so the surplus space accumulated would be located adjacent to higher traffic areas where it can be effectively utilized for concessions and other public service functions to enhance the revenue generating potential of the terminal. Until such time as it becomes feasible to consider a complete renovation of the ticket counters and associated ATO space, surplus space behind the ticket counters can be used for baggage screening or to consolidate offices for Airport staff or other outside agencies such as TSA.

MHT is projected to have more than sufficient ticket counter frontage through PAL 4 enplanement levels; however, the depth of the ticket lobby is not ideal and congestion at the intersection of traffic between the pedestrian bridge landing and the escalator up to Level 2 and the lateral circulation path between the ticket counters and the terminal wall has been observed during peak departure periods. Most of this congestion is due to the concentration of departing passengers using the main entrance, as well as those coming from the garage via the pedestrian bridge that must also use the ticket counter. To reach the ticket counter, these passengers must move against the flow of passengers that have already used the ticket counter, thereby causing frequent interruption of flow in either direction. Based on the potential addition of the new entrance vestibule near the west end of the ticket counter frontage and proposed improvements along the curbside to spread out enplaning passengers, the percentage of passengers contributing to this condition should be reduced and no further improvements related to this condition are recommended for the current Airport Master Plan Update.

7.3.4 PASSENGER SECURITY SCREENING

Like many airports, the passenger security checkpoint at MHT is a point of congestion. Since the inception of various, more stringent screening methods and TSA policies, airports with limited space have been challenged to provide a quick, efficient checkpoint. It is anticipated that these guidelines will only become stricter as various threats continue to evolve. Most recent is the introduction of the whole body imagers (WBI) scanning units to enhance passenger screening, and advance technology (AT) systems to improve screening of carry-on baggage. The purpose of new technology is to improve security screening and increase throughput. Currently, it is still unknown how these new units, being deployed around the country, will affect throughput. Even if the newer technology is more rapid, and efficient layouts are planned, often times the checkpoint is not staffed appropriately by the TSA to achieve the potential level of throughput. An analysis of the number of lanes required for passenger screening was conducted for this Airport Master Plan Update (see Section 4.1, Terminal Capacity/Facility Requirements). This study used a processing rate of 175 passengers per lane, per hour, and the results indicated that six lanes will be required at PAL 2.

Checkpoint arrangement alternatives are illustrated in **Figures 7.3.4-1 and 7.3.4-2**. The six-lane checkpoint, depicted in Figure 7.3.4-1, illustrates the recommended improvements for the PAL 2 peak hour demand, including the checkpoint with sufficient queuing and overflow space on the pedestrian bridge, the introduction of the direct deplaning corridor from the concourse to baggage claim, and existing Level 2 non-secure concessions which were adjacent to the concourse reoriented to serve the secure concourse. Redevelopment of this concession area should take advantage of the opportunity to supplement holdroom seating requirements and provide enhanced revenue benefits for the concession tenants and the Airport.

Another early alternative concept was explored, which shifted the full checkpoint function and layout into the adjacent concession space, while retaining the center stair (Figure 7.3.4-2). Several attempts were made to identify alternatives for a consolidated checkpoint which preserved the existing center stair. The lane arrangement illustrated in Figure 7.3.4-2 is one of several attempts to develop a concept which preserves the center stair. This space was not large enough for the passenger checkpoint operation. It was determined that the only way then to provide the necessary area for consolidating the security checkpoint in the central area was to relocate the center stair.

This illustration demonstrates the dimensional limitations of the existing terminal floor area adjacent to the existing checkpoint area. It seems clear that the arrangement illustrated in Figure 7.3.4-1 is the only feasible option for lane organization and lane orientation for the consolidated checkpoint.

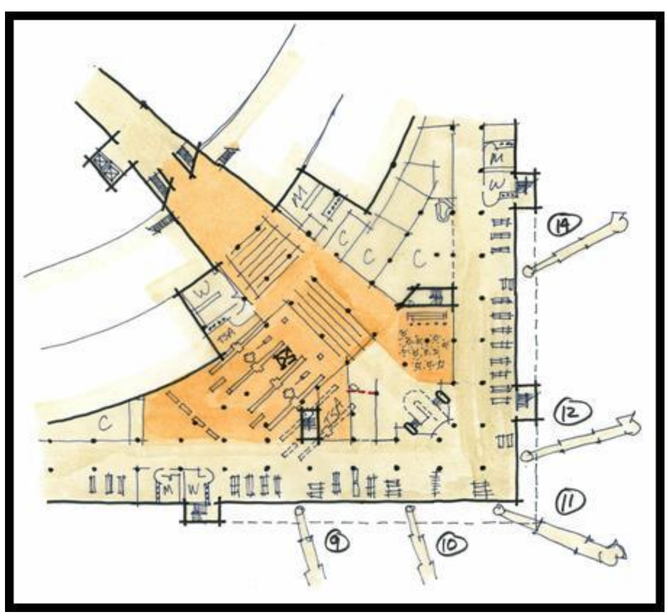
<u>Checkpoint Conclusion</u>

The layout illustrated in Figure 7.3.4-1 is the recommended concept for a six-lane consolidated passenger screening checkpoint. However, queuing requirements for a six-lane checkpoint effectively block access to most of the existing non-secure concessions on Level 2. Since six lanes are not actually required until PAL 2, MHT requested the Airport Master Plan team to continue the search for an alternative concept with the goal of maintaining as much of the existing Level 2 non-secure concessions space as possible. Further study revealed that a five-lane checkpoint alternative will satisfy passenger screening demand through PAL 1 and development of this alternative is discussed further in Section 7.8.4.

FIGURE 7.3.4-1
SIX-LANE CHECKPOINT LAYOUT

Source: URS Corporation, 2010.

FIGURE 7.3.4-2
ALTERNATE CHECKPOINT LANE ORIENTATION



Source: URS Corporation, 2010.

7.3.5 *PASSENGER HOLDROOMS*

In general, the airline industry is phasing out older aircraft for newer fuel efficient aircraft. Airline consolidation and cutbacks in flights mean that airlines are lowering the frequency of flights and flying larger aircraft. It is possible that the overall number of passengers may decrease, but peak periods are higher. At MHT, which is predominately an Origin and Destination (O&D) airport, it is expected that the general size of aircraft will generally remain the same as the current mix. Based on the PAL 2 facility requirements, a minimal increase of holdroom space needs to be accommodated.

Due to the projected passenger demand, financial considerations, and expansion possibilities inside the terminal, limited development alternatives outside the existing footprint were considered. There are a few possibilities to remove or relocate existing concourse functions such as smoking rooms or storage areas to provide more holdroom space. Additionally, minimal expansion alternatives were considered near Gates 1 and 15/15A in conjunction with adding aircraft parking positions. Due to financial considerations, this alternative is not likely feasible in the short-term.

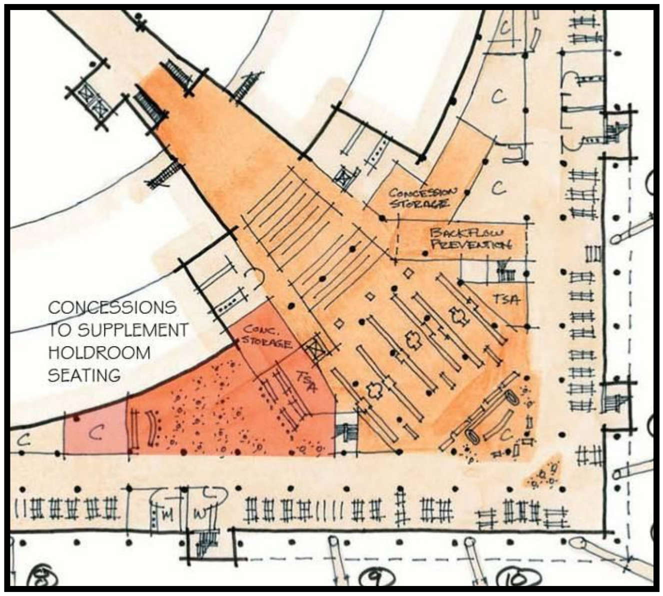
The most efficient and economical way to accommodate the holdroom demand is the integration of concession seating. It is a standard assumption that holdroom seating demand can be reduced by as much as 20 percent with a sizable concessions area adjacent. Also, with the integration of the two, concession spaces are more visible to passengers. Passengers will tend to stay longer at concessions, increasing the revenue potential, if they are within viewing distance of their gate.

The best location to accomplish the above described integration is adjacent to the security checkpoint. The highlighted area in **Figure 7.3.5-1** depicts the location of concessions which will lose non-secure public access from the checkpoint area as they are reoriented to the secure side, at the point in the future when six lanes are required in the security checkpoint. By reconfiguring the non-secure concessions to secure concessions, additional seating to supplement existing holdroom seating may be gained. This will accommodate the anticipated holdroom demand and provide a high passenger LOS.

7.3.6 *RENTAL CAR COUNTERS*

The rental car counters are currently located in the baggage claim lobby. It is anticipated that rental car demand could be accommodated in its current location, but the anticipated passenger demand level in the baggage claim will exceed the existing layout. To accommodate PAL 2 baggage claim demand and the relocation of concessions discussed in previous sections of this Airport Master Plan Update, the development of alternatives considered relocating the rental car counters to the parking garage. Additionally, funds from Customer Facility Charges (CFCs) could be used to finance the relocation of the rental car operations and the redevelopment of the baggage claim lobby.

FIGURE 7.3.5-1
CONCESSIONS SUPPLEMENTING HOLDROOM SEATING



Source: URS Corporation, 2010.

Three alternatives for rental car counters relocation within the garage were considered. Two alternatives inside the garage at Level 1 and at Level 2. The third alternative expands Level 1 into an area located between the pedestrian bridge and exit stair tower at Level 1 (**Figure 7.3.6-1**). These alternatives were further refined later in the planning process.

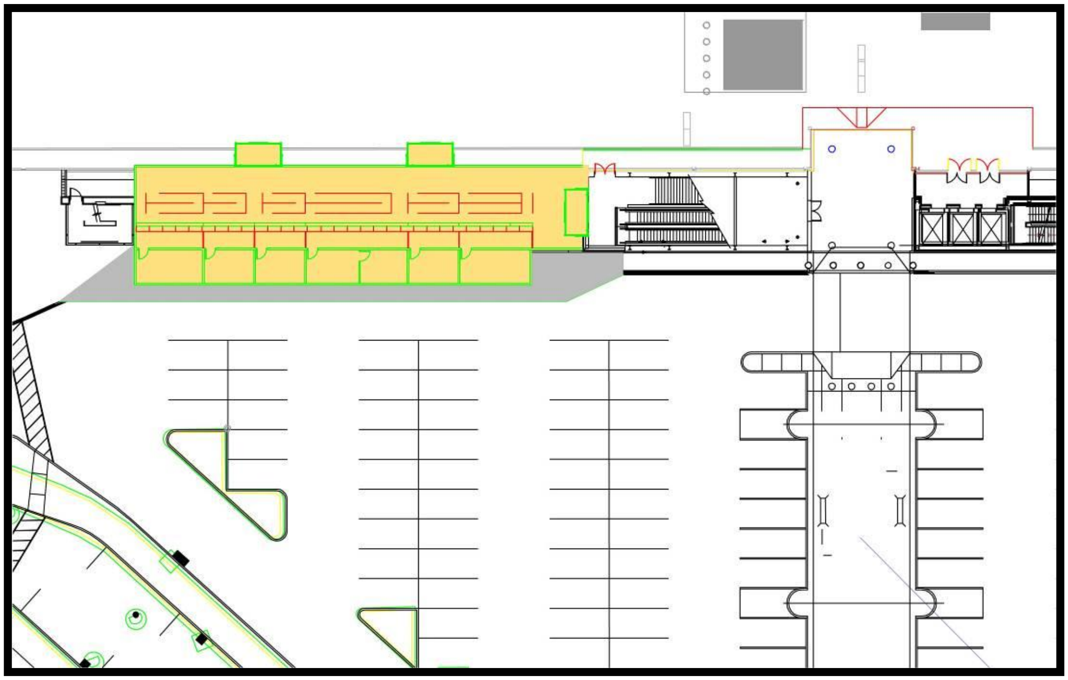
Fully protected access from the terminal to the garage is provided via the pedestrian bridge, although currently many passengers exit the lower level and walk across to the garage. For ultimate flexibility for future growth, the best location for the rental car offices is at Level 1, preserving the parking spaces and associated revenue at the Level 2. Additionally, from a constructability perspective, developing the lower level rental car offices will be more economical.

Figure 7.3.6-1 depicts the proposed exterior rental car counters location.

7.3.7 BAGGAGE CLAIM

Though the demand on the baggage claim lobby will exceed capacity by PAL 2, it is unlikely that the baggage claim area will be expanded outside the existing terminal envelope within the 20-year planning period. However, it is anticipated that the current flat plate devices will need significant maintenance or replacement in the next 10 years. With the short-term baggage belt length demand, and the rental car counter relocation, multiple concepts, such as extending the baggage claim devices in the short-term and adding a fourth claim unit, if needed, were considered. Schematic alternatives were developed to address a more efficient baggage and lower lever operation, as discussed later in Section 7.8.3.

FIGURE 7.3.6-1
PROPOSED RELOCATED RENTAL CAR COUNTERS EXTERIOR CONCEPTUAL PLAN



Source: URS Corporation, 2010.

7.4 TERMINAL INFORMATION TECHNOLOGY DIRECTION (COMMUNICATIONS WIRED AND WIRELESS INFRASTRUCTURE AND NETWORK SUPPORT SYSTEMS)

The existing Local Area Network at MHT is structured as a flat layer two network. One Cisco 4510R chassis based switch is utilized as a network core switch. This core switch aggregates traffic from 27 stackable access layer switches. The core switch is also a connection point for both physical and virtual servers. Uplinks between access layer switches and the core switch are predominantly one-gigabit per second links using single mode fiber. Several switches are connected to the core through 100 megabit per second links.

A detailed review of the core switch configuration and statistics indicates that the existing network is configured correctly and is working well. Traffic statistics, power, central processing unit (CPU) capacity, and memory are well within normal limits.

7.4.1 ADDITIONAL PROGRAM ELEMENTS

During an Airport staff interview, the Airport Master Plan team was informed of a number of additional key network and infrastructure elements, which included the following items:

- Information Technology (IT) staff consists of Network Admin, Systems Admin, and one Tech
- MHT is a subset of City IS

- MHT is connected with City network using fiber optic cable
- Backbone is configured in a star configuration with partial path diversity
- Wireless is controlled by a Cisco 4400 controller using approximately 150 APs
- Public Internet and MHT staff internet are provided by two cable modems at engineering
- Core switch is a Cisco 4510R with dual supervisors located at the terminal
- Access layer switches are a mix of stackable switches uplinked with gig-E and 100-FX
- MHT uses a Cisco ASA firewall on the internet connections
- Video, Access Controls, Parking, etc. are on separate virtual local area networks (VLANs)
- MHT currently does not have an internet protocol (IP) addressing master plan
- MHT is currently using open shortest path first (OSPF) as a routing protocol for inter-VLAN routing
- Storage Area Network is HP
- Approximately 25 of the 30 to 40 servers at MHT have been virtualized using VM ESX
- Public Address is currently IED. Moving to a voice over IP (VoIP) paging solution
- Existing Comdial PABX will be replaced with VoIP over the next 3 to 4 years
- Tenant's fiber requirements are provided by MHT
- MHT is served with one DS3 circuit from the telco. This is groomed down into DS0s
- City has master Centrex contract with AT&T
- Comdial PABX at maintenance and terminal are served with separate Centrex trunks

7.4.2 NETWORK SUPPORT SYSTEMS RECOMMENDATIONS

The only shortcoming of the existing network is that there is a single core switch and a single path to each of the connected access layer switches. The core switch and the individual access layer uplinks then become a potential single point of failure. Core switch failure would result in a complete failure of the network and all connected services.

Therefore, the Airport Master Plan team recommends that a second Cisco 4510R (or equivalent) switch be installed at the terminal in an equipment room separate from the existing core switch. The existing core switch is located in the older portion of the terminal, and it is recommended that the new switch be located in the newer portion of the building, which is likely on a separate electrical service. For purposes of clarity, the existing core switch is referred to as the "Blue" core switch. The new core switch is referred to as the "Red" core switch.

The access layer switches are dual homed to the two core switches. It may be possible to extend a high strand count single mode cable between the two switch locations so that the second uplink from the access switches can be patched through to the new core switch. If fiber is inadequate out to remote switches, optics can be changed from 1000-base-LX to 1000-base-BX to allow the existing two-strand circuits to serve as two separate uplinks. The high strand count cable will also support trunked and channeled links between the two switches.

The introduction of a second core switch and second uplink from each of the access layer switches not only increases reliability, it allows for increased network performance. The Airport Master Plan team recommends that VLANs at MHT be broken into two ranges. For purposes of clarity, we are naming low order VLANs 1-127 as "red" VLANs. High order VLANs 128-254 are named as "blue" VLANs.

Per VLAN Spanning Tree (PVST) is being used at MHT, and the Airport Master Plan team recommends the following configuration steps:

1. Change from PVST to Rapid PVST+. This change allows spanning tree to re-converge the network much faster than standard spanning tree after a link failure, on the order of a few seconds rather than the 50 seconds or so normal to standard spanning tree.

2. Lower the bridge priority on the red core switch from the default of 32000 on each red VLAN to a value of 8000. This will force ports on the red switch to serve as a normal forwarding path (root bridge) for traffic on the red VLANs. Similarly, lower the red VLAN bridge priorities on the blue core switch to a value of 16000. This will ensure that the blue switch is elected as the secondary path for red VLAN traffic in the event that an uplink to the red switch fails.

3. Lower the bridge priority on the blue core switch from the default of 32000 on each blue VLAN to a value of 8000. This will force ports on the blue switch to serve as a normal forwarding path (root bridge) for traffic on the blue VLANs. Similarly, lower the blue VLAN bridge priorities on the red core switch to a value of 16000. This will ensure that the red switch is elected as the secondary path for red VLAN traffic in the event that an uplink to the red switch fails.

4. Implement Hot Standby Routing Protocol (HSRP) for each VLAN designating the red core switch as the HSRP primary for the red VLANs and the blue core switch as the primary for the blue VLANs. Configure HSRP for preemptive failback so that traffic will return to normal paths after an uplink failure is repaired.

Configuring spanning tree and HSRP in this manner will allow normal traffic from VLANs in the red VLAN range to favor a path through the red core switch through the network. Under normal conditions, traffic from the blue VLANs will favor a path through the blue core switch to cross the network. When a core switch or access layer uplink fails, traffic from all VLANs will traverse the surviving uplink or core switch.

Load balancing across the network is accomplished by simply assigning new VLANs in either the red or blue VLAN ranges. This nearly doubles the available bandwidth in the network with a simple configuration.

The Airport Master Plan team also recommends two additional configuration steps for uplinks between access layer switches and the core switches. First, implement Uni-Directional-Link-Detection (UDLD) on all two-strand links such as 1000-base-LX or 100-base-FX. If a link becomes uni-directional (bad or un-patched fiber strand or failed optics), it can cause spanning tree to fail. UDLD monitors for this condition and shuts the link down if it becomes uni-directional. The last recommendation for uplinks and core-to-core links is to configure these links as Ether-Channel links. This creates very little overhead on the switches and allows incremental bandwidth to be increased by simply adding new uplink(s) to the Ether-Channel.

Other technical discussion and recommendations are contained in **Appendix H**.

7.5 TERMINAL SERVICES, SYSTEMS, AND FUNCTIONAL REQUIREMENTS

MHT requested that the Airport Master Plan team evaluate the program and area requirements associated with the following terminal functions and determine if they could be either incorporated into the existing building footprint or if existing, improved upon or upgraded to improve their current Level of Service (LOS). Those terminal functions included the following

- Communications Center
- Outbound Baggage System
- First Aid Room
- Additional Storage/OPS Space
- Administrative Space
- Pet Relief Area

7.5.1 COMMUNICATIONS CENTER

Existing Conditions

The Airport Master Plan team visited the Airport Communications Center where the Airport Operations Superintendent provided the planning team staff with a comprehensive overview of the physical facilities inclusive of the Communications Center and their support facilities, as well as the adjacent security badging operation.

The Communications Center occupies a footprint of 100 square feet, operates 24/7, and is staffed by between one and three person, depending on shift. During the site visit, two staff members were on duty, which is normal during busy periods. The Airport Master Plan team's impression of the space was that the addition of a third person would unnecessarily overcrowd the work area; however, considering the adjacent support spaces, there is potential to reconfigure the existing space to better accommodate the staff and functional requirements.

Several recommendations and criteria were put forward by the staff in support of the reconfiguration of the Communications Center space. A few key elements included:

- Creation of a supervisory/training position area;
- Enlargement of the core Communications Center area;
- Reconfiguration of the space to eliminate the public's direct view into the Center, and specifically its closed circuit television (CCTV) assets from the primary entrance but retain access to the public;
- Proximity to the security badging operation was considered very important; and
- Use of ballistic proof glass with impenetrable wall beneath for the wall/glass separating the Communications Center personnel from the public.

In addition, the Airport Master Plan team was informed about the various electronic, IT, and communications systems in the space which form the primary functionality and capabilities of the Communications Center. These included:

Function	**Supporting Equipment**
E-911 Dispatch (terminal facilities only)	Telephone (Comdial) and Radio Motorola (MCC 5500 Consoles (2) positions equipped)
Airport Access Control	Software House (Tyco) C-CURE
Radio Communications	(MCC 5500 Consoles (2) positions equipped)
CCTV System	Mix of Analog and Digital cameras and OnSSI video management system software
Records Management/Log	Excel (internal template)
Lost and Found Log	MS Access (internally developed template)
Telephone Communications	CommDial Telephone System
Call Recording	Recall – GR Hindsight – recording provided for all comm center phone lines and radio select audio (4 Radio channels)
Personnel Paging	Paging performed from Microsoft Outlook
Fire Alarm Monitoring	Edwards System Technology (EST) Panel located in space. Fire alarm is done with 10-minute delay on audibles. Instant audible on multiple alarms. System scheduled for replacement.
Voice Paging (Terminal Paging)	IED Microphone station
Garage Intercoms	Stentophone
Duress Alarms	Integrated into C-CURE ACS
Crash Telephone	TelLabs 292 (scheduled for replacement)
MHT Ethernet Access	CISCO (equipment room in Airport Communications Center)
Phone System Backup	Two mobile phones (Nextel #3085A)

Other functionality includes:

- General incoming Airport phone calls come into Airport Administration during business hours and are redirected to the Communications Center after hours
- TSA checkpoint phones ring down to Communications Center
- Two generator monitor panels are located and monitored in the Communications Center
- Maintenance trouble reports are recorded and managed by Communications Center staff
- Communications Center staff dispatch fire, medical, police, and maintenance resources

Emergency Operations Center

The Primary Emergency Operations Center (EOC) is located on the third floor of the terminal in the administrative area. The EOC is equipped with CCTV system resources and 12 telephone lines. Radio communications are by handheld radios.

Family Assistance Center

The large board room in the terminal serves as the Family Assistance Center. The Family Assistance Center incorporates limited functionality and includes 12 telephone lines.

Additional Program Elements

In addition to the primary Airport Communications Center, MHT also has a pair of back-up command and control facilities. These include a back-up ACC that can provide key Airport Communications Center functions in a degraded mode of operation, and an EOC. These facilities are located in the second floor of the Aircraft Rescue and Fire Fighting (ARFF)/Maintenance Building located across the airfield from the terminal building. It is worth noting that the Public Utility Phone Lines to the terminal and the ARFF/Maintenance Building are from the same location but are separate feeds. This provides a limited amount of security in the form of redundancy in event of a catastrophic event in either the ARFF/Maintenance facility or the terminal building.

The EOC, which doubles as a training facility/room, has an abundance of telephone/data jacks to also support family assistance operations and is well equipped, containing the following systems:

- CCTV System access via the MHT Administrative Local Area Network
- Back-up radio systems communications (7 channels)
- Back-up Comdial (DXP) Telephone PABX
- Crash Telephone
- All resources available via the MHT Local Area Network

The equipment located in the back-up Airport Communications Center includes:

- Access to and full capabilities of the Access Control System
- Access to and full control, recording, and playback of recorded video
- Radio communications via handheld radios
- Telephone communications
- All resources available via the MHT Local Area Network

7.5.2 CURRENT AND FUTURE BAGGAGE SCREENING (OUTBOUND BAGGAGE SYSTEM)

The Airport Master Plan team investigated the 'outbound' baggage handling systems (BHS) with respect to four planning elements for the purpose of defining the future requirements. Those elements included the following:

1. Space requirements,
2. Quantities of equipment,
3. Equipment performance (more specifically the performance levels of TSA screening equipment), and
4. Trigger points for upcoming project work.

The Outbound BHS is comprised of the ticket counter conveyor take-away belts, the conveyors in the TSA functions, which transport and queue-up bags, the Explosives Detection Systems (EDS), the transport conveyors down-stream of the EDS machine, which transport bags through and to additional screening, and ultimately to the make-up carousels.

Existing Conditions

As part of the work session meetings in early 2010, the Airport Master Plan team toured the baggage handling/screening systems and documented their observations below.

There are six dedicated modules for outbound baggage handling and screening systems, (the TSA designates the screening systems as Checked Baggage Inspection Systems). Each system commences from the departures hall, where airline ticket agents place checked baggage onto the take-away conveyors (just behind the ticket counters). The BHS transports the bags into a back-of-house space, where the baggage screening function begins. The preliminary screening function is to queue-up bags needing to enter the EDS devices. The queuing function allows the system to control bags entering the EDS machine, as the belts within the EDS are running slower than the BHS conveyors. This queuing area provides a buffer of a few bags between the public space and the security screening function; but the buffer is very limited.

After bags pass through the EDS machine, a portion have been ‘cleared’ by the EDS and are being transported toward the airline make-up function, and others are experiencing additional screening as they are being transported (a level-2 screening). A portion of these bags will be ‘cleared’ in this process and will be directed toward the make-up carousel. The remainder of the ‘non-cleared’ bags will be diverted (down) for additional TSA screening at the Explosives Trace Detection (ETD) positions. The ‘cleared’ bags are diverted up to be placed onto the make-up carousel through a ‘tip-chute.’ The bags cleared through the ETD process are placed on the make-up carousel by the TSA Officers (TSOs).

The make-up carousels are flat-plate carousels, laid-out to circulate from the back-of-house space (where the TSA functions occur) to the airside space (bag room) where airline handling agents place the bags in the carts of the designated departing flight.

While the majority of the BHS equipment was provided by the U.S. firm G+T Conveyor, Inc., the vertical diverters were produced by a German firm, SEW. It was noted that it takes quite a long time to get parts to do maintenance for the SEW devices.

The BHS are maintained by the Airport and the majority of the conveyors appear to be in good working condition. It was noted that there is on-going work to refurbish moving parts on the carousels (both inbound and outbound). Additionally, modifications (to provide back-guards) to the ‘B’ area claim carousels appear to be quite robust and should serve all parties well.

The Existing Modular Design

The outbound baggage handling/screening systems are each configured in similar modular layouts; and the modules’ layout represents design thinking of the early period post ‘9-11.’ There are some benefits inherent in the layouts and some issues.

Benefits

- Short travel distances
- Modular design – similar equipment
- Proven Technology of EDS
- Consistent Equipment for Make-up
- Redundancy through the Ticket Counters

Consequences

- Limited buffer space before EDS
- Limited redundancy of EDS
- Merge challenges
- Dedicated TSA agents per pod
- Communications Issues between the BHS and the EDS

Beneficial Features

The short distance from the departures hall through the ATO space to the bag room inherently helps define a short travel time for bags when traveling from the ticket counters to the bag room. The airlines are keenly aware that having control over their baggage and limiting the time that the bags spend in the screening process, reduces the likelihood the airlines will have delayed or missing bags and minimizes the costs associated with getting these bags to passengers. For the airlines, a short 'time in system' metric is highly important.

Having similar equipment across the six modules is important to the maintenance of the systems. Similar operations and parts will keep inventory of parts down. The maintenance crews also have a more precise set of maintenance issues to handle in a modular design.

The L-3-Communication's Examiner 6000's are good devices for throughput and fairly reliable for operations. Of the equipment types that were available at the time these were deployed, this L-3 platform was probably the most reliable.

The flat-plate make-up carousel also works well in the layout of this terminal building. The depth dimension from curbside to airfield is fairly narrow and each of the functional areas is laid-out in a narrow fashion. The flat-plate carousels are consistent with this. The benefit of the narrow carousels is the space left over in the bag rooms for tug and cart operations.

There was evidently some thought put into the modular design for redundancy of baggage operations. The original design established the module and then placed a second module (mirrored) to work with it. In a mirrored condition, some ticket counter conveyors were placed end to end and in 'back-up' operational modes, bags could be transported along the alternate ticket counter conveyors. In some conditions, this book-end condition was established with a doorway in between the two ticket counter conveyors. In such a condition, the bags need to be handled, passed by laborers from the one conveyor to the other for this alternate (redundant) operation. While these layouts do not provide a robust level of redundancy, it is certainly a workable solution.

Consequential Features

The space in which the EDS machine and the preceding queue conveyors were placed is quite short. The result of this is that there is limited buffer space; space for bags to queue-up prior to the EDS screening function. It was identified that, on the aggregate, this is not a significant issue today (i.e., there are not that many times when bags queuing for the screening function cause the ticket counter conveyor to 'die back'). However, it was noted by Airport staff that when passenger volumes were higher in the past, the ticket counter conveyor on which Southwest Airlines operates 'died back' quite often. As passenger levels return, the Southwest outbound system should be monitored.

A stand-alone EDS is located in the USAirways bag room. It was identified that when one of the other EDS becomes non-operational, the Airport maintenance crew is enlisted to manually bring bags to this EDS for screening. This form of redundancy serves a number of the modules and, therefore, can be used as a back-up plan, but it is a labor intensive solution.

Currently, both modules at the ends are configured with two EDS devices and one make-up carousel. In these modules, one of the screening lines merges bags onto another transport line. It was identified that the merge locations are a problem condition; bags are being tracked through the Level-2 screening function across the merge and the merge function needs to be refined. More bags will end up in the final screening stage than necessary.

Because the Checked Baggage Inspection Systems is incorporated into each of the modules, the Level-3 screening (TSA staffed ETD stations) is also dedicated to each module. One of the issues that TSA has been repeating since the first issuance of the Planning Guideline and Design Standard (Version 1, October 2007) is the evaluation of designs to ensure that the most cost effective solutions are being installed. The Planning Guideline and Design Standard (now up to Version 3) incorporates high-level evaluation of a number of solutions at the commencement of a project and each concept must be evaluated on life-cycle costs over a 20-year period. The effect is typically to weed-out dedicated solutions, as more equipment and TSOs are deployed and the costs to TSA are generally higher. As the costs to TSA are significant with dedicated systems, as exist at MHT, it is speculated that TSA (if it had the opportunity) would generally push for solutions at the other end of the spectrum (i.e., common systems). Yet the terminal layout is such that the expense of providing a layout other than the dedicated systems seems out-of-reach.

As the Airport Master Plan team reviewed the BHS systems of the terminal, it was noted that there are problems associated with the controls-interface communications between the Examiner 6000's and the BHS controls computers (Programmable Logic Controllers – PLCs). This causes more bags to end up at the Level-3 screening function than should in fact be present and, therefore, a higher than normal error rate.

<u>Future and More Advanced TSA Bag Screening Technologies</u>

This section presents ideas that are described in the latest versions of the Planning Guideline and Design Standard (Version 3) and describes more-recently certified and future TSA equipment that may be possible for use at MHT. Some of the issues that the Airport Master Plan team developed included the following.

There are new EDS and screening protocols being certified and deployed that can be retrofitted:

- Reduced Size EDS
  - Size Advantages
  - Throughput Advantages
- Higher throughput EDS
  - Throughput Advantages
- Newer configurations from TSA lessons learned

These are discussed in more detail below.

Trigger Points

A master plan will typically define a trigger point(s) of capacity which will generate the need for a project to enhance the facility or a system. There is also another trigger point that often is present in the BHS world, and that is life-span (or useable life) of screening equipment.

The baggage screening devices (EDS machines) will come to the end of their useable life cycle in the near future and will have to be replaced. TSA defines the typical life cycle to be 10 years. For the stakeholders of this terminal, it can expect that the existing EDS machines will need to be replaced in the next couple of years. It is speculated that the time frame may be in the 2013 to 2015 period and 2014 will be used as a target date.

Currently, the EDS machines are L-3-Communications Examiner 6000's, operating at an aggregate rate of about 325 bags per hour. The approximate demand load being processed on these (extrapolated to 2010 levels from the program report) are defined as:

Peak Hour

Air Carrier	Baggage Load
Southwest Airlines	519
USAirways	273
Air Canada/United Airlines	125
Delta (including NW)	175
Continental	70

TSA requires a planning horizon of 5 years for the evaluation of demand to capacity; therefore, it is reiterated that for the sake of quantifying the replacement equipment, the EDS machines will have to be replaced in the target date of 2014. The planning demand load then has been extrapolated from the current demand loads to 2019 levels. The anticipated forecasts are:

Peak Hour

Air Carrier	Baggage Load
Southwest Airlines	519
USAirways	243
Air Canada/United Airlines	144
Delta (including NW)	198
Continental	101

Several questions are examined as the next set of EDS machines are considered for the replacement cycle:

- Is replacing the EDS in-kind the best replacement philosophy?
- Can a different EDS and/or configuration reduce the number of TSOs needed and, therefore, reduce operating costs?
- Can a different configuration provide better redundancy for the operation?

The Airport Master Plan team considered several scenarios to analyze the questions noted above; these are described in more detail in **Appendix I**.

Baggage Screening Systems Types

Above and beyond the issue of what type of EDS machines can be placed into a baggage screening system, the configuration of the baggage screening system(s) must be considered. Currently, the dedicated modules are integrated into the layout of the terminal and when constructed this integrated layout met the design intent of early screening systems well. Because of the narrow shape of the terminal, there were some compromises to the performance of the screening operations and some natural limitations to the BHSs.

TSA has defined a number of generic system types and describes these in the Planning Guideline and Design Standard. These include: 1) Stand-alone systems, 2) Mini-in-Line systems, 3) Medium-Volume systems, and 4) High-Volume systems. The type of system is generally provided to serve a specific demand load, but configurations are also highly dependent upon other criteria: facility layout and operation, efficiency of the layout, and cost effectiveness, to name some primary issues.

MHT is not expected to have a baggage volume to warrant a High-Volume system. The baggage volume of MHT, collectively, might be enough to warrant a Medium-Volume system. This type of layout would presume to bring all outbound baggage to a central location for screening. The function of this type of system would be considered ‘common’ as all bags of all air carriers would be combined during the screening process. A Medium-Volume system such as this might have to be located in a landside space, such as the existing surface parking lot.

There are two significant arguments that define why these two locations for a Medium-Volume system would not be attractive. For a system located in a parking area, a new facility would have to be constructed (taking away some of the parking capacity). Additionally, the conveyor lines leading to and from this facility would be extensive. The cost of such a project would be high, in addition to being a potentially unattractive solution on the public side of the terminal. For a solution in a large centralized bagroom, the conveyor lines would have to pass to and from this location. There would have to be significant vertical clearance in the terminals lower level to accommodate the depth of one or perhaps two conveyor lines over drive aisles. The MHT terminal was originally constructed with a somewhat low structure and would not accommodate the conveyor routes. A solution in a centralized bagroom would also have extensive conveyor lines and; therefore, the cost of such a system would be fairly high.

Stand-alone solutions might be provided for very small operations. The challenge associated with these types of systems is that they are labor intensive. They are generally provided in departures lobbies or in bagrooms, although for MHT the existing systems might be reworked for a stand-alone arrangement. It is reasonable to believe that the stakeholders of MHT would evaluate stand-alone systems as a backward step though. The labor required to process bags in a stand-alone layout would be extensive.

The remaining system then is Mini-in-line type, which is what the terminal is equipped with today. The Mini-in-line dedicated modules fit the operations appropriately. The systems have been integrated into the terminal building shape.

From a planning perspective, it would be difficult to envision converting the existing baggage screening systems' configurations to another type without significant rework to the facility or to create systems that are not as efficient (from a labor stand-point or from a baggage processing stand-point).

Conclusion

Two types of replacement projects were evaluated to replace existing EDS machine in their existing Mini-in-line configurations. The first type of project considered including L-3-Communications' newer EDS machines and the second considered Reveal equipment.

The studies of capacities of replacing the existing EDS equipment with newer L-3 equipment have noted some advantages. The consistency of EDS manufacturers is a significant benefit. The communications protocols would be more consistent (between the existing L-3 units and new L-3 unit versus the existing and Reveal equipment). There would be a consistency of the reporting capability between the L-3 platforms as well.

As noted in the previous discussion of trigger points, L-3 has a new small unit (L-3 3DX SX), which has capacities that could accommodate the BHS with smaller throughputs. Additionally, the newer L-3 equipment (L-3 3DX 6600) could be integrated into the Southwest Airlines without much modification. The Reveal machines would require more rework of the communications protocols between the BHS and the EDS machines.

Replacing in-kind may be a most efficient way to resolve the trigger point issues associated with needing to replace the existing EDS machines. As identified earlier, there exist communications issues between the existing EDS machines and the BHS. These issues could be resolved in the process of replacing EDS. The industry has learned many lessons through the past years of in-line baggage screening systems. It is believed that the existing communications issue relates to a communication card (a hardware piece) and that it could be easily resolved.

The challenge of the two end screening systems (the merging issues) are related to how the conveyor equipment has been placed and how the controls of the merge work. Based on lessons learned from other baggage screening systems, it is very reasonable to believe that these can be resolved with some refinements to the equipment and/or controls logic.

Recommendations

It is recommended that the system configuration continue to be Mini-in-line solutions. There does not seem to be a feasible means of providing an alternate configuration with L-3 equipment or with Reveal equipment.

The L-3 equipment will be the better choice in replacing the EDS machines that have met the limit of their useable life span. The existing systems are already configured with L-3 components and the BHS/EDS communications protocols would remain consistent.

The Southwest Airlines system can be replaced with L-3 EDS machines of increased throughput, which will be well received by the airline.

The merge issues can also be refined at the time of the system replacement.

7.5.3 First Aid Room

Currently, MHT has no dedicated First Aid Room; rather this function is accommodated within the Communications Center/Badging Office area. This location is central, on the first floor, behind the main escalator. The majority of the injuries treated at this location are ambulatory in nature (i.e., sprained or twisted ankles). More severe injuries are treated by Emergency Medical Technicians (EMTs) at the scene of an injury.

Within this suite of spaces, there is one open office area, located off the central corridor to the north, in which a passenger could be looked at and allowed some time to gather themselves, before continuing on with their travels. This area has only a small desk and chair, along with base and upper cabinets, but no medical equipment or storage at present.

Desired First Aid Room Elements

On February 16, 2010, the Airport Master Plan team had a working session with Airport staff to determine the issues and needs associated with the First Aid Room. Items discussed during the interview included preferred location, program elements, capacity requirements, and storage requirements. From that meeting, the following program elements were developed:

- Exam table
- Adjacent handicap accessible restroom
- Defibrillator
- Wall mounted exam lighting
- Minimal medical storage required (i.e., band-aids, first-aid kits)
- Small sink with upper and lower base cabinets
- Hold approximately 6 people

After further discussion regarding these program elements, it was agreed that what the Airport required was a typical family health center style exam room.

First Aid Room Location

The Airport's preferred location for a First Aid room is to keep the facility on the first floor and centrally located. There was significant discussion about locating it in the space currently occupied by the first floor smoker's lounge, behind the main escalator.

The Airport believes that providing a smoker's lounge, in an alternate location, is still a desirable amenity to provide its passengers. To that end, there was general discussion about trying to relocate this function to the curbside by reclaiming and enclosing one of the existing bus or curbside check-in shelters. The Airport Master Plan team has proposed a curbside location for a relocated smoking room.

Other Potential Medical Care Opportunities

During a Working Session with senior staff, the Airport Director mentioned that the Airport was in contact with a local hospital to possibly provide a for-profit clinic in the terminal. At this time it is unclear what the program or area requirements for such a service might be and whether this service would supplement or replace the need for the First Aid Room. It was decided that until such an agreement was reached no further action was required by the Airport Master Plan team.

7.5.4 OPPORTUNITIES FOR ADDITIONAL STORAGE/OPS SPACE

This section describes the airport administrative, concession, and maintenance storage needs.

Administrative Storage - Existing Conditions

The airport administrative storage needs, included Administration, Operations, and Engineering and Planning. Of the three, Engineering and Planning was already located outside of the terminal.

Currently, MHT Management has two locations for file and records storage in the terminal. The first and largest area (approximately 500 square feet) is located on the first floor at the north end of the in-bound baggage area, adjacent to the Baggage Services Offices (BSOs) on the secure side of the Airport Operations Area (AOA) wall. The second smaller area is a space located on the third floor in the Administration suite and is approximately 130 square feet.

Engineering and Planning is currently located outside of the terminal building, in a two-story office building owned by the Airport. They currently occupy the entire second floor which includes the following program spaces:

- Lobby
- Offices (7)
- Conference Room
- File and Drawing Storage areas
- Kitchen
- Restrooms

Concessions Storage - Existing Conditions

The Airport indicated that there is a significant shortage of available area for concession storage within close proximity of the loading dock located on the north end of the building and, as a result, concession and retail vendors were required to immediately off-load their merchandise and process it through the security check point. This, in turn, creates an exaggerated backlog at the checkpoint, because the TSA has to dedicate a single lane to the processing of merchandise, often times when traveling passengers are also trying to process through security. Care has been taken to minimize this conflict by scheduling deliveries for off peak times, such as mid-day, but conflicts still arise.

On the first floor, the only concession storage space available is on the airside by Gate 14, across from the “B” baggage claim tunnel and tugway. On the second floor, the majority of the concession storage is in the sterile area, except for the areas associated with the food court and Hudson News, adjacent to the central screening area. The sterile area concessions storage includes: space between Gates 7 and 8 which is dedicated to Starbucks and Hudson News, a small amount of storage adjacent to Quiznos, and space in the west end of the terminal near the Sam Adams Café & Pub. The area near the Sam Adams Café & Pub includes some general storage in their kitchen area, as well as space directly east of the kitchen (in the mechanical area) where Hudson News stocks merchandise (i.e., tee shirts, sweatshirts, and hats).

Concessions storage in the terminal building consumes valuable space and depending on the cost, there is a limit to how much a concession operation can pay for storage area.

Maintenance Storage - Existing Conditions

Maintenance storage is limited primarily to the central shop, located on the first floor near Gate 10, off the tugway. As was noted by the Airport during the interview session, Maintenance has increasingly lost space over the years to accommodate other functions and growth, specifically the IT Group. Should a new entrant airline start service at MHT, Maintenance admits that they will be “without a home” as they will need to turn their first floor area over for airline ramp operations. Maintenance also noted that they have a small garage area on the first floor, at the west end of terminal, which they use as staging area for work at that end of the building. However, this space is limited to a single garage bay, and has more rack storage than useable work area.

7.5.5 OPPORTUNITIES FOR ADDITIONAL ADMINISTRATIVE SPACE

The issue of additional administrative office support space was reviewed by the Airport Master Plan team through interviews and discussion with MHT senior staff. A number of improvements were identified during these discussions and a space program for existing and future administrative space (see **Table 7.5.5-1**) developed previously, was reviewed. Specific additions and improvements were identified as follows:

- Additional Conference Room (200 square feet)
- Additional Offices (two at 160 square feet)
- Additional Work Station (64 square feet)
- Expansion of Kitchen/Break Room (100 square feet)

TABLE 7.5.5-1
MHT ADMINISTRATIVE SPACE REQUIREMENTS

Description	Existing Space (sf)	Future Desirable Space (sf)
Administration Space Terminal Building (3rd Floor)		
Office – Airport Director	458	458
Office – Deputy Airport Director	184	184
Office – AAD Operations and Facilities	184	184
Office – AAD Marketing	188	188
Office – AAD Properties	185	185
Office – Property and Contracts	160	160
Office – Financial CFO	166	166
Office – Airport Security	163	163
Office – Future	N/A	160
Office – Future	N/A	160
Work Station – Adm. Assistant – Director	98	98
Work Station – Adm. Assistant – Ops/Facilities	64	64
Work Station – Adm. Assistant	64	64
Work Station – Adm. Assistant – Properties	58	58
Work Station – Future	N/A	64
Airport Adm. – Lobby/Receptionists/Seating (waiting) Area	485	485
Board Room #1	1,031	1,031
Board Room Storage Closet	75	75
Conference Room #2	265	265
Conference Room #3	N/A	200
Kitchen/Break Room	201	300
Copy/Fax/Supplies Room	131	131
Storage Room	169	169
Storage Room	61	61
Storage Room	42	42
Storage Room	75	75
Files Areas – 1 and 2 Properties	335	335
Files Areas – 3 Central	514	514
Files Areas – 4 Ops and Marketing	544	544
Circulation	1,220	1,220
Restrooms	370	370
Subtotal	**7,490**	**8,173**
Administration Space Engineering/Planning (2nd Floor)		
Office #23 – Director of Engineering and Planning	246	246
Office #21 – Engineer and CAD System/Equipment	342	342
Office #24 – Environmental Specialist	190	185
Office #31 – Adm. Assistant of Engineering and Planning	185	185
Office #25 – Vacant/Future	200	185
Office #30 – Vacant	210	N/A
Office #31 – Files	185	N/A
Conference Room #22	294	294
Storage/Drawing Files #28	182	182
Storage Files #26	272	272
Storage #29	188	188
Lobby/Circulation/Miscellaneous Space #27	645	445
Kitchen	100	N/A
Restrooms	178	N/A
Subtotal	**3,435**	**2,542**
Total	**10,925**	**10,715**

Source: URS Corporation, 2010.

In addition to the above existing 3rd floor administrative expansion items, it is desirable to consolidate all MHT administrative functions to the terminal third floor administration space. This includes relocation the existing Engineering and Planning group currently located in a separated facility on the other side of the airport. The expansion to the 3rd floor to accommodate the engineering and planning group would require an area of approximately 2,500 square feet. Based on the current economic conditions, it is not feasible to relocate this group to the 3rd floor terminal building at this time.

7.5.6 PET RELIEF AREA

One of the requested Airport Master Plan Update elements was to identify a location for a pet relief area. Since that time, the Airport has identified a location on the north end of the terminal building, between the landscape bed and the brick loading dock wall.

The pet relief area is approximately 150 square feet, with a mulch surface. It has pole mounted waste receptacles and bag dispensers, exterior lighting, and terminal signage from the existing curbside.

During the staff interview, the Airport Master Plan team presented some additional program elements for the Airport to consider with this function; those included providing coverage, as well as a water fountain for pets. The issue of water was discussed, and it was the Airports' observation that typically the passenger will already bring bottled water and a cup or bowl for their animal, so additional water would not be required. Further, an outside fountain, in a winter climate would most likely be turned off for at least four to five months out of the year.

The Airport was supportive of providing a covered area for the pets, but discussed the timing of such an addition, recognizing that the pet relief area may need to be relocated, if and when, the north end of the terminal would be expanded. Given the longer-term timing of that expansion, the cover is recommended to be provided in the short-term.

7.6 CONCESSIONS PLANNING

7.6.1 INTRODUCTION

This analysis considered the opportunities for increased concession revenue and improved customer convenience within the terminal at MHT. Available space, existing concession agreements, and passenger activity levels drive the development and terminal reconfiguration options that potentially enhance the concession program.

For the purposes of this analysis, "concessions" are defined as shops, stores, kiosks, or carts offering food products or retail merchandise for sale or which offer services, such as shoe shine, video arcades, business services, or massage. Concessions, for this analysis, do not include rental cars, ground transportation providers, baggage service providers, or advertising services.

7.6.2 FACTORS IMPACTING CONCESSION DEMAND AND PERFORMANCE

There are a number of factors that determine the demand for concessions at an airport. These include:

- The number of potential customers

- Terminal configuration/customer flows
- Security issues
- Dwell time/alternative activities
- Concession pricing policy
- Flight stage length/in-flight amenities
- Concession branding

Each of these factors is discussed in **Appendix J**. In addition, there are several metrics that can be considered to quantify concession performance and productivity. These include:

- Effective percentage rent
- Sales per square foot
- Sales per enplaned passenger
- Revenue for enplaned passenger
- Square feet per 1,000 enplaned passengers

These are also explained in Appendix J.

7.6.3 EXISTING CONCESSIONS

As part of the analysis of the demand for future concessions at the Airport, it is important to consider the productivity of the existing locations and the factors that impact their usage. This section reviews the existing concessions at MHT and provides analysis regarding the issues that strengthen or weaken each location. Photographs of existing concessions are included in Appendix J.

7.6.3.1 Landside Concessions

The existing landside food court is in a state of transition. Since the termination of the agreement with McDonalds in 2008, the Milltowne Grille access changed from landside to airside, and the implementation of the Sam Adams Meetinghouse opened in the early summer of 2009, and there have been a number of other changes to the Airport's facilities. There are currently two quick-service food outlets in the food court, Great American Bagel and Pizza Hut Express. The food court offers an adequate amount of seating, comfortable lighting, and an ATM. Visibility of the food court is somewhat limited from the stairways and escalators from which ticketed passengers access the departures level. Also, its proximity to the security lines may be a hindrance to sales: people who view a security queue are more likely to enter the line in order to immediately access the airside, rather than spend time eating on the landside, due to concerns that they might be delayed in security lines. Also, because the security queues and stanchions bisect the terminal, it can be difficult to move from one side of the terminal to the other.

In addition to the food court, there are two shop concessions located on the opposite side of the security queues. A Hudson News convenience retail shop offers a typical selection of newspapers, books, candy, snacks, and souvenirs. There is also a small Dunkin Donuts shop offering pastries, beverages, and a limited selection of sandwiches. There is a flower vending machine located in the entrance to the food court.

In the first floor baggage claim area, adjacent to the restrooms, there are four vending machines. A wide selection of snack and beverage items is available 24 hours per day to terminal users.

7.6.3.2 Airside Concessions

As on the non-secure side of the terminal building, there have been significant changes to the airside concessions at MHT over the past few years. These changes include:

- Opening of an airside Dunkin Donuts location, near Gate 15 in early 2008.
- Closure of the McDonald’s location in 2008.
- Change of the Milltowne Grille from landside to airside access.
- Addition of a Starbucks between Gates 7 and 8; the Great American Bagel; a Sam Adams Pub and Café located between Gates 4 and 5; and a Quiznos, near Gate 8.

These changes should all positively impact concession sales at MHT by placing more options in the locations where passengers are likely to be waiting for their flights. The configuration of the terminal limits the exposure of passengers to the entire selection of concessions, as it is unlikely, for example, that a passenger on a Southwest Airlines flight (Gates 11-15) would venture to the Samuel Adams Pub and Café located near Gate 4. This “long-thin” terminal configuration necessitates the duplication of concession types at various locations, and limits the opportunity to create a “critical mass” of concessions that could become a shopping/dining destination within the terminal.

The airside of the terminal also features multiple Hudson News locations, serving the Southwest Airlines gates, near Gates 8 and 9, and a store serving Gates 1-4, adjacent to the Samuel Adams Pub and Café. An additional Hudson News/Aero Mart location in the baggage claim area was closed in the summer of 2009 to make way for a large-item baggage claim device.

The secure side of the terminal also offers a number of other concession-related amenities to travelers, including a game room and massage chairs.

7.6.4 EXISTING CONCESSION SALES

Table 7.6.4-1 displays the 2008 through 2010 sales history for concessions at MHT.

TABLE 7.6.4-1
MANCHESTER-BOSTON REGIONAL AIRPORT CONCESSION SALES

	2010 (through Sept)		2009		2008	
	Sales	Sales/EPAX	Sales	Sales/EPAX	Sales	Sales/EPAX
Host	$2,924,840	$2.77	$4,150,764	$2.60	$3,714,746	$2.00
Milltowne Grille	$1,356,611	$1.29	$1,935,341	$1.21	$2,146,478	$1.15
McDonalds/Ben & Jerry's	N/A	N/A	N/A	N/A	$1,663,601	$0.89
Dunkin' Donuts	$997,629	$0.95	$1,428,366	$0.90	$1,087,170	$0.58
Hudson News	$2,297,141	$2.18	$3,404,696	$2.13	$4,042,475	$2.17
Total	**$7,576,221**	**$7.18**	**$10,919,167**	**$6.84**	**$12,654,470**	**$6.80**

Notes: McDonalds/Ben & Jerry's closed at end of 2008. Numbers may not sum due to rounding.
Sales/EPAX = Sales per enplaned passenger
Sources: MHT Records; McFarland Johnson analysis.

The change of the Milltowne Grille's entrance from the landside to the airside reaped benefits for the operator and the Airport, as evidenced by the increase in sales per enplaned passenger since 2008. Host's sales per enplaned passenger have increased with the opening of the Sam Adams Meetinghouse in the spring of 2009, as the sale of alcohol and the higher price points on the Meetinghouse menu have had a positive impact on sales per enplaned passenger.

7.6.5 FOOD SERVICE CONCESSION ANALYSIS

Manchester's performance is generally around the average for the airports considered across all of the metrics (**Table 7.6.5-1**). Sales are slightly above average, which indicates a concession program that meets the needs of its users.

MHT's effective percentage rent is the lowest among the comparable group. The rating is primarily driven by low rent ("privilege fees") divided by above average sales. The low rent results from significant capital investment by concessionaires offset by negotiated fees below averages of comparable airports.

MHT's food service sales per square foot are well above the average for facilities within its size category. This metric indicates good utilization and productivity from the available concession space.

The sales per enplaned passenger figure at Manchester is significantly above the norm for airports and terminals within its size category.

At 5.79 square feet of concession space per 1,000 enplaned passengers, MHT is right about at the average for concessions at airports and facilities with similar utilization. Palm Beach International offers the least amount of space per 1,000 enplaned passengers, which contributes to their poor performance, as they offer their customers little variety and only limited locations.

In conclusion, MHT's food service concession sales are reasonably strong, which suggests that customers are content with what is offered.

TABLE 7.6.5-1
COMPARABLE AIRPORT FOOD SERVICE CONCESSION ANALYSIS

	Enplaned Passengers (EPAX)	Sales	Revenue	Square Feet	Effective % Rent	Sales/ Square Foot	Sales/ EPAX	Revenue/ EPAX	Square Foot/ 1,000 EPAX
Richmond	1,737,688	$6,923,656	$905,000	11,529	13.07%	$600.54	$3.98	$0.52	6.63
PHX T2	1,744,148	$7,670,499	$820,000	10,808	10.69%	$709.71	$4.40	$0.47	6.20
SJC T-3	1,771,727	$6,911,438	$748,696	4,780	10.83%	$1,445.91	$3.90	$0.42	2.70
TPA A-E	1,812,066	$6,860,347	$1,292,034	10,219	18.83%	$671.33	$3.79	$0.71	5.64
Norfolk	1,822,946	$8,733,930	$1,073,205	16,025	12.29%	$545.02	$4.79	$0.59	8.79
Louisville	1,843,133	$8,863,865	$996,013	18,100	11.24%	$489.72	$4.81	$0.54	9.82
Manchester	1,854,758	$8,611,995	$897,836	10,741	10.43%	$801.79	$4.64	$0.48	5.79
TPA A-F	1,919,006	$7,497,388	$1,361,873	10,778	18.16%	$695.62	$3.91	$0.71	5.62
PBI - B	2,026,081	$5,134,478	$624,026	3,651	12.15%	$1,406.32	$2.53	$0.31	1.80
Tucson	2,116,694	$8,656,723	$1,211,941	16,322	14.00%	$530.37	$4.09	$0.57	7.71
STL ET	2,220,143	$9,690,988	$1,110,319	9,558	11.46%	$1,013.91	$4.37	$0.50	4.31
AVERAGE	1,897,126	$7,777,755	$1,003,722	11,137	12.91%	$698.35	$4.10	$0.53	5.87

Sources: Airport Revenue News Fact Book, 2009; Airports Named; and McFarland Johnson Analysis.
Airports: PHX – Phoenix Sky Harbor International Airport; PBI – Palm Beach International Airport; SJC – Mineta San Jose International Airport; TPA – Tampa International Airport; STL – Lambert St. Louis International Airport

7.6.5.2 Retail Concession Analysis

Airport retail is generally divided into two categories in U.S. domestic airports:

- Specialty Retail: A type of retail that specializes in the sale of a particular category of consumer products such as clothing, sporting goods, electronics, travel accessories, books, leather goods and luggage, souvenirs, lotions and personal care items, and home accessories. Automated retail of goods that would generally be sold in specialty retail shops may also be included in this category and/or may be individual locations or small "stores-within-a-store" that are accounted for separately from the larger location.

- News/Gift (also referred to as Convenience Retail, Newsstand, or Sundries Retail): A type of retail operation that specializes in the sale of magazines, newspapers and other periodicals, candy, gum, snacks, sundries, magazines, paperback books, and souvenirs. Some news/gift stores may sell hardcover books as part of its product mix, but such books are not the primary item offered. Single-serve canned or bottled drinks may also be sold at such locations[2].

An additional category is duty-free retail, which is the sale of in-bond merchandise, free of taxes, to travelers who are departing the United States for a foreign destination. Although MHT does have flights to Toronto, the number and frequency of these flights does not support a duty-free retail program at this time.

MHT does not currently have a specialty retail program. Rather, all retail merchandise is sold through news/gift outlets operated by Hudson News, one of the largest airport retail operators in the United States. Generally speaking, news/gift retail fulfills customer's perceived "needs," whereas specialty retail is often more of an impulse sale. MHT does not currently offer available space and storage to support a specialty retail program.

Table 7.6.5-2 displays the sales metrics for the retail programs (not including duty-free) at comparably sized airports.

Manchester's retail program is limited – the metrics in Table 7.6.5-2 reflect less than average sales per enplaned passenger (i.e., $2.18 per enplaned passenger at MHT in contrast to an average of $2.34 per enplaned passenger for comparable airports). Lack of available space and storage constrains development of a more robust program. Table 7.6.5-2 reflects MHT's space limitation (i.e., $2.64 per square foot per 1,000 enplaned passengers in contrast to an average of $3.20 per square foot per 1,000 enplaned passengers). The difference in this metric translates to adding about 1,000 square feet of space devoted to a specialty retail program that would enhance revenue per enplaned passenger. MHT's sales per square foot are above average for comparable airports supporting the notion that there are retail revenue growth opportunities, if new space and storage could be identified.

The news/gift concession at MHT is a poor revenue producer in respect to fees paid to the Airport when compared to other airports. At the behest of the Airport, Hudson News built quality news/gift shops faster than the growth the Airport experienced.

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2 Source: Airports Council International North America 2009 Airport Concession Benchmarking Survey.

TABLE 7.6.5-2
COMPARABLE AIRPORTS COMBINED NEWS/GIFT AND SPECIALTY RETAIL SALES

	Enplaned Passengers (EPAX)	Sales	Revenue	Square Feet	Effective % Rent	Sales/ Square Foot	Sales/ EPAX	Revenue/ EPAX	Square Foot/ 1,000 EPAX
Richmond	1,737,688	$4,368,645	$825,000	6,904	18.88%	$632.77	$2.51	$0.47	3.97
PHX T2	1,744,148	$6,527,489	$968,957	3,502	14.84%	$1,863.93	$3.74	$0.56	2.01
SJC T-3	1,771,727	$2,285,627	$399,474	1,700	17.48%	$1,344.49	$1.29	$0.23	0.96
TPA A-E	1,812,066	$3,440,455	$642,387	2,886	18.67%	$1,192.12	$1.90	$0.35	1.59
Norfolk	1,822,946	$4,550,042	$794,629	22,058	17.46%	$206.28	$2.50	$0.44	12.10
Louisville	1,843,133	$6,003,613	$705,470	8,256	11.75%	$727.18	$3.26	$0.38	4.48
Manchester	1,854,758	$4,042,475	$404,248	4,900	10.00%	$824.99	$2.18	$0.22	2.64
TPA A-F	1,919,006	$3,907,191	$699,598	2,406	17.91%	$1,623.94	$2.04	$0.36	1.25
PBI – B	2,026,081	$3,638,342	$730,515	1,157	20.08%	$3,144.63	$1.80	$0.36	0.57
Tucson	2,116,694	$7,000,732	$875,092	7,294	12.50%	$959.79	$3.31	$0.41	3.45
Omaha	2,193,292	$3,605,699	$660,348	6,902	18.31%	$522.41	$1.64	$0.30	3.15
STL ET	2,220,143	$4,682,222	$655,638	5,795	14.00%	$807.98	$2.11	$0.30	2.61
Average	1,921,807	$4,504,378	$696,780	6,147	15.47%	$732.82	$2.34	$0.36	3.20

Sources: Airport Revenue News Fact Book, 2009; Airports Named; and McFarland Johnson Analysis.
Airports: PHX – Phoenix Sky Harbor International Airport; PBI – Palm Beach International Airport; SJC – Mineta San Jose International Airport; TPA – Tampa International Airport; STL – Lambert St. Louis International Airport

The news/gift shops at MHT are neat and organized, but formulaic. Indeed, the traveler might find about the same store at the majority of comparable airports. Hudson News has successfully developed a book nook within two locations that are well received by New England travelers.

7.6.6 AIRPORT PERFORMANCE PROJECTIONS

Based on the existing concession productivity, benchmarks from other comparable airports and forecast passenger enplanements, projections can be prepared regarding future sales, revenues, and required concession space. These projections include a number of assumptions for developing estimates for the food service concessions:

- All sales are in constant 2008 dollars, with no inflation factor considered.
- Sales are based on current sales per enplaned passenger by vendor at MHT. The sales for the "master concessionaire" were inflated slightly to reflect the addition of the Samuel Adams Meetinghouse on the landside (higher average expected check and alcohol sales). Sales for the local sit-down restaurant and the snack service are constant with current levels.
- For the purposes of calculating revenue to MHT, the split between alcohol and food/non-alcoholic beverage sales were calculated based on current ratios for each vendor.
- Percentage rents are adjusted for the master concessionaire starting in 2016 (the contract expires in April 2015, but forecasts allow for some slight extensions and transition period), with food and non-alcoholic beverage earning 12 percent of revenue (compared to the existing stepped revenue of 6, 8, and 10 percent, depending on sales) and alcoholic beverage sales paying MHT at a rate of 16 percent of sales, instead of the existing 14 percent.
- Percentage rents for the local sit-down restaurant are adjusted starting in 2013 to 11 percent for food and non-alcoholic beverage sales (up from 9 percent) and 16 percent on sales of alcoholic beverages (up from 14 percent), based on a new contract being entered into in 2012.
- Percentage rents for snack service are not changed.
- Required concession space is estimated using a sales density of $698.35 per square foot, which is the average for food service concessions among comparable airports.
- Passenger projections are forecast at the "Base" level.
- Meeter/greeters, individuals and groups which bring passengers to the Airport, and employees are not included in the passenger projections.

Table 7.6.6-1 shows Manchester's projected food service sales, revenue, and required concession space for the next 10 years, based on the above assumptions.

TABLE 7.6.6-1
PROJECTED FOOD SERVICE SPACE DEMAND

Year	Projected Sales	Projected Revenue	Recommended Space	Existing Space	Excess (Deficit)
2010	$7,437,461	$736,572	10,650	10,741	91
2011	$7,492,221	$742,260	10,728	10,741	13
2012	$7,771,001	$771,219	11,128	10,741	-387
2013	$7,965,152	$836,414	11,406	10,741	-665
2014	$8,134,411	$854,953	11,648	10,741	-907
2015	$8,303,671	$873,492	11,890	10,741	-1,149
2020	$9,214,685	$1,103,986	13,195	10,741	-2,454
2025	$10,225,264	$1,225,061	14,642	10,741	-3,901
2030	$11,340,385	$1,358,661	16,239	10,741	-5,498

Source: McFarland Johnson, 2009.

In considering the retail program at MHT, the following assumptions were made:

- All sales are in constant 2008 dollars, with no inflation factor considered.
- Sales are based on current sales per enplanement for 2009, and then are increased over the next 3 years to reach the average of comparable airports.
- Recommended square footage is calculated based upon the average of comparable airports.
- Passenger projections are forecast at the “Base” level.
- Meeter/greeters and employees are not included in the passenger projections.

Retail sales, revenue, and supportable space projections appear in **Table 7.6.6-2**.

TABLE 7.6.6-2
PROJECTED RETAIL SPACE DEMAND

Year	Projected Sales	Projected Revenue	Recommended Space	Existing Space	Excess (Deficit)
2010	$3,227,040	$322,704	4,404	4,900	496
2011	$3,386,250	$338,625	4,621	4,900	279
2012	$3,652,740	$565,079	4,984	4,900	-84
2013	$3,744,000	$579,197	5,109	4,900	-209
2014	$3,823,560	$591,505	5,218	4,900	-318
2015	$3,903,120	$603,813	5,326	4,900	-426
2020	$4,331,340	$670,058	5,911	4,900	-1,011
2025	$4,806,360	$743,544	6,559	4,900	-1,659
2030	$5,330,520	$824,631	7,274	4,900	-2,374

Source: McFarland Johnson analysis.

Based on the above analysis, although there is no immediate need for additional concession space, there will be a deficit of approximately 1,600 square feet of concession space (both food service and retail) by 2015. This may impact sales and resulting revenues, as the existing concession space will not be able to adequately serve the passenger demand for products and services. Also, opportunities for increasing sales through offering of different products will also be lost unless adequate space can be established in appropriate locations in the Airport. When the additional opportunities that might be present from the employee and Airport visitor markets are considered, it is clear that the development of additional, strategically placed concessions will greatly benefit the Airport.

7.7 AIRPORT INPUT FOLLOWING WORKING MEETING

In March 2010, the Airport Master Plan team conducted a presentation to MHT key staff to review issues identified during the initial development of terminal plans. The purpose was to obtain additional input and comments related to the data gathered and for MHT management to provide direction on alternatives analysis.

The Airport Master Plan team prepared a list of questions and clarifications resulting from the meeting and submitted to MHT for final input before proceeding into the alternatives analysis. The issues addressed include the following:

- Rental car counter relocation
- Curbfront utilization
- Bag claim options
- FIS plans
- Checkpoint A closure
- Consolidation of Checkpoints B and C and stair to Observation Area
- Connection from concourse to bag claim
- Level 2 concessions
- Concession merchandise checkpoint

The Airport Master Plan team's responses to Airport comments and further evaluations were part of the next phase of the terminal planning process involving emerging alternatives.

7.8 TERMINAL ALTERNATIVES ANALYSES

The first half of this section presented a discussion of existing terminal uses and elements and early consideration of possible options and direction for future planning and development. The remaining part of this section focuses in more detail on available alternatives and their comparative characteristics, leading to a series of recommended locations/layouts. This section documents the approach to proposed physical modifications for the terminal building to be accomplished over the 20-year planning horizon timeline of this Airport Master Plan Update. Many of the improvements proposed herein are based on optimizing the use of space within the existing terminal footprint, as well as the maintenance of existing equipment or hardware to avoid equipment failures, which could lead to delays in passenger processing and/or degrade future levels of service.

Other objectives of these analyses were to enhance revenue from concession operations and to improve the efficiency of existing passenger processing operations. The passenger forecast included in Section 3.0 examined and summarized growth in terms of Passenger Activity Levels as follows: 2.0 (PAL

1), 2.25 (PAL 2), 2.5 (PAL 3), and 2.75 (PAL 4) million annual enplanements. Growth in passenger demand doesn't become a significant factor in the passenger processing capacity of the existing terminal facility until approaching PAL 2 which, according to the passenger forecast, may not occur until the later part of the 20-year planning horizon.

While demand appears to increase slowly over the 20-year planning horizon, there are a number of basic terminal operational considerations which need to be addressed, as funding becomes available, to ensure the highest and best use of the existing facilities. As stated previously, the upgrade and replacement of aging equipment must be accomplished at certain times to maintain operational effectiveness.

This section and its supporting graphics illustrate the proposed enhancements or improvements to the terminal based on the analysis documented in Section 4.1, Terminal Facility Requirements, and as further defined in the Terminal Space Program included therein. The Terminal Space Program addresses improvements through PAL 2 and incorporates an interim development period identified as the "Short-Term," which covers the time period between the current date and PAL 1. The Terminal Plans and associated alternatives included in this section illustrate proposed improvements for the Short-Term and for the PAL 2 activity levels.

7.8.1 RENTAL CAR COUNTERS

There was early agreement among Airport staff and the Airport Master Plan team on relocation of the existing rental car counters from the lower level of the main terminal to the parking garage, adjacent to the rental car agencies' ready car areas.

The three relocation alternatives studied in more detail are shown in **Figures 7.8.1-1 through 7.8.1-3** and include the following:

- Option(s) A1 and A2 – A new structure at the face of the existing garage between the vertical circulation area at the pedestrian bridge and the emergency stair at the corner. Two variations were evaluated: one with the offices at the outside wall, providing agents with a view into the rental car counters staging, and a second with the offices directly adjacent to the referenced staging areas, providing easier agent access.

- Option B – Construction of a new enclosure totally inside the garage. Though this new enclosure option is somewhat less expensive than the others ($1.84 million vs. $2.18 million), it reduces the number of spaces and requires a redistribution of rental car counters boundaries.

The recommended location and layout for the rental car counters relocation is Option A2 as presented above and shown at the end of this section in Figure 7.12-1, which depicts development on Level 1 of the terminal area in the Short-Term period.

7.8.2 CURBSIDE UTILIZATION ENHANCEMENT

Earlier discussion in this section identified three elements associated with improvement or optimization of the terminal curbfront utilization. These were: 1) relocation of airline identification signs back along the inner roadway away from the pedestrian bridge; 2) modification of landscaping to improve visibility and recognition of terminal destinations; and 3) a new entrance vestibule to the western-most ticket lobby.

Though no further physical alternative analysis was warranted, the resulting evaluation addressed the timing of such improvements. The airline signage ($30,000) and landscaping ($250,000) would have more immediate effects on curbside usage and are shown on Figure 7.12-1 for the Short-Term period. The addition of the more centrally-located entrance ($1.33 million) would be phased into later stages of the planning period with higher passenger activity (see Figure 7.12-4, PAL 2 Level 1, at the end of this section).

