# Terminal Area Master Plan

FLYMHK
Manhattan Regional Airport

## Manhattan Regional Airport

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# Table of Contents

**Chapter 4 Demand Capacity Analysis and Determination of Facility Requirements**

**Chapter 5 Alternatives and Alternatives Analysis**



**Chapter 6 Development Area**

**Figures**

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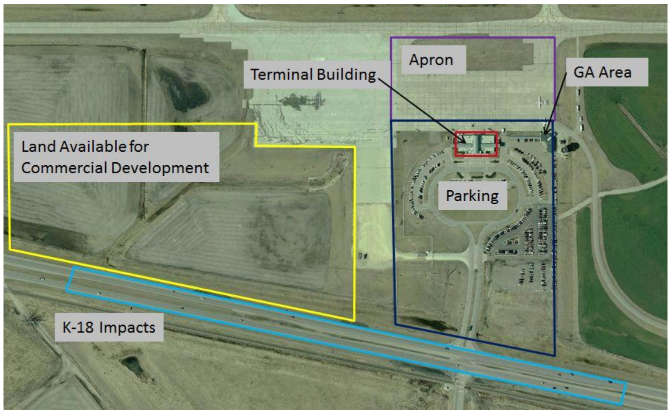


# Chapter 1

## Introduction

A Master Plan Update was completed in February 2009 for Manhattan Regional Airport and the City of Manhattan (Sponsor). Since that time, the Airport has acquired air service to Chicago O'Hare and Dallas-Fort Worth which has generated a dramatic increase in passenger enplanements. In an effort to address the short, intermediate and long-term terminal area development needs of the Airport and provide a program for realistic implementation, the Sponsor, along with the Federal Aviation Administration (FAA), has elected to undertake a study to create a terminal area master plan. The primary focus of the terminal area plan is the terminal building, automobile parking, terminal apron, the Fixed Based Operator located in the terminal area, commercial development area and the impacts to the airport from the K-18 highway improvements.

## 1.1 Public Participation Component

Airport officials, community leaders, and the general public all play an important role in the Terminal Area Master Planning process. A Planning Advisory Committee was appointed to assist in the preparation of this Plan and met regularly throughout the study period to ensure that a comprehensive, community based perspective was incorporated into the project. The planning advisory committee consisted of the following local stakeholders, officials and professionals:

| | |
|---|---|
| Gordon Smith | FBO – Heartland Aviation, Inc. |
| Ron Nordt | FBO – Kansas Air Center |
| Dave Rogers | Airport Advisory Board – General Aviation |
| Jackie Hartman | Kansas State University – Administration |
| Reid Sigmon | Kansas State University – Athletics |

| | |
|---|---|
| Eric Cattell | Assistant Director for City Community Development |
| Karen Hibbard | Chamber of Commerce – Convention and Visitors Bureau |
| James MacGregor | Ft Riley – Division Rep |
| Dick Wollenberg | Ft Riley – DOL Transportation Chief |
| Teresa Mayes | Ft Riley – DFMWR ITR |
| Craig Phillips | Ft Riley – Installation Planner |
| Mike Goreham | Ft Riley – Master Planner |

Early in the terminal area plan, a meeting was held at the Chamber of Commerce to solicit input from airport users. Tenant interview were also conducted to gather information on the strengths and deficiencies of the existing terminal and terminal area. Three planning advisory committee meetings were held over the course of the project to provide committee members with study updates at critical decision milestones and to solicit information, comments and feedback. In addition, presentations were given at two City Commission work sessions to provide city officials and the general public opportunities to ask questions, gather information and communicate ideas regarding the project. Two presentations were given to the airport advisory board to further exchange information during the project.

## 1.2 Terminal Area Master Plan Organization

The Federal Aviation Administration (FAA) has developed the airport planning process to assist the nation's airports in developing plans for expansion and improvement to facilities, with the goal of meeting both existing and future aviation demand and safety requirements. The Terminal Area plan was completed with guidance from the Federal Aviation Administration (FAA) Advisory Circulars 150/5300-13 Airport Design and 150/5070-6B Airport Master Plans, AC 150/5360-9 Planning and Design of Airport Terminal Building Facilities at Nonhub Locations, and 150/5360-13 Planning and Design Guidelines for Airport Terminal Facilities.

The terminal area master plan is organized into six chapters, arranged in the following manner:

- *Chapter 2, Inventory and observations of existing facilities* – The purpose of this chapter is to provide an inventory of facilities and conditions that currently exist within the terminal area at Manhattan Regional Airport (MHK). An inventory of existing facilities provides a baseline, which is required to evaluate existing facility performance and anticipate future need.

- *Chapter 3, Projections of aviation demand* – This chapter contains aviation activity forecasts for Manhattan Regional Airport (MHK) over the 20-year planning horizon. Aviation demand forecasts are an important step in the terminal planning process. Ultimately, they form the basis for future demand-driven improvements at the Airport and they provide data from which to estimate future off airport needs such as terminal space and parking.

- *Chapter 4, Demand capacity, and facility requirements analysis* – This chapter identifies existing and long-range terminal area facility requirements currently anticipated for the airport through the year 2030. The capacity of the existing terminal area facilities are described and assessed against the aviation demand projections. The purpose of this analysis is to determine the requirements for future facility improvements, based on industry standards and guidelines that have been developed by the FAA.

- *Chapter 5, Alternatives and Alternatives Analysis* – This chapter follows the process of developing alternative layouts of both the terminal complex and terminal building; exploring and, finally, identifying the options that best meet projected facility requirements. The layouts will be assessed for expected aeronautical utility, fiscal feasibility and operational performance. In addition, comments on constraints and opportunities of the alternatives as discussed in public and airport user meetings will be noted. Through this process, a recommended alternative will emerge and will be described in detail.

- *Chapter 6, Development Area* – Part of the scope of the Manhattan Airport Terminal Master Plan is to investigate the opportunities for commercial development on the airport property. This chapter will review the access for the proposed development area, land ownership, possible commercial development lot layouts, the serviceability of utilities and infrastructure, and potential uses of the land.

- *Chapter 7, Financial plan* – This chapter of the Terminal Area Master Plan explores eligibility for federal FAA funding for the projects that have been recommended in this document, demonstrates MHK's ability to finance the project and discusses funding sources for the projects. A feasible Airport Capital Improvement Plan (ACIP) for MHK will be presented and used to implement the selected Airport improvement alternatives.

- *Airport Layout Plan Update* – The updated Airport Layout Plan (ALP) is one of the culminating elements of this planning process, as it provides the official graphic representation of the Airport's existing and proposed facilities. Once the FAA approves the ALP, projects can be eligible for Federal grant funding.

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# Chapter 2
# Inventory and Observations

## Introduction

The purpose of this chapter is to provide an inventory of facilities and conditions that currently exist within the terminal area at Manhattan Regional Airport (MHK). An inventory of existing facilities provides a baseline, which is required to evaluate existing facility performance and anticipate future need.

This chapter describes the terminal area existing conditions as observed June through September of 2011. The inventory and observations are based on a June 2011 site survey of the terminal building, parking lot and apron as well user surveys and examination of record drawings.

This chapter is organized into the following sections:

- Terminal Building
- Parking Lot
- Terminal Apron

## 2.1 Terminal Building

The existing terminal building construction was completed in 1996. The building is located south of the intersection of Runways 3/21 and 13/31, and on a perpendicular axis road to highway K-18. It is a 12,670 square-foot, one-story structure with a 20-foot-wide, two-story atrium that extends from the main land-side entry to the air-side of the building. The main corridor is 1-1/2 story high by 10-foot-wide and bisects the building in the opposite direction, providing access to all the building amenities as shown in **Figure 2.1**.

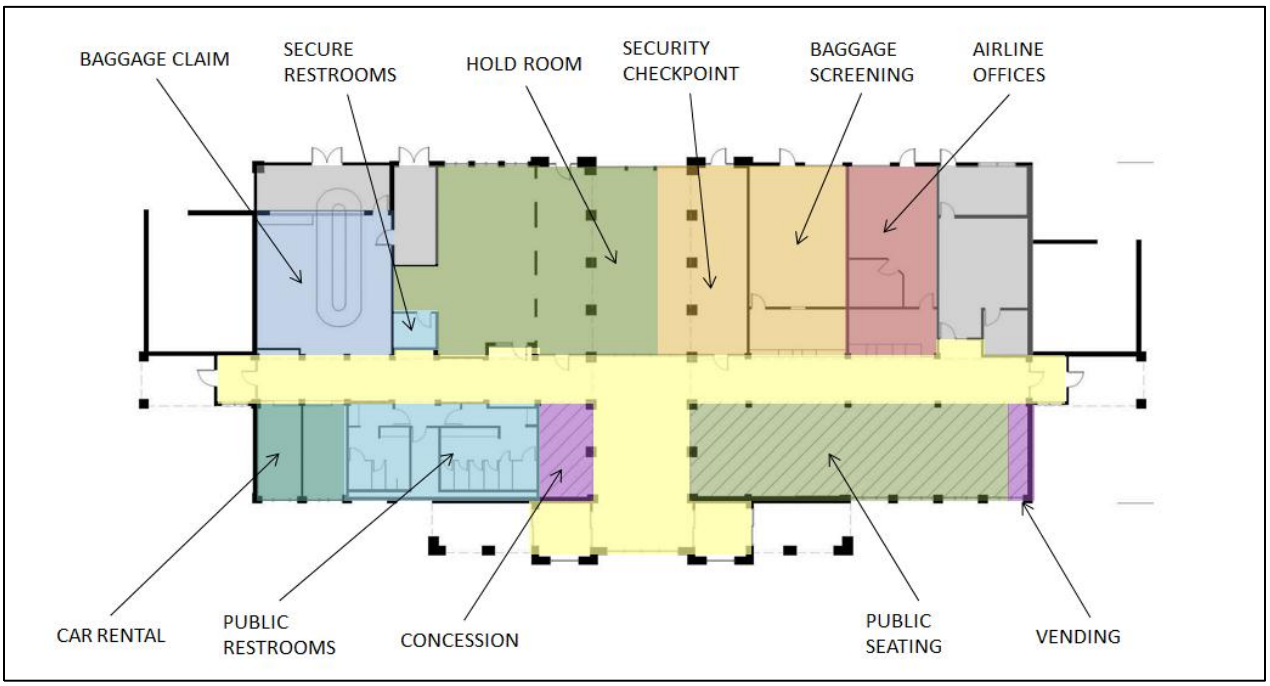



**FIGURE 2.1: MANHATTAN REGIONAL AIRPORT FLOOR PLAN**

A complete breakdown of existing terminal spaces is shown below on **Table 2-1**. An Analysis of space requirements is found in Chapter 4, *Demand Capacity Analysis and Determination of Facility Requirements*. This portion of Chapter 2 will focus on the inventory of the terminal building and the operational and building deficiencies related to architectural layout, as well as the condition of the mechanical, electrical, plumbing, and fire protection systems. Data for this analysis was collected from record drawings, site investigations, questionnaires, and interviews. Observations of deficiencies are found at the end of each subsection. Recommendations for resolutions to deficiencies will be addressed in Chapter 5, *Alternatives and Alternative Analysis*.

**Table 2-1. Manhattan Regional Airport – Existing Terminal Building Space Inventory**

| Area Description | Area (SF) |
|---|---|
| TSA Security Checkpoint | 644 |
| TSA Office, (off-site) | 150 |
| Checkpoint Exit Lane | 0 |
| Checkpoint Queuing | 540 |
| Public Circulation – Non-Sterile & Sterile | 2,297 |
| Public Restrooms | 718 |
| Public Waiting | 1,209 |
| Public Business Lounge | 0 |
| Hold Room, (+ticket lift) | 2,478 |
| Baggage Claim | 865 |
| Inbound Baggage | 268 |
| Oversized Bags / Circulation | 0 |
| Outbound Baggage | 0 |
| Airline Ticket Office | 551 |
| Ticket Counter Area | 187 |
| Ticketing Queue | 106 |
| Rental Car Office | 0 |
| Rental Car Counter Area | 377 |
| Rental Car Queue | 58 |
| Sterile Concessions / Vending | 25 |
| Public Concessions / Vending | 325 |
| Concession Storage | 0 |
| Hotel Board | 0 |
| TSA Baggage Screening | 718 |
| TSA Ops / Office | 0 |
| Wheelchair Storage | 0 |
| Local Law Enforcement | 0 |
| Receiving | 0 |
| Janitor/ Storage | 75 |
| Plumb / Mech / Elec / Comm | 181 |
| Circulation - Non-Public, Non-Sterile, & Sterile | 0 |
| Chases | 39 |
| Building Structure | 1,009 |
| **Total Area** | **12,670** |
| *note that areas above exclude offsite TSA support space | |

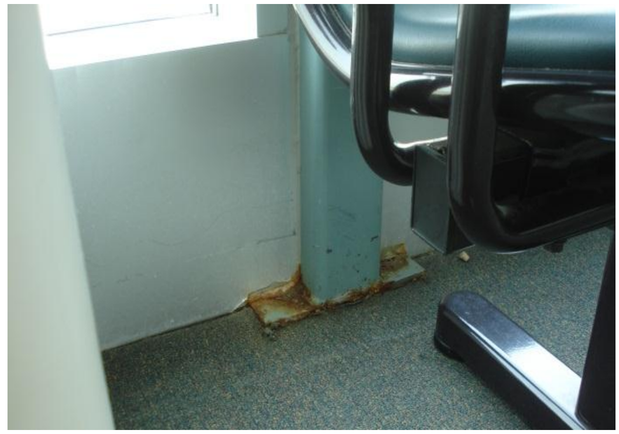
### 2.1.1 Terminal Building Code Analysis

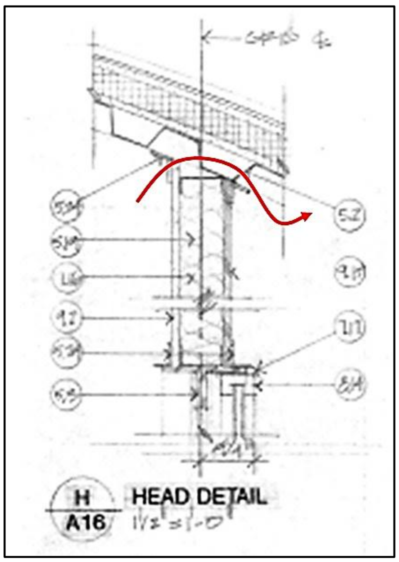
A code analysis was performed on the existing building, using the 2009 IBC, which is the adopted code of the City of Manhattan. This analysis indicates that the building is ADA accessible throughout and that egress is sufficient even at peak use. In addition, the hold room is code compliant; however, the capacity of the hold room is constrained by the operation of the security checkpoint. The hold room could accommodate 174 occupants, but security screening equipment has encroached on the floor area that was formerly dedicated to passenger seating, reducing the number of occupants that the room can accommodate to 130. Restroom fixture counts are also sufficient for code requirements, but not acceptable for use at an airport terminal building where actual restroom demand is driven by passenger activity. Since passengers deplane in a group, and since enplaning passengers in the hold room are unable to use restrooms on the non-sterile side of the checkpoint, actual demand calls for a greater number of fixtures in the building than the code requires. The building has emergency exit lighting, and fire extinguishers, but is not sprinklered. In a significant terminal renovation, code will require that the fire alarm control panel is relocated from the mechanical room to the primary exit to allow fire department access in an emergency. It is also likely that a renovation will need to consider the installation of a fire suppression system to allow greater flexibility in fire protection of the structural frame.