7.8.3 MAIN BAG CLAIM AREA

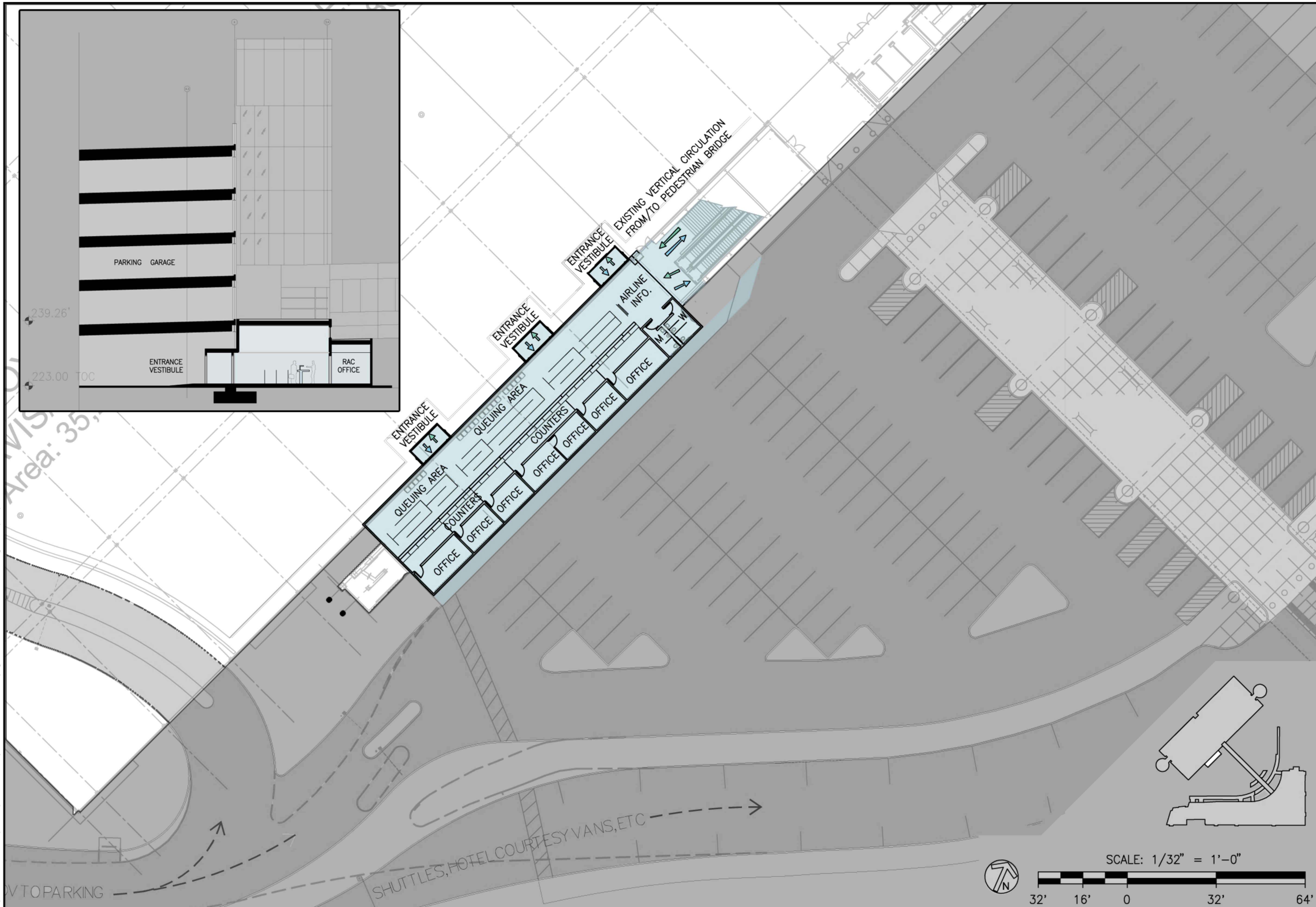
Earlier discussion of Bag Claim Area B addressed both operational and demand issues. Considerations influencing the proposed improvements and choice of claim device configurations included: system requirements based on growth in passenger demand, replacement of aging equipment, best passenger level of service, and relative difficulty in making structural modifications to the existing terminal. The PAL 2 baggage analysis indicated that the existing bag claim devices be changed from flat plate to sloped bed devices due to the needed storage capacity at that time, but also due to the loss of bag claim area from a possible longer-term direct vertical connection to bag claim from the second level concourse. The plan to add a fourth claim device was based solely on the fact that the new device will be needed between PAL 2 and PAL 3; however, the decision to add that device can be revisited at a future time.

Three optional configurations were studied further (see **Figures 7.8.3-1 through 7.8.3-3**), and are described below.

- Option A – Sloped Bed Under Floor Fed Option – This option is proposed primarily out of consideration for passenger Level of Service and gaining the improved bag storage capacity needed between PAL 2 and PAL 3. As free standing units, the ability to circulate completely around each device provides the greatest flexibility in freedom of movement for passenger access and circulation. However, the cost of the tunnels is relatively greater and further exacerbated by the length of feed belt required to service the devices ($13.27 million, four devices).

- Option B – Sloped Bed Above Floor Fed Option – This option does not offer the improvement in passenger LOS as the free standing device, due to the feed belt limiting the ability of the passenger to circulate completely around each device. It does, however, facilitate construction of the possible direct connection from concourse to bag claim and provides adequate bag storage capacity for future growth demands between PAL 2 and PAL 3, at a lesser cost ($9.36 million, four devices). This recommended Long-Term option is shown in Figure 7.12-4 at the end of this section.

- Option C – This option uses flat plate claim devices similar to the existing units in Bag Claim B. Due to the existing systems age, the three existing devices will likely be replaced prior to PAL 2. The existing belt bag storage capacity (length) becomes deficient in the Short-Term Planning Period and; therefore, when the devices are replaced, the length of each unit should be increased per the proposed layout ($1.70 million, three devices), shown on **Figure 7.8.3-4** and Figure 7.12-1. Replacement of these units as shown will provide sufficient length to satisfy passenger demand through the 20-year planning horizon of this study. With an expected life of about 20 years, these units will again need replacement just beyond the 20-year horizon ($2.52 million, three devices).



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SHORT-TERM ENLARGED PLAN

RAC OFFICE LOCATION AT GARAGE - OPTION A1

FIGURE 7.8.1-1

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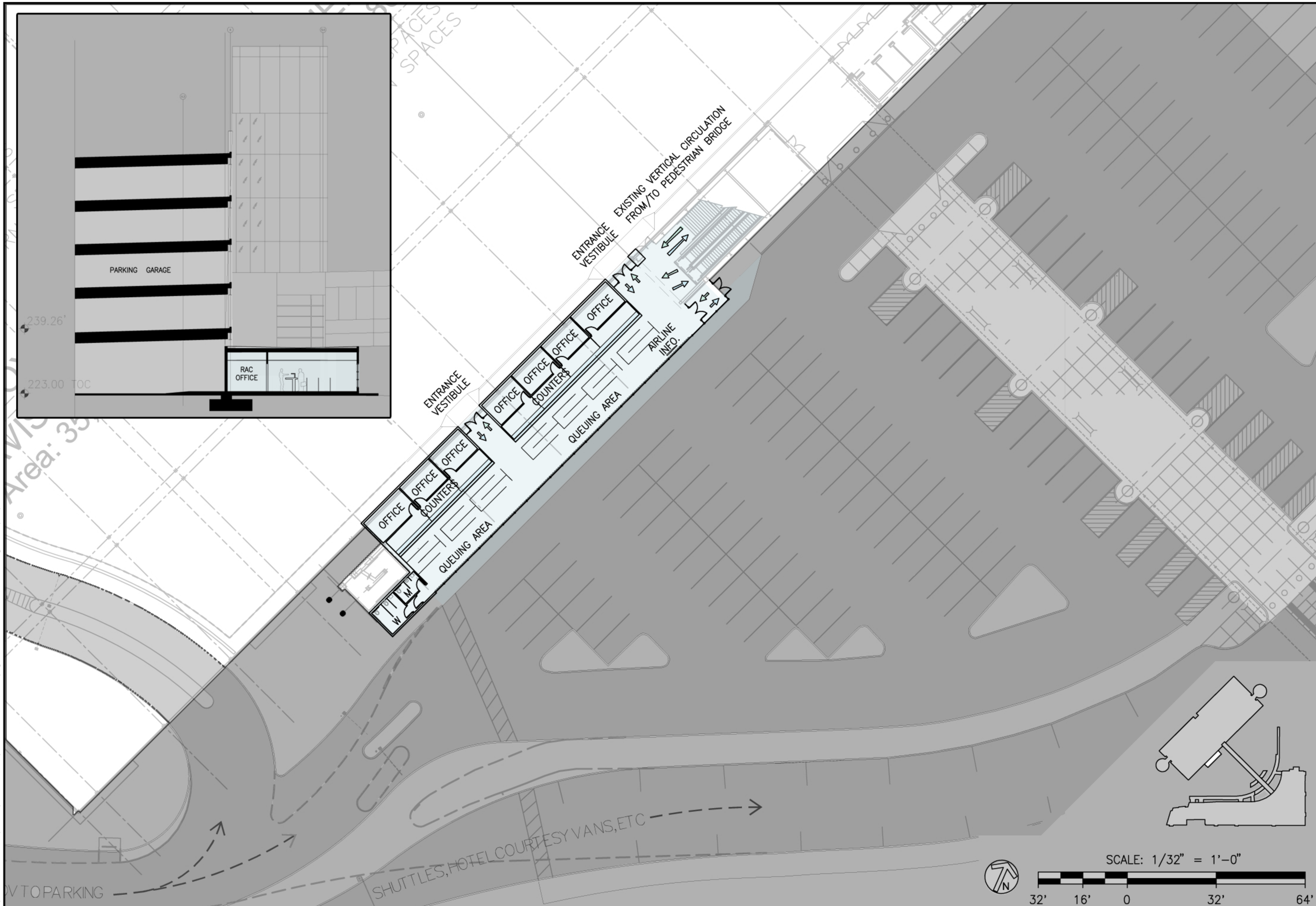

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SHORT-TERM ENLARGED PLAN
RAC OFFICE LOCATION AT GARAGE - OPTION A2

FIGURE 7.8.1-2

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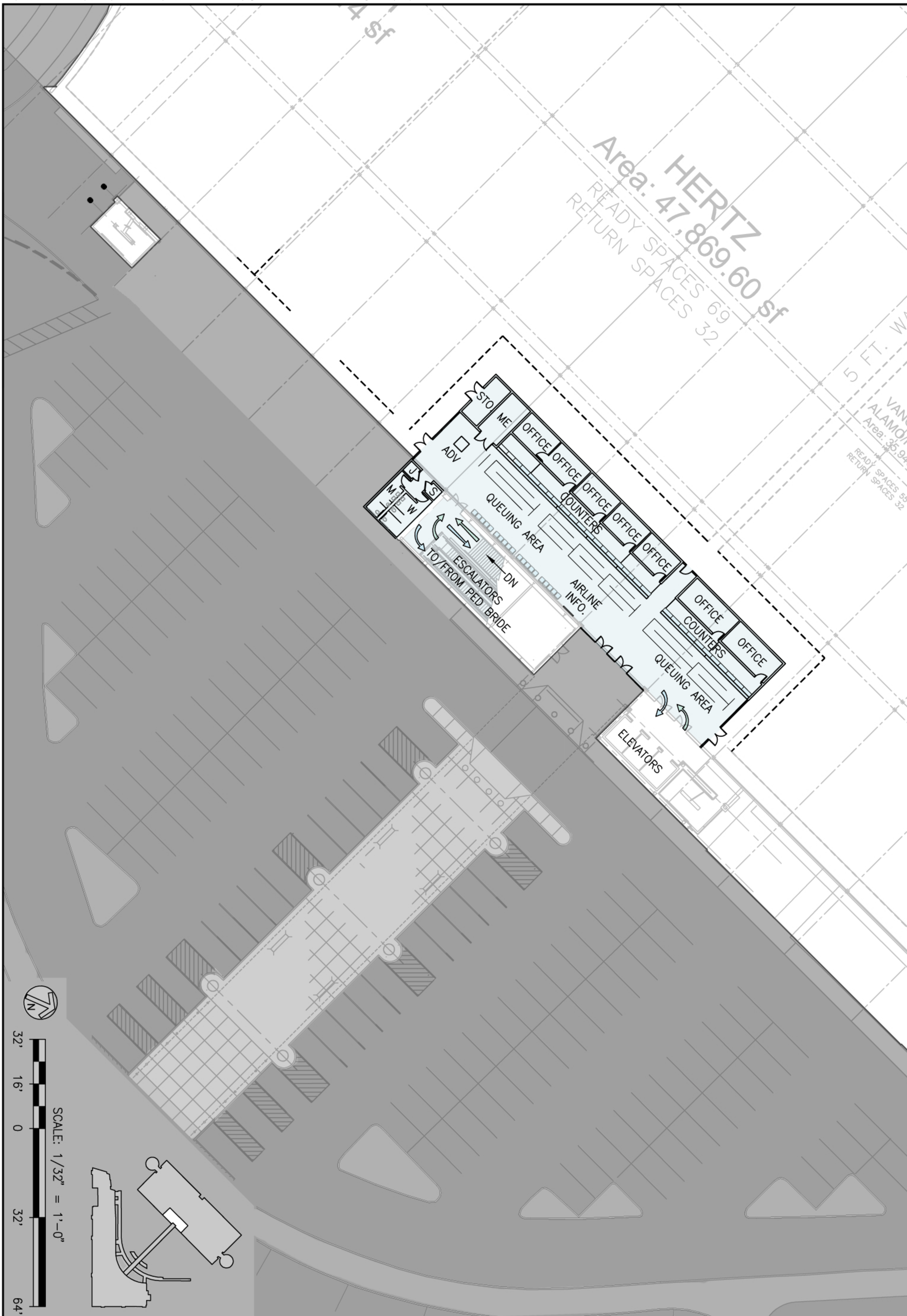

FIGURE 7.8.1-3

SHORT-TERM ENLARGED PLAN
OPTIONAL RAC OFFICE LOCATION AT GARAGE - OPTION B

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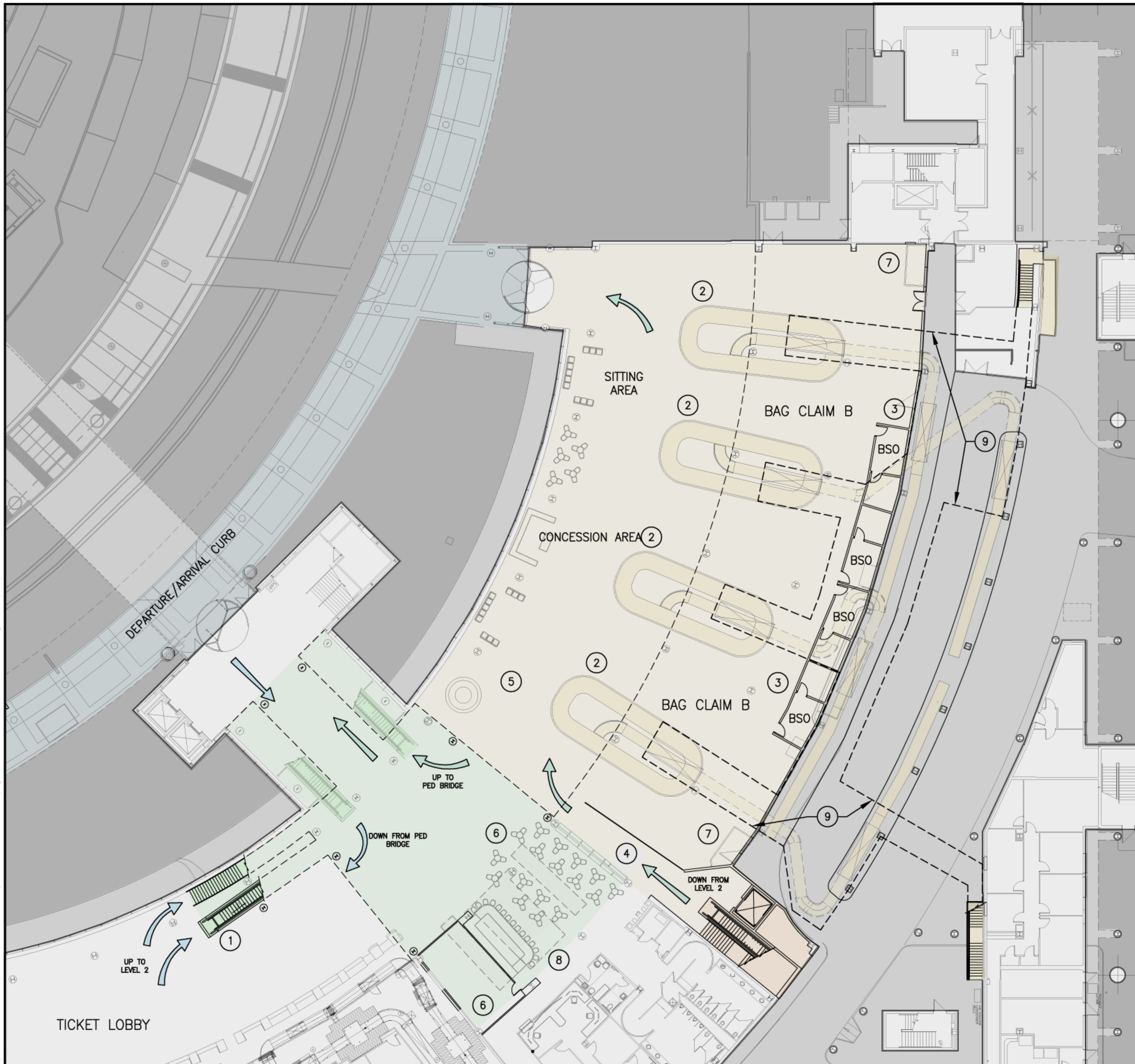
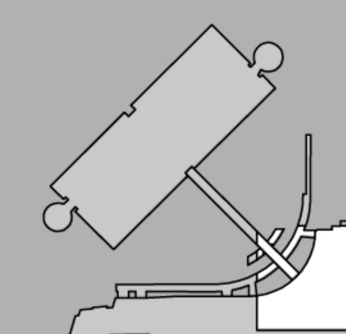


1. NEW ESCALATOR/STAIR TO LEVEL 2.
2. ADD FOURTH CLAIM DEVICE AND CONVERT ALL DEVICES TO SLOPED PLATE CLAIM UNITS FEED FROM UNDER FLOOR SIMILAR TO EXISTING BAG CLAIM A.
3. RELOCATED BAG SERVICE OFFICES (BSO).
4. NEW ACCESS FROM CONCOURSE TO BAGGAGE CLAIM AND TICKETING.
5. MEETER/GREETER AREA.
6. NEW FOOD/BEVERAGE OR OTHER MIX OF APPROPRIATE CONCESSION USES.
7. NEW INBOUND OVERSIZED BAG SLIDE
8. REMOVE EXISTING ESCALATOR/STAIR
9. BAGGAGE SYSTEM TUNNELS



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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PAL 2 ENLARGED PLAN
LEVEL 1 - BAG CLAIM AREA OPTION A

FIGURE 7.8.3-1

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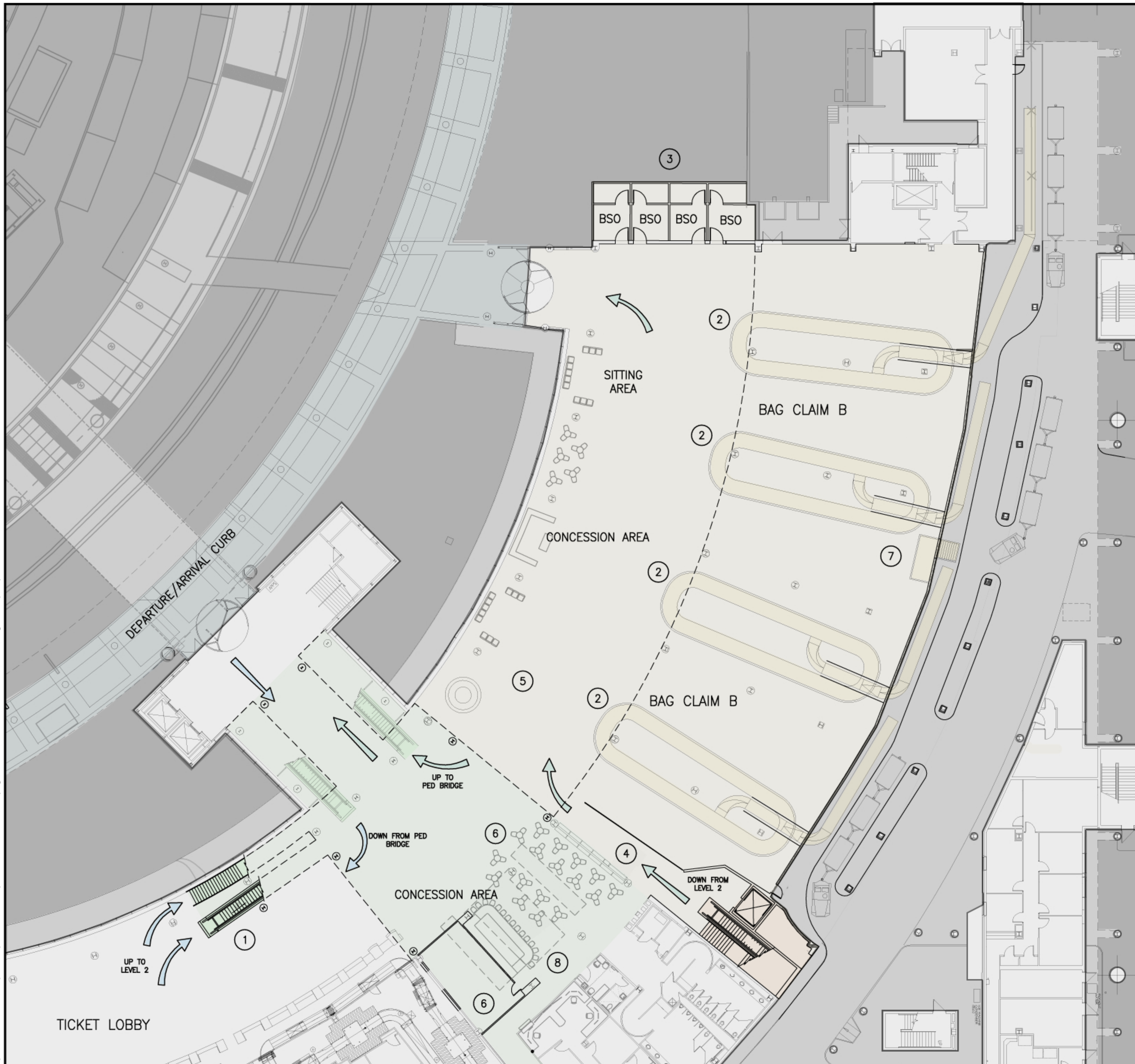
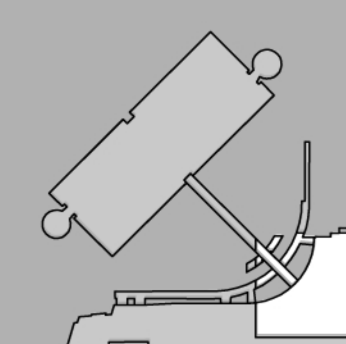


1. NEW ESCALATOR/STAIR TO LEVEL 2.
2. ADD FOURTH CLAIM DEVICE AND CONVERT ALL DEVICES TO SLOPED PLATE CLAIM UNITS WITH OVERHEAD FEED ARRANGEMENT.
3. RELOCATED BAG SERVICE OFFICES (BSO).
4. NEW ACCESS FROM CONCOURSE TO BAGGAGE CLAIM AND TICKETING.
5. MEETER/GREETER AREA.
6. NEW FOOD/BEVERAGE OR OTHER MIX OF APPROPRIATE CONCESSION USES.
7. NEW INBOUND OVERSIZED BAG SLIDE
8. REMOVE EXISTING ESCALATOR/STAIR



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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PAL 2 ENLARGED PLAN

LEVEL 1 - BAG CLAIM AREA OPTION B

FIGURE 7.8.3-2

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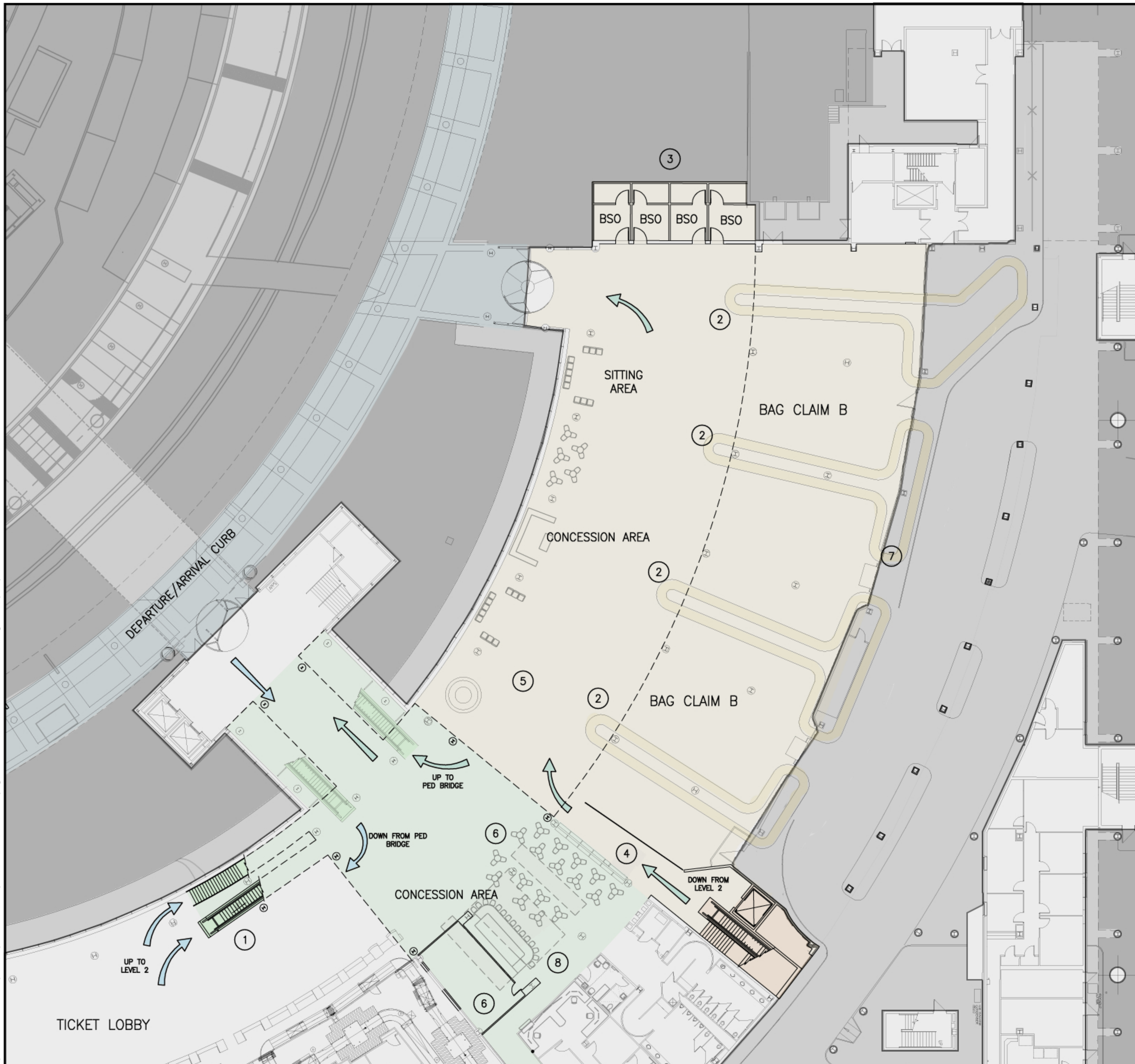
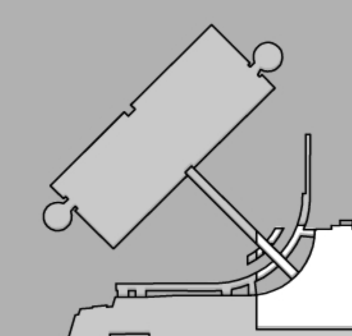


1. NEW ESCALATOR/STAIR TO LEVEL 2.
2. ADD FOURTH CLAIM DEVICE WITH FLAT PLATE DEVICES.
3. RELOCATED BAG SERVICE OFFICES (BSO).
4. NEW ACCESS FROM CONCOURSE TO BAGGAGE CLAIM AND TICKETING.
5. MEETER/GREETER AREA.
6. NEW FOOD/BEVERAGE OR OTHER MIX OF APPROPRIATE CONCESSION USE.
7. NEW INBOUND OVERSIZED BAG SLIDE
8. REMOVE EXISTING ESCALATOR/STAIR



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

Manchester-Boston REGIONAL AIRPORT

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Airport Master Plan Update

PAL 2 ENLARGED PLAN

LEVEL 1 - BAG CLAIM AREA OPTION C

FIGURE 7.8.3-3

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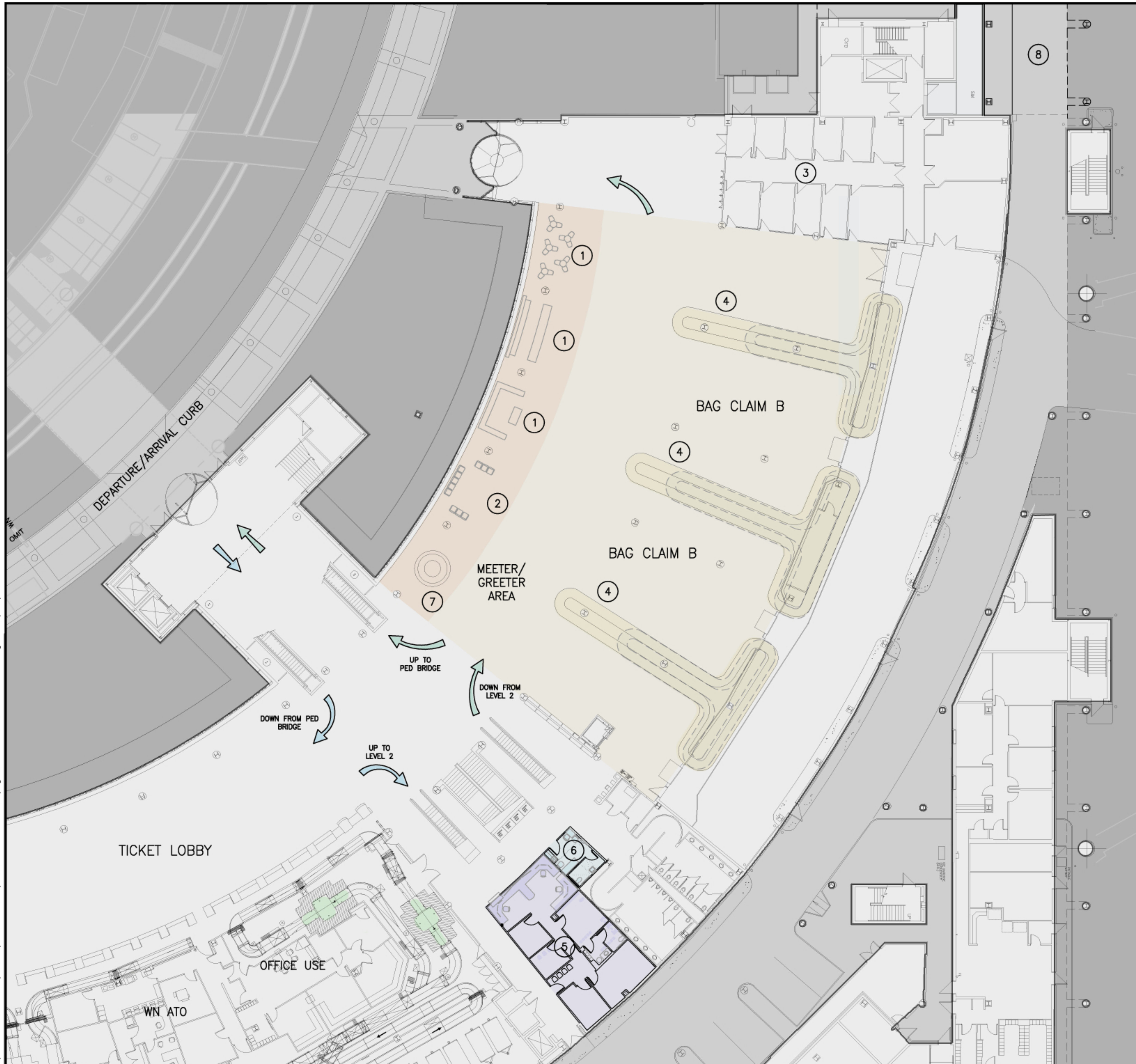
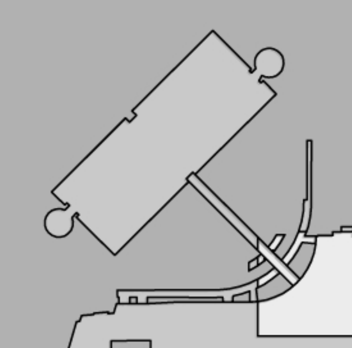


1. NEW CONCESSION SPACE.
2. PROVIDE ADDITIONAL PUBLIC SEATING FOR CLAIM AREA WAITING.
3. MAINTAIN EXISTING BAG SERVICE OFFICES UNTIL PAL 2 AND ADDITION OF FOURTH BAG CLAIM UNIT.
4. REPLACE EXISTING AGING FLAT PLATE BAGGAGE CLAIM DEVICE WITH NEW UNITS. EXTEND LENGTH TO INCREASE DISPLAY FRONTAGE CAPACITY.
5. RENOVATE EXISTING COMMUNICATION CENTER.
6. ADD FIRST AID ROOM.
7. RELOCATED INFORMATION KIOSK.



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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SHORT-TERM ENLARGED PLAN
LEVEL 1 - BAG CLAIM AREA

FIGURE
7.8.3-4

Q:\Shoebox Studio\Stark\Manchester\Task 8.4 BaseInfo\Figure 8.4.1-1 Level 1_ST.dwg 01/10/2011 13:07

7.8.4 CONSOLIDATION OF PASSENGER SECURITY CHECKPOINTS

7.8.4.1 Short-Term

With the overall objective to create an efficient centralized checkpoint for future passenger screening, it was assumed that Checkpoint A will be closed permanently and that screening activities will occur only at a consolidated checkpoint on Level 2, in the central processing point in front of the non-secure stairs to the Observation Area. Planning for the consolidation required analysis and discussion of multiple factors beyond just the number of checkpoint lanes and processing rates to include: meeter/greeter and well-wisher characteristics, passenger queuing area, existing concession locations, and continuing public access to the third level for observation.

The screening checkpoint consolidation would eliminate the use of the central staircase for public access to the Observation Area. Several attempts were made to identify alternatives which would preserve the center stairs. The concept of re-orienting the checkpoint through the adjacent non-secure concessions area was found to be too small and restrictive for that purpose. The proposed five-lane screening configuration is shown in **Figure 7.8.4-1**. Though there were no other alternative screening consolidation layouts for that area, that action required an assessment of alternative stair locations.

Two options for the location of the new stair were developed and are shown in **Figures 7.8.4-1 and 7.8.4-2**:

- Option 1 – Locate the new stair abutting the east face of the southerly emergency exit stairwell adjacent to the new Short-Term (five-lane) consolidated checkpoint. This stair location is highly visible and can be constructed with less structural modifications and avoids disruption of other functional areas of the terminal to reach the Observation Area. However, this stair would have to be demolished when passenger demand requires six lanes for the checkpoint operation. This option is proposed as the replacement location until that point is reached (see Figures 7.12-2 and 7.12-5, at the end of this section).

- Option 2 – Locate new stair in a portion of the existing service area of Samuel Adams on the west side of the Level 2 checkpoints. Extend stair up into existing Administrative Area above and connect back to the existing walkway leading to the Observation Area. Expand Administrative Area on Level 3 to provide space to relocate functions displaced by new stair.

  The stair in this location can be freely accessed and removes it from future conflict with requirements for operation of the consolidated checkpoint. The expansion of Level 3 would provide sufficient surplus Administrative Area to address existing Level 3 space issues, which can only be resolved with more floor area. The Samuel Adams restaurant would likely require access to space to replace lost seating due to stair encroachment.

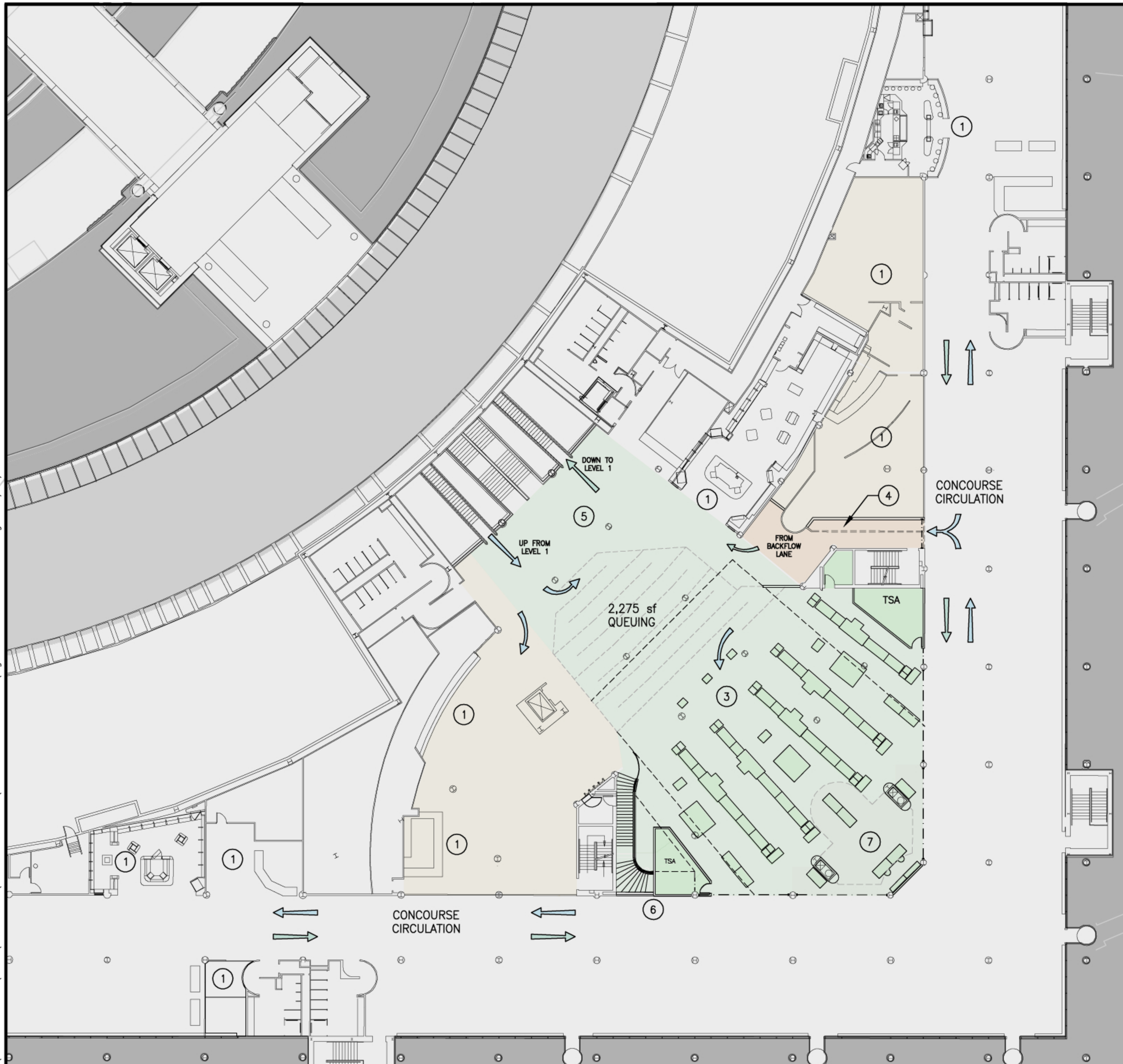
- The checkpoint consolidation also requires the relocation of a "back flow lane," which brings deplaning passengers from the secure gate areas back into the unsecured second level central area. This lane, located adjacent to the northern-most screening lane and adjacent exit stair tower, will require some renovation to existing concession space (see Figure 7.8.4-1).

7.8.4.2 Long-Term

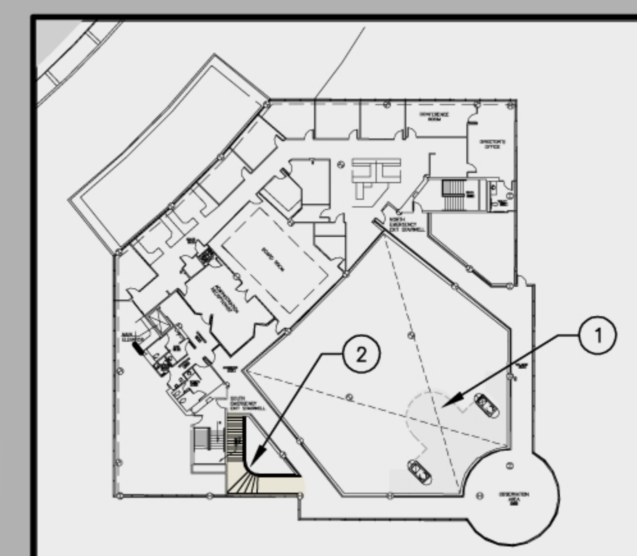
In the longer term time frame, this same control area of Level 2 would be modified to handle the needed future expansion to six lanes of processing. **Figure 7.8.4-3** illustrates the main features associated with this long-term checkpoint expansion:

- New pedestrian bridge connector – provides direct access to checkpoint for passengers parked in garage with boarding pass and carry-on bags. Provides for additional queuing area and queuing area overflow.
- New six-lane checkpoints provide increased lane length for divestiture and reclaim processes to insure optimum passenger throughput.
- Layout provides additional TSA operational support space.
- Renovated existing non-secure concession area maintains access to non-secure public stair (Stair Option 2) to Observation Area on Level 3.
- Renovated existing concession space adjacent to the checkpoint area reoriented from non-secure access to secure-side service. It should be noted that first priority consideration for future concession uses in these areas should be compatible with supplementing holdroom seating requirements for adjacent holdrooms, whenever feasible.
- New direct connection from concourse to baggage claim and ticketing moves meeter/greeter function down to the bag claim area eliminating potential access congestion to the checkpoint screening area during peak periods of arrival/departure.

Figure 7.8.4-4 illustrates how the new pedestrian bridge connector uses a system of ramping to facilitate change in elevation from pedestrian bridge to the Level 2 floor area at the checkpoint. Incorporation of this new connection will require the raising of the existing terminal roof between the existing pedestrian bridge and existing terminal Level 2 floor plate to maintain vertical clearance above the bridge surface.

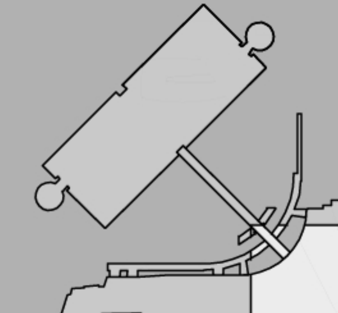


1. EXISTING CONCESSIONS TO REMAIN
2. NEW CONCESSIONS - NONE THIS OPTION
3. NEW CONSOLIDATED 5 LANE SCREENING AREA WITH EXPANDED LANE LENGTH AND QUEUING SUPPORT AREA ABLE TO SERVICE FORECAST DEMAND UP TO PAL 2. INCLUDES ADDITIONAL TSA SUPPORT SPACE.
4. REDUCE AREA OF MILLTOWNE GRILLE AND RELOCATE BACKFLOW LANE FOR ARRIVING PASSENGERS.
5. MEETER/ GREETER AREA.
6. NEW ARCHITECTURAL PUBLIC STAIR - OPTION 1 - PROVIDING NON-SECURE ACCESS TO OBSERVATION AREA ON LEVEL 3.
7. REMOVE EXISTING CENTER STAIR



LEVEL 3

1. REMOVE EXISTING CENTER STAIR
2. NEW STAIR TO OBSERVATION AREA - OPTION 1



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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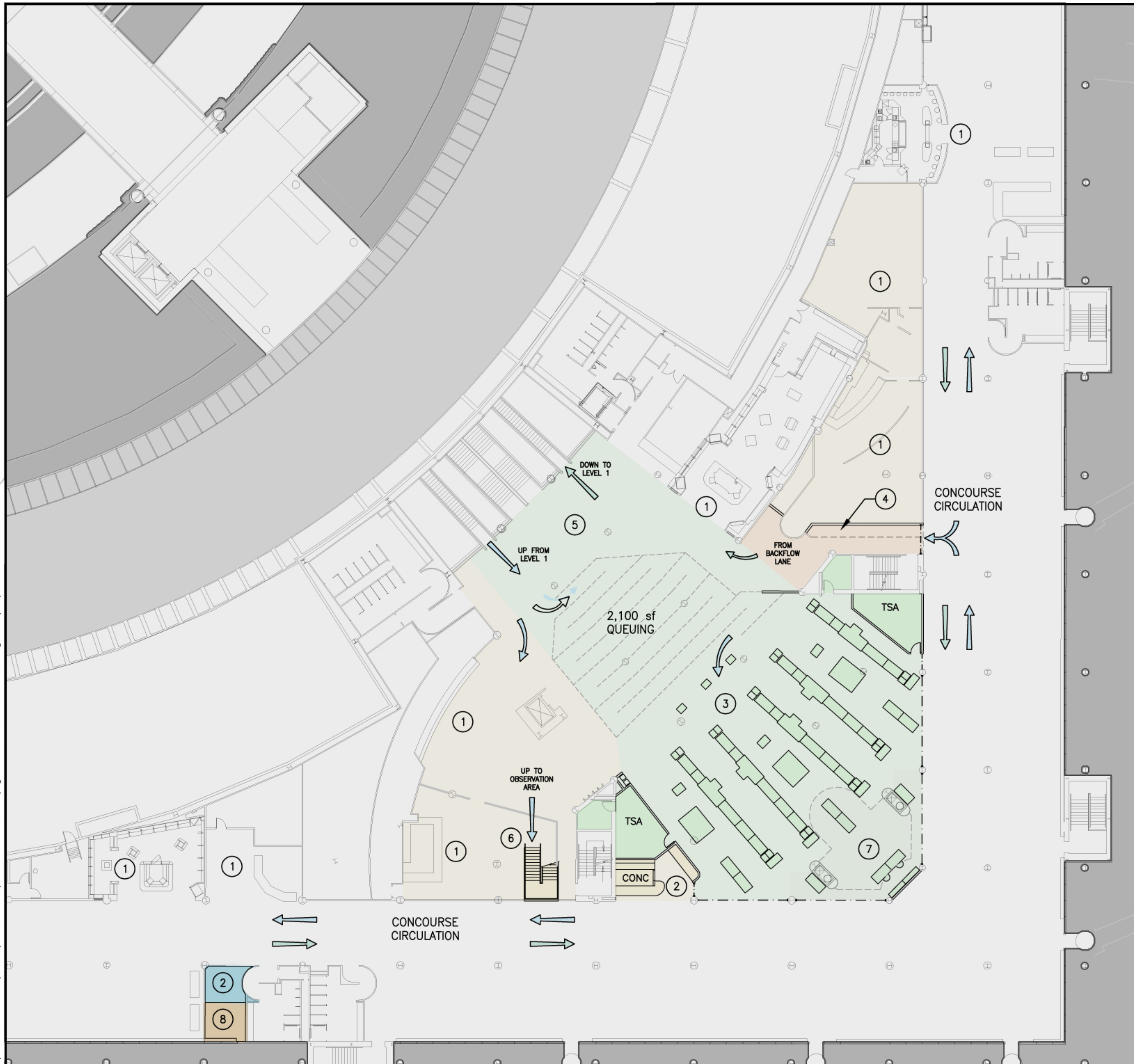
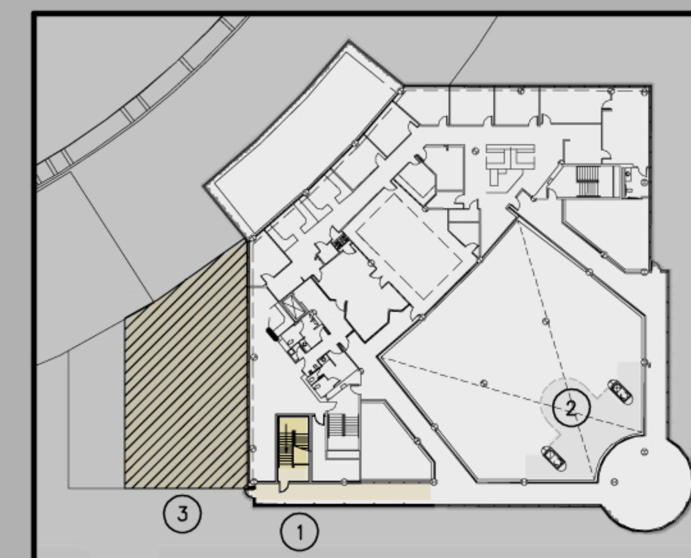
SHORT-TERM PLAN
CONSOLIDATED CHECKPOINT 5 LANES - STAIR OPTION 1

FIGURE 7.8.4-1

Q:\Shoebox Studio\Stark\Manchester\Task 8.4 BaseInfo\FINAL DWGS 8_5_2011\Figure 8.4.1-2 Level 2_ST.dwg 09/02/2011 10:14

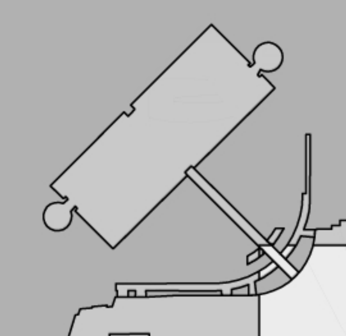


1. EXISTING CONCESSIONS TO REMAIN
2. NEW CONCESSIONS.
3. NEW CONSOLIDATED 5 LANE SCREENING AREA WITH EXPANDED LANE LENGTH AND QUEUING SUPPORT AREA.
4. REDUCE AREA OF MILLTOWNE GRILLE AND RELOCATE BACKFLOW LANE FOR ARRIVING PASSENGERS.
5. MEETER/ GREETER AREA.
6. NEW ARCHITECTURAL PUBLIC STAIR - OPTION 2 - PROVIDING NON-SECURE ACCESS TO OBSERVATION AREA ON LEVEL 3.
7. REMOVE EXISTING CENTER STAIR
8. NEW FAMILY RESTROOM



LEVEL 3

1. NEW NON-SECURE PUBLIC ACCESS STAIR TO OBSERVATION AREA FOR LEVEL 2 - OPTION 2, NEW LEVEL 3 PLAN STAIR
2. REMOVE EXISTING CENTER STAIR
3. EXPANSION FOR RELOCATION OF OFFICES AND IMPROVEMENTS TO EXISTING ADMINISTRATIVE SPACE INCLUDING KITCHEN MODIFICATIONS



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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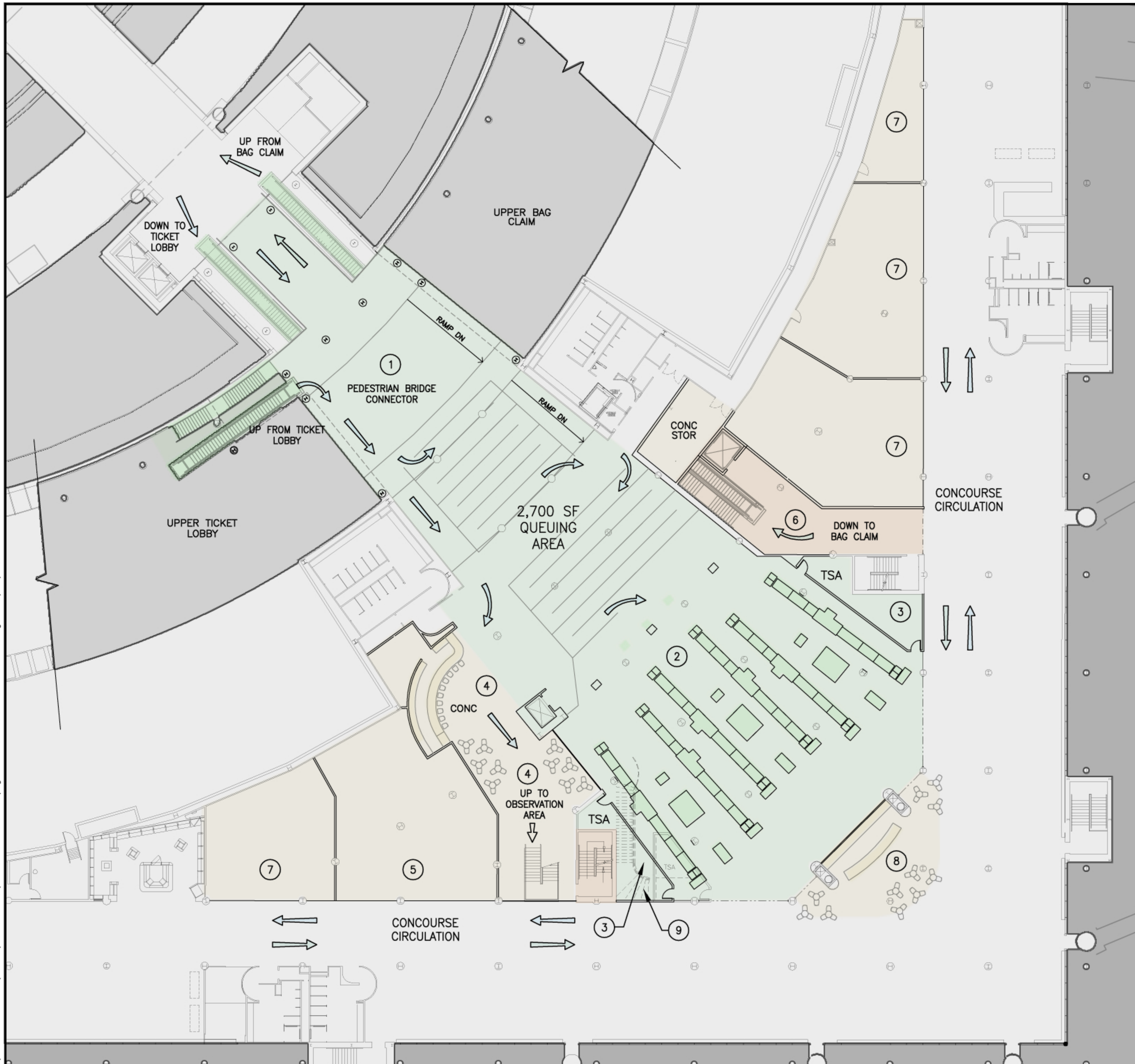
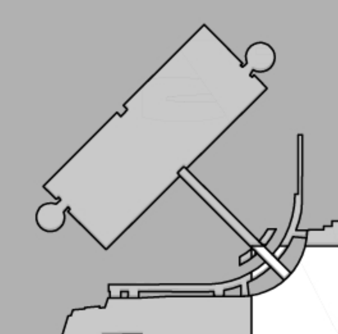
SHORT-TERM PLAN

CONSOLIDATED CHECKPOINT 5 LANES - STAIR OPTION 2

FIGURE 7.8.4-2



1. NEW PEDESTRIAN BRIDGE CONNECTOR PROVIDES DIRECT ACCESS TO CHECKPOINT FOR PASSENGERS PARKED IN GARAGE WITH BOARDING PASS AND CARRY-ON BAGS. PROVIDES FOR QUEUING AREA OVERFLOW IN THE EVENT IT IS NEEDED DURING PEAK PERIODS.
2. NEW 6 LANE CHECKPOINT PROVIDING INCREASED LANE LENGTH TO INSURE BEST PASSENGER THROUGHPUT.
3. ADDITIONAL TSA OPERATIONAL SUPPORT SPACE.
4. RENOVATED EXISTING NON-SECURE CONCESSION AREA PROVIDING ACCESS TO NON-SECURE PUBLIC STAIR TO OBSERVATION AREA ON LEVEL 3.
5. RENOVATED EXISTING CONCESSION SPACE REORIENTED TO SECURE SIDE SERVICE. USE SHOULD BE COMPATIBLE WITH SUPPLEMENTING HOLDROOM SEATING REQUIREMENTS FOR ADJACENT HOLDROOMS.
6. NEW DIRECT DEPLANING CORRIDOR FROM CONCOURSE TO BAGGAGE CLAIM AND TICKETING MOVES MEETER/GREETER FUNCTION DOWN TO THE BAG CLAIM AREA REDUCING CONGESTION OF ACCESS TO THE CHECKPOINT SCREENING AREA DURING PEAK PERIODS OF ARRIVAL/DEPARTURE.
7. RENOVATED EXISTING CONCESSIONS. USE SHOULD BE COMPATIBLE WITH SUPPLEMENTING HOLDROOM SEATING REQUIREMENTS FOR ADJACENT HOLDROOMS.
8. NEW SECURE SIDE CONCESSIONS.
9. DEMOLISH OPTION 1 STAIR.



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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PAL 2 ENLARGED PLAN
LEVEL 2 - CONSOLIDATED CHECKPOINT 6 LANES

FIGURE 7.8.4-3

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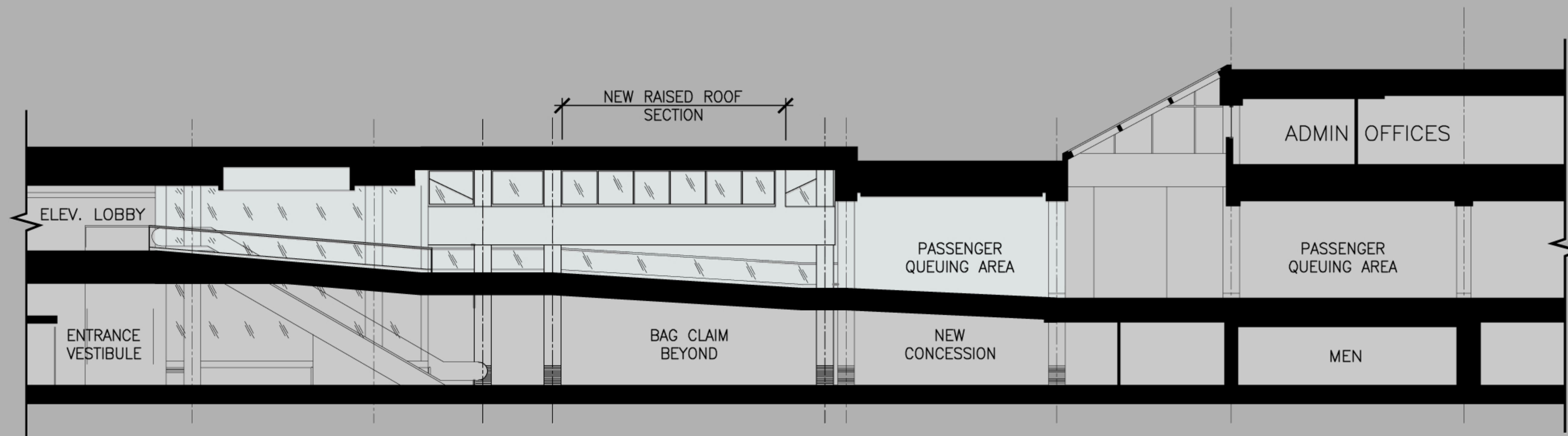
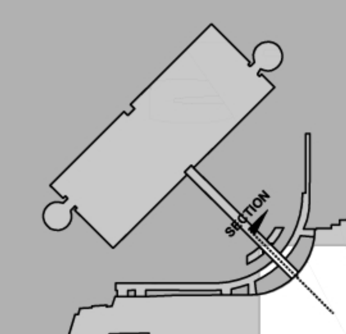


SECTION THROUGH PEDESTRIAN BRIDGE CONNECTOR



SCALE: 1/16" = 1'–0"

16' 8' 0 16' 32'

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PAL 2 BUILDING SECTION
SECTION AT PEDESTRIAN BRIDGE CONNECTOR

FIGURE
7.8.4-4

Q:\Shoebox Studio\Stark\Manchester\Task 8.4 BaseInfo\Figure 8.4.3-2 Level 2_PAL 2.dwg 09/23/2010 11:49

7.9 OTHER TERMINAL AREAS/FUNCTIONS

Earlier in this section, the reconfiguration of the Communication Center space was addressed. A possible improved layout was evaluated and is shown in the Short-Term time frame in **Figure 7.9-1** and later in Figure 7.12-1. Adjacent to the Communication Center location would be a new first aid room.

In the Long-Term or PAL 2 time frame, consideration should be given to relocating the Communication Center and first aid room to the west end of the Level 1 ticket lobby to provide available space for concessions development in the higher revenue producing central core area (Figure 7.12-4).

Concession merchandise storage was identified as a pressing need. The analysis of the storage and screening functions led the study team to assess the area and expansion potential of the north end of the terminal. New areas for concession storage and screening are proposed at Levels 1 and 2 and are shown in **Figures 7.9-2 and 7.9-3**.

The replacement of the EDS units within the outbound baggage systems are depicted in **Figure 7.9-4**.

7.10 FUTURE CONCESSION LOCATIONS

It is not enough to simply add more concession space. Shops and restaurants without adequate exposure to passengers and other airport users will not produce the desired level of sales or revenue. Passenger flows and terminal configuration dictate, to a great extent, where concessions can/should be built or expanded.

Table 7.10-1 shows the split of concessions landside versus airside for comparably sized airports for which data is available.

TABLE 7.10-1
COMPARABLE AIRPORT CONCESSION SPACE LOCATION

	Enplaned Passengers	Airside/Landside Concession Space Ratio
Boise	1,584,944	85/15
Tulsa	1,591,703	77/23
Spokane	1,715,773	90/10
Winnipeg	1,785,016	80/20
Manchester	1,854,758	70/30
Tucson	2,116,694	70/30
Reno	2,323,681	40/60
Providence	2,353,715	90/10
Buffalo	2,762,401	80/20

Source: Airport Revenue News Fact Book, 2009 and Airports named.

Generally speaking, the balance struck at airports in this size category finds about 20-30 percent of the concessions located on the non-secure (land) side of the terminal and 70-80 percent located on the secure (air) side of the facility. Based on these comparable airports, it is evident that the existing balance of concession space at MHT is appropriate, and it should be maintained as a *goal* as additional concession space is added.

Given the regulations on products (i.e., liquids) that can be carried through security checkpoints, if development on one side of security were to be favored, it is recommended that it be on the secure (airside) of the terminal. Passengers are most likely to dwell in an airport on the secure side whenever possible, as people generally wish to pass through the security screening checkpoint as early as possible. Therefore, they will tend to have more free time on the secure side, which suggests this would be the appropriate venue for additional concessions.

7.10.1 CONCESSION PRODUCT DELIVERY

Provision for screening of goods and services at an airport is a key planning issue that has resulted from the requirements of an increased level of security. MHT currently screens all deliveries of products for its concessions on the secure side of the terminal through the passenger screening areas. There are no secure loading docks available in the existing configuration. Additionally, limited storage space in the terminal (on both the secure and non-secure sides) results in a higher number of smaller deliveries being necessary in order to keep the airside concessions stocked at an appropriate level. Creating airside delivery points with screening dedicated to concession goods would support both the concession operations and ease some congestion at public screening checkpoints.

At this point, TSA is not requiring that separate screening be established for concession merchandise, just recommending it. However, failure to plan for this eventuality may result in negative impacts on customer service or making substantive and expensive unplanned changes to the facility at a future date. Therefore, the following options are available to the Airport.

One option would be the creation of a remote (not located in the terminal) delivery point with landside and airside access. Deliveries could be brought to the landside of such building, screened, and then placed on airside vehicles for delivery to the concession locations. This system would require a number of components:

- A building with both landside and airside access.
- Security screening equipment that would be dedicated solely to merchandise.
- One or more loading docks on the secure side of the terminal.
- A means for getting merchandise from the screening building to the terminal and then from the terminal loading dock(s) to storage or concession areas.

This system may be more costly than incorporating enlarged storage space in the terminal, and it is likely that the costs could not solely be borne by the concessionaires. It would also be necessary to establish a staffing agreement with the TSA or to get them to agree to private screening, which would add to the cost for either the Airport or the concessionaires.

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SHORT-TERM ENLARGED PLAN

LEVEL 1 - COMMUNICATION CENTER AND FIRST AID ROOM

FIGURE 7.9-1

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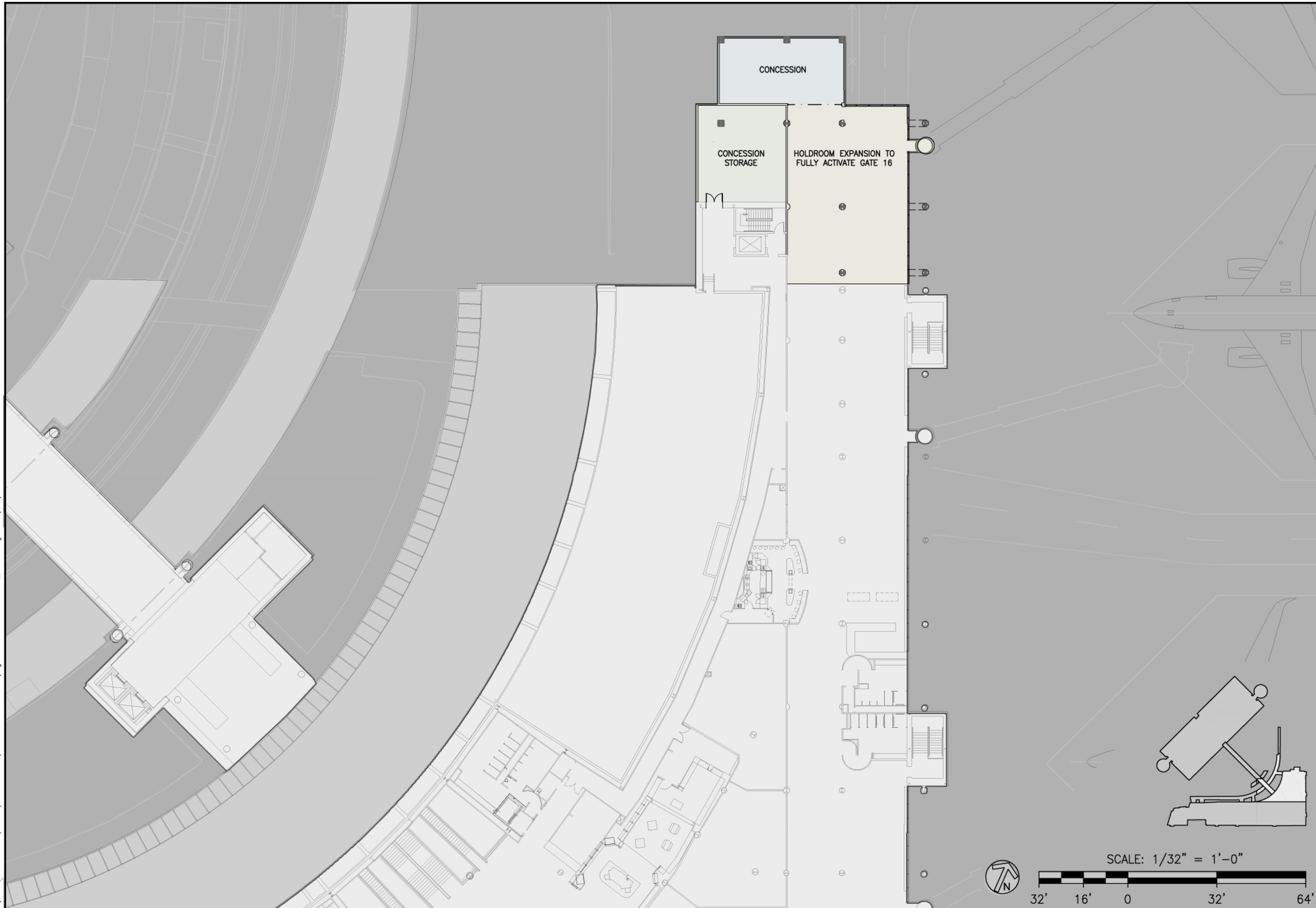
SHORT-TERM ENLARGED PLAN
LEVEL 1 - TSA MERCHANDISE SCREENING AT LOADING DOCK AREA

FIGURE 7.9-2



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SHORT-TERM ENLARGED PLAN
LEVEL 2 - CONCESSION AND GATE 16 EXPANSION

FIGURE 7.9-3

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1. REPLACEMENT OF EXISTING EDS UNITS SHOULD BE CONSIDERED AS THE UNITS APPROACH THEIR 10 YEAR TSA STANDARD LIFE CYCLE. COORDINATE REPLACEMENT WITH TSA.

SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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SHORT-TERM ENLARGED PLAN
LEVEL 1 - OUTBOUND BAGGAGE SYSTEM

FIGURE 7.9-4

The preferred option would be to create a screening point within the terminal that is dedicated solely to concession merchandise screening. This could be accomplished either by changing one of the three existing passenger screening areas to one dedicated to goods screening, or by establishing a new screening point at another location that is currently not used for passenger screening (see Figures 7.10-1 and 7.10-2).

7.10.2 FUTURE CONCESSION RECOMMENDATIONS

The first step is what types of concessions would be good additions to the Airport's concession program. As shown previously in Tables 7.6.6-1 and 7.6.6-2, there is no immediate need for concession expansion, based on the current passenger projections. Over-supplying concession space can lead to poor productivity and business failure (or, alternately, vendors taking steps to ensure they are profitable, which may include raising prices, cutting customer service, or deferring maintenance, which impacts the image of the program and the Airport). However, there are "holes" in the breadth of concession options that might be filled in the short-term, which could lead to increased sales and revenues. These include:

- There is currently no specialty retail component in the concession program. While there is likely not sufficient space, nor sufficient demand, to include in-line specialty retail stores, there are opportunities throughout the terminal airside for the placement of automated retail "shops" selling electronics, cosmetics, and other products. Zoom Systems is the industry leader at the moment, but other vendors are introducing these upscale vending options. These machines do not, generally, cannibalize sales from news/gift shops because they offer a different, and often more expensive, product line. These shops need to be placed in high visibility areas, and require power supply, but often do not require data lines, as they can handle credit card transactions via cellular methods. The size of the machines may vary, depending on manufacturer and product, but commonly, Zoom System Shops are approximately 6' x 3' x 6'. It may be possible to place automated retail against the walls opposite the holdrooms, or within holdrooms, back-to-back. Because exposure to the largest number of passengers possible is key to the success of these offerings, it is recommended that these be placed in or near Southwest Airlines holdrooms, or in or opposite holdrooms for Gates 8, 9, and 10. Zoom Systems concessions generally pay percentage rents of between 6 and 9 percent, depending on the products being offered (electronics usually pay less, cosmetics more).

- Another option for concession development on the airside of the Airport would be personal services, such as seated massage (not automated chair massage), manicures, etc. These services can be provided by vendors who move from holdroom to holdroom, essentially following the traffic, requiring only a place to store their equipment when it is not being used. The State of New Hampshire has specific licensing requirements for massage practitioners, and a state license is required to operate a barber shop, which includes Cosmetology, Manicuring, and Esthetics. However, neither of these prevents this as a possible future business opportunity. They will likely not be large revenue generators, but will add incremental revenue to the Airport and will likely also be well received by customers.

- Most of the retail offerings are generic “news/souvenir” products, with little representation of Manchester, New Hampshire, or New England. One way to address this would be to implement a local-product cart program. There are a number of ways to manage such a program; it can be done through the existing news/gift provider, working with them to obtain the carts, place them, source vendors, and manage the program. Alternately, if the Airport were to manage the program, a few kiosks/carts could be procured and set up with power. Through community outreach, vendors could be found who wish to offer their wares to travelers, and contracts can be of short duration to allow trial, and rapid change if a product line (or a vendor) does not work out. This is an outstanding way to showcase local goods, increase revenues to the Airport, and build community relations.

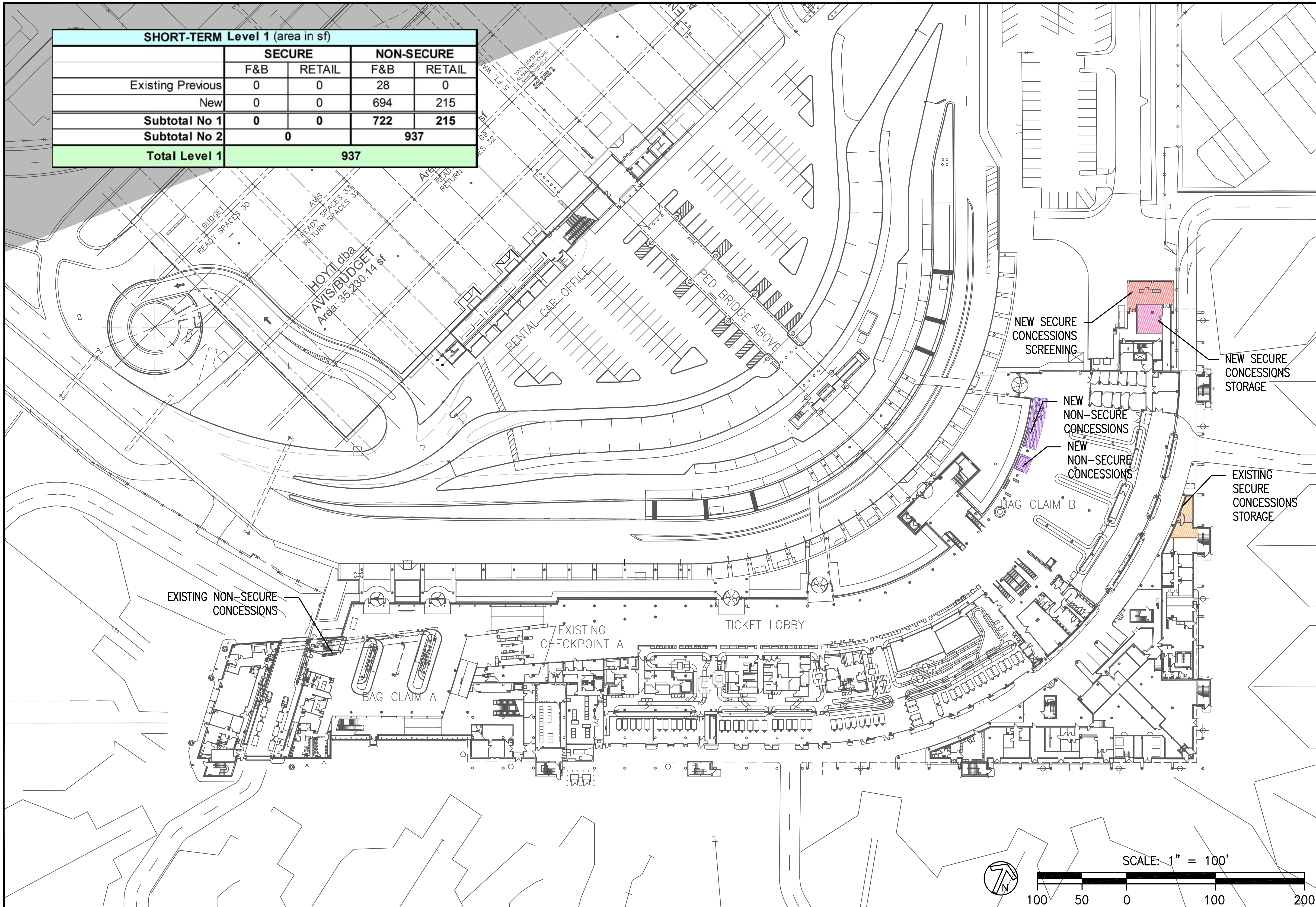
One proposed location for concession development would be the placement of a coffee/pastry/snack concession in the baggage claim area, at the current rental car counter locations. This specific location would focus on serving persons waiting for their baggage to be delivered and meeter/greeters waiting for their parties to arrive, especially if an effort is made to have them wait in baggage claim instead of in the already over-crowded Atrium. It is likely, however, that this location would somewhat detract from the existing landside Dunkin Donuts shop, which may be advantageous in controlling queues in front of the existing shop.

The Observation Area, located on the 3rd floor of the terminal building offers another opportunity the future development of concessions. A snack kiosk would likely appeal to the meeters/greeters and early-arriving passengers who often congregate in this area to watch aircraft. This kiosk can also conveniently serve Airport employees whose offices are located on the 3rd level of the terminal.

In addition to filling the now-vacant in-line space within the landside food court, additional concession opportunities can be offered by moving (or removing) some seating to create locations for kiosk-based retailing or food service. Food offerings can complement the existing units, selling snacks or treats, such as ice cream, popcorn, or pretzels. These locations also lend themselves to specialty retail because they offer good exposure, which is necessary because most specialty retail purchases are not pre-planned. Souvenir items, local gift food or crafts, or electronics and accessories might all be opportunities within this space.

Figures 7.10-1 through 7.10-4 depict locations of possible concession locations for the Short-Term and the Long-Term PAL 2 conditions for terminal Levels 1 and 2.

SHORT-TERM Level 1 (area in sf)				
	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	0	0	28	0
New	0	0	694	215
Subtotal No 1	**0**	**0**	**722**	**215**
Subtotal No 2	**0**		**937**	
Total Level 1	**937**			



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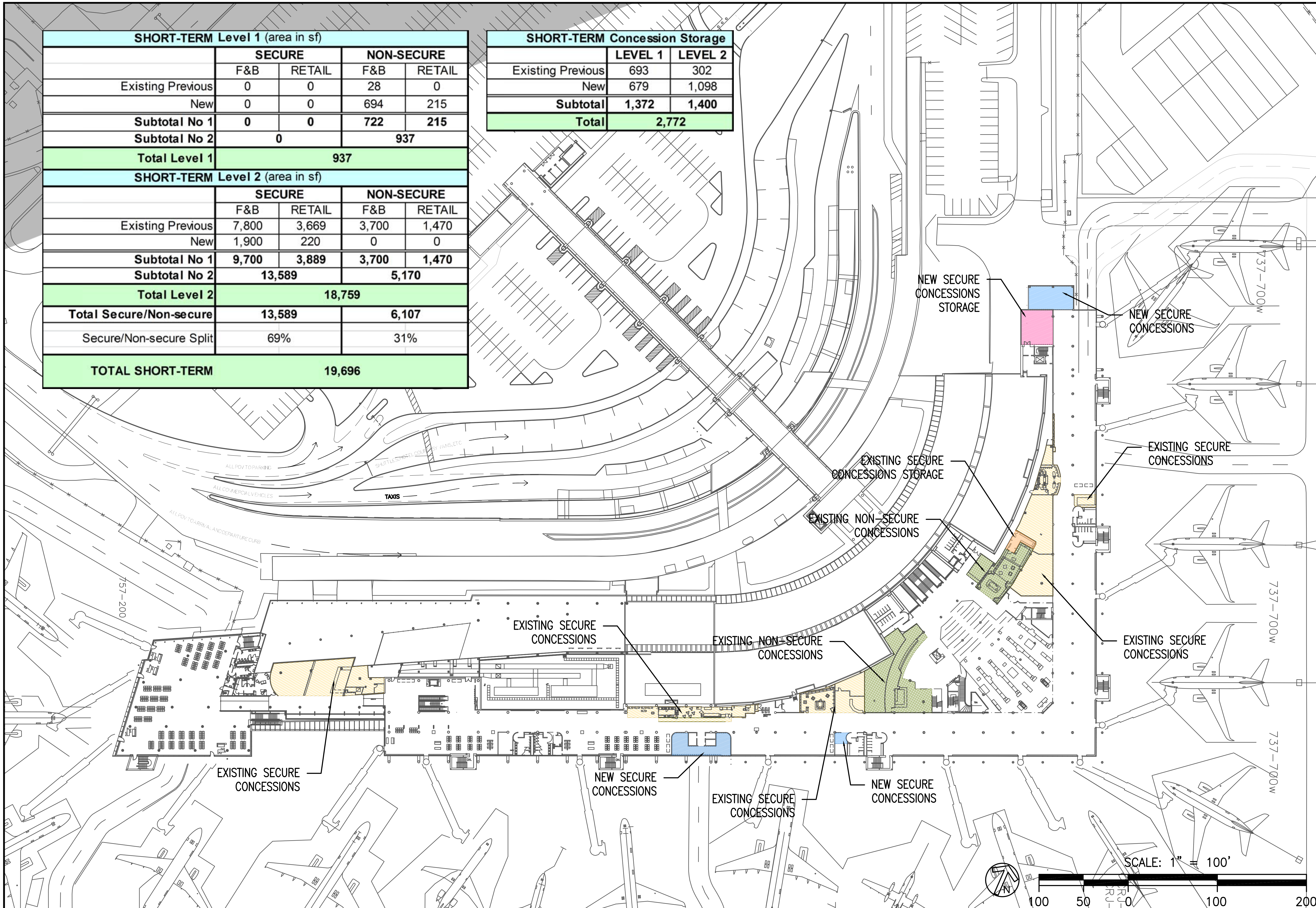
CONCESSIONS SHORT-TERM OVERALL PLAN - LEVEL 1

FIGURE 7.10-1

SHORT-TERM Level 1 (area in sf)	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	0	0	28	0
New	0	0	694	215
Subtotal No 1	**0**	**0**	**722**	**215**
Subtotal No 2	**0**		**937**	
Total Level 1	**937**			

SHORT-TERM Level 2 (area in sf)	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	7,800	3,669	3,700	1,470
New	1,900	220	0	0
Subtotal No 1	**9,700**	**3,889**	**3,700**	**1,470**
Subtotal No 2	**13,589**		**5,170**	
Total Level 2	**18,759**			
Total Secure/Non-secure	**13,589**		**6,107**	
Secure/Non-secure Split	69%		31%	
TOTAL SHORT-TERM	**19,696**			

SHORT-TERM Concession Storage	LEVEL 1	LEVEL 2
Existing Previous	693	302
New	679	1,098
Subtotal	**1,372**	**1,400**
Total	**2,772**	



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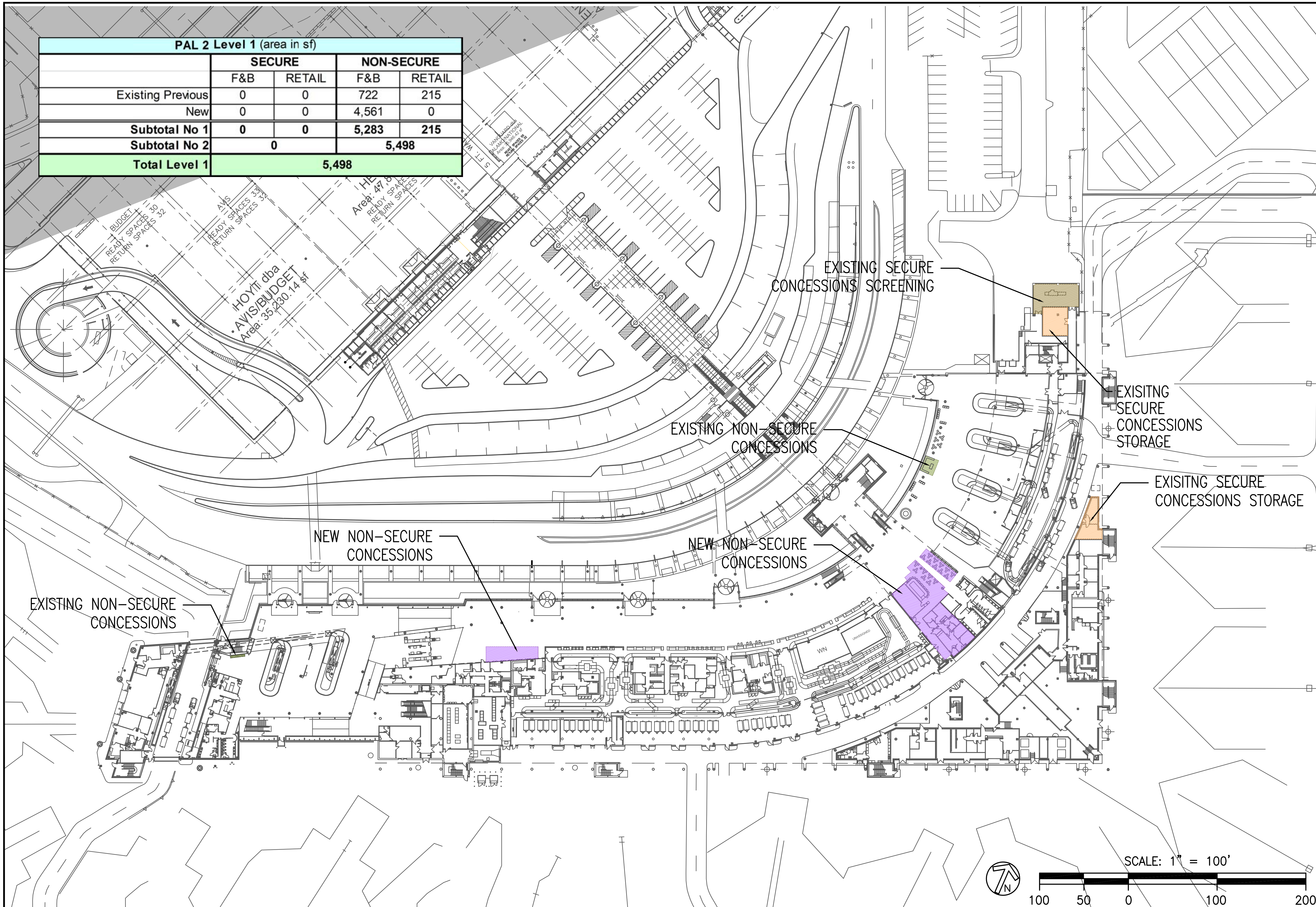
CONCESSIONS SHORT-TERM OVERALL PLAN - LEVEL 2

FIGURE 7.10-2

PAL 2 Level 1 (area in sf)				
	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	0	0	722	215
New	0	0	4,561	0
Subtotal No 1	**0**	**0**	**5,283**	**215**
Subtotal No 2	**0**		**5,498**	
Total Level 1	**5,498**			



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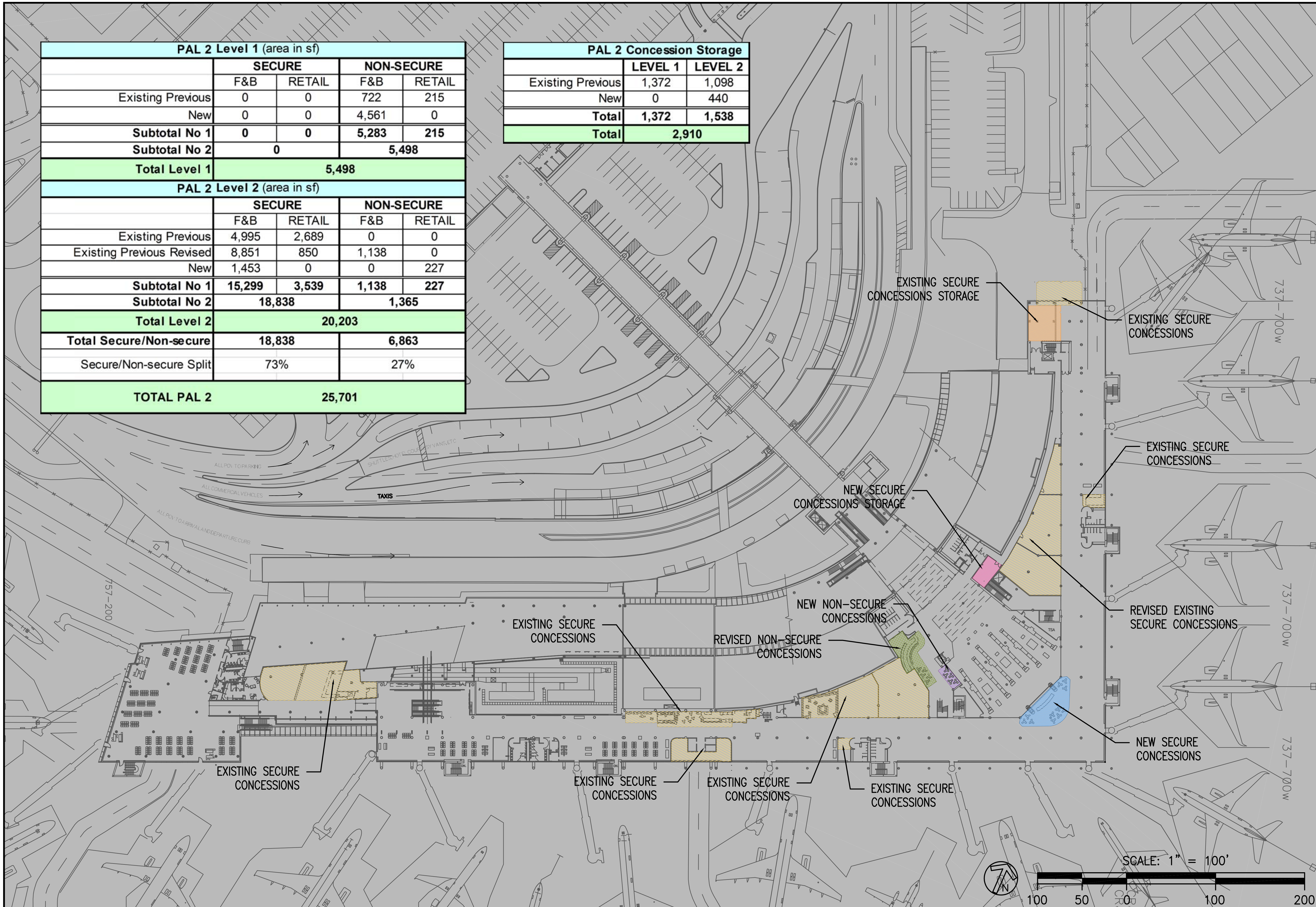
CONCESSIONS PAL 2 OVERALL PLAN - LEVEL 1

FIGURE 7.10-3

PAL 2 Level 1 (area in sf)				
	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	0	0	722	215
New	0	0	4,561	0
Subtotal No 1	**0**	**0**	**5,283**	**215**
Subtotal No 2	**0**		**5,498**	
Total Level 1	**5,498**			

PAL 2 Level 2 (area in sf)				
	SECURE		NON-SECURE	
	F&B	RETAIL	F&B	RETAIL
Existing Previous	4,995	2,689	0	0
Existing Previous Revised	8,851	850	1,138	0
New	1,453	0	0	227
Subtotal No 1	**15,299**	**3,539**	**1,138**	**227**
Subtotal No 2	**18,838**		**1,365**	
Total Level 2	**20,203**			
Total Secure/Non-secure	**18,838**		**6,863**	
Secure/Non-secure Split	73%		27%	
TOTAL PAL 2	**25,701**			

PAL 2 Concession Storage		
	LEVEL 1	LEVEL 2
Existing Previous	1,372	1,098
New	0	440
Total	**1,372**	**1,538**
Total	**2,910**	



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CONCESSIONS PAL 2 OVERALL PLAN - LEVEL 2

FIGURE 7.10-4

7.11 FIS GATE/INTERNATIONAL SERVICE

7.11.1 FIS REVIEW

This particular terminal planning task was limited to a review of the 2008 FIS architectural concept plans and to preparation of recommendations related to those plans. Additionally, a facility program was developed based on current Customs and Border Patrol (CBP) guidelines. This program was developed around the following assumptions: one daily B767-300 flight; a reduced facility for a temporary FIS; minimal CBP staff arriving only for the one arriving flight; a reduction of necessary staff office space; as well as developing alternatives that provided a temporary short-term facility that could be used in an ultimate configuration if demand warranted a permanent facility.

The on-record FIS architectural concept plans were developed by Lavallee Brensinger Architects (LBA) in 2008 and included a space program and concept design for a 200-passenger per hour FIS facility. The proposed plan added a two-level, 6,000 square foot addition to the south end of the concourse at Gate 1. Primary inspection was located at the concourse level. Baggage claim, secondary processing, and associated offices were located at the apron level. Office space at the existing baggage claim area would be reconfigured and one of the existing carousels would be converted to a swing carousel to accommodate both international and domestic traffic.

The Airport Master Plan team reviewed the LBA FIS architectural concept plans and concluded that there were a number of elements leaving a potentially low LOS, but no fatal flaws. LOS issues include: 1) inadequate area for restroom facilities to serve arriving international passengers awaiting Primary Inspection, 2) sterile queuing area for primary inspection may be inadequate to hold full aircraft should Primary processing be delayed, and 3) Primary Inspection provides two processing lanes which will require in excess of 2 hours for a 767-300 aircraft. As an alternative to the LBA concept plan, the Airport Master Plan team recommended that the airport develop a plan which maximizes the use of the existing terminal and minimizes new construction through the initial development of a temporary FIS facility.

7.11.2 FIS ALTERNATIVE CONCEPT

The Airport Master Plan team proceeded to develop an alternative concept based on use of a temporary facility, rather than permanent construction to house the Primary Inspection function of the FIS. A temporary FIS facility would require less capital investment and could be designed and constructed in such a manner that it could be incorporated into a permanent structure, if future demand warrants, or elements of the facility could be incorporated into a domestic operation, if demand is discontinued.

The recommended Short-Term (temporary) Level 1 concept can accommodate 200 passengers per hour, uses the existing facilities, including the security checkpoint, but requires a temporary modular bump-out. In the Short-Term plan, the only permanent investment is the new elevator from the FIS capable gate (Gate 4) to Primary processing, which can be part of a permanent facility or be used by domestic passengers if the FIS facility is not in use.

7.11.3 FIS FACILITY PLAN

Short- and Long-Term conceptual sketches were refined during the terminal planning phase. It was confirmed that existing Gate 4 could be used for international arrivals, with sterile passenger circulation down into the existing Baggage Claim A area for processing. A temporary module building unit is proposed for the Short-Term to facilitate space for the immigration processing function, with addition of facilities to secure one bag claim device in the existing bag claim area for international arriving bags. The second unit would remain open for domestic bag claim. U.S. Customs Inspection is proposed to use the space currently occupied by Checkpoint A. Both bag claim conveyors in Bag Claim A could be utilized for domestic bag claim during periods when the FIS is not in use. The facility is sized for processing a 767-300 in approximately one hour. **Figures 7.11.3-1 and 7.11.3-2** illustrate:

- A sterile corridor to primary inspection below, limiting impact to other holdrooms/gates.
- Primary inspection area with restroom (addition constructed with a temporary modular style structure for economy).
- Secondary inspection area. Secured with movable barriers during international processing and otherwise cross-utilized for domestic arrivals. U.S. Customs Inspection is located in space currently occupied by Checkpoint A.

Estimated construction cost for this Short-Term layout is approximately $3.65 million. This option provides the minimum required facilities to quickly and economically activate process of international arrivals, cross utilizing many of the terminal's existing facilities to limit investment.

In the Long-Term, should international service significantly increase traction, the permanent alternative shown in **Figure 7.11.3-3** utilizes the same arrival gate (Gate 4) and vertical circulation components from Level 2 to Level 1 as the Short-Term plan. The western most bag claim device is removed to make space for the primary inspection function. The remaining bag claim device is used primarily for international arrivals, but can also be cross utilized for domestic baggage claim at other times. The secondary or U.S. Customs inspection is accomplished in the same basic facility as in the Short-Term option. It is assumed that the all domestic baggage claim activity will occur at Bag Claim B when international arrivals are processed. Construction cost is estimated at $6 million.

The potential new FIS facility within the terminal relates to a demand driven opportunity, not a PAL-driven project. It can be a new element to handle start-up international air service, but it is not tied to any implementation schedule. If the initial start-up scheduled service is successful, the Airport can move forward with the longer-term permanent facility. As such, these improvements are not depicted on the PAL-related graphic layouts.

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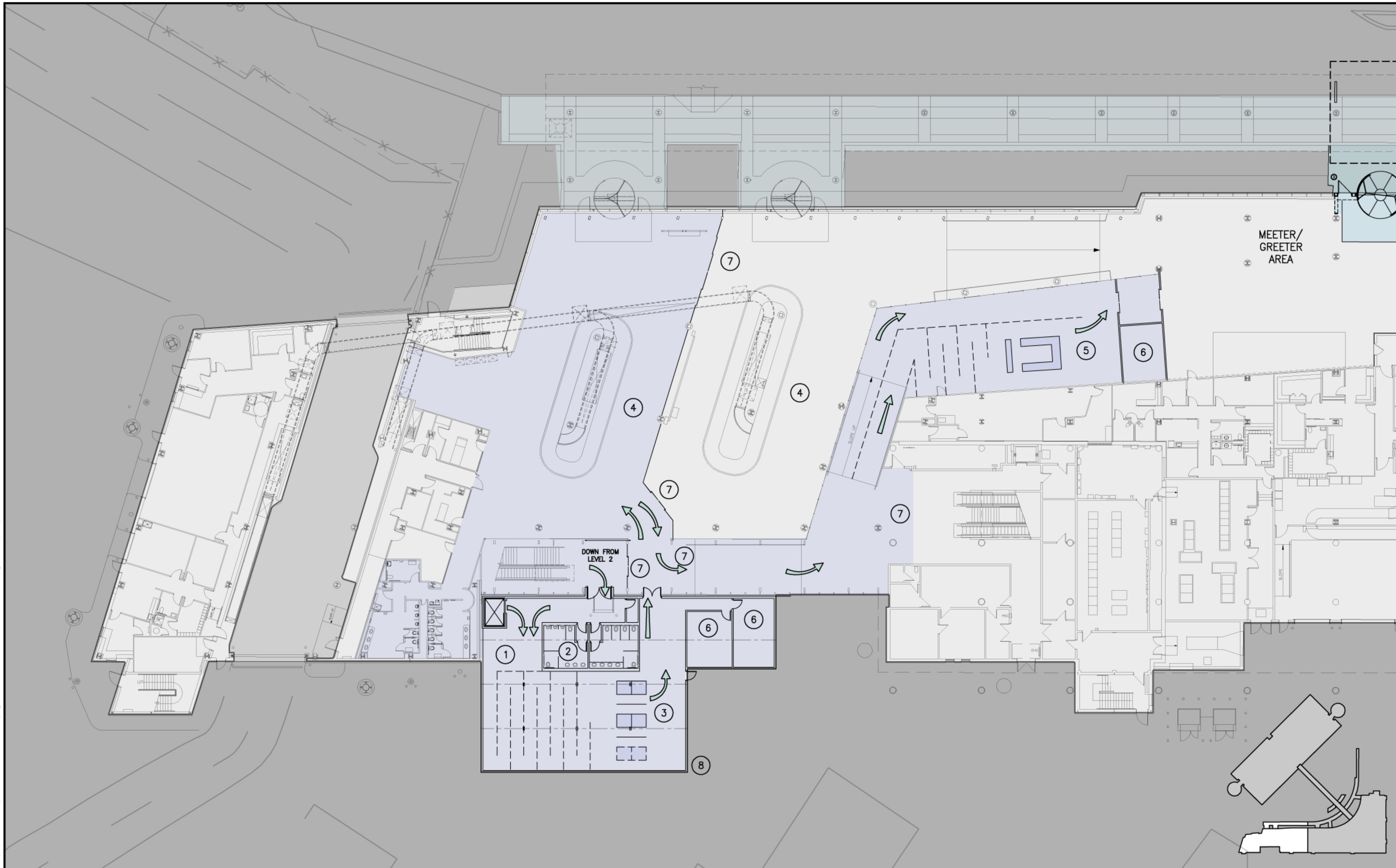


1. IMMIGRATION QUEUING
2. RESTROOMS
3. IMMIGRATION PROCESSING
4. BAG CLAIM
5. US CUSTOMS
6. OFFICE
7. SLIDING DOORS OPERATE TO ISOLATE AREA DURING INTERNATIONAL PROCESSING AND OPEN AREA TO BE CROSS-UTILIZED FOR DOMESTIC BAG CLAIM OPERATION
8. TEMPORARY MODULAR STRUCTURE

SCALE: 1/32" = 1'–0"

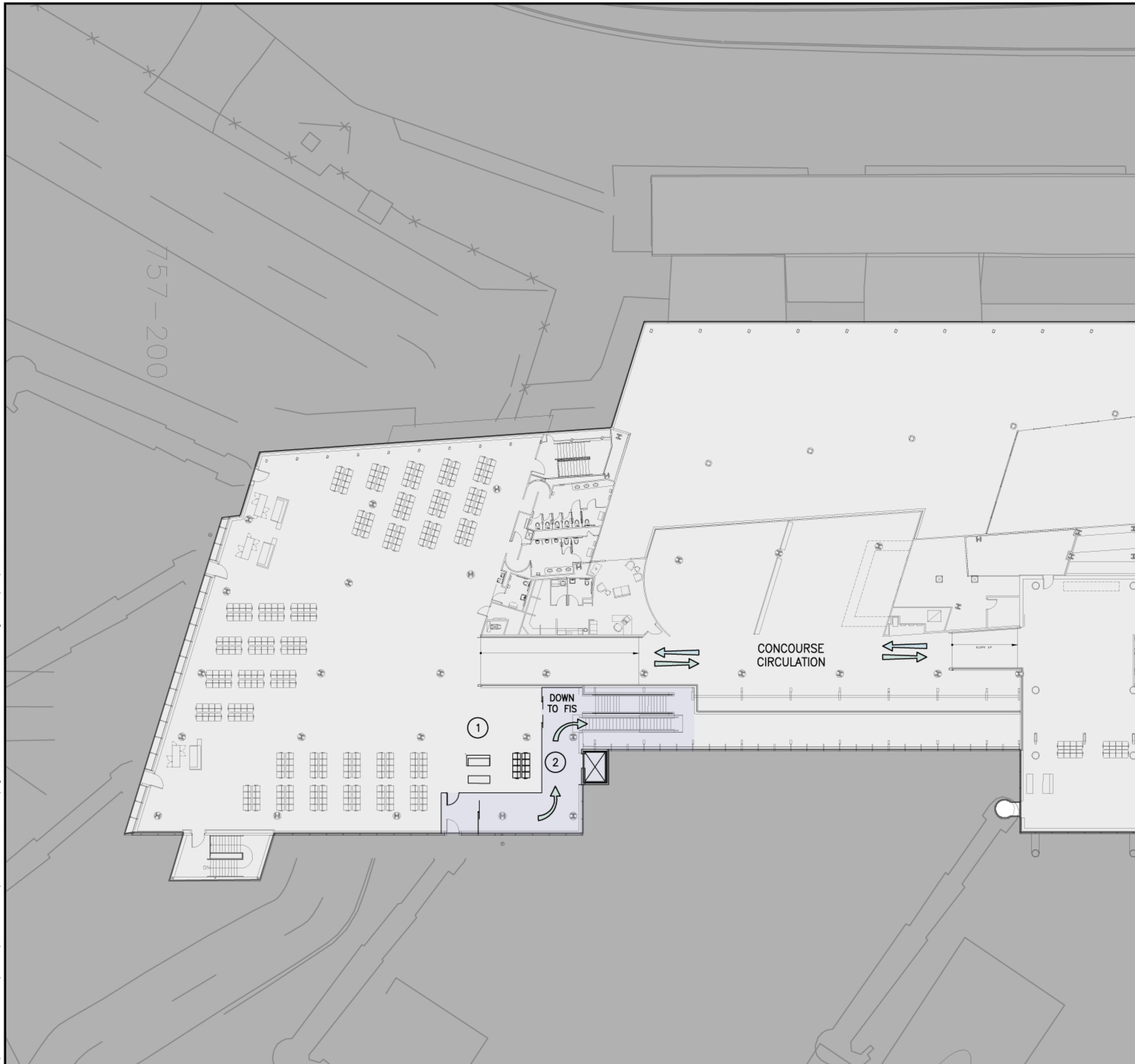
32' 16' 0 32' 64'

N

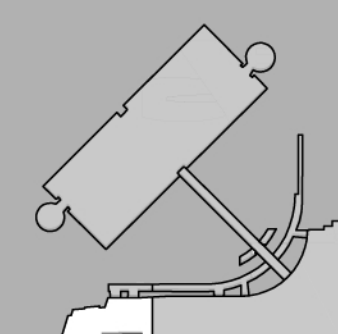
ENLARGED PLAN - LEVEL 1
SHORT-TERM (TEMPORARY) FEDERAL INSPECTION SERVICES (FIS) FACILITY

FIGURE
7.11.3-1

Q:\Shoebox Studio\Stark\Manchester\Task 8.4 BaseInfo\Figure 8.4.3-1 Level 1_PAL 2.dwg 09/23/2010 11:47



1. GATE PODIUM MODIFICATIONS
2. STERILE CIRCULATION TO FIS/BAG CLAIM



SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

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ENLARGED PLAN - LEVEL 2
NEW FEDERAL INSPECTION SERVICES (FIS) FACILITY

FIGURE 7.11.3-2

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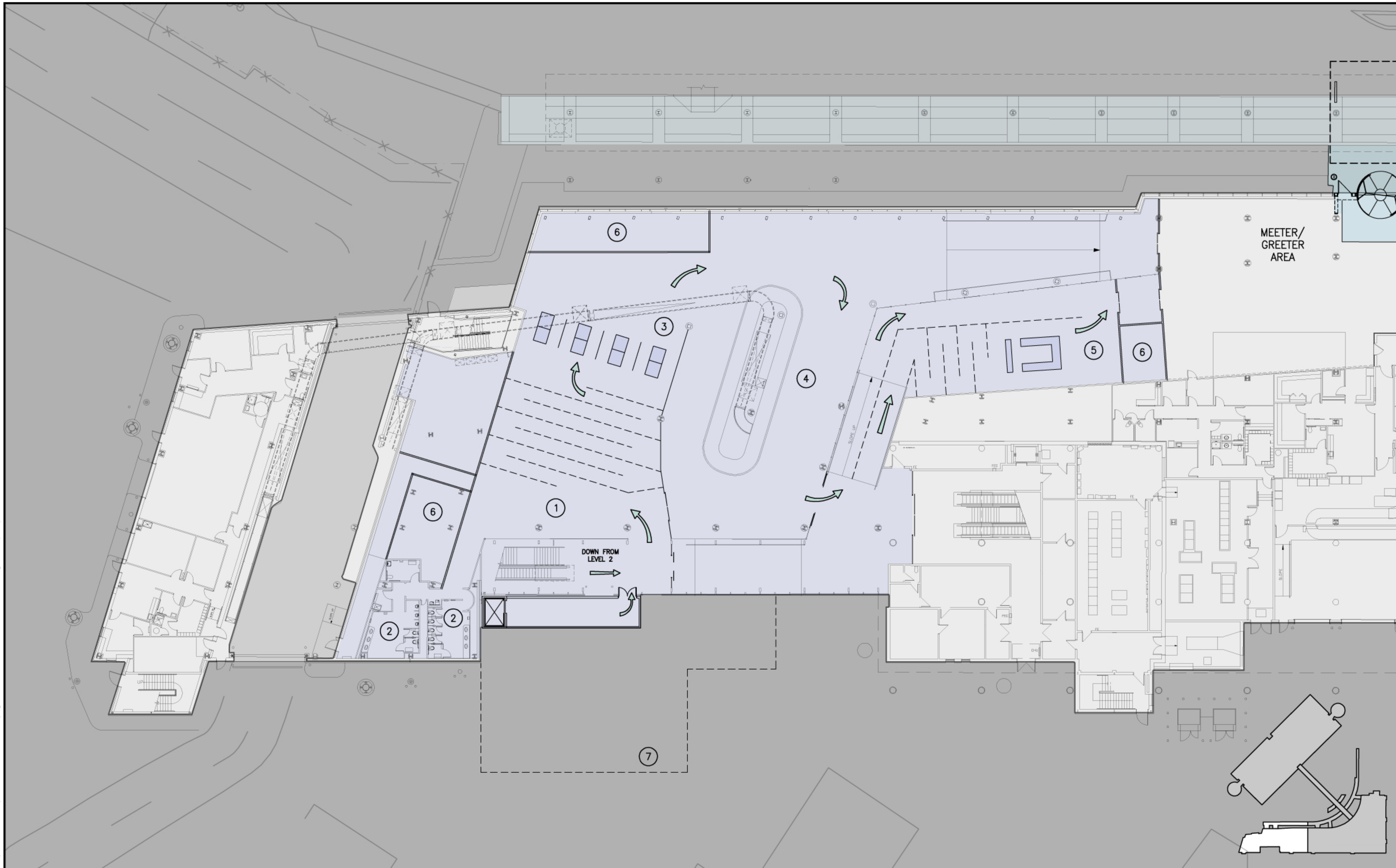

1. IMMIGRATION QUEUING
2. RESTROOMS
3. IMMIGRATION PROCESSING
4. BAG CLAIM
5. US CUSTOMS
6. OFFICE
7. REMOVE TEMPORARY MODULAR STRUCTURE

SCALE: 1/32" = 1'-0"

32' 16' 0 32' 64'

N

Manchester-Boston REGIONAL AIRPORT

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ENLARGED PLAN - LEVEL 1
LONG-TERM PERMANENT FEDERAL INSPECTION SERVICES (FIS) FACILITY

FIGURE 7.11.3-3

Q:\Shoebox Studio\Stark\Manchester\Task 8.4 BaseInfo\Figure 8.4.3-1 Level 1_PAL 2.dwg 09/23/2010 11:48

7.12 SUMMARY

At its basic functional level, the terminal is a space which affords a modal interface, where passengers and their bags transfer to/from aircraft and surface vehicles. But to make the processing operations occur most effectively and efficiently, that space must also accommodate and integrate multiple space and functional requirements such as airport management and operations, other stakeholder/user needs, passenger and baggage security screening measures, revenue-producing and passenger-comfort concessions, and supporting technology and infrastructure. With this range of factors, terminal planning is a challenging element of any master plan update.

The terminal planning for MHT and this Airport Master Plan Update was unique in that:

- Airport management recognized the pressures from recent passenger growth, which were beginning to be placed on current facilities, prompting the consideration of short-term enhancements, while

- Airport Master Plan forecasts were suggesting a slow post-recession recovery of passenger activity throughout the 20-year planning period.

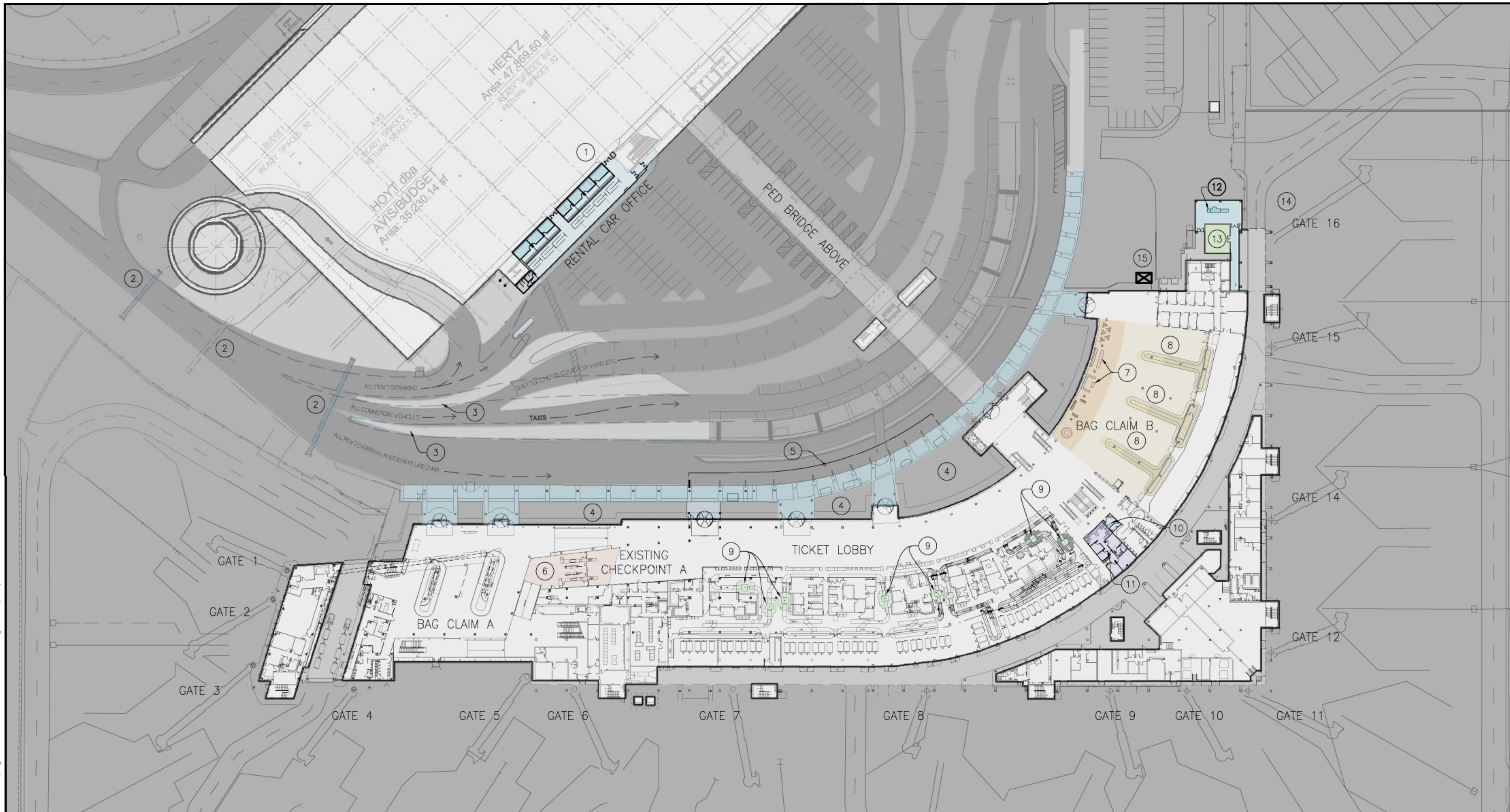
To this end, the terminal studies addressed both short-term optimization measures, as well as facilities needed for long-term, or PAL 2, activity levels. In some instances, the timing of replacement, expanded, or new facilities was based on factors other than passenger growth (i.e., bag claim devices, FIS, rental car counters).

The proposed terminal improvements are presented by time frame and terminal level in **Figures 7.12-1 through 7.12-6**. Major Short-Term actions include:

- Relocation of rental car counters to the garage
- New concession space in the vacated rental car counter area
- Replacement and expansion of flat plate baggage claim devices
- Replacement of checked baggage screening equipment
- Improved curbside airline signage
- Renovated Communication Center
- New first aid room
- New concession screening and storage area
- Consolidated passenger screening checkpoint
- New stairway to observation area
- New airside concessions areas

Major Long-Term (PAL 2) improvements include:

- New ticket lobby vestibule
- Possible relocation of Communication Center and first aid room
- Expanded bag claim area
- Direct access to bag claim area from concourse
- New landside concession area
- Expanded passenger screening area
- Relocated stairway to observation area
- Pedestrian bridge connector and expanded passenger screening queuing area
- New/renovated airside concession areas
- Airport administration office expansion



1. RELOCATE RAC OFFICES AND SERVICE COUNTERS TO PARKING GARAGE.
2. ADD NEW OVERHEAD LANE I.D. SIGN & RELOCATE EXISTING OVERHEAD SIGN.
3. MODIFY ROADWAY LANE/ISLAND LAYOUT TO CREATE CLEAR DECISION POINT BETWEEN TRAVEL LANES TO - ALL PARKING, COMMERCIAL VEHICLES, AND DEPARTURE/ARRIVAL CURB.
4. REWORK LANDSCAPING TO IMPROVE VISIBILITY OF TERMINAL FRONT AND ENTRANCES FOR VEHICLES APPROACHING ON ROADWAY.
5. CURBSIDE UTILIZATION. CARRIER SIGNAGE AND CURBSIDE CHECK-IN RELOCATION.
6. CLOSURE OF EXISTING CHECKPOINT A IS ANTICIPATED DURING SHORT-TERM PLANNING PERIOD. THIS AREA RESERVED FOR FUTURE FIS FUNCTION.
7. ADD NEW CONCESSION IN AREA VACATED BY RAC.
8. REPLACE EXISTING FLAT PLATE BAGGAGE CLAIM DEVICES.
9. REPLACE ALL EDS UNITS
10. NEW FIRST AID ROOM
11. RENOVATED COMM CENTER
12. NEW CONCESSION RECEIVING AND TSA MERCHANDISE SCREENING.
13. NEW CONCESSION STORAGE.
14. APRON MODIFICATIONS FOR GATE 16 EXPANSION.
15. COVERED PET RELIEF AREA

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SHORT-TERM OVERALL PLAN - LEVEL 1

FIGURE 7.12-1

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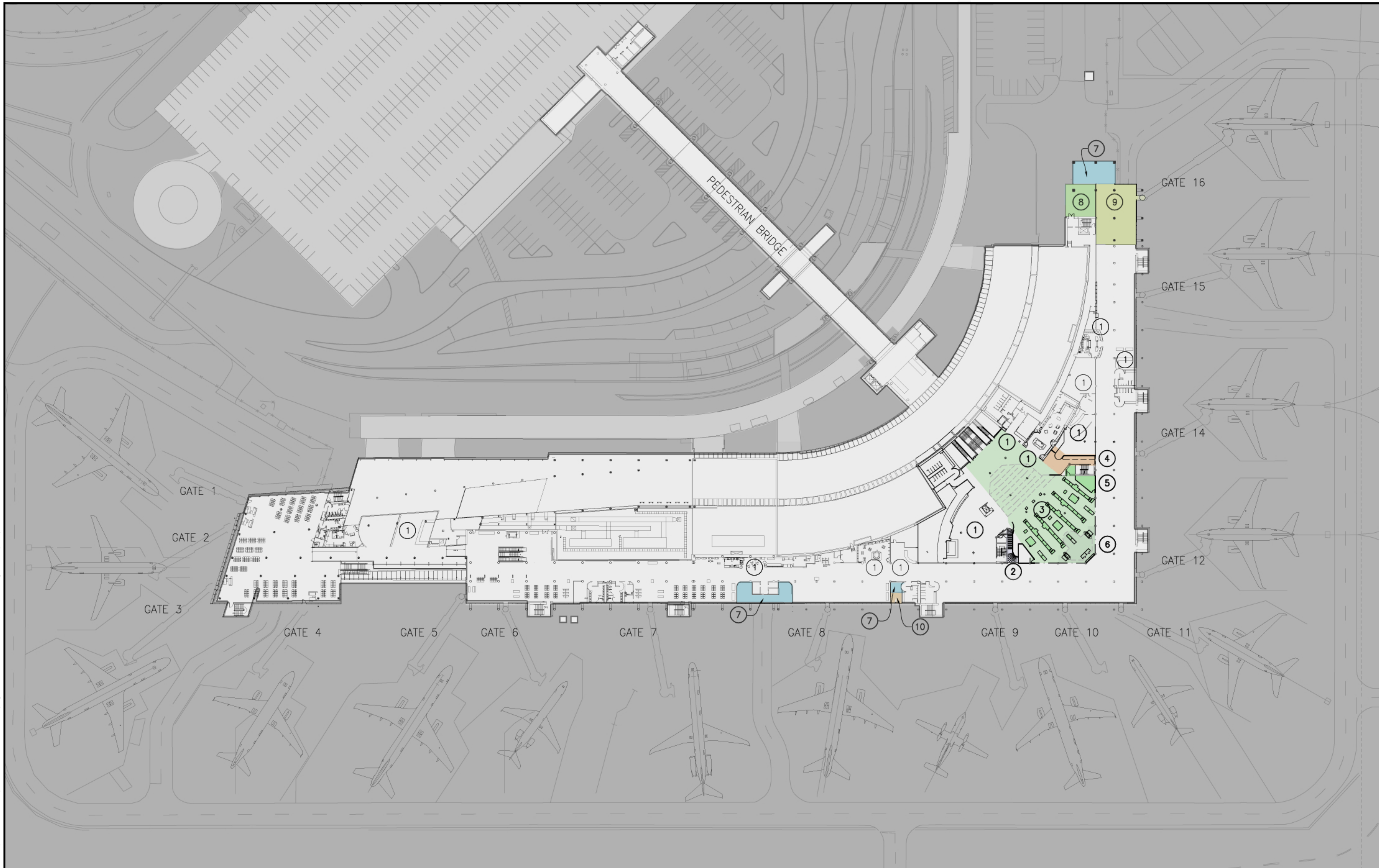

1. EXISTING CONCESSIONS
2. NEW STAIR TO OBSERVATION AREA
3. NEW CONSOLIDATED 5 LANE SCREENING AREA
4. RELOCATED BACK FLOW LANE
5. TSA SUPPORT
6. REMOVE EXISTING CENTER STAIR
7. NEW CONCESSIONS
8. NEW CONCESSIONS STORAGE
9. EXPAND EXISTING HOLDROOM TO FULLY ACTIVATE GATE 16.
10. NEW FAMILY RESTROOM.

N

SCALE: 1" = 100'

100 50 0 100 200

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SHORT-TERM OVERALL PLAN - LEVEL 2

FIGURE 7.12-2

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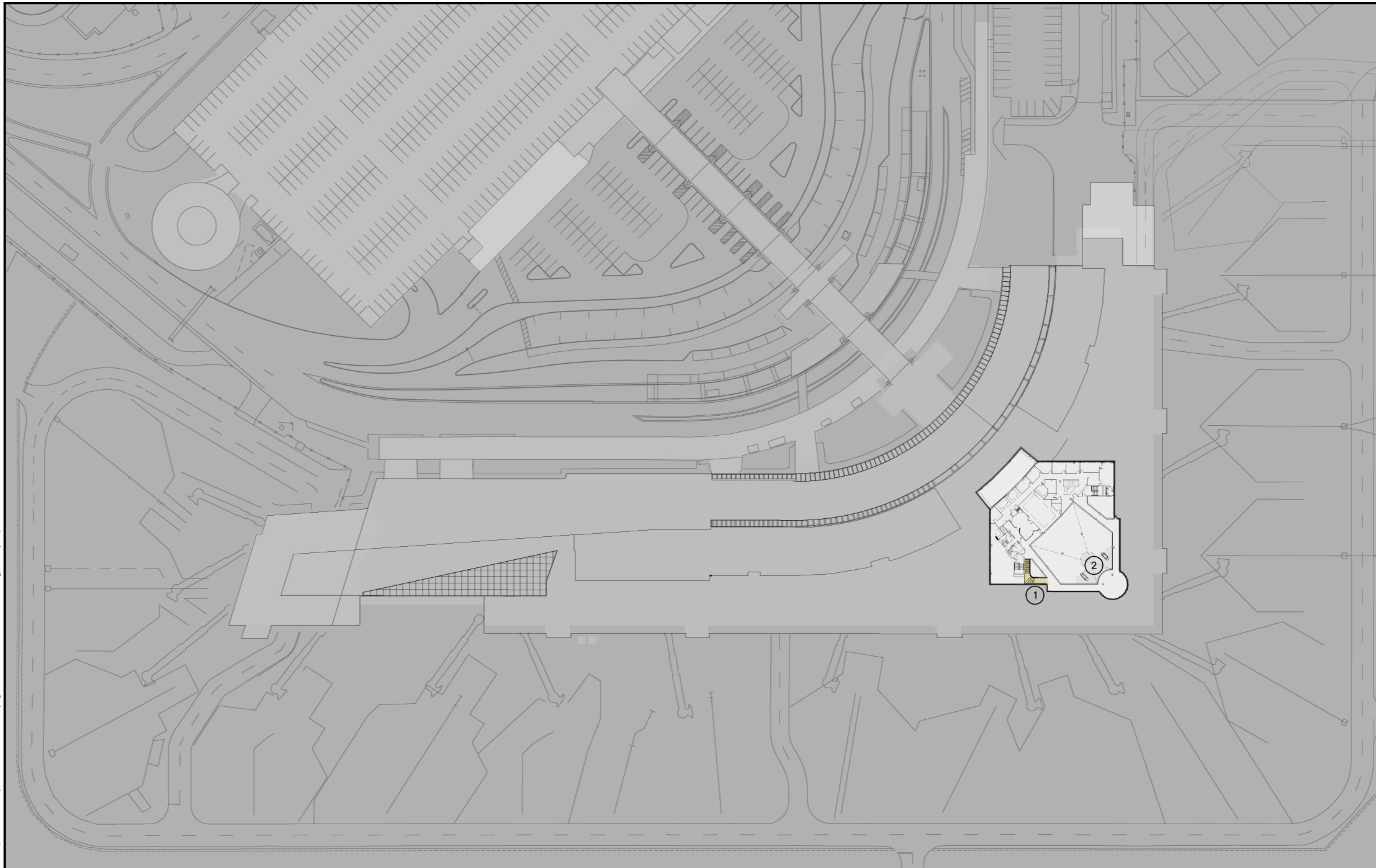

1. NEW NON-SECURE PUBLIC ACCESS STAIR TO OBSERVATION AREA FOR LEVEL 3 - OPTION 1

2. REMOVE EXISTING CENTER STAIR

SCALE: 1" = 100'

100 50 0 100 200

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SHORT-TERM OVERALL PLAN - LEVEL 3

FIGURE 7.12-3

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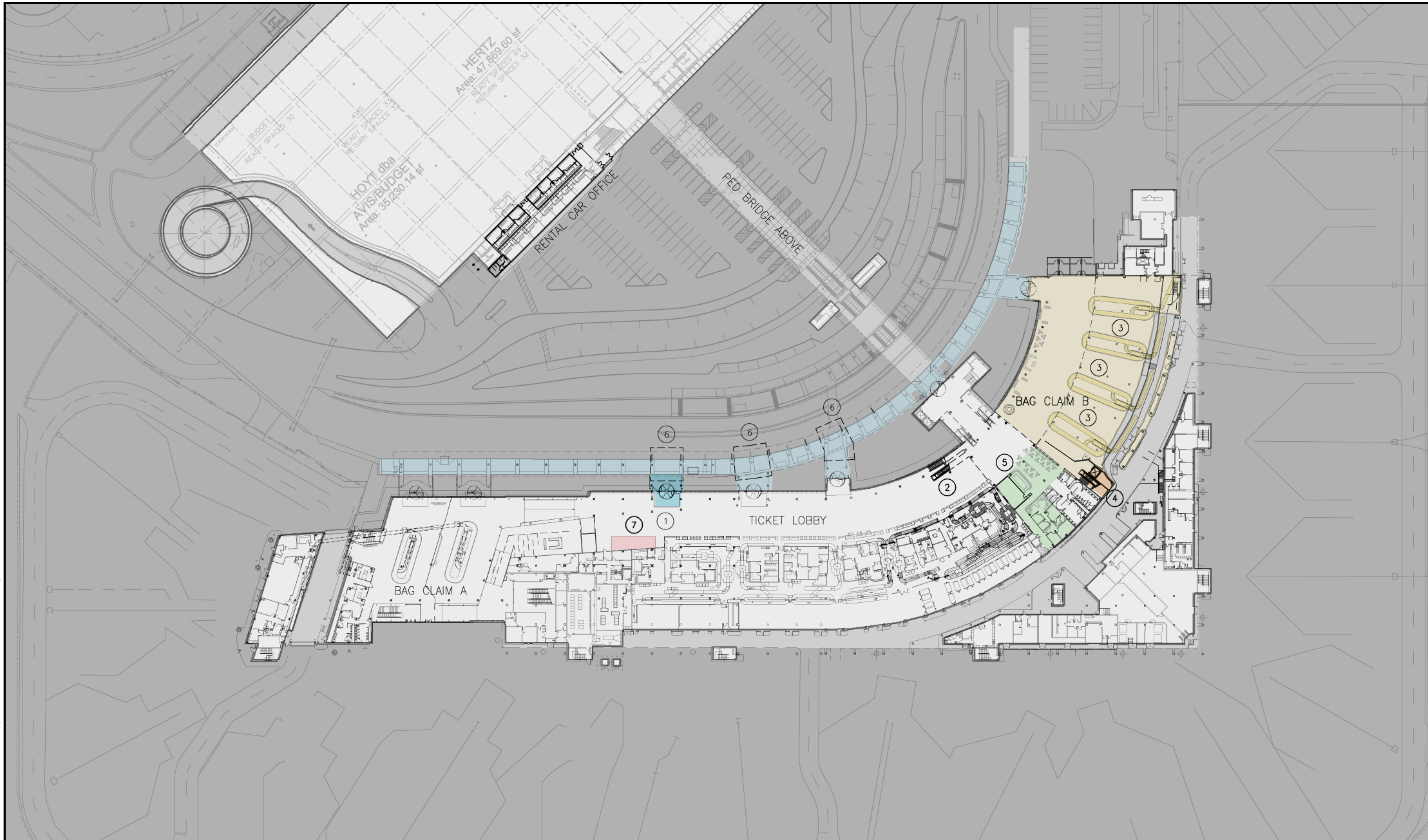

1. NEW TICKET LOBBY ENTRANCE VESTIBULE. IF NOT ADDED AT AN EARLIER TIME
2. NEW STAIR/ ESCALATOR ACCESS TO LEVEL 2.
3. RELOCATE BAG SERVICE OFFICES. ADD FOURTH CLAIM DEVICE AND TRANSITION TO SLOPED PLATE CLAIM UNITS.
4. NEW ACCESS FROM CONCOURSE TO BAGGAGE CLAIM.
5. NEW FOOD/BEVERAGE CONCESSION AREA.
6. NEW CANOPY FEATURE TO VISUALLY REINFORCETICKET LOBBY ENTRANCE.
7. NEW CONCESSION

SCALE: 1" = 100'

100 50 0 100 200

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PAL 2 OVERALL PLAN - LEVEL 1

FIGURE 7.12-4

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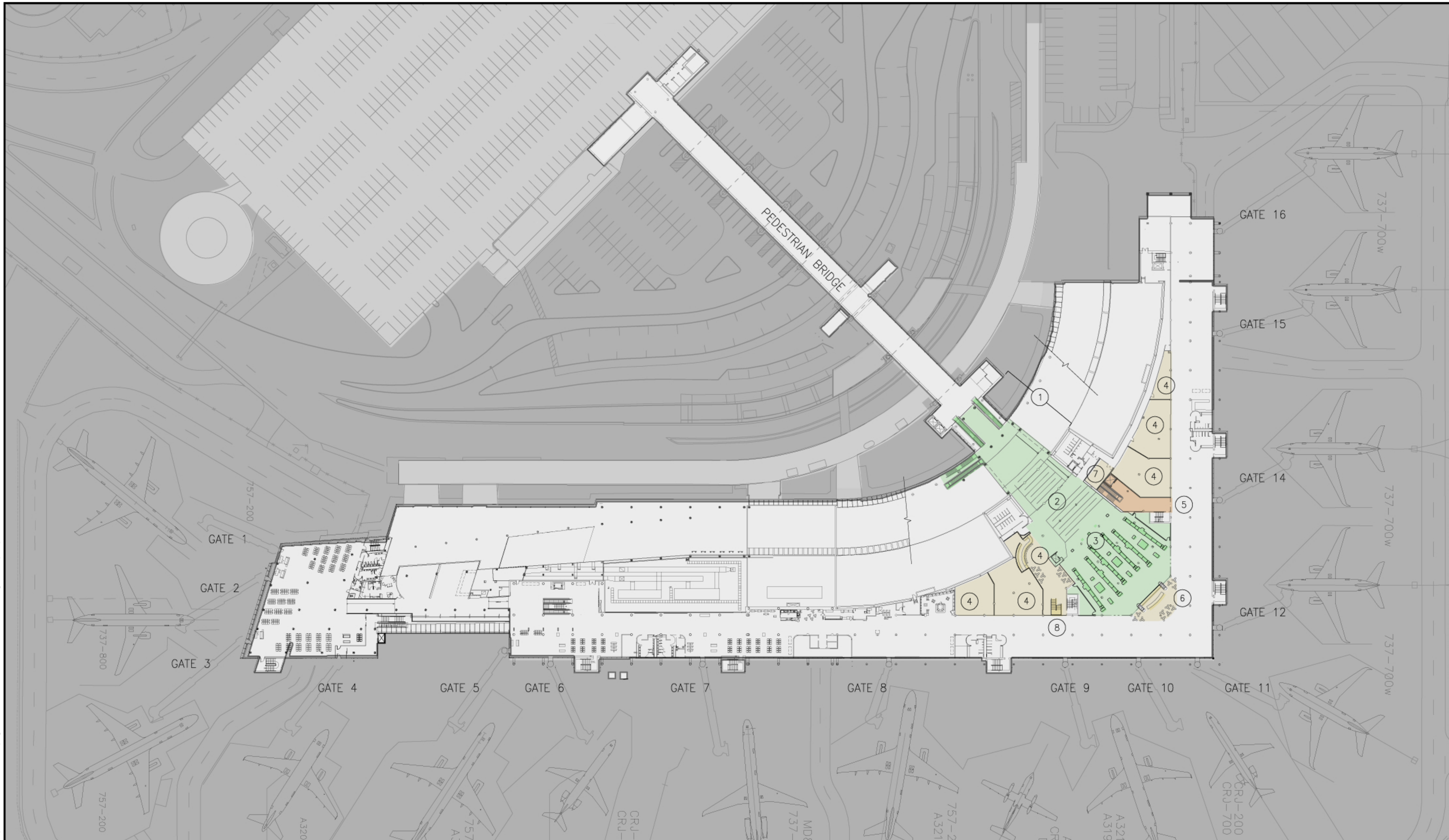

1. NEW PEDESTRIAN BRIDGE CONNECTOR
2. PASSENGER QUEUING
3. NEW 6 LANE CHECKPOINT
4. RENOVATED CONCESSION AREA
5. NEW DIRECT DEPLANING CORRIDOR FROM CONCOURSE TO BAGGAGE CLAIM.
6. NEW CONCESSION AREA
7. NEW CONCESSIONS STORAGE
8. RELOCATED STAIR TO OBSERVATION AREA

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PAL 2 OVERALL PLAN - LEVEL 2

FIGURE 7.12-5

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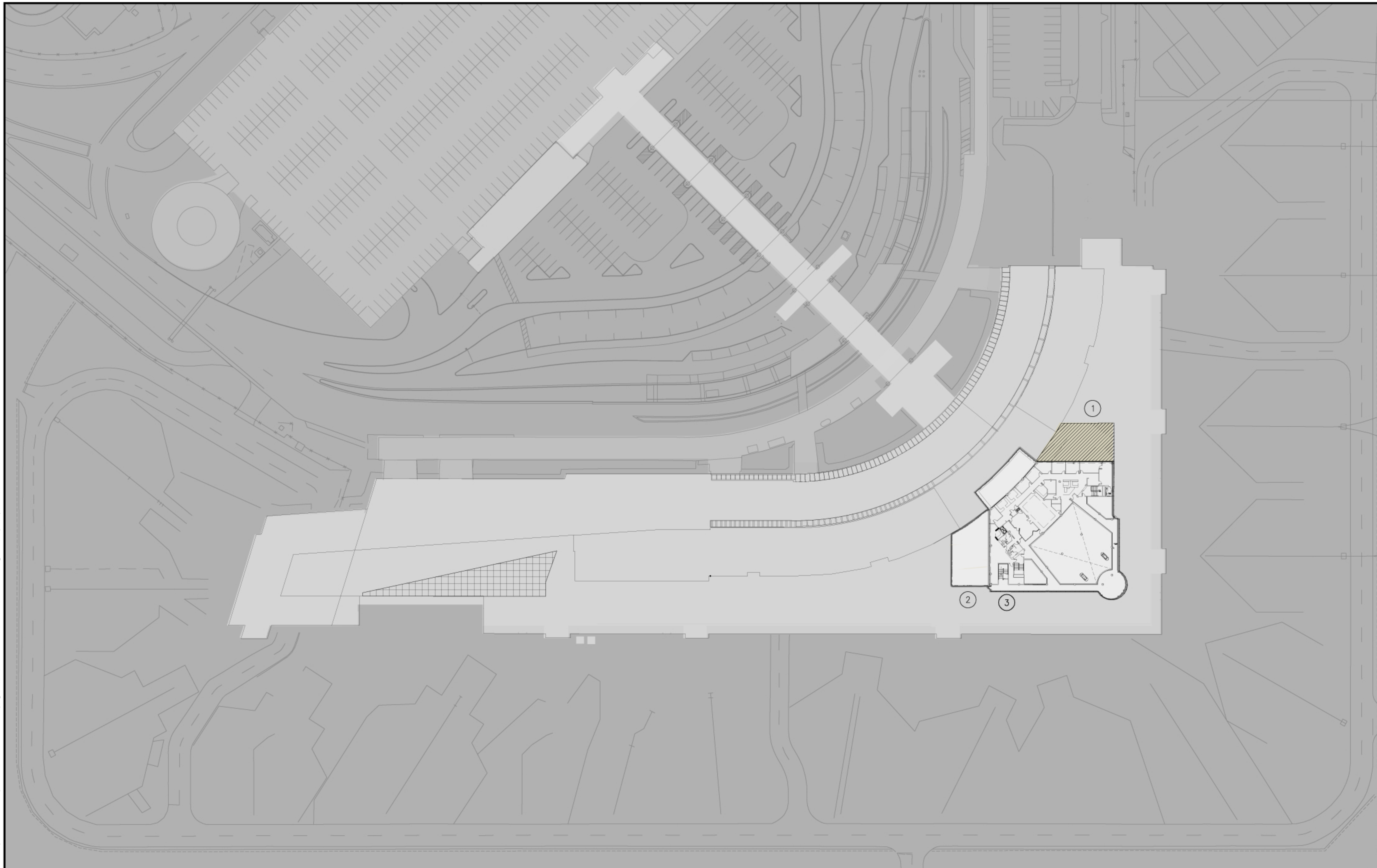

1. E&P RELOCATION AND EXISTING ADMINISTRATION OFFICE RENOVATIONS
2. EXPANSION/OFFICE RENOVATION FROM RELOCATED STAIR
3. RELOCATED STAIR

N

SCALE: 1" = 100'

100 50 0 100 200

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PAL 2 OVERALL PLAN - LEVEL 3

FIGURE 7.12-6

MANCHESTER-BOSTON REGIONAL AIRPORT

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SECTION EIGHT

Development Planning

SECTION 8.0
DEVELOPMENT PLANNING

8.1 INTRODUCTION

This section presents the 20-year development planning for Manchester-Boston Regional Airport (MHT). The planning is described in a series of development topics for clarity and understanding. Emphasis is placed on capital improvements through the year 2030, in keeping with the Federal Aviation Administration (FAA) definition of a 20-year master plan. However, provisions are made for expanding the airport beyond twenty years to its ultimate capacity and configuration.

The planning described and displayed in this section includes short- to long-term airport improvement features selected during the planning phase of the study. Major topic areas that were identified and described in this section include:

- Land Acquisition/Land Control,
- On-Airport Land Use,
- Airfield/Airside improvements and considerations,
- Midfield Terminal area improvements and potential ultimate development,
- Rental Car Storage/Lot "E" redevelopment planning,
- Air Cargo area planning,
- General Aviation area planning,
- Airport Maintenance Facility expansion,
- Fuel Farm expansion, and
- Potential non-aviation development areas

8.2 LAND ACQUISITION/LAND USE CONTROL PLAN

8.2.1 INTRODUCTION

Existing MHT property, as shown in Section 2.0, Inventory, consists of approximately 1,200 acres. The official airport property map, referred to as the Exhibit "A" Property Map, is maintained and periodically updated by MHT staff.

As shown on **Figure 8-1**, this Airport Master Plan Update identified additional land acquisition for land control purposes and additional Avigation Easements to be acquired. The proposed property acquisition and Avigation Easements are described in the following sub sections.

8.2.2 *PROPERTY ACQUISITION*

8.2.2.1 Runway 6 Runway Protection Zone Property

The FAA recommends that an airport own or control land within its Runway Protection Zones (RPZs) to enhance the protection of people and property on the ground. A number of properties within the Runway 6 RPZ have been purchased over the years. The latest parcel to be acquired was the Highland property in July 2010. About 30 to 40 percent of this property is located in the Runway 6 RPZ.

There are still a number of residential properties within the Runway 6 RPZ that have not yet been purchased. Residential properties within the Runway 6 RPZ are recommended to be purchased in the future, as they become available. There are approximately 27 parcels consisting of approximately 8.6 acres.

8.2.2.2 North Side Airfield Service Road (Adjacent to the Jewel Property)

A segment of the existing north side airfield service road, located adjacent to the Jewel property, is currently nonconforming to the FAA airfield Object Free Area (OFA) design standards. Acquisition of approximately 1.3 acres of the Jewel property is required in order to relocate the existing airfield service road outside the OFA. This property has been identified as a future airport acquisition, when available.

8.2.2.3 Former FAA Radar Site

The former FAA radar site, located south of the airport, should continue to be programmed for possible future land acquisition. This parcel of property consists of approximately 67.4 acres. If, and when this government-owned property becomes available under the government surplus land program, the airport should be in a position to acquire it through transfer or purchase. The previous Airport Layout Plan (ALP) depicted this parcel as a possible CONRAC facility site. This could still be considered a long-term potential use to support the airport ground transportation element.

8.2.2.4 Noise Land

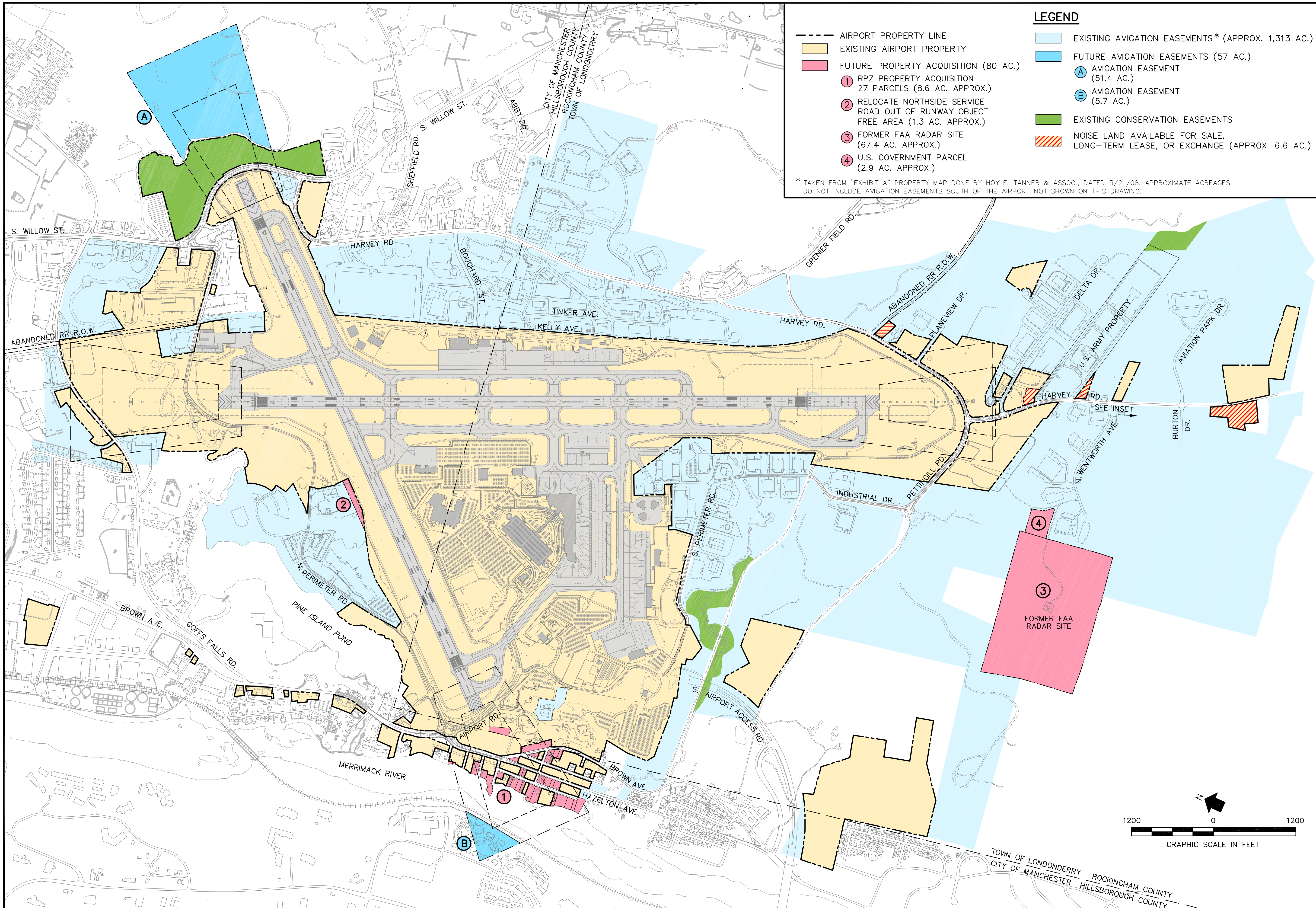
The MHT Noise Land Inventory/Reuse Study (2010) identified six parcels (shown previously on Figure 8-1) to be sold or leased. All six parcels are located on the south end of the airport, along Harvey road. The airport plans to retain these six parcels until market conditions improve to allow the sale or lease of the properties.

Other future fee simple property acquisitions have not been identified at this time in this plan. However, in the future if the opportunity to purchase additional potential revenue producing land around the airport as it becomes available, the airport will consider it.

8.2.3 *FUTURE AVIGATION EASEMENTS TO BE ACQUIRED OFF RUNWAY 6/24*

8.2.3.1 Runway 6 Runway Protection Zone

The Runway 6 RPZ footprint extends off-airport, across the Merrimack River. Approximately 5.7 acres of Avigation Easement is to be acquired.



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LAND ACQUISITION/LAND USE CONTROL PLAN

FIGURE 8-1

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8.2.3.2 Runway 24 Runway Protection Zone

The Runway 24 RPZ footprint extends off-airport, over wetland area. Approximately 51 acres of Avigation Easement is to be acquired.

8.3 FUTURE AIRPORT LAND USE PLAN

An essential ingredient to the efficient operation of an airport is the organization of the various functions that occur on the airport into manageable units. These units should be organized in such a manner as to provide equal status to like uses, while at the same time separating units to allow for expansion as the airport continues to develop.

Previously in Section 2.0, Figure 2.16 illustrated the existing on-airport land use plan for MHT, whereas, **Figure 8-2** illustrates the future on-airport land use plan. All airport property is shown belonging to a land use category (see **Table 8-1**).

8.3.1 ON-AIRPORT LAND USE CLASSIFICATIONS

Categories of existing and future on-airport land use and their respective acreage area for regulatory and comparison purposes are presented in Table 8-1. The following paragraphs define each of these categories, and describe where on the airport property these land uses are located.