### 2.1.2 Terminal Building Exterior

The exterior cladding consists of coursed limestone veneer and a lighter colored EIFS, (Exterior Insulation and Finishing System). Windows are anodized aluminum framed units, and doors are anodized aluminum framed automatic doors with airlock vestibules. The roof is comprised of a main low slope asphalt roll roof, and raised barrel-vaulted, standing seam metal roofs over the high areas. Clerestories below the high metal roofs provide natural light to the interior spaces below. Additionally, the metal roofs extend over the secondary entrances, providing protection from the elements.

The existing window system is deficient in flashing and the gaskets and sealants that are near the end of their expected life. As a result, many of these units are no longer weather-tight. Concrete pavement at the air side building perimeter has heaved, which interferes with function of doors and contributes to water infiltration issues. See 2.3.1 Terminal Apron and FBO Apron for additional discussion on air side concrete. Poor water drainage from the roof of the building contributes to an abundance of water at the exterior wall of the building. These circumstances have led to water intrusion to the interior of the building. For example, clerestory window leaks have caused damage to carpet below at the corridor near baggage claim and wind-driven water has made its way beneath full-height window frames in the hold room area, causing water damage at carpet and surface rust at structural steel tubes.



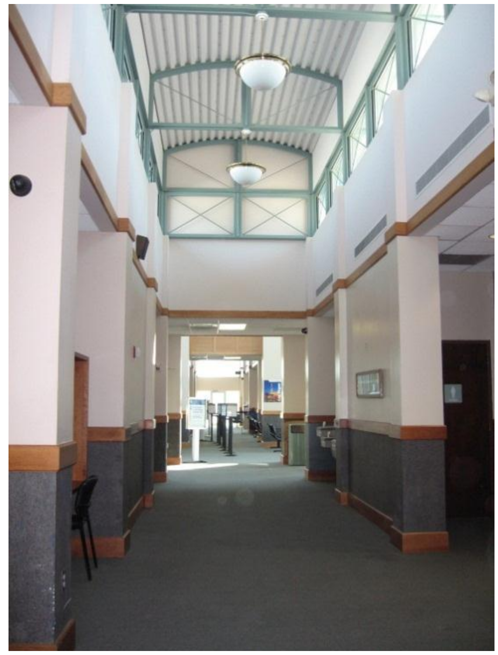



Record drawings show existing insulation R-values are approximately R-8 for the low slope roof, R-8 for the metal roof, R-13 for the exterior walls and R-6 for the floor slab. Current building envelope insulation requirements for this region as prescribed by IECC 2003 area as follows: R-24 for continuous above roof deck insulation, R-30, for metal roof and R-13 for exterior steel-framed walls. Note that proposed ASHRAE 189 standards will increase recommended levels of insulation above current levels, as they are adopted in the future.

There is evidence of hail damage on the metal roof. The roll roofing on the low slope roof has a relatively short life span of approximately ten years. The existing building construction does not prevent thermal bridging from occurring at locations where different assemblies come together. This circumstance results in thermal loss between the assemblies, reducing the building's overall energy efficiency. Current building best practices recommend details that provide continuous insulation between building assemblies, reducing thermal bridging and greatly increasing building energy efficiency.

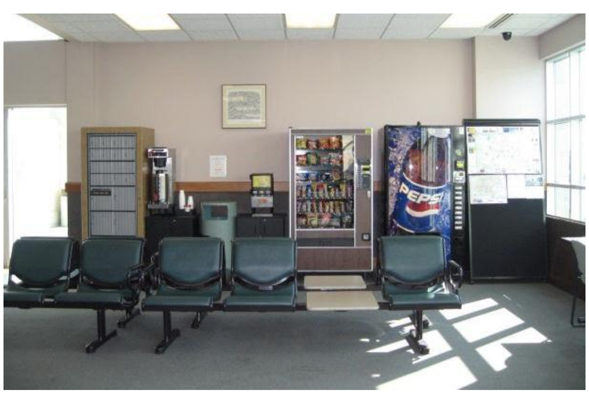
### 2.1.3 Terminal Building Interior

The interior finishes in both the sterile and non-sterile areas consist of light green Berber carpeting, plastic laminate wainscot, wood baseboards and chair rails, off-white and pure white painted gypsum framed walls and column boxes. The ceiling is a white 2x2 drop ceiling with 2x4 fluorescent lights. The steel framing and cross-bracing for the atrium, clerestory, and trusses has bolted connections and is painted green.



Though the facility is well-maintained, many of the finishes are reaching the end of their expected lives and will require replacement in the near future. In addition, the carpet shows signs of water damage, and has started buckling in some areas. This carpet is scheduled to be replaced in late 2011. Existing furnishings and millwork are in good repair, but are showing signs of wear. Note that the beam seating in the sterile and non-sterile areas does not match in style or color and would be difficult to use together in the same room.

A factor that affects interior layout in this facility is that the structural bays have unusually short spans, and are as little as ten feet wide. This spacing, along with the boxed columns, impinges on the openness and adaptability of this building. The primary example of this limitation is the ten foot wide main corridor, which may not meet future code requirements for egress. This corridor often becomes very crowded at peak hour. As enplanements increase, there will be a diminished ability to meet egress requirements in the future.

**Non-Sterile, Public Area**

The non-sterile portion of the terminal building refers to facilities between the parking lot and the security checkpoint, which is accessible to both ticketed passengers and the general public.

Amenities in the public area include: 2 car rental offices, restrooms, a small concession, a public seating area, vending, airport administration offices, one airline ticketing office with 18 linear feet of ticket counters, one ticketing kiosk, and a baggage claim area with one baggage claim device with 50 linear feet of frontage. All airline offices and operations areas are located behind the ticket counter. The checked baggage screening area is located adjacent to the airline, in a space that was intended for a second airline. There is an additional 18 linear feet of ticket counters associated with the bag screening area that is currently not used.

**Checkpoint and Sterile Area**

Sterile areas are accessible only to ticketed passengers and staff with security clearance. The Transportation Security Administration (TSA) passenger-screening checkpoint separates the sterile area from the non-sterile, public areas. The security checkpoint has security equipment for a single checkpoint lane and a small area for passenger queuing. Beyond the checkpoint is the hold room and gate area where ticketed passengers enplane and deplane. The hold room area includes seating for passengers, a vending machine, and a single unisex restroom. At the checkpoint, passengers pass through the divesture area, where they place their personal items into bins, prior to passing through the screening equipment. After passing through the screening equipment, passengers pass into the recomposure area, where they recover personal their items. There is insufficient space for divesture and recomposure areas at the security checkpoint. The limited amount of space has made it necessary for private screening to be performed behind a curtain, instead of in a room with hard walls.

## 2.1.4 Terminal Building Observations and User Surveys

Functional deficiencies have been documented through user surveys and site observation. Many of these observations only apply to peak usage, while others apply to availability of amenities at all times.

**User surveys**

- The current claim device does not allow for all inbound baggage to be loaded onto the belt at the same time, contributing to congestion in the bag claim area.
- There is need for additional seating in the hold room.
- There is need for a second restroom in the hold room.
- The terminal is over-crowded at periods of peak use, making it difficult to move through the building.
- Vending machines currently provide the only access to refreshments in the sterile area.
- There is user interest in having a concession that serves food and beverages in the hold room.

**Site Observation**

- There is a great amount of congestion in the public circulation areas due to narrowness of the circulation area and a conflict between general circulation and queuing at ticket counters, security checkpoint and car rentals.
- The security checkpoint is congested and has insufficient space for efficient queuing, divesture, equipment, recomposure and private passenger screening. New screening equipment, such as an Advanced Imaging Technology scanner (AIT), would require a reconfiguration of the checkpoint and at least doubling the amount of available space.
- Cross-traffic between deplaning passengers retrieving baggage and customers at car rental counters creates inefficient circulation.
- Existing utilities and generator, located at the south end of the building will require relocation if building is expanded in this direction.
- Maintenance staff indicated that the baggage claim device is nearing the end of its expected life.
- Mechanical system in hold room appears to be deficient, since maintenance has provided fans to increase air circulation.
- There is a demand for increased number of restrooms in the non-sterile and sterile areas of the terminal.

## 2.1.5 Terminal Building Structural Systems

The superstructure of the building consists of flat and curved roof systems. The flat roof structures are roof deck on joists. The joists bear on interior steel beams and trusses and exterior concrete masonry bearing walls. The interior steel beams and trusses bear on steel columns. The curved roof structure is roof deck on custom curved top chord steel trusses. The custom trusses bear on steel beams and trusses which are supported by steel columns. Elimination of any interior structural columns would require a thorough structural examination, structural engineering, and custom detailing.

The interior columns rest on concrete piers which bear on spread footings. The exterior walls are supported by concrete foundation walls on continuous strip footings.

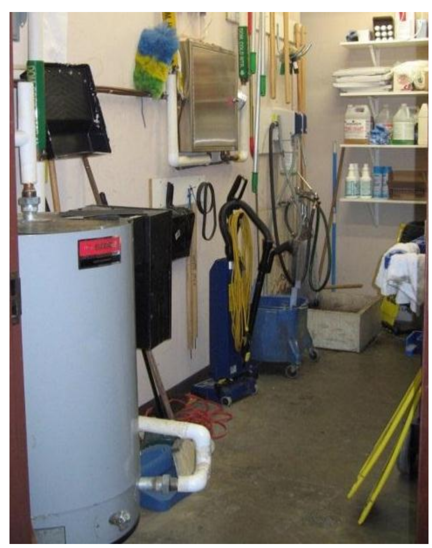
The lateral load resisting system consists of metal roof deck diaphragm on exterior shear walls. The load paths for the transfer of diaphragm forces through the high roofs is unclear on the design drawings. Since the exterior concrete masonry walls are used for lateral load resistance they are an important structural element. Removal of any shear walls will require comprehensive examination and analysis of the structure to ensure stability against wind and earthquake forces.

## 2.1.6 Terminal Building Mechanical Systems

The terminal building is served by packaged, indirect gas-fired roof top units with direct expansion (R-22) cooling. The building is zoned into seven areas with ducts supplying air to the spaces. The building has approximately 60 tons of cooling and 1000 MBH heating capacities. Return air is transferred to the open ceiling space (plenum) which allows air to be returned back to the rooftop units. Ventilation air and exhaust air are provided/expunged from the spaces as required. Gas service, provided by Kansas Gas, a division of Oneok, is brought into the building along the south side and is distributed to the rooftop units. In general, the heating/air-conditioning/ventilation systems are at or beyond their expected life. Replacing the equipment should be in the airport's planning for the near future. The existing HVAC is controlled by a Johnson Controls Metasys System, Windows 95. The controls system operates the rooftop units and fans. There are smoke sensors located in the return ducts of units supplying more than 2000 cfm. The existing control system is still functioning; however it is in need of an update. The software and network control engine are proprietary to Johnson controls and have become outdated making maintenance and monitoring the equipment difficult. In addition sensors, relays, contacts, etc. begin to fail and fall out of calibration without regular servicing.

## 2.1.7 Terminal Building Plumbing Systems

- *Domestic Water* - The water service is provided by the City of Manhattan. The city water main runs parallel to the front of the building. A 2-inch water takeoff with an exterior curb stop valve provides the water main to the building and enters from the front of the building into the janitor's closet. Water pressure and flow is unknown but is adequate for current operation. Hot water is generated by a 30 gallon electric water heater. Water is distributed to plumbing fixtures throughout the facility (predominantly on the southern portion of the building). A 3/4-inch cold water line is routed beneath the floor of the lobby to serve a wall hydrant (used for general maintenance) located on the north end of the building.



- *Sanitary* - The sanitary service is also provided by the City of Manhattan. The existing sanitary main is a 4-inch pipe exiting from the front of the building. There are no sanitary lines on the northern side of the terminal.

- *Storm* - Rain water is pitched to localized roof drains on the low slope portions of the roof. The water is piped and dropped along the exterior walls and scuppered to grade approximately three feet above grade. The grade surrounding the site is relatively flat making draining away from the building difficult in some areas. In the event of a roof drain being clogged, overflow scuppers are provided in the roof parapet along the perimeter of the building to avoid standing water on the roof.

### 2.1.8 Terminal Building Electrical Systems

- *Lighting* - The interior lighting is predominantly T-8 2x4 fixtures. The exterior building mounted lighting is metal halides as well as the parking lot lights. Occupancy sensors are located in the bathrooms (men's and women's) to control the lighting fixtures.

- *Power* - The electric power service is provided by Westar Energy with the main service size being 120/208Y $3\phi$-4W, 800A. The transformer and a back-up/emergency generator are located to the south of the building. There is one main electrical panel that feeds six sub-main panels and two exterior charging stations for aircraft equipment (located on the airside of the building). The sub-main panels serve the exterior parking lot lighting, interior lighting, equipment, receptacles, etc. Three panels are located in the north baggage claim room and the main and remaining sub-main panels are in the mechanical room.

- *Special Systems* - The fire protection (Heartland) telecommunications (Southwestern Bell), cable (Cox), and security system (Homeland/True Surveillance) are all housed in the mechanical room. The flight information display (FIDS) is operated from a remote computer and updated by staff at regular intervals. The FIDS should be replaced with a new system to allow continuously automatic updates to the flight status of arriving and departing aircraft.

## 2.2 Terminal Parking

### 2.2.1 Parking Lot

The parking lot and loop road configuration was originally constructed in 1996 as shown in **Figure 2.2**. The initial construction consisted of the loop road, short term parking area, rental car parking area, and long term parking area. The 1996 parking lots and access road areas were constructed with 6 inches and 8 inches continuously reinforced concrete pavement, respectively, over a compacted subgrade. Parking lot and roadway lighting was installed. Storm water is collected with the use of curb and gutter and curb inlets that route water through reinforced concrete pipe to the southwest where it outlets to a drainage ditch.

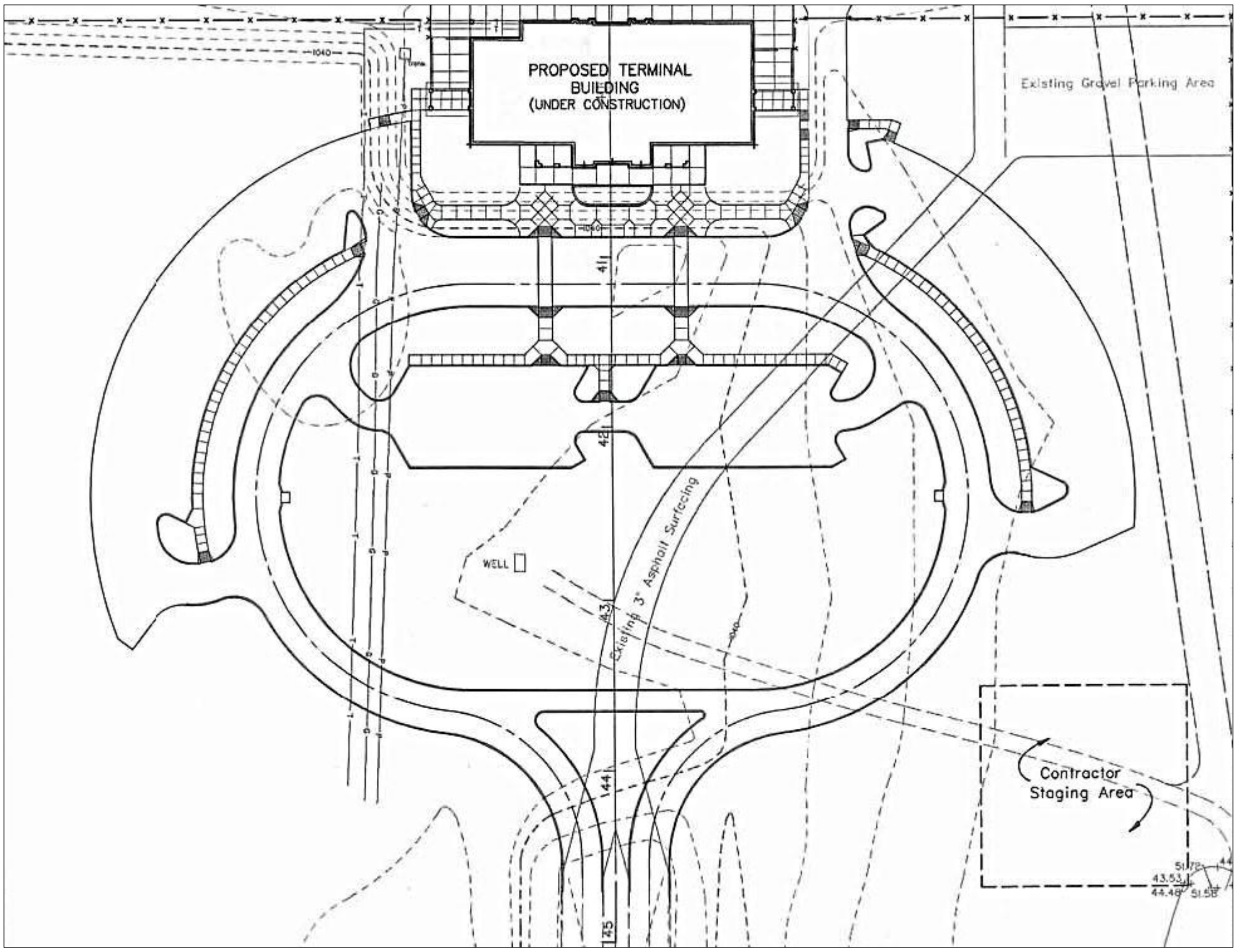



**FIGURE 2.2: 1996 PARKING LOT CONSTRUCTION**

In 1999, the General Aviation (GA) building just west of the aircraft control tower was erected and an asphalt parking lot was constructed for the Kansas Air Center and their customers. This lot also currently provides parking for the Transportation Security Administration (TSA) and Airport staff. Parking lot lighting is provided in this area.

An additional parking lot was constructed in 2010 to provide an additional 140 parking spaces on asphalt pavement. Parking lot lighting and curb and gutter are present in this area. A gravel lot was also constructed during this time for overflow parking. The overflow parking has been observed at full capacity with airport users parking in the nearby grass.

Current parking at Manhattan Regional Airport provides auto parking for the traveling public, airport employees, TSA agents, rental cars, and General Aviation (GA) users at the Kansas Air Center Terminal. Paved parking is available for 319 cars with parking being free to all airport users.

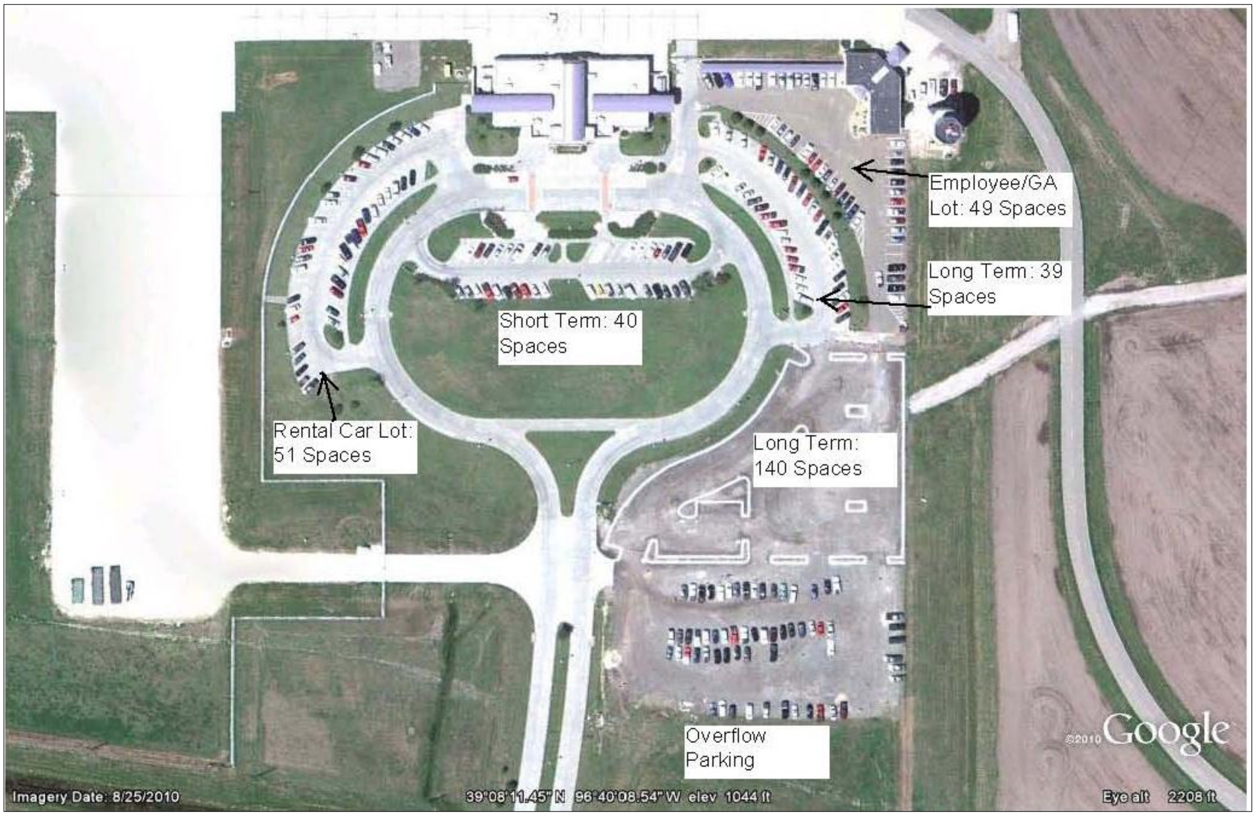



**FIGURE 2.3: 2011 AIRPORT PARKING DIAGRAM**

## 2.2.2 Parking Lot Observations and User Surveys

The capacity and functionality of parking areas has been noted by airport users and observations by Mead & Hunt staff over the course of the study. Many of these observations again only apply to peak usage but still are relevant to the capacity analysis of the facility. These comments we incorporated are listed below.

**User surveys**

- Rental car agencies have seen times of overflow in their designated lot due to passengers incorrectly parking in their stalls. Triple parking and double parking in rental car area as shown in photos.

- Free parking for passengers is desirable when using Manhattan Regional Airport as their departure destination of choice but a low parking fee would be agreeable if revenue is used to pay for airport parking improvements.

**Site Observation**

- This infrastructure is in good condition and has useful life remaining in its current state.
- The current configuration was designed for enplanements of 10,000 passengers per year and has outgrown its intended function as the parking lots are at capacity.
- The existing loop road and parking lot is not configured for installing potential revenue collection equipment.
- Way finding and signage for vehicles to be directed to rental car, GA, long term, and short term lots for parking could be improved.
- The gravel parking area is currently utilized by many cars and could be paved to better serve customers. The paving of this lot was paved with one lift of asphalt in late 2011.
- The entrances and exit to the short term parking are awkward.
- Numerous entrance and exit points exist to different parking lots.

## 2.3 Terminal Apron

### 2.3.1 Terminal Apron Inventory

The current terminal area apron at the Manhattan Regional Airport provides aircraft parking and maneuvering space for commercial service aircraft utilizing the terminal building, general aviation aircraft using the Fixed Base Operator (FBO) facility, and military aircraft on the Army Deployment Apron that is connected to the terminal apron. This section provides inventory and observations of the existing terminal apron and army deployment apron.

FIGURE 2.4: FROST HEAVE DAMAGE AT DOOR

The existing terminal apron is approximately 196,000 square feet in size. Aircraft can access the terminal apron via Taxiway A. The terminal apron, shown in **Figure 2.5,** below, was constructed in 1992 and consists of 13 inches of concrete pavement, 6 inches of crushed aggregate base course and a compacted subgrade. It is in good condition with the exception of the row of concrete panels immediately adjacent to the terminal building. This row of concrete panels was constructed along with the terminal building in 1996 with 6 inches of concrete over 2 inches of sand. This pavement section near the terminal building has not been able to withstand frost heave and heaves enough to block the opening of terminal doors onto the apron. See **Figure 2.4,** above, shows a photograph of a frost heave location.

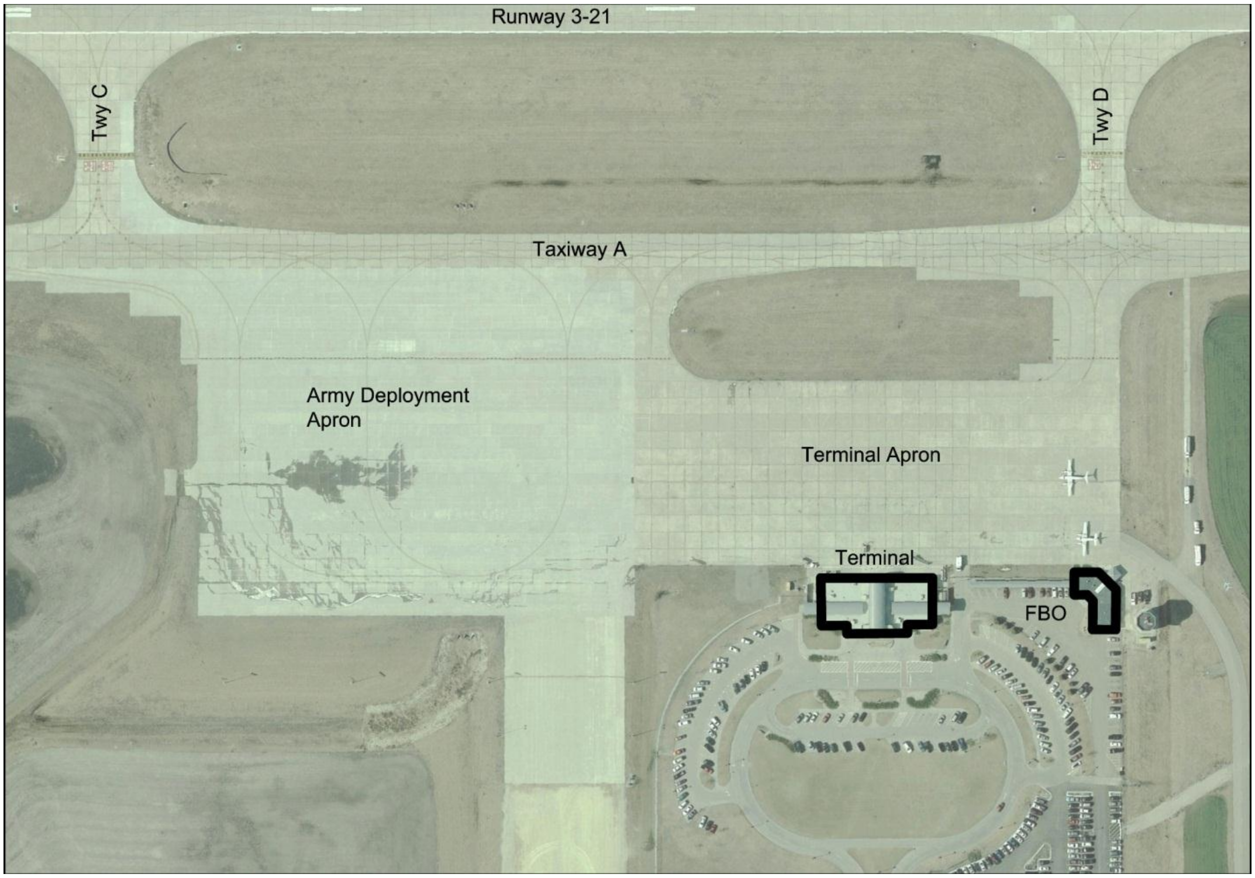



**FIGURE 2.5: EXISTING TERMINAL APRON**

The terminal apron is used by commercial service aircraft accessing the terminal building as well as itinerant aircraft utilizing the FBO. Approximately 1 acre of space has been set aside for the FBO (Fixed Base Operator), Kansas Air Center Inc.

Located adjacent to the terminal apron is the Army Deployment Apron which covers approximately 462,000 square feet. The Army Deployment Apron was constructed by the Department of Defense for Fort Riley's use. This apron was constructed in 2008 with concrete and is in excellent condition. The apron has been designed to allow two C-17 aircraft to park at the same time. The Army Deployment Apron has first rights to the apron space with the Airport and FBO able to utilize the apron when not needed for military operations. The apron is often used by the FBO to park aircraft once their designated terminal apron space is fully occupied.

**User Surveys and Site Observations**

- The close proximity of General Aviation aircraft at the FBO to the commercial service aircraft is undesirable for security reasons.
- The terminal apron is often congested with FBO and commercial traffic.
- The army apron is utilized by nonmilitary aircraft approximately 40% of the time.
- Frost heave on first row of panels near terminal.

# Chapter 3
# Aviation Forecasts

## Introduction

This chapter contains aviation activity forecasts for Manhattan Regional Airport (MHK) over the 20-year planning horizon. Aviation demand forecasts are an important step in the terminal planning process. Ultimately, they form the basis for future demand-driven improvements at the Airport, they provide data from which to estimate future off airport needs such as terminal space and parking.

Enplanements are defined as the activity of passengers boarding commercial service aircraft that depart an airport. Enplanements include passengers on scheduled commercial service aircraft or un-scheduled charter aircraft but not the airline crew. Passenger enplanement data is provided to Airport management by commercial passenger service carriers, who maintain data as they transport people to and from the facility.

Forecasts of enplanements for MHK were prepared in the Airport's 2009 Airport Master Plan and the 2009 Kansas State System Plan. These forecasts were prepared prior to significant increases in air service offerings at the airport which has significantly altered the type of service and increased the number of passengers using the airport. Therefore these forecasts are not indicative of the current passenger levels and new passenger forecasts will be prepared as part of this chapter.

The Federal Aviation Administration's (FAA) 2011-2015 ***National Plan of Integrated Airport Systems*** (NPIAS) categorizes Manhattan Regional Airport as a "Primary Nonhub Airport." The NPIAS defines a Nonhub Primary Airport as a commercial service airport that enplanes more than 10,000 but less than 0.05 percent of total U.S. Passengers enplanements. The 2011-2015 NPIAS reported that there are 244 nonhub airports that together account for 3% of all enplanements nationwide. The NPIAS identifies existing and proposed airports that are significant to the national air transportation system. It contains estimates of costs of airport development projects eligible for federal aid that are needed to meet aviation demand over the next five years.

The FAA has estimated figures on file called Terminal Area Forecasts (TAF) that is compared with the projections developed for this Master Plan. Forecasts that are developed for airport master plans and/or federal grants must be approved by the FAA. It is the FAA's policy, listed in AC 150/5070-6B, Airport Master Plans, that FAA approval of forecasts at non-hub airports with commercial service should be consistent with the TAF. Master plan forecasts for operations, based aircraft, and enplanements are considered to be consistent with the TAF if they meet the following criteria:

a) Forecasts differ by less than 10 percent in the five-year forecast and 15 percent in the 10-year or 20-year period, or
b) Forecasts do not affect the timing or scale of an airport project, or
c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, Field Formulation of the National Plan of Integrated Airport Systems.