TABLE 8-1
ON-AIRPORT LAND USE CATEGORIES

Airport Land Use Category	Future Land Use Plan (acres)
Airfield/RPZs	551
Terminal Area	29
Terminal Support	97
General Aviation	29
Aviation Related	14
Air Cargo	46
Operations	24
Light Industrial/Commercial Business Park/ Mixed Use	146
Institutional	3
Environmentally-Sensitive Land	157
Open Space	59
Future Property Acquisition	81
Total	**1,236**

Source: Compiled by URS Corporation, 2010.

8.3.1.1 Airfield/RPZs

This category includes land that is used for runway/taxiway pavements, navigational aids (NAVAIDS), and RPZs that are located beyond each runway end. On the future airport land use plan, the Airfield/RPZ category consists of approximately 551 acres, as depicted in Figure 8-2. The future airfield land use plan includes the proposed future relocation of Ammon Drive and the airport service road along the southeast side of Runway 6/24. This road relocation is required to meet FAA airfield OFA design standards.

8.3.1.2 Terminal Area

This designation encompasses all the facilities needed to serve commercial airline service and passenger needs. These facilities include, but are not limited to, the passenger terminal and the aircraft apron adjacent to the terminal. On the future airport land use plan, the Terminal Area category will increase from 23 acres to 29 acres (see Figure 8-2). The future airport land use plan reserves land on the north side of the terminal for future expansion. This would include potential baggage claim facility expansion, new concession supplies/materials delivery area, new loading dock/freight elevator, new concession storage space, miscellaneous terminal support space, and concourse expansion to accommodate up to seven additional aircraft parking positions/gates ultimately.

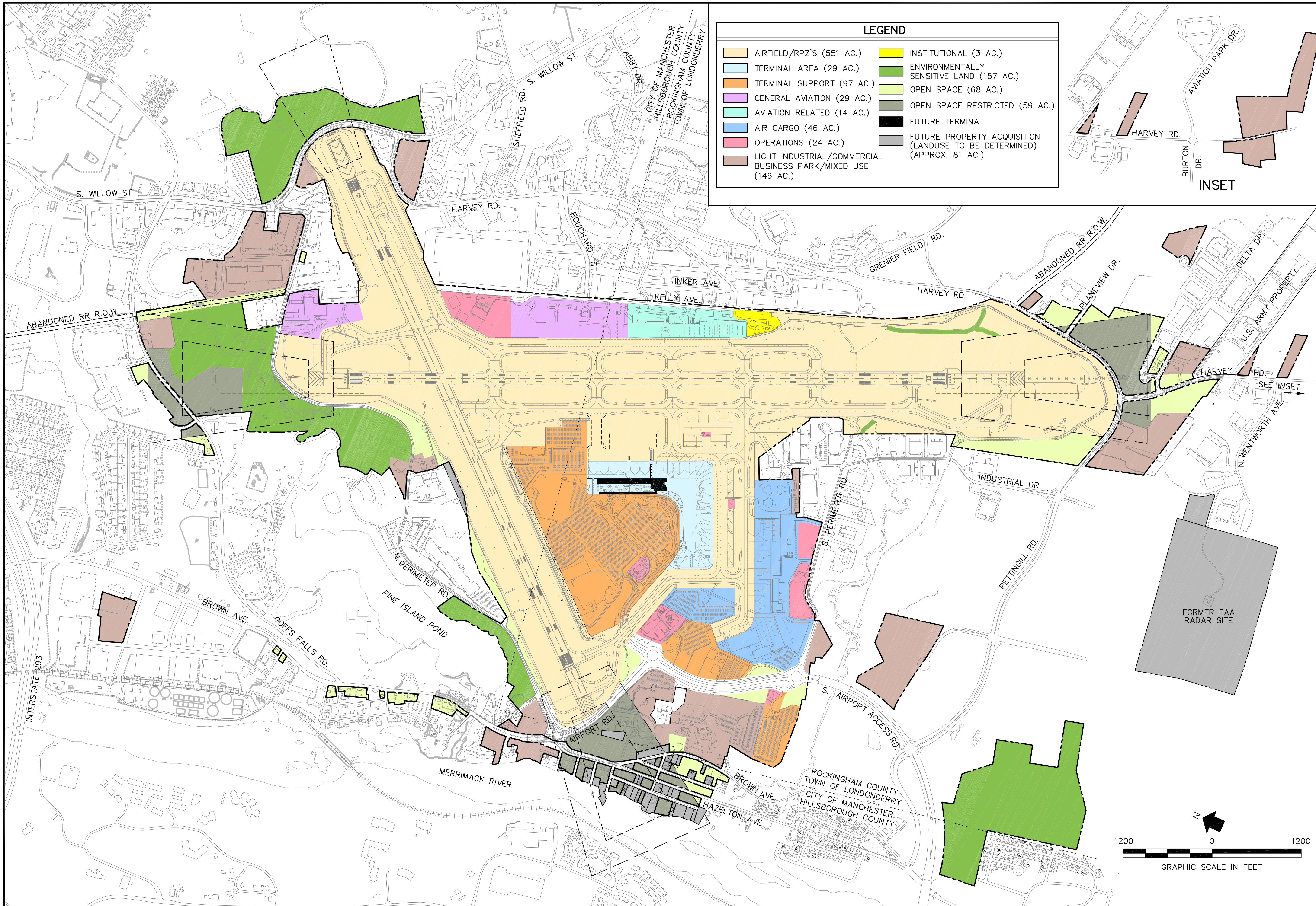
8.3.1.3 Terminal Support

This land use category includes land that is used for facilities associated with terminal area activities. These uses include public parking Lots “A” through “D,” employee parking, taxi/limo/bus pick up areas, rental car ready and return, rental car maintenance (quick turnaround (QTA)) areas, as well as non-active remote public parking areas designated as parking Lots “E” through “G.” Employee parking areas are also included. Parking Lot “G,” however, is currently leased to an auto dealer (IRA Toyota) for car dealership vehicle storage.

On the future airport land use plan, it is anticipated that this land use category will consists of approximately 97 acres as depicted previously in Figure 8-2. Several structures are programmed to be removed over time. Current long-term leases will affect the timing of removing certain structures. The future midfield terminal support area plans include the eventual removal of four structures: Ammon Center, Freudenberg NOK, and two old hangars in this area. In the long-term, the majority of the midfield area would be reserved and converted to future public auto parking.

8.3.1.4 General Aviation

All general aviation activities at MHT are grouped under this land use designation. This includes both general aviation commercial activities (Fixed Base Operators (FBOs)) and general aviation non-commercial facilities (i.e., aircraft storage hangars). The general aviation commercial aviation function, by definition, consists of the FBOs and specialized FBOs that provide commercial aircraft services. These activities involve the sale of aviation services for a profit to the general public, such as maintenance, storage, and service of aircraft; sale of aircraft; sale of aircraft parts and accessories; sale of aircraft fuel and lubricants; and non-scheduled and charter transportation. The non-commercial aviation function, by definition, consists of those activities which involve the facilities for storage and service of aircraft for an individual, private organization, or corporation.



Manchester-Boston REGIONAL AIRPORT

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FUTURE AIRPORT LAND USE PLAN

FIGURE 8-2

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All general aviation facilities, on the existing land use plan, are located in three distinct areas: the existing area east of Runway 17/35, the existing area north of Runway 6/24 and the existing area west of Runway 17/35, and south of Taxiway "E" and east of the existing air cargo area.

The future airport land use plan anticipates that the three existing general aviation areas would be expanded or redeveloped (see Figure 8-2). On the east side, it is anticipated that the general aviation (Wiggins FBO) area could be expand to the north by filling in a portion of the area adjacent to Taxiway "H" between airport maintenance and the FBO. On the northeast side, there is a small track of undeveloped land that is reserved for future general aviation development. On the southwest side, the three existing Aerohex Hangars, area adjacent to the air cargo facilities could be redeveloped in the long-term, as needed, and as depicted on the future land use plan for other uses.

8.3.1.5 Aviation-Related Development

The area south of the Wiggins FBO and north of the Aviation Museum has been designated for future aviation-related development. The total area consists of approximately 14 acres that includes the existing apron area. This is a market opportunity to develop the entire 14-acre track or subdivide it as necessary to achieve the highest and best use of the land. There are a number of potential market opportunities that includes Maintenance Repair and Overhaul (MRO) facility, second FBO, corporate aviation jet center, etc.

8.3.1.6 Air Cargo

An area located adjacent to Taxiway "E" has been developed for air cargo use. Current tenants include United Parcel Service (UPS), FedEx, Telford Aviation, Mountain Air Cargo, and Wiggins Airways, Inc.

On the future airport land use plan it is anticipated that the future Air Cargo category could expand from 32 acres to approximately 46 acres (see Figure 8-2). The potential long-term expansion of the Air Cargo area would include: 1) removing the existing Aerohex Hangars and converting the site to Air Cargo facilities and 2) converting of a portion of the existing parking Lot "E" to future Air Cargo facilities.

8.3.1.7 Operations

This designation encompasses facilities needed to serve and support operational aspects of the airport. These facilities include, but are not limited to: Aircraft Rescue and Fire Fighting (ARFF) station, airport maintenance and equipment storage, airport bus shuttle maintenance, Airport Traffic Control Tower (ATCT), airline fuel storage/fuel farm, de-icing equipment, and sand storage, as well as areas designated for snow collection and run-off.

It is anticipated that this category will increase from approximately 17 to 24 acres on the future airport land use plan as depicted previously in Figure 8-2. Future plans indicate an area located on the northeast side adjacent to the existing airport maintenance facility and Taxiway "H" is reserved for expanded maintenance facilities.

8.3.1.8 Light Industrial/Commercial Business Park/Mixed Use

This category includes approximately 52 acres of land that is used for light industrial, commercial, or business park-related activities.

Over time, this land use category is expected to increase to 146 acres (see Figure 8-2). Some land currently designated as Airport Open Space on the existing airport land use plan is expected to be converted to the Light Industrial/Commercial Business Park land use category.

8.3.1.9 Institutional

The Institutional category includes land occupied by the Aviation Museum of New Hampshire, which was relocated and restored on the east side of the airport in 2004. An additional educational facility has been constructed next to the Aviation Museum. This facility is operated and managed by the New Hampshire Aviation Historical Society. As shown on the existing airport land use plan, approximately 3 acres has been designated for Institutional use. It is anticipated that the acreage for this category will remain the same on the future airport land use plan as depicted previously in Figure 8-2.

8.3.1.10 Environmentally-Sensitive Land

This category includes environmentally-sensitive land on the airport that should remain undeveloped through the planning period and beyond. There are four areas on airport property identified as environmentally-sensitive land. This land use category includes approximately 157 acres and is depicted previously in Figure 8-2.

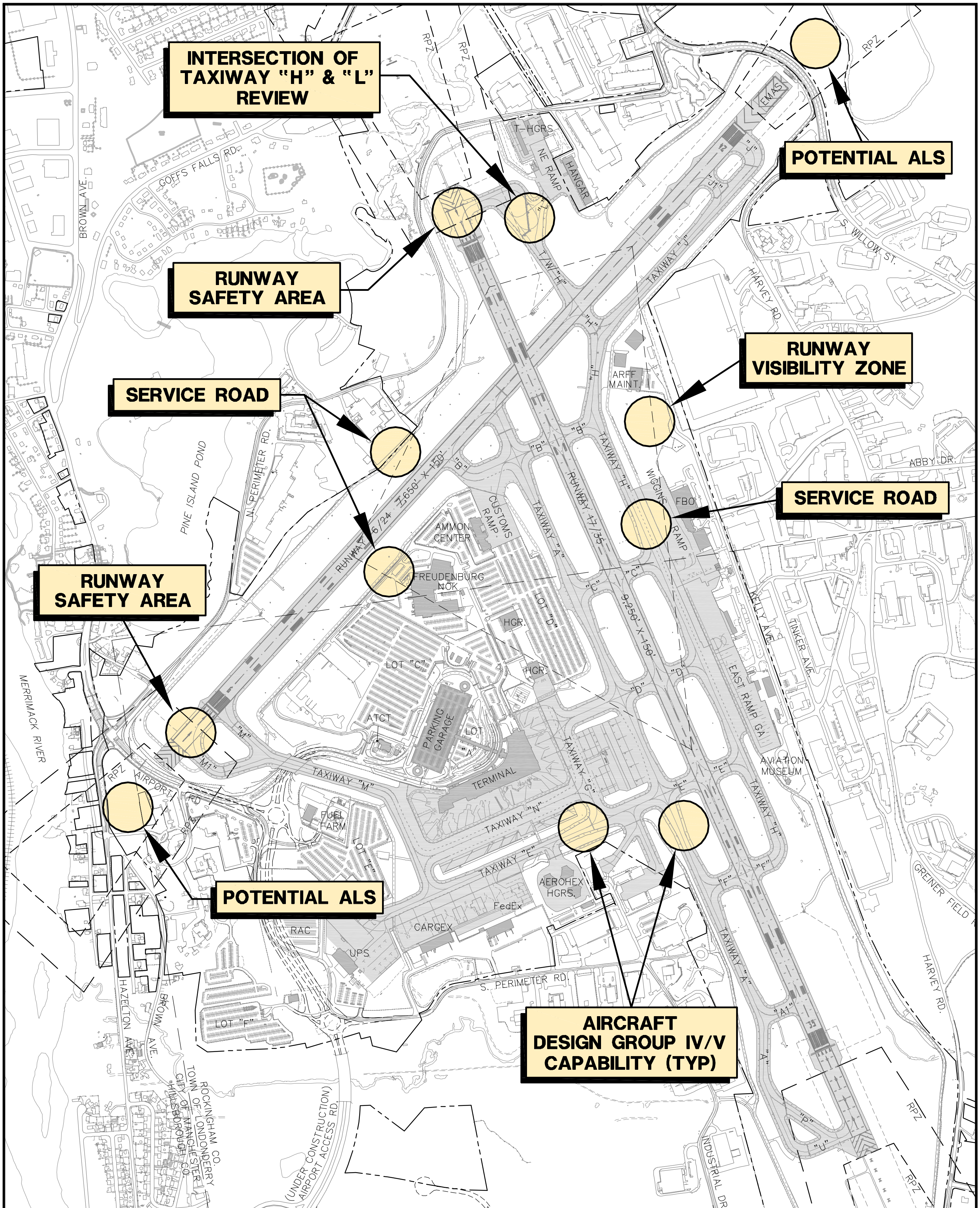
An existing environmental-sensitive area is located adjacent to Taxiway "H," between Wiggins FBO and the airport maintenance facilities. In the future, when this land is needed for airport maintenance and operations facility expansion and or FBO/General Aviation expansion, the area would be developed. On the future land use plan, this area is shown as operations and general aviation.

8.3.1.11 Open Space

This classification of open space identifies areas of land free of any structure or dedicated use. On the future airport land use plan, as depicted previously in Figure 8.2, this category consists of approximately 59 acres. It is anticipated in the future that this category could be reduced as more land is converted to revenue producing land for the airport.

8.4 AIRFIELD PLANNING CONSIDERATIONS

Major airfield improvements were addressed in the 1998 Airport Master Plan Update. Over the last 10 years, a majority of the airfield improvements proposed in the 1998 Airport Master Plan Update have been implemented. The major items include extending Runways 17/35 and 6/24, extending Taxiway "A," construction of Taxiway "M" and a structural overpass over Airport Road, and substantial Runway Safety Area (RSA) improvements. This Airport Master Plan Update reviewed several outstanding airfield design criteria compliance issues, along with several other airfield-related considerations. These items are summarized in the following paragraphs and shown on **Figure 8-3**. Section 5.0 of this Airport Master Plan Update discusses each of these airfield-related items in detail.



Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

AIRFIELD PLANNING CONSIDERATIONS

FIGURE 8-3

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8.4.1 *AMMON DRIVE/SERVICE ROAD RELOCATION*

Ammon Drive and the vehicle service road along the south side of Runway 6/24 are both currently located within the OFA and do not meet FAA design standards. The plan is to relocate both roadways completely out of the Runway 6/24 ROFA. The roadways would be realigned approximately 112 feet to the south. This roadway relocation project is currently programmed in the 5-year MHT Capital Improvement Program (CIP) and will correct the noncompliance issue.

8.4.2 *EAST SIDE AIRFIELD SERVICE ROAD (ADJACENT TO THE WIGGINS FBO LEASES)*

A section of the east side airfield service road, located adjacent to the Wiggins FBO lease area, is currently in noncompliance with FAA design standards. With the required OFA set-back from Taxiway H centerline, the airfield service road should be located along the inner edge of the existing Wiggins FBO apron area lease hold. When the Wiggins FBO lease expires, the Wiggins FBO apron lease area would be modified and this noncompliance issue will be corrected.

8.4.3 *NORTH SIDE AIRFIELD SERVICE ROAD (ADJACENT TO JEWEL PROPERTY)*

A section of the north side airfield service road that is located adjacent to the Jewel property is currently in noncompliance with FAA design standards. With the required OFA set-back from the Runway 6/24 centerline, the segment of the north side airfield service road should be relocated along the southern edge of the Jewel property. Correcting this issue will require the acquisition of approximately 1.3 acres of the Jewel property. When this land becomes available and the road segment is relocated, this noncompliance issue will be corrected.

8.4.4 *RUNWAY VISIBILITY ZONE (RVZ)*

The MHT RVZ is an irregular, geometrically-shaped zone at intersecting runways that defines an area of an unobstructed line-of-sight between runways. MHT is a controlled airport with a 24-hour ATCT. As long as MHT has a 24-hour ATCT, the unobstructed line-of-sight RVZ criteria does not apply. The RVZ is a good planning line-of-sight guideline that still should be considered when redeveloping this area in the future. There are three existing structures located in the midfield area that are within the RVZ. One is the Freudenberg NOK facility. When this facility’s long-term lease expires, this structure can be demolished and the area converted to auto parking. The Ammon Center is also located within the RVZ. There are two old FBO hangars in the midfield area. One hangar is within the RVZ and the other is just outside the RVZ. These old hangars are currently used for snow removal equipment storage, maintenance of the MHT shuttle bus fleet, and general storage. Both of these old hangars are programmed to be removed in the future when this area is needed for terminal expansion or terminal support facility expansion.

8.4.5 *RUNWAY 6/24 POTENTIAL APPROACH LIGHTING SYSTEMS*

This Airport Master Plan Update depicts future Approach Lighting Systems (ALSs) on both ends of Runway 6/24. For the Runway 6 end, a Medium-Intensity Approach Listing System with Runway Alignment (MALSR) would be desirable, but due to the construction cost and environmental impacts to install a structural lighting system in the Merrimack River, it is not considered feasible at this time. However, a Medium-Intensity Approach Listing System with Sequenced Flashers (MALSF) would not extend into the river and would be feasible from a construction standpoint. Any improvement to enhance the visual approach alignment to Runway 6 is safety-related and is supported by airport management.

For the Runway 24, the operational justification requirements, along with environmental wetland issues associated with the installation of a MALSR, could impact the future implementation of this project. For planning purposes, this Airport Master Plan Update reserves the capability for the future installation of a MALSR on the Runway 24 end.

8.4.6 RUNWAY SAFETY AREAS

The airport meets FAA RSA design standards with the use of Declared Distances on Runways 17/35 and 6/24. These declared distances were determined and implemented in the 2003 to 2006 time frame by the FAA in conjunction with Runways 17/35 and 6/24 improvement projects.

8.4.7 AIRPLANE DESIGN GROUP V AIRCRAFT GROUND CIRCULATION CAPABILITY

MHT is a Design Group IV airport and the most recent airfield improvements associated with both runway extension projects were designed to Group IV standards. Group V aircraft historically have used MHT on an infrequent basis. This Airport Master Plan Update reviewed the taxiway clearance geometry and related issues associated with Group V aircraft taxiing on the airfield. This Group V criteria assessment was discussed in detail in Section 5.0 of this Airport Master Plan Update. At this time, there are no plans to modify existing taxiway clearance geometry to accommodate Group V aircraft.

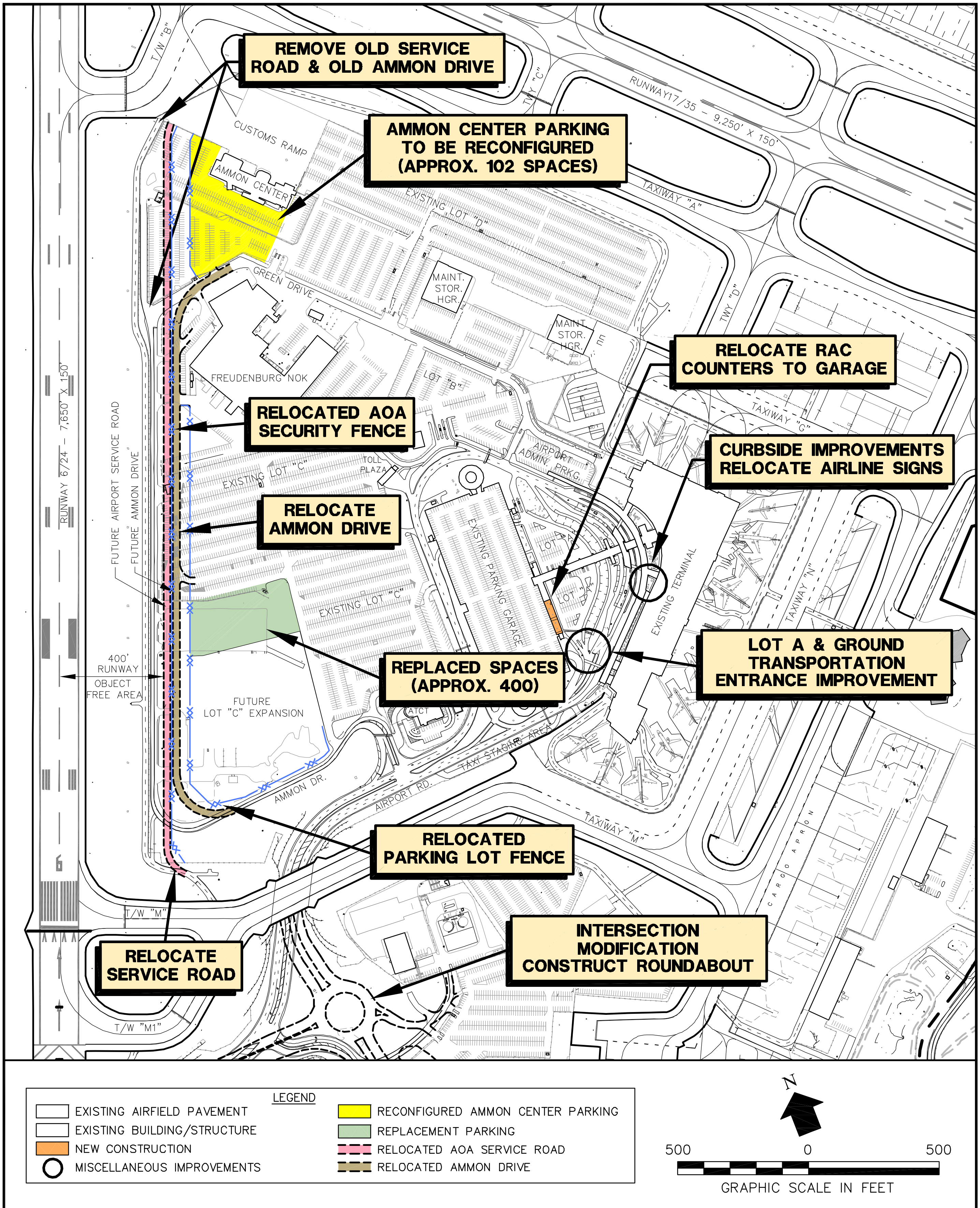
8.5 MIDFIELD/TERMINAL AREA IMPROVEMENT PLAN

For the purpose of defining midfield planning improvements, the plan is divided into three time periods. The three time periods include: 0-10-year Near-Term midfield planning improvements, 10-20-year Long-Term midfield planning improvements, and beyond the 20-year planning period. The “Ultimate” midfield planning improvements, which are beyond the 20-year planning horizon evaluated in this Airport Master Plan Update, are placeholders or areas to be reserved for long-term development. These midfield planning improvements are discussed below.

8.5.1 NEAR-TERM MIDFIELD/TERMINAL AREA DEVELOPMENT PLAN (0-10 YEARS)

As shown on **Figure 8-4**, the Near-Term midfield improvement plan identifies what the anticipated development projects will be included within the next 10-year time period. Within the 10-year planning period, the items identified to date include:

- Airport Road/Perimeter Road Intersection Roundabout New Hampshire Department of Transportation (NHDOT) project (2014),
- Airfield South Side Service Road Relocation,
- Airfield Security Fence Relocation,
- Ammon Drive Relocation,
- Parking Lot “C” Fence Relocation,



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MIDFIELD/TERMINAL AREA IMPROVEMENT PLAN

FIGURE 8-4

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- Parking Lot “C” Expansion Phase 1,
- Ammon Center Parking Lot Reconfiguration,
- Freudenberg NOK Parking Lot Reconfiguration,
- Relocate Rental Car Counters from Terminal to Parking Garage,
- Terminal Curbside Utilization Improvements, and
- Lot “A” and Ground Transportation Signage and Entrance Improvements.

Note: The Service Road/Ammon Drive relocation project is an airfield compliance issue and safety area-related project that needs to done in the next several years, if Federal funding is available.

8.5.1.1 Near-Term Terminal Facility Improvements

The following is a list of proposed near-term improvements and modifications to the Terminal and terminal support facilities. For detailed descriptions on the Terminal facility planning see Section 7.0 of this report.

- PA system upgrades;
- HVAC system upgrade;
- Construct First Aid room;
- Airline sign and landscape improvements;
- Relocate rental car counters to garage, refurbish rent-a-car (RAC) area for concessions and establish a meet and greet waiting area, expand bag claim equipment;
- Consolidate security check points “B” and “C” on second level;
- Upgrade outbound baggage system;
- Renovate Communications Center;
- Merchandise Screening/Concession Storage/Holdroom expansion (Gate 15 area); and
- New Ticket Lobby Entrance Vestibule and curb canopy entrance.

8.5.2 LONG-TERM TERMINAL AREA DEVELOPMENT PLAN (10-20 YEARS)

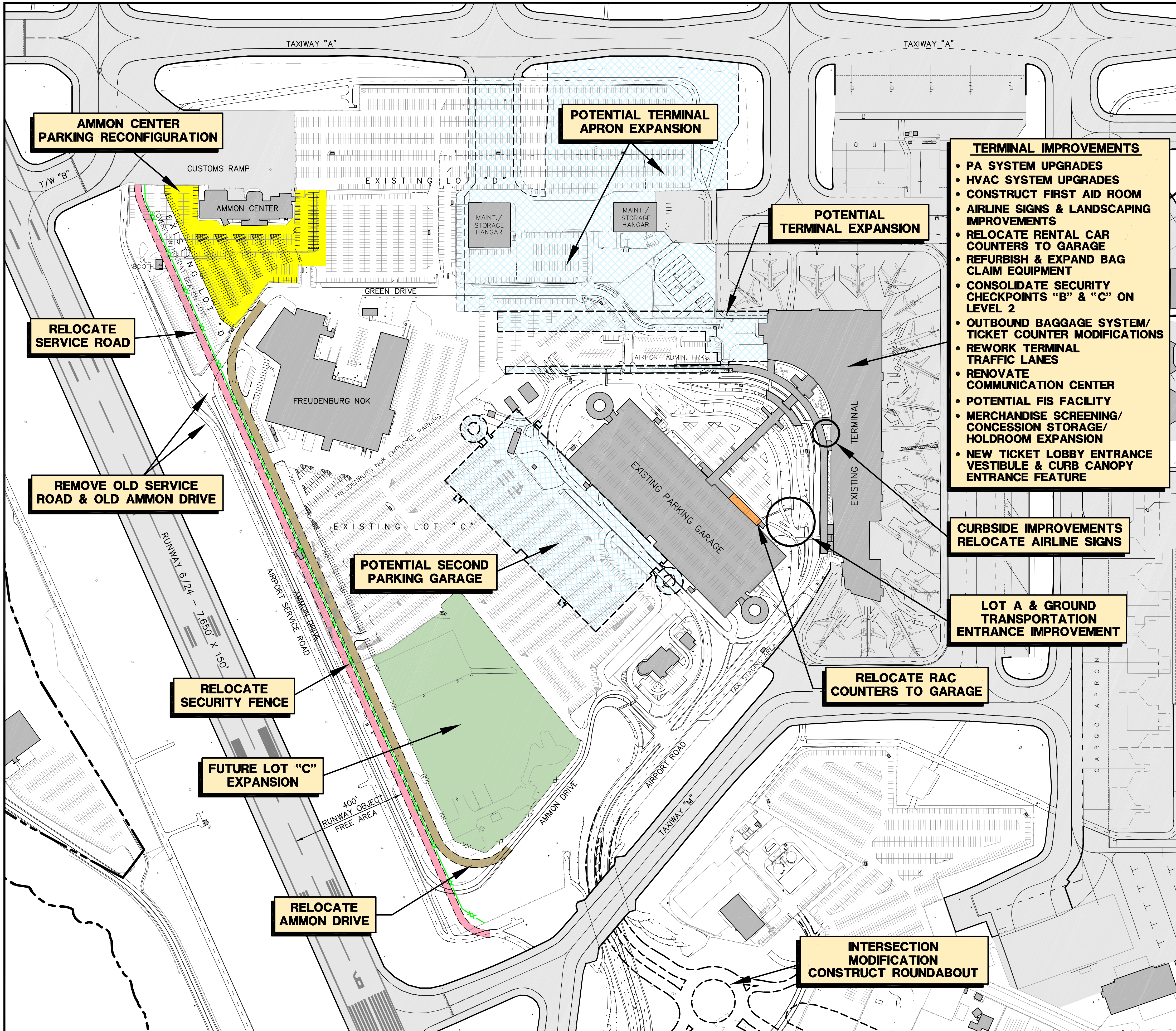
As shown on **Figure 8-5**, a Long-Term midfield improvement plan identifies what the anticipated development will be within the 10- to 20-year time period. Within this planning period, the Freudenberg NOK facility lease expires. The future plan calls for the eventual removal of the Freudenberg NOK facility and expansion of public parking Lot "C."

8.5.3 ULTIMATE MIDFIELD TERMINAL AREA (CONCEPT)

For the ultimate midfield planning purposes, two potential major improvement projects are shown on (Figure 8-5) as place holders for potential expansion. The two major development improvements include a second parking garage, and the expansion of the terminal with a seven gate expanded concourse. These two projects are anticipated to be needed at some point beyond the 20-year planning period.

Two ultimate midfield loop road and parking site configuration options are also presented for future consideration. These are discussed as follows and shown on **Figures 8-6 and 8-7**.

> **Option 1** – This terminal access road concept is shown looping around the second parking garage and was previously presented in the 2004 MHT Terminal area planning study. The ultimate terminal concourse expansion to the east is also shown.
>
> **Option 2** – This is an alternative roadway/parking lot layout to Option 1 that consolidates Lot "C" parking and the garage parking/Lot "A" fee collection plaza into one centrally-located parking fee collection facility.



LEGEND

- EXISTING AIRFIELD PAVEMENT
- EXISTING BUILDING/STRUCTURE
- NEW CONSTRUCTION
- RECONFIGURED PARKING
- FUTURE PARKING
- POTENTIAL AVIATION RELATED DEVELOPMENT
- RELOCATED AOA SERVICE ROAD
- RELOCATED AMMON DRIVE
- MISCELLANEOUS IMPROVEMENTS AREA

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20 YEAR MIDFIELD/TERMINAL AREA IMPROVEMENT PLAN

FIGURE 8-5

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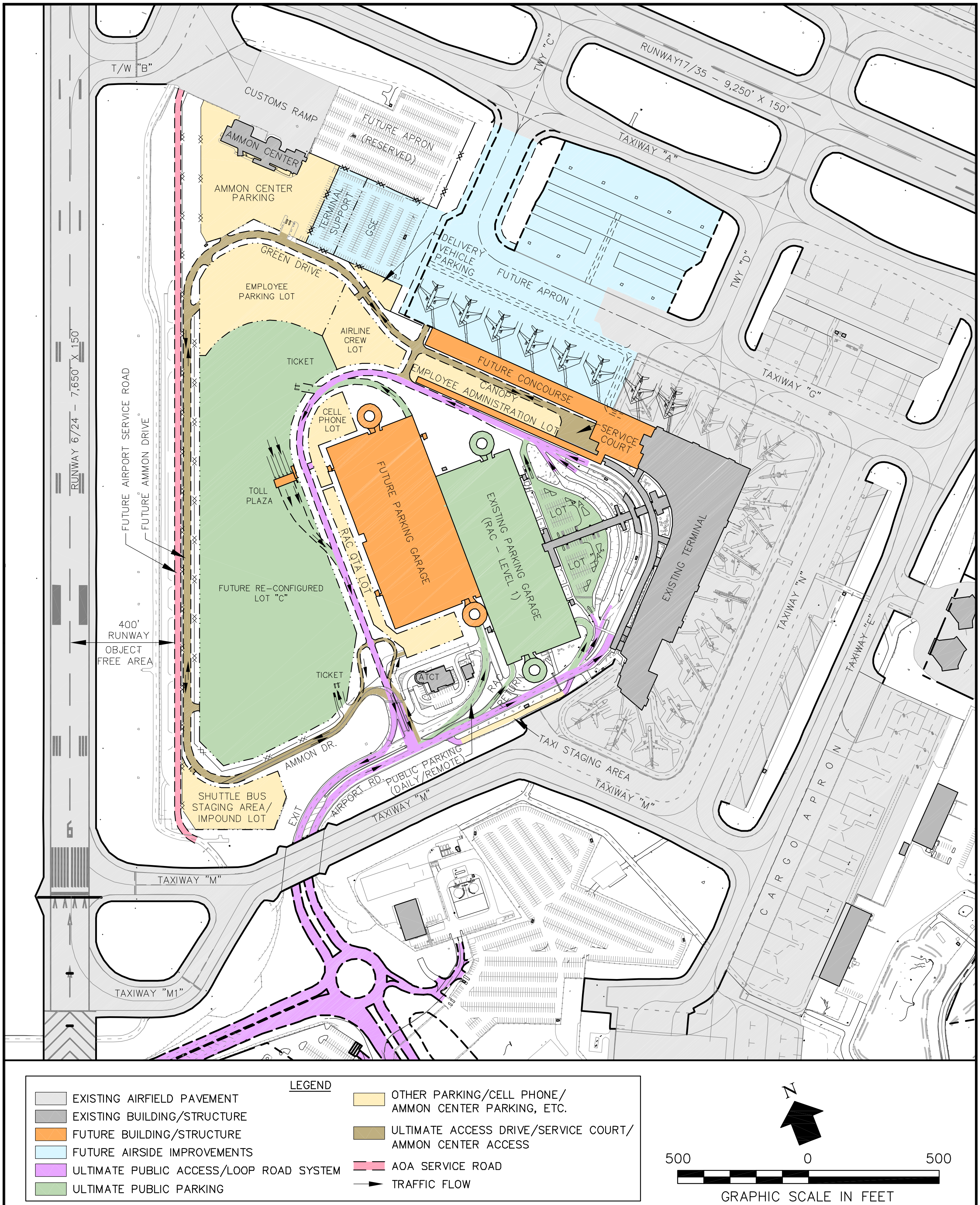

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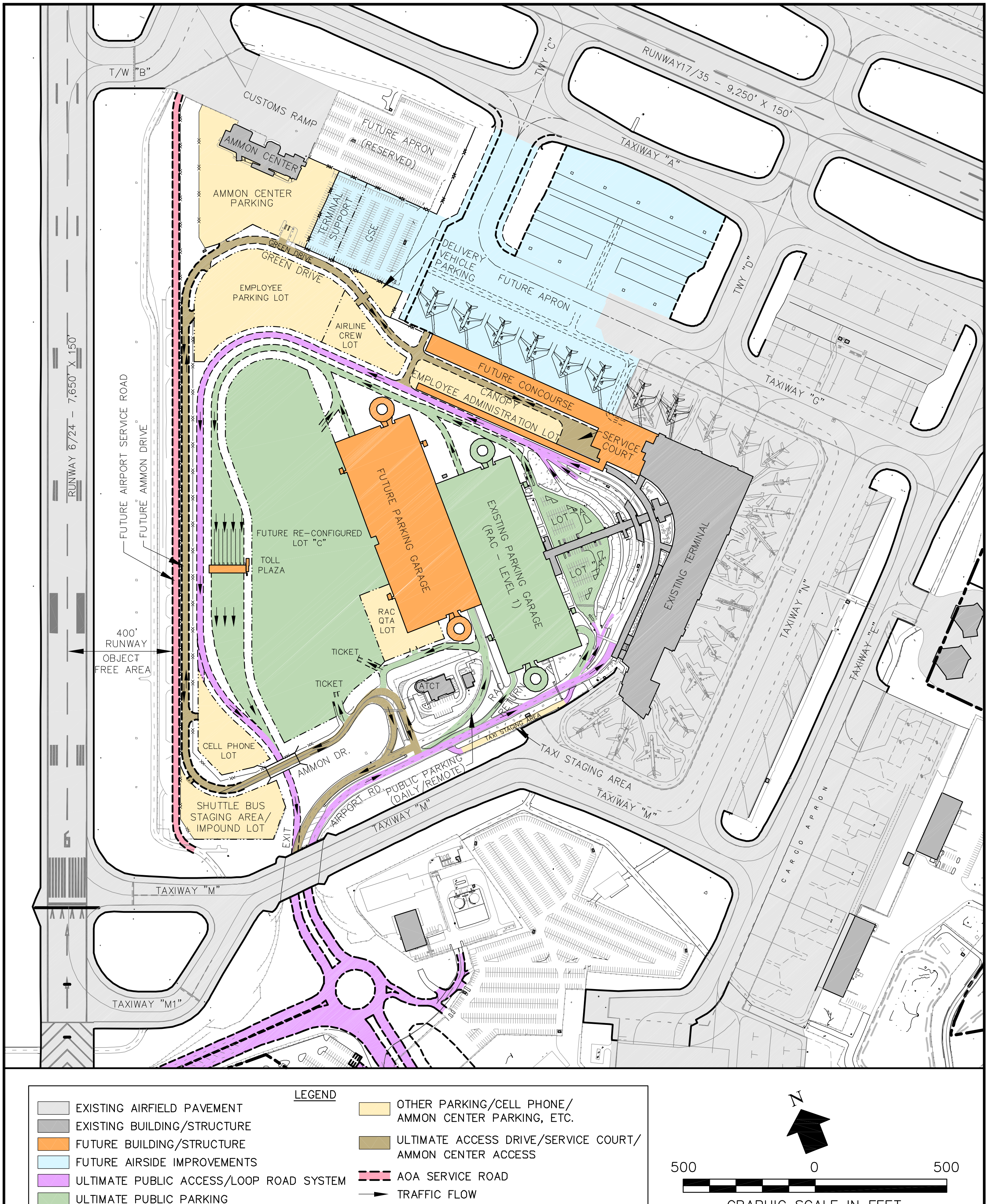
CONCEPT ULTIMATE MIDFIELD DEVELOPMENT PLAN (OPTION 1)

FIGURE 8-6



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CONCEPT ULTIMATE MIDFIELD DEVELOPMENT PLAN (OPTION 2)

FIGURE 8-7

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8.6 LOT "E" REDEVELOPMENT PLAN AND RENTAL CAR STORAGE LOTS

8.6.1 LOT "E" REDEVELOPMENT PLAN

The concept idea evolved to develop a Terminal Support Area close to the terminal to accommodate all the RAC vehicle storage needs along with a potential location for a combined Gas Station, Convenience Store and Cell Phone Lot facility. The existing auto parking Lot "E" was identified as an area that could be redeveloped for this purpose. The highest and best use of the Lot "E" area would be for terminal support functions because of Lot "E's" close proximity to the terminal and convenient location to the new Airport Access Road. The forecast for public parking indicated that the existing midfield parking Lots A through D can accommodate the 20-year demand for long- term public parking. Auto parking Lot "E" is currently inactive and has not been used for remote long-term public parking for some time.

With the Hertz and Budget/Avis reconfigured parcels in place, as a result of the new Airport Access Road, the Lot "E" redevelopment concept plan was to link all the RAC parcels together by a loop service road. Linking the existing Wiggins fuel farm access road with the existing Hertz, Budget/Avis, and National access road/alley way forms a loop service road system into and out of the overall Lot "E" site area. The overall Lot "E" redevelopment concept plan calls for three new rental car storage lots for Dollar, Thrifty, and possibly National in the Lot "E" area. Also, the development of a potential Gas Station/Convenience Store/Cell Phone Lot facility is included in the plan. In addition, potential expansion of the existing Budget/Avis lot to the south is possible by utilizing the section of the old South Perimeter Road that is programed to be removed. The overall concept identifies additional Lot "E" area that is to be reserved for future expanded rental car vehicle storage lots or another Terminal support function.

Key features of the reconfigured RAC lots and the Lot "E" Redevelopment concept plan are listed below and the layout of the preliminary lease areas are shown on **Figure 8-8**.

Key features of the Lot "E" Redevelopment Concept Plan include:

- The new Airport Access Road (under construction).
- New, relocated access connector road to the UPS, Hertz, Budget, and Avis sites.
- Reconfigured existing Hertz, Budget, and Avis lots.
- Second access to the Budget/Avis RAC lot.
- Future small parcel of land reserved for lease next to the Avis lot.
- Reconfigured drainage detention pond.
- Realigned Galaxy Way access road off the roundabout to Wiggins fuel farm and to the reconfigured Lot "E" development area.
- New development/lease areas: new gas station/convenience store site, new cell phone lot, and new RAC (Dollar, Thrifty, and possibly National) storage sites.
- Additional lease area available/reserved for future lease opportunity.

8.6.2 *RENTAL CAR STORAGE LOTS*

The new Airport Access Road corridor alignment impacted the four existing RAC storage lots (Hertz, Budget, National, and Avis) by reducing their lot sizes. One of the early planning considerations discussed was to relocate these RAC storage lots to another area around the airport. It was decided by MHT management that the existing RAC storage lots would remain at their current site and existing leased parcels would be reconfigured to be compatible with the new Airport Access Road right-of-way.

Also there were several other things to consider in reconfiguring the RAC storage lots. The consolidation of the Budget/Avis RAC companies was considered in reconfiguring the lots. National RAC was going through their own consolidation of companies and National was no longer interested in retaining a RAC storage lot at that location. Also, both Dollar and Thrifty RAC companies, who currently maintain off-site RAC storage facilities, requested space from MHT to locate their RAC storage facilities on the airport. The following is a breakdown of each RAC storage lot user.

Hertz – Hertz leases two lots, plus the alleyway located outside and adjacent to their fenced lot area. Hertz QTA services are conducted on these lots, along with RAC storage. Because of the new Airport Access Road right-of-way alignment the existing Hertz lot sizes were slightly modified.

Budget/Avis – The old RAC site currently has Budget and Avis separated by a lot leased by National. As part of the new Airport Access Road projects proposed RAC lot size reconfiguration plan, these companies are to be consolidated and the parcel was reconfigured that included taking over the National parcel. Also, a second access from the existing service road to the reconfigured Budget/Avis site is proposed.

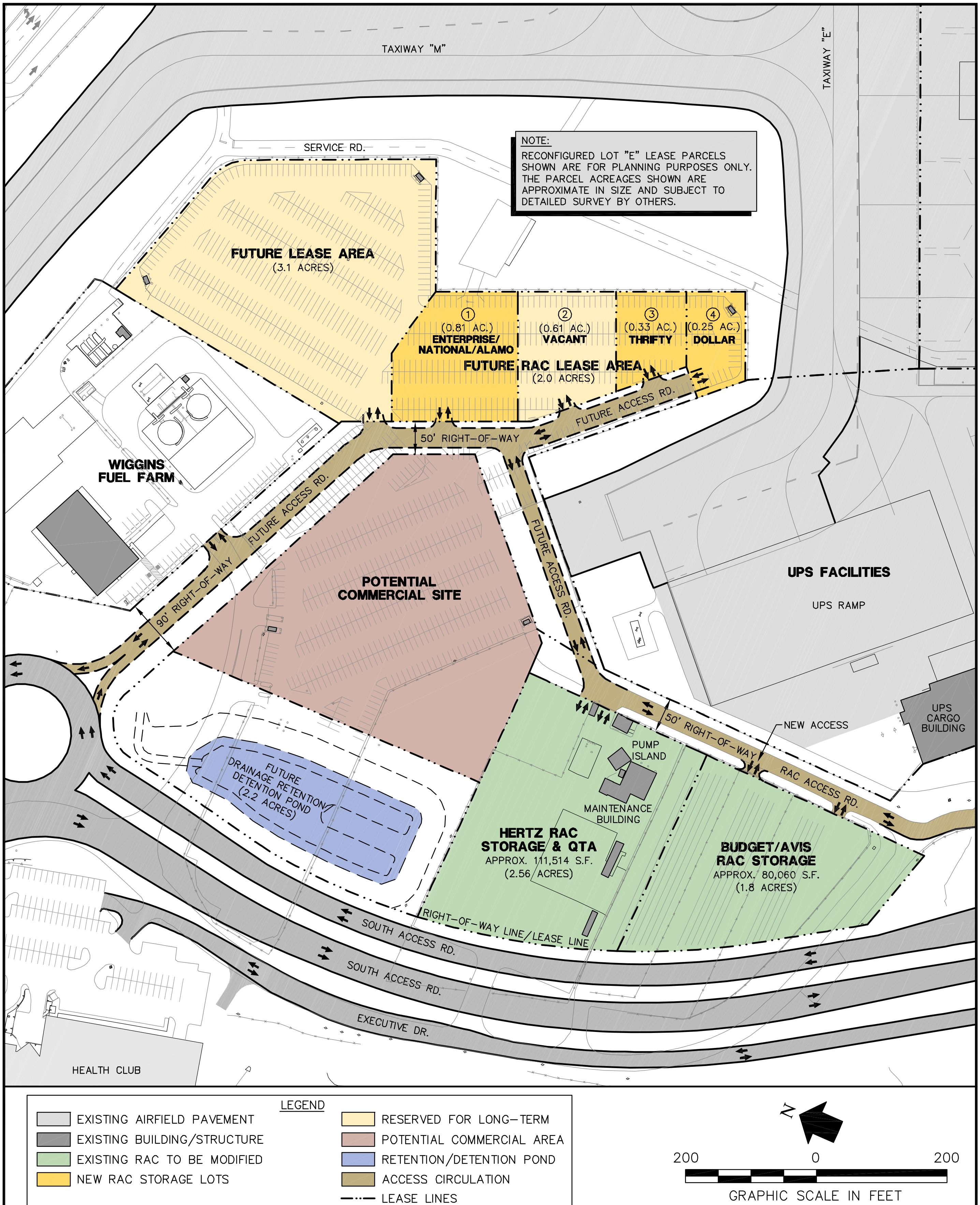
Thrifty – Currently, Thrifty RAC storage is not located on the airport. Thrifty RAC has requested storage on-site and will be accommodated in the new location designated for rental cars in Lot “E,” as shown previously on Figure 8-8. They have requested a lot size of approximately 0.33 acres.

Dollar – Currently Dollar RAC storage is not located on the airport. Dollar RAC has requested storage on site and will be accommodated in the new location designated for rental cars in Lot “E,” as shown previously on Figure 8-8. They have requested a lot size of approximately 0.25 acres.

Enterprise/National/Alamo – National had leased approximately a 0.81-acre parcel between Budget and Avis lots in the old RAC site. With the new Airport Access Road right-of-way, National opted to move out of this space. In the future, National has the opportunity to locate on the airport in the Lot '”E” area designated and reserved for RAC storage. This new RAC site can be a combined/shared space with National partners Enterprise and Alamo, if desirable.

8.6.3 *LOOP SERVICE ROAD*

The Lot “E” redevelopment plan includes a new loop/service access road connecting the existing RAC road/alleyway from the Hertz RAC facility to the Wiggins fuel farm Galaxy Way access road. This new loop/service road provides two access connections to the new Airport Access Road. This service road needs to be able to accommodate auto transport carrier trucks delivering and picking up rental cars. The design of this roadway needs to be wide enough to accommodate the turning of these 55-foot transport truck and trailers. Areas adjacent to the RAC lots need to be wide enough to accommodate parked transport trucks and trailers to be used as a staging areas while they unload/load vehicles from the trailers.



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RENTAL CAR STORAGE LOTS & LOT "E" REDEVELOPMENT PLAN

FIGURE 8-8

The alleyway is a 75-foot by 300-foot unsecured (no fence) area currently leased by Hertz. The alleyway corridor could be used as a common use area for all the RAC auto transport truck carriers as a remote temporary parking area or a staging area for unloading/loading RAC vehicles throughout the year.

8.6.4 DRAINAGE DETENTION POND

As part of the new Airport Access Road project, a drainage detention pond basin of approximately 2.2 acres will be constructed that occupies part of the existing west portion of Lot "E." The overall drainage pond and easement parcel size would be approximately 2.7 acres.

8.6.5 GAS STATION/CONVENIENCE STORE/CELL PHONE LOT CONCEPT

The Lot "E" redevelopment plan calls for the development of approximately a 3.0- to 3.5-acre site for a Gas Station/Convenience Store/Cell Phone lot facility. The site would be configured to provide convenient access off the new Airport Access Road into a gas station and convenience store. As part of this facility, a cell phone lot should be considered. The Cell Phone lot should consist of approximately 40 to 50 customer parking spaces. Also, an airline flight information display board should be considered at the cell phone lot to provide waiting customers arriving flight information so they could plan when to proceed to the Terminal curb to pick-up arriving passengers.

Two site configurations were considered, as shown on **Figure 8-9**. Option 1 is the preferred option.

8.6.6 ULTIMATE REUSE OF LOT "E"

The ultimate plan for the Lot "E" redevelopment site area, beyond the 20-year horizon, is to accommodate potential long-term Air Cargo expansion. Within the 20-year planning period, this area is not expected to be needed for Air Cargo expansion. If a regional Air Cargo Mini Hub facility was to be considered for MHT, the Lot "E" area and adjacent areas, including the existing Air Cargo facilities space, would be the site for complete reconfiguration and redevelopment of a new Air Cargo complex.

8.7 AIR CARGO FACILITIES

8.7.1 INTRODUCTION

This section depicts the existing conditions and discusses future considerations for Air Cargo on the airport. Section 2.0 of this report documents existing conditions of all the cargo elements to serve MHT that includes the commercial airline cargo handling agent Quantem Aviation Services and the integrated cargo carriers such as UPS, FedEx, and DHL.

To understand the future needs of the cargo carriers at MHT, interviews were conducted with the air cargo managers of the major all-cargo/integrated carriers during the planning phase of the study. The general theme from all the interviews was that cargo traffic has steadily decreased in recent years and it is going to take time just to recover and get back to where cargo traffic activity and cargo tonnage was 5 to 6 years ago.

None of the cargo carriers expressed any desire to expand their current facilities at the present time. All the air cargo carriers stated that there was a surplus of existing space. The air cargo carriers indicated that it would take at least 5 years or more before additional space would even be considered.

For planning purposes, the cargo area that has historically been reserved for all air cargo development will remain the designated air cargo area throughout the 20-year planning period and beyond. The previous planning documents have shown the expansion capabilities of the existing cargo facilities (buildings and aprons) which for the purposes of this 20-year Airport Master Plan Update will remain on future plans.

From a strategic stand point, MHT was at one time considered as a candidate for the development of a mini regional air cargo hub. This idea and capability should be retained as a long-term possibility. Land has been identified to accommodate this concept.

8.7.2 AIR CARGO OPERATORS/FACILITIES

The following is a brief overview of the MHT Air Cargo operations and facilities, by tenant. The majority of cargo facilities at the airport are leased to Cargex, which, in turn, subleases buildings and ramp space to various operators, including FedEx and Quantem Aviation. UPS has land lease with the airport. **Figure 8-10** shows the locations of cargo areas operated by FedEx, Cargex, and UPS at MHT.

8.7.2.1 Cargex

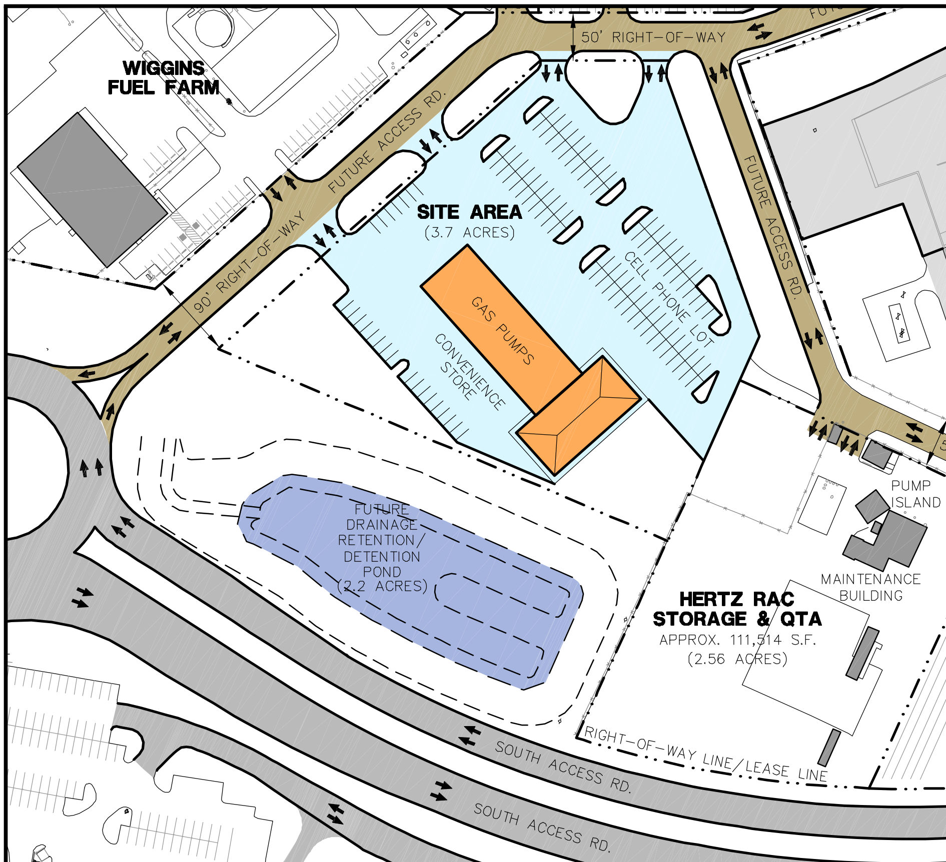
Cargex is an Air Cargo Facility Developer who leases several large parcels of property from the airport. A number of cargo buildings and support facilities have been constructed by Cargex on airport land. In total, Cargex leases just under 722,000 square feet of land at the airport. In addition to the land leases, Cargex also leases approximately 41,000 square feet of building space in the “Ammon Center.”

8.7.2.2 FedEx

FedEx leases building, apron, and other facilities from Cargex. FedEx has approximately 99 employees on the airport. Vehicle and truck parking spaces are available on site for 66 employees, 37 trailers, and 31 tractors. On the airside, FedEx aircraft utilize three wide-body aircraft gates with hardstands, one narrow-body aircraft gate, and five feeder aircraft gates. FedEx has indicated they do not have any expansion plans at the present time.

8.7.2.4 Quantem Aviation Services

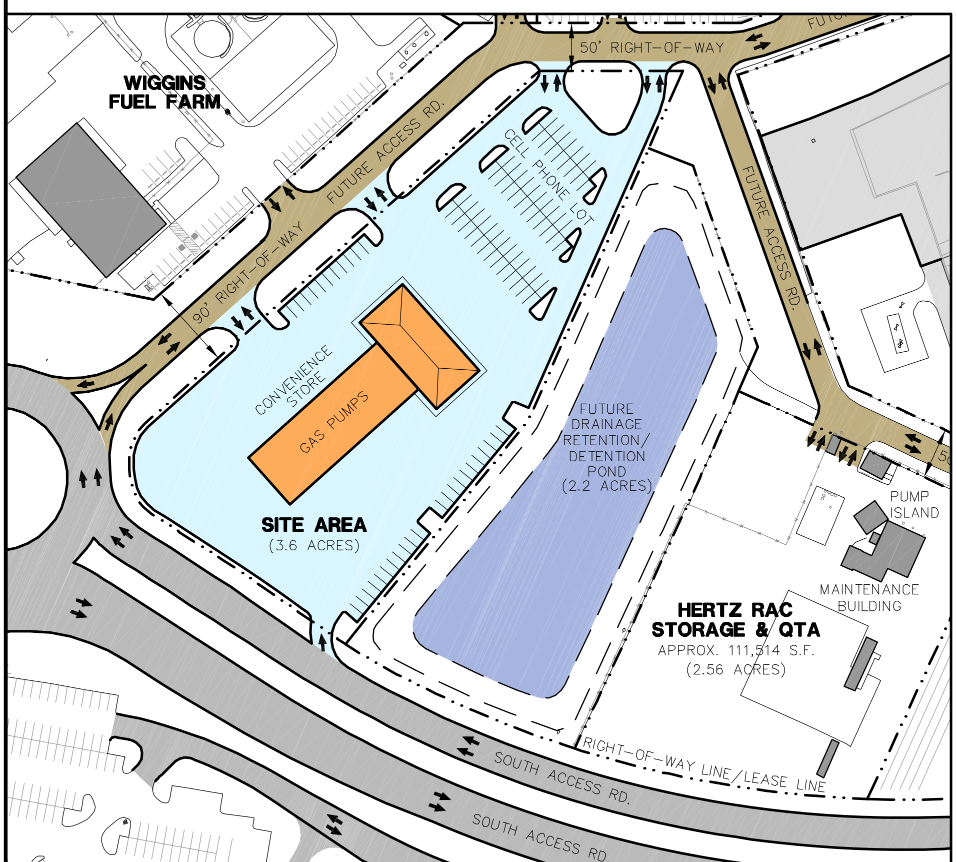
Quantem Aviation Services, the commercial airline cargo handling agent leases building, apron, and other facilities from Cargex at 38 Perimeter Road. Quantem Aviation Services management has indicated they do not have any expansion plans at the present time.



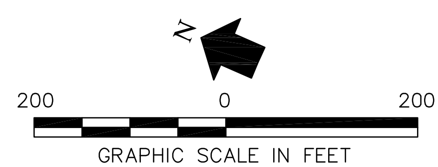
OPTION 1

LEGEND

- AIRFIELD PAVEMENT
- AIRPORT BUILDING
- FUTURE SOUTH AIRPORT ACCESS ROAD
- FUTURE GAS STATION PAVEMENT
- FUTURE CONVENIENCE STORE/ GAS PUMP ISLAND CANOPY
- FUTURE ACCESS ROAD
- FUTURE DRAINAGE BASIN



OPTION 2



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Airport Master Plan Update

LOT "E" GAS STATION/CONVENIENCE STORE/ CELL PHONE LOT CONCEPT PLAN

FIGURE 8-9

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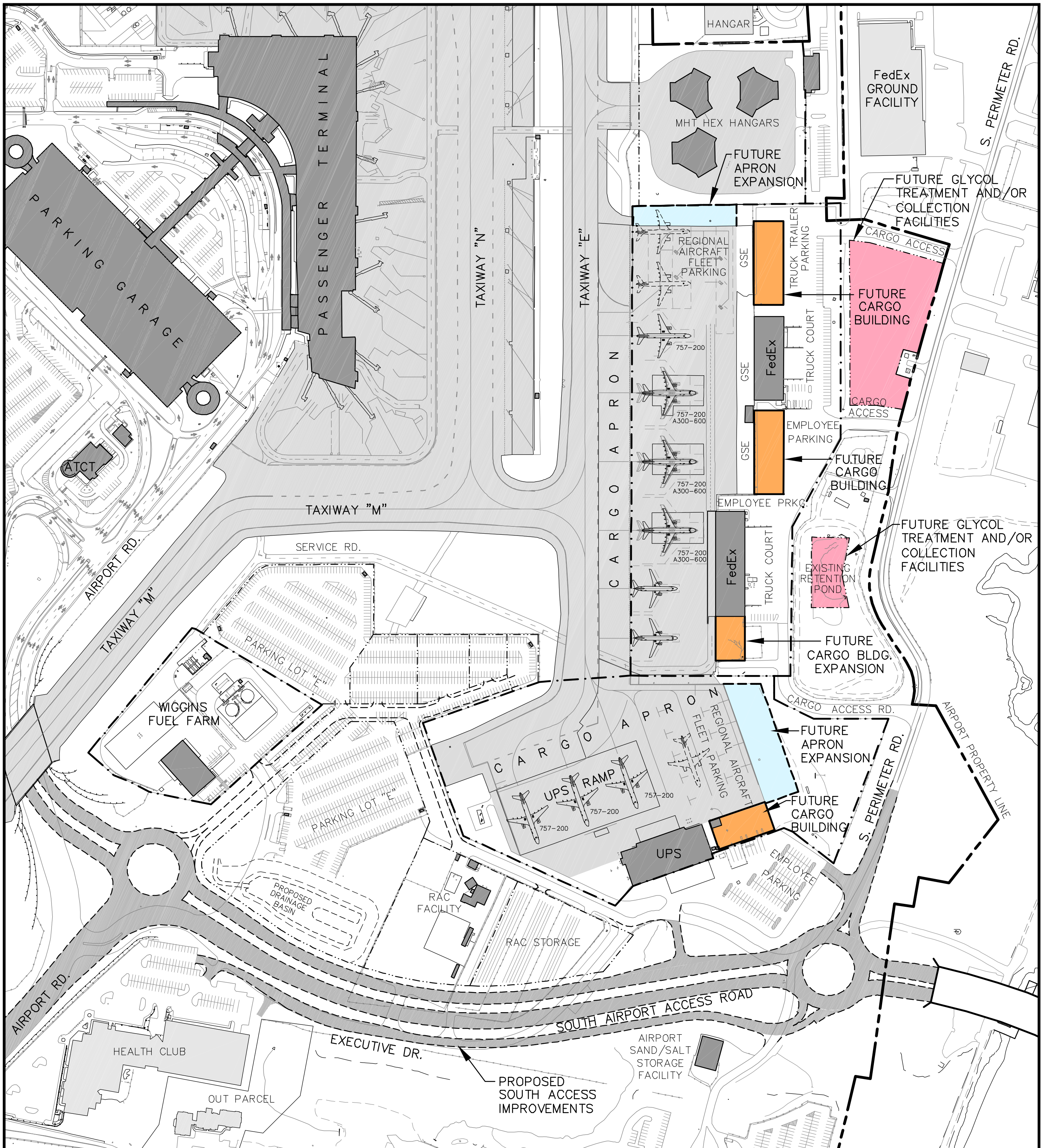

LEGEND

- EXISTING AIRFIELD PAVEMENT
- EXISTING BUILDING/STRUCTURE
- FUTURE CARGO BUILDINGS
- FUTURE CARGO APRON
- EXISTING CARGO LEASE LINE
- EXISTING/FUTURE DEVELOPMENT AREA

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NEAR-TERM AIR CARGO AREA PLAN

FIGURE 8-10

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8.7.2.5 United Parcel Service

The existing UPS facility and leasehold area is located west of the terminal area adjacent to and directly west of the Cargex leasehold area as shown previously on Figure 8-10. The UPS leasehold covers approximately 559,246 square feet (12.8 acres) and includes a 23,000-square-foot building, ramp space, and truck parking/truck maneuvering space. The UPS aircraft apron accommodates three wide-body aircraft and approximately eight smaller regional air cargo aircraft. The public parking, truck parking, and truck maneuvering areas can accommodate approximately 10 package van/truck vehicle parking spaces and approximately 70 personal car parking spots. UPS reported in 2009 that the company had 169 employees at its MHT facilities.

UPS management has indicated they do not have any immediate plans to expand the existing UPS facilities. UPS has the capability to expand their facility by using the former DHL hangar and adjacent ramp space area. Also to the south of the existing UPS regional aircraft parking apron area the cargo apron could be expanded as shown previously on Figure 8-10.

8.7.3 FUTURE AIR CARGO AREA

As identified on the future airport land use plan, Air Cargo operations will remain in the current location on the south side through the 20-year planning period and beyond. From a planning standpoint, the goal is to optimize the highest and best use of the existing air cargo facilities, as well as the available land adjacent to each air cargo operator's facilities.

For this Airport Master Plan Update, two air cargo plans were prepared, one for the near-term to long-term planning period and the second as an ultimate build-out concept. Both plans are discussed in the following paragraphs.

8.7.3.1 Near-Term Air Cargo Area

Each air cargo operator was interviewed and all air cargo operators reported there are no immediate plans for expansion of their current facilities. Each operator expressed the fact that because of the current economy it could take a number of years to get back to the cargo volumes that MHT experienced and recorded in the mid-2000 period.

The near-term air cargo site planning is shown previously on Figure 8-10. The existing air cargo area as shown, consisting of approximately 32 acres, is sufficient in size to accommodate expansion of each air cargo operator's facilities in the near-term and beyond. The existing total Air Cargo building square footage is approximately 72,300 square feet. The future Air Cargo building facility expansion square footage consists of approximately 65,700 square feet. The total existing and future Air Cargo building space identified for the near-term period and beyond is approximately 138,000 square feet. Also shown on the plan, are the potential air cargo apron expansion areas.

8.7.3.2 Ultimate Air Cargo Area

Based on discussions with MHT staff, an ultimate (beyond 20 years) air cargo build-out configuration was prepared as a what if scenario. This concept, as shown on **Figure 8-11**, illustrates how the existing air cargo area could be expanded using the existing building footprints. The potential air cargo apron/facility expansion areas of existing facilities are shown on this plan. The ultimate air cargo facility expansion depicts redeveloping two areas that currently serve another use. The Lot "E" area is identified as a potential long-term site for airside related air cargo expansion. The second area is the existing Aerohex hangar site area.

The existing air cargo area consists of approximately 32 total acres. The total ultimate air cargo area, including Lot "E" and the Aerohex hangars would be approximately 46 acres. Total ultimate air cargo building square footage would be approximately 220,000 square feet. As shown on this concept, the total ultimate air cargo site could accommodate up to 22 Airport Design Group IV aircraft parking positions.

The ultimate build-out concept could include a Mini Regional Air Cargo hub at MHT which was discussed as a possibility at one time but generates no interest among the cargo carriers this time.

8.8 GENERAL AVIATION FACILITIES

8.8.1 INTRODUCTION

MHT offers numerous facilities for general aviation aircraft and operations that include: FBO services, conventional hangar and T-hangar aircraft storage, aircraft tie-down apron space, and corporate aviation services. As shown on **Figure 8-12**, there are three separate areas on the airport where General Aviation facilities are located. The north area consists of T-Hangars and Aviation Associates. On the east side of the airport is Wiggins Airways FBO operation and Saflite Pilot Training. On the south side is the Aerohex hangar complex and the private property owner ProStar Aviation who has MHT airside access.

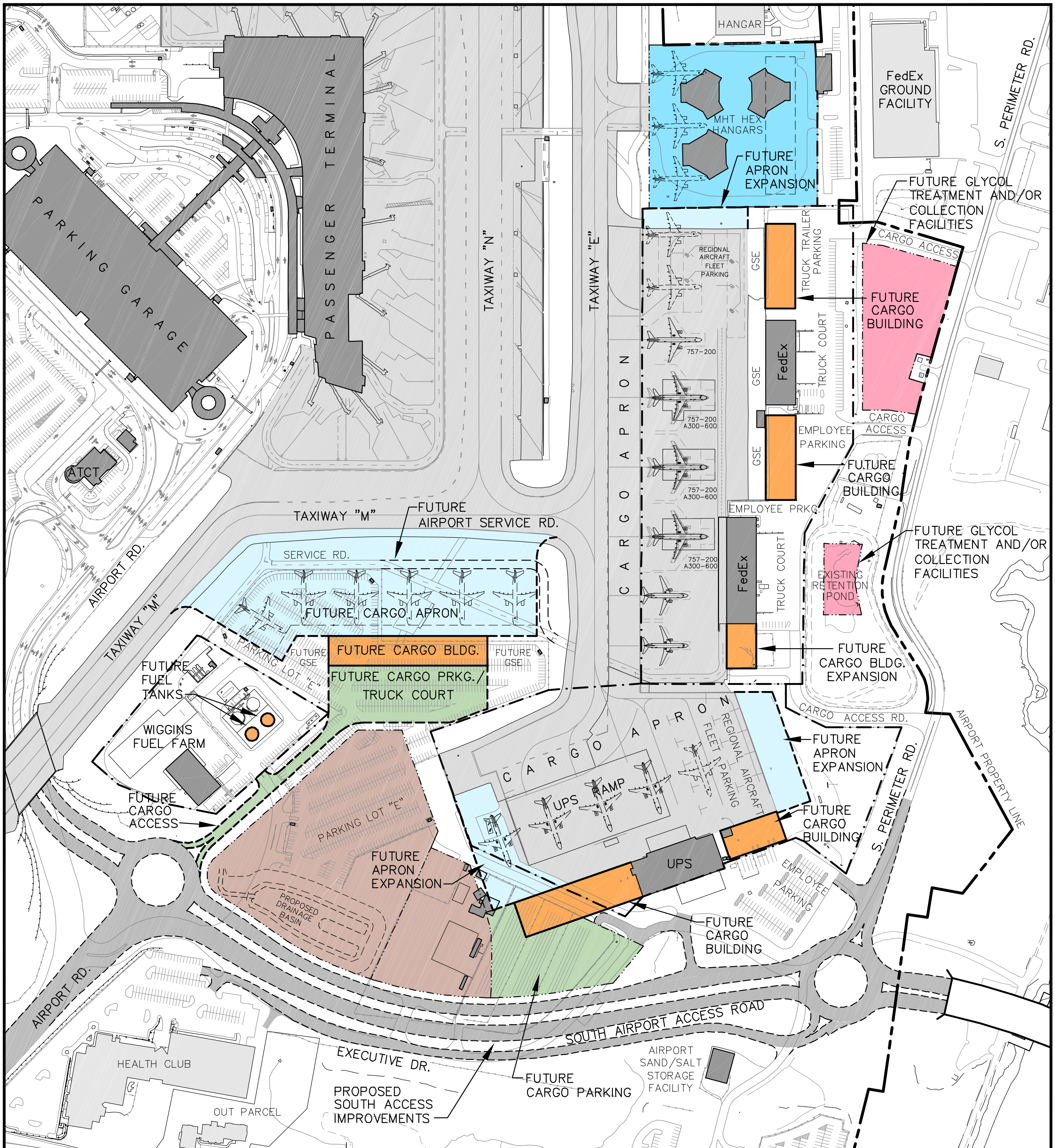
8.8.2 MHT FBO AND OTHER AIRCRAFT/PILOT SERVICES

From the General Aviation service standpoint, MHT has multiple companies providing FBO services to airport users. The following is a brief description of the four firms that offer General Aviation customer services to itinerant and local pilots and visitors.

8.8.2.1 Wiggins Airways

Wiggins Airways is the primary full service FBO at the MHT. Wiggins Airways is located on the east side of the airport along the east ramp and adjacent to Kelly Avenue. Wiggins operates 24 hours per day, 7 days per week. Wiggins leases approximately 13 acres, which includes the General Aviation Terminal, hangars, and east ramp area. Wiggins constructed a three-story, 23,000-square-foot general aviation terminal and has 73,000 square feet of hangar and operations space adjacent to its general aviation terminal.

In discussions with Wiggins management, they do not have any current plans to expand their facilities at MHT. In the long-term, and within the current Wiggins leasehold, a new hangar site location has been identified and reserved on the north side of the existing Wiggins facilities for expansion. In addition, as shown previously on Figure 8-12, apron expansion could be accommodated on the north side of Wiggins current apron leased area.



LEGEND

- EXISTING AIRFIELD PAVEMENT
- EXISTING BUILDING/STRUCTURE
- FUTURE CARGO BUILDINGS
- FUTURE CARGO APRON
- FUTURE CARGO PARKING/TRUCK COURT
- FUTURE CARGO DEVELOPMENT AREA
- FUTURE GLYCOL TREATMENT FACILITY
- POTENTIAL COMMERCIAL AREA
- EXISTING CARGO LEASE LINE
- EXISTING/FUTURE DEVELOPMENT AREA

Manchester-Boston REGIONAL AIRPORT

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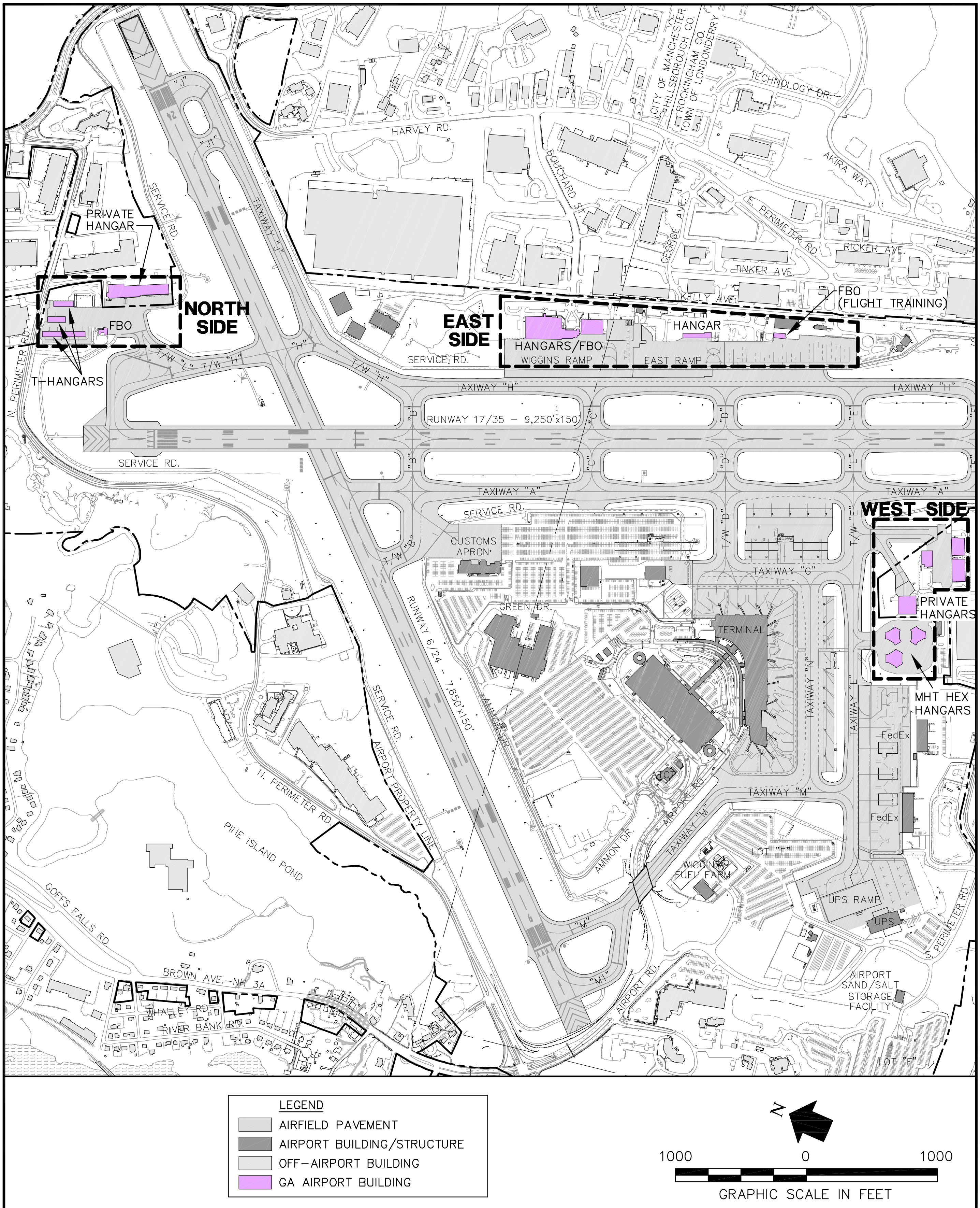
ULTIMATE AIR CARGO AREA PLAN

FIGURE 8-11

J:\Manchester\CAD\Exhibits\FIG 8-11.dwg 09/21/2011 10:51



Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

EXISTING GENERAL AVIATION SITE LOCATIONS

FIGURE 8-12

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8.8.2.2 Saflite Pilot Training

Saflite leases a 3,760-square-foot airport building adjacent to the east ramp and north of the Aviation Museum. Saflite offers pilot training, photo flights, aircraft rentals, a pilot lounge, and an aviation pilot products store. In the future the highest and best use of the Saflite site has been identified and reserved as an opportunity area for revenue producing aviation-related redevelopment.

8.8.2.3 Aviation Associates

Aviation Associates offers limited specialized FBO-type services at MHT. The FBO provides annual aircraft inspections, aircraft maintenance, power plant, airframe, and avionics services. The company leases a building with an attached hangar within the northeast general aviation area as shown previously on Figure 8-12. Currently, there are no plans to expand this facility.

8.8.2.4 Aerohex Hangars

The Areohex hangars are located on the south side of the airport adjacent to Taxiway "E." There are three existing Areohex Hangar structures with consists of three units per hangar for a total of nine aircraft storage units. In the long-term, the highest and best use of this 5-acre Areohex hangar site has been identified for potential new aviation-related redevelopment.

8.8.2.5 ProStar Aviation

ProStar Aviation is located on the south side of the airport. ProStar is a factory authorized service center for Hawker, King Air, Premier, and Beech jet aircraft, and is the only authorized TFE-731 engine line maintenance facility in New England. The FBO is a Pilatus PC-12 sales and service center and also provides avionics, airframe and engine maintenance and inspection for a large segment of the general aviation fleet.

ProStar Aviation operates out of two facilities on the south side. The ProStar Aviation administrative/sales operation is conducted on leased airport property. They lease building space on the first floor at 6 Industrial Drive. In close proximity to the leased building space from the airport, ProStar Aviation owns property located adjacent to Taxiways "E" and "A" that includes several large corporate hangars and support facilities. ProStar aircraft operations have direct access the MHT airfield by way of a connector taxiway to Taxiway "E."

8.8.2.6 North Side and East Side T-Hangars

MHT currently has T-Hangars on the north side and the east side of the airport. Within the 20-year planning period, there are no plans to add additional T-Hangars on MHT. In the long-term, the east side T-Hangars adjacent to the east ramp, could be removed to provide land for potential higher revenue producing aviation-related redevelopment opportunities.

8.8.3 FUTURE GENERAL AVIATION AND AVIATION-RELATED DEVELOPMENT

In the future, general aviation, aviation-related development, and redevelopment planning around the airport has been identified. The goal is to optimize the use of existing general aviation facilities, as well as plan for general aviation expansion of existing facilities and market new aviation-related development opportunities.

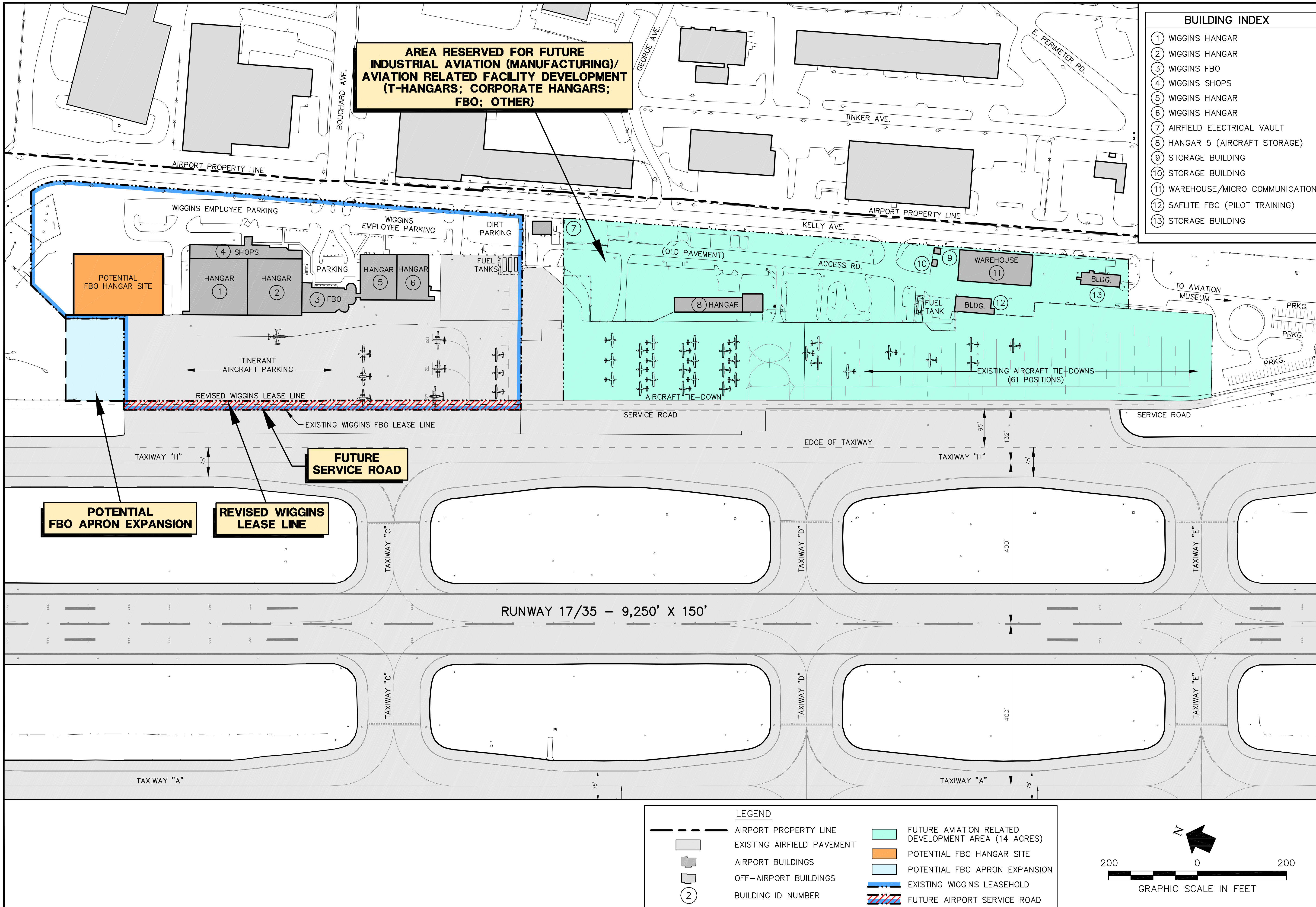
As identified on the future airport land use plan, the two areas within the airport property designated for long-term general aviation and aviation-related development are on the east side and the north side of the airport. These areas are summarized as follows.

On the east side, as shown on **Figure 8-13**, an area has been reserved for potential future expansion of the Wiggins FBO facilities to the north of their current FBO complex.

On the east ramp area between the Wiggins leasehold and the Aviation Museum, as shown on Figure 8-13, a tract of land is identified for future redevelopment to its highest and best aviation-related use. This tract of land consists of approximately 14 acres, which includes the building area and the existing east ramp pavement area. The potential aviation-related uses could be an aircraft MRO facility, Industrial Aviation Manufacturing Facility, second FBO, corporate jet aviation service center, corporate aviation hangar complex, or T-Hangar complex.

On the north side, there is a small tract of land, approximately 0.7 acres, reserved for General Aviation expansion or the highest and best aviation-related activity use.

There is no General Aviation expansion is planned for on the south side. In the long-term, Areohex hangars are programed to eventually be removed/relocated and the Areohex hangar site would be redeveloped to its highest and best aviation-related activity use.



Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

FUTURE GENERAL AVIATION DEVELOPMENT PLAN (EAST SIDE)

FIGURE 8-13

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8.9 AIRPORT MAINTENANCE/ARFF FACILITIES

The MHT Airport Maintenance/ARFF facilities are centrally-located on the airport with convenient direct access to the airfield. There are three major structures on this site. Two facilities accommodate airport maintenance operations exclusively and one facility is a shared Airport Maintenance/AARF facility.

The airport owns and maintains a number of airport maintenance vehicles and expensive snow removal equipment. Existing maintenance equipment is documented in Section 2.0 of this report. The airport currently uses one of the old FBO hangars on the west side of Runway 17/35 for off-season airport maintenance equipment storage. This old hangar, along with several other old structures in the area that fall within the RVZ, is programmed to eventually be removed. The airport needs to provide new airport maintenance equipment storage space convenient to the existing airport maintenance facilities. A 2-acre site for this facility is required.

The preliminary planning efforts recommend construction of a new snow removal equipment storage building on the south side of the current Airport Maintenance/ARFF facility, as shown on **Figure 8-14**. It is proposed that this facility consists of approximately 68,500 square feet of space. This includes 60,000 square feet (200-foot by 300-foot) for the storage of all MHT's snow removal equipment and 8,500 square feet for support areas and special equipment areas. Additional pavement in front of the facility will provide direct access to the airfield and additional area in the back of this facility would provide the opportunity to expand employee parking or other maintenance-related support needs.

The proposed snow removal equipment storage building site on the south side of the Maintenance/Airport ARFF facility will need to be evaluated. The existing small, low-value wetland area will need to be assessed. The overall site would require filling in a portion of an existing wetland and mitigation of the lost low-value wetlands. The airfield drainage into this area would also need to be analyzed and redesigned.

8.10 FUELING FACILITIES

8.10.1 FUEL FARM AND FUELING SERVICE

The existing fuel farm and de-icing fluid storage and dispensing area is located adjacent to Parking Lot "E" and Taxiway "M" on the west side of the airport, as shown on **Figure 8-15**. Wiggins Airways leases 4.2 acres of land, manages the existing fuel farm, and provides both fueling and de-icing services. Wiggins provides fueling services to airlines, air cargo carriers, and general aviation users. Full aviation fueling service for general aviation customers is provided 24 hours a day, using a fleet of four trucks to dispense Jet-A and 100LL.

8.10.2 FUTURE FUEL FARM EXPANSION

The existing fuel storage site has the capability to expand. The fuel farm site layout, as shown on **Figure 8-15**, has space for two future 250,000-gallon Jet-A tanks. In the future, the fuel farm site would have a total of four 250,000-gallon tanks, which would bring the Jet-A fuel storage capacity to 1 million gallons. The average daily volume of Jet-A fuel, as documented in Section 2.0 of this report, is approximately 70,000 gallons.

8.11 NON-AVIATION LAND

There is a number of Non-Aviation related out-parcels around the airport. These out-parcels are discussed in the following paragraphs and shown on **Figure 8-16**.

8.11.1 BROWN AVENUE PROPERTY

This is an out-parcel located about 1 mile north of the airport along Brown Avenue, close to I-293/Brown Avenue intersection. The airport purchased the 5.8-acre Brown Avenue property in 2002 and planned to develop it for remote off-site airport parking. The parcel was never developed and has remained vacant. Currently, it is identified as open space on the Airport Land Use plan. The future use of this property could be commercial or industrial, or a combination of both. The existing adjacent hotel complex has shown some interest in the past about acquiring or leasing a portion of this property for hotel expansion. In addition to developing this property, the airport has the option to sell this parcel in the future.

8.11.2 HIGHLANDER PROPERTY

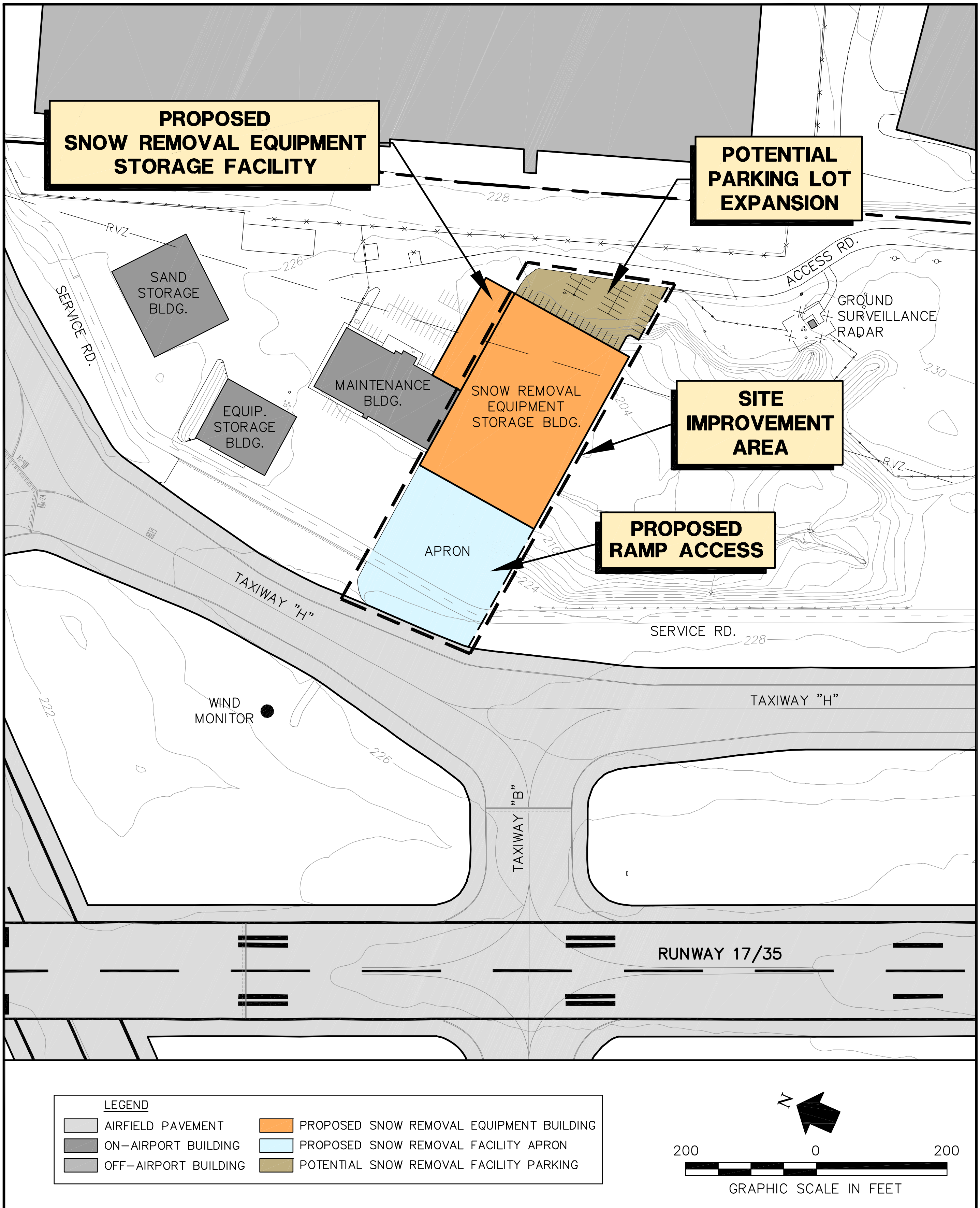
The airport acquired the Highlander property in July 2010. The existing old Highlander structures are programmed to be demolished in 2 or 3 years. The existing Highlander site consists of approximately 32 acres and is ideal for a new hotel conference center complex/business park, as shown on **Figure 8-17**. In addition, there are properties adjacent to the west side of the Highlander land that could be purchased by the airport in the future, as they become available. This adjacent land could be consolidated with the Highlander tract of land, thus increasing the overall size of the Highlander tract of land which could make this property even more appealing to a potential developer. Also, some of the existing local road right-of-ways could be abandoned or realigned that would make this property contiguous to the Highlander tract of land.

8.11.3 AIRPORT PROPERTY ADJACENT TO THE MERRIMACK RIVER/BROWN AVENUE

There are a number of residential out parcels of property along Brown and Hazelton Avenues on the west side of the airport that were purchased during the 1990s. At this time, this property is identified as open space. In the short- to mid-term, this property will remain an open space category. Additional land adjacent to the Merrimack River and within the Runway 6 end RPZ area, which is not currently owned by the airport, is to be acquired by the airport as it becomes available. In the long-term, some of this property could be developed for commercial or recreational use independent of or in conjunction with the Highlander track of land.

8.11.4 GOFFS FALLS ROAD AIRPORT PROPERTY

This track of land on the north side of Goffs Falls Road is within the Runway 17 end RPZ. This land was purchased with Federal funds under the noise land acquisition program. This land is to remain an open space category within this Airport Master Plan Update 20-year planning period.



J:\Manchester\CAD\Exhibits\FIG 8-14.dwg 09/21/2011 10:57

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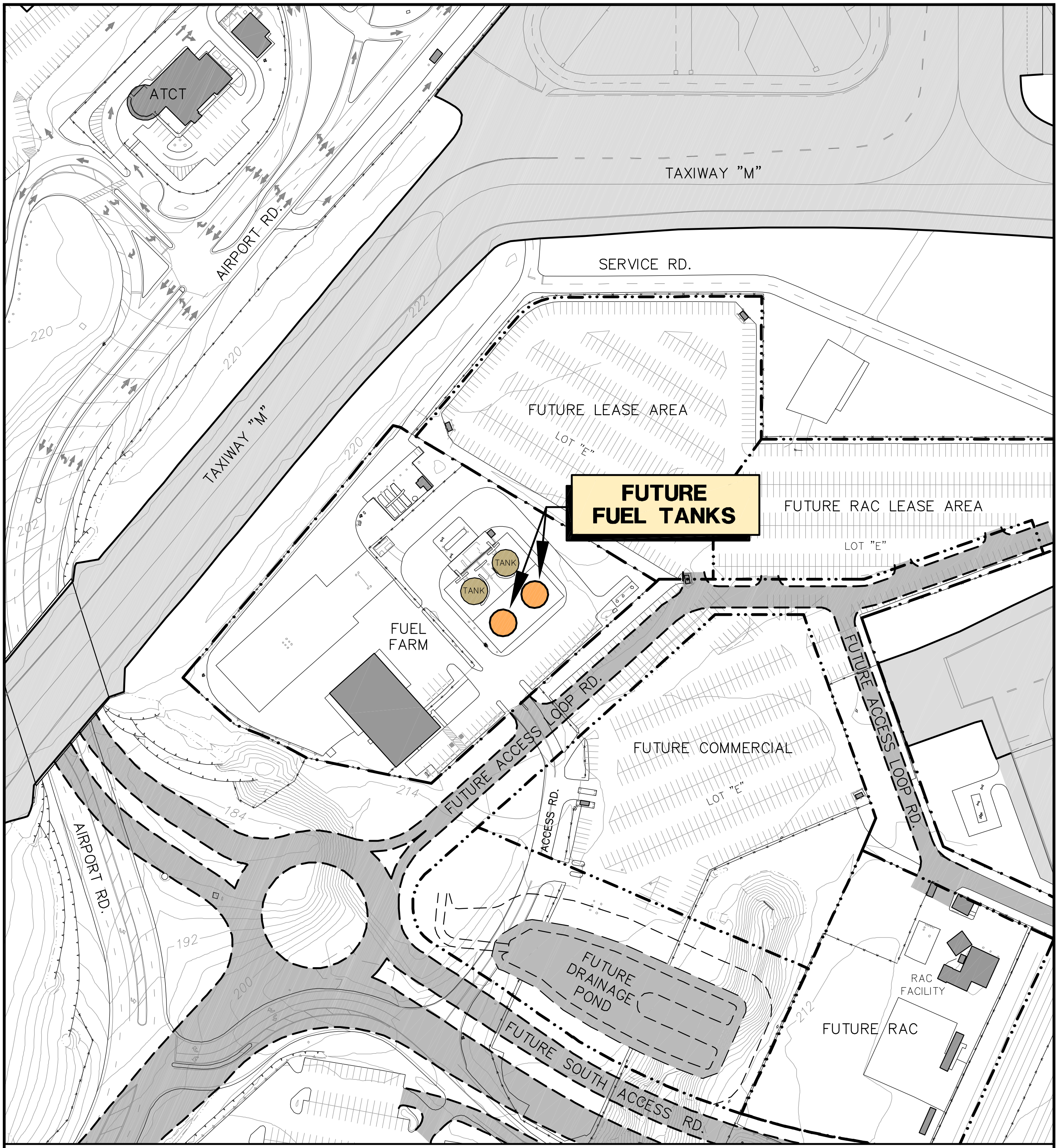
PROPOSED SNOW REMOVAL EQUIPMENT STORAGE FACILITY

FIGURE 8-14



LEGEND

- AIRFIELD PAVEMENT
- ON-AIRPORT BUILDING
- EXISTING FUEL TANKS
- FUTURE FUEL TANKS
- EXISTING LEASE LINE
- FUTURE LEASE LINE

J:\Manchester\CAD\Exhibits\FIG 8-15.dwg 09/21/2011 10:58

Manchester-Boston REGIONAL AIRPORT

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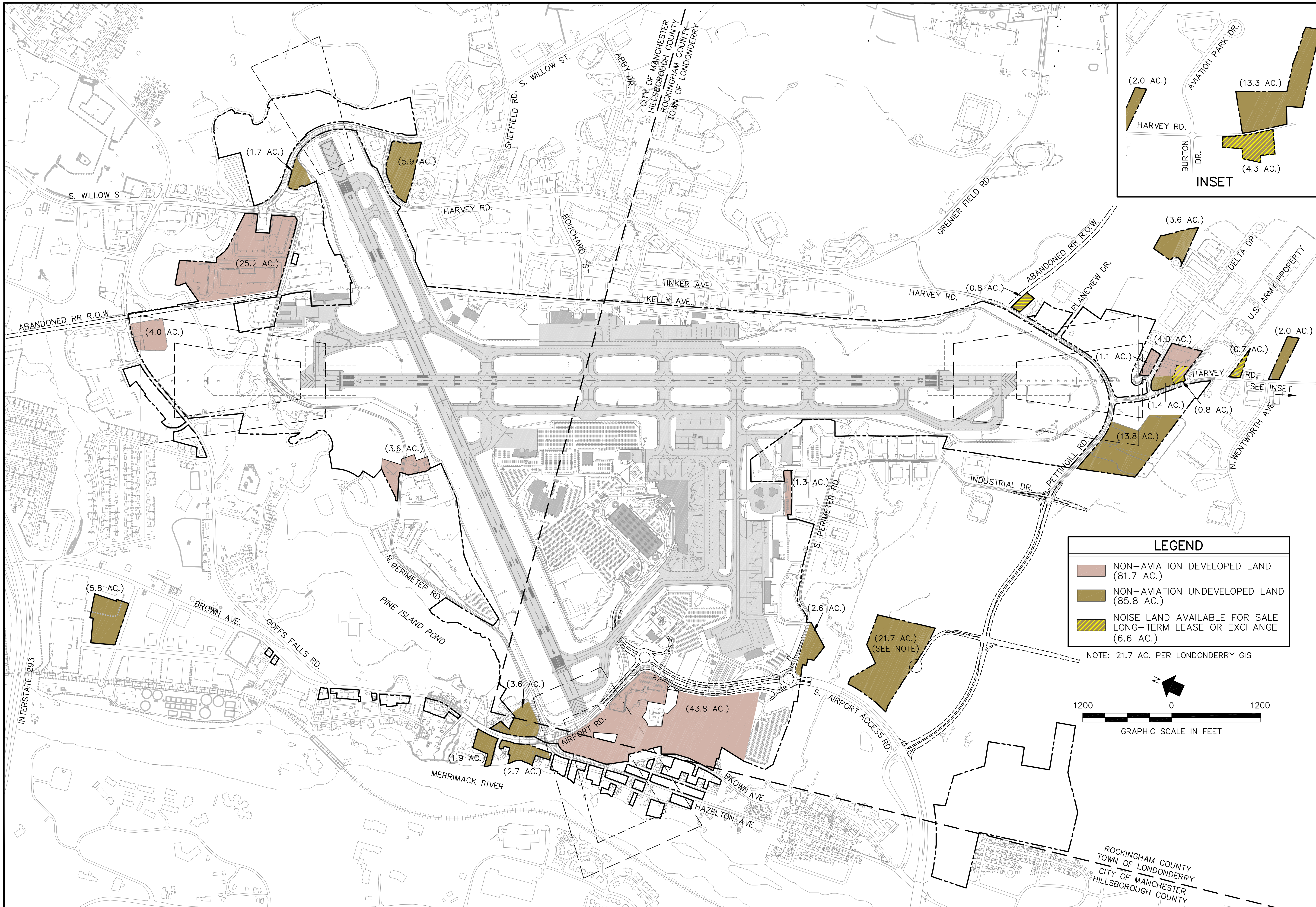
FUEL FARM EXPANSION

FIGURE 8-15



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NON-AVIATION LAND

FIGURE 8-16

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LAND USE LEGEND

- EXISTING OFFICE COMPLEX (2.7 AC.)
- EXISTING HEALTH CLUB (3.9 AC.)
- BUILDINGS TO BE REMOVED
- POTENTIAL DEVELOPMENT AREA (20 AC.)
- RESTRICTED DEVELOPMENT AREA (8 AC.) (NO STRUCTURES/PARKING & INFRASTRUCTURE)
- HEALTH CLUB PARKING (AIRPORT PROPERTY)

LEGEND

- AIRPORT PROPERTY LINE
- EXISTING AIRFIELD PAVEMENT
- AIRPORT BUILDINGS
- OFF–AIRPORT BUILDINGS
- HIGHLANDER PROPERTY (36 AC.)
- EXISTING SITE ACCESS
- EXISTING TREELINE
- EXISTING DRAINAGE
- NEW SOUTH ACCESS ROAD

N

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Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

HIGHLANDER SITE - REDEVELOPMENT LAND

FIGURE 8-17

J:\Manchester\CAD\Exhibits\FIG 8-17.dwg 09/21/2011 11:02

8.11.5 AIRPORT PARCEL (FUTURE LONDONDERRY INDUSTRIAL/BUSINESS PARK/PETTINGILL ROAD)

Local county records indicate the airport owns a 21.7-acre parcel of property adjacent to the new Airport Access Road and the proposed new Pettingill Road (as shown on **Figure 8-18**). The parcel has been identified as part of the 1,000-acre future Londonderry Industrial/Business Park. Infrastructure and the new Pettingill Road project are currently in the planning/development phase. Rezoning of this area by Londonderry is to include mix use zoning which will add flexibility to the future develop of this industrial park. Currently the proposed development of this area by others is for future Non-Aviation-related Industrial/Business Park development.

8.11.6 LOT "F"

With the redevelopment of Lot "E" for RAC storage and other uses, Lot "F" is the closest remaining remote parking to the MHT terminal. This lot will remain as a backup over flow remote long term public parking lot to the existing midfield parking Lots A through D. Future potential use for Lot "F" could be a park and ride site, similar to what the Highlander property provided for years.

8.11.7 LOT "G"

Lot "G," located at the south end of the airport and was constructed as a public parking lot to support the peak MHT air service traffic demands of the mid 2000 years. Lot "G" was never used for public parking and is currently leased to a non-aviation tenant. The tenant is an auto dealership that uses the lot for new vehicle inventory storage. This parcel of land is adjacent to the proposed new Londonderry Industrial/Business Park development. In the future, the highest and best use of this parcel of land would be to redevelop the Lot "G" parcel to complement the Londonderry Industrial/Business Park development plan.

When planning future redevelopment, the Lot "G" parcel, which a portion of the site is located in the approach surface to Runway 35, has some height restrictions that need to be taken into consideration.

8.11.8 HARVEY ROAD AREA PROPERTY

There are a number of airport-owned properties along Harvey Road and adjacent to Harvey Road that are currently cleared and identified as open space. Some of these properties are height restricted and will remain undeveloped as planned open space. Some of these properties are developable.

Six parcels of land previously purchased under the FAA Noise Land Acquisition Program were identified in the recent Noise Land Inventory/Noise Land Reuse Plan as surplus to aviation. The parcels are located south of the airport along Harvey Road. These six parcels, which are listed in **Table 8-2**, are to be placed on the real estate market for sale. The airport has the option to purchase any or all of this property.

8.11.9 SOUTH WILLOW STREET

There are two vacant parcels along South Willow Street in the vicinity and adjacent to the Runway 24 end that are potential commercial development sites. One is located next to the Triangle Mall and the other is located at the Willow Street/Harvey Road intersection area.

TABLE 8-2
NOISE LAND INVENTORY DATABASE

Property ID (Hillsborough Co.)	Address	Acreage	Proposed Categorization (Disposal Method)
014 012 0	102 Harvey Road	0.83	Sale/Lease
014 023 0	70 Harvey Road	0.33	Sale/Lease
014 025a 0	60 Harvey Road	0.88	Sale/Lease
014 043 0	33 Harvey Road	0.83	Sale/Lease
014 042a 0	29 Harvey Road	1.49	Sale/Lease
014 042 0	31 Harvey Road	1.84	Sale/Lease

Source: Information compiled from MHT Noise Land Inventory/Noise Land Reuse Plan prepared by URS Corporation, 2009.

8.11.10 PERIMETER ROAD NON-AVIATION DEVELOPMENT

There are several non-aviation related facilities along Perimeter Road. These are described in the following paragraphs.

Existing Industrial Park Buildings

There are four airport-owned industrial-related facilities grouped together along Perimeter Road in the north east corner of the airport. These four industrial type facilities are currently occupied and produce revenue to the airport. At this time, there is no other highest and best use for this property.

1 Harvey Road Building

The building is located next to the Fire Station with access to Willow Street and is currently leased as office space.

Allegro Micro System Building

Allegro Micro System building is located at 801 Perimeter Road. The site consists of approximately 1.64 acres. The airport purchased this property as an investment and revenue opportunity. The building is not owned by the airport.

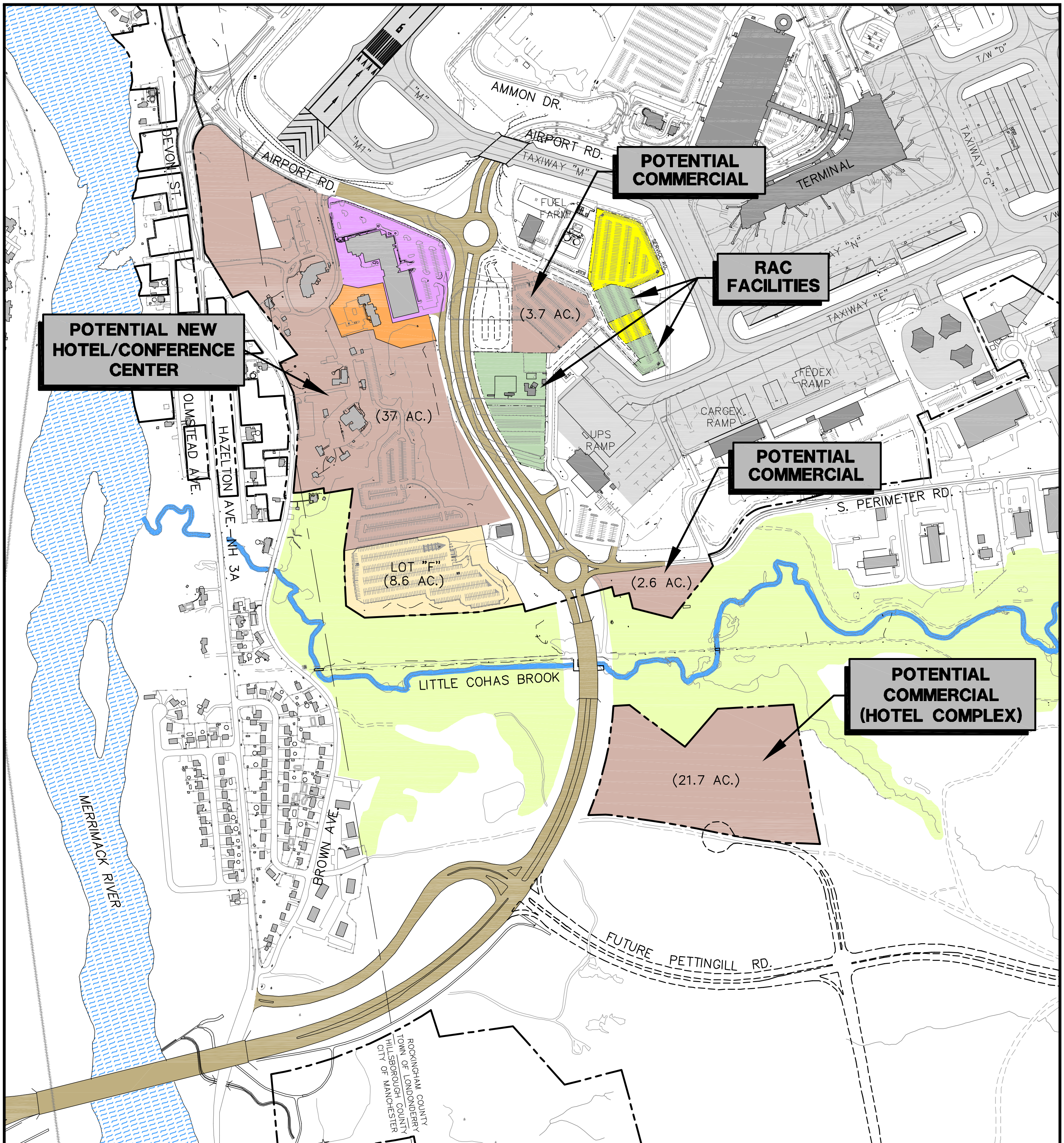
8.11.11 OLD RAILROAD RIGHT-OF-WAY

The section of old railroad right-of-way located north of Perimeter Road is vacant and is designated on the existing land use plan as open space. This land is not needed for aviation purposes and could be sold. If this land is to be retained by the airport, it could continue to be used for a community Pedestrian Walk Way/Bike Trail.

8.11.12 OTHER

Bike Path

A bike path has been identified in the vicinity and adjacent to the airport, as shown on **Figure 8-19**.



LEGEND

EXISTING AIRFIELD PAVEMENT	HEALTH CLUB
EXISTING BUILDING/STRUCTURE	RENTAL CAR FACILITIES
NEW SOUTH AIRPORT ACCESS ROAD	RENTAL CAR EXPANSION
POTENTIAL DEVELOPMENT AREA	RESERVED FOR PARKING
BUSINESS COMPLEX	GREEN SPACE

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SOUTH AIRPORT ACCESS ROAD ADJACENT LAND USES

FIGURE 8-18

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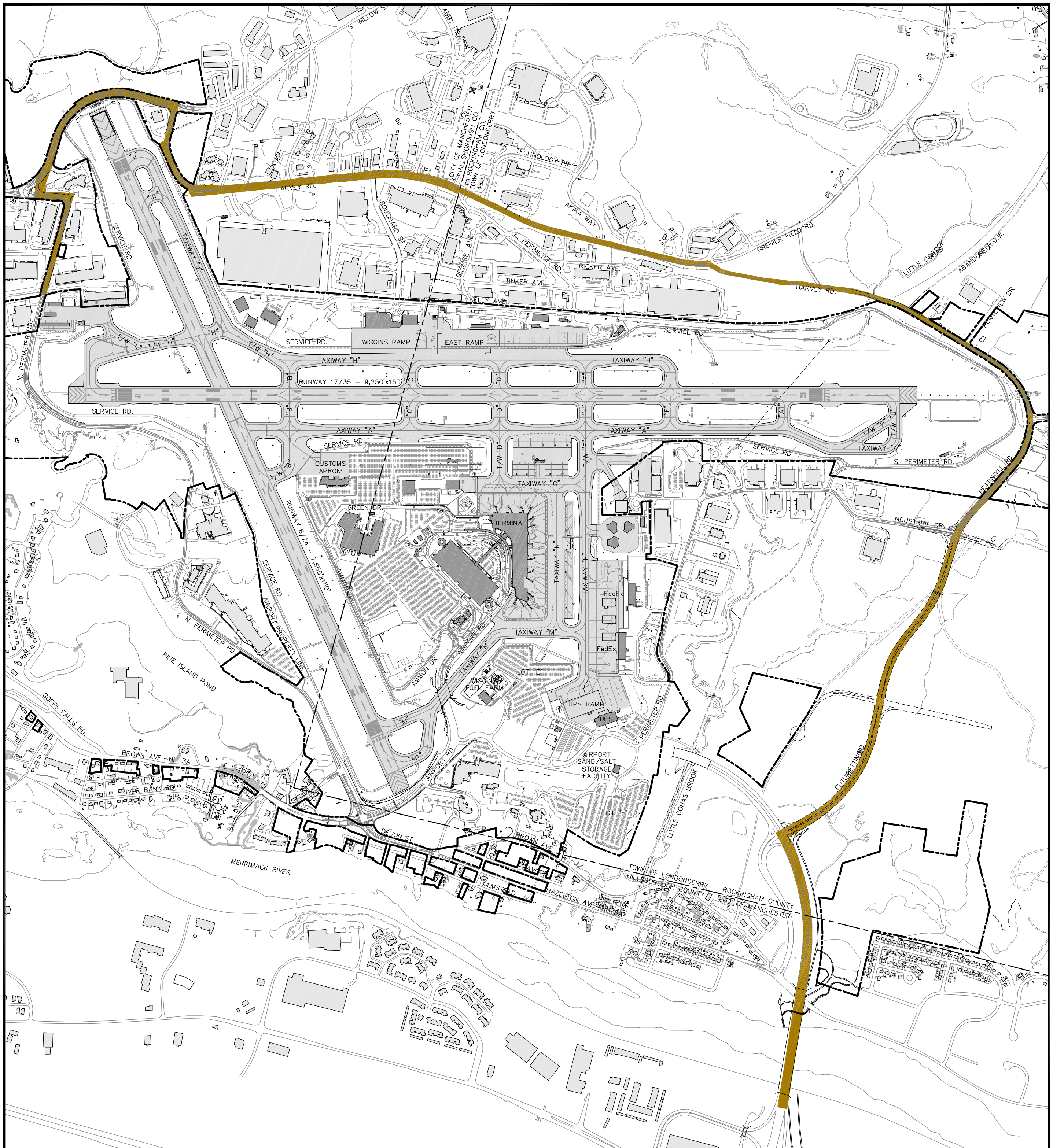

LEGEND

AIRFIELD PAVEMENT	BIKE PATH
AIRPORT BUILDING/STRUCTURE	AIRPORT PROPERTY LINE
OFF–AIRPORT BUILDING	COUNTY LINE

N

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GRAPHIC SCALE IN FEET

Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

AIRPORT VICINITY BIKE PATH

FIGURE 8-19

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SECTION NINE

Implementation Program/CIP

SECTION 9.0
IMPLEMENTATION PROGRAM/CIP

9.1 INTRODUCTION

This section describes the recommended 20-year airport implementation plan or Airport Capital Improvement Program (ACIP). The major value of long-term planning is to ensure that adequate provisions have been made for the orderly and timely development of on-airport land use and expenditures for capital improvements to achieve long-range development goals. It is the Airport Master Plan Update's recommendation to construct new airport facilities only as demand supports the economic and/or customer service benefits of making such improvements. However, it is possible to establish and set forth a series of priorities within the framework of the forecasts planning periods of 0-5 years (Short-Term), 6-10 years (Intermediate-Term), and 11-20 years (Long-Term).

It should also be pointed out that implementing a strategy of constructing new facilities only when demand indicates a need requires periodic review of the overall plan and individual projects. This review will ensure that changes in market demand, design criteria, airport use, and technological advances will be fully considered as airport development progresses.

In general, the investigative work undertaken for this Airport Master Plan Update indicates that priorities should be established as follows:

- Ensure that all airfield (runway/taxiway system) elements are adequate and permit safe and efficient aircraft operations;
- Develop additional, expanded, or improved aviation facilities to increase airport revenues;
- Develop non-aviation industrial/commercial areas to increase airport revenues; and
- Reserve areas for future aviation development to meet potential long-range demands beyond the 20-year planning period.

Under this general priority list, it is possible to outline capital improvement programs for the time periods consistent with the financial capability of the airport to implement the programs. The following paragraphs set forth the programs on this basis.

It should be noted that possible changes in the funding capability of Manchester-Boston Regional Airport (MHT), federal, or state governments might require delaying certain actions until funding is available. However, the general sequencing of development action should remain as shown.

9.2 SHORT-TERM AIRPORT IMPLEMENTATION PLAN (0-5 YEARS)

The implementation program/CIP recommends specific annual airport improvements beginning in 2011 and continuing through 2015 (Short-Term).

The cost estimates for this program are based on probable project development costs. The total projected cost for the short-range improvement program which includes design services and contingencies is estimated at $59,635,000 (2010 dollars). These estimates are identified in **Table 9-1**. This table lists joint federal, state, and airport-funded projects. Proposed improvement items in the 5-year capital improvement program are graphically illustrated on **Figure 9-1**, which follows Table 9-1.

The following is a list of projects recommended to be completed during the next 5-year time frame.

1. LAND ACQUISITION

- 1A. Property Acquisition - Runway 6 Runway Protection Zone (RPZ)
- 1B. Property Acquisition - Future Development

2. AIRFIELD IMPROVEMENTS

- 2A. Airfield - Glycol Management Program - Phase I
- 2B. Airfield - Glycol Management Program - Phase II
- 2C. Airfield - Terminal Ramp Replacement - Phase I
- 2D. Airfield - Relocate Airport Service Road/Ammon Drive (Design Only)
- 2E. Airfield - Terminal Ramp Replacement - Phase II
- 2F. Airfield - Relocate Airport Service Road/Ammon Drive (Construction Phase)
- 2G. Airfield - Rehabilitate Taxiway “N” at Terminal Apron
- 2H. Airfield - Rehabilitate South Portion of Taxiway “M”
- 2I. Airfield - Rehabilitate Taxiway “H,” Adjacent to Taxiway “B”
- 2J. Airfield - Rehabilitate Bituminous Portion of Ramp at Gates 1-3 and Portions of Taxiways “N” & “E”
- 2K. Airfield - Rehabilitate Portions of Taxiways “A” and “B” including U.S. Customs Ramp

3. LANDSIDE IMPROVEMENTS

- 3A. Landside - Rehabilitate Airport Road Section (Under T/W “M” Overpass)
- 3B. Landside - Rehabilitate Section of Parking Lot “C”- Phase I
- 3C. Landside - Expand Parking Lot “C” (Phase I)

4. TERMINAL IMPROVEMENTS

- 4A. Terminal - Public Address (PA) System Upgrades
- 4B. Terminal - Heating, Ventilation and Air Conditioning (HVAC) System Upgrades
- 4C. Terminal - Construct “First-Aid” Room
- 4D. Terminal - Relocate Terminal Curbside Airline Signs
- 4E. Terminal - Rework Terminal Landscaping
- 4F. Terminal - Relocate Rental Car Counters to Garage - Design
- 4G. Terminal - Relocate Rental Car Counters to Garage - Construction
- 4H. Terminal - Refurbish/Replace Bag Claim “B” Lobby Area - Construct New Concessions
- 4I. Terminal - Refurbish and Expand Bag Claim Equipment
- 4J. Terminal - Consolidate Security Checkpoints “B” & ”C” on Level 2 (Design)

5. SECURITY IMPROVEMENTS

- 5A. Security - Closed Circuit TV (CCTV) System - Phase IV

6. OPERATIONS IMPROVEMENTS

- 6A. Operations - Incident Command Vehicle
- 6B. Operations - Acquisition of Snow Removal Equipment

- 6C. Operations - Interactive Employee Training Module
- 6D. Operations - Snow Removal Equipment Storage Building (Phase I - Design)
- 6E. Operations - Snow Removal Equipment Storage Building (Phase II - Site Work)
- 6F. Operations - Snow Removal Equipment Storage Building (Phase III - Construction)

7. MISCELLANEOUS IMPROVEMENTS

- 7A. Miscellaneous - Demolition of Highlander Buildings

The list of projects are described in the following paragraphs which include a project narrative, project justification statement, and project development or acquisition cost estimates.

1. LAND ACQUISITION

1A. Property Acquisition - Runway 6 RPZ

Project Narrative: Acquire RPZ property off the end of Runway 6. This is property that the airport has purchased that was formerly part of the Highlander complex. A portion of that property is in the RPZ and is eligible for federal funds.

Project Justification: It is recommended that all RPZ property be owned (fee simple) or controlled via avigational easement by the airport.

Project Cost: The budget for this property acquisition is $5,300,000.

1B. Property Acquisition – Future Development

Project Narrative: Property to be acquired adjacent to the airport as it become available for Non-Aviation development. This would include the balance of non-eligible Highlander property.

Project Justification: Provides additional revenue generating opportunities for the airport.

Project Cost: The budget for this property acquisition is $5,000,000.

2. AIRFIELD IMPROVEMENTS

2A. Airfield - Glycol Management Program - Phase I

Project Narrative: The Glycol Management Program - Phase I includes a study to define the proposed infrastructure needed to support this program. This phase follows a 1-year EPA study.

Project Justification: This phase defines the proposed action plan and implementation cost estimates.

Project Cost: The estimated cost of this project is $400,000

2B. Airfield - Glycol Management Program - Phase II

Project Narrative: Glycol Management Program - Phase II includes construction of the infrastructure for this program.

Project Justification: Implementation phase of the Glycol Management Program.

Project Cost: The estimated cost of this project is $4,000,000.

2C. Airfield - Terminal Ramp Replacement - Phase I

Project Narrative: The existing terminal ramp is deteriorating and becoming a maintenance and potential safety problem for the airport.

Project Justification: The Portland Cement Concrete (PCC) ramp is showing signs of distress due to the affects of Alkali Silica Reaction (ASR). The pavement is expanding and as a result is causing problems adjacent to the terminal building and at the ramp trench drains.

Project Cost: The estimated cost of this project is $4,700,000.

2D. Airfield - Relocate Airport Service Road/Ammon Drive (Design Only)

Project Narrative: Relocate sections of Airport Service Road and Ammon Drive roadways outside Runway 6/24 Object Free Area (ROFA). This project would include design services only.

Project Justification: The location of the existing Airport Service Road and Ammon Drive are in violation of FAA criteria since both lie inside the Runway 6/24 Object Free Area. This project will be for the design of the relocation of both roadways, relocating the perimeter fence and modifications to Parking Lot "C," the Ammon Center parking lot, and an industrial facility.

Project Cost: The estimated cost for the design phase of the project is $200,000.

2E. Airfield - Terminal Ramp Replacement - Phase II

Project Narrative: This is the balance of the PCC ramp needing replacement due to ASR.

Project Justification: The PCC ramp is showing signs of distress due to the affects of ASR. The pavement is expanding and as a result is causing problems adjacent to the terminal building and at the ramp trench drains.

Project Cost: The estimated cost of this project is $4,780,000.

2F. Airfield - Relocate Airport Service Road/Ammon Drive (Construction Phase)

Project Narrative: Relocate sections of Airport Service Road and Ammon Drive roadways outside Runway 6/24 ROFA. This project would include construction phase.

Project Justification: The location of the existing Airport Service Road and Ammon Drive are in violation of FAA criteria since both lie inside the Runway 6/24 Object Free Area. This project will be for the construction phase of the relocation of both roadways, relocating the perimeter fence and modifications to Parking Lot "C," the Ammon Center parking lot, and an industrial facility.

Project Cost: The estimated cost of this project is $3,000,000.

2G. Airfield - Rehabilitate Taxiway “N” at Terminal Apron

Project Narrative: Rehabilitate and re-mark pavement section of Taxiway “N”. Taxiway “N” adjacent to Remote Overnight Aprons “A” and ”B” serves as the primary taxiway to the terminal’s air carrier gates located on the south side of the terminal building. Taxiway “N” pavement rehabilitation for this project consists of 15,889 SY.

Project Justification: This section of pavement has served its useful life and is showing signs of deterioration. The pavement is in “Fair” condition and had a PCI of 59 (2009).

Project Cost: The estimated cost of this project is $975,000.

2H. Airfield - Rehabilitate a Portion of Taxiway “M”

Project Narrative: Rehabilitate and re-mark south pavement section of Taxiway “M”. Taxiway “M” section is located on the southwest side of the terminal building. The Taxiway “M” pavement section consists of approximately 18,556 SY.

Project Justification: Taxiway “M” provides ingress and egress to the terminal gates and the air cargo area. The pavement is in “Fair” condition and shows signs of deterioration. Although this Taxiway “M” pavement section is 9 years old (2001), it had a PCI of 56 (2009). This section of Taxiway “M” gets hard use being near the terminal ramp and services as the primary aircraft taxing access route out to Runway 6. This section is predicted by MHT Pavement Management Software Program to be in “Serious” condition in 2014 and “Failed” by 2016. In spite of airport maintenance staff efforts, this section of taxiway is in need of complete rehabilitation.

Project Cost: The estimated cost of this project is $1,125,000.

2I. Airfield - Rehabilitate Taxiway “H” adjacent to Taxiway “B”

Project Narrative: Rehabilitate and re-mark mid-section of Taxiway ”H” pavement. The Taxiway “H” pavement section is adjacent to Taxiway “B” and located between the airport Annex Facility and Wiggins Fixed Based Operator (FBO). The pavement rehabilitation consists of approximately 19,445 SY. Taxiway “H” serves as partial parallel taxiway to Runway 17/35 and is located on the east side of the airport.

Project Justification: The pavement has served its useful life and shows signs of deterioration. The Taxiway “H” pavement section between the airport Annex Facility and Wiggins FBO is in “Fair” condition and had a PCI of 57 (2009). Taxiway “H” provides access to the Wiggins Airways Facility, the general aviation area, the Airport Rescue and Firefighting Facility (ARFF) and maintenance facility, and the northeast apron.

Project Cost: The estimated cost of this project is $1,180,000.

2J. Airfield - Rehabilitate Bituminous Portion of Ramp at Gates 1-3 and Portions of Taxiways "N" & "E"

Project Narrative: Rehabilitate and re-mark bituminous section of terminal ramp located adjacent to Gates 1-3 including a portion of Taxiway "N" over to the overnight aircraft remote parking Apron "A". Taxiway "E" pavement rehabilitation section is from the Hex Hangars to FedEx area. The bituminous section of terminal ramp, portions of Taxiways "N" and "E" total pavement areas collectively consists of approximately 23,945 SY.

Project Justification: The bituminous section of terminal ramp and the portion of Taxiway "N" provide ingress and egress to the terminal gates. The portion of Taxiway "E" provides access to the air cargo area. The pavement is in "Fair" condition and shows signs of deterioration. The section of bituminous terminal ramp pavement experiences excessive use.

Project Cost: The estimated cost of this project is $ 1,450,000.

2K. Airfield - Rehabilitate Portions of Taxiways "A" and "B" including U.S. Customs Ramp

Project Narrative: Rehabilitate and re-mark portion of Taxiway "A" pavement including west connector stub Taxiway "B." Taxiway "A" serves as partial parallel taxiway to Runway 17/35 and is located on the west side of the runway. Taxiway "A" provides access to the terminal apron. Also included is the rehabilitation of the U.S. Customs Ramp.

Project Justification: The pavement has served its useful life and shows signs of deterioration. Taxiway "A"' is projected to be in "Serious" condition by 2015. This section of Taxiway "A" pavement is in "Fair" condition and had a PCI of 62 (2009). It should be scheduled for overlay no later than 2015.

Project Cost: The estimated cost of this project is $2,470,000.

3. LANDSIDE IMPROVEMENTS

3A. Landside - Rehabilitate Airport Road Section (Under T/W "M" Overpass)

Project Narrative: The section of airport entrance road from the new South Perimeter Road roundabout to the Ammon Drive connector, approximately 9,600 SY, is in need of rehabilitation.

Project Justification: The pavement in this area has deteriorated to the point that it needs immediate attention.

Project Cost: The estimated cost of this project is $325,000.

3B. Landside - Rehabilitate Section of Parking Lot "C" – Phase I

Project Narrative: Rehabilitate/resurface a section of existing Parking Lot "C."

Project Justification: This section of Parking Lot "C" pavement has served its useful life and is need of rehabilitation.

Project Cost: The estimated cost of this project is $760,000.

3C. Landside – Expand Parking Lot "C" (Phase I)

Project Narrative: As part of the Ammon Drive/Service road relocation project, approximately 380 parking spaces will be removed. This project will replace the removed public parking spaces in the area reserved for Lot "C" expansion.

Project Justification: Lot "C" is the primary Long Term parking lot and the parking capacity of this lot should not be decreased. Decreasing the capacity of Lot "C" could require the airport to open other remotes lots sooner during peak periods, therefore, increasing operating costs.

Project Cost: The estimated cost of this project is $1,000,000.

4. TERMINAL IMPROVEMENTS

4A. Terminal - PA System Upgrades

Project Narrative: The project will upgrade the airport's public address (PA) system.

Project Justification: The existing PA system was installed in 1994 and replacement parts for the system are limited. The upgrade will consist of installation of a computerized system with state-of-the art components. The existing speakers and microphone stands will remain.

Project Cost: The estimated cost of this project is $150,000.

4B. Terminal - HVAC System Upgrades

Project Narrative: The HVAC system in the terminal building would be upgraded to improve efficiency and reduce maintenance costs.

Project Justification: The existing HVAC system was installed with the construction of the terminal building in 1993. Additionally, as a result of an Energy Audit undertaken by the airport it was determined that the existing system is inefficient and costly to operate and maintain. The upgrade will allow for the temperatures in the terminal to be more efficiently regulated and result in energy savings.

Project Cost: The estimated cost of this project is $500,000.

4C. Terminal - Construct New "First-Aid" Room

Project Narrative: Construct and furnish a new "First-Aid" room in the terminal on the first level adjacent to the existing communication center.

Project Justification: The new "First-Aid" room will be located in a central area close to the entrance of the terminal. The facility will provide a suitable location in the terminal for paramedic staff to respond quickly to passenger needs and medical emergencies.

Project Cost: The estimated cost of this project is $100,000.

4D. Terminal - Relocate Terminal Curbside Airline Signs

Project Narrative: Relocate and re-position existing airline identification signs along the curbside. Current airline signs are clustered in one area giving the approaching vehicles the impression there is only one defined designated passenger drop off area. Airline signs should be located adjacent to their respective airline ticket lobby entrances.

Project Justification: Improves terminal curbside utilization by re-positioning the designated customer/passenger drop off areas.

Project Cost: The estimated cost of this project is $30,000.

4E. Terminal - Rework Terminal Landscaping

Project Narrative: Rework terminal landscaping to improve visibility of the terminal front and location of airline ticket lobby entrances for vehicles approaching the terminal curbside from the airport access roadway.

Project Justification: Improves curbside utilization and customer visibility for dropping off passengers.

Project Cost: The estimated cost of this project is $250,000.

4F. Terminal - Relocate Rental Car Counters to Garage - Design

Project Narrative: The existing rental car offices and service counters located in the terminal building would be relocated to the parking garage. This is the design phase and there are three options under consideration for this relocation.

Option A1 - At outside face of parking garage between the escalator and the outside southeast stairs. In this option, the office and service counters face into the Rent-a-Car (RAC) staging area.

Option A2 - At outside face of parking garage between the escalator and the outside southeast stairs. In this option, the office and service counters face into the Short-Term parking lot.

Option B - Directly inside the parking garage ground level adjacent to the elevator/escalator lobby areas.

Project Justification: This is the design phase which will define the preferred option. This phase includes coordination with the RAC tenants and establishing the funding source through the Customer Facility Charge (CFC's) program for this project. The implementation of this project will provide space to incorporate new concessions opportunity adjacent to the existing bag claim area and for the expansion of the existing inbound baggage claim conveyor system.

Project Cost: The estimated cost of this design phase of the project is $250,000.

4G. Terminal - Relocate Rental Car Counters to Garage - Construction

Project Narrative: The existing rental car offices and service counters are to be relocated to the parking garage.

Project Justification: This is the construction phase for the project.

Project Cost: The estimated cost of this project is $2,000,000.

4H. Terminal – Refurbish/Replace Bag Claim "B" Lobby Area/Construct New Concessions

Project Narrative: Remove the old rental car offices and service counters and refurbish the entire baggage claim lobby area to include: relocation of the New Hampshire tourist information counter, install a meet and greet (public seating) area for bag claim waiting and construct a new concession area. Potential concession vendors could include: Food and Beverage (Coffee/Pastry Bar), Retail (News/Gift Shop), or other concession use.

Project Justification: Provides an improved meet and greet seating/waiting area for the general public and the new concessions will provide additional airport revenue.

Project Cost: The estimated cost of this project is $150,000.

4I. Terminal – Refurbish and Expand Bag Claim Equipment

Project Narrative: The existing baggage claim area "B" consists of three flat plate baggage claim devices. The project is to refurbish/replace and expand the linear conveyer belt capacity/display frontage of all three bag claim devices.

Project Justification: Two of the three existing Baggage Claim Devices will have reached their useful life by 2015 and are in need of refurbishment.

Project Cost: The estimated rehabilitation and expansion cost per device is $658,000. Total cost estimate to rehab and expand all three devices in one project is approximately $1,700,000.

4J. Terminal - Consolidate Security Checkpoints "B" & "C" on Level 2 (Design)

Project Narrative: This project includes the design for the reconfiguration and consolidation of existing security check points "B" and "C" area located on the second level. The project includes concession modifications, passenger circulation and access modification to the third level. The items included in this project are listed as follows:

- Construct new unsecured stairs to the third level Observation Area - note that two stair options are provided;
  - Option 1 stair is permanent stair solution for future expansion of checkpoint but requires expansion and renovation of office space on Level 3 noted below,
  - Option 2 stair does not disrupt existing office space on Level 3, but will require removal in the event the checkpoint is expanded.
- Modify existing Samuel Adams seating area;

- Demolish existing central stairs and existing security screening checkpoints;
- Construct five new security screening checkpoints;
- Construct Transportation Security Administration (TSA) support space;
- Install new security grilles at concourse;
- Construct new passenger arrival backflow lane. Modify Milltown Grill seating area;
- Construct new secured concession along concourse adjacent to Gate 9; and Modification to third level public space and level 3 expansion to accommodate relocation of airport administration area kitchen and several offices.

Project Justification: Consolidation of check points “B” and “C” will improve the passenger screening process and overall arriving and departing passenger circulation.

Project Cost: The estimated cost of the design of this project is $ 300,000.

5. SECURITY IMPROVEMENTS

5A. Security - CCTV System - Phase IV

Project Narrative: The closed circuit television (CCTV) system – Phase IV is a continuation of on-going upgrades to the airport’s existing CCTV system. The upgrades will include new servers to increase storage capacity and additional security cameras.

Project Justification: The project will provide security enhancements to satisfy the changing requirements.

Project Cost: The estimated cost of this project is $625,000.

6. OPERATIONS IMPROVEMENTS

6A. Operations - Incident Command Vehicle

Project Narrative: Acquire new mobile Incident Command Vehicle.

Project Justification: Safety/Security.

Project Cost: The estimated cost of this project is $500,000.

6B. Operations - Acquisition of Snow Removal Equipment

Project Narrative: Acquire the following new snow removal equipment: Ramp Plow, RW Multi-Task, Plow/Sander.

Project Justification: New snow removal equipment needed for improved operational efficiency.

Project Cost: The estimated cost of this project is $1,655,000.

6C. Operations - Interactive Employee Training Program

Project Narrative: FAA Interactive Training Module for airport operations staff.

Project Justification: Provides airport operations staff with a stand-alone training station with most current program and implementation information.

Project Cost: The estimated cost of this FAA Training Module is $260,000.

6D. Operations - Snow Removal Equipment Storage Building (Phase I - Design)

Project Narrative: This project would provide design services for a new building to be constructed on the north side of the airport next to the existing airport maintenance facility. It is proposed that this facility will require approximately 68,500 SF of space. This includes 60,000 SF (200' X 300') for the storage of all MHT's snow removal equipment and 8,500 SF for support areas and special equipment areas. Preferred site, approximately two acres, has been identified on the south side of the current airport ARFF/Maintenance facility. Existing site conditions need to be verified and the drainage for the area needs to be analyzed and redesigned. The existing small wetland area needs to be assessed and mitigated. The proposed snow removal equipment storage space needs to be defined and the building designed. In addition, site preparation and building construction cost would be confirmed.

Project Justification: This new facility will provide enclosed space to service snow removal equipment.

Project Cost: The estimated cost of this project is $500,000.

6E. Operations - Snow Removal Equipment Storage Building (Phase II - Site Work)

Project Narrative: This project implements the site work phase for a new snow removal equipment storage building. This phase of the project includes permits, mitigation of low value wetlands, tree removal, clearing/ grubbing site; drainage relocation, earthwork and site grading. Ideally the best location for this building is a located on the south side of the current Airport ARFF/Maintenance building. The overall site is approximately two acres and this new building location would require filling in a portion of an existing wetland and mitigation of the lost wetlands.

Project Justification: Phase II - Site Work.

Project Cost: The estimated cost of this project is $2,000,000.

6F. Operations - Snow Removal Equipment Storage Building (Phase III - Construction)

Project Narrative: This phase of the project is related to the building construction, pavement construction, installation/relocation of security fencing etc.

Project Justification: Construction Phase - This new facility will protect and provide space to service the airport's snow removal equipment.

Project Cost: The estimated cost of this project is $10,000,000.

7. MISCELLANEOUS IMPROVEMENTS

7A. Miscellaneous - Demolition of Highlander Buildings

Project Narrative: The Highlander Inn, Conference Center, Bed & Breakfast and other associated buildings will be demolished.

Project Justification: Remove structures from RPZ.

Project Cost: The estimated cost of this project is $2,000,000.

TABLE 9-1
SHORT-TERM (YEAR 2011 TO 2015) COST ESTIMATES

Project Description	Total
1. LAND ACQUISITION	
1A. Property Acquisition - Runway 6 RPZ	$5,300,000
1B. Property Acquisition - Future Development	$5,000,000
Land Acquisition Total	***$10,300,000***
2. AIRFIELD IMPROVEMENTS	
2A. Airfield - Glycol Management Program - Phase I	$400,000
2B. Airfield - Glycol Management Program - Phase II	$4,000,000
2C. Airfield - Terminal Ramp Replacement - Phase I	$4,700,000
2D. Airfield - Relocate Airport Service Road/Ammon Drive (Design Only)	$200,000
2E. Airfield - Terminal Ramp Replacement - Phase II	$4,780,000
2F. Airfield - Relocate Airport Service Road/Ammon Drive (Construction Phase)	$3,000,000
2G. Airfield - Rehabilitate Taxiway “N” at Terminal Apron	$975,000
2H. Airfield - Rehabilitate a South Portion of Taxiway “M”	$1,125,000
2I. Airfield - Rehabilitate Taxiway “H” Adjacent to T/W “B”	$1,180,000
2J. Airfield - Rehabilitate Bituminous Portion of Terminal Ramp at Gates 1-3 and Portions of Taxiways “N” & “E”	$ 1,450,000
2K. Airfield - Rehabilitate Portions of Taxiways “A” and “B” including U.S. Customs Ramp	$2,470,000
Airfield Improvements Total	***$24,280,000***
3. LANDSIDE IMPROVEMENTS	
3A. Landside - Rehabilitate Airport Road Section (Under T/W “M” Overpass)	$325,000
3B. Landside - Rehabilitate Section of Parking Lot “C” – Phase I	$760,000
3C. Landside - Expand Parking Lot “C” (Phase I)	$1,000,000
Landside Improvements Total	***$2,085,000***
4. TERMINAL IMPROVEMENTS	
4A. Terminal - PA System Upgrades	$150,000
4B. Terminal - HVAC System Upgrades	$500,000
4C. Terminal - Construct “First-Aid” Room	$100,000
4D. Terminal - Relocate Terminal Curbside Airline Signs	$30,000
4E. Terminal - Rework Terminal Landscaping	$250,000
4F. Terminal - Relocate Rental Car Counters to Garage - Design	$250,000
4G. Terminal - Relocate Rental Car Counters to Garage - Construction	$2,000,000
4H. Terminal - Refurbish/Replace Bag Claim “B” Lobby Area - Construct New Concessions	$150,000
4I. Terminal - Refurbish and Expand Bag Claim Equipment	$1,700,000
4J. Terminal - Consolidate Security Checkpoints “B” & “C” on Level 2 (Design)	$300,000
Terminal Improvements Total	***$5,430,000***
5. SECURITY IMPROVEMENTS	
5A. Security - CCTV System - Phase IV	$625,000
Security Improvements Total	***$625,000***
6. OPERATIONS IMPROVEMENTS	
6A. Operations - Incident Command Center Vehicle	$500,000
6B. Operations - Acquisition of Snow Removal Equipment	$1,655,000
6C. Operations - Interactive Employee Training Program	$260,000
6D. Operations - Snow Removal Equipment Storage Building (Phase I - Design)	$500,000
6E. Operations - Snow Removal Equipment Storage Building (Phase II - Site Work)	$2,000,000
6F. Operations - Snow Removal Equipment Storage Building (Phase III - Construction)	$10,000,000
Operations Improvements Total	***$14,915,000***

TABLE 9-1 (CONTINUED)
SHORT-TERM (YEAR 2011 TO 2015) COST ESTIMATES

Project Description	Total
7. MISCELLANEOUS IMPROVEMENTS	
7A. Miscellaneous - Demolition of Highlander Buildings	$2,000,000
Miscellaneous Improvements Total	***$2,000,000***
0-5 Year Total	***$59,635,000***

Source: URS Corporation and McFarland Johnson, 2010.