This chapter, which presents aviation activity forecasts through 2030, is organized as follows:

1. Overview
2. Airline Passenger Forecasts
3. Commercial Aircraft Operations Forecasts
4. Based Aircraft Forecasts
5. Based Aircraft Fleet Mix
6. General Aviation Operations Forecasts
7. Military Operations Forecasts
8. Peak Passenger Activity and Operations Forecasts
9. Forecast Summary and TAF Comparison

## 3.1 Airline Passenger Forecasts

In 2011, a Passenger Demand Analysis was conducted for Manhattan Regional Airport focusing on travel patterns of local airline passengers who reside in the Manhattan geographic area. Specifically, the Analysis examined:

- The originating airports used by air travelers
- Diversion of airline passenger traffic to competing airports
- An estimate of total airline passengers in the catchment area and related destinations
- Airlines used by local air travelers
- Average airfares by origin and destination airport
- Service levels at MHK and competing airports
- An assessment of the air service situation at MHK

Some of the key findings of the Passenger Demand Analysis include:

- MHK's total air service market, called the true market, is estimated at 415,191 annual origin and destination passengers or 624 passengers daily each way.
- Nineteen percent of catchment area travelers used MHK, while the other 81 percent diverted to Kansas City International (MCI).

- When using MHK (based on US DOT data), catchment area travelers flew with American Airlines 96 percent of the time and Great Lakes just four percent of the time reflecting Great Lakes' three months of service in 2010.
- From 2001 through 2010, MHK's domestic origin and destination passengers (as reported by airlines to the US DOT) increased at a compounded annual growth rate (CAGR) of 15.7 percent. MHK passengers have ranged from 11,160 (2004) to 74,750 (2010). MHK's dramatic rise in passengers in 2009/2010 reflects the impact of American's DFW service which was initiated in August of 2009, with the first full month of service in September of 2009.
- MHK's catchment area support of American's service provides a solid foundation for attracting new service; in fact the addition of a second ORD roundtrip was recently announced by American Airlines for initiation in November 2011. Care should be exercised that additional new or expanded service should complement existing service with minimal diversion. The addition of service to the Denver hub, Las Vegas, and possibly Orlando service are the best new service opportunities for MHK.

The Air Service Market Research report was also completed in 2011 to review the impact of American Airlines service on the performance at Manhattan Regional Airport and to further evaluate the potential of new service at MHK. Some of the key findings of the ASMR are as follows:

- MHK load factors have increased significantly since American Airlines entered the market. Prior to American, load factors averaged 31 to 54 percent by quarter from 2008 forward. Post American service, the load factor peaked in the third quarter 2010 at 83 percent.
- The MHK domestic market increased to $17 million in 2010 and continues to increase with the new American service.
- In a ranking of domestic and international passenger, MHK ranked 272$^{nd}$ in passengers and 260$^{th}$ in revenue of all US airports.
- Eight percent of Manhattan's passengers were to international destinations. This trailed the national average of 11 percent but it should increase with better hub connecting service.
- MHK ranked 134$^{th}$ out of 171 on a passenger basis and ranked 130$^{th}$ in revenue in 2010.
- Air service opportunities were evaluated for all potential carriers, hubs and destinations including fleet compatibility.

Copies of both the Passenger Demand Analysis and Air Service Market Research reports can be obtained by contacting the Airport Director.

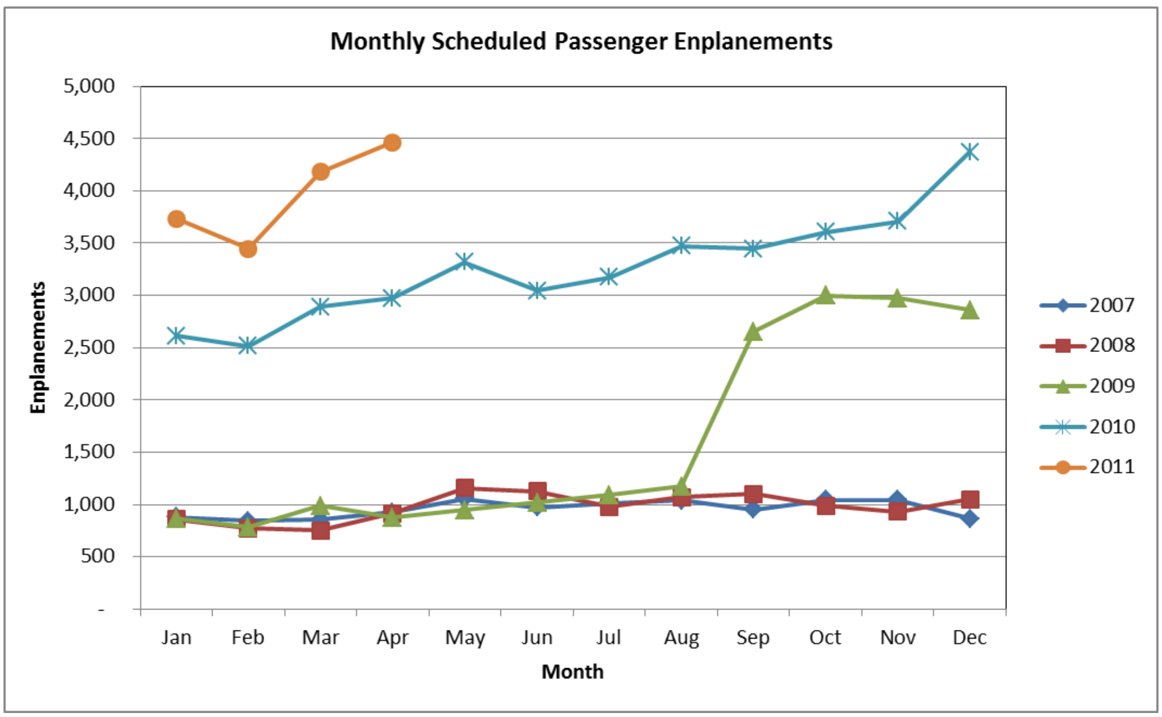
### 3.1.1 Passenger Enplanements

**Table 3-1** presents the historical annual passenger enplanements from 2000 to 2010 and charts monthly scheduled passenger enplanements since 2007 through April of 2011. Total enplanements from 2000 through 2008 were relatively consistent, between a low of 11,395 and a high of 16,489. Scheduled carrier enplanements at Manhattan Regional Airport have significantly increased since the introduction of American Airlines service to Dallas-Fort Worth in August of 2009, with the first full month of service being September of 2009. There was also a significant increase in enplanements with the introduction of American Airlines service to Chicago-O'Hare in late November of 2010.

Data on nonscheduled carrier enplanements is shown from 2006 through 2009; these nonscheduled enplanements reported to the FAA have been between 2,716 and 5,849. These are typically passenger charters for military personnel to/from Ft. Riley, and university athletic charters to/from Kansas State University (KSU) for athletic events. It should also be noted that in 2009 and 2010, runway construction reduced the amount of runway length available and forced some larger B737 and B757 Ft. Riley passenger charters to utilize other airports.

**Table 3-1**
**Historical Passenger Enplanements**

| Year | Scheduled Carrier Enplanements | Nonscheduled Carrier Enplanements | Total Enplanements |
|---|---|---|---|
| 2000 | NA | NA | 15,490 |
| 2001 | NA | NA | 13,543 |
| 2002 | NA | NA | 15,085 |
| 2003 | NA | NA | 11,395 |
| 2004 | NA | NA | 13,479 |
| 2005 | NA | NA | 15,140 |
| 2006 | 10,860 | 4,109 | 14,969 |
| 2007 | 11,313 | 2,716 | 14,029 |
| 2008 | 11,649 | 4,840 | 16,489 |
| 2009 | 19,225 | 5,849 | 25,074 |
| 2010 | 39,126 | 5,357 | 44,483 |




Sources: Hist Enplanements - 2000-2010 FAA Office of Planning & Programming
Monthly Enplanements - Airport Records

### 3.1.2 Nonscheduled Passenger Enplanement Projection

By their very nature, charter flights are difficult to forecast as they are operated on the demand of their customer. The two primary generators of nonscheduled activity at MHK are charters related to KSU sports teams and those related to Ft. Riley personnel transport. **Table 3-2** depicts total charter operations reported by the airport's fixed base operator (FBO) for 2008 through 2010. Also noted is the number of nonscheduled passenger boarding's reported by the various aircraft operators to the FAA. The two data sources indicate an approximate load factor of 79 to 81%, which is a reasonable load factor for charter operations, indicating that the two data sets correlate well with each other and the data appears fairly reasonable and well reported.

**Table 3-2**
**Nonscheduled airline activity by type**

| | | 2008 | 2009 | | | 2010 | | |
|---|---|---|---|---|---|---|---|---|
| **Aircraft Type** | **Approx Seats** | **Total** | **KSU** | **Ft. Riley** | **Total** | **KSU** | **Ft. Riley** | **Total** |
| **Total Charter Operations** | | | | | | | | |
| B757 | 200 | 11 | | 6 | 6 | 4 | 5 | 9 |
| A320 | 165 | 8 | 7 | | 7 | 1 | 9 | 10 |
| B737 | 150 | 45 | 5 | 61 | 66 | 3 | 44 | 47 |
| A319 | 140 | 2 | 4 | | 4 | | | |
| MD-80 | 140 | 1 | | | | 5 | | 5 |
| DC9 | 125 | 1 | | | | 4 | | 4 |
| CRJ 200 | 50 | 4 | | | | | | |
| EMB145 | 50 | 14 | 21 | | 21 | 19 | | 19 |
| Dornair 328 | 32 | 11 | 20 | | 20 | 21 | | 21 |
| EMB120 | 30 | | | | | 9 | | 9 |
| Total | | 97 | 57 | 67 | 124 | 66 | 58 | 124 |
| **Departing Seats (Assuming 1/2 of total operations are departures)** | | | | | | | | |
| B757 | 200 | 1,100 | 0 | 600 | 600 | 400 | 500 | 900 |
| A320 | 165 | 660 | 578 | 0 | 578 | 83 | 743 | 825 |
| B737 | 150 | 3,375 | 375 | 4,575 | 4,950 | 225 | 3,300 | 3,525 |
| A319 | 140 | 140 | 280 | 0 | 280 | 0 | 0 | 0 |
| MD-80 | 140 | 70 | 0 | 0 | 0 | 350 | 0 | 350 |
| DC9 | 125 | 63 | 0 | 0 | 0 | 250 | 0 | 250 |
| CRJ 200 | 50 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| EMB145 | 50 | 350 | 525 | 0 | 525 | 475 | 0 | 475 |
| Dornair 328 | 32 | 176 | 320 | 0 | 320 | 336 | 0 | 336 |
| EMB120 | 30 | 0 | 0 | 0 | 0 | 135 | 0 | 135 |
| | Total Departing Seats | 6,034 | 2,078 | 5,175 | 7,253 | 2,254 | 4,543 | 6,796 |
| Reported Unscheduled Passenger Boardings | | 4,840 | | | 5,849 | | | 5,357 |
| | Approx. Load Factor | 80% | | | 81% | | | 79% |

Note: 2008 Charters not specified by Type (i.e. KSU vs. Ft. Riley)
Sources: Total Charter Flights, FBO (Kansas Air Center)

The FBO also noted that in both 2009 and 2010 runway construction was occurring at MHK which reduced the amount of runway length available and forced some larger charter operations to other airports. For 2010 the FBO estimated the number of diverted charter flights as twenty-five narrow body (B757, B737, A320) type aircraft departures and the same number of return arrivals. Assuming a similar split between B757 (9%), B737 (76%), and A320 (15%) charter flights as the remainder of 2010, indicates that an additional 3,950 departing seats were diverted elsewhere because of the lack of available runway length. Assuming an 80% load factor on these diverted fights indicates that the airport would have boarded approximately an additional 3,160 charter passengers, putting them on pace for nearly 8,520 unscheduled passenger boarding's in 2010 (2010 total of 5,357 enplanements plus the 3,160 of diverted passengers).

Charter activity associated with KSU is fairly consistent, being comprised primarily of narrowbody aircraft for KSU or visiting team football team charters and regional jets for basketball and volleyball charters. There are also some occasional fan charters to high profile away games such as college football bowl games. This activity is generally fairly consistent and anticipated to remain so through the forecast period.

Troop transport associated with Ft. Riley is primarily to transfer military personnel. This activity has increased slightly over the past few years as the population at Ft. Riley has increased. This activity is anticipated to remain at or about the same as the activity that would have occurred in 2010 if not for the runway project.

**Table 3-3** summarizes the projected unscheduled passenger enplanements.

**Table 3-3**
**Nonscheduled Passenger Enplanement Projection**

| Year | Nonscheduled Enplanements |
|---|---|
| **Historical** | |
| 2007 | 2,716 |
| 2008 | 4,840 |
| 2009 | 5,849 |
| 2010 | 5,357 * |
| *Projected to have been 8,520 if runway hadn't been shortened for construction. | |
| **Projected** | |
| 2015 | 8,520 |
| 2020 | 8,520 |
| 2025 | 8,520 |
| 2030 | 8,520 |

Source: FAA reports and FBO charter activity information

### 3.1.3 Scheduled Passenger Enplanement Projections

Due to recent air service additions, scheduled passenger enplanements have significantly increased since late 2009, and newly anticipated air service additions are anticipated to continue to increase enplanement levels through 2012. As was shown in Table 2 and previously mentioned, monthly seats and passengers increased with the introduction of American Airlines service to Dallas-Fort Worth in September of 2009. There was also another noted increase in enplanements with the introduction of American Airlines service to Chicago-O'Hare in late November of 2010. The current air carrier schedules include three daily round-trips to Dallas-Fort Worth and one daily round-trip to Chicago-O'Hare.

**Table 3-4** summarizes the number of enplanements through April for 2009, 2010, and 2011. As shown below scheduled year to date passenger enplanements through April are currently 44% higher than in 2010, putting the airport on pace for 56,320 scheduled passenger enplanements in 2011. It has also been recently announced that a second MHK-ORD round-trip flight, five times per week will be initiated in November of 2011. This will be approximately 13,000 additional departing seats in 2012 above the 2011 seats. The ORD service has been having slightly lower load factors than the DFW service, therefore assuming a 70% load factor on these seats indicates that 2012 will likely have an additional 9,100 scheduled passenger enplanements than the anticipated 2011 level.

Given these recent significant increases in scheduled passenger enplanements, the projected 2011 and 2012 passenger levels will be included as evaluation years in this analysis.

**Table 3-4**
**Projected 2011 Scheduled Passenger Enplanements**

| Year | Year to Date Enplanements Through April | Percent Change | Annual Enplanements |
|---|---|---|---|
| 2009 | 3,507 | | 19,225 |
| 2010 | 10,991 | 213% | 39,126 |
| 2011 | 15,821 | 44% | *56,320* |
| 2012 | - | - | *65,420* |

[1] 2011 Estimated at 44% over 2010 Enplanement Level
[2] Includes full year addition of 2nd daily ORD round trip 5x per week

Sources: Monthly Enplanements - Airport Records
Projections - Mead & Hunt

Given the significant recent changes in the air service levels and passenger levels at MHK, historical trend line analysis isn't appropriate. Therefore a market share methodology was used to project future scheduled passenger enplanements. The market share methodology compares activity levels at an airport to a larger geographical region as a whole over a given length of time. For the purposes of this analysis the market share methodology compares activity at Manhattan Regional Airport with total U.S. domestic enplanements. The FAA develops national forecasts annually in its FAA Aerospace Forecast document, taking into consideration such items as projected U.S. and world economies, gross domestic products, fuel prices, carrier capacities, and other considerations.

As shown in **Table 3-5**, the anticipated number of enplanements in 2011 is 56,320, which represents 0.0086 percent of the total U.S. domestic market. The market share methodology applies this market share to projections of total U.S. domestic enplanement projections described in the FAA Aerospace Forecasts 2011-2031 (see Table 5).