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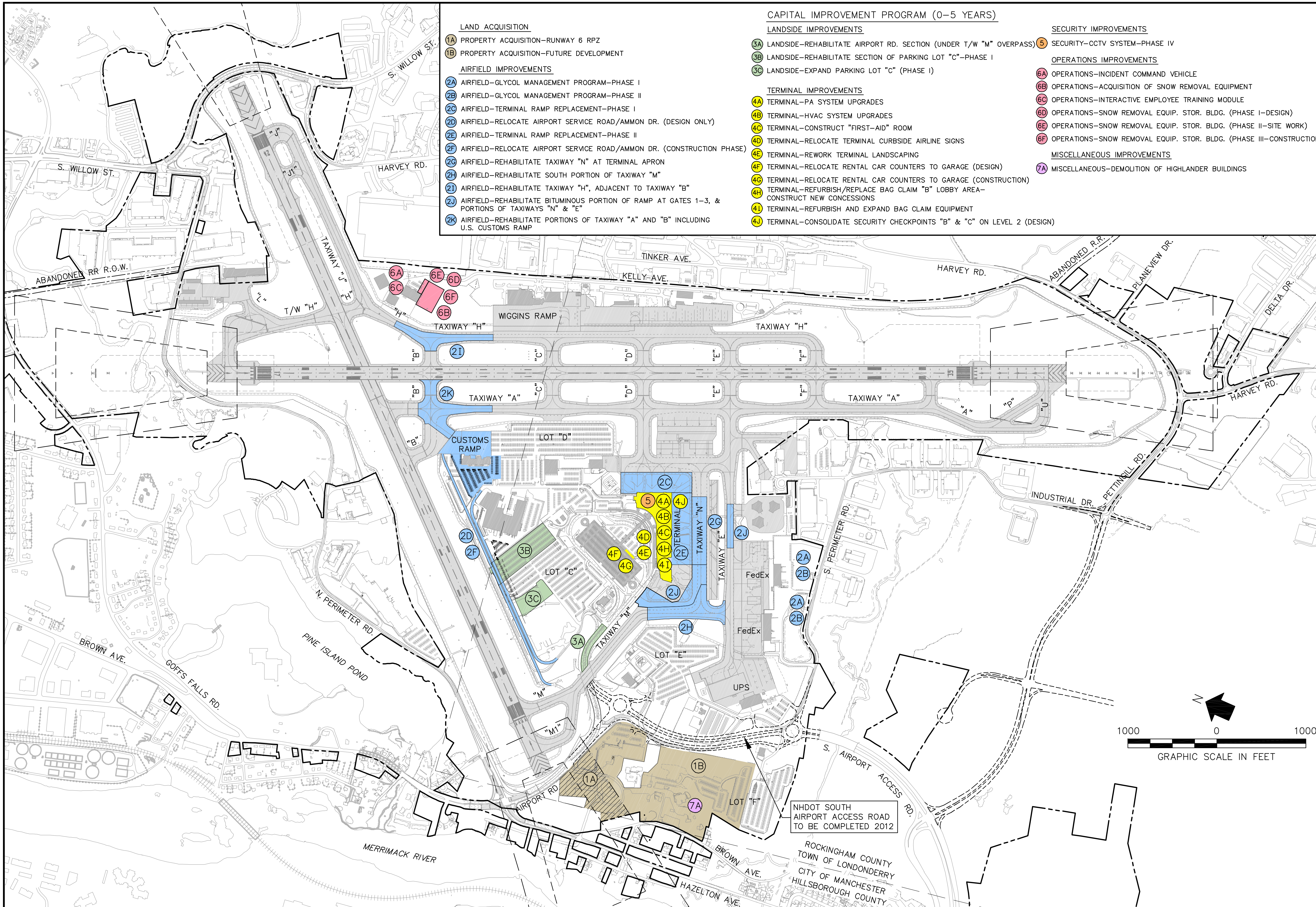

CAPITAL IMPROVEMENT PROGRAM (0–5 YEARS)

LAND ACQUISITION

- 1A PROPERTY ACQUISITION–RUNWAY 6 RPZ
- 1B PROPERTY ACQUISITION–FUTURE DEVELOPMENT

AIRFIELD IMPROVEMENTS

- 2A AIRFIELD–GLYCOL MANAGEMENT PROGRAM–PHASE I
- 2B AIRFIELD–GLYCOL MANAGEMENT PROGRAM–PHASE II
- 2C AIRFIELD–TERMINAL RAMP REPLACEMENT–PHASE I
- 2D AIRFIELD–RELOCATE AIRPORT SERVICE ROAD/AMMON DR. (DESIGN ONLY)
- 2E AIRFIELD–TERMINAL RAMP REPLACEMENT–PHASE II
- 2F AIRFIELD–RELOCATE AIRPORT SERVICE ROAD/AMMON DR. (CONSTRUCTION PHASE)
- 2G AIRFIELD–REHABILITATE TAXIWAY "N" AT TERMINAL APRON
- 2H AIRFIELD–REHABILITATE SOUTH PORTION OF TAXIWAY "M"
- 2I AIRFIELD–REHABILITATE TAXIWAY "H", ADJACENT TO TAXIWAY "B"
- 2J AIRFIELD–REHABILITATE BITUMINOUS PORTION OF RAMP AT GATES 1–3, & PORTIONS OF TAXIWAYS "N" & "E"
- 2K AIRFIELD–REHABILITATE PORTIONS OF TAXIWAY "A" AND "B" INCLUDING U.S. CUSTOMS RAMP

LANDSIDE IMPROVEMENTS

- 3A LANDSIDE–REHABILITATE AIRPORT RD. SECTION (UNDER T/W "M" OVERPASS)
- 3B LANDSIDE–REHABILITATE SECTION OF PARKING LOT "C"–PHASE I
- 3C LANDSIDE–EXPAND PARKING LOT "C" (PHASE I)

TERMINAL IMPROVEMENTS

- 4A TERMINAL–PA SYSTEM UPGRADES
- 4B TERMINAL–HVAC SYSTEM UPGRADES
- 4C TERMINAL–CONSTRUCT "FIRST–AID" ROOM
- 4D TERMINAL–RELOCATE TERMINAL CURBSIDE AIRLINE SIGNS
- 4E TERMINAL–REWORK TERMINAL LANDSCAPING
- 4F TERMINAL–RELOCATE RENTAL CAR COUNTERS TO GARAGE (DESIGN)
- 4G TERMINAL–RELOCATE RENTAL CAR COUNTERS TO GARAGE (CONSTRUCTION)
- 4H TERMINAL–REFURBISH/REPLACE BAG CLAIM "B" LOBBY AREA–CONSTRUCT NEW CONCESSIONS
- 4I TERMINAL–REFURBISH AND EXPAND BAG CLAIM EQUIPMENT
- 4J TERMINAL–CONSOLIDATE SECURITY CHECKPOINTS "B" & "C" ON LEVEL 2 (DESIGN)

SECURITY IMPROVEMENTS

- 5 SECURITY–CCTV SYSTEM–PHASE IV

OPERATIONS IMPROVEMENTS

- 6A OPERATIONS–INCIDENT COMMAND VEHICLE
- 6B OPERATIONS–ACQUISITION OF SNOW REMOVAL EQUIPMENT
- 6C OPERATIONS–INTERACTIVE EMPLOYEE TRAINING MODULE
- 6D OPERATIONS–SNOW REMOVAL EQUIP. STOR. BLDG. (PHASE I–DESIGN)
- 6E OPERATIONS–SNOW REMOVAL EQUIP. STOR. BLDG. (PHASE II–SITE WORK)
- 6F OPERATIONS–SNOW REMOVAL EQUIP. STOR. BLDG. (PHASE III–CONSTRUCTION)

MISCELLANEOUS IMPROVEMENTS

- 7A MISCELLANEOUS–DEMOLITION OF HIGHLANDER BUILDINGS

Manchester-Boston REGIONAL AIRPORT
Airport Master Plan Update

CAPITAL IMPROVEMENT PROGRAM SHORT-TERM (YEAR 2011 - 2015)

FIGURE 9-1

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9.3 INTERMEDIATE-TERM AIRPORT IMPLEMENTATION PLAN (6-10 YEARS)

The program recommends specific demand-driven airport improvements estimated to begin in 2016 and continue through 2020 (Intermediate-Term).

The cost estimates for this program are based on probable project development costs. The total estimated project cost for the intermediate-range improvement program, which includes design services and contingencies, is estimated at $43,770,000 (2010 dollars). These estimates are identified in **Table 9-2**, which is presented after the description of recommended capital improvements. Table 9-2 lists joint federal, state, and airport funded projects. Proposed improvement items in the 6-10 year capital improvement program are graphically illustrated on **Figure 9-2**, which follows Table 9-2.

The following is a list of projects recommended to be completed during the 6-10 year time frame.

1. LAND ACQUISITION

- 1A. Land Acquisition - Future Development

2. AIRFIELD IMPROVEMENTS

- 2A. Airfield - Rehabilitate Portions of Taxiways “A,” “C,” and “D”
- 2B. Airfield - Rehabilitate South Taxiway “A,” including Taxiways “P,” “U,” and portions of “E” and “F”
- 2C. Airfield - Rehabilitate Taxiway “H” South
- 2D. Airfield - Rehabilitate Taxiway “M” North
- 2E. Airfield - Rehabilitate Runway 6/24 and 17/35 Intersection
- 2F. Airfield - Rehabilitate East Ramp
- 2G. Airfield - Install Approach Lighting System (ALS) Runway 6

3. LANDSIDE IMPROVEMENTS

- 3A. Landside - Rehabilitate Parking Lot “B” and Administrative Lot
- 3B. Landside - Rehabilitate Parking Lot “A”
- 3C. Landside - Rehabilitate Parking Lot “D”
- 3D. Landside - Rehabilitate Parking Lot “C” - Phase II
- 3E. Landside - Rehabilitate Airport Entrance/Terminal Loop Road

4. TERMINAL IMPROVEMENTS

- 4A. Terminal - Consolidate Security Checkpoints “B” & “C” on Level 2 (Construction)
- 4B. Terminal - Outbound Baggage System
- 4C. Terminal - Rework Terminal Traffic Lanes
- 4D. Terminal - Renovate Communication Center
- 4E. Terminal - Merchandise Screening/Concession Storage/Holdroom Expansion
- 4F. Terminal - Short-Term Federal Inspection Services (FIS) Facility

The following list of Airside/Airfield, Landside and Terminal projects are recommended to be completed during the 6-10 year time frame are described in the following paragraphs which include a project narrative, project justification statement, and project cost:

1. LAND ACQUISITION

1A. Land Acquisition - Future Development

Project Narrative: Acquire property as it becomes available for future development. Property off the end of Runway 6 has been identified for future acquisition as the property becomes available.

Project Justification: Enhance surrounding airport compatibility and potential revenue generating property for the airport.

Project Cost: The budget for this acquisition is $3,000,000.

2. AIRFIELD IMPROVEMENTS

2A. Airfield - Rehabilitate Portions of Taxiways "A," "C," and "D"

Project Narrative: Rehabilitate and re-mark approximately 27,334 SY of pavement section on Taxiways "A," "C," and "D" as well as stub Taxiways "C" and "D" west of Runway 17/35.

Project Justification: This portion of Taxiway "A" is located west of Runway 17/35 and serves as a partial parallel taxiway. The pavement is starting to show signs of deterioration. The section of Taxiway "A" pavement is in "Fair" condition and had a PCI of 62 (2009). It is estimated the taxiway will be in need of complete rehabilitation by the 2016 year time period. The airport currently uses MicroPAVER™ to conduct pavement evaluations and will continue to monitor the condition.

Project Cost: The estimated cost of this project is $1,640,000.

2B. Airfield - Rehabilitate South Taxiway "A," including "P," "U," and portions of "E" and "F"

Project Narrative: Rehabilitate and re-mark approximately 107,800 SY of pavement on the south section of Taxiways "A," including Taxiways "P," "U," and portions of Taxiways "E" and "F." In addition, connector taxiway pavement stubs off this section of Taxiway "E" adjacent to corporate Hangars would be rehabilitated.

Project Justification: This south section of Taxiway "A" is located west of Runway 17/35 and serves as a partial parallel taxiway. The pavement is starting to show signs of deterioration. The section of Taxiway "A" pavement is in satisfactory condition and had a PCI of 78 (2009). It is estimated the taxiway will be in need of complete rehabilitation by around the year 2017.

Project Cost: The estimated cost of this project is $6,520,000.

2C. Airfield - Rehabilitate Taxiway "H" South

Project Narrative: Rehabilitate and re-mark south section of Taxiway "H" pavement, between stub connector Taxiways "D" and "F," consisting of approximately 44,000 SY of pavement area.

Project Justification: Taxiway ”H” serves as a partial parallel taxiway to Runway 17/35. The pavement is starting to show signs of deterioration. The section of Taxiway “H” pavement is in satisfactory condition and had a PCI of 74 (2009). It is estimated the taxiway will be in need of complete rehabilitation by around the year 2018.

Project Cost: The estimated cost of this project is $2,670,000.

2D. Airfield - Rehabilitate Taxiway “M” North

Project Narrative: Rehabilitate and re-mark north section of Taxiway ”M” and Taxiway “M1,” including bridge pavement. These sections of taxiways consist of approximately 33,445 SY of pavement area.

Project Justification: Taxiways ”M” and “M1” are located on the west side of the airport. The pavement was constructed in 2003 and shows signs of deterioration. The section of Taxiways “M” and “M1” pavement are in satisfactory condition and had a PCI of 78 (2009). It is estimated the taxiways will be in need of rehabilitation by the year 2019. This section of pavement which is not that old will be monitored.

Project Cost: The estimated cost of this project is $2,135,000.

2E. Airfield - Rehabilitate Runway 6/24 and 17/35 Intersection

Project Narrative: Rehabilitate and re-mark approximately 37,579 SY of pavement at the Runway 6/24 and 17/35 intersection.

Project Justification: Runway 6/24 is 7,650 feet long by 150 feet wide and serves as airport’s secondary runway, whereas Runway 17/35 is 9,250 feet long by 150 feet wide and serves as airport’s primary runway. The runway intersection pavement was constructed in 2003 and shows signs of deterioration. This section of intersecting runway pavement is in Fair condition and had a PCI of 63 (2009).

Project Cost: The estimated cost of this project is $2,430,000.

2F. Airfield - Rehabilitate East Ramp

Project Narrative: Rehabilitate the East Ramp, approximately 39,922 SY of pavement area.

Project Justification: The East Ramp consists of 22,922 SY of bituminous concrete and 17,000 SY of PCC. Both areas are showing signs of deterioration due to age and are in need of rehabilitation. The rehabilitation anticipated would mill four inches off of the surface and replace it with four inches of new bituminous concrete. Included in the rehabilitation will be the replacement of aircraft tie-downs.

Project Cost: The estimated cost of this project is $3,800,000.

2G. Airfield - Install ALS Runway 6

Project Narrative: Install a Medium Intensity Approach Lighting System with Sequenced Flashing Lights (MALSF) on the approach and to Runway 6.

Project Justification: The addition MALSF on the Runway 6 end will enhance the margin of safety for the runway during periods of poor visibility.

Project Cost: The estimated cost of this project is $2,500,000.

3. LANDSIDE IMPROVEMENTS

3A. Landside - Rehabilitate Parking Lot "B" and Administrative Lot

Project Narrative: Rehabilitate/resurface approximately 14,200 SY of existing Parking Lot "B" and the Administrative Lot.

Project Justification: The pavement in Parking Lot "B" will have served its useful life by the Intermediate-Term and will be in need of rehabilitation.

Project Cost: The estimated cost of this project is $525,000.

3B. Landside - Rehabilitate Parking Lot "A"

Project Narrative: Rehabilitate/resurface approximately 10,500 SY of existing Parking Lot "A".

Project Justification: The pavement in Parking Lot "A" will have served its useful life by the Intermediate-Term and will be in need of rehabilitation.

Project Cost: The estimated cost of this project is $325,000.

3C. Landside - Rehabilitate Parking Lot "D"

Project Narrative: Rehabilitate/resurface approximately 68,400 SY of existing Parking Lot "D".

Project Justification: The pavement in Parking Lot "D" will have served its useful life by the Intermediate-Term and will be in need of rehabilitation.

Project Cost: The estimated cost of this project is $2,400,000.

3D. Landside - Rehabilitate Parking Lot "C" - Phase II

Project Narrative: Phase II - The overlay the remainder of Parking Lot "C," Phase I Parking Lot "C" programmed for 2012.

Project Justification: The pavement in the Phase II area of Parking Lot "C" will have served its useful life by the Intermediate-Term and will be in need of rehabilitation.

Project Cost: The estimated cost of this project is $975,000.

3E. Landside - Rehabilitate Airport Entrance/Terminal Loop Road

Project Narrative: Rehabilitate Airport Entrance/Terminal Loop Road from Ammon Drive around the parking garage back to Airport Road.

Project Justification: The Terminal Loop Road's pavement, overlaid in 2005, will be in need of rehabilitation.

Project Cost: The estimated cost of this project is $700,000.

4. TERMINAL IMPROVEMENTS

4A. Terminal - Consolidate Security Checkpoints "B" & "C" on Level 2 (Construction)

Project Narrative: This project includes the reconfiguration and consolidation of existing security check points "B" and "C" areas located on Level 2 of the passenger terminal building. The project includes concession modifications, passenger circulation and access modification to Level 3. The items included in this project are listed as follows:

- Construct new unsecured stairs to Level 3 Observation Area;
- Modify existing Samuel Adams seating area;
- Demolish existing central stairs and existing security screening checkpoints;
- Construct five new security screening checkpoints;
- Construct TSA support space;
- Install new security grilles at concourse;
- Construct new passenger arrival backflow lane. Modify Milltown Grill seating area;
- Construct new secured concession along concourse adjacent to Gate 9; and
- Modification to Level 3 public space and Level 3 expansion for the relocation of airport administration area, kitchen and several offices.

Project Justification: Consolidation of check points "B" and "C" will improve the passenger screening process and overall arriving and departing passenger circulation.

Project Cost: The estimated cost of this project is $4,000,000.

4B. Terminal - Outbound Baggage System

Project Narrative: This project includes the replacement of all existing EDS equipment and coordinating with TSA. While the EDS replacement equipment will be supplied by TSA, MHT will be required to modify building components necessary for installation of new EDS equipment. MHT will be required to provide modifications to existing bag belts, which interface with the new equipment, and make final electrical connections. In addition, MHT will have to provide a new control system and provide for testing required to certify the new EDS System prior to acceptance by TSA.

Project Justification: Existing EDS equipment is nearing the end of the 10 year TSA standard life cycle, which will be January 1, 2013.

Project Cost: The estimated cost of this project is $1,500,000.

4C. Terminal - Rework Terminal Traffic Lanes

Project Narrative: Modify existing terminal approach roadway lanes/islands layout to create clear decision point between travel lanes to all parking, commercial vehicles and departure/arrival curbs. Items include: 1) reshape islands, 2) relocate parking/ground transportation traffic control gates, 3) relocate existing overhead lane identification sign and 4) add new overhead lane identification sign.

Project Justification: Improves the customer's decision time for parking verses passenger drop-off while approaching the terminal area.

Project Cost: The estimated cost of this project is $900,000.

4D. Terminal - Renovate Communication Center

Project Narrative: Renovate the existing Communication Center located on Level 1 of the passenger terminal building adjacent to the existing elevator.

Project Justification: Expand and renovate existing Communications Center to provide work stations for staff of three required during peak conditions (one position suitable for training in off-peak periods). Correct functional issues with public visual access to sensitive data displays and upgrade equipment as required to maintain full coordination of communications functions.

Project Cost: The estimated cost of this project is $1,000,000.

4E. Terminal – Merchandise Screening/Concession Storage/Holdroom Expansion

Project Narrative: Construct a small expansion at the north end of the terminal adjacent to the existing loading dock to provide space dedicated to TSA merchandise screening and additional concession storage. The area above on level 2, permits construction of additional concession storage and new concession location. This development further provides the opportunity to convert Gate 15A to a fully functional Gate 16 by expanding the existing holdroom area serving Gate 15.

Project Justification: Currently, concessions deliveries are made from either the roadway in front of the terminal or the existing loading dock at the north end of the terminal. All merchandise, regardless of where delivered, is screened by TSA through one of the passenger screening checkpoint lanes.

According to the conclusions reached in the concession analysis provided as part of the Airport Master Plan Update, the terminal is currently deficient in concession storage area. In addition, the terminal will be deficient in the optimum square footage of revenue producing concession area.

Project Cost: The estimated cost of the project is $3,100,000.

4F. Terminal - Short-Term FIS Facility

Project Narrative: The Short-Term FIS Facility Option provides the minimum required facilities to quickly and economically activate processing of international arrivals. Full access to the existing facility will remain available for domestic flights other than when international processing is in progress.

Project Justification: This Option cross-utilizes many of the terminal's existing facilities to limit the amount of investment required to activate the FIS operation. A modular-style structure, which is the least disruptive and most cost effective method to expand the available enclosed floor area, is used to house the primary inspection function. U.S. Customs inspection utilizes floor area from the proposed elimination of existing Checkpoint A.

Project Cost: The estimated cost of this project is $3,650,000.

TABLE 9-2
INTERMEDIATE-TERM (YEAR 2016 TO 2020) COST ESTIMATES

Project Description	Total
Land Acquisition	
1A. Land Acquisition - Future Development	$3,000,000
Land Acquisition Total	***$3,000,000***
Airfield Improvements	
2A. Airfield - Rehabilitate Portions of Taxiways “A,” “C,” and “D”	$1,640,000
2B. Airfield - Rehabilitate South Taxiway “A” including “P” and “U” and portions of “E” and “F”	$6,520,000
2C. Airfield - Rehabilitate Taxiway “H” South	$2,670,000
2D. Airfield - Rehabilitate Taxiway “M” North	$2,135,000
2E. Airfield - Rehabilitate Runway 6/24 and 17/35 Intersection	$2,430,000
2F. Airfield - Rehabilitate East Ramp	$3,800,000
2G. Airfield - Install ALS Runway 6	$2,500,000
Airfield Improvements Total	***$21,695,000***
Landside Improvements	
3A. Landside - Rehabilitate Parking Lot “B” and Administrative Lot	$525,000
3B. Landside - Rehabilitate Parking Lot “A”	$325,000
3C. Landside - Rehabilitate Parking Lot “D”	$2,400,000
3D. Landside - Rehabilitate Parking Lot “C” - Phase II	$975,000
3E. Landside - Rehabilitate Airport Entrance/Terminal Loop Road	$700,000
Landside Improvements Total	***$4,925,000***
Terminal Improvements	
4A. Terminal - Consolidate Security Checkpoints “B” & “C” on Level 2 (Construction)	$4,000,000
4B. Terminal - Outbound Baggage System	$1,500,000
4C. Terminal - Rework Terminal Traffic Lanes	$900,000
4D. Terminal - Renovate Communication Center	$1,000,000
4E. Terminal - Merchandise Screening/Concession Storage/Holdroom Expansion	$3,100,000
4F. Terminal - Short-Term FIS Facility	$3,650,000
Terminal Improvements Total	***$14,150,000***
6-10 Year Total	***$43,770,000***

Source: URS Corporation and McFarland Johnson, 2010.

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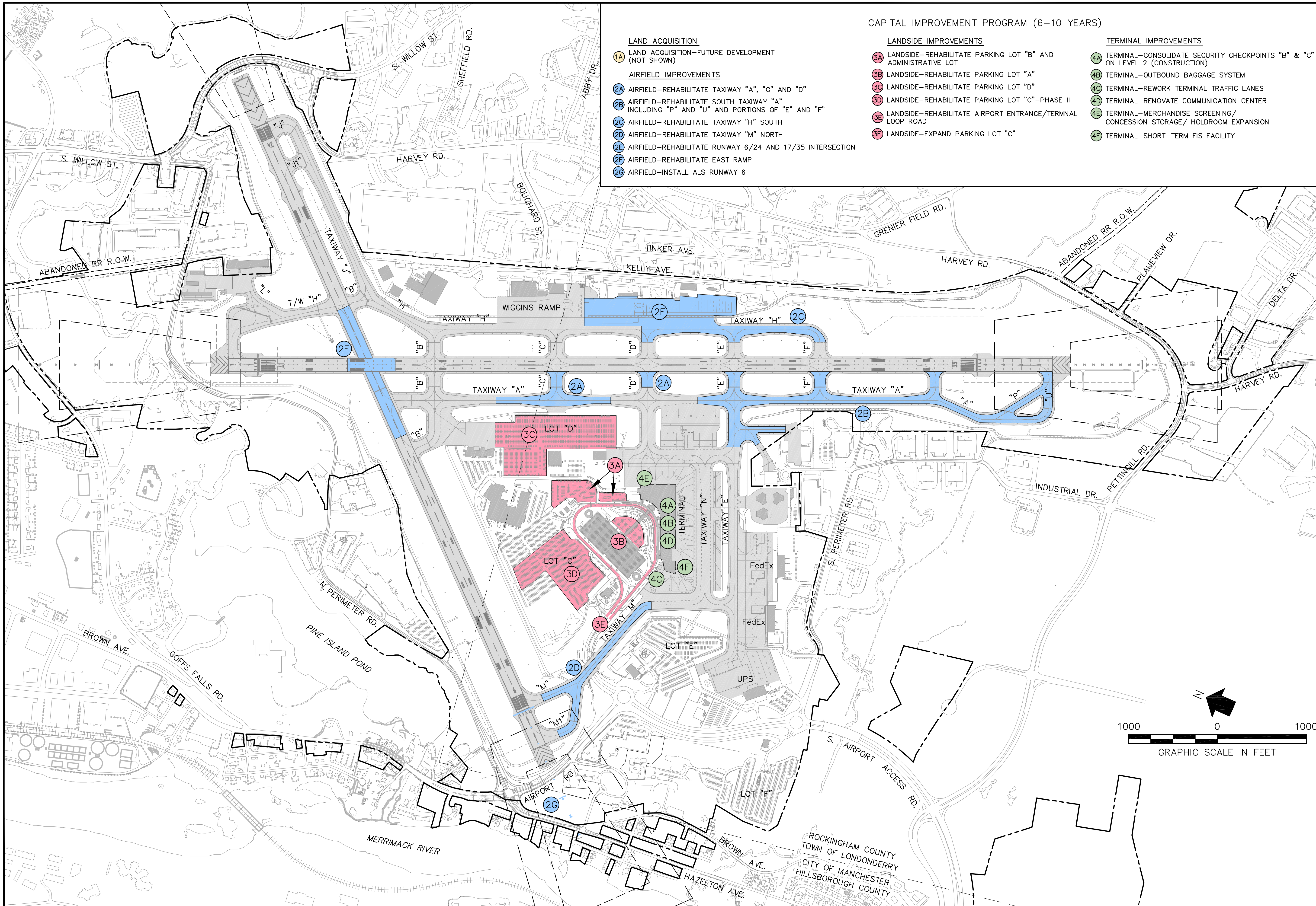

CAPITAL IMPROVEMENT PROGRAM (6–10 YEARS)

LAND ACQUISITION

1A LAND ACQUISITION–FUTURE DEVELOPMENT (NOT SHOWN)

AIRFIELD IMPROVEMENTS

2A AIRFIELD–REHABILITATE TAXIWAY "A", "C" AND "D"
2B AIRFIELD–REHABILITATE SOUTH TAXIWAY "A" INCLUDING "P" AND "U" AND PORTIONS OF "E" AND "F"
2C AIRFIELD–REHABILITATE TAXIWAY "H" SOUTH
2D AIRFIELD–REHABILITATE TAXIWAY "M" NORTH
2E AIRFIELD–REHABILITATE RUNWAY 6/24 AND 17/35 INTERSECTION
2F AIRFIELD–REHABILITATE EAST RAMP
2G AIRFIELD–INSTALL ALS RUNWAY 6

LANDSIDE IMPROVEMENTS

3A LANDSIDE–REHABILITATE PARKING LOT "B" AND ADMINISTRATIVE LOT
3B LANDSIDE–REHABILITATE PARKING LOT "A"
3C LANDSIDE–REHABILITATE PARKING LOT "D"
3D LANDSIDE–REHABILITATE PARKING LOT "C"–PHASE II
3E LANDSIDE–REHABILITATE AIRPORT ENTRANCE/TERMNAL LOOP ROAD
3F LANDSIDE–EXPAND PARKING LOT "C"

TERMINAL IMPROVEMENTS

4A TERMINAL–CONSOLIDATE SECURITY CHECKPOINTS "B" & "C" ON LEVEL 2 (CONSTRUCTION)
4B TERMINAL–OUTBOUND BAGGAGE SYSTEM
4C TERMINAL–REWORK TERMINAL TRAFFIC LANES
4D TERMINAL–RENOVATE COMMUNICATION CENTER
4E TERMINAL–MERCHANDISE SCREENING/ CONCESSION STORAGE/ HOLDROOM EXPANSION
4F TERMINAL–SHORT–TERM FIS FACILITY

Manchester-Boston REGIONAL AIRPORT
Airport Master Plan Update

CAPITAL IMPROVEMENT PROGRAM INTERMEDIATE-TERM (YEAR 2016 - 2020)

FIGURE 9-2

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9.4 LONG-TERM AIRPORT IMPLEMENTATION PLAN (11-20 YEARS)

The program recommends specific annual airport improvements beginning in 2021 and continuing through 2030 (Long-Term). Airfield pavements conditions will continue to be monitored by MHT staff annually through their Pavement Management Software Program. Programmed pavement rehabilitation time periods will be adjusted accordingly. Other landside facilities would be rehabilitated and constructed as the need is justified.

The total estimated project cost for the Long-Term improvement program, which includes design services and contingencies, is estimated at $71,470,000 (2010 dollars). These project cost estimates are listed in **Table 9-3**, which is presented after the brief descriptions of proposed long-range improvement items. In addition, recommended improvements are graphically illustrated on **Figure 9-3**, which follows Table 9-3.

The following is a list of projects recommended to be completed during the 11 to 20 year and beyond time frame. For this CIP the 11 to 20 year time frame project lists is grouped by categories: Airfield, Landside and Terminal.

1. AIRFIELD IMPROVEMENTS

- 1A. Airfield - Rehabilitate Taxiway “H” North of Runway 6/24
- 1B. Airfield - Rehabilitate Taxiway “J,” “J1” and Portion of “H”
- 1C. Airfield - Rehabilitate Taxiway “H” at Taxiway “C”
- 1D. Airfield - Rehabilitate Taxiway “H” at Runway 17, “A,” “B,” “M,” and “M1” at Runway 6
- 1E. Airfield - Rehabilitate One Half of Runway 17/35 South of Runway 6/24
- 1F. Airfield - Rehabilitate One Half of Runway 17/35 South of Runway 6/24
- 1G. Airfield - Rehabilitate East Side Taxiway Stubs
- 1H. Airfield - Rehabilitate Runway 6/24 East of Runway 17/35
- 1I. Airfield - Rehabilitate Taxiway “A” and “D” (West)
- 1J. Airfield - Rehabilitate Taxiway “E” (Cargo)
- 1K. Airfield - Rehabilitate Runway 17/35 (North of Runway 6/24)
- 1L. Airfield - Rehabilitate Runway 6/24 West of Runway 17/35
- 1M. Airfield - Rehabilitate Taxiway “L” at N.E. Ramp

2. LANDSIDE IMPROVEMENTS

- 2A. Landside - Expand Parking Lot “C” (Phase II)
- 2B. Landside - Rehabilitate Green Drive from Ammon Center to Terminal Building Delivery Dock.

3. TERMINAL IMPROVEMENTS

- 3A. Terminal - New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature
- 3B. Terminal - Construct Pedestrian Bridge Connector
- 3C. Terminal - Baggage Claim Area Upgrade Adding Fourth Claim Device
- 3D. Terminal - Provide Direct Vertical Passenger Circulation from Concourse to Baggage Claim
- 3E. Terminal - Renovate Consolidated Checkpoint to Add a Sixth Screening Lane
- 3F. Terminal - Administrative Office Expansion/Renovation - Level 3
- 3G. Terminal - Permanent FIS Facility

The following list of Airfield, Landside and Terminal improvement projects should be budgeted and programmed during the Long-Term 11-20 year and beyond time frame. Some projects could be accelerated or deferred based on demand and or useful life conditions.

1. AIRFIELD IMPROVEMENTS

1A. Airfield – Rehabilitate Taxiway "H" North of Runway 6/24

Project Area: 30,000 SY
Last Rehabilitation: 1993
Project Budget Cost Estimate: $1,810,000

1B. Airfield – Rehabilitate Taxiway "J," "J1," and Portion of "H"

Project Area: 58,600 SY
Last Rehabilitation: 1999
Project Budget Cost Estimate: $3,520,000

1C. Airfield – Rehabilitate Taxiway "H" at Taxiway "C"

Project Area: 25,120 SY
Last Rehabilitation: 1995
Project Budget Cost Estimate: $1,550,000

1D. Airfield – Rehabilitate Taxiway "H" at Runway 17, "A," "B," "M," and "M1" at Runway 6

Project Area: 25,000 SY
Last Rehabilitation: 1999/2001
Project Budget Cost Estimate: $1,500,000

1E. Airfield – Rehabilitate One Half of Runway 17/35 South of Runway 6/24

Project Area: 63,334 SY
Last Rehabilitation: 2002
Project Budget Cost Estimate: $3,975,000.

1F. Airfield – Rehabilitate One Half of Runway 17/35 South of Runway 6/24

Project Area: 63,334 SY
Last Rehabilitation: 2002
Project Budget Cost Estimate: $3,975,000

1G. Airfield – East Side Taxiway Stubs

Project Area: 17,900 SY
Last Rehabilitation: 2003
Project Budget Cost Estimate: $1,110,000

1H. Airfield – Rehabilitate Runway 6/24 East of Runway 17/35

Project Area: 35,940 SY
Last Rehabilitation: 1999
Project Budget Cost Estimate: $2,310,000

1I. Airfield – Rehabilitate Taxiway “A” and “D” (West)

Project Area:	37,060 SY
Last Rehabilitation:	2003
Project Budget Cost Estimate:	$2,200,000

1J. Airfield – Rehabilitate Taxiway “E” (Cargo)

Project Area:	24,000 SY
Last Rehabilitation:	2008
Project Budget Cost Estimate:	$1,465,000

1K. Airfield – Rehabilitate Runway 17/35 (North of Runway 6/24)

Project Area:	34,570 SY
Last Rehabilitation:	2003
Project Budget Cost Estimate:	$2,200,000

1L. Airfield – Rehabilitate Runway 6/24 West of Runway 17/35

Project Area:	66,700 SY
Last Rehabilitation:	2006
Project Budget Cost Estimate:	$4,225,000

1M. Airfield – Rehabilitate Taxiway “L” at N.E. Ramp

Project Area:	6,800 SY
Last Rehabilitation:	2006
Project Budget Cost Estimate:	$465,000

2. LANDSIDE IMPROVEMENTS

2A. Landside – Expand Parking Lot “C” (Phase II)

Project Narrative: This project consists of the Phase II expansion of Parking Lot “C” which is the primary Long-Term parking lot at MHT. The project would add approximately 900 public parking spaces.

Project Justification: The project will be required when the passenger demand requires additional parking at the airport and /or the airport wishes to gain the highest and best use of Lot “C” potential parking capacity. This would allow the airport to delay opening the remote lot during peak periods thus reducing labor cost.

Project Cost: The estimated cost of this project is $2,000,000.

2B. Landside - Rehabilitate Green Drive – from Ammon Center to Terminal Building Delivery Dock

Project Narrative: Rehabilitate Green Drive from Ammon Center to terminal building delivery dock.

Project Justification: This section of Green Drive is in “Good” condition and was rehabilitated in 2008. This project will need rehabilitation of the pavement within the long-term time period.

Project Cost: The estimated cost of this project is $200,000.

3. TERMINAL IMPROVEMENTS

3A. Terminal – New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature

Project Narrative: As part of the initiative to improve curb frontage utilization, the addition of a third entrance point to the main ticket lobby is proposed. Included as part of the proposal is the modification of the existing entrance canopy structure to eliminate one column at each entrance point to open up visibility to the vestibules and add/modify the canopy to provide a visual queue at each entrance point.

Project Justification: Improves curbside utilization and customer visibility for dropping off passengers in order to avoid vehicles clustering at the center of the terminal front effectively blocking effective through circulation on the roadway.

Project Cost: The estimated cost of this project is $1,325,000.

3B. Terminal – Construct Pedestrian Bridge Connector

Project Narrative: The development of the pedestrian bridge connector between the end of the existing pedestrian bridge and level 2 at the entrance to the checkpoint area will provide a number of desirable benefits:

A. This addition will provide a direct path for pre-ticketed passengers with boarding passes and carry-on baggage using the parking garage and existing pedestrian bridge thereby reducing potential congestion in the Level 1 area between ticketing and bag claim.

B. The floor area gained from constructing the bridge connector on Level 2 will provide the additional space necessary to support queuing for the required expansion of the passenger screening checkpoint from 5 to 6 lanes and increasing each lanes length to insure maximum per lane throughput. The additional space will also provide queuing overflow area during periods of reduced screening capacity.

Project Justification: As peak hour passenger volume recovers to levels experienced in 2005, it is anticipated that departing passengers will again experience congestion resulting from meeter/greeters waiting for arriving passengers at the top of the escalator area. This condition will become even more disruptive on occasions when the queue for the passenger screening checkpoint overflows into this area resulting from insufficient screening capacity for the rate of passenger arrivals during peak departure periods.

Project Cost: The estimated cost of the project is $7,275,000.

3C. Terminal – Baggage Claim Area Upgrade Adding Fourth Claim Device

Project Narrative: As a result of growth in passenger volume, additional conveyor frontage and a fourth claim device will be required during the period approaching the Passenger Activity Level (PAL) 2 planning horizon.

Project Justification: In order to avoid unacceptable levels of congestion and delay in Bag Claim Area "B," three alternatives have been identified, which satisfy the minimum claim frontage requirements and provide adequate waiting area and new Baggage Service Offices (BSO), as outlined below:

A. Option A provides for freestanding sloped bed claim devices which offer the minimum recommended claim frontage and bag storage capacity. Bags are delivered to the devices through a system of belts in under floor tunnels. This Option provides the expanded claim capacity and new BSO space within the existing building footprint.

B. Option B repositions the sloped bed claim devices back to the rear wall of the claim area so bags can be delivered via overhead belts rather than tunnels. The devices are longer due to the need to make up for the loss of claim frontage and waiting area as provided around Option A above. This option (B) requires a small addition to the building footprint to accommodate the new BSO space.

C. Option C maintains the flat bed claim devices previously upgraded and adds a fourth device of the same characteristics. This option requires a small addition to the building to accommodate the BSO space as in Option B above.

Project Cost: The estimated project cost of each option is:

Option A: $13,270,000

Option B: $ 9,362,000

Option C: $ 2,516,000

Note: For budget purposes, the highest option cost estimate is shown in Table 9-3.

3D. Terminal – Provide Direct Vertical Passenger Circulation from Concourse to Baggage Claim

Project Narrative: When a sixth lane is added to the passenger screening checkpoint, it is recommended that the access to bag claim for arriving passengers be revised to move arriving passengers directly from the concourse to bag claim thereby eliminating the backflow lane through the screening and queuing area.

Project Justification: The proposed change will eliminate the congestion resulting from meeter/greeters gathering in same area as departing passengers are preparing to enter the queue for screening. Adequate space is available in baggage claim for this activity. Relocating meeter/greeters to the claim lobby will also benefit the concessions operating around the claim area.

Project Cost: The estimated cost of this project is $2,300,000.

3E. Terminal – Renovate Consolidated Checkpoint to Add a Sixth Screening Lane

Project Narrative: As a result of growth in passenger volume, an additional passenger screening lane will be required. At this time, most existing non-secure concessions on Level 2 will lose access frontage. These areas will be renovated to reorient this space to concessions serving the secure area off the concourse. Renovate area to maintain one non-secure concession off the checkpoint queuing area, and add one new concession on concourse at the checkpoint exit.

Project Justification: The additional screening lane is required to avoid excessive waiting times, departure delays and unacceptable levels of congestion associated with passenger screening. Renovated food and beverage concessions will supplement potential deficiencies in holdroom seating capacity and should be located with this in mind.

Project Cost: The estimated cost of this project is $5,320,000.

3F. Terminal – Administrative Office Expansion/Renovation - Level 3

Project Narrative: Expand the administrative office floor area on Level 3 to add space for relocation of Engineering and Planning (E&P) to the terminal building and create additional area to accommodate future administrative space requirements.

Project Justification: Relocation of E&P will centralize the management and engineering/planning resources of the airport's operation. Adding space for future use will provide additional capacity for expanding staff when needed.

Project Cost: The estimated cost of this project is $3,475,000.

3G. Terminal – Permanent FIS Facility

Project Narrative: The Permanent FIS Facility Option provides for use of the existing terminal facilities for a dedicated FIS Facility operation and incorporates some of the improvements made to construct the Short-Term FIS Facility including provisions for sterile circulation on Level 2, a sterile elevator between Level 2 and Level 1 and secure circulation on Level 1.

Project Justification: In the event international service gains sufficient importance to warrant the development of a permanent FIS Facility to serve MHT, the Permanent Option can utilize some of the improvements constructed to support the Short-Term FIS Facility and otherwise be developed within the footprint of the existing terminal envelope for all remaining elements.

Project Cost: The estimated cost of this project is $6,000,000.

TABLE 9-3
LONG-TERM (YEAR 2021 TO 2030) COST ESTIMATES

Project Description	Total
1. Airfield Improvements	
1A. Airfield - Rehabilitate Taxiway “H” North of Runway 6/24	$1,810,000
1B. Airfield - Rehabilitate Taxiway “J,” “J1,” and Portion of “H”	$3,520,000
1C. Airfield - Rehabilitate Taxiway “H” at Taxiway “C”	$1,550,000
1D. Airfield - Rehabilitate Taxiway “H” at Runway 17, “A,” “B,” “M,” and “M1” at Runway 6	$1,500,000
1E. Airfield - Rehabilitate One Half of Runway 17/35 South of Runway 6/24	$3,975,000
1F. Airfield - Rehabilitate One Half of Runway 17/35 South of Runway 6/24	$3,975,000
1G. Airfield - Rehabilitate East Side Taxiway Stubs	$1,110,000
1H. Airfield - Rehabilitate Runway 6/24 East of Runway 17/35	$2,310,000
1I. Airfield - Rehabilitate Taxiway “A” and “D” (West)	$2,200,000
1J. Airfield - Rehabilitate Taxiway “E” (Cargo)	$1,465,000
1K. Airfield - Rehabilitate Runway 17/35 (North of Runway 6/24)	$2,200,000
1L. Airfield - Rehabilitate Runway 6/24 West of Runway 17/35	$4,225,000
1M. Airfield - Rehabilitate Taxiway “L” at N.E. Ramp	$465,000
Airfield Improvements Total	***$30,305,000***
2. Landside Improvements	
2A. Landside – Expand Parking Lot “C” (Phase II)	$2,000,000
2B. Landside - Rehabilitate Green Drive – Section of Road from Ammon Drive Center to Terminal Building Delivery Dock	$200,000
Landside Improvements Total	***$2,200,000***
3. Terminal Improvements	
3A. Terminal – New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature	$1,325,000
3B. Terminal – Construct Pedestrian Bridge Connector	$7,275,000
3C. Terminal – Baggage Claim Area Upgrade Adding Fourth Claim Device	$13,270,000
3D. Terminal – Provide Direct Vertical Pax. Circulation from Concourse to Baggage Claim	$2,300,000
3E. Terminal – Renovate Consolidated Checkpoint to Add a Sixth Screening Lane	$5,320,000
3F. Terminal – Administrative Office Expansion/Renovation - Level 3	$3,475,000
3G. Terminal – Permanent FIS Facility	$6,000,000
Terminal Improvements Total	***$38,965,000***
11-20 Year Total	***$71,470,000***

Source: URS Corporation and McFarland Johnson, 2010.

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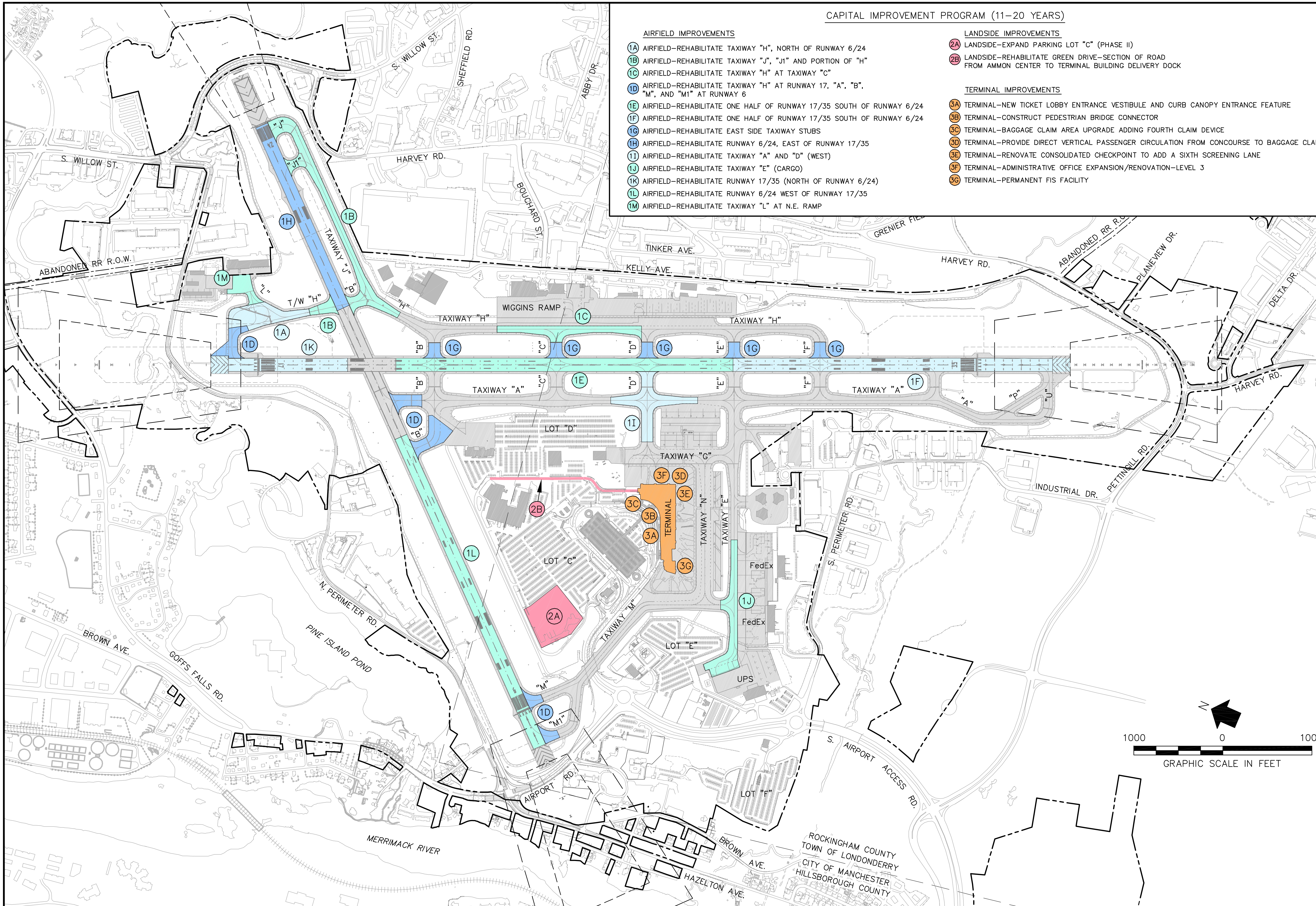


Manchester-Boston REGIONAL AIRPORT

Airport Master Plan Update

CAPITAL IMPROVEMENT PROGRAM LONG-TERM (YEAR 2021 - 2030)

FIGURE 9-3

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION TEN

Environmental Considerations

SECTION 10.0
ENVIRONMENTAL CONSIDERATIONS

10.1 INTRODUCTION

The following sections provide information on the anticipated environmental considerations for the projects proposed under the Manchester-Boston Regional Airport's (MHT's) Capital Improvement Program (CIP). This discussion of environmental considerations is divided into three sections, based on when the project is proposed. Short-Term projects are proposed within the next five years (2011 to 2015). Intermediate-Term projects are proposed within the next 6 to 10 years (2016 to 2020). Long-Term projects are proposed within the next 11 to 20 years (2021 to 2030). Within each section, the potential environmental considerations are discussed by project. **Tables 10-1, 10-2, and 10-3**, located further in Section 10.6, also provide a summary of the environmental considerations for each project. Environmental considerations may include constraints that need to be assessed and integrated into the project design, as well as permits and approvals that may need to be obtained. In all cases, the identification of constraints and the initiation of the various permitting process should occur as early in the design process as practicable to avoid project delays.

State and federal permits/approvals may be required prior to the construction of many of the proposed improvement projects. The major permit programs are discussed in this section of the Airport Master Plan Update. Additional project-specific permits and/or approvals are addressed further in Section 10.1.1.

10.1.1 2008 MULTI-SECTOR GENERAL PERMIT

Portions of MHT are subject to requirements of the Federal National Pollutant Discharge Elimination System (NPDES) program and the Airport is required to obtain coverage under the <u>2008 Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activities</u> (MSGP). MHT submitted a Notice of Intent (NOI) to the U.S. Environmental Protection Agency (EPA) seeking coverage under the MSGP. Coverage was granted under Sector "S" of the permit and Permit Number NHR05BM69 was issued to MHT. Those areas of MHT covered by the permit include vehicle maintenance areas (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication); equipment cleaning operations; and deicing operations. The requirements of the MSGP include:

- The design and implementation of "control measures" to protect area surface waters from adverse impacts of stormwater discharges;
- The implementation of "corrective measures" to eliminate conditions that may cause adverse impacts to area surface waters;
- The conduction of routine facility inspections, quarterly visual assessments of stormwater discharges, and an annual comprehensive site inspection;
- The preparation and maintenance of a Stormwater Pollution Prevention Plan (SWPPP);
- The implementation of a sampling program that may include four annual rounds of sampling during the deicing season from outfalls that receive runoff from areas where

aircraft deicing activities occur, and annual sampling of all outfalls that discharge to "impaired waters" as listed on the most recent Section 303(d);

- The submission of annual reports documenting the completion of applicable permit requirements;

- The tracking of aircraft deicing fluid usage at MHT;

- Verification that stormwater discharge and related activities will not "adversely affect any species that are Federally-listed as endangered under the Endangered Species Act (ESA) and will not result in the adverse modification or destruction of habitat that is Federally-listed as 'critical habitat' under the ESA"; and

- Verification that stormwater discharge and related activities will not adversely impact historic properties.

10.1.2 NPDES CONSTRUCTION GENERAL PERMIT

Construction activities that disturb one or more acres of ground surface, or are part of a "larger common plan of development" that will eventually disturb one or more acres of ground surface, are subject to the requirements of the NPDES Construction General Permit (CGP). This permitting process is initiated by submitting a NOI form to the EPA prior to the start of construction. The permit also requires the preparation of a SWPPP, which outlines Best Management Practices (BMPs) to be used during construction to minimize adverse impacts from erosion and sedimentation. The CGP also requires that site inspections be conducted weekly (or bi-weekly and within 24 hours of a storm event with at least 0.5 inches of rain) during construction. Completion of the SWPPP and NOI also involves determining if any Federally-listed threatened or endangered species are located near the project. Following the completion of the project and final stabilization of all disturbed areas, a Notice of Termination (NOT) form must be completed and submitted to EPA.

10.1.3 NEW HAMPSHIRE ALTERATION OF TERRAIN PERMIT

If a project will involve more than 100,000 square feet (approximately 2.3 acres) of ground disturbance, an Alteration of Terrain Permit will need to be obtained from the New Hampshire Department of Environmental Services (NHDES) (RSA 485-A:17). This involves coordination with NHDES and the completion of a permit application. The Alteration of Terrain Permit process also requires documentation regarding threatened and endangered species and exemplary natural communities. This generally involves coordination with the New Hampshire Natural Heritage Bureau (NHNHB), the New Hampshire Fish and Game Department (NHF&G), and the U.S. Fish and Wildlife Service (USFWS). If recorded occurrences of threatened or endangered species are found, then any potential adverse impacts need to be assessed.

10.1.4 WETLAND PERMITS

Impacts to wetlands are regulated on the state level through the NHDES Dredge and Fill Permit process (RSA 482-A). In order to obtain a Dredge and Fill Permit, wetland impacts must first be avoided whenever possible and then minimized to the maximum extent practicable during the design process. If the project will involve more than 10,000 square feet of wetland impact, some form of compensatory mitigation will likely be required. Mitigation could include wetland creation or restoration, upland buffer preservation and/or a payment to the NHDES Aquatic Resource Mitigation Fund (Env-Wt 807.19). In addition to the NHDES permitting requirements, coordination with the U.S. Army Corps of Engineers (USACE) would also be required, pursuant to applicable portions of Section 404 of the Federal Clean Water Act (CWA). Projects impacting less than three acres of wetland would likely be covered under the New Hampshire Programmatic General Permit. If total wetland impacts would exceed three acres, an Individual Permit from the USACE would be required.

As part of the wetland permitting process, documentation regarding threatened and endangered species and exemplary natural communities needs to be completed. A copy of the Dredge and Fill Permit application also needs to be submitted to the New Hampshire State Historic Preservation Officer (SHPO). In New Hampshire, the New Hampshire Division of Historical Resources (NHDHR) functions as the SHPO.

10.1.5 SECTION 401 WATER QUALITY CERTIFICATION

The Section 401 Water Quality Certification Program is authorized by NH RSA 485-A:12, III and IV and administered by NHDES. The purpose of the program is to protect surface water quality and uses. A Water Quality Certification is needed if a project requires certification under Section 401 of the Federal Clean Water Act or if it involves the direct surface water withdrawal or diversion of surface water that require registration under RSA 488:3. Under RSA 488:3, registration is required if the cumulative amount of withdrawal or discharge is more than 20,000 gallons of water per day, averaged over any seven-day period, or more than 600,000 gallons of water over any 30-day period. Under Section 401 of the Federal Clean Water Act projects that need a Federal license or permit to discharge into navigable waters are required to obtain a certification from the State that the discharge will meet State Surface Water Quality Standards. This could include discharge of dredged or fill material into navigable waters or discharges of wastewater or stormwater that require a NPDES permit.

Projects that involve the discharge of dredged or fill material into navigable waters and are covered under the USACE Programmatic General Permit may be covered by a Programmatic General Permit Water Quality Certification. Projects that require an Individual USACE Permit would need to apply for and obtain an individual Water Quality Certification from the NHDES Watershed Management Bureau. Early coordination with the NHDES Watershed Management Bureau is recommended for projects that involve discharges to surface waters, even if the project may be covered under an USACE Programmatic General Permit.

10.2 SHORT-TERM PROJECTS (2011-2015)

10.2.1 TERMINAL

The following is a list of Short-Term projects that are proposed for MHT terminal:

- Security CCTV System – Phase IV;
- PA System Upgrades;
- HVAC System Upgrades;

- Construct “First-Aid” Room;
- Relocate Terminal Curbside Airline Signs;
- Rework Terminal Landscaping;
- Relocate Rental Car Counters to Garage;
    - Design
    - Construction
- Refurbish/Replace Bag Claim “B” Lobby Area, Construct New Concessions;
- Refurbish and Expand Bag Claim Equipment; and
- Consolidate Security Checkpoints “B” & “C” on Level 2 (Design).

These projects are not anticipated to have any significant environmental considerations since the work will occur in currently developed areas. MHT has considered various options regarding heating of the terminal building, including replacing the current boilers and replacing the boilers with an alternative heating system. The current system is considered a stationary source fuel burning device, and as such requires a New Hampshire Air Quality Permit pursuant to State regulations Env-A 1703.01 and 1704.01. Any significant alterations to the current system would require an amendment to the permit.

10.2.2 OPERATIONS

The following is a list of Short-Term projects that are proposed for MHT operations:

- Incident Command Vehicle;
- Acquisition of Snow Removal Equipment;
- Interactive Employee Training Module; and
- Snow Removal Equipment Storage Building
    - Phase I - Design
    - Phase II - Site Work
    - Phase III - Construction.

Of the above-listed projects, only the Snow Removal Equipment Storage Building is anticipated to involve environmental issues. A small wetland is located in the area where the new building is proposed.

Since this project will likely involve the disturbance of more than one acre of land and associated wetland impacts, coverage under the CGP will need to be obtained and the wetland permitting process will need to be implemented. Coordination with the SHPO will also need to be initiated. If the project will disturb greater than 100,000 square feet of ground surface an Alteration of Terrain Permit will also be required.

In 2001, MHT constructed a new 20,000 square-foot Aircraft Rescue and Firefighting (ARFF)/ Maintenance Facility in proximity to the proposed site of the new Snow Removal Equipment Storage

Building. Subsurface investigations conducted at the site detected the presence of several polynuclear aromatic hydrocarbon compounds in concentrations that exceed NHDES S-1 Soil Standards. A Remedial Action Plan was prepared and implemented at the site resulting in the excavation and removal of a portion of the contaminated soils. Pursuant to the requirements of Section 11.0 of the NHDES's *Contaminated Sites Risk Characterization and Management Policy,* Activities and Use Restrictions (AURs) were implemented at the site.

Under the terms of the AURs, the following uses and activities are prohibited at the ARFF/Maintenance site unless a modification of the Activity and Use Restrictions is granted by the NHDES:

- No additional construction or placement of buildings that require excavation within the restricted area or installation of additional subsurface utilities will occur, unless reviewed and approved by the NHDES;

- No excavation and/or removal of subsurface materials will occur, unless approved by the NHDES; and

- The use of any groundwater well supply for human consumption will be prohibited.

If changes to the drainage system in the vicinity of the Snow Removal Equipment Storage Building are proposed, the airport's MSGP SWPPP would need to be updated after construction is complete.

10.2.3 AIRFIELD

The following is a list of Short-Term projects that are proposed for MHT airfield:

- Glycol Management Program;
    - Phase I
    - Phase II
- Terminal Ramp Replacement;
    - Phase I
    - Phase II
- Relocate Airport Service Road/Ammon Drive;
    - Design
    - Construction
- Rehabilitate Taxiway "N" at Terminal Apron;
- Rehabilitate South Portion of Taxiway "M";
- Rehabilitate Taxiway "H", Adjacent to Taxiway "B";
- Rehabilitate Bituminous Portion of Ramp at Gates 1-3 and Portions of Taxiways "N" & "E"; and
- Rehabilitate Portions of Taxiway "A" and "B" including U.S. Customs Ramp.

These projects will likely require some environmental review and coordination. The following sections provide more detailed information on the anticipated environmental considerations.

Glycol Management

As noted in Section 10.1.1, MHT is required to seek coverage under the 2008 MSGP, in part, because of aircraft deicing operations conducted by its tenants. Aircraft deicing and anti-icing are conducted at the airport for scheduled commercial air carriers, cargo carriers, and General Aviation (GA) aircraft. MHT conducts no aircraft deicing operations. All aircraft deicing is conducted by the individual carriers or the airport's "Fixed Base Operator (FBO)" Wiggins Airways (Wiggins). During the past five deicing seasons an average of approximately 126,350 gallons of propylene glycol-based Aircraft Deicing Fluid (ADF) has been applied by airport tenants. In response to a Federal lawsuit, EPA is proposing technology-based effluent standards for stormwater discharges from airport deicing operations. Proposed Effluent Limitation Guidelines (ELGs) were published in the *Federal Register* on August 28, 2009, and if adopted in final form, would require airports that conduct aircraft deicing operations have 1,000 or more annual jet departures and 10,000 or more total annual operations to collect and treat spent ADF. In their current form the ELGs would require airports that annually apply less than 460,000 gallons of ADF to collect and treat at least 20 percent of the total applied.

In April 2009, MHT received a letter from the EPA requesting that Stormwater Sampling and Water Quality Modeling be conducted at MHT stormwater outfalls to evaluate potential impacts to area receiving waters resulting from aircraft deicing operations at the airport. The results of the ensuing twelve-month study were forwarded to the EPA on October 23, 2010 in a Final Water Quality Report. The EPA anticipated using the data collected during the study to define "additional effluent limitation(s) for deicing chemicals."

When the final ELGs are issued and the EPA has reviewed and commented on the October 2010 Final Water Quality Report, MHT will coordinate with FAA, NHDES, and all affected tenants to identify, design, and implement suitable and appropriate Best Management Practices to achieve and maintain compliance all applicable regulations and guidelines.

Relocate Service Road/Ammon Drive

Since this project will likely involve the disturbance of more than one acre of land, coverage under the CGP will need to be obtained. The requirements of this permit are discussed in Section 10.1.2.

If the project will involve more than 100,000 square feet of ground disturbance, an Alteration of Terrain Permit will need to be obtained from the New Hampshire Department of Environmental Services (NHDES). The requirements of this permit are discussed in Section 10.1.3.

If changes to the drainage system in the vicinity of the project are proposed, the airport's MSGP SWPPP would need to be updated after construction is complete.

Terminal Ramp Replacement/Taxiway Rehabilitation

Since the terminal ramp replacement and taxiway rehabilitation projects will involve more than one acre of land disturbance, coverage under the CGP will need to be obtained. The requirements of this Permit are discussed in Section 10.1.2.

An Alteration of Terrain Permit may not be necessary if the terminal ramp replacement and taxiway rehabilitation projects include only asphalt maintenance. In accordance with Env-Wq 1503.03, the projects could be covered under Permit by Rule if the following conditions are met:

- "The project is limited to replacement of the existing asphalt surface to its existing grade;
- The project is limited to the footprint of the existing surface;
- There is no change in the existing drainage system; and
- If base course gravels are replaced, removed base course gravels are replaced at the end of each working day."

If these conditions cannot be met, then the project would require an Alteration of Terrain Permit.

10.2.4 LANDSIDE AND PROPERTY ACQUISITION

The following is a list of Short-Term landside projects and proposed property acquisitions:

- Runway 6 Runway Protection Zone (RPZ)/Highlander Property;
    - Property Acquisition
    - Building Demolition
- Rehabilitate Airport Road Section (Under T/W "M" Overpass);
- Rehabilitate Section of Parking Lot "C"; and
- Expand Parking Lot "C" (Phase I)

As discussed in Section 10.2.3, pavement rehabilitation projects would not require an Alteration of Terrain Permit if they meet the conditions of Env-Wq 1503.03. The projects would require coverage under the CGP if they will involve more than one acre of land disturbance.

Highlander Property

Since some of the buildings located on the Highlander Property were constructed more than 50 years ago, coordination with the NHDHR will be required prior to the demolition of these buildings. A survey of the buildings may need to be completed by an Architectural Historian. Based on the information provided in the survey, NHDHR will determine if the buildings are eligible for listing on the National Register of Historic Places. In the buildings will be impacted by redevelopment or demolition, mitigation may be required by NHDHR.

Based upon the property's proximity to Little Cohas Brook and the Merrimack River, the NHDHR may determine that portions of the property have cultural/archeological significance and require that a Phase IA Archeological Sensitivity Assessment be completed. Any additional work would be determined by the results of the Phase IA study.

Due to the age and nature of the buildings on the property, it is likely that some of the materials used in their construction may contain asbestos. Similarly, it is likely that some lead-based paints have historically been applied to portions of some of the buildings. Therefore, asbestos-containing material and lead-based paint surveys should conducted and appropriate abatement measures should be implemented, as necessary, prior to demolition of the structures.

A Preliminary Environmental Site Assessment and Transaction Screening Questionnaire prepared for the Highlander property identified the presence of various "universal waste" items in several of the buildings, including: mercury switches, lithium batteries, and fluorescent light bulbs. These items and any other universal waste will need to be removed and properly disposed of as part of the site demolition process.

If the project will result in the disturbance of more than one acre of land, coverage under the CGP will need to be obtained. The requirements of this permit are discussed in Section 10.1.2.

10.3 INTERMEDIATE-TERM PROJECTS (2016-2020)

10.3.1 TERMINAL

The following is a list of Intermediate-Term projects that are proposed for MHT terminal:

- Consolidate Security Checkpoints "B" & "C" on Level 2 (Construction);
- Outbound Baggage System;
- Rework Terminal Traffic Lanes;
- Renovate Communication Center;
- Merchandise Screening/Concession Storage/Holdroom Expansion; and
- Short-Term Federal Inspection Services (FIS) Facility.

The above projects are not anticipated to have any significant environmental considerations since the work will occur in currently developed areas in and around the terminal building. No environmental documentation or permitting is anticipated for any of these proposed projects.

10.3.2 AIRFIELD

The following is a list of Intermediate-Term projects that are proposed for MHT airfield:

- Rehabilitate portions of Taxiways "A," "C," and "D,"
- Rehabilitate South Taxiway "A," including "P" and "U" and portions of "E" and "F;"

- Rehabilitate Taxiway “H” South;
- Rehabilitate Taxiway “M” North;
- Rehabilitate Runways 6/24 and 17/35 Intersection;
- Rehabilitate East Ramp; and
- Install Approach Lighting System (ALS) Runway 6.

As discussed in Section 10.2.3, pavement rehabilitation projects would not require an Alteration of Terrain Permit if they meet the conditions of Env-Wq 1503.03. The projects would require coverage under the CGP if they will involve more than one acre of land disturbance.

The ALS for Runway 6 may involve more extensive environmental considerations. The following sections provide information on the permits and approvals that may be required for each end of Runway 6.

Approach Lighting System for Runway 6

If the ALS will be located in the channel or bank of the Merrimack River, a Dredge and Fill Permit would be required from NHDES, since both areas are jurisdictional resources that are regulated by NHDES. As discussed in Section 10.1.4, wetland impacts would need to be minimized to the maximum extent practicable during the design process. If the project will involve more than 10,000 square feet of wetland impact, some form of compensatory mitigation will be required. In addition to NHDES permitting, coordination with the USACE would also be required. If the project would involve less than three acres of wetland impact, it would likely be covered under the New Hampshire Programmatic General Permit. If the total wetland impact would be greater than three acres, an Individual Permit from the USACE would be required. Since the project may involve discharges to the Merrimack River, a Section 401 Water Quality Certification may be required from NHDES.

As part of the wetland permitting process, documentation regarding threatened and endangered species and exemplary natural communities needs to be completed. Based on information received from NHNHB in 2009, the Merrimack River is known to provide habitat for the state-listed endangered brook floater mussel (*Alasmidonta varicosa*) and the state-listed threatened bald eagle (*Haliaeetus leucocephalus*). The river birch (*Betula nigra*), a state-listed threatened plant species has also been reported along the Merrimack River bank. Coordination with NHF&G regarding potential impacts to the brook floater and bald eagle would be required. Coordination with NHNHB regarding river birch would also be necessary.

A copy of the Dredge and Fill Permit application also needs to be submitted to the NH State Historic Preservation Officer (SHPO). Because the project will involve ground disturbance, coordination with the NHDHR is recommended early in the design process. The project may be in an area that is sensitive for historic resources since it is located near the Merrimack River. If the project area is considered to be sensitive for historic resources, a survey may need to be completed by an archaeologist.

In addition to the Dredge and Fill Permit, a NHDES Shoreland Permit would also likely be required, since the project would be located within the 250-foot protected shoreland of the Merrimack River. The permit application process involves determining the amount of new and existing impervious surface within the protected shoreland. A Tree Survey may also be required.

Additional studies may be required if the FAA determines that operation of the ALS exceeds the FAA Order 1050.1E threshold for light impacts which is triggered "when an action's light emissions create annoyance to interfere with normal activities."

10.3.3 LANDSIDE AND PROPERTY ACQUISITION

The following is a list of Intermediate-Term landside projects and proposed property acquisitions:

- Rehabilitate Parking Lots "B" and Administrative Lot, "A", and "D;"
- Rehabilitate Parking Lot "C" – Phase II;
- Rehabilitate Airport Entrance/Terminal Loop Road; and
- Future Development Land Acquisition.

As discussed in Section 10.2.3, pavement rehabilitation projects would not require an Alteration of Terrain Permit if they meet the conditions of Env-Wq 1503.03. The rehabilitation projects would require coverage under the CGP if they will involve more than one acre of land disturbance.

Prior to the acquisition of future development land, it is likely that at least a Phase I Environmental Due Diligence Audit will need to be conducted on each proposed parcel.

10.4 LONG-TERM PROJECTS (2021-2030)

10.4.1 TERMINAL

The following is a list of Long-Term projects that are proposed for MHT terminal:

- New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature;
- Construct Pedestrian Bridge Connector;
- Baggage Claim Area Upgrade Adding Fourth Claim Device;
- Provide Direct Vertical Passenger Circulation from Concourse to Baggage Claim;
- Renovate Consolidated Checkpoint to Add a Sixth Screening Lane;
- Administrative Office Expansion/Renovation – Level 3; and
- Permanent FIS Facility.

These projects are not anticipated to have any significant environmental considerations since the work will occur in currently developed areas in and around the terminal building. With the exception of the permanent FIS facility, no environmental documentation or permitting is anticipated for any of these proposed projects. Depending on the proposed size and location of the permanent FIS Facility, CGP and

Alteration of Terrain Permits may be required. Furthermore, any alterations or additions to the airside storm drain system would need to be documented in a MSGP SWPPP amendment.

10.4.2 AIRFIELD

The following is a list of Long-Term projects that are proposed for MHT airfield:

- Rehabilitate Taxiway “H” North of Runway 6/24;
- Rehabilitate Taxiway “J”, “J1” and Portion of “H;”
- Rehabilitate Taxiway “H” at Taxiway “C,”
- Rehabilitate Taxiway “H” at Runway 17, “A,” “B,” “M,” and “M1”at Runway 6;
- Rehabilitate One Half of Runway 17/35 South of Runway 6/24;
- Rehabilitate One Half of Runway 17/35 South of Runway 6/24;
- Rehabilitate East Side Taxiway Stubs;
- Rehabilitate Runway 6/24 East of Runway 17/35;
- Rehabilitate Taxiway “A” and “D” (West);
- Rehabilitate Taxiway “E” (Cargo);
- Rehabilitate Runway 17/35 (North of Runway 6/24);
- Rehabilitate Runway 6/24 West of Runway 17/35; and
- Rehabilitate Taxiway “L” at N.E. Ramp.

As discussed in Section 10.2.3, pavement rehabilitation projects would not require an Alteration of Terrain Permit if they meet the conditions of Env-Wq 1503.03. The projects would require coverage under the CGP if they will involve more than one acre of land disturbance.

10.4.3 LANDSIDE

The following projects are proposed as a Long-Term landside project:

- Expand Parking Lot “C” (Phase II); and
- Rehabilitate Green Drive - Section of Road from Ammon Center to Terminal Building Delivery Dock.

The Parking Lot “C” expansion project would likely require both a CGP and an Alteration of Terrain Permit. If an infiltration system is proposed for stormwater management, a groundwater discharge registration application will likely need to be submitted to NHDES.

If changes to the drainage system in the vicinity of the project are proposed, the Airport's MSGP SWPPP would need to be updated after construction is complete.

As discussed in Section 10.2.3, pavement rehabilitation projects would not require an Alteration of Terrain Permit if they meet the conditions of Env-Wq 1503.03. The rehabilitation projects would require coverage under the CGP if they will involve more than one acre of land disturbance.

10.5 LIST OF FEDERAL AND STATE LAWS

The following sections provide a list of the Federal and state laws and statutes that are referenced in this document.

10.5.1 FEDERAL LAWS AND STATUTES

The Endangered Species Act of 1973 (P.L. 85-624; 16 U.S.C. 661,664, 1008 note);

Section 106, National Historic Preservation Act of 1966 [P.L. 89-665; 16 U.S.C 407(f)];

The Archaeological and Historic Data Preservation Act of 1974 (P.L. 86-253, as amended by P.L. 93-291, 16 U.S.C 469); and

Section 404, Federal Water Pollution Control Act Amendments for 1972 (P.L. 92-500; 33 U.S.C. 1344), as amended by the Clean Water Act of 1977 (P.L. 95-217; 33 U.S.C. 1251).

10.5.2 STATE LAWS AND STATUTES

New Hampshire Fill and Dredge in Wetlands (RSA 482-A);

New Hampshire Comprehensive Shoreland Protection Act (RSA 483-B);

New Hampshire Native Plant Protection Act of 1987;

New Hampshire Endangered Species Conservation Act of 1979;

New Hampshire Water Pollution and Waste Disposal, Terrain Alteration (RSA 485-A:17);

New Hampshire Water Pollution and Waste Disposal, Enforcement of Classification (RSA 485-A:12); and

New Hampshire Water Management, Registration Required (RSA 488:3).

10.6 SUMMARY OF ENVIRONMENTAL CONSIDERATIONS

A summary of environmental considerations for each project is shown in the following tables. **Table 10-1** CIP Short-Term (Year 2011-2015), **Table 10-2** CIP Near-Term (Year 2016-2020), and **Table 10-3** CIP Long-Term (Year 2021-2030). Identification of Acronyms used in the following tables is provided in **Appendix A**.

TABLE 10-1
CIP SHORT-TERM (YEARS 2011 TO 2015)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Terminal	Security CCTV System – Phase IV	None anticipated	None anticipated
	PA System Upgrades	None anticipated	None anticipated
	HVAC System Upgrades	None anticipated	Possible amendment to NHDES Stationary Source Air Permit
	Construct “First-Aid” Room	None anticipated	None anticipated
	Relocate Terminal Curbside Airline Signs	None anticipated	None anticipated
	Rework Terminal Landscaping	None anticipated	None anticipated
	Relocate Rental Car Counters to Garage – Design – Construction	None anticipated	None anticipated
	Refurbish/Replace Bag Claim “B” Lobby Area, Construct New Concessions	None anticipated	None anticipated
	Refurbish and Expand Bag Claim Equipment	None anticipated	None anticipated
	Consolidate Security Checkpoints “B” & “C” on Level 2 (Design)	None anticipated	None anticipated
Operations	Incident Command Vehicle	None anticipated	None anticipated
	Acquisition of Snow Removal Equipment	None anticipated	None anticipated
	Interactive Employee Training Module	None anticipated	None anticipated
	Snow Removal Equipment Storage Building – Design – Site Work – Construction	– Wetlands – Hazardous Materials	– Wetland Permit (NHDES and USACE) – NPDES Construction General Permit (CGP) – Alteration of Terrain Permit – Activities and Use Restrictions – Amend SWPPP

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

TABLE 10-1 (CONTINUED)
CIP SHORT-TERM (YEARS 2011 TO 2015)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Airfield	Glycol Management Program – Phase I – Phase II	Stormwater issues	NPDES Multi-Sector General Permit – Effluent Limitation Guidelines
	Terminal Ramp Replacement – Phase I – Phase II	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Relocate Airport Service Road/Ammon Drive – Design – Construction	None anticipated	– NPDES CGP – Alteration Terrain Permit – Amend SWPPP
	Rehabilitate Taxiway “N” at Terminal Apron	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate South Portion of Taxiway “M”	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway “H”, Adjacent to Taxiway “B”	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Bituminous Portion of Ramp at Gates 1-3 and Portions of Taxiways “N” & “E”	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Portions of Taxiway “A” and “B” including U.S. Customs Ramp	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
Landside and Property Acquisition	Runway 6 Runway Protection Zone (RPZ)/Highlander Property – Property Acquisition – Building Demolition	– Potential asbestos, lead paint, and universal waste removal – Potential historic buildings	– Asbestos and lead paint surveys – Coordination with NH Division of Historical Resources (NHDHR) – NPDES CGP
	Rehabilitate Airport Road Section (Under T/W “M” Overpass)	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Section of Parking Lot “C” – Phase I	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Expand Parking Lot “C” (Phase I)	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

TABLE 10-2
CIP INTERMEDIATE-TERM (YEARS 2016 TO 2020)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Terminal	Consolidate Security Checkpoints "B & "C" on Level 2 (Construction)	None anticipated	None anticipated
	Outbound Baggage System	None anticipated	None anticipated
	Rework Terminal Traffic Lanes	None anticipated	None anticipated
	Renovate Communication Center	None anticipated	None anticipated
	Merchandise Screening/ Concession Storage/ Holdroom Expansion	None anticipated	None anticipated
	Short-Term Federal Inspection Services (FIS) Facility	None anticipated	None anticipated
Airfield	Rehabilitate Taxiways "A," "C," and "D"	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate South Taxiway "A" including P" and "U" and portion of "E" and "F"	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway "H" South	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway "M" North	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Runways 6/24 and 17/35 Intersection	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate East Ramp	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

TABLE 10-2 (CONTINUED)
CIP INTERMEDIATE-TERM (YEARS 2016 TO 2020)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Airfield	Install Approach Lighting System (ALS) for Runway 6 end	– Wetlands (Merrimack River) – Threatened & Endangered Species (brook floater, bald eagle, river birch) – Shoreland Protection Area (Merrimack River) – Archaeological Resources	– Wetland Permit (NHDES and USACE) – Shoreland Permit (NHDES) – Section 401 Water Quality Certification – NPDES CGP – Coordination with NH Natural Heritage Bureau (NHNHB) and NH Fish and Game (NHF&G) – Coordination with NHDHR – Light impact study
Landside and Property Acquisition	Rehabilitate Parking Lots "B" and Administrative Lot, "A", and "D"	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Parking Lot "C" – Phase II	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Airport Entrance/Terminal Loop Road	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Future Development Land Acquisition	Unknown – Dependent upon location of parcels	Environmental Due Diligence Audit

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

TABLE 10-3
CIP LONG-TERM (YEARS 2021 TO 2030)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Terminal	New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature	None anticipated	None anticipated
	Construct Pedestrian Bridge Connector	None anticipated	None anticipated
	Baggage Claim Area Upgrade Adding Fourth Claim Device	None anticipated	None anticipated
	Provide Direct Vertical Passenger Circulation from Concourse to Baggage Claim	None anticipated	None anticipated
	Renovate Consolidated Checkpoint to Add a Sixth Screening Lane	None anticipated	None anticipated
	Administrative Office Expansion/Renovation – Level 3	None anticipated	None anticipated
	Permanent FIS Facility	None anticipated	– NPDES CGP
Airfield	Rehabilitate Taxiway "H" North of Runway 6/24	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway "J", "J1" and Portion of "H"	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway "H" at Taxiway "C"	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway "H" at Runway 17, "M," "M1," "A," and "B" at Runway 6	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate One Half of Runway 17/35 South of Runway 6/24	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate One Half of Runway 17/35 South of Runway 6/24	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate East Side Taxiway Stubs	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

TABLE 10-3 (CONTINUED)
CIP LONG-TERM (YEARS 2021 TO 2030)

Location	Proposed Project	Environmental Concerns and Constraints	Anticipated Permitting Requirements and Approvals
Airfield	Rehabilitate Runway 6/24 East of Runway 17/35	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway “A” and “D” (West)	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway “E” (Cargo)	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Runway 17/35 (North of Runway 6/24)	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Runway 6/24 West of Runway 17/35	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
	Rehabilitate Taxiway “L” at N.E. Ramp	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)
Landside	Expand Parking Lot “C” (Phase II)	None anticipated	– NPDES CGP – Alteration Terrain Permit – Groundwater Discharge Registration Application (if infiltration system for stormwater treatment is proposed) – Amend SWPPP
	Rehabilitate Green Drive - Section of Road from Ammon Center to Terminal Building Delivery Dock	None anticipated	– NPDES CGP – Alteration Terrain Permit (not required if Env-Wq 1503.03 conditions are met)

Sources: Proposed Projects – URS Corporation, 2010.
Environmental Concerns and Constraints, and Anticipated Permitting Requirements and Approvals – The Smart Associates, 2010.

MANCHESTER-BOSTON REGIONAL AIRPORT

Airport Master Plan Update

SECTION ELEVEN

Financial Capacity, Plan of Finance, and Business Plan

SECTION 11.0
FINANCIAL CAPACITY, PLAN OF FINANCE, AND BUSINESS PLAN

11.1 FRAMEWORK FOR FINANCIAL OPERATIONS

The City of Manchester (the City) owns and, through its Department of Aviation, operates Manchester-Boston Regional Airport (MHT). The Department is operated as an economically self-supporting enterprise fund of the City and operates pursuant to an annual departmental budget approved by the City. The Department is operated under the direction of the Airport Director, who is appointed by the Mayor.

The Department of Aviation funds Airport operations and capital improvements with revenues generated from airline Rental and Fee Payments and other Airport Revenues,[1] Passenger Facility Charge (PFC) Revenues, bond proceeds, and federal and state grants-in-aid. The Department maintains its financial records in accordance with generally accepted accounting principles as they apply to governmental entities. Airport funds are held in separate Department of Aviation accounts.

The framework for the Airport's financial operations is largely governed by the provisions of their Bond Resolution and Airline Agreements, described in the following sections.

11.1.1 BOND RESOLUTION

Bonds are issued by the City, pursuant to the General Airport Revenue Bond Resolution adopted by the City as of October 1, 1998 and amended and supplemented. Collectively, these documents are referred to as the Bond Resolution, and they specify the covenant made by the Department as to airline rates and charges, the conditions for issuing additional Bonds, and, with the Airline Agreement, the flow of Airport revenues.

11.1.1.1 Rate Covenant

In Section 705 of the Bond Resolution, referred to as the Rate Covenant, the City covenants that, in each Fiscal Year:

1. Revenues Available for Bond Debt Service shall at least equal the sum of Required Debt Service Fund Deposits plus other required deposits; plus

2. The sum of Revenues Available for Bond Debt Service plus the Coverage Amount shall at least equal 125% of the Required Debt Service Fund Deposits on all then-Outstanding Bonds for that Fiscal year.

For purposes of the Rate Covenant, the Debt Service requirement is calculated after deducting amounts of Debt Service paid from sources other than Revenues. These sources include Capitalized Interest and

[1] Revenues include all rentals, fees, charges, concession revenues, and all other revenues received by or on behalf of the City as operator of the Airport in connection with the operation of the Airport; all income, interest, or revenues resulting from the investment of any Airport funds by the City; and customer facility charges collected by the City. Revenues do not include any revenue or income from gifts, proceeds of insurance coverage, proceeds of disposition of assets, restricted funds, payments from governmental units or public agencies, or PFC Revenues. Most state and federal grants-in-aid are also excluded from Revenues, with the exception of certain items such as reimbursement by the TSA for law enforcement officer expenses, reimbursement by the Federal Emergency Management Agency (FEMA) for declared weather emergencies, and funds from the State of New Hampshire from fees paid by general aviation users.

Note: Except as noted otherwise, capitalized terms in this report are used as defined in the Bond Resolution or the Airline Agreements, as discussed later in this report.

investment earnings on the Project Fund and, to the extent permitted by federal law and so applied by the City, PFC Revenues and Airport Improvement Program (AIP) grants received from the FAA.

11.1.1.2 Additional Bonds Test

Section 206 of the Bond Resolution specifies certain conditions that must be met before additional Bonds secured by a parity lien on Revenues Available for Bond Debt Service may be issued. These conditions require, among other things, that two certificates be delivered prior to issuance:

A. A Certificate signed by an Authorized Representative of the City, which states that the Rate Covenant was met for any period of 12 consecutive months during the most recent 18 consecutive months

AND

B. A Certificate that is:

1. Signed by an Authorized Representative of the City and confirmed by a Certificate of an Accountant, which states that for any period of 12 consecutive months during the most recent 18 consecutive months:

> The sum of the Revenues Available for Debt Service plus the Coverage Amount was at least equal to 125% of the maximum Adjusted Debt Service on all Outstanding Bonds after giving effect to the issuance of such Bonds, and to the refunding of any Prior Bonds or Bonds issued pursuant to the Bond Resolution.

OR

2. Signed by the Airport Consultant stating that, in its estimate, the Rate Covenant will be satisfied for each Fiscal Year during the period commencing with (and including) the Fiscal Year in which the Bonds are to be issued and ending with (and including) the later of the fifth subsequent Fiscal Year or the second Fiscal Year following the date on which all projects financed by the Bonds are estimated to have been completed.

   In preparing the Certificate, the Airport Consultant is required to take into account (1) the Series of Bonds to be issued and the refunding of any Bonds, (2) estimated costs to complete and time for completion of projects financed by the Bonds, as provided by the City's Independent Engineer, and (3) any estimated increases in Operation and Maintenance Expenses and in Revenues resulting from the completion of such projects or any portion thereof.

It is assumed in this analysis that the Bond Resolution will remain the same throughout the planning horizon (FY 2011 through FY 2030.)

11.1.2 AIRLINE AGREEMENTS

The Department has entered into agreements with signatory airlines at the Airport which stipulate the methodology for the calculation of airline Rental and Fee Payments. Such charges include the Terminal Building Rental Rate, the Landing Fee and the Apron Fee. As of October 2010, signatory airlines included Air Canada, Delta Air Lines, Southwest Airlines, and US Airways and/or their regional affiliates. United Airlines and Continental Airlines are operating at the Airport as non-signatory airlines pending their merger.

The current Airline Agreements were put in place on July 1, 2005, were amended and extended effective July 1, 2010, and expire on July 1, 2015. While the amended Airline Agreements do not differ materially from the prior Airline Agreements, changes include, but are not limited to:

1. The Department may amortize annual Airport project costs of up to $5,000,000 in the airline Rental and Fee Payments (under the prior Airline Agreements, only $1,000,000 of annual project cost amortization was allowed.)

2. Provisions for extraordinary coverage protection payments were formalized, such that the signatory airlines agreed to supplement their Rental and Fee Payments, as necessary, to meet the Rate Covenant (under the prior Airline Agreements, extraordinary coverage protection payments would have been governed by the Bond Resolution.)

The Airline Agreements establish procedures for the annual adjustment of Signatory Airline Terminal Building Rentals, Apron Fees, and Landing Fees charged for the use and occupancy of terminal and airfield facilities. Under the new Airline Agreements, Operation and Maintenance (O&M) Expenses at the Airport are allocated to the following cost centers:

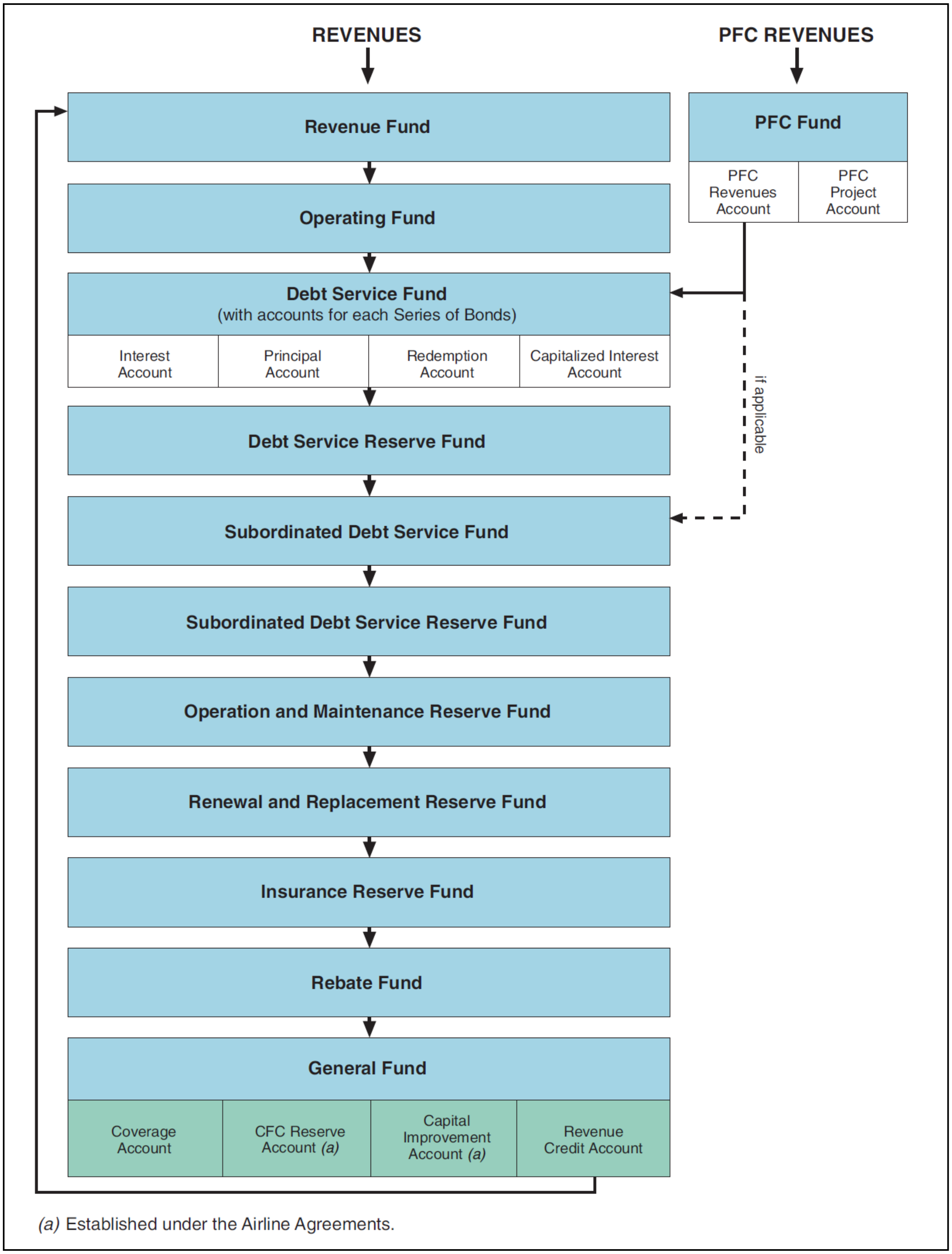
- Airfield
- Terminal Building and Landside
- Parking and Roadways
- Other Buildings and Areas

As set forth in the Airline Agreements, the Terminal Building Rental Requirement and the Landing Fee Requirement are based on compensatory and residual rate-making methodologies, respectively. Under the Airline Agreements, net revenues are deposited 60% to the Airport into the Capital Improvement Account and 40% to the airlines into the Revenue Credit Account to reduce the Landing Fee. The Apron Requirement is determined to recover the capital costs associated with construction of an aircraft apron adjacent to the terminal building.

11.1.3 APPLICATION OF REVENUES TO FUNDS AND ACCOUNTS

The Bond Resolution and Airline Agreements establish certain Funds and Accounts and the priority for the flow of Revenues to such Funds and Accounts, as illustrated on **Figure 11-1**.

FIGURE 11-1
FLOW OF FUNDS UNDER BOND RESOLUTION AND AIRLINE AGREEMENTS



Sources: Leigh Fisher, 2010.

The provisions of the Airline Agreements are subordinate to the provisions of the Bond Resolution. All Revenues are deposited in the Revenue Fund and are applied monthly for various purposes to Funds and Accounts in the following priority per the Bond Resolution:

1. *Operating Fund*. Deposit amount required to pay the following month's Operation and Maintenance Expenses as shown in the Operating Budget.

2. *Debt Service Fund*. Deposit amount required to pay the following month's accrual of Debt Service on Outstanding Bonds from the applicable Account. This Fund contains the following Accounts with respect to each Series of Outstanding Bonds: Principal Account, Interest Account, Redemption Account, and Capitalized Interest Account.

3. *Debt Service Reserve Fund*. Deposit one-twelfth of the required amount so that amounts on deposit are equal to the Aggregate Debt Service Reserve Fund Requirement.

4. *Subordinated Debt Service Fund*. Deposit amount required to pay Debt Service on Outstanding Subordinated Bonds from the applicable Account in an amount determined.

5. *Subordinated Debt Service Reserve Fund*. Deposit amount necessary to pay amounts required by any Supplemental Resolution securing Subordinated Bonds.

6. *Operation and Maintenance Reserve Fund*. Deposit amount required so that amount on deposit shall equal the sum of Operation and Maintenance Expenses for the three consecutive months following the next succeeding month in the current Operating Budget.

7. *Renewal and Replacement Reserve Fund*. Deposit one-twelfth of the required amount to maintain the Renewal and Replacement Reserve Requirement, currently $250,000.

8. *Insurance Reserve Fund*. Deposit one-twelfth of the required amount to maintain the Insurance Reserve Fund Requirement for the current Fiscal Year.

9. *Rebate Fund*. Deposit required to maintain the Rebate Fund Requirement.

10. *General Fund*. Deposit all remaining moneys in the General Fund. This Fund is to be used by the City for any lawful purpose, and is to contain the Coverage Account and the Revenue Credit Account.

In addition to the Coverage Account and Revenue Credit Account established by the Bond Resolution, the Airline Agreements establish four subaccounts in the General Fund: the Coverage Account (as also established by the Bond Resolution), the Customer Facility Charge (CFC) Reserve Account, the Capital Improvement Account, and the Revenue Credit Account (as also established by the Bond Resolution). According to the Airline Agreements, amounts in the General Fund are to be applied in the following manner:

1. To the *Coverage Account*, an amount equal to 25% of the annual Net Debt Service Requirement.

2. To the *CFC Reserve Account*, any annual CFC revenues in excess of expenses allocable to rental car operations at the Airport. Amounts in the CFC Reserve

Account shall be used for any lawful Airport purpose at the City's discretion. (Transfers to the CFC Reserve Account began in FY 2010.)

3. To the *Capital Improvement Account*, Revenues remaining up to $1,000,000. Amounts in the Capital Improvement Account are to be used for any lawful purpose including, at the City's discretion, payment of the costs of Capital Improvements. Capital Improvements funded from the Capital Improvement Account are to be amortized and may be included in the calculation of airline Rental and Fee Payments.

4. To the *Revenue Credit Account*, Revenues remaining up to $500,000. The balance in the Revenue Credit Account at the beginning of each Fiscal Year is to be transferred to the Revenue Fund and used as a credit in calculating the Landing Fee Rate for the Signatory Airlines for that Fiscal Year.

5. Any remaining Revenues after deposits to the Revenue Credit Account have reached $500,000 are to be divided as follows: 60% to the Capital Improvement Account and 40% to the Revenue Credit Account.

The above sections describe the provisions of the Bond Resolution and Airline Agreements regarding the application of Revenues. In addition to those listed above, the Bond Resolution establishes a number of funds, such as the Subordinated Debt Service Fund, Insurance Reserve Fund, Rebate Fund, etc., that are not currently needed by the Department. **Figure 11-2** provides a matrix summary of the various funds and accounts outlined in either the Bond Resolution or the Airline Agreements that are active at Manchester-Boston Regional Airport. This matrix is intended to be a reference for Department staff in managing the various funds and accounts.

11.2 SOURCES OF FUNDS

11.2.1 AIRPORT IMPROVEMENT PROGRAM (AIP) GRANTS

Federal AIP grants are administered by the FAA and generated by aviation user taxes. AIP grants are made available to airport operators in numerous forms, but primary airports receive AIP grants largely through entitlement and discretionary grants. Entitlement grants are apportioned to primary airports based on levels of passenger traffic and to cargo service airports based on levels of cargo aircraft landed weight, subject to certain minimum and maximum levels. Discretionary funds are distributed based on the ranking of the airport's projects in relation to others deemed most important for improving the national airspace system or maintaining existing airfield capacity.

According to FAA regulations, eligible projects include those improvements related to enhancing airport safety, capacity, security, and environmental concerns. AIP entitlement and discretionary funds are generally key funding sources for land acquisitions, runway extensions, and new runways and taxiways, as well as rehabilitation and overlay of airfield pavement. AIP entitlements may also be used as a secondary funding source for projects such as non-revenue producing areas of terminals and public roadway improvements.

FIGURE 11-2
REVIEW OF FUNDS AND ACCOUNTS UNDER BOND RESOLUTION AND AIRLINE AGREEMENT

	Authorizing Document	Funding Requirement	Purpose	Funding Source	Fund Exists?
Debt Service Fund	Bond Resolution in Section 502(b)(iii)	Amount of principal and interest due, net of capitalized interest, through the last day of the succeeding month on all Outstanding Bonds – Bond Resolution in Section 505(a)(ii)	To put aside Revenues to pay upcoming interest and principal debt service payments	Revenues, Passenger Facility Charge Revenues, grants received pursuant to Letter of Intent	Yes, funded monthly
Debt Service Reserve Fund	Bond Resolution in Section 502(b)(iv)	Monthly deposit such that, by the end of the Fiscal Year, balance equals the maximum aggregate amount of debt service due on Outstanding Bonds in any succeeding Fiscal Year – Bond Resolution in Section 505(a)(iii)	To provide assurance to bond-holders that the Airport always has a year of debt service payments available	Bond Proceeds	Yes, fully funded
Operation and Maintenance Reserve Fund	Bond Resolution in Section 502(b)(vii)	Amount necessary to pay Operation and Maintenance Expenses for the next three months – Bond Resolution in Section 505(a)(vi)	To provide assurance to bond holders that the Airport will be able to pay O&M expenses	Revenues	Yes, fully funded
Renewal and Replacement Reserve Fund	Bond Resolution in Section 502(b)(viii)	Minimum of $250,000 and amounts shown in Operating Budget thereafter – Bond Resolution in Section 505(a)(vii)	To provide assurance to bond holders that Airport will be able to maintain and repair facilities	Revenues	Yes, fully funded
General Fund	Bond Resolution in Section 502(b)(xi)	Any remaining revenues after making all other required deposits – Bond Resolution in Section 505(a)(x)	To allocate remaining revenue after bond holder obligations are fulfilled	Revenues	No, cash balance in Department accounts at end of Fiscal Year
Coverage Account	Bond Resolution - Section 502(b)(xi)(A) and in Airline Agreement in Article 8.02(J)(1)	Amount equal to 25% of the annual Debt Service Requirement, net of PFCs	To ensure that Airport maintains 1.25x coverage requirement	Revenues	No, part of General Fund
CFC Reserve Account	Airline Agreement in Article 8.02(J)(2)	Any CFC revenues in excess of rental car expenses available in General Fund	To ensure CFC revenues do not subsidize airline rentals	CFC revenues only	No, but to be created in FY 2012
Capital Improvement Account	Airline Agreement in Article 8.02(J)(3)	Portion of remaining revenues as outlined in the Airline Agreement in Article 8.02(J)(3)	To provide discretionary cash flow to Airport	Revenues	No, part of General Fund
Revenue Credit Account	BR Section 502(b)(xi)(B) and in Airline Agreement in Article 8.02(J)(4)	Portion of remaining revenues as outlined in the Airline Agreement in Article 8.02(J)(4)	To share nonairline revenues with airlines and reduce landing fee rates	Revenues	No, part of General Fund

Sources: Leigh Fisher, 2010.

Any professional services that are necessary for eligible projects, such as planning, surveying, and design, are also eligible. Aviation demand at the airport must justify the projects, which must also meet federal environmental and procurement requirements. Projects related to revenue-generating improvements and operational costs—such as salaries, equipment, and supplies—are not eligible for AIP grants. AIP grants can fund up to 95% of project costs at small-hub airports and 75% at medium- and large-hub airports.

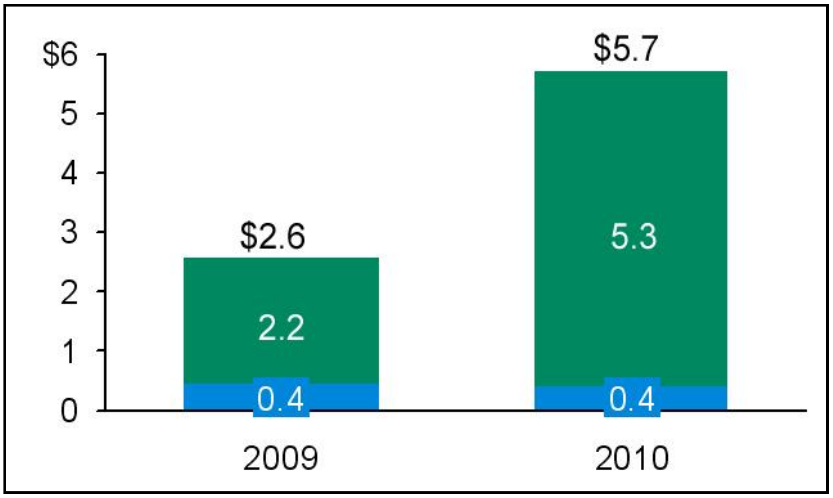
Large- and medium-hub airports which chose to levy a $4.50 passenger facility charge, described later in the report, are required to forego 75.0% of their AIP passenger entitlements. Small-hub airports receive no reduction in their passenger entitlements related to passenger facility charges.

11.2.1.1 AIP Grants at the Airport

Figure 11-3 below illustrates AIP entitlement amounts received by the Airport in Federal Fiscal Years [2] (FFY) 2009 and 2010. The Airport was reclassified from a medium-hub airport to a small-hub airport as of Federal Fiscal Year (FFY) 2010 and received the full complement of its AIP entitlement grants.

[2] Federal Fiscal Years are the 12 months ending September 30.

FIGURE 11-3
HISTORICAL AIP ENTITLEMENTS
(MILLIONS)



Sources: Leigh Fisher, 2010; Airport Management, 2011.

The Department has also consistently received between $300,000 and $400,000 in AIP cargo entitlement funding. Cargo entitlements are not affected by the PFC level at an airport. Since 2006, the Department has received an average of $7.0 million in AIP discretionary funding annually, primarily for the extension of runway safety areas.

11.2.1.2 AIP Outlook and Assumptions

AIP funding is subject to appropriation and authorization by Congress. The previous multi-year authorization for the FAA expired in September 2007 and the FAA has since operated under a series of continuing resolutions. Current legislation governing AIP grant distributions stipulate that a minimum of $3.2 billion must be appropriated to the AIP in order for entitlements to be distributed to airports at current levels. AIP is assumed to be funded at a level of at least $3.2 billion during the forecast period.

The Airport's current 5-year Capital Improvement Program (CIP) reflects the use of $21.7 million of the $24.6 million estimated AIP entitlement grants in the Near-Term. Uses include, among others, the purchase of snow melters, the construction of a glycol management system, HVAC upgrades, purchase of snow removal equipment, and storage facilities for snow removal equipment.

In addition, the Airport's CIP assumes $23.4 million in AIP discretionary grants for a number of projects, the largest of which are the snow removal equipment storage building, land acquisition in the runway protection zone, glycol management program, and terminal ramp replacement. The Department is currently negotiating with the FAA regarding these amounts, which are significantly higher than the amounts received historically for projects not related to airfield capacity or safety. Beyond the discretionary amounts in the Near-Term CIP, no additional discretionary amounts are assumed to be awarded. If the amounts assumed in the Near-Term CIP are not realized, deferral of projects to later time periods may facilitate additional funding.

Based on the base passenger forecast used in this Airport Master Plan Update and the FAA's Terminal Area Forecast for nationwide enplanements, the Airport is assumed to remain a small-hub and receive its full complement of AIP entitlement funding without an offset for collecting a PFC. Beginning in FY 2016, the percentage of project costs than can be funded with AIP grants is assumed to decrease from 95% to its historical level of 90% for small-hub airports. **Exhibit 1** shows the calculation of annual AIP passenger entitlement grants and assumed AIP cargo grants.

11.2.2 STATE GRANTS

The New Hampshire Department of Transportation provides funding for airport and aviation-related projects in the form of outright grants or matching share for federal AIP grants. The eligibility for state grants is similar to the criteria for AIP grants. These grants are provided from New Hampshire's general fund.

11.2.2.1 State Grants at the Airport

State grants at the Airport have traditionally been a stable, limited funding source, and have been awarded to provide a 5.0% local matching share for AIP projects. State grants must be negotiated every two years and have been determined through 2011.

11.2.2.2 State Grants Outlook and Assumptions

The Airport anticipates that state grants will fund $2.4 million in project costs, under its current 5-year CIP. New Hampshire, like many other states nationwide, has experienced difficulties during the recent economic recession and funding for future state grants is uncertain. Beyond the Near-Term planning period through FY 2015, state grants are assumed to provide a 5.0% local matching share only for AIP entitlement amounts. **Exhibit 1** shows the assumed level of state grants throughout the forecast period.

11.2.3 PASSENGER FACILITY CHARGES (PFCS)

Passenger Facility Charges (PFCs) are authorized by the FAA, are collected from qualified enplaned passengers to fund eligible projects, and may be used to fund projects that preserve or enhance Airport safety, security, or capacity; reduce aircraft noise or mitigate noise impacts; or furnish opportunities for enhanced airline competition. PFC eligibility is generally the same as AIP eligibility, although terminal eligibility is expanded to revenue and non-revenue producing areas related to the movement of passengers and their baggage and noise program eligibility is also expanded. PFCs can be used on a pay-as-you-go basis, or can be leveraged and used to pay debt service on bonds issued to finance PFC eligible projects.

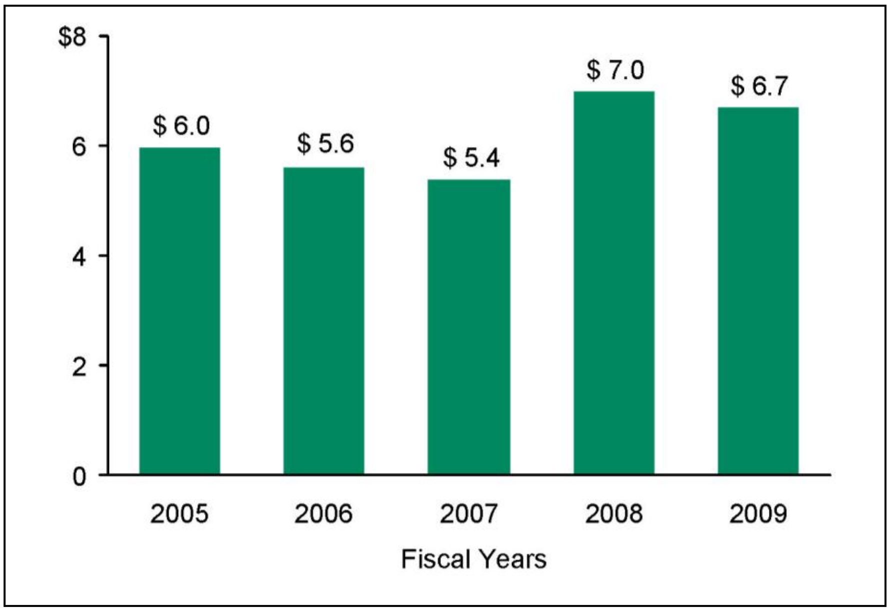
PFCs are often levied at either a $3.00 or a $4.50 level and paid to the airline with a passenger's fare. Large- and medium-hub airports wishing to impose a PFC at a $4.50 PFC level must demonstrate that projects included make a "significant contribution" to improving air safety and security, increasing competition, reducing congestion, or reducing noise.

11.2.3.1 PFCs at the Airport

Passengers enplaning at the Airport are currently paying a $4.50 PFC. Under the terms of FAA approved PFC applications and amendments since 1992, the Airport has been authorized to collect and use $198.3 million of

PFC Revenues. Through the end of FY 2010, the Department has collected $71.4 million and expended $67.2 million, leaving a balance in the PFC account of $4.2 million. Historical PFC collections are shown on **Figure 11-4** below. Under its current approvals, the Airport is authorized to collect PFCs through December 1, 2022.

FIGURE 11-4
HISTORICAL PFC COLLECTIONS
(MILLIONS)



Sources: City of Manchester Department of Aviation.

The Airport's PFC approvals by application and project are shown in **Table 11-1** on the following page. The Department is in the process of amending PFC application #8 to the $4.50 level.

Pursuant to the terms of the Bond Resolution, PFC Revenues at the Airport are excluded from the definition of Revenues. However, on a monthly basis, the City transfers PFC Revenues into the Debt Service Fund in an amount equal to one-twelfth of the annual Debt Service allocable to PFC-approved projects. The purpose of this transfer is to reduce the amount of Required Debt Service Fund Deposits that would otherwise be payable from Revenues Available for Bond Debt Service for that year. PFC revenues at the Airport have been primarily used to pay Debt Service on Series 1998, 2000, 2002, 2005 and 2009 Bonds.

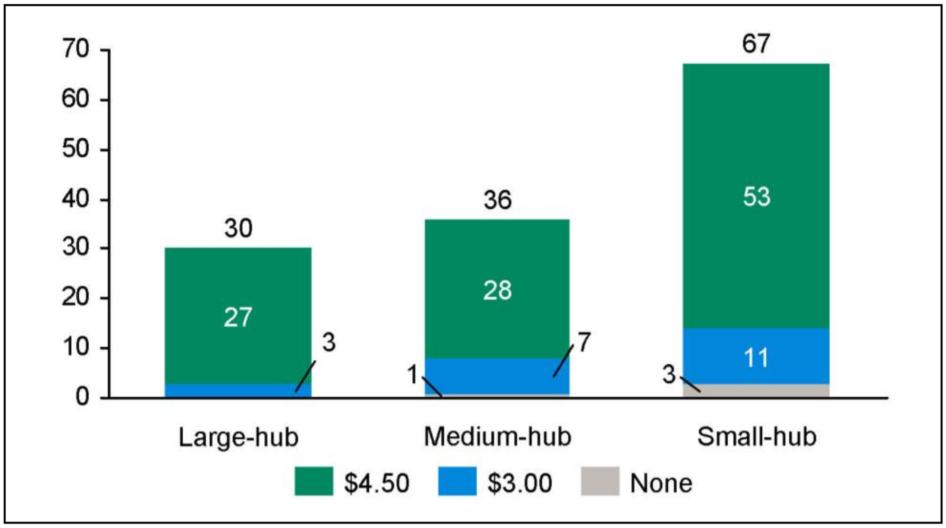
TABLE 11-1
APPROVED PFC COLLECTIONS AND USE

		Approved PFC collections			
Application	Project description	Pay-as-you-go	Debt service	Total	Collection level
1	Apron construction, Runway 6/24 improvements, and snow removal equipment	$ 1,405,644	$ --	$ 1,405,644	$ 3.00
2	Residential sound insulation program	1,400,000	--	1,400,000	3.00
3	*Application withdrawn*	--	--	--	3.00
4	Snow removal equipment	527,070	--	527,070	3.00
5	Remote apron construction and snow removal equipment	2,386,396	--	2,386,396	3.00
6	Upgrade Runway 6/24	1,742,423	--	1,742,423	3.00
7	Runway 6/24 reconstruction, remote apron construction, and property acquisition	1,102,888	114,741,562	115,844,450	3.00/4.50
8	Kelly Road relocation	--	3,033,074	3,033,074	3.00
9	Acquire airport rescue and firefighting vehicle	678,332	--	678,332	4.50
10	Runway 17/35 reconstruction and extension, residential sound insulation program, terminal expansion, and PFC application development	7,172,902	43,598,544	50,771,446	4.50
11 and 12*	Runway 6 reconstruction and safety area improvements, reconstruction of Taxiway E, construction of a stub Taxiway L, removal of the original ATCT, glycol collection system, extension of the Runway 24 safety areas, and PFC application development	2,135,167	18,405,501	20,540,668	4.50
		$18,550,822	$179,778,681	$198,329,503	

*Under amended Application 11, the Department received impose authority for $20,540,668 and use authority for $7,205,669. Under amended Application 12, the remaining amount of $13,334,999 was approved for use.

As shown on **Figure 11-5** on the following page, the $4.50 PFC collection rate charged at the Airport is consistent with other major airports across the nation. As of December 2009, 97% of hub airports impose a PFC, and 85% are imposing at the $4.50 level.

FIGURE 11-5
PFC LEVELS IMPOSED AT LARGE-, MEDIUM-, AND SMALL-HUB AIRPORTS
DECEMBER 2009



Sources: Federal Aviation Administration (FAA).

11.2.3.2 PFC Outlook and Assumptions

As shown in **Exhibit 2**, in the Near-Term, the Department is assumed to continue collecting PFC revenues at the $4.50 level, consistent with their existing and pending approvals. In the Near-Term, between $6.2 million to $6.5 million annually is assumed to be used to pay debt service on Outstanding Bonds.

The Department also has approximately $5.0 million of approved completed pay-as-you-go projects for which it has not yet reimbursed itself. In the Near-Term, a majority of PFC collections beyond those needed for debt service are assumed to be used for those reimbursements. The Near-Term CIP identifies approximately $2.3 million in additional projects on a pay-as-you-go basis.

In the current FAA reauthorization proposals, the cap on PFC levels may be raised beyond the $4.50 level to provide additional funding available outside of AIP. Beginning in FY 2016, the Department is assumed to increase its PFC level to $6.00. These additional collections are assumed to be used on a pay-as-you-go basis for future projects.

11.2.4 CUSTOMER FACILITY CHARGES (CFCS)

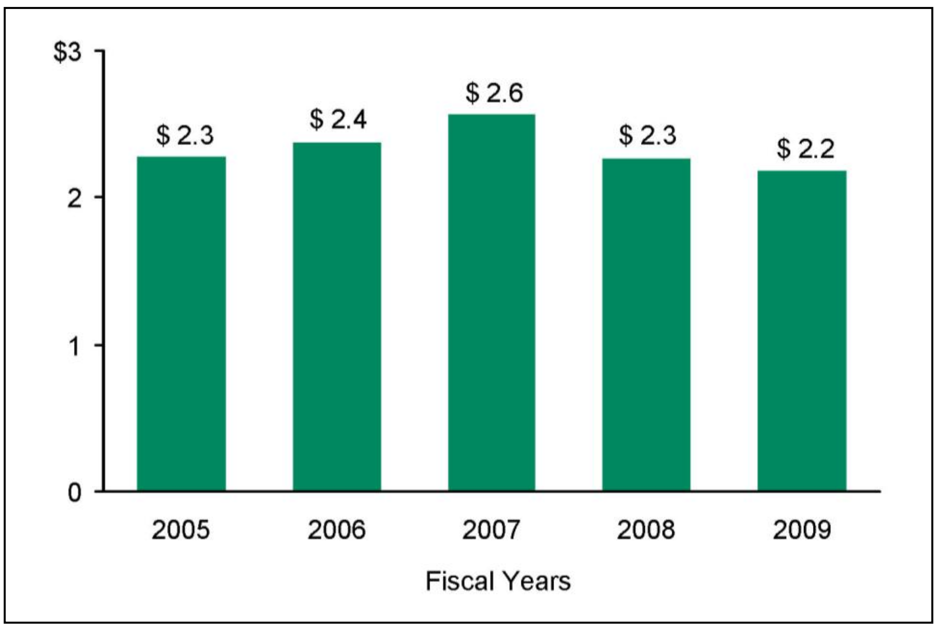
Customer Facility Charges (CFCs) are charged to customers renting cars at an airport and may be assessed on a per-transaction basis (a one-time charge for each rental car contract) or on a per-transaction-day basis (a charge for each day the rental car contract is in effect.) CFCs are usually established pursuant to an ordinance that documents the CFC amount, among other things, and the CFC may thereafter be a part of an airport's annual rate resolution. Because rental car companies cannot unilaterally charge a CFC or transportation fee, the airport operator has a great degree of discretion in setting and charging the fees.

CFCs are used to pay all of a portion of the operating and capital costs of a consolidated rental car area or structured facility, and may include the cost of transportation to the terminals. CFC revenues may be used on a stand-alone basis to support special facility bonds or may be used together with other airport revenues to support airport revenue bonds.

11.2.4.1 CFCs at the Airport

Currently, the Department collects a CFC of $2.25 per rental car per transaction day from rental car customers at the Airport. This rate has remained unchanged since 1999. Historical CFCs collected at the Airport can be viewed on **Figure 11-6** below.

FIGURE 11-6
HISTORICAL CFC COLLECTIONS
(MILLIONS)



Sources: City of Manchester Department of Aviation.

CFC revenues collected at the Airport are used to recover:

- Amortized cost of the rental car space in the garage;
- Amortized cost of the pedestrian walkway;
- O&M expenses for the rental car space in the garage and the pedestrian walkway; and
- Foregone increases in office space rentals and ground rents through FY 2009.

Under the Airline Agreements and the Automobile Agreements, any CFC revenues both (1) collected in excess of expenses allocable to rental car operations at the Airport and (2) available in the General Fund are set aside to pay for new facilities in later years.

11.2.4.2 CFC Outlook and Assumptions

As of FY 2010, certain CFC revenues are deposited into the CFC Reserve Account. These deposits are projected to continue throughout the forecast period. Funds in the CFC Reserve Account may be used in the Near-Term to reimburse the Department for historical rental car-related land acquisition costs.

Figure 11-7 shows CFC collection levels at other major New England airports, and at similarly sized airports nationwide. The CFC collection rate at the Airport is lower than many other similarly sized airports; additionally it is lower than many other New England airports, including Boston, Providence and Bradley. The Department could easily increase its CFC if additional rental car projects are identified.

As no substantial rental car projects were identified in the Intermediate- or Long-Term, the CFC was assumed to remain at its current level of $2.25 during the forecast period. The Department was assumed to use funds in the CFC Reserve Account on a pay-as-you-go basis to pay for projects associated with rental car operations.

11.2.5 AIRPORT REVENUE BONDS

Airport Revenue Bonds are traditionally the most common source of funds for airport infrastructure and can be issued for nearly any lawful airport purpose. The interest rate paid by an airport sponsor on bonds is typically a function of its credit rating. Their credit rating is based on revenues generated at the airport from airline rates and charges, parking, rental car operations, terminal concessions, other leases, interest, and any other revenues of the airport.

11.2.5.1 Airport Revenue Bonds at the Airport

Airport Revenue Bonds are issued pursuant the Bond Resolution. As of July 1, 2010, eight series of City of Manchester, New Hampshire, General Airport Revenue Bonds (Series 1998A, 2000A, 2002A, 2002B, 2005A, 2008, 2009A and 2009B), totaling $228,410,000, were Outstanding (see **Table 11-2**).

11.2.5.2 Airport Revenue Bond Outlook and Assumptions

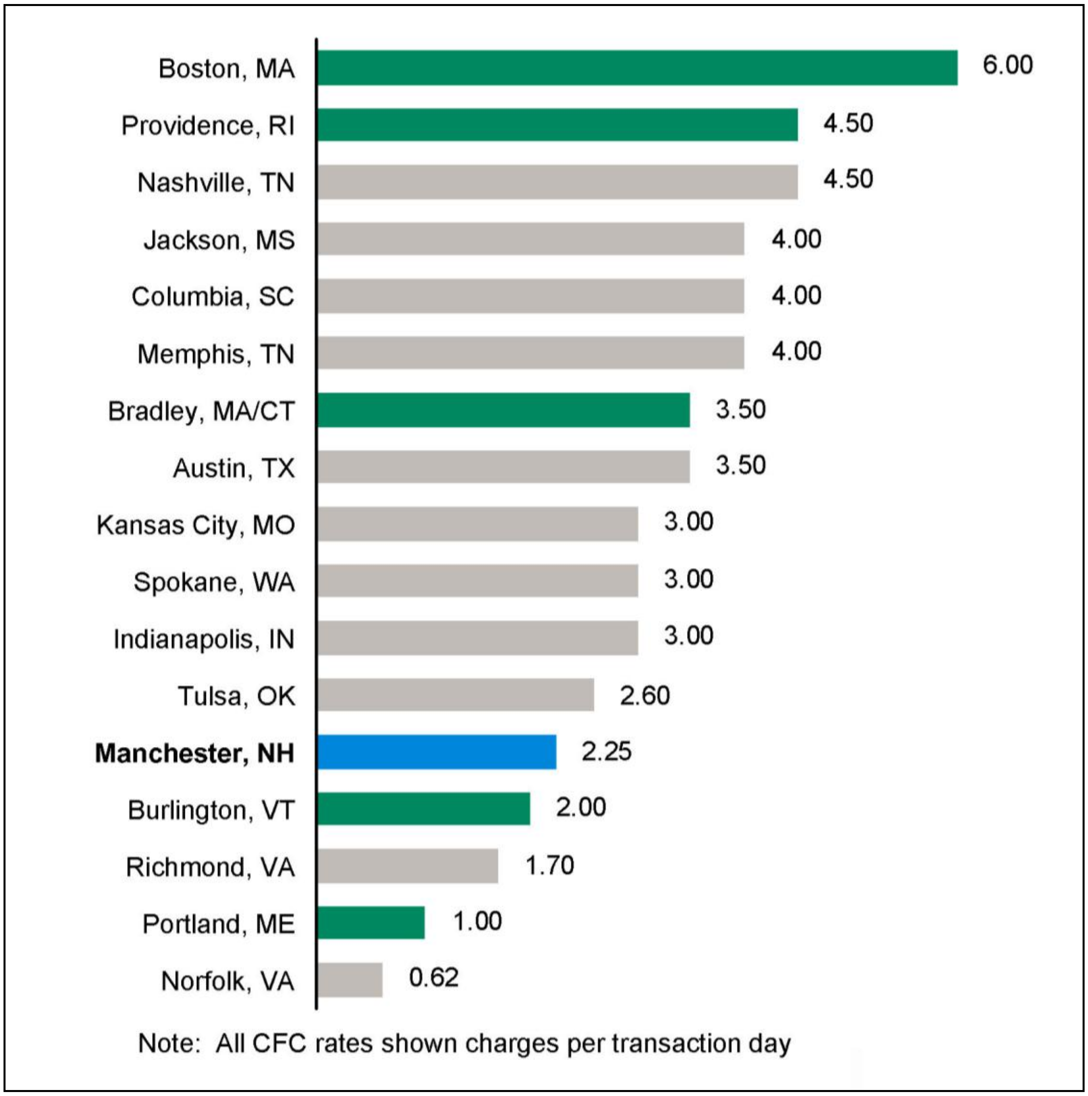
In assessing the Department's capacity for issuing Additional Bonds, numerous factors must be evaluated, including the:

- *Provisions of the Bond Resolution*. A financial forecast for the Department was developed for the 20-year planning horizon to estimate debt service coverage levels.

  As debt service coverage is a function of the Airport's overall financial performance, forecasts of Debt Service Requirements (see **Exhibit 3**), Operating Expenses (see **Exhibit 4**), Revenues (see **Exhibit 5**), and account deposits (see **Exhibit 6**) were prepared to estimate future debt service coverage levels (see **Exhibit 7**.)

  The exhibits present budgeted results for FY 2010 and FY 2011, and forecast results for FY 2012 through FY 2030 with the exception of FY 2012 Revenues. The Department has prepared a preliminary budget for FY 2012 revenues and those have been incorporated into the exhibits to reflect changes in revenues due to the current economic climate.

FIGURE 11-7
CFC COLLECTION RATES AT SELECTED AIRPORTS



Sources: Leigh Fisher, 2010.

TABLE 11-2
SUMMARY OF THE CITY'S OUTSTANDING AIRPORT REVENUE BONDS

Series	Amount Issued	Purpose	Principal Outstanding as of July 1, 2010 *(a)*
1998	$124,275,000	New Money Issue	$ 61,205,000
2000	55,990,000	New Money Issue	710,000
2002	69,655,000	New Money Issue	37,640,000
2005	76,325,000	Refunding	16,285,000
2008	30,255,000	Refunding	27,035,000
2009	85,535,000	Refunding	85,535,000
			$228,410,000.00

Sources: Leigh Fisher, 2010.

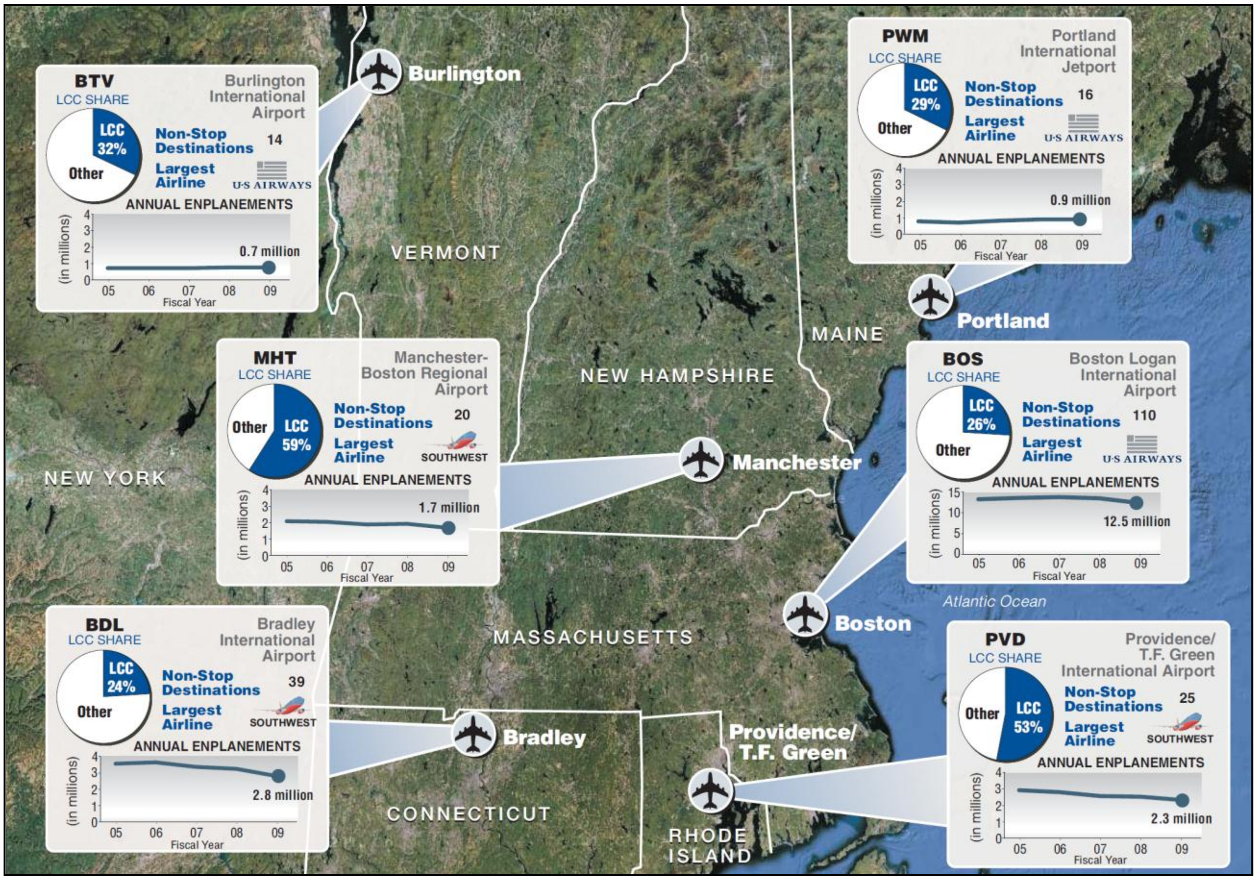
The exhibits were developed using the following assumptions, not described in other sections:

- Future airline traffic demand at the Airport in accordance with the rest of the Airport Master Plan Update.
- Estimated sources and uses of funds for the 2011 through 2016 capital improvement plan.
- Historical relationships among revenues, expenses, and airline traffic at the Airport and other factors that may affect future revenues and expenses.
- Historical relationships between PFC revenues and passenger numbers.
- The City's historical results for the Airport, budgeted results for FY 2010 through FY 2011, projected staffing requirements, and other operational considerations.
- The City's policies and contractual arrangements relating to the use and occupancy of Airport facilities, including the calculation of airline rentals, fees, and charges under the Airline Agreement; the operation of concession privileges; and the leasing of buildings and grounds.

- *Metrics assessed by the rating agencies.* Debt per enplaned passenger, debt service coverage ratios, airline payments per enplaned passenger, and landing fee rates, among others, are used by rating agencies to assess the creditworthiness of an airport.

To benchmark the Airport's position on these metrics, data was gathered for a selection of airports in New England as well as nationwide data provided by the rating agency Moody's Investor Services for 2008. The benchmarked airports are reflected on **Figure 11-8** on the following page.

FIGURE 11-8
BENCHMARKED NEW ENGLAND AIRPORTS



Sources: Leigh Fisher, 2010.

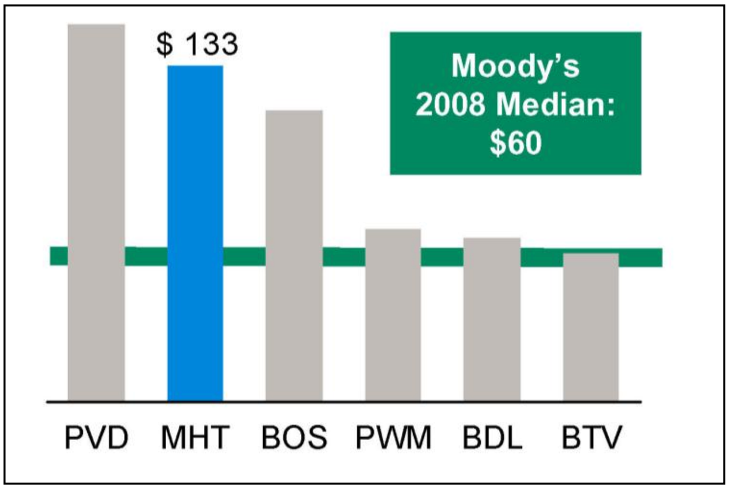
Debt levels at the Airport can be compared with other airports using the debt per enplaned passenger metric, which is calculated by dividing outstanding debt by enplanements. Debt per enplanement illustrates how "loaded" an airport is with debt, relative to its size.

Figure 11-9 presents debt per enplanement levels at the Airport for FY 2009, compared with the five other major New England airports, and with the average median for debt per enplanements at U.S. Airports, as calculated by Moody's Investor Services in 2008. Consistent with Outstanding Debt at the Airport, the benchmark comparison included CFC and PFC backed debt, but excluded airline special facility debt. Debt per enplanement at the Airport was $133 in FY 2009; higher than the Moody's 2008 median, and all other New England Airports, with the exception of Providence.

The debt per enplanement metric also indicates where an airport is in its capital cycle; the Airport's relatively high debt per enplanement reflects the extensive capital improvements that have been made in the past decade. The Department will continue to make principal payments and lower debt outstanding. After the debt service payments shown on **Exhibit 4**, the Airport's debt per enplanement levels are forecast to reduce to $115 in FY 2015, $75 in FY 2020, and less than $10 in FY 2030.

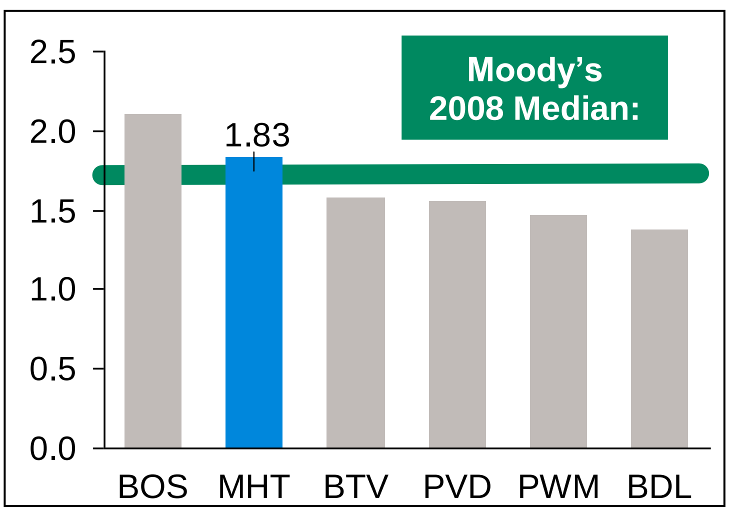
In addition to the level of debt outstanding, rating agencies evaluate the ability of the airport to pay the associated debt service annually through the debt service coverage ratio. In FY 2009, the Airport's debt coverage ratio was 1.83x, one of the highest among New England airports and higher than industry-wide medians, as shown on **Figure 11-10**. As shown on **Exhibit 7**, budgeted levels of debt service coverage for FY 2011 are lower, forecast to remain level through the Near- and Intermediate-Term, and increase again in the Long-Term as Outstanding Debt is retired.

FIGURE 11-9
DEBT PER ENPLANEMENT FOR SELECTED AIRPORTS



Sources: Financial statements for airports shown for 2008 or 2009.

FIGURE 11-10
DEBT SERVICE COVERAGE RATIOS FOR SELECTED AIRPORTS



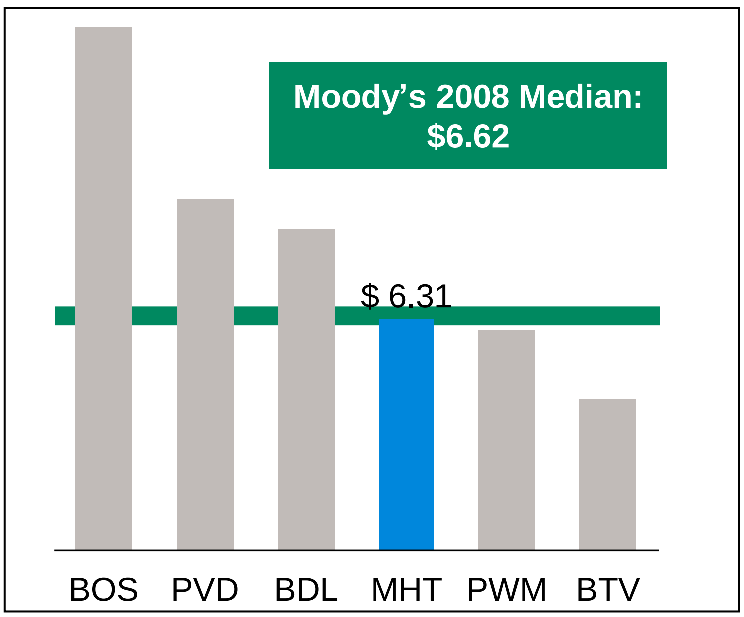
Sources: Financial or official statements for airports shown for 2008, 2009, or 2010.

Exhibit 5 shows projected passenger airline payments expressed per enplaned passenger. The projections were prepared on the assumption that the terms of the current Airline Agreement relating to the calculation of airline Rental and Fee Payments will extend through the forecast period and that the airlines collectively will make all payments required by such terms.

Payments made by airlines to airports (landing fees, terminal rentals, and other payments) represent a relatively small part of an airline's overall cost structure. Nevertheless, required airline payments inevitably affect airline business decisions, particularly in areas where there is competition among airports or alternate travel modes. Airline payments may affect airline decisions regarding expanding service or continuing to provide service at an airport.

Figure 11-11 presents the Airport's airline payments per enplaned passenger compared to the benchmarked airports and Moody's medians for 2008. The Airport has a relatively low, competitive level of airline payments and, as shown in **Exhibit 7**, these levels are forecast to remain competitive.

FIGURE 11-11
AIRLINE PAYMENTS PER ENPLANED PASSENGER FOR SELECTED AIRPORTS



Sources: Financial or official statements for airports shown for 2008, 2009, or 2010.

The Department's relatively high debt per enplaned passenger levels and reduced coverage ratios indicate that additional bond issuances may weaken the Airport's financial position. Accordingly, it was assumed that no additional airport revenue bonds would be issued during the forecast period. The Department is forecast to continue to make principal payments, lower the level of debt outstanding, and improve its coverage ratios. With these actions, the Department will be better positioned for additional debt issuances in the longer-term.

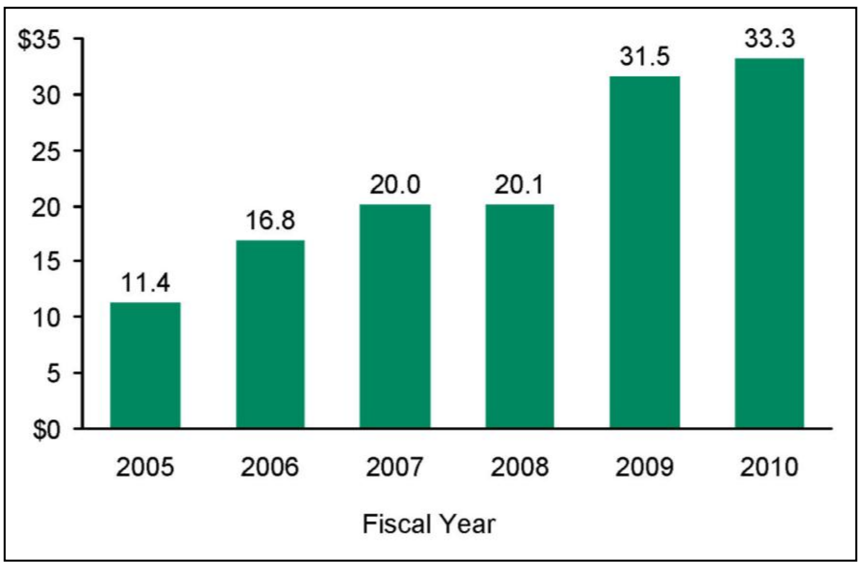
11.2.6 CAPITAL IMPROVEMENT ACCOUNT

As described in the earlier section "Application of Revenues to Funds and Accounts," the Department retains a portion of the Net Revenues of the Airport in the Capital Improvement Account. The Capital Improvement Account can be used by the Department for any lawful purpose, including funding capital projects. The Department has historically used this fund for smaller scale capital projects. Funds spent out of the Capital Improvement Account for projects in the Airfield, Terminal, or Apron cost centers can be amortized and included in airline Rental and Fee Payments.

11.2.6.1 Capital Improvement Account at the Airport

Unrestricted cash balances at the Airport from FY 2005 through FY 2010 are shown on **Figure 11-12**. Unrestricted cash balances at the Airport are comprised of balances in the Capital Improvement Account, the O&M Reserve Account, the Coverage Account and the Renewal and Replacement Account. The Airport's unrestricted cash balances have been increasing from FY 2005 through FY 2010.

FIGURE 11-12
HISTORICAL UNRESTRICTED CASH BALANCES



Sources: City of Manchester Department of Transportation.

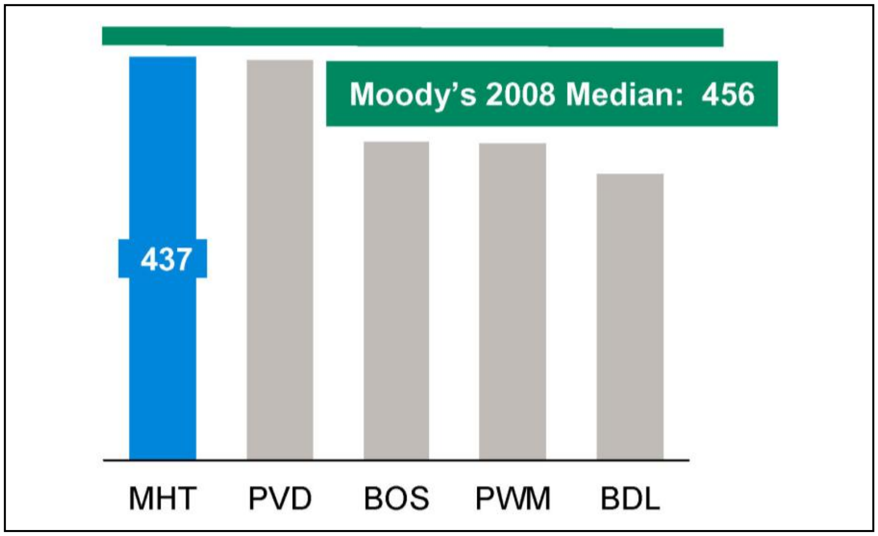
The Airport's cash position, relative to other airports, can be assessed using the days cash on hand metric. Days cash on hand is a measurement of airport liquidity, and is calculated by dividing unrestricted cash on hand by operating expenses, and multiplying by 365. As shown on **Figure 11-13**, the Airport has a higher liquidity level than other major New England airports, an attribute which has been cited by a significant credit positive by rating agencies. Days cash on hand at all airports shown is lower than the Moody's 2008 median for US Airports.

11.2.6.2 Capital Improvement Account Outlook and Assumptions

As shown previously on Figure 11-12, the Department was able to significantly increase its balances in the Capital Improvement Account through FY 2010. As enplaned passenger levels have decreased and deposits to the CFC Reserve Account commence, deposits to the Capital Improvement Account are forecast to be reduced from historical levels.

As shown in **Exhibit 8**, the Department is assumed to continue its practice of funding smaller scale capital projects from the Capital Improvement Account. To replenish that account over time, expenditures are assumed to be amortized in the calculation of airline Rental and Fee Payments.

FIGURE 11-13
DAYS CASH ON HAND



Note: Figures are from Fiscal Years 2007 through 2010, depending on the airport.
Sources: City of Manchester Department of Aviation Records, Rating Agency Reports, Comprehensive Annual Financial Reports (CAFRs).

11.3 PROJECT INFORMATION

The Airport Master Plan Update for Manchester-Boston Regional Airport has identified a proposed 20-year capital plan to maintain existing facilities, improve customer service, and relieve capacity constraints. Detailed information regarding the projects, their scope, and their cost estimates is presented elsewhere in the Airport Master Plan Update report. The overall 20-year capital plan includes an estimated total of $177.2 million in project costs over the following time frames:

- ***Near-Term*** projects occurring in FY 2011 through FY 2015 are estimated to total $58.2 million, as shown on **Table 11-3**.
- ***Intermediate-Term*** projects occurring in FY 2016 through FY 2020 are estimated to total $47.5 million, as shown on **Table 11-4**.

- ***Long-Term*** projects occurring in FY 2021 through FY 2030 are estimated to total $71.5 million, as shown on **Table 11-5**.

Tables 11-3, 11-4, and 11-5 assign each project to one of the Airport's Cost Centers established under the Airline Agreements as (Airfield, Terminal Building and Landside, or Parking and Roadways) and into categories established for this financial analysis:

- ***Renewal and optimization*** projects renew and replace existing Airport facilities to ensure continued safe and efficient operations, and their timing is driven by the useful life of the asset rather than passenger or operational demands. The primary renewal and optimization projects are the replacement of equipment; rehabilitation of airfield, parking and roadway pavement; and upgrades to terminal utility and communication systems.

- ***Customer service*** projects are smaller scale projects to improve the customer experience at the Airport, and their timing is driven by the availability of funding. The primary customer service projects include improved signage, security checkpoints consolidation to improve processing, and relocation of the rental car counters to the parking garage.

- ***Demand-driven*** projects are capacity enhancements to accommodate existing or forecast passenger levels, and their timing is driven by reaching certain thresholds of passenger activity. Near-Term projects address existing constraints or take advantage of funding opportunities. The number and size of these projects increases in the Intermediate- and Long-Term capital plans as passenger levels increase. The primary demand-driven projects are improvements to the baggage claim, FIS facilities to meet international demands, and incremental expansion of terminal capacity.

Figure 11-14 shows the breakdown of projects by cost center for each planning period and **Figure 11-15** shows the breakdown by type of project.

TABLE 11-3
NEAR-TERM CAPITAL PLAN COST ESTIMATES (FY 2011 – FY 2015)

Project	Cost Estimate
Airfield	
Renewal and Optimization	
Property Acquisition - Runway 6 RPZ	$ 5,000,000
Glycol Management Program	4,400,000
Terminal Ramp Replacement	9,480,000
Relocate Airport Service Road/Ammon Drive	3,200,000
Rehabilitate Taxiway "N" at Terminal Apron	975,000
Rehabilitate a South Portion of Taxiway "M"	1,125,000
Rehabilitate Taxiway "H" Adjacent to T/W "B"	1,180,000
Rehabilitate Bituminous Portion of Terminal Ramp at Gates 1-3 and Portions of Taxiways "N" & "E"	1,450,000
Rehabilitate Portions of Taxiways "A" and "B" including U.S. Customs Ramp	2,470,000
Incident Command Center Vehicle	500,000
Acquisition of Snow Removal Equipment	1,655,000
Snow Removal Equipment Storage Building	12,500,000
Demolition of Highlander Buildings	2,000,000
Airfield subtotal	$45,935,000
Terminal	
Renewal and Optimization	
PA System Upgrades	$ 150,000
HVAC System Upgrades	400,000
CCTV System - Phase IV	625,000
Interactive Employee Training Program	260,000
Subtotal	$ 1,435,000
Customer Service	
Construct "First-Aid" Room	$ 100,000
Relocate Terminal Curbside Airline Signs	30,000
Consolidate Security Checkpoints "B" & "C" on Level 2 (Design)	300,000
Subtotal	$ 430,000
Demand-driven	
Refurbish/Replace Bag Claim "B" Lobby Area - Construct New Concessions	$ 150,000
Refurbish and Expand Bag Claim Equipment	1,700,000
Subtotal	$ 1,850,000
Terminal subtotal	$ 3,715,000
Parking and Roadways/Other Buildings and Areas	
Renewal and Optimization	
Rework Terminal Landscaping	$ 250,000
Rehabilitate Airport Road Section (Under T/W "M" Overpass)	325,000
Rehabilitate Section of Parking Lot "C" – Phase 1	760,000
Expand Parking Lot "C" (Phase 1)	1,000,000
Subtotal	$ 2,335,000
Customer Service	
Relocate Rental Car Counters to Garage	$ 2,250,000
Demand-driven	
Future Development	$ 4,000,000
Parking and Roadways/Other Buildings and Areas subtotal	$ 8,585,000
All Projects Total	**$58,235,000**

Sources: Leigh Fisher, 2010.

TABLE 11-4
INTERMEDIATE-TERM CAPITAL PLAN COST ESTIMATES (FY 2016 – FY 2020)

Project	Cost Estimate
Airfield	
Renewal and Optimization	
Rehabilitate Taxiway “A” at “C” and “D”	$ 1,640,000
Rehabilitate South Taxiway “A” Including “P” and “U” and Portion of “E”	6,520,000
Rehabilitate Taxiway “H” South	2,670,000
Rehabilitate Taxiway “M” North	2,135,000
Rehabilitate Runway 6/24 and 17/35 Intersection	2,430,000
Rehabilitate East Ramp	5,000,000
Install ALS Runway 6/24	5,000,000
Airfield subtotal	$25,395,000
Terminal	
Renewal and Optimization	
Rework Terminal Traffic Lanes	$ 900,000
Renovate Communication Center	1,000,000
Subtotal	$ 1,900,000
Customer Service	
Consolidate Security Checkpoints B&C on Level 2	$ 4,000,000
Demand-driven	
Outbound Baggage System	$ 1,500,000
Merchandise Screening/Concession Storage/Holdroom Expansion	3,100,000
Short-Term FIS Facility	3,650,000
Subtotal	$ 8,250,000
Terminal subtotal	$14,150,000
Parking and Roadways/Other Buildings and Areas	
Renewal and Optimization	
Rehabilitate Parking Lot "B" and Administrative Lot	$ 525,000
Rehabilitate Parking Lot "A"	325,000
Rehabilitate Parking Lot "D"	2,400,000
Rehabilitate Parking Lot "C" - Phase II	975,000
Rehabilitate Airport Entrance/Terminal Loop Road	700,000
Subtotal	$ 4,925,000
Demand-driven	
Future Development	$ 3,000,000
Parking and Roadways/Other Buildings and Areas subtotal	$ 7,925,000
All Projects Total	**$47,470,000**

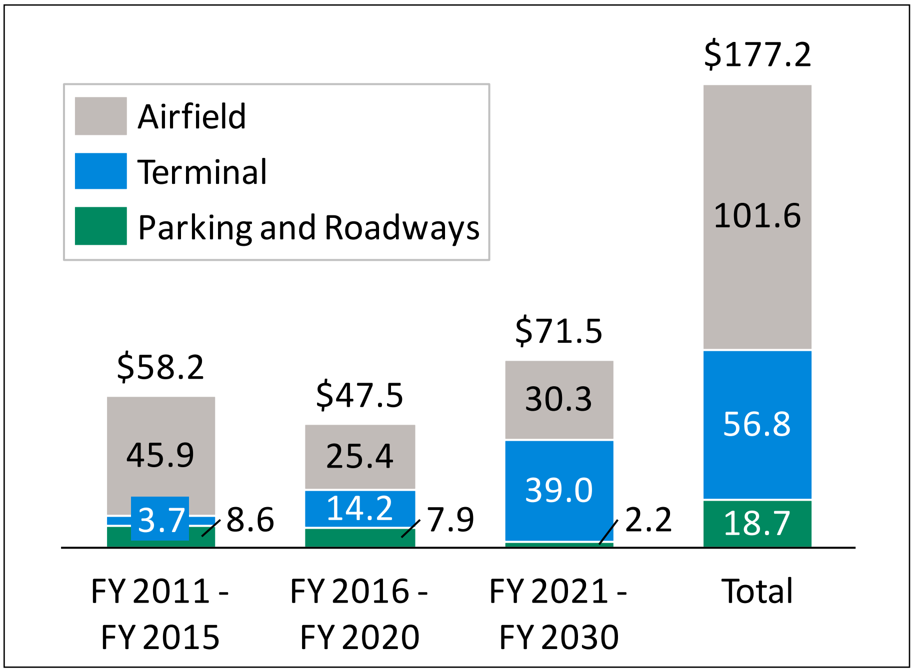
Sources: Leigh Fisher, 2010.