**Table 3-5**
**Projected Scheduled Passenger Enplanements**

| | Market Share Methodology | | |
|---|---|---|---|
| **Year** | **MHK Enplanements** | **Total U.S. Domestic Enpl (mil)** | **MHK Market Share** |
| **Historical:** | | | |
| 2006 | 10,860 | 668.4 | 0.0016% |
| 2007 | 11,313 | 690.1 | 0.0016% |
| 2008 | 11,649 | 680.7 | 0.0017% |
| 2009 | 19,225 | 630.8 | 0.0030% |
| 2010 | 39,126 | 635.3 | 0.0062% |
| **Projected:** | | | |
| 2011 | 56,320 | 654.0 | 0.0086% |
| 2012 | 65,420 | 675.0 | 0.0097% |
| 2015 | 72,931 | 752.5 | 0.0097% |
| 2020 | 83,960 | 866.3 | 0.0097% |
| 2025 | 93,623 | 966.0 | 0.0097% |
| 2030 | 102,511 | 1,057.7 | 0.0097% |
| *CAGR (2010-2030)* | *4.93%* | *2.58%* | |
| *CAGR (2011-2030)* | *3.20%* | *2.56%* | |

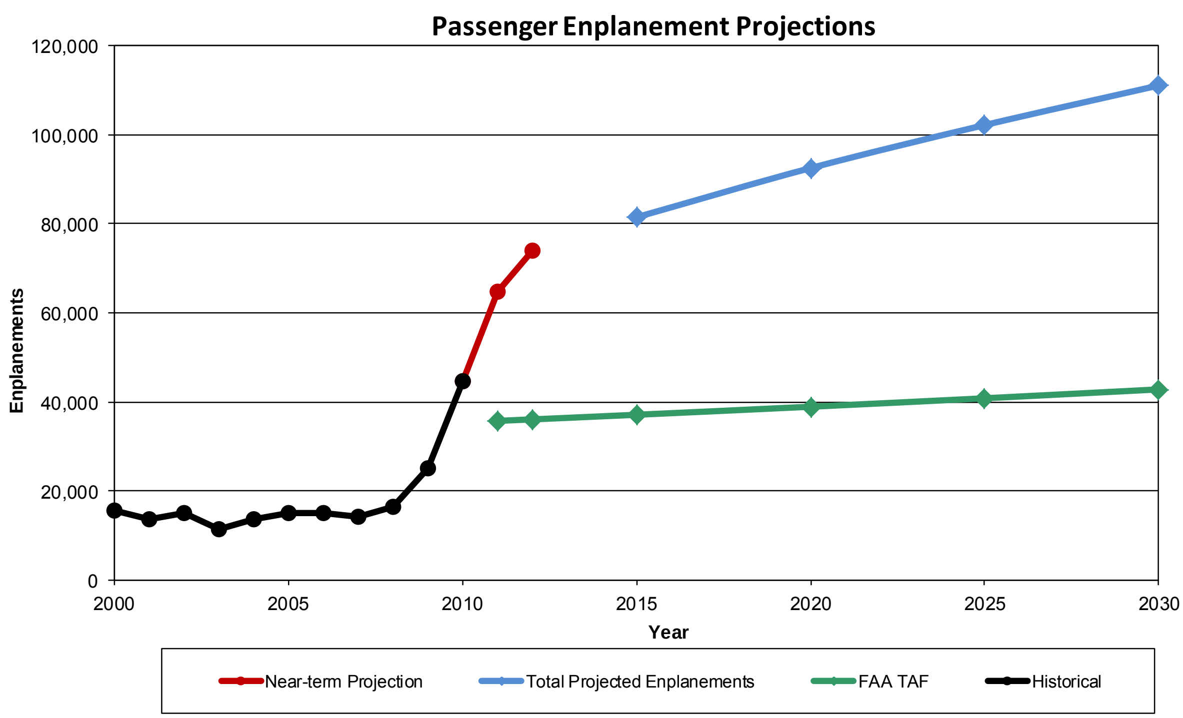
Notes: CAGR = Compounded Annual Growth Rate
Sources: Hist Enplanements - 2006-2009 FAA Office of Planning & Programming; 2010 Airport Records
Total U.S. Domestic Enplanements - FAA Aerospace Forecasts 2011-2031
Projections - Mead & Hunt

### 3.1.4 Total Passenger Enplanement Projections

**Table 3-6** summarizes the total scheduled and nonscheduled passenger enplanement projections in comparison to the FAA Terminal Area Forecasts.

**Table 3-6**
**Passenger Enplanement Projections Summary**

| Year | Scheduled Enplanements | Nonscheduled Enplanements | Total Enplanements | FAA TAF Total Enplanements |
|---|---|---|---|---|
| **Historical:** | | | | |
| 2000 | NA | NA | 15,490 | 14,592 |
| 2001 | NA | NA | 13,543 | 14,566 |
| 2002 | NA | NA | 15,085 | 14,236 |
| 2003 | NA | NA | 11,395 | 8,950 |
| 2004 | NA | NA | 13,479 | 6,555 |
| 2005 | NA | NA | 15,140 | 13,088 |
| 2006 | 10,860 | 4,109 | 14,969 | 13,167 |
| 2007 | 11,313 | 2,716 | 14,029 | 14,037 |
| 2008 | 11,649 | 4,840 | 16,489 | 13,757 |
| 2009 | 19,225 | 5,849 | 25,074 | 17,863 |
| 2010 | 39,126 | 5,357 | 44,483 | 35,365 |
| *CAGR (2000-2010)* | | | *11.13%* | |
| **Projected:** | | | | |
| 2011 | 56,320 | 8,520 | 64,840 | 35,702 |
| 2012 | 65,420 | 8,520 | 73,940 | 36,042 |
| 2015 | 72,931 | 8,520 | 81,451 | 37,082 |
| 2020 | 83,960 | 8,520 | 92,480 | 38,887 |
| 2025 | 93,623 | 8,520 | 102,143 | 40,783 |
| 2030 | 102,511 | 8,520 | 111,031 | 42,777 |
| *CAGR (2010-2030)* | *4.93%* | *2.35%* | *4.68%* | *0.96%* |




Notes: CAGR = Compounded annual growth rate.
Sources: Historical Enplanements - Airport Records
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

## 3.2 Commercial Aircraft Operations Forecasts

The following sections describe projections of aircraft operations. As with passenger enplanements, several factors are taken into account when assessing demand in both commercial and non-commercial operations. Forecasts have been developed for the following categories:

- Commercial Operations
- Air Carrier Fleet Mix

### 3.2.1 Commercial Operations

Commercial operations can be either scheduled or un-scheduled. Typically, un-scheduled commercial flights are chartered flights or air taxi flights. In recent years, the proportion of un-scheduled operations at Manhattan Regional Airport has decreased.

***Scheduled Commercial Passenger Operations Projections***

National trends in aviation demand have been volatile in recent years. The events that occurred on 9/11/2001 had a significant impact on collective national travel behavior, and the economic recession that began in 2008 has resulted in fewer passenger enplanements at several airports in the U.S. With recent increases in aircraft operating costs, airlines have been forced to maximize fleet efficiency in order to remain profitable, if not sustainable.

In many markets, air carriers are reducing or retiring less fuel efficient aircraft with regional and larger jets that have more seats and lower operational costs per passenger. In many markets, the use of larger aircraft is reducing the frequency of particular routes. Because of increasing fuel and operational costs, air carriers must maintain higher passenger load factors to remain profitable. Projections of scheduled commercial operations are based on enplanement projections described in Section 2.2. At Manhattan Regional Airport, the average number of seats per aircraft departure has changed significantly since the introduction of the 50 regional jet services and the discontinuance of the 19 seat turboprop service. The number of seats per departure is projected to continue to rise as 50 seat regional jets are replaced with 70 to 90 seat regional jets both nationally and in the MHK market. Additionally the market has the strong potential for narrowbody service (which is typically 130 to 150 seats) a few times per week to leisure destinations, and would be anticipated to increase the average seat size. The number of seats per departure is anticipated to increase from 39.8 in 2010, to 62.0 in 2015, 63.0 in 2020, 64.0 in 2025, and 65.0 in 2030. Passenger load factor is also anticipated to remain steady through the projection period. The load factor is projected to slowly increase through the projection period from, 75% in 2015 to US regional carrier average of 77%. **Table 3-7** presents the projected average seats per departure and load factor.

**Table 3-7**
**Average Seat/Departure and Load Factor Projection**

| | Average Seats/Dep | | Load Factor % (Domestic) | |
|---|---|---|---|---|
| Year | MHK | US Regional Carrier Fleet | MHK | US Regional Carrier Fleet |
| **Historical:** | | | | |
| 2008 | 19.0 | 52.8 | 34.6% | 73.7% |
| 2009 | 22.4 | 55.0 | 38.4% | 74.3% |
| 2010 | 39.8 | 56.2 | 73.9% | 75.8% |
| **Projected:** | | | | |
| 2015 | 62.0 | 58.6 | 75.0% | 76.8% |
| 2020 | 63.0 | 60.8 | 75.0% | 77.1% |
| 2025 | 64.0 | 63.1 | 76.0% | 77.2% |
| 2030 | 65.0 | 65.4 | 77.0% | 77.3% |

Sources: Hist Average Seat Data - apgDat
Hist Load Factor Calculated from Historial Passengers (airport records), Historcial Seats (apgDat)
Hist and Projected US Carrier Fleet Avg/Seats & Load Factor - FAA Aerospace Forecasts FY2011-2031
Projections - Mead & Hunt, Inc.

To calculate future scheduled commercial operations, the average number of seats per departure at the Airport is multiplied by the passenger load factor. Projected passenger enplanements are divided by this figure to obtain scheduled commercial passenger departures. It is assumed that the number of annual commercial departures and arrivals will be the same; departures are multiplied by two to calculate projected scheduled commercial operations (see **Table 3-8**). 2,613 scheduled commercial operations are projected in 2015, 2,960 in 2020, 3,250 in 2025, and 3,503 in 2030, a CAGR of 1.39 percent.

**Table 3-8**
**Scheduled Passenger Operations Projection**

| Year | Scheduled Enplanements | Scheduled Passenger Dep | Average Seats/Dep | Load Factor | Scheduled Passenger Ops |
|---|---|---|---|---|---|
| **Historical:** | | | | | |
| 2008 | 11,649 | 1,773 | 19.0 | 34.6% | 3,546 |
| 2009 | 19,225 | 2,237 | 22.4 | 38.4% | 4,474 |
| 2010 | 39,126 | 1,330 | 39.8 | 73.9% | 2,660 |
| **Projected:** | | | | | |
| 2015 | 72,931 | 1,568 | 62.0 | 75.0% | 3,137 |
| 2020 | 83,960 | 1,777 | 63.0 | 75.0% | 3,554 |
| 2025 | 93,623 | 1,925 | 64.0 | 76.0% | 3,850 |
| 2030 | 102,511 | 2,048 | 65.0 | 77.0% | 4,096 |
| *CAGR (2010-2030)* | *4.93%* | *2.18%* | | | *2.18%* |

Sources: Hist Enplanements - Airport Records
Hist Scheduled Air Carrier Dep's and Avg Seat Data - apgDat
Projections - Mead & Hunt, Inc.

**Table 3-9** presents the historical and projected scheduled passenger fleet. Commercial aircraft equipped with 40 or fewer seats left the market in early 2010 and the market is currently served exclusively with 50 seat regional jets. As noted it is anticipated that 50 seat regional jets will be replaced with 70 to 90 seat regional jets by the carriers through the projection period, both nationally and at MHK. Additionally service by narrowbody aircraft, with 130 to 150 seats, a few times per week to leisure destinations, is anticipated through the projection period.

**Table 3-9**
**Scheduled Carrier Fleet Mix Projection**

| Seat Range | Typical Aircraft | Historical Departures 2008 | 2009 | 2010 | Projected - Departures 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| Less than 40 | Beech 1900, EMB120, Saab340 | 1,773 | 1,992 | 312 | 0 | 0 | 0 | 0 |
| | | *100.0%* | *89.0%* | *23.5%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* |
| 40-60 | CRJ200, ERJ145 | 0 | 245 | 1,018 | 1,145 | 1,226 | 1,251 | 1,249 |
| | | *0.0%* | *11.0%* | *76.5%* | *73.0%* | *69.0%* | *65.0%* | *61.0%* |
| 61-99 | CRJ700, CRJ900, EMB170 | 0 | 0 | 0 | 298 | 409 | 520 | 635 |
| | EMB175 | *0.0%* | *0.0%* | *0.0%* | *19.0%* | *23.0%* | *27.0%* | *31.0%* |
| 100-130 | B717, DC9, EMB190, EMB195 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | A319 | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* |
| 131-150 | A320, MD80, B737-5 | 0 | 0 | 0 | 125 | 142 | 154 | 164 |
| | | *0.0%* | *0.0%* | *0.0%* | *8.0%* | *8.0%* | *8.0%* | *8.0%* |
| 151 or more | B737-8, B737-9, B757 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* | *0.0%* |
| Total Scheduled Passenger Aircraft Departures | | 1,773 | 2,237 | 1,330 | 1,568 | 1,777 | 1,925 | 2,048 |
| Average Seats Per Departure | | 19.0 | 22.4 | 39.8 | 62.0 | 63.0 | 64.0 | 65.0 |
| Total Scheduled Seats | | 33,664 | 50,043 | 52,953 | 97,241 | 111,947 | 123,188 | 133,131 |

Sources: Historical Scheduled Departures and Average Seat Data - apgDat
Projections - Mead & Hunt, Inc.

**Nonscheduled Commercial Passenger Operations Projections**

As noted earlier, nonscheduled passenger operations at MHK are quite substantial. These flights are typically passenger charters for military personnel to/from Ft. Riley, and university athletic charters to/from Kansas State University (KSU) for athletic events.

The FBO noted that in both 2009 and 2010 runway construction was occurring at MHK which reduced the amount of runway length available and forced some larger charter operations to other airports. For 2010 the FBO estimated the number of diverted charter flights as twenty-five narrow body (B757, B737, A320) type aircraft departures and the same number of return arrivals. It is assumed that these 50 operations have a similar fleet split between B757 (9%), B737 (76%), and A320 (15%) charter flights as the remainder of 2010 Ft. Riley passenger charters.

Charter activity associated with KSU is fairly consistent, being comprised primarily of narrowbody aircraft for KSU or visiting team football team charters and regional jets for basketball and volleyball charters. There are also some occasional fan charters to high profile away games such as college football bowl games. This activity is generally fairly consistent and anticipated to remain so through the forecast period.

Troop transport associated with Ft. Riley is primarily to transfer military personnel. This activity has increased slightly over the past few years as the population at Ft. Riley has increased. This activity is anticipated to remain at or about the same as the activity that would have occurred in 2010 if not for the runway project.

**Table 3-10** summarizes the projected unscheduled passenger operations; demand through the projection period is anticipated to remain about the same as the 2010 demand.

**Table 3-10**
**Nonscheduled airline activity by type**

| | 2010 Operations | | | | Projected Operations | | | |
|---|---|---|---|---|---|---|---|---|
| **Aircraft Type** | **KSU** | **Ft. Riley** | **Diverted** | **Total Demand** | **2015** | **2020** | **2025** | **2030** |
| **Total Charter Operations** | | | | | | | | |
| B757 | 4 | 5 | 4 | 13 | 13 | 13 | 13 | 13 |
| A320 | 1 | 9 | 8 | 18 | 18 | 18 | 18 | 18 |
| B737 | 3 | 44 | 38 | 85 | 85 | 85 | 85 | 85 |
| A319 | | | | 0 | 0 | 0 | 0 | 0 |
| MD-80 | 5 | | | 5 | 5 | 5 | 5 | 5 |
| DC9 | 4 | | | 4 | 4 | 4 | 4 | 4 |
| CRJ 200 | | | | 0 | 0 | 0 | 0 | 0 |
| EMB145 | 19 | | | 19 | 19 | 19 | 19 | 19 |
| Dornair 328 | 21 | | | 21 | 21 | 21 | 21 | 21 |
| EMB120 | 9 | | | 9 | 9 | 9 | 9 | 9 |
| Total | 66 | 58 | 50 | 174 | 174 | 174 | 174 | 174 |

Sources: Total Charter Flight Demand, FBO (Kansas Air Center)

## 3.3 Based Aircraft Forecasts

There are several factors that affect the number of aircraft at an airport. The overall cost to own and operate an aircraft has increased significantly in recent years, which contributed to a slight decline in the U.S. general aviation fleet since 2007; at Manhattan Regional Airport the number of based aircraft has fluctuated been between 45 and 54.

Total U.S. fleet projections are obtained from the FAA Aerospace Forecasts 2011-2031. MHK's market share of the total U.S. general aviation fleet has fluctuated between approximately 0.019% and 0.026% from 2000 to 2010, with an average of 0.022%. The Market Share Projection Methodology assumes that the Airport's market share will slightly increase from its current 0.020%, to its historic average of 0.022 by the year 2030. As shown below, the market share methodology projects 47 based aircraft in 2015, 50 in 2020, 55 in 2025 and 60 in 2030, a CAGR of 1.42 percent.

**Table 3-11**
**Based Aircraft Projections**

| | | Market Share Methodology | | |
|---|---|---|---|---|
| **Year** | **FAA TAF** | **Based Aircraft** | **Total U.S. Active Aircraft** | **Market Share** |
| **Historical:** | | | | |
| 2000 | 45 | 45 | 217,533 | 0.021% |
| 2001 | 54 | 54 | 211,446 | 0.026% |
| 2002 | 54 | 54 | 211,244 | 0.026% |
| 2003 | 54 | 54 | 209,606 | 0.026% |
| 2004 | 54 | 54 | 219,319 | 0.025% |
| 2005 | 54 | 54 | 224,350 | 0.024% |
| 2006 | 45 | 45 | 221,939 | 0.020% |
| 2007 | 45 | 45 | 231,606 | 0.019% |
| 2008 | 45 | 45 | 228,668 | 0.020% |
| 2009 | 45 | 45 | 223,920 | 0.020% |
| 2010 | 45 | 45 | 224,172 | 0.020% |
| | | | *Average (2000-2010)* | 0.022% |
| **2011** | | | | |
| 2015 | 49 | 47 | 229,140 | 0.021% |
| 2020 | 51 | 50 | 237,795 | 0.021% |
| 2025 | 56 | 55 | 250,560 | 0.022% |
| 2030 | 61 | 60 | 267,055 | 0.022% |
| *CAGR (2010-2030)* | *1.53%* | *1.42%* | *0.88%* | |

Notes: CAGR = Compounded Annual Growth Rate
Sources: Hist Based Aircraft - FAA Terminal Area Forecast
Total U.S. Active Aircraft - FAA Aerospace Forecasts 2011-2031
Projections - Mead & Hunt

## 3.4 Based Aircraft Fleet Mix

Historical based aircraft by type and the projected based aircraft fleet mix at Manhattan Regional Airport is shown below. In 2010 73 percent of the local fleet was comprised of single engine aircraft and 27 percent multi-engine aircraft, with no based jet aircraft. The FAA Aerospace Forecast 2011-2031 projects that jet aircraft will see the most significant growth of any type of aircraft through 2030. This is a trend that is also anticipated to occur locally as jet aircraft are expected to increase to five percent by 2030.

**Table 3-12**
**Based Aircraft Fleet Mix Projections**

| | Single Engine | | Multi-Engine | | Jet | | Helicopter | | Other | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **#** | **%** | **#** | **%** | **#** | **%** | **#** | **%** | **#** | **%** | **Total** |
| **Historical:** | | | | | | | | | | | |
| 2000 | 29 | 64% | 16 | 36% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| 2001 | 42 | 78% | 12 | 22% | 0 | 0% | 0 | 0% | 0 | 0% | 54 |
| 2002 | 42 | 78% | 12 | 22% | 0 | 0% | 0 | 0% | 0 | 0% | 54 |
| 2003 | 42 | 78% | 12 | 22% | 0 | 0% | 0 | 0% | 0 | 0% | 54 |
| 2004 | 42 | 78% | 12 | 22% | 0 | 0% | 0 | 0% | 0 | 0% | 54 |
| 2005 | 48 | 89% | 6 | 11% | 0 | 0% | 0 | 0% | 0 | 0% | 54 |
| 2006 | 33 | 73% | 12 | 27% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| 2007 | 33 | 73% | 12 | 27% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| 2008 | 33 | 73% | 12 | 27% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| 2009 | 33 | 73% | 12 | 27% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| 2010 | 33 | 73% | 12 | 27% | 0 | 0% | 0 | 0% | 0 | 0% | 45 |
| **Projected:** | | | | | | | | | | | |
| 2015 | 34 | 71% | 13 | 27% | 1 | 2% | 0 | 0% | 0 | 0% | 47 |
| 2020 | 35 | 69% | 14 | 27% | 2 | 4% | 0 | 0% | 0 | 0% | 50 |
| 2025 | 38 | 69% | 15 | 27% | 2 | 4% | 0 | 0% | 0 | 0% | 55 |
| 2030 | 41 | 68% | 16 | 27% | 3 | 5% | 0 | 0% | 0 | 0% | 60 |
| *CAGR (2010-2030)* | *1.04%* | | *1.48%* | | *NA* | | *NA* | | *0.00%* | | *1.42%* |

Notes: CAGR = Compounded Annual Growth Rate.
Numbers may not add due to rounding
Sources: Historical Based Aircraft - FAA Terminal Area Forecasts
Projections - Mead & Hunt, Inc.

## 3.5 General Aviation Operations Forecasts

General aviation operations are those which are not categorized as commercial or military. General aviation activity at the Airport has declined in recent years. In 2010 the number of annual operations per based aircraft was 351. This figure is applied to the projected number of based aircraft as described in Section 2.4 and results in 16,600 general aviation operations in 2015, 17,700 in 2020, 19,150 in 2025, and 20,943 in 2030, a CAGR of 1.42 percent.

**Table 3-13**
**General Aviation Operations Projection**

| Year | Based Aircraft | Operations per Based Aircraft | Total Operations |
|---|---|---|---|
| **Historical:** | | | |
| 2002 | 45 | 590 | 26,534 |
| 2003 | 54 | 468 | 25,274 |
| 2004 | 54 | 487 | 26,279 |
| 2005 | 54 | 426 | 23,020 |
| 2006 | 54 | 359 | 19,370 |
| 2007 | 54 | 399 | 21,568 |
| 2008 | 45 | 379 | 17,071 |
| 2009 | 45 | 371 | 16,710 |
| 2010 | 45 | 351 | 15,793 |
| | *Avg (2002-2010)* | *426* | |
| **Projected:** | | | |
| 2015 | 47 | 351 | 16,600 |
| 2020 | 50 | 351 | 17,700 |
| 2025 | 55 | 351 | 19,150 |
| 2030 | 60 | 351 | 20,943 |
| *CAGR (2010-2030)* | *1.42%* | | *1.42%* |

Notes: CAGR = Compounded Annual Growth Rate
Sources: Historical Operations - Air Traffic Activity Data System (ATADS)
Projections - Mead & Hunt, Inc.

Historically, itinerant general aviation operations have comprised approximately 56% of the total general aviation operations, while local operations have accounted for approximately 44% percent of total general aviation operations. It is anticipated that this split will remain constant throughout the projection period. A summary of projected local and itinerant general aviation operations is shown below.

**Table 3-14**
**General Aviation Operations Summary**

| Year | Total GA Operations | Itinerant GA Operations | Itinerant GA Percent | Local GA Operations | Local GA Percent |
|---|---|---|---|---|---|
| **Historical:** | | | | | |
| 2002 | 26,534 | 14,962 | 56% | 11,572 | 44% |
| 2003 | 25,274 | 15,257 | 60% | 10,017 | 40% |
| 2004 | 26,279 | 15,127 | 58% | 11,152 | 42% |
| 2005 | 23,020 | 12,898 | 56% | 10,122 | 44% |
| 2006 | 19,370 | 11,560 | 60% | 7,810 | 40% |
| 2007 | 21,568 | 11,372 | 53% | 10,196 | 47% |
| 2008 | 17,071 | 10,034 | 59% | 7,037 | 41% |
| 2009 | 16,710 | 9,046 | 54% | 7,664 | 46% |
| 2010 | 15,793 | 8,278 | 52% | 7,515 | 48% |
| | | *Average (2002-2010)* | *56%* | *Average (2002-2010)* | *44%* |
| **Projected:** | | | | | |
| 2015 | 16,600 | 9,371 | 56% | 7,229 | 44% |
| 2020 | 17,700 | 9,993 | 56% | 7,708 | 44% |
| 2025 | 19,150 | 10,811 | 56% | 8,339 | 44% |
| 2030 | 20,943 | 11,823 | 56% | 9,120 | 44% |
| *CAGR (2010-2030)* | *1.42%* | *1.80%* | | *0.97%* | |

Notes: CAGR = Compounded Annual Growth Rate.
Sources: Historical Operations - Air Traffic Activity Data System (ATADS)
Projections - Mead & Hunt, Inc.

## 3.6 Military Operations Forecasts

Military operations are driven more by policy decisions than by economic conditions, therefore military operations have been projected to remain at their average 2002-2010 levels. The number of military operations at the Airport is anticipated to remain flat throughout the projection period.

**Table 3-15**
**Military Operations Projection**

| | Itinerant | | Local | | |
|---|---|---|---|---|---|
| **Year** | **Operations** | **%** | **Operations** | **%** | **Total** |
| **Historical:** | | | | | |
| 2002 | 1,057 | 62% | 658 | 38% | 1,715 |
| 2003 | 1,123 | 78% | 316 | 22% | 1,439 |
| 2004 | 1,240 | 81% | 284 | 19% | 1,524 |
| 2005 | 946 | 60% | 636 | 40% | 1,582 |
| 2006 | 728 | 40% | 1,106 | 60% | 1,834 |
| 2007 | 1,019 | 25% | 3,014 | 75% | 4,033 |
| 2008 | 530 | 76% | 165 | 24% | 695 |
| 2009 | 977 | 34% | 1,890 | 66% | 2,867 |
| 2010 | 516 | 69% | 232 | 31% | 748 |
| *Avg (2002-2010)* | *904* | *58%* | *922* | *42%* | *1,826* |
| **Projected:** | | | | | |
| 2015 | 1,066 | 58% | 761 | 42% | 1,826 |
| 2020 | 1,066 | 58% | 761 | 42% | 1,826 |
| 2025 | 1,066 | 58% | 761 | 42% | 1,826 |
| 2030 | 1,066 | 58% | 761 | 42% | 1,826 |

Sources: Historical Military Operations - FAA Air Traffic Activity Data System (ATADS)
Projections - Mead & Hunt, Inc.

## 3.7 Peak Passenger Activity and Operations Forecasts

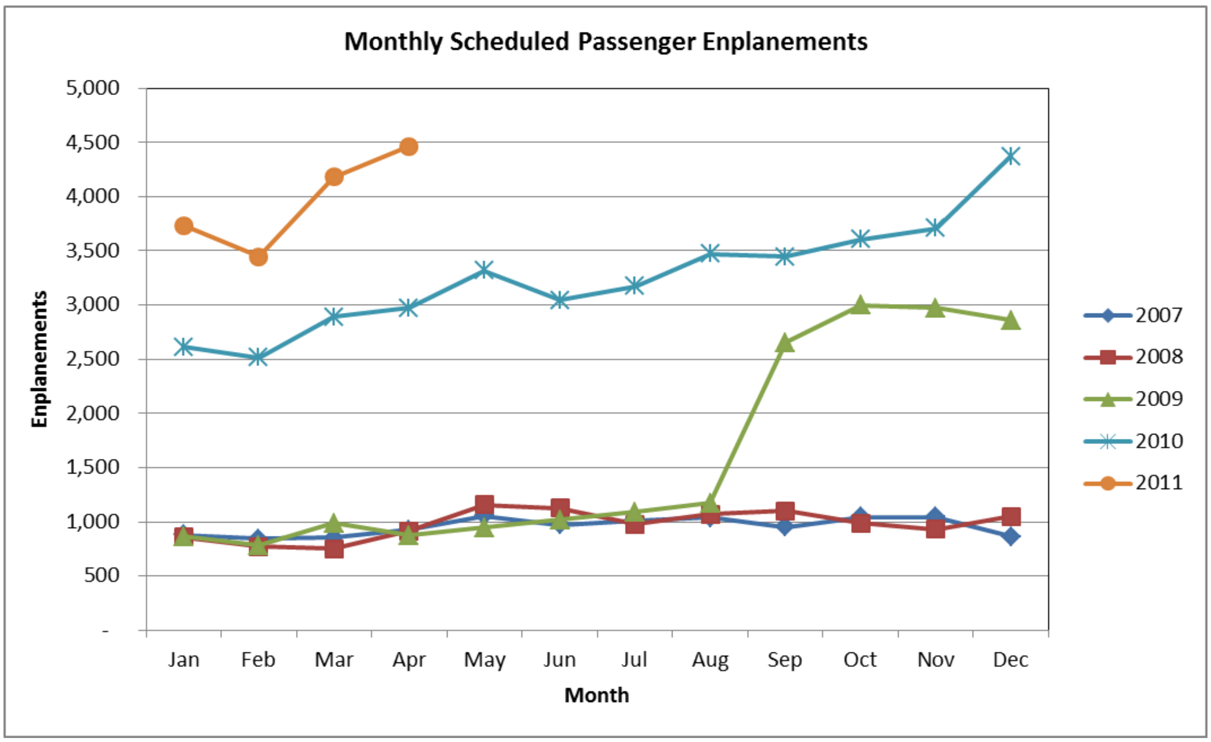
Planning for facilities and equipment requirements is often based on peak periods of passenger and aircraft activity. This section identifies monthly, daily, and hourly peaking characteristics for passenger and aircraft activity at Manhattan Regional Airport.

### 3.7.1 Peak Enplanements and Passenger Activity Forecasts

**Table 3-16** presents scheduled monthly passenger enplanements. As shown below, significant air service changes recently have made the determination of a peak month for the current American Airlines service to DFW and ORD difficult. Examination of the steady 2007 and 2008 monthly passenger levels, which had consistent air service levels, indicates that the months are fairly equal with a slight peak in May with 9.9% of the annual activity.

**Table 3-16**
**Historical Monthly Passenger Enplanements**

| Month | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|
| Jan | 879 | 857 | 862 | 2,612 | 3,734 |
| Feb | 843 | 773 | 784 | 2,516 | 3,444 |
| Mar | 855 | 752 | 985 | 2,888 | 4,179 |
| Apr | 925 | 915 | 876 | 2,975 | 4,464 |
| May | 1,054 | 1,157 | 944 | 3,317 | |
| Jun | 971 | 1,124 | 1,017 | 3,045 | |
| Jul | 1,013 | 976 | 1,092 | 3,174 | |
| Aug | 1,037 | 1,072 | 1,173 | 3,472 | |
| Sep | 952 | 1,100 | 2,652 | 3,447 | |
| Oct | 1,044 | 985 | 3,000 | 3,603 | |
| Nov | 1,045 | 930 | 2,974 | 3,708 | |
| Dec | 864 | 1,049 | 2,862 | 4,369 | |
| Total | 11,482 | 11,690 | 19,221 | 39,126 | |
| Peak Month | 1,054 | 1,157 | 3,000 | 4,369 | |
| Percent | 9.2% | 9.9% | 15.6% | 11.2% | |




Sources: Monthly Enplanements - Airport Records

It is assumed that peak monthly enplanements and deplanements will be equal, and that peak month enplanements will continue to be 9.9 percent of annual activity. This figure is applied to projections of passenger enplanements described in Section 2 and shown in **Table 3-17**.