TABLE 11-5
LONG-TERM CAPITAL PLAN COST ESTIMATES (FY 2021 – FY 2030)

Project	Cost Estimate
Airfield	
Renewal and Optimization	
Rehabilitate Taxiway "H" North of Runway 6/24	$ 1,810,000
Rehabilitate Taxiway "J", "J1" and Portion of "H"	3,520,000
Rehabilitate Taxiway "H" at Taxiway "C"	1,550,000
Rehabilitate Taxiway "H" at Runway 17, "M" & "M1" at Runway 6 and "A" & "B"	1,500,000
Rehabilitate One Half of Runway 17/35 South of Runway 6/24	3,975,000
Rehabilitate One Half of Runway 17/35 South of Runway 6/24	3,975,000
Rehabilitate East Side Taxiway Stubs	1,110,000
Rehabilitate Runway 6/24 East of Runway 17/35	2,310,000
Rehabilitate Taxiway "A" and "D" (West)	2,200,000
Rehabilitate Taxiway "E" (Cargo)	1,465,000
Rehabilitate Runway 17/35 (North of Runway 6/24)	2,200,000
Rehabilitate Runway 6/24 West of Runway 17/35	4,225,000
Rehabilitate Taxiway "L" at N.E. Ramp	465,000
Airfield subtotal	$30,305,000
Terminal	
Renewal and Optimization	
Rehabilitate Green Drive - Section of Road from Ammon Drive Center to Terminal Building Delivery Dock	$ 200,000
Customer Service	
New Ticket Lobby Entrance Vestibule and Curb Canopy Entrance Feature	$ 1,325,000
Construct Pedestrian Bridge Connector	7,275,000
Provide Direct Vertical Pax. Circulation from Concourse to Baggage Claim	2,300,000
Subtotal	$10,900,000
Demand-driven	
Baggage Claim Area Upgrade Adding Fourth Claim Device	$13,270,000
Renovate Consolidated Checkpoint to Add a Sixth Screening Lane	5,320,000
Administrative Office Expansion/Renovation - Level 3	3,475,000
Permanent FIS Facility	6,000,000
Subtotal	$28,065,000
Terminal subtotal	$39,165,000
Parking and Roadways/Other Buildings and Areas	
Demand-driven	
Expand Parking Lot C	$ 2,000,000
All Projects Total	**$71,470,000**

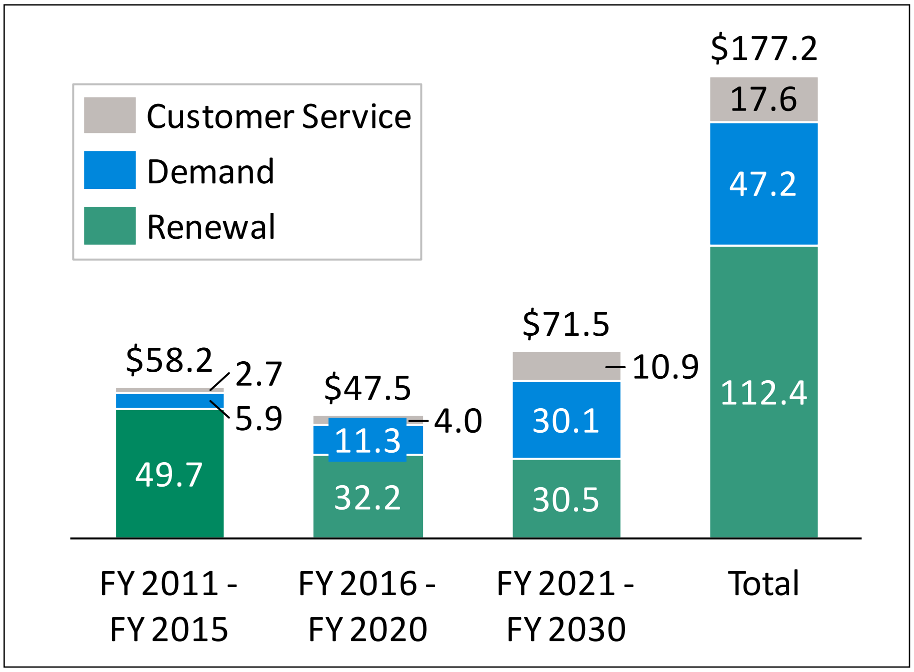
Sources: Leigh Fisher, 2010.

FIGURE 11-14
PROJECT COSTS BY COST CENTER



Sources: Leigh Fisher, 2010.

FIGURE 11-15
PROJECT COSTS BY TYPE

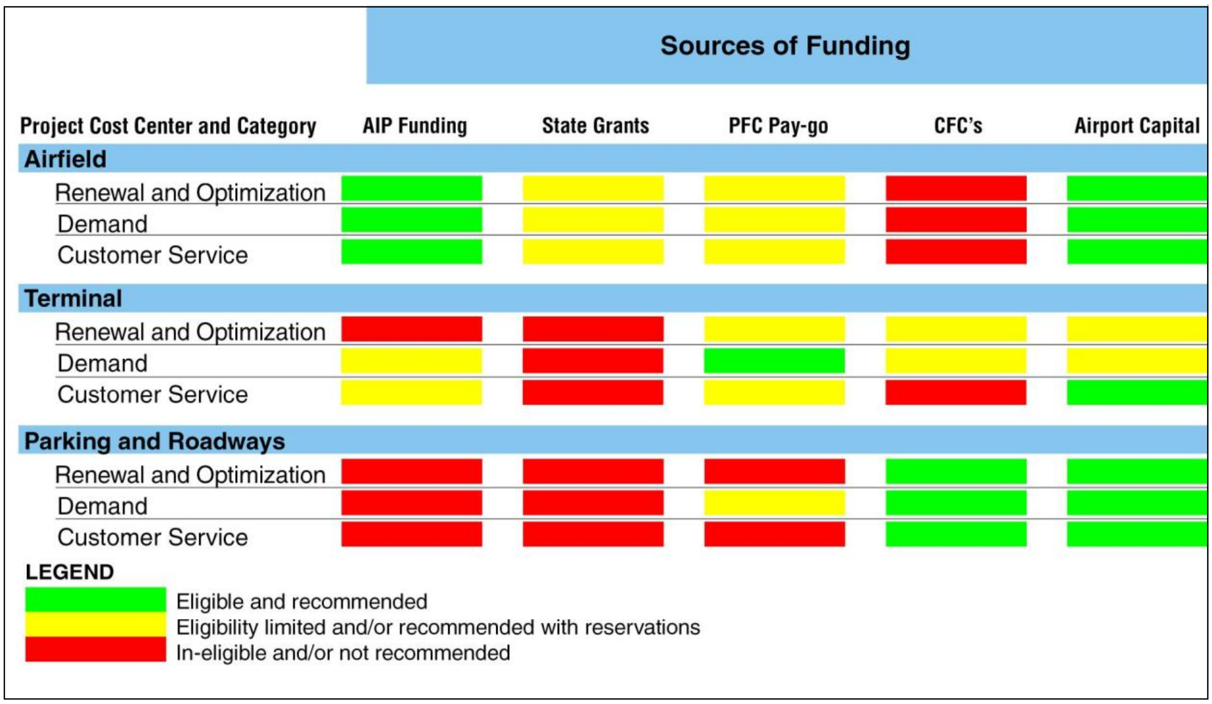


Sources: Leigh Fisher, 2010.

11.4 PLAN OF FINANCE

A plan of finance has been developed that recognizes the financial framework of the Airport, available sources of funds, and the timing and drivers of each of the projects identified in the Airport Master Plan Update for the Airport. For the Near-Term capital program, project by project funding sources are presented in **Table 11-6**. The Near-Term capital program funding sources are consistent with the Department's 5 year CIP, with further discussion in the following sections. For the Intermediate- and Long-Term capital program in **Tables 11-7 and 11-8**, respectively, project funding sources are presented by category and cost center of project. The recommend plan of finance by Airport Cost Center and category of the project (renewal and optimization, customer service, or demand-driven) is shown on **Figure 11-16**.

FIGURE 11-16
RECOMMENDED PLAN OF FINANCE BY COST CENTER AND TYPE OF PROJECT



Sources: Leigh Fisher, 2010.

TABLE 11-6
NEAR-TERM CAPITAL PLAN FUNDING SOURCES (FY 2011 – FY 2015)

	Federal Grants-in-Aid		State	PFC Pay-		Airport	
Project Title	Entitlement	Discretionary	Grants	as-you-go	CFC's	Capital	Total
Airfield							
Renewal and Optimization							
Property Acquisition - Runway 6 RPZ	$ 1,600,000	$ 3,150,000	$ 250,000	$ --	$ --	$ --	$ 5,000,000
Glycol Management Program	2,280,000	1,900,000	220,000	--	--	--	4,400,000
Terminal Ramp Replacement	3,671,040	5,334,960	474,000	--	--	--	9,480,000
Relocate Airport Service Road/Ammon Drive	1,534,000	1,506,000	160,000	--	--	--	3,200,000
Rehabilitate Taxiway "N" at Terminal Apron	926,250	--	48,750	--	--	--	975,000
Rehabilitate a South Portion of Taxiway "M"	1,068,750	--	56,250	--	--	--	1,125,000
Rehabilitate Taxiway "H" Adjacent to T/W "B"	279,660	841,340	59,000	--	--	--	1,180,000
Rehabilitate Bituminous Portion of Terminal Ramp at Gates 1-3 and Portions of Taxiways "N" & "E	1,377,500	--	72,500	--	--	--	1,450,000
Rehabilitate Portions of Taxiways "A" and "B" including U.S. Customs Ramp	597,740	1,748,760	123,500	--	--	--	2,470,000
Incident Command Center Vehicle	166,000	309,000	25,000	--	--	--	500,000
Acquisition of Snow Removal Equipment	1,572,250	--	82,750	--	--	--	1,655,000
Snow Removal Equipment Storage Building	4,455,000	7,420,000	625,000	--	--	--	12,500,000
Demolition of Highlander Buildings	688,000	1,212,000	100,000	--	--	--	2,000,000
Airfield subtotal	$20,216,190	$23,422,060	$2,296,750	$ --	$ --	$ --	$45,935,000
Terminal							
Renewal and Optimization							
PA System Upgrades	$ 142,500	$ --	$ 7,500	$ --	$ --	$ --	$ 150,000
HVAC System Upgrades	380,000	--	20,000	--	--	--	400,000
CCTV System - Phase IV	593,750	--	31,250	--	--	--	625,000
Interactive Employee Training Program	247,000	--	13,000	--	--	--	260,000
Subtotal	$ 1,363,250	$ --	$ 71,750	$ --	$ --	$ --	$ 1,435,000
Customer Service							
Construct “First Aid” Room	$ 95,000	$ --	$ 5,000	$ --	$ --	$ --	$ 100,000
Relocate Terminal Curbside Airline Signs	--	--	--	--	--	30,000	30,000
Consolidate Security Checkpoints “B” & “C” on Level 2 (Design)	--	--	--	300,000	--	--	300,000
Subtotal	$ 95,000	$ --	$ 5,000	$ 300,000	$ --	$ 30,000	$ 430,000
Demand-driven							
Refurbish/Replace Bag Claim “B” Lobby Area - Construct New Concessions	$ --	$ --	$ --	$ --	$ 150,000	$ --	$ 150,000
Refurbish and Expand Bag Claim Equipment	--	--	--	1,700,000	--	--	1,700,000
Subtotal	$ --	$ --	$ --	$1,700,000	$ 150,000	$ --	$ 1,850,000
Terminal subtotal	$ 1,458,250	$ --	$ 76,750	$2,000,000	$ 150,000	$ 30,000	$ 3,715,000
Parking and Roadways/Other Buildings and Areas							
Renewal and Optimization							
Rework Terminal Landscaping	$ --	$ --	$ --	$ --	$ --	$ 250,000	$ 250,000
Rehabilitate Airport Road Section (Under T/W "M" Overpass)	--	--	--	325,000	--	--	325,000
Rehabilitate Section of Parking Lot "C" – Phase 1	--	--	--	--	--	760,000	760,000
Expand Parking Lot “C” (Phase 1)	--	--	--	--	--	1,000,000	1,000,000
Subtotal	$ --	$ --	$ --	$ 325,000	$ --	$2,010,000	$ 2,335,000
Customer Service							
Relocate Rental Car Counters to Garage	$ --	$ --	$ --	$ --	$2,250,000	$ --	$ 2,250,000
Demand-driven							
Future Development	$ --	$ --	$ --	$ --	$4,000,000	$ --	$ 4,000,000
Parking and Roadways/Other Buildings and Areas subtotal	$ --	$ --	$ --	$ 325,000	$6,250,000	$2,010,000	$ 8,585,000
All Projects Total	**$21,674,440**	**$23,422,060**	**$2,373,500**	**$2,325,000**	**$6,400,000**	**$2,040,000**	**$58,235,000**

Sources: Leigh Fisher, 2010.

TABLE 11-7
INTERMEDIATE-TERM CAPITAL PLAN FUNDING SOURCES (FY 2016 – FY 2020)

Project Title	Federal Grants-in-Aid Entitlement	Federal Grants-in-Aid Discretionary	State Grants	PFC Pay-as-you-go	CFC's	Airport Capital	Total
Airfield							
Renewal and Optimization	$22,855,500	$ --	$1,269,750	$ --	$ --	$1,269,750	$25,395,000
Terminal							
Renewal and Optimization	$ 1,710,000	$ --	$ 95,000	$ --	$ --	$ 95,000	$ 1,900,000
Customer Service	3,600,000	--	200,000	--	--	200,000	4,000,000
Demand-driven	-	--	--	8,250,000	--	-	8,250,000
Subtotal	$ 5,310,000	$ --	$ 295,000	$8,250,000	$ --	$ 295,000	$14,150,000
Parking and Roadways/Other Buildings and Areas							
Renewal and Optimization	$ 630,000	$ --	$ 35,000	$ 35,000	$ --	$4,225,000	$ 4,925,000
Demand-driven	-	--	--	--	--	3,000,000	3,000,000
Subtotal	$ 630,000	$ --	$ 35,000	$ 35,000	$ --	$ 7,225,000	$ 7,925,000
All Projects Total	**$28,795,500**	**$ --**	**$1,599,750**	**$8,285,000**	**$ --**	**$8,789,750**	**$47,470,000**

Sources: Leigh Fisher, 2010.

TABLE 11-8
LONG-TERM CAPITAL PLAN FUNDING PLAN (FY 2021 – FY 2030)

Project Title	Federal Grants-in-Aid Entitlement	Federal Grants-in-Aid Discretionary	State Grants	PFC Pay-as-you-go	CFC's	Airport Capital	Total
Airfield							
Renewal and Optimization	$27,274,500	$ --	$1,515,250	$ --	$ --	$1,515,250	$30,305,000
Terminal							
Renewal and Optimization	$ --	$ --	$ --	$ --	$ --	$ 200,000	$ 200,000
Customer Service	--	--	--	10,900,000	--	--	10,900,000
Demand-driven	--	--	--	28,065,000	--	--	28,065,000
Subtotal	$ --	$ --	$ --	$38,965,000	$ --	$ 200,000	$39,165,000
Parking and Roadways/Other Buildings and Areas							
Demand-driven	$ --	$ --	$ --	$ --	$ --	$2,000,000	$ 2,000,000
All Projects Total	**$27,274,500**	**$ --**	**$1,515,250**	**$38,965,000**	**$ --**	**$3,715,250**	**$71,470,000**

Sources: Leigh Fisher, 2010.

11.4.1 AIRFIELD

11.4.1.1 Renewal and Optimization Projects

Pavement rehabilitation projects in the Airfield must occur on a regular schedule tied to the useful life of the project. While AIP grants, State grants, and the Capital Improvement Account balances are somewhat reliant upon enplaned passenger levels at the Airport, they provide the most stable funding source for future Airfield renewal and optimization projects. Per the current formula for AIP passenger entitlements, as shown in **Exhibit 1**, for every passenger over one million, the Department only receives $1. Variations in passenger levels have far less effect on AIP entitlement amounts compared to other funding sources such as PFCs for which each passenger represents $4.39, after the airline collection fee.

As the Airfield is a residual cost center, any expenditure from the Capital Improvement Account will be fully replenished over time through Landing Fee collections. While increasing the Landing Fee does increase Airline Rental and Fee Payments, forecast levels of both remain relatively stable over the forecast period.

In the Near-Term, the local matching share of AIP grants is assumed to be provided by State grants. In the Intermediate- and Long-Term, the local matching share was assumed to be provided by funds from the Airport's Capital Improvement Account and amortized in the Landing Fee, as shown in **Exhibits 5B and 8**. As shown on Figure 11-16, PFC funding is not recommended for Airfield renewal and optimization projects as AIP funding is forecast to be available.

In addition to AIP entitlement funding, the Near-Term capital program reflects significant AIP discretionary funding for projects such as the Snow Removal Equipment Storage building, terminal ramp replacement, glycol management systems, and pavement rehabilitation. When awarding AIP discretionary funding, the FAA prioritizes airport projects nationwide using a numerical model called the National Priority Rating (NPR) system. The NPR system is one of several tools FAA uses to prioritize airport development projects.

According to the FAA's website, "The model generates values between 1 and 100, with a higher number indicating higher priority. Each fiscal year, an NPR threshold is established. All projects at or above the NPR threshold are considered to be consistent with FAA goals and objectives. Since 2005 this threshold has been around 41 for discretionary funds."

Reviewing the NPR rating for projects similar to the Airport's Near-Term capital plan can provide some indication of the likelihood of receiving AIP discretionary funding. Between FFY 2005 and FFY 2009, projects with the titles indicated received the following range of NPR ratings:

- Construct Snow Removal Equipment Building: 36-41
- Rehabilitate Apron: 56-62
- Construct Deicing Containment Facility: 41-61
- Rehabilitate Taxiway: 61-68

Each of the Department's planned projects for AIP discretionary funding is in the historical NPR range for discretionary funds, although a number are borderline. For planned projects with lower NPR ratings, the Department may need to defer implementation until the Intermediate-Term which more AIP entitlement funding is forecast to be available.

11.4.1.2 Demand-driven Projects

No demand-driven projects are planned for the Airfield.

11.4.1.3 Customer Service Projects

No customer service projects are planned for the Airfield.

11.4.2 TERMINAL

11.4.2.1 Renewal and Optimization Projects

In the Near-Term, Terminal renewal and optimization projects have been identified to upgrade existing security and utility systems. While these projects would have a low NPR ranking, they are non-revenue producing and are eligible for AIP entitlement funding. The local matching share is planned to be funded through State grants. No renewal and optimization projects are planned for the Terminal in the Intermediate- or Long-Term.

11.4.2.2 Demand-driven Projects

Terminal demand-driven projects are inherently related to increased passenger levels and the variety of services those passengers demand (new concessions offerings, international service, etc.) Funding revenue-producing projects, such as concession expansion, with Capital Improvement Account balances or CFCs, if rental car related, is recommended.

For projects related to the movement of passengers and their baggage, PFCs are the recommended funding source. As discussed earlier, PFC capacity at the Airport is limited in the Near-Term, but as passenger levels increase and the PFC level is potentially increased from $4.50 to $6.00, significant additional funding is available. As PFC Revenue is directly related to the level of enplaned passengers, PFCs are the recommended funding source for terminal demand-driven projects.

The plan of finance presented in Tables 11-7 and 11-8 for the Intermediate- and Long-Term projects does assume that the PFC level is increased to $6.00. Without that increase, limited funding for terminal demand-driven projects is available.

11.4.2.3 Customer Service Projects

Similar to demand-driven projects, customer service projects are recommended to be funded with PFC revenues for larger scale projects. Smaller-scale or PFC-ineligible customer service projects would be funded from the Capital Improvement Account.

11.4.3 PARKING AND ROADWAYS

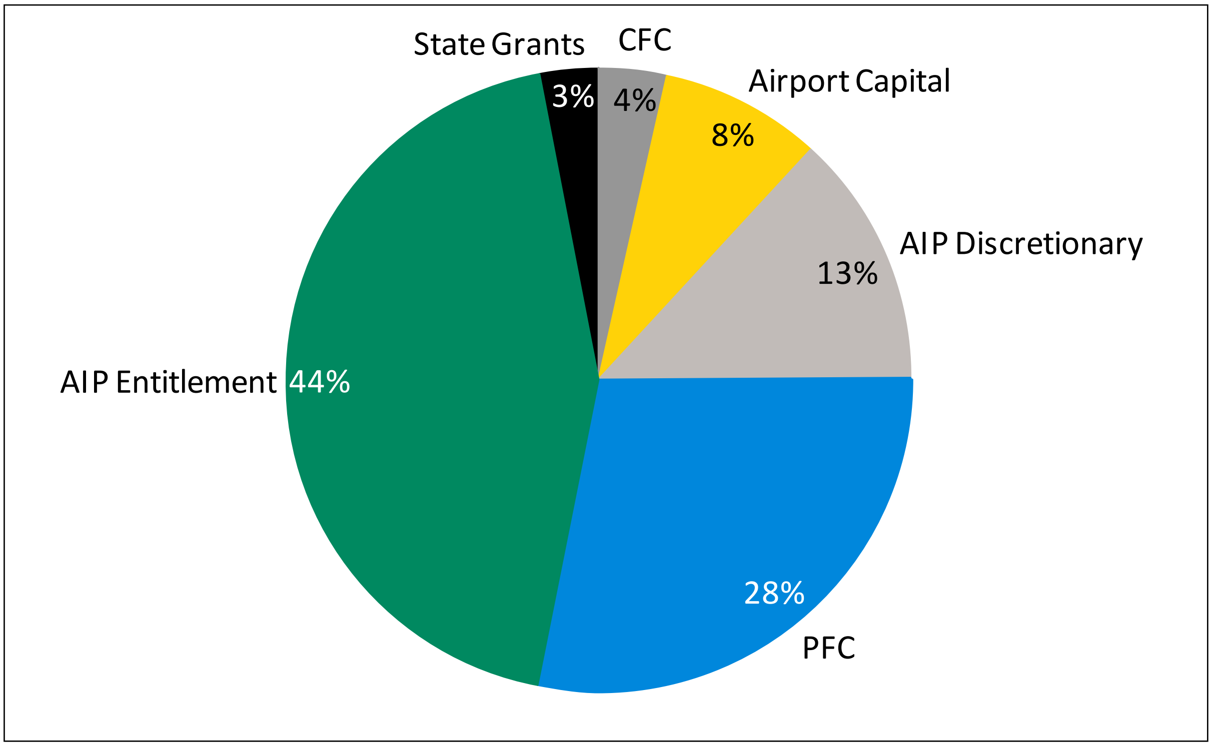
Projects in the Parking and Roadways Cost Center have the most limited available sources of funding as most are ineligible for AIP or PFC funding, except improvements to the public roadway systems. Regardless of the type of project, projects in the Parking and Roadways Cost Center are recommended to be funded primarily upon CFC revenues, if the project is rental car related, or Capital Improvement Account balances. Unlike Airfield and Terminal Capital Improvement Account expenditures, there is no amortization in the rate base for Parking and Roadways expenditures. The primary source of revenues for the Capital Improvement Account is parking revenues, so using those funds for reinvestment makes sense.

11.4.4 ANNUAL CASH FLOW BY FUNDING SOURCE

Exhibit 10 presents the annual cash flow by funding source for the 20-year capital program, and **Figure 11-17** reflects the distribution of the planned sources. For the Near-Term capital program, expenditures and funding are allocated by year. For the Intermediate- and Long-Term, expenditures are spread evenly over the planning period. For some sources of funding, planned expenditures exceed forecast available funds, but short-term cash flow concerns were assumed to be addressed through the timing of projects or other interim financing. The uses of each funding source are shown on the earlier Exhibits to demonstrate that sufficient funding is available within a 2-year cycle.

The plan of finance presented in the Exhibits and in Tables 11-6, 11-7, and 11-8 does not utilize every dollar forecast to be available to the Department as some funding was preserved for unforeseen projects.

FIGURE 11-17
PLAN OF FINANCE FOR 20-YEAR CAPITAL PROGRAM



Sources: Leigh Fisher, 2010.

Exhibit 1

AIP ENTITLEMENTS AND STATE GRANTS
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

		Forecast 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AIP Entitlements																					
Enplaned Passengers		1,570	1,494	1,505	1,561	1,600	1,634	1,668	1,703	1,739	1,775	1,813	1,851	1,890	1,930	1,970	2,012	2,054	2,097	2,141	2,186
AIP Passenger Entitlements																					
For less than 50,000:	$ 15.60	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780	$ 780
For 50,001 to 100,000:	10.40	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520	520
For 100,001 to 500,000:	5.20	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
For 500,001 to 1,000,000:	1.30	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650	650
For greater than 1,000,000:	1.00	570	494	505	561	600	634	668	703	739	775	813	851	890	930	970	1,012	1,054	1,097	1,141	1,186
Total AIP Entitlements		$ 4,600	$ 4,524	$ 4,535	$ 4,591	$ 4,630	$ 4,664	$ 4,698	$ 4,733	$ 4,769	$ 4,805	$ 4,843	$ 4,881	$ 4,920	$ 4,960	$ 5,000	$ 5,042	$ 5,084	$ 5,127	$ 5,171	$ 5,216
Available Share of AIP Grants		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AIP Passenger Entitlements		$ 4,600	$ 4,524	$ 4,535	$ 4,591	$ 4,630	$ 4,664	$ 4,698	$ 4,733	$ 4,769	$ 4,805	$ 4,843	$ 4,881	$ 4,920	$ 4,960	$ 5,000	$ 5,042	$ 5,084	$ 5,127	$ 5,171	$ 5,216
AIP Cargo Entitlements		350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Available AIP Entitlements		$ 4,950	$ 4,874	$ 4,885	$ 4,941	$ 4,980	$ 5,014	$ 5,048	$ 5,083	$ 5,119	$ 5,155	$ 5,193	$ 5,231	$ 5,270	$ 5,310	$ 5,350	$ 5,392	$ 5,434	$ 5,477	$ 5,521	$ 5,566
AIP Discretionary		$ 3,459	$ 7,577	$ 870	$ 1,506	$ 10,010	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total AIP Funding		$ 8,409	$ 12,451	$ 5,755	$ 6,447	$ 14,990	$ 5,014	$ 5,048	$ 5,083	$ 5,119	$ 5,155	$ 5,193	$ 5,231	$ 5,270	$ 5,310	$ 5,350	$ 5,392	$ 5,434	$ 5,477	$ 5,521	$ 5,566
State Grants																					
Available AIP Funding		$ 8,409	$ 12,451	$ 5,755	$ 6,447	$ 14,990	$ 5,014	$ 5,048	$ 5,083	$ 5,119	$ 5,155	$ 5,193	$ 5,231	$ 5,270	$ 5,310	$ 5,350	$ 5,392	$ 5,434	$ 5,477	$ 5,521	$ 5,566
Divided by:		0.95	0.95	0.95	0.95	0.95	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Multiplied by:		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total State Grants		$ 443	$ 655	$ 303	$ 339	$ 789	$ 279	$ 280	$ 282	$ 284	$ 286	$ 289	$ 291	$ 293	$ 295	$ 297	$ 300	$ 302	$ 304	$ 307	$ 309
Total AIP and State Grants		$ 8,852	$ 13,106	$ 6,058	$ 6,786	$ 15,779	$ 5,293	$ 5,328	$ 5,365	$ 5,403	$ 5,441	$ 5,482	$ 5,522	$ 5,563	$ 5,605	$ 5,647	$ 5,692	$ 5,736	$ 5,781	$ 5,828	$ 5,875
Uses of Funds																					
Planned expenditures		$ 9,090	$ 10,700	$ 5,480	$ 8,550	$ 13,650	$ 6,079	$ 6,079	$ 6,079	$ 6,079	$ 6,079	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879

Exhibit 2

APPLICATION AND USE OF PASSENGER FACILITY CHARGE (PFC) REVENUES
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Forecast 2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
PFC Revenues																				
Enplaned Passengers	1,500	1,533	1,581	1,617	1,651	1,686	1,721	1,757	1,794	1,832	1,871	1,910	1,950	1,991	2,033	2,076	2,119	2,164	2,209	2,255
Multiplied by: % of PFC Eligible Passengers	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PFC Eligible Enplaned Passengers	1,425	1,456	1,501	1,536	1,568	1,601	1,635	1,669	1,704	1,740	1,777	1,815	1,853	1,891	1,931	1,972	2,013	2,055	2,099	2,142
PFC per Passenger Fee	$ 4.50	$ 4.50	$ 4.50	$ 4.50	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00
Less: PFC Airline Collection Fee	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Net PFC per Passenger Fee	$ 4.39	$ 4.39	$ 4.39	$ 4.39	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89	$ 5.89
PFC Collections	$ 6,254	$ 6,393	$ 6,591	$ 6,744	$ 9,238	$ 9,431	$ 9,630	$ 9,831	$ 10,038	$ 10,251	$ 10,466	$ 10,687	$ 10,911	$ 11,141	$ 11,376	$ 11,613	$ 11,857	$ 12,106	$ 12,360	$ 12,618
Interest Earnings	63	64	66	67	92	94	96	98	100	103	105	107	109	111	114	116	119	121	124	126
Total PFC Revenues	$ 6,316	$ 6,457	$ 6,657	$ 6,811	$ 9,331	$ 9,526	$ 9,726	$ 9,930	$ 10,139	$ 10,353	$ 10,571	$ 10,794	$ 11,020	$ 11,252	$ 11,489	$ 11,730	$ 11,975	$ 12,227	$ 12,484	$ 12,744
PFC Uses																				
Beginning Fund Balance	$ 4,170	$ 3,658	$ 3,517	$ 3,080	$ 2,864	$ 2,893	$ 3,356	$ 3,758	$ 4,377	$ 5,217	$ 7,283	$ 7,338	$ 6,890	$ 5,937	$ 5,224	$ 4,753	$ 4,718	$ 6,139	$ 10,189	$ 16,385
Plus: PFC Revenues	6,316	6,457	6,657	6,811	9,331	9,526	9,726	9,930	10,139	10,353	10,571	10,794	11,020	11,252	11,489	11,730	11,975	12,227	12,484	12,744
Less: Reimbursement of prior pay-go	-	-	(500)	(500)	(750)	(750)	(1,000)	(1,000)	(1,000)	-	-	-	-	-	-	-	-	-	-	-
Less: PFC Eligible Debt Service	(6,503)	(6,598)	(6,594)	(6,528)	(6,552)	(6,655)	(6,666)	(6,654)	(6,642)	(6,630)	(6,620)	(7,347)	(8,076)	(8,069)	(8,064)	(7,868)	(6,658)	(4,281)	(2,391)	(931)
Less: PFC Pay-as-you-go	(325)	-	-	-	(2,000)	(1,657)	(1,657)	(1,657)	(1,657)	(1,657)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)	(3,897)
Ending Fund Balance	$ 3,658	$ 3,517	$ 3,080	$ 2,864	$ 2,893	$ 3,356	$ 3,758	$ 4,377	$ 5,217	$ 7,283	$ 7,338	$ 6,890	$ 5,937	$ 5,224	$ 4,753	$ 4,718	$ 6,139	$ 10,189	$ 16,385	$ 24,301

Exhibit 3

DEBT SERVICE REQUIREMENTS
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast																		
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
DEBT SERVICE REQUIREMENTS																					
Series 1998ABC	$ 6,923	$ 2,779	$ 2,779	$ 2,779	$ 2,779	$ 4,917	$ 7,112	$ 7,174	$ 7,180	$ 7,184	$ 7,189	$ 7,196	$ 7,202	$ 7,206	$ 7,213	$ 7,220	$ 3,610	$ -	$ -	$ -	$ -
Series 2000AB	1,715	729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Series 2008	2,903	2,866	2,590	2,622	2,656	2,687	2,721	2,759	2,796	2,833	2,874	2,919	1,556	-	-	-	-	-	-	-	-
Series 2002A	2,506	2,486	2,510	2,511	2,514	2,515	2,516	2,519	2,522	2,524	2,526	2,527	2,529	2,532	2,535	2,538	2,541	2,544	2,546	1,744	470
Series 2002B	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	1,156	2,433
Series 2005A	919	913	907	900	893	885	876	869	862	856	849	843	2,051	3,266	3,267	3,272	3,276	1,636	-	-	-
Series 2005A	2,609	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Series 2009A	-	3,672	3,681	3,672	5,735	6,450	5,082	5,050	5,012	4,980	4,947	4,918	4,887	4,851	4,816	4,777	8,335	11,848	7,763	3,721	1,848
Series 2009B	-	4,848	5,698	5,704	3,625	772	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subordinated Debt Service	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Debt Service requirement	$ 17,926	$ 18,643	$ 18,516	$ 18,539	$ 18,552	$ 18,575	$ 18,657	$ 18,721	$ 18,723	$ 18,727	$ 18,736	$ 18,753	$ 18,576	$ 18,206	$ 18,182	$ 18,157	$ 18,113	$ 16,378	$ 10,659	$ 6,621	$ 4,751
Less: transfer from the PFC Revenue Account	(6,305)	(6,503)	(6,598)	(6,594)	(6,528)	(6,552)	(6,655)	(6,666)	(6,654)	(6,642)	(6,630)	(6,620)	(7,347)	(8,076)	(8,069)	(8,064)	(7,868)	(6,658)	(4,281)	(2,391)	(931)
Less: transfer from the LOI Revenue Account	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Debt Service requirement	$ 11,620	$ 12,140	$ 11,917	$ 11,945	$ 12,025	$ 12,024	$ 12,002	$ 12,055	$ 12,069	$ 12,085	$ 12,106	$ 12,134	$ 11,229	$ 10,130	$ 10,112	$ 10,094	$ 10,245	$ 9,720	$ 6,379	$ 4,230	$ 3,820
ALLOCATION TO AIRPORT COST CENTERS																					
Airfield	$ 806	$ 405	$ 857	$ 860	$ 910	$ 885	$ 813	$ 816	$ 816	$ 817	$ 818	$ 820	$ 710	$ 583	$ 581	$ 578	$ 733	$ 876	$ 568	$ 272	$ 135
Terminal Building	4,142	4,690	4,026	4,048	4,066	4,092	4,130	4,161	4,185	4,208	4,234	4,263	3,320	2,244	2,242	2,240	2,218	2,190	1,745	1,021	368
Apron	487	474	464	467	454	469	502	507	510	513	517	521	392	243	243	243	186	128	84	40	20
Parking and Roadways	6,184	6,570	6,571	6,571	6,595	6,578	6,557	6,571	6,558	6,547	6,537	6,530	6,807	7,059	7,046	7,033	7,109	6,525	3,982	2,896	3,297
Other Buildings and Areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Debt Service requirement	$ 11,620	$ 12,140	$ 11,917	$ 11,945	$ 12,025	$ 12,024	$ 12,002	$ 12,055	$ 12,069	$ 12,085	$ 12,106	$ 12,134	$ 11,229	$ 10,130	$ 10,112	$ 10,094	$ 10,245	$ 9,720	$ 6,379	$ 4,230	$ 3,820

(a) Source: City of Manchester, Department of Aviation.

Exhibit 4

OPERATION AND MAINTENANCE EXPENSES AND ALLOCATION TO AIRPORT COST CENTERS
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast								
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
By Line Item											
Salaries and benefits	$ 8,572	$ 7,769	$ 7,769	$ 7,967	$ 8,139	$ 8,387	$ 8,642	$ 8,906	$ 9,177	$ 9,457	$ 9,747
Purchased property and services	18,710	16,084	16,405	17,002	17,431	18,021	18,629	19,261	19,913	20,589	21,291
Equipment and capital outlays	4,123	3,170	3,170	3,241	3,304	3,399	3,496	3,596	3,699	3,805	3,914
Other	734	708	708	715	722	737	751	766	782	797	813
Total Operating Expenses	$ 32,139	$ 27,730	$ 28,052	$ 28,926	$ 29,596	$ 30,543	$ 31,519	$ 32,530	$ 33,571	$ 34,649	$ 35,765
By Cost Center											
Airfield	$ 8,496	$ 8,275	$ 7,813	$ 8,057	$ 8,243	$ 8,507	$ 8,779	$ 9,060	$ 9,351	$ 9,651	$ 9,962
Terminal Building	13,354	11,648	10,751	11,086	11,342	11,705	12,079	12,467	12,866	13,279	13,707
Parking and Roadways	7,837	6,134	7,318	7,546	7,720	7,968	8,222	8,486	8,757	9,039	9,330
Other Buildings and Areas	2,452	1,672	2,170	2,238	2,290	2,363	2,438	2,516	2,597	2,680	2,767
Total Operating Expenses	$ 32,139	$ 27,730	$ 28,052	$ 28,926	$ 29,596	$ 30,543	$ 31,519	$ 32,530	$ 33,571	$ 34,649	$ 35,765
% Increase	12.5%	-13.7%	1.2%	3.1%	2.3%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Line Item										
Salaries and benefits	$ 10,044	$ 10,351	$ 10,667	$ 10,992	$ 11,328	$ 11,673	$ 12,028	$ 12,395	$ 12,774	$ 13,162
Purchased property and services	22,014	22,764	23,537	24,339	25,170	26,026	26,913	27,832	28,783	29,763
Equipment and capital outlays	4,026	4,142	4,261	4,383	4,510	4,639	4,772	4,910	5,051	5,196
Other	830	846	863	880	898	916	934	953	972	991
Total Operating Expenses	$ 36,914	$ 38,103	$ 39,328	$ 40,595	$ 41,905	$ 43,254	$ 44,648	$ 46,090	$ 47,580	$ 49,113
By Cost Center										
Airfield	$ 10,282	$ 10,613	$ 10,954	$ 11,307	$ 11,672	$ 12,048	$ 12,436	$ 12,837	$ 13,252	$ 13,680
Terminal Building	14,147	14,603	15,072	15,558	16,060	16,577	17,111	17,664	$ 18,235	18,822
Parking and Roadways	9,630	9,940	10,259	10,590	10,932	11,283	11,647	12,023	12,412	12,812
Other Buildings and Areas	2,856	2,948	3,042	3,140	3,242	3,346	3,454	3,566	3,681	3,799
Total Operating Expenses	$ 36,914	$ 38,103	$ 39,328	$ 40,595	$ 41,905	$ 43,254	$ 44,648	$ 46,090	$ 47,580	$ 49,113
% Increase	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%

(a) Source: City of Manchester, Department of Aviation.

Exhibit 5

REVENUES
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)(b)			Forecast																	
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AIRLINE RENTAL AND FEE PAYMENTS																					
Landing Fees	$ 6,800	$ 7,160	$ 9,266	$ 9,508	$ 9,740	$ 9,971	$ 10,163	$ 10,458	$ 10,860	$ 11,128	$ 11,370	$ 11,621	$ 11,767	$ 11,401	$ 11,392	$ 11,612	$ 11,995	$ 12,400	$ 12,100	$ 10,923	$ 10,420
Terminal Building Rentals	6,431	5,160	4,488	4,597	4,680	4,798	4,924	5,052	5,224	5,373	5,514	5,660	5,514	5,331	5,480	5,635	5,787	5,943	5,978	5,934	5,917
Apron Fees	422	317	292	294	287	296	317	320	322	324	326	329	247	154	153	153	117	81	53	25	13
Total Airline Rental and Fee Payments (a)	$ 13,653	$ 12,638	$ 14,046	$ 14,399	$ 14,707	$ 15,066	$ 15,403	$ 15,830	$ 16,406	$ 16,825	$ 17,210	$ 17,609	$ 17,528	$ 16,886	$ 17,026	$ 17,400	$ 17,899	$ 18,424	$ 18,131	$ 16,883	$ 16,350
Payments per enplaned passenger																					
Total Airline Rental and Fee Payments	$ 13,653	$ 12,638	$ 14,046	$ 14,399	$ 14,707	$ 15,066	$ 15,403	$ 15,830	$ 16,406	$ 16,825	$ 17,210	$ 17,609	$ 17,528	$ 16,886	$ 17,026	$ 17,400	$ 17,899	$ 18,424	$ 18,131	$ 16,883	$ 16,350
Less: Cargo Airline Payments	(2,457)	(2,275)	(2,528)	(2,592)	(2,647)	(2,712)	(2,773)	(2,849)	(2,953)	(3,028)	(3,098)	(3,170)	(3,155)	(3,040)	(3,065)	(3,132)	(3,222)	(3,316)	(3,264)	(3,039)	(2,943)
Total Airline Requirements per Enplaned Passenger	$ 11,195	$ 10,363	$ 11,518	$ 11,807	$ 12,060	$ 12,354	$ 12,631	$ 12,981	$ 13,453	$ 13,796	$ 14,112	$ 14,439	$ 14,373	$ 13,847	$ 13,961	$ 14,268	$ 14,677	$ 15,108	$ 14,868	$ 13,844	$ 13,407
Enplaned Passengers	1,532	1,500	1,533	1,581	1,617	1,651	1,686	1,721	1,757	1,794	1,832	1,871	1,910	1,950	1,991	2,033	2,076	2,119	2,164	2,209	2,255
Airline Payments Per Enplaned Passenger (CPE)	$7.31	$6.91	$7.51	$7.47	$7.46	$7.48	$7.49	$7.54	$7.66	$7.69	$7.70	$7.72	$7.53	$7.10	$7.01	$7.02	$7.07	$7.13	$6.87	$6.27	$5.95
NON-AIRLINE REVENUES																					
Airfield																					
Aircraft parking/tiedown rents	$ 10	$ 10	$ 10	$ 10	$ 10	$ 10	$ 10	$ 10	$ 11	$ 11	$ 11	$ 11	$ 11	$ 12	$ 12	$ 12	$ 12	$ 13	$ 13	$ 13	$ 13
Aircraft operating fees	30	30	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	$ 41	41
Fuel flowage fees (general aviation)	210	118	159	160	162	165	169	172	175	179	182	186	190	194	198	201	206	210	214	218	222
Aviation land rentals	163	163	232	234	237	241	246	251	256	261	266	272	277	283	288	294	300	306	312	318	325
Total Airfield revenue	$ 413	$ 320	$ 440	$ 444	$ 448	$ 456	$ 465	$ 473	$ 482	$ 491	$ 500	$ 509	$ 518	$ 528	$ 538	$ 548	$ 558	$ 568	$ 579	$ 590	$ 601
Terminal Building																					
Concessions																					
Rental cars																					
Privilege Fees	$ 3,640	$ 3,800	$ 3,000	$ 3,090	$ 3,163	$ 3,248	$ 3,335	$ 3,425	$ 3,518	$ 3,613	$ 3,710	$ 3,811	$ 3,914	$ 4,019	$ 4,128	$ 4,239	$ 4,353	$ 4,470	$ 4,591	$ 4,715	$ 4,841
Rental car ready/return parking	598	577	581	587	593	605	617	629	642	655	668	681	695	709	723	737	752	767	783	798	814
Customer Facility Charge revenues	1,930	1,750	1,641	1,937	1,953	1,991	2,051	2,113	2,176	2,242	2,309	2,377	2,448	2,519	2,592	2,668	2,744	2,823	2,903	2,986	3,070
Terminal counter rentals	58	76	77	78	79	81	82	84	85	87	89	91	92	94	96	98	100	102	104	106	108
Food and beverage	820	636	634	660	682	710	740	770	802	836	870	906	944	983	1,024	1,066	1,110	1,156	1,204	1,254	1,306
News and gift	365	315	262	273	282	294	306	319	332	346	360	375	390	407	423	441	459	478	498	519	540
Advertising	365	310	260	268	274	280	286	292	298	304	311	317	324	331	338	345	352	359	367	375	382
Vending machines	32	29	29	29	30	30	31	31	32	33	33	34	35	35	36	37	38	38	39	40	41
Nonairline space rentals	132	117	122	123	124	127	129	132	135	137	140	143	146	149	152	155	158	161	164	167	171
Total Terminal Building revenue	$ 7,940	$ 7,610	$ 6,607	$ 7,046	$ 7,181	$ 7,366	$ 7,577	$ 7,796	$ 8,020	$ 8,252	$ 8,491	$ 8,735	$ 8,988	$ 9,246	$ 9,512	$ 9,786	$ 10,067	$ 10,356	$ 10,654	$ 10,960	$ 11,273
Parking and Roadways																					
Public parking	$ 20,750	$ 16,992	$ 17,500	$ 18,132	$ 18,644	$ 19,226	$ 19,824	$ 20,444	$ 21,081	$ 21,740	$ 22,422	$ 23,123	$ 23,847	$ 24,590	$ 25,358	$ 26,152	$ 26,965	$ 27,806	$ 28,674	$ 29,570	$ 30,487
Crew Parking	75	57	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Non-NG Parking	110	75	76	77	78	80	81	83	84	86	88	90	91	93	95	97	99	101	103	105	107
Parking fines	10	10	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	9	9	10	10
Total Parking and Roadways revenue	$ 20,945	$ 17,134	$ 17,643	$ 18,277	$ 18,789	$ 19,373	$ 19,973	$ 20,595	$ 21,233	$ 21,894	$ 22,578	$ 23,280	$ 24,007	$ 24,751	$ 25,522	$ 26,318	$ 27,133	$ 27,976	$ 28,846	$ 29,744	$ 30,664
Other Buildings and Areas	$ 844	$ 834	$ 933	$ 942	$ 951	$ 971	$ 990	$ 1,010	$ 1,030	$ 1,051	$ 1,072	$ 1,093	$ 1,115	$ 1,137	$ 1,160	$ 1,183	$ 1,207	$ 1,231	$ 1,255	$ 1,281	$ 1,306
Other revenues																					
Interest income	$ 500	$ 100	$ 115	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Miscellaneous	607	606	676	682	689	703	717	731	746	761	776	792	807	824	840	857	874	891	909	927	946
Total Other revenues	$ 1,107	$ 706	$ 791	$ 1,182	$ 1,189	$ 1,203	$ 1,217	$ 1,231	$ 1,246	$ 1,261	$ 1,276	$ 1,292	$ 1,307	$ 1,324	$ 1,340	$ 1,357	$ 1,374	$ 1,391	$ 1,409	$ 1,427	$ 1,446
Total nonairline revenues	$ 31,249	$ 26,604	$ 26,414	$ 27,891	$ 28,558	$ 29,369	$ 30,221	$ 31,105	$ 32,011	$ 32,948	$ 33,916	$ 34,909	$ 35,935	$ 36,986	$ 38,071	$ 39,191	$ 40,339	$ 41,522	$ 42,743	$ 44,002	$ 45,291
Total Revenues	$ 44,901	$ 39,242	$ 40,460	$ 42,290	$ 43,266	$ 44,435	$ 45,625	$ 46,935	$ 48,417	$ 49,773	$ 51,126	$ 52,518	$ 53,463	$ 53,872	$ 55,097	$ 56,591	$ 58,238	$ 59,946	$ 60,874	$ 60,886	$ 61,641
Percent increase	0.4%	-12.6%	3.1%	4.5%	2.3%	2.7%	2.7%	2.9%	3.2%	2.8%	2.7%	2.7%	1.8%	0.8%	2.3%	2.7%	2.9%	2.9%	1.5%	0.0%	1.2%

(a) Source: City of Manchester, Department of Aviation.
(b) All FY 2012 revenues are budgetary revenues except Airline Rental and Fee Payments, which are calculated based on FY 2012 forecasted data.

Exhibit 5A

TERMINAL BUILDING RENTAL RATE
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands except for rates)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast																		
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
TERMINAL BUILDING RENTAL RATE																					
Operation and Maintenance Expenses	$ 13,354	$ 11,648	$ 10,751	$ 11,086	$ 11,342	$ 11,705	$ 12,079	$ 12,467	$ 12,866	$ 13,279	$ 13,707	$ 14,147	$ 14,603	$ 15,072	$ 15,558	$ 16,060	$ 16,577	$ 17,111	$ 17,664	$ 18,235	$ 18,822
Operation and Maintenance Reserve Fund deposit	257	-	-	-	-	-	-	-	139	187	194	200	207	213	220	228	234	242	250	259	266
Net Debt Service requirement	4,142	4,690	4,026	4,048	4,066	4,092	4,130	4,161	4,185	4,208	4,234	4,263	3,320	2,244	2,242	2,240	2,218	2,190	1,745	1,021	368
Required deposit to Coverage Account	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amortization of City-funded assets	-	127	-	2	2	2	2	7	11	16	20	25	25	25	25	25	25	25	25	25	25
Terminal Building Requirement	$ 17,753	$ 16,464	$ 14,777	$ 15,136	$ 15,410	$ 15,799	$ 16,212	$ 16,635	$ 17,200	$ 17,690	$ 18,155	$ 18,635	$ 18,155	$ 17,554	$ 18,045	$ 18,552	$ 19,054	$ 19,569	$ 19,684	$ 19,540	$ 19,481
Usable Space (square feet)	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309	309
Terminal Building Rental Rate per square foot	$ 57.49	$ 53.32	$ 47.85	$ 49.02	$ 49.91	$ 51.17	$ 52.50	$ 53.87	$ 55.70	$ 57.29	$ 58.80	$ 60.35	$ 58.80	$ 56.85	$ 58.44	$ 60.08	$ 61.71	$ 63.37	$ 63.75	$ 63.28	$ 63.09
Rate imposed by the City	$ 57.49	$ 53.32	$ 47.85	$ 49.02	$ 49.91	$ 51.17	$ 52.50	$ 53.87	$ 55.70	$ 57.29	$ 58.80	$ 60.35	$ 58.80	$ 56.85	$ 58.44	$ 60.08	$ 61.71	$ 63.37	$ 63.75	$ 63.28	$ 63.09
Airline rented space (square feet)	111.85	96.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78	93.78
Total Terminal Building Rentals	$ 6,431	$ 5,160	$ 4,488	$ 4,597	$ 4,680	$ 4,798	$ 4,924	$ 5,052	$ 5,224	$ 5,373	$ 5,514	$ 5,660	$ 5,514	$ 5,331	$ 5,480	$ 5,635	$ 5,787	$ 5,943	$ 5,978	$ 5,934	$ 5,917

(a) Source: City of Manchester, Department of Aviation.

Exhibit 5B

AIRLINE LANDING FEE AND APRON FEE
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands except for rates)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast																		
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AIRLINE LANDING FEE																					
Operation and Maintenance Expenses	$ 8,496	$ 8,275	$ 7,813	$ 8,057	$ 8,243	$ 8,507	$ 8,779	$ 9,060	$ 9,351	$ 9,651	$ 9,962	$ 10,282	$ 10,613	$ 10,954	$ 11,307	$ 11,672	$ 12,048	$ 12,436	$ 12,837	$ 13,252	$ 13,680
Operation and Maintenance Reserve Fund deposit	163	-	-	-	-	-	-	-	101	136	141	145	150	155	160	165	170	176	182	188	194
Net Debt Service requirement	806	405	857	860	910	885	813	816	816	817	818	820	710	583	581	578	733	876	568	272	135
Required deposit to Coverage Account	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amortization of City-funded assets	-	-	1,036	1,036	1,036	1,036	1,036	1,055	1,075	1,015	949	883	812	742	672	607	541	476	410	345	280
Additional airfield improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Airfield Requirement	$ 9,466	$ 8,681	$ 9,706	$ 9,952	$ 10,189	$ 10,427	$ 10,628	$ 10,931	$ 11,342	$ 11,619	$ 11,870	$ 12,130	$ 12,286	$ 12,434	$ 12,720	$ 13,022	$ 13,492	$ 13,964	$ 13,998	$ 14,058	$ 14,288
Revenue credit from prior year	(2,190)	(1,200)	-	-	-	-	-	-	-	-	-	-	-	(505)	(790)	(862)	(939)	(996)	(1,319)	(2,544)	(3,267)
Other Airfield revenues	(413)	(320)	(440)	(444)	(448)	(456)	(465)	(473)	(482)	(491)	(500)	(509)	(518)	(528)	(538)	(548)	(558)	(568)	(579)	(590)	(601)
Net Airfield Requirement	$ 6,863	$ 7,160	$ 9,266	$ 9,508	$ 9,740	$ 9,971	$ 10,163	$ 10,458	$ 10,860	$ 11,128	$ 11,370	$ 11,621	$ 11,767	$ 11,401	$ 11,392	$ 11,612	$ 11,995	$ 12,400	$ 12,100	$ 10,923	$ 10,420
Airline aircraft landed weight (1,000 pound units)	2,325.00	2,200.00	2,249.15	2,318.84	2,372.39	2,422.27	2,472.89	2,524.97	2,577.79	2,632.08	2,687.83	2,744.31	2,802.27	2,860.95	2,921.11	2,982.73	3,045.08	3,108.90	3,174.19	3,240.95	3,308.44
Landing Fee Rate per 1,000 pound unit	$ 2.95	$ 3.25	$ 4.12	$ 4.10	$ 4.11	$ 4.12	$ 4.11	$ 4.14	$ 4.21	$ 4.23	$ 4.23	$ 4.23	$ 4.20	$ 3.99	$ 3.90	$ 3.89	$ 3.94	$ 3.99	$ 3.81	$ 3.37	$ 3.15
Rate imposed by the City	$ 2.95	$ 3.25	$ 4.12	$ 4.10	$ 4.11	$ 4.12	$ 4.11	$ 4.14	$ 4.21	$ 4.23	$ 4.23	$ 4.23	$ 4.20	$ 3.99	$ 3.90	$ 3.89	$ 3.94	$ 3.99	$ 3.81	$ 3.37	$ 3.15
APRON FEE																					
Net Debt Service requirement	$ 487	$ 474	$ 464	$ 467	$ 454	$ 469	$ 502	$ 507	$ 510	$ 513	$ 517	$ 521	$ 392	$ 243	$ 243	$ 243	$ 186	$ 128	$ 84	$ 40	$ 20
Required deposit to Coverage Account	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apron Requirement	$ 487	$ 474	$ 464	$ 467	$ 454	$ 469	$ 502	$ 507	$ 510	$ 513	$ 517	$ 521	$ 392	$ 243	$ 243	$ 243	$ 186	$ 128	$ 84	$ 40	$ 20
Apron space (square feet)	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06	874.06
Calculated Apron Fee Rate per square foot	$ 0.56	$ 0.54	$ 0.53	$ 0.53	$ 0.52	$ 0.54	$ 0.57	$ 0.58	$ 0.58	$ 0.59	$ 0.59	$ 0.60	$ 0.45	$ 0.28	$ 0.28	$ 0.28	$ 0.21	$ 0.15	$ 0.10	$ 0.05	$ 0.02
Rate imposed by the City	$ 0.77	$ 0.58	$ 0.53	$ 0.53	$ 0.52	$ 0.54	$ 0.57	$ 0.58	$ 0.58	$ 0.59	$ 0.59	$ 0.60	$ 0.45	$ 0.28	$ 0.28	$ 0.28	$ 0.21	$ 0.15	$ 0.10	$ 0.05	$ 0.02
Airline rented space (square feet)	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37	551.37
Total Apron Fee	$ 422	$ 317	$ 292	$ 294	$ 287	$ 296	$ 317	$ 320	$ 322	$ 324	$ 326	$ 329	$ 247	$ 154	$ 153	$ 153	$ 117	$ 81	$ 53	$ 25	$ 13

(a) Source: City of Manchester, Department of Aviation.

Exhibit 6

APPLICATION OF REVENUES
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast							
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sources of Funds										
Airline Revenues	$ 13,653	$ 12,638	$ 14,046	$ 14,399	$ 14,707	$ 15,066	$ 15,403	$ 15,830	$ 16,406	$ 16,825
Non-Airline Revenues	31,249	26,604	26,414	27,891	28,558	29,369	30,221	31,105	32,011	32,948
Subtotal Revenues	$ 44,901	$ 39,242	$ 40,460	$ 42,290	$ 43,266	$ 44,435	$ 45,625	$ 46,935	$ 48,417	$ 49,773
Transfer from Revenue Credit Account	2,190	1,200	-	-	-	-	-	-	-	-
Total Revenues	$ 47,091	$ 40,442	$ 40,460	$ 42,290	$ 43,266	$ 44,435	$ 45,625	$ 46,935	$ 48,417	$ 49,773
Coverage Amount	3,100	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275
Total Revenues and transfer from Coverage Account	$ 50,191	$ 43,717	$ 43,735	$ 45,565	$ 46,541	$ 47,710	$ 48,899	$ 50,210	$ 51,692	$ 53,047
Application of Revenues										
Operation and Maintenance Expenses (d)	$ 32,139	$ 27,730	$ 28,052	$ 28,926	$ 29,596	$ 30,543	$ 31,519	$ 32,530	$ 33,571	$ 34,649
Debt Service Fund (e)	11,620	12,140	11,917	11,945	12,025	12,024	12,002	12,055	12,069	12,085
Operation and Maintenance Reserve Fund	420	-	-	-	-	-	-	-	239	323
General Fund										
Coverage Account	2,905	3,035	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275
CFC Reserve Account	-	-	491	1,420	1,645	1,840	1,895	1,952	2,010	2,071
Capital Improvement Account	1,000	812	-	-	-	28	210	399	527	644
Revenue Credit Account	500	-	-	-	-	-	-	-	-	-
Subtotal	$ 48,584	$ 43,717	$ 43,735	$ 45,565	$ 46,541	$ 47,710	$ 48,899	$ 50,210	$ 51,692	$ 53,047
Remaining revenues	$ 1,607	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Additional deposit to Capital Improvement Account (60%)	$ 964	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Additional deposit to Revenue Credit Account (40%)	643	-	-	-	-	-	-	-	-	-
Total additional deposits	$ 1,607	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Sources of Funds											
Airline Revenues	$ 17,210	$ 17,609	$ 17,528	$ 16,886	$ 17,026	$ 17,400	$ 17,899	$ 18,424	$ 18,131	$ 16,883	$ 16,350
Non-Airline Revenues	33,916	34,909	35,935	36,986	38,071	39,191	40,339	41,522	42,743	44,002	45,291
Subtotal Revenues	$ 51,126	$ 52,518	$ 53,463	$ 53,872	$ 55,097	$ 56,591	$ 58,238	$ 59,946	$ 60,874	$ 60,886	$ 61,641
Transfer from Revenue Credit Account	-	-	-	505	790	862	939	996	1,319	2,544	3,267
Total Revenues	$ 51,126	$ 52,518	$ 53,463	$ 54,377	$ 55,887	$ 57,453	$ 59,177	$ 60,942	$ 62,194	$ 63,430	$ 64,907
Coverage Amount	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275
Total Revenues and transfer from Coverage Account	$ 54,401	$ 55,793	$ 56,738	$ 57,652	$ 59,162	$ 60,728	$ 62,452	$ 64,217	$ 65,469	$ 66,705	$ 68,182
Application of Revenues											
Operation and Maintenance Expenses (d)	$ 35,765	$ 36,914	$ 38,103	$ 39,328	$ 40,595	$ 41,905	$ 43,254	$ 44,648	$ 46,090	$ 47,580	$ 49,113
Debt Service Fund (e)	12,106	12,134	11,229	10,130	10,112	10,094	10,245	9,720	6,379	4,230	3,820
Operation and Maintenance Reserve Fund	335	345	357	367	380	393	405	418	432	447	460
General Fund											
Coverage Account	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275
CFC Reserve Account	2,133	2,196	2,262	2,327	2,394	2,464	2,534	2,607	2,681	2,757	2,834
Capital Improvement Account	788	929	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Revenue Credit Account	-	-	500	500	500	500	500	500	500	500	500
Subtotal	$ 54,401	$ 55,793	$ 56,726	$ 56,927	$ 58,257	$ 59,630	$ 61,213	$ 62,168	$ 60,357	$ 59,788	$ 61,002
Remaining revenues	$ -	$ -	$ 12	$ 725	$ 905	$ 1,098	$ 1,239	$ 2,049	$ 5,111	$ 6,917	$ 7,180
Additional deposit to Capital Improvement Account (60%)	$ -	$ -	$ 7	$ 435	$ 543	$ 659	$ 743	$ 1,229	$ 3,067	$ 4,150	$ 4,308
Additional deposit to Revenue Credit Account (40%)	-	-	5	290	362	439	496	819	2,044	2,767	2,872
Total additional deposits	$ -	$ -	$ 12	$ 725	$ 905	$ 1,098	$ 1,239	$ 2,049	$ 5,111	$ 6,917	$ 7,180

(a) Source: City of Manchester, Department of Aviation.

Exhibit 7

COMPLIANCE WITH RATE COVENANT AND COVERAGE REQUIREMENT
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast																		
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
RATE COVENANT (TEST 1)																					
Revenues	$ 44,901	$ 39,242	$ 40,460	$ 42,290	$ 43,266	$ 44,435	$ 45,625	$ 46,935	$ 48,417	$ 49,773	$ 51,126	$ 52,518	$ 53,463	$ 53,872	$ 55,097	$ 56,591	$ 58,238	$ 59,946	$ 60,874	$ 60,886	$ 61,641
Transfer from Revenue Credit Account	2,190	1,200	-	-	-	-	-	-	-	-	-	-	-	505	790	862	939	996	1,319	2,544	3,267
Less: Operation and Maintenance Expenses	(32,139)	(27,730)	(28,052)	(28,926)	(29,596)	(30,543)	(31,519)	(32,530)	(33,571)	(34,649)	(35,765)	(36,914)	(38,103)	(39,328)	(40,595)	(41,905)	(43,254)	(44,648)	(46,090)	(47,580)	(49,113)
Revenues Available for Bond Debt Service	$ 14,953	$ 12,712	$ 12,408	$ 13,364	$ 13,670	$ 13,892	$ 14,106	$ 14,405	$ 14,846	$ 15,124	$ 15,361	$ 15,604	$ 15,359	$ 15,049	$ 15,292	$ 15,548	$ 15,923	$ 16,294	$ 16,104	$ 15,850	$ 15,794
Required Debt Service Fund deposits																					
Series 1998 ABC	$ 6,923	$ 2,779	$ 2,779	$ 2,779	$ 2,779	$ 4,917	$ 7,112	$ 7,174	$ 7,180	$ 7,184	$ 7,189	$ 7,196	$ 7,202	$ 7,206	$ 7,213	$ 7,220	$ 3,610	$ -	$ -	$ -	$ -
Series 2000AB	1,715	729	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Series 2008	2,903	2,866	2,590	2,622	2,656	2,687	2,721	2,759	2,796	2,833	2,874	2,919	1,556	-	-	-	-	-	-	-	-
Series 2002A	2,506	2,486	2,510	2,511	2,514	2,515	2,516	2,519	2,522	2,524	2,526	2,527	2,529	2,532	2,535	2,538	2,541	2,544	2,546	1,744	470
Series 2002B	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	351	1,156	2,433
Series 2005A	919	913	907	900	893	885	876	869	862	856	849	843	2,051	3,266	3,267	3,272	3,276	1,636	-	-	-
Series 2005B	2,609	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Series 2009A	-	3,672	3,681	3,672	5,735	6,450	5,082	5,050	5,012	4,980	4,947	4,918	4,887	4,851	4,816	4,777	8,335	11,848	7,763	3,721	1,848
Series 2009B	-	4,848	5,698	5,704	3,625	772	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Less: Transfer from the PFC Revenues Account	(6,305)	(6,503)	(6,598)	(6,594)	(6,528)	(6,552)	(6,655)	(6,666)	(6,654)	(6,642)	(6,630)	(6,620)	(7,347)	(8,076)	(8,069)	(8,064)	(7,868)	(6,658)	(4,281)	(2,391)	(931)
Less: LOI payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Required Debt Service Fund deposits	$ 11,620	$ 12,140	$ 11,917	$ 11,945	$ 12,025	$ 12,024	$ 12,002	$ 12,055	$ 12,069	$ 12,085	$ 12,106	$ 12,134	$ 11,229	$ 10,130	$ 10,112	$ 10,094	$ 10,245	$ 9,720	$ 6,379	$ 4,230	$ 3,820
Other Required Fund deposits																					
Debt Service Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operation and Maintenance Reserve Fund	420	-	-	-	-	-	-	-	239	323	335	345	357	367	380	393	405	418	432	447	460
Variable Rate Bond Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Required Fund deposits	$ 420	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 239	$ 323	$ 335	$ 345	$ 357	$ 367	$ 380	$ 393	$ 405	$ 418	$ 432	$ 447	$ 460
Revenues Available for Bond Debt Service	$ 14,953	$ 12,712	$ 12,408	$ 13,364	$ 13,670	$ 13,892	$ 14,106	$ 14,405	$ 14,846	$ 15,124	$ 15,361	$ 15,604	$ 15,359	$ 15,049	$ 15,292	$ 15,548	$ 15,923	$ 16,294	$ 16,104	$ 15,850	$ 15,794
Total required deposits	12,040	12,140	11,917	11,945	12,025	12,024	12,002	12,055	12,309	12,409	12,441	12,478	11,586	10,497	10,492	10,487	10,650	10,138	6,811	4,677	4,280
RATE COVENANT (TEST 2)																					
Revenues	$ 47,091	$ 40,442	$ 40,460	$ 42,290	$ 43,266	$ 44,435	$ 45,625	$ 46,935	$ 48,417	$ 49,773	$ 51,126	$ 52,518	$ 53,463	$ 54,377	$ 55,887	$ 57,453	$ 59,177	$ 60,942	$ 62,194	$ 63,430	$ 64,907
Transfer from Revenue Credit Account	2,190	1,200	-	-	-	-	-	-	-	-	-	-	-	505	790	862	939	996	1,319	2,544	3,267
Less: Operation and Maintenance Expenses	(32,139)	(27,730)	(28,052)	(28,926)	(29,596)	(30,543)	(31,519)	(32,530)	(33,571)	(34,649)	(35,765)	(36,914)	(38,103)	(39,328)	(40,595)	(41,905)	(43,254)	(44,648)	(46,090)	(47,580)	(49,113)
Revenues Available for Bond Debt Service	$ 17,143	$ 13,912	$ 12,408	$ 13,364	$ 13,670	$ 13,892	$ 14,106	$ 14,405	$ 14,846	$ 15,124	$ 15,361	$ 15,604	$ 15,359	$ 15,554	$ 16,082	$ 16,410	$ 16,862	$ 17,289	$ 17,423	$ 18,395	$ 19,060
Coverage Amount	3,100	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275	3,275
Revenues Available for Bond Debt Service and Coverage	$ 20,243	$ 17,187	$ 15,683	$ 16,639	$ 16,945	$ 17,167	$ 17,381	$ 17,680	$ 18,121	$ 18,399	$ 18,636	$ 18,879	$ 18,634	$ 18,829	$ 19,357	$ 19,685	$ 20,137	$ 20,564	$ 20,698	$ 21,670	$ 22,335
Required Debt Service Fund Deposits	$ 12,040	$ 12,140	$ 11,917	$ 11,945	$ 12,025	$ 12,024	$ 12,002	$ 12,055	$ 12,309	$ 12,409	$ 12,441	$ 12,478	$ 11,586	$ 10,497	$ 10,492	$ 10,487	$ 10,650	$ 10,138	$ 6,811	$ 4,677	$ 4,280
Revenue bond Debt Service coverage	1.68	1.42	1.32	1.39	1.41	1.43	1.45	1.47	1.47	1.48	1.50	1.51	1.61	1.79	1.84	1.88	1.89	2.03	3.04	4.63	5.22
Rate Covenant Debt Service coverage requirement	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

(a) Source: City of Manchester, Department of Aviation.

Exhibit 8

APPLICATION AND USE OF CAPITAL IMPROVEMENT ACCOUNT FUNDS
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)		Forecast																		
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Capital Improvement Account Deposits																					
Deposit to Capital Improvement Account	$ 1,964	$ 812	$ -	$ -	$ -	$ 28	$ 210	$ 399	$ 527	$ 644	$ 788	$ 929	$ 1,007	$ 1,435	$ 1,543	$ 1,659	$ 1,743	$ 2,229	$ 4,067	$ 5,150	$ 5,308
Reimbursement of prior PFC pay-go	-	-	500	500	750	750	1,000	1,000	1,000	-	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings	200	242	264	224	211	219	228	238	235	234	234	225	218	226	234	247	261	276	293	314	354
Total Capital Improvement Account Funds	$ 2,165	$ 1,054	$ 764	$ 724	$ 961	$ 997	$ 1,438	$ 1,637	$ 1,762	$ 878	$ 1,022	$ 1,154	$ 1,225	$ 1,660	$ 1,777	$ 1,906	$ 2,004	$ 2,505	$ 4,359	$ 5,464	$ 5,662
Capital Improvement Account Uses																					
Beginning Fund Balance	$ 24,201	$ 26,365	$ 22,420	$ 21,143	$ 21,867	$ 22,829	$ 23,825	$ 23,505	$ 23,384	$ 23,388	$ 22,508	$ 21,772	$ 22,555	$ 23,408	$ 24,697	$ 26,102	$ 27,637	$ 29,270	$ 31,403	$ 35,391	$ 40,484
Plus: Deposits	2,165	1,054	764	724	961	997	1,438	1,637	1,762	878	1,022	1,154	1,225	1,660	1,777	1,906	2,004	2,505	4,359	5,464	5,662
Less: Pay-as-you-go	-	(5,000)	(2,040)	-	-	-	(1,758)	(1,758)	(1,758)	(1,758)	(1,758)	(372)	(372)	(372)	(372)	(372)	(372)	(372)	(372)	(372)	(372)
Ending Fund Balance	$ 26,365	$ 22,420	$ 21,143	$ 21,867	$ 22,829	$ 23,825	$ 23,505	$ 23,384	$ 23,388	$ 22,508	$ 21,772	$ 22,555	$ 23,408	$ 24,697	$ 26,102	$ 27,637	$ 29,270	$ 31,403	$ 35,391	$ 40,484	$ 45,774

(a) Source: City of Manchester, Department of Aviation.

Exhibit 9

ANNUAL CASH FLOW BY FUNDING SOURCE
City of Manchester, Department of Aviation
Fiscal Years Ending June 30
(in thousands)

The forecasts presented in this exhibit were prepared using information from the sources indicated and assumptions provided by, or reviewed with and agreed to by, Department of Aviation management, as described in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. The achievement of any financial forecast may be affected by fluctuating economic conditions and is dependent upon the occurrence of other future events that cannot be assured. Therefore, there are likely to be differences between the forecast and actual results, and these differences may be material.

	Budget (a)						Forecast													
Funding Source	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Grants																				
Federal Grants-in-Aid																				
Entitlement	$ 5,177	$ 2,588	$ 4,336	$ 6,617	$ 2,957	$ 5,759	$ 5,759	$ 5,759	$ 5,759	$ 5,759	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727
Discretionary	3,459	7,577	870	1,506	10,010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	$ 8,636	$ 10,165	$ 5,206	$ 8,123	$ 12,968	$ 5,759	$ 5,759	$ 5,759	$ 5,759	$ 5,759	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727	$ 2,727
State Grants	455	535	274	428	683	320	320	320	320	320	152	152	152	152	152	152	152	152	152	152
Subtotal Grants	$ 9,090	$ 10,700	$ 5,480	$ 8,550	$ 13,650	$ 6,079	$ 6,079	$ 6,079	$ 6,079	$ 6,079	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879	$ 2,879
PFC																				
Pay-as-you-go	$ 325	$ -	$ -	$ -	$ 2,000	$ 1,657	$ 1,657	$ 1,657	$ 1,657	$ 1,657	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897
Bonds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal PFC	$ 325	$ -	$ -	$ -	$ 2,000	$ 1,657	$ 1,657	$ 1,657	$ 1,657	$ 1,657	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897	$ 3,897
CFC	$ -	$ -	$ 4,250	$ 2,000	$ 150	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Airport Capital	$ -	$ 2,040	$ -	$ -	$ -	$ 1,758	$ 1,758	$ 1,758	$ 1,758	$ 1,758	$ 372	$ 372	$ 372	$ 372	$ 372	$ 372	$ 372	$ 372	$ 372	$ 372
Total Funding	$ 9,415	$ 12,740	$ 9,730	$ 10,550	$ 15,800	$ 9,494	$ 9,494	$ 9,494	$ 9,494	$ 9,494	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147	$ 7,147

(a) Source: City of Manchester, Department of Aviation.