**Table 3-17**
**Peak Month Scheduled Passenger Enplanements**

| Year | Annual Enplanements | Peak Month % of Total | Peak Month Enplanements | Peak Month Deplanements | Peak Month Total Activity |
|---|---|---|---|---|---|
| **Historical** | | | | | |
| 2010 | 39,126 | 11.2% | 4,369 | 4,369 | 8,738 |
| **Projected** | | | | | |
| 2011 | 56,320 | 9.9% | 5,576 | 5,576 | 11,151 |
| 2015 | 72,931 | 9.9% | 7,220 | 7,220 | 14,440 |
| 2020 | 83,960 | 9.9% | 8,312 | 8,312 | 16,624 |
| 2025 | 93,623 | 9.9% | 9,269 | 9,269 | 18,537 |
| 2030 | 102,511 | 9.9% | 10,149 | 10,149 | 20,297 |

Sources: Monthly Enplanements - Airport Records
Projections - Mead & Hunt

## 3.7.2 Peak Daily Passenger Activity Forecasts

It should be noted that planning for facility and equipment requirements is based on the probable demand that may occur over time. If planning is contingent on the absolute busiest periods of activity, it can lead to overestimation, overspending, and inefficiencies. Daily peak activity figures are based on a typical day during the peak month. It is assumed that the peak month is May, with 31 days. Peak month enplanements/deplanements are divided by the number of days in the peak month to determine the average daily passenger enplanements/deplanements that occur in the peak month. **Table 3-18** presents the peak month average day scheduled passenger activity.

**Table 3-18**
**Peak Month Average Day Scheduled Passenger Enplanements**

| Year | Peak Month Enpl/Depl | Day in Peak Month | Peak Month - Average Day (Scheduled) Enplanements | Peak Month - Average Day (Scheduled) Deplanements | Peak Month - Average Day (Scheduled) Total Activity |
|---|---|---|---|---|---|
| **Historical** | | | | | |
| 2010 | 4,369 | 31 | 141 | 141 | 282 |
| **Projected** | | | | | |
| 2011 | 5,576 | 31 | 180 | 180 | 360 |
| 2015 | 7,220 | 31 | 233 | 233 | 466 |
| 2020 | 8,312 | 31 | 268 | 268 | 536 |
| 2025 | 9,269 | 31 | 299 | 299 | 598 |
| 2030 | 10,149 | 31 | 327 | 327 | 655 |

Sources: Monthly Enplanements - Airport Records
Projections - Mead & Hunt

## 3.7.3 Peak Hour Passenger Activity Forecasts

The number of arriving and departing seats according to the current daily air carrier schedule is depicted in **Table 3-19**.

**Table 3-19**
**Current Scheduled Carrier Schedule/Ramp Chart**

| Arrivals | | | | | Departures | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Carrier** | **Origin** | **Arr time** | **Equip** | **Seats** | **Carrier** | **Dest** | **Dep Time** | **Equip** | **Seats** |
| AA | | | | | AA | DFW | 0635 | ER4 | 50 |
| AA | | | | | AA | ORD | 0725 | ER4 | 50 |
| AA | DFW | 1120 | ER4 | 50 | AA | DFW | 1155 | ER4 | 50 |
| AA | DFW | 1645 | ER4 | 50 | AA | DFW | 1725 | ER4 | 50 |
| AA | ORD | 2100 | ER4 | 50 | AA | | | | |
| AA | DFW | 2135 | ER4 | 50 | AA | | | | |

Sources: ApgDat - September 2011 Schedule

Peak hour departing seats occurs between 6:30am and 7:30am, and peak hour arriving seats occurs between 9:00pm and 10:00pm. It has recently been announced that a second daily MHK-ORD round-trip flight, five times per week will be initiated in November 2011. The schedule for this flight has it arriving at noon and departing at 12:40 pm. This additional flight would create a second arrival and departure peak of equal size to the current early morning departure peak and late night arrival peak.

The percentage of daily seats during the peak hour is applied to the average daily passenger figures and shown in **Table 3-20**.

**Table 3-20**
**Scheduled Peak Hour Passenger Projections**

| **Time of Day** | **Number of Seats** | **Total Daily Seats** | **Percent of Day in Peak Hour (PH)** |
|---|---|---|---|
| Peak Hour Departing Seats (Enplanements) | | | |
| 0630 to 0730 | 100 | 200 | 50.0% |
| Peak Hour Arriving Seats (Deplanements) | | | |
| 2100 to 2200 | 100 | 200 | 50.0% |

| **Peak Hour** | **Average Day Passengers** | | **Peak Hour Passengers** | |
|---|---|---|---|---|
| | | | **Enplanements** | **Deplanements** |
| **Year** | **Enplanements** | **Deplanements** | ***50.0%*** | ***50.0%*** |
| **Historical** | | | | |
| 2010 | 141 | 141 | 70 | 70 |
| **Projected** | | | | |
| 2011 | 180 | 180 | 90 | 90 |
| 2015 | 233 | 233 | 116 | 116 |
| 2020 | 268 | 268 | 134 | 134 |
| 2025 | 299 | 299 | 149 | 149 |
| 2030 | 327 | 327 | 164 | 164 |

Source: ApgDat - September 2011 Schedule
Projections- Mead & Hunt

**Peak Hour Including Nonscheduled Passenger Operations**

In accordance with FA Advisory Circular 150/5360-13, *Planning and Design Guidelines for airport Terminal Facilities* nonscheduled operaitons are normally not considered the primary basis for terminal planning and it is recommended that they be evaluated separately.

As noted earlier, nonscheduled charter passenger operations at MHK are quite substantial. These flights are typically passenger charters for military personnel to/from Ft. Riley, and university athletic charters to/from Kansas State University (KSU) for athletic events. Charter activity is summarized in **Table 3-21**.

**Table 3-21**
**Charter Activity**

| | | 2010 Operations | | | | Projected Operations | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Aircraft Type** | **Approx Seats** | **KSU** | **Ft. Riley** | **Diverted** | **Total Demand** | **2015** | **2020** | **2025** | **2030** |
| **Total Charter Operations** | | | | | | | | | |
| B757 | 200 | 4 | 5 | 4 | 13 | 13 | 13 | 13 | 13 |
| A320 | 165 | 1 | 9 | 8 | 18 | 18 | 18 | 18 | 18 |
| B737 | 150 | 3 | 44 | 38 | 85 | 85 | 85 | 85 | 85 |
| A319 | 140 | | | | 0 | 0 | 0 | 0 | 0 |
| MD-80 | 140 | 5 | | | 5 | 5 | 5 | 5 | 5 |
| DC9 | 125 | 4 | | | 4 | 4 | 4 | 4 | 4 |
| CRJ 200 | 50 | | | | 0 | 0 | 0 | 0 | 0 |
| EMB145 | 50 | 19 | | | 19 | 19 | 19 | 19 | 19 |
| Dornair 328 | 32 | 21 | | | 21 | 21 | 21 | 21 | 21 |
| EMB120 | 30 | 9 | | | 9 | 9 | 9 | 9 | 9 |
| Total | | 66 | 58 | 50 | 174 | 174 | 174 | 174 | 174 |

Sources: Total Charter Flight Demand, FBO (Kansas Air Center)
Projections - Mead & Hunt

Currently not all charters use the terminal building for passenger processing, partly due to the deficiencies in size of the existing terminal building facilities. The ability to accommodate charter operations through the terminal building should be evaluated and protected for to the extent practicable due to the regular and reoccurring nature of these operations at MHK. That being said, due to the erratic nature and atypical operations of many of these charter operations the impact of the charter activity will need to be evaluated on a facility by facility basis in terms of terminal planning and facility requirements. For instance some many large charters are University football teams and their baggage can be transferred directly to their charter bus upon arrival and will never need to be processed through the baggage claim facilities. However there are also a number of public charters which are operated and handled just like a regularly scheduled airline flight.

The total peak hour passenger demands would include the regularly occurring charter activity in addition to the regularly scheduled commercial activity. A good portion of the charter activity is made up of narrowbody aircraft with 140 to 165 seats at various times throughout the day, therefore the addition of a charter flight of this size, in addition to the regularly scheduled activity should be considered. **Table 3-22** summarizes the peak hour activity associated with the scheduled and charter activity.

**Table 3-22**
**Peak Hour Passengers - Scheduled & Charter**

| | Number of Seats | Load Factor | Passengers |
|---|---|---|---|
| Charter Flight | 165 | 85.0% | 140 |

**Peak Hour Passengers - Scheduled & Charter**

| | Scheduled Airlines | | Nonscheduled | Total Peak Hour Passengers | |
|---|---|---|---|---|---|
| **Year** | **Enplanements** | **Deplanements** | **Charter** | **Enplanements** | **Deplanements** |
| **Historical** | | | | | |
| 2010 | 70 | 70 | 140 | 211 | 211 |
| **Projected** | | | | | |
| 2011 | 90 | 90 | 140 | 230 | 230 |
| 2015 | 116 | 116 | 140 | 257 | 257 |
| 2020 | 134 | 134 | 140 | 274 | 274 |
| 2025 | 149 | 149 | 140 | 290 | 290 |
| 2030 | 164 | 164 | 140 | 304 | 304 |

Source: ApgDat - September 2011 Schedule
Charter Activity, FBO (Kansas Air Center)
Projections- Mead & Hunt

## 3.8 Forecast Summary and FAA TAF Comparison

Passenger and aircraft activity at the Manhattan Regional Airport has increased significantly in recent history. The FAA template for summarizing and documenting airport planning forecasts and for comparing projections with the FAA TAF Forecasts are presented in **Table 3-23** and **Table 3-24**. The recent increases in air service have resulted in passenger projections that are well above the FAA TAF forecasts. The airport had 44,563 enplanements in 2010, and is on pace for over 56,000 enplanements in 2011. These totals are well above the TAF's 2030 projection of 42,777 enplanements, indicating that the FAA's TAF projections need to be revised to reflect the current air service and passenger volumes at the airport.

**Table 3-23**
**FAA Template for Summarizing and Documenting Airport Planning Forecasts**

**A. Forecast Levels and Growth Rates**

Specify base year: 2010

| | 2010 | 2015 | 2020 | 2025 | 2030 | Average CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Base Yr. Level | Base Yr. + 5yr. | Base Yr. + 10yrs. | Base Yr. + 15yrs. | Base Yr. + 20yrs. | Base Yr. + 5yr. | Base Yr. + 10yrs. | Base Yr. + 15yrs. | Base Yr. + 20yrs. |
| **Passenger Enplanements** | | | | | | | | | |
| TOTAL Air Carrier & Commuter | 44,483 | 81,451 | 92,480 | 102,143 | 111,031 | 12.9% | 7.6% | 5.7% | 4.7% |
| **Operations** | | | | | | | | | |
| Itinerant | | | | | | | | | |
| Air carrier | 100 | 972 | 1,227 | 1,472 | 1,723 | 46.1% | 25.6% | 18.3% | 14.5% |
| Commuter/air taxi | 3,148 | 2,339 | 2,501 | 2,551 | 2,548 | -4.8% | -2.1% | -1.3% | -1.0% |
| Total Commercial Operations | 3,248 | 3,311 | 3,728 | 4,024 | 4,270 | 0.3% | 1.3% | 1.3% | 1.3% |
| General aviation | 8,278 | 9,371 | 9,993 | 10,811 | 11,823 | 2.1% | 1.7% | 1.7% | 1.7% |
| Military | 516 | 1,066 | 1,066 | 1,066 | 1,066 | 12.8% | 6.8% | 4.6% | 3.5% |
| Local | | | | | | | | | |
| General aviation | 7,515 | 7,229 | 7,708 | 8,339 | 9,120 | -0.6% | 0.2% | 0.7% | 0.9% |
| Military | 232 | 761 | 761 | 761 | 761 | 21.9% | 11.4% | 7.7% | 5.8% |
| TOTAL OPERATIONS | 19,789 | 21,737 | 23,255 | 25,000 | 27,040 | 1.6% | 1.5% | 1.5% | 1.5% |
| **Based Aircraft** | | | | | | | | | |
| Single Engine (Nonjet) | 33 | 34 | 35 | 38 | 41 | 0.3% | 0.5% | 0.8% | 1.0% |
| Multi Engine (Nonjet) | 12 | 13 | 14 | 15 | 16 | 1.0% | 1.2% | 1.3% | 1.4% |
| Jet Engine | 0 | 1 | 2 | 2 | 3 | - | - | - | - |
| Helicopter | 0 | 0 | 0 | 0 | 0 | 0.0% | 0.0% | 0.0% | 0.0% |
| Other | 0 | 0 | 0 | 0 | 0 | 0.0% | 0.0% | 0.0% | 0.0% |
| TOTAL | 45 | 47 | 50 | 54 | 60 | 0.9% | 1.0% | 1.2% | 1.4% |

**B. Operational Factors**

| | Base Yr. Level | Base Yr. + 5yr. | Base Yr. + 10yrs. | Base Yr. + 15yrs. | Base Yr. + 20yrs. |
|---|---|---|---|---|---|
| **Average aircraft size (seats)** | | | | | |
| Air carrier & Commuter | 39.8 | 62.0 | 63.0 | 64.0 | 65.0 |
| **Average enplaning load factor** | | | | | |
| Air carrier & Commuter | 73.9% | 75.0% | 75.0% | 76.0% | 77.0% |
| **GA operations per based aircraft** | 351 | 351 | 351 | 352 | 351 |

CAGR = Compound Annual Growth Rate

**Table 3-24**
**FAA Template for Comparing Airport Planning and TAF Forecasts**

| | Year | Airport Forecast | TAF | AF/TAF (% Difference) |
|---|---|---|---|---|
| **Passenger Enplanements** | | | | |
| Base Yr. Level | 2010 | 44,483 | 35,365 | 25.8% |
| Base Yr. + 5yr. | 2015 | 81,451 | 37,082 | 119.7% |
| Base Yr. + 10yrs. | 2020 | 92,480 | 38,887 | 137.8% |
| Base Yr. + 15yrs. | 2025 | 102,143 | 40,783 | 150.5% |
| Base Yr. + 20yrs. | 2030 | 111,031 | 42,777 | 159.6% |
| **Commercial Operations** | | | | |
| Base Yr. Level | 2010 | 3,248 | 3,754 | -13.5% |
| Base Yr. + 5yr. | 2015 | 3,311 | 3,848 | -14.0% |
| Base Yr. + 10yrs. | 2020 | 3,728 | 3,943 | -5.5% |
| Base Yr. + 15yrs. | 2025 | 4,024 | 4,042 | -0.5% |
| Base Yr. + 20yrs. | 2030 | 4,270 | 4,142 | 3.1% |
| **Total Operations** | | | | |
| Base Yr. Level | 2010 | 19,789 | 21,649 | -8.6% |
| Base Yr. + 5yr. | 2015 | 21,737 | 20,899 | 4.0% |
| Base Yr. + 10yrs. | 2020 | 23,255 | 21,772 | 6.8% |
| Base Yr. + 15yrs. | 2025 | 25,000 | 22,686 | 10.2% |
| Base Yr. + 20yrs. | 2030 | 27,040 | 23,651 | 14.3% |

**NOTES: TAF data is on a U.S. Government fiscal year basis (October through September).**
**Airport Forecast is on a calendar year basis.**

FLYMHK
Manhattan Regional Airport

# Chapter 4

# Demand Capacity Analysis and Determination of Facility Requirements

## Introduction

The airport terminal complex serves as a point of interchange between ground and air transportation. The manner in which this interchange takes place at MHK will influence a passenger's first impressions of the city of Manhattan and the surrounding region. The efficiency with which an airport functions can be studied in an analysis of the facility's capacity, compared with its operational requirements.

This Chapter of the Terminal Area Master Plan identifies existing and long-range terminal area facility requirements currently anticipated for the airport through the year 2030. The capacity of the existing terminal area facilities are described and assessed against the aviation demand projections in the previous chapter. The purpose of this analysis is to determine the requirements for future facility improvements, based on industry standards and guidelines that have been developed by the FAA.

This chapter is organized into the following sections:

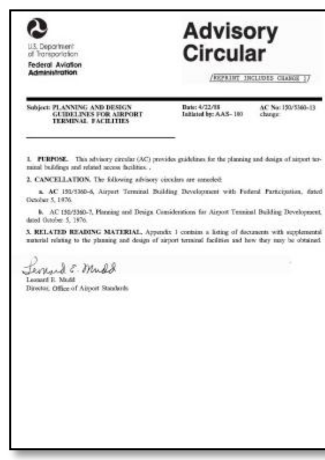
- Terminal Building
- Parking Lot
- Terminal Apron

## 4.1 Passenger Terminal Facility Requirements

This portion of the chapter develops facility requirements for the terminal building by assessing existing space and projecting future requirements, based on forecasted peak enplanement increases. Chapter 3, the Aviation Demand Forecasts chapter, projects an increase in annual enplanements at a steady rate over the next 20 years. Overall, air carrier and commuter travel is projected to increase at MHK at a compound annual growth rate of 4.68 percent over the next 20 years. This increase will come from a combination of more flight operations along with a projected increase in average aircraft size and load factors. As the number of passengers per flight increases, a corresponding rise in peaking activity will occur. "Peak hour" is the time in which a terminal building will experience the most concentrated public use and all facilities must be capable of adequately meeting the facility demands of this point in time.

Some of the recommendations for changes to the facilities are the result of shortfalls, and others will improve operational performance. At this point in time, for example, operational performance can be improved by advancements made in technology and energy efficient construction, which are addressed at the end of this portion of the chapter. The recommendations for future requirements are developed by comparing the projected level of activity at the terminal building to industry standards. Several key resources providing guidelines and recommendations for terminal facilities are listed below:

- FAA's Advisory Circular (AC) 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations
- FAA's Advisory Circular (AC) 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities


U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

REPRINT INCLUDES CHANGE 1

Subject: PLANNING AND DESIGN GUIDELINES FOR AIRPORT TERMINAL FACILITIES

Date: 4/22/88
Initiated by: AAS-100

AC No: 150/5360-13
change:

1. PURPOSE. This advisory circular (AC) provides guidelines for the planning and design of airport terminal buildings and related access facilities.

2. CANCELLATION. The following advisory circulars are canceled:

a. AC 150/5360-6, Airport Terminal Building Development with Federal Participation, dated October 5, 1976.

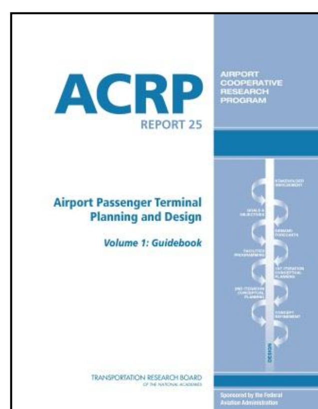
b. AC 150/5360-7, Planning and Design Considerations for Airport Terminal Building Development, dated October 5, 1976.

3. RELATED READING MATERIAL. Appendix 1 contains a listing of documents with supplemental material relating to the planning and design of airport terminal facilities and how they may be obtained.

Leonard E. Mudd
Director, Office of Airport Standards

These Circulars were developed in the 1980s and, while some of the recommendations they provide are still useful today, some of the guidelines are no longer relevant. More recent references have been developed by various entities to address current airport terminal facility requirements. These references include:

- Transportation Security Administration's Checkpoint Design Guide
- Airport Cooperative Research Program (ACRP) Report 25: Airport Passenger Terminal Planning and Design.




The approach of referencing and comparing several guidelines has led to the successful development of many airports. For this reason, the guidelines listed above will be used as references throughout this document, as well as consultant developed factors that have been based on prior experience with airport work. This portion of the chapter will compare the size of existing areas in the terminal building with current facility requirements and with projected facility requirements. Shortfalls will be identified and recommendations will be provided to address these shortfalls. The goal of the recommendations for changes to the facilities is to enable the airport to identify current facility shortfalls and to meet projected demand over the planning period, which extends to the year 2030. In addition, it should be noted that airport terminal planning is invariably affected by changing technology, by changes in airline industry operation, and by economic forces that affect passenger processing and terminal function. To extend the life of the facility, it is beneficial for an airport terminal design to factor in the ability for the facility to adapt to future changes and to unexpected growth.

## 4.2 Existing Terminal Building

The terminal building is 12,670 square feet in overall area and was built in 1996 to serve the 19-passenger Beech 1900. It is a one-story structure with a linear layout, which is consistent in form with recommendations for airports with enplanement numbers similar to MHK per Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities. Restrooms, car rental and bag claim are to the left of the main entry, while public seating, airport administration, Airline Ticket Offices (ATO) and bag screening are to the right of the main entry. The hold room, security checkpoint, and a small concession occupy the center of the building as shown in **Figure 4.1**.

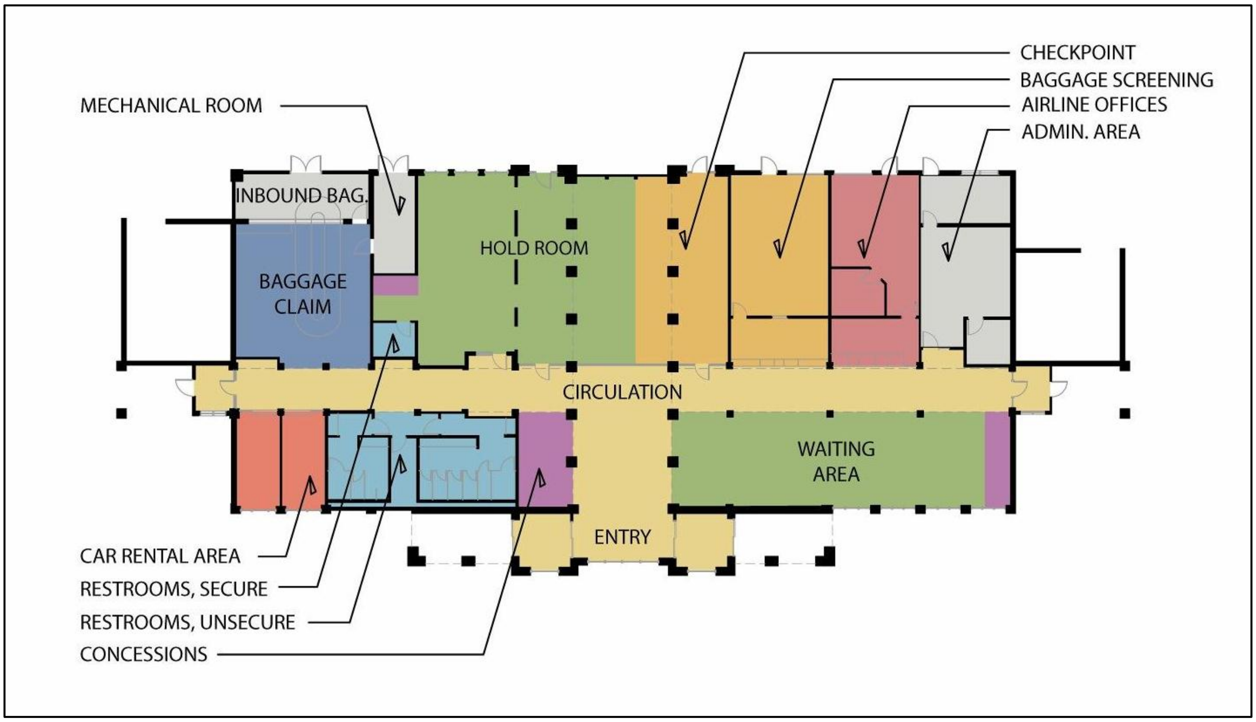



**FIGURE 4.1: MANHATTAN REGIONAL AIRPORT EXISTING FLOOR PLAN**

### 4.2.1 Analysis of Overall Size of Terminal Building

An analysis of overall square footage of the terminal building will determine if the facility is sized adequately for the number of passengers it services annually. The objective is to calculate current and future space requirements through the 20-year planning period, in order for airport operations to continue efficiently.

A useful tool for determining the rough overall terminal building size is a guideline that is provided in FAA Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, which estimates 150 square feet of terminal space for each peak hour passenger. It should be noted that the guideline above generally applies to terminal buildings that have at least 250,000 annual enplanements however, Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, which applies to smaller airports, provides only a recommendation for minimum terminal building size, and no a guideline based on enplanement numbers. Applying this guideline to growth projections from Chapter 3, **Table 4-1** shows a year 2015 passenger terminal size of 38,500 square feet and the projected size for the year 2030 of 45,600 square feet. Assuming that design and construction of a significant terminal addition would take several years, “Current Requirements” in this document will target needs for the year 2015. Although more precise space recommendations will be determined later in this chapter, this information is useful in providing an overview of the appropriate terminal size to meet FAA guidelines and to provide an adequate level of service for passengers.

**Table 4-1.**
**Manhattan Regional Airport – Forecasted Enplanements Relationship to Overall Terminal Floor Area**

| | Existing Floor Area | Current Requirements | Year 2030 Requirements |
|---|---|---|---|
| Peak Hour Passengers | - | 257 | 304 |
| Area (SF) | 12,670 | 38,500 | 45,600 |
| % Growth | - | 304% | 360% |


Beechcraft 1900D

When planning for airport terminal interior spaces, it is important to not only consider peak hour enplanement numbers, but also to consider the aircraft fleet mix, since it will affect the sizing of facilities and determination of equipment to service the aircraft. At the time the terminal building was constructed, the 19-seat Beech 1900 was the commercial aircraft that served MHK. The existing terminal had the flexibility to accommodate larger aircraft up to 50-seats, until security requirements changed after events of 9/11/01. Chapter 3, Forecasts of Aviation Demand gives a detailed analysis of projected aircraft fleet mix and notes that the market is currently served almost exclusively by regional jets with 50 seats. The number of seats per aircraft is projected to continue to rise as 50 seats regional jets are replaced with 70 to 90 seat regional jets. Additionally, occasional service by narrow body aircraft with 150 to 200 seats is anticipated through the projection period. The scheduled Carrier Fleet Mix projection can be found in Chapter 3. Detailed descriptions of the individual spaces and the methodologies that were used to calculate the projected space requirements are further elaborated in the following section.

Boeing 757

In addition to commercial service, nonscheduled passenger operations at MHK are substantial. These nonscheduled operations primarily consist of narrow body charters for Ft. Riley military personnel and Kansas State University (KSU) athletic events. This document will provide recommendations that will provide the terminal building with the ability to serve the charters for KSU as they will be utilizing the terminal, while Ft. Riley charters are not. Instead, Ft. Riley personnel are bussed directly between the aircraft and Ft. Riley. The nonscheduled Fleet Mix project can be found in Chapter 3.

## 4.3 Terminal Space Requirements by Area

The types of space that are inside an airport terminal are divided into categories in order to quantify facility requirements. The first division of these spaces is between usable and non-usable areas. Usable areas are defined as those areas that are the occupiable parts of the facility, located within the structure. This includes both common areas and rentable areas. Non-usable areas are those areas, such as building structure, chases and utilities, which are required for the building to function. Usable area is further divided into revenue generating and non-revenue generating areas. Revenue generating spaces generally refer to those that are leased areas and non-revenue generating spaces are those that are unleased.

### 4.3.1 Usable Area: Revenue Generating Space

Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, recommends that up to 55 percent of a passenger terminal facility's usable area be revenue generating, though the amount at non-hub airports is typically much less. These spaces include areas leased by airlines for ticketing counters, offices, and operations. The airline spaces often include areas for baggage make-up and passenger support in hold rooms. Other revenue generating space includes car rental agencies and concessions, which provide food, beverage and retail options to travellers. All other leased spaces within the passenger terminal facility are also considered to be in the revenue generating category.

Revenue generating spaces are addressed individually in the following sections.

### 4.3.1.1 Airline Tenant Space

Airline tenant space includes areas used by airlines to conduct passenger services as well as for airline administrative and operational functions. These include airline ticketing counters, airline ticketing and operations offices, and baggage make-up areas or outbound baggage.

### 4.3.1.2 Airline Ticketing Counters


The counter length recommended by Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, for a two-position ticketing counter with bag wells is approximately 10 lineal feet. In practice, however, counter lengths for two-position ticketing positions vary from airline to airline, and changing technology is reducing the amount of space an airline requires at the ticket counter. At non-hub airports, a two-position counter is standard for most commuter airlines and a four position ticketing counter is sufficient for most regional and major airlines. Manhattan Regional Airport currently has a single commuter airline and several charter operations. Air service studies and aviation activity forecasts show that there is demand for additional carriers and additional space for the existing carrier at the ticket counters. The existing ticket counter length for the airline is about 19 feet. There is an additional 20 feet of counter length at the TSA baggage screening area, which was originally designed as a space for a second airline.

Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, recommends roughly 55 lineal feet of ticket counter length, however this Circular was written before electronic ticketing kiosks and other ticketing technology improvements, which have affected ticketing operational space requirements, resulting in a reduction in the amount of space needed for both airline offices and ticketing queuing. Consequently, two 2-position counters at approximately 20 lineal feet each would meet current demand. This ticket counter length of 40 lineal feet total restores the airport's ability to expand the current airline space or provide space for a second airline. In the future, an additional 40 lineal feet beyond that will be required to provide expansion opportunities for additional space for the existing carrier or for additional carriers. In addition, it is recommended that the space for ticketing kiosks is provided near the ticketing queue area, since this location has the benefit of being accessible to both passengers and airline agents.

### 4.3.1.3 Airline Ticketing and Operations Offices

At most medium and small airports, airline operational efficiencies are realized if airline functions are centralized in the space located behind the ticketing counter. Airline ticketing offices, (ATOs), are typically located here and are often used by staff to handle related administrative and operational duties, such as accounting, management and communications. It is also common for storage and break rooms to be included in these spaces. Current airline business operations, as well as online and kiosk options for passengers, have resulted in a reduced need for airline office space.

The existing area for ATOs is 551 square feet and includes space formerly used for baggage make-up. The original design of the existing terminal provided space for an additional 610 square feet for ATOs, however this space is currently occupied by the TSA baggage screening area.

According to the Advisory Circular, the current facility requirements for the ATO area are for 5,000 square feet of space and projected requirements for the year 2030 are for 6,000 square feet, however, the Advisory Circular also assumes that the bag make-up occurs within this area. A consolidated baggage handling system, which is now typical for airports of this size, removes the baggage make-up area from the individual ATOs and places it in an outbound tug drive, which is shared by all of the airlines. In addition, changes in technology and operations have reduced the airline's need for space in the terminal building. With a consolidated baggage handling system, recommendations for current ATO requirements would be 1,400 square feet and, projected 2030 requirements, for the area would be 2,250 square feet of space.

### 4.3.1.4 Outbound Baggage

The outbound baggage or baggage make-up area is used for sorting and loading of baggage onto carts to be towed to the enplaning aircraft. In the past, baggage was manually carried or mechanically conveyed between the ticketing counter directly to the baggage make-up area, within a single airline's leased space. Current TSA requirements are for all baggage to be screened by the TSA prior to being brought into the baggage make-up area and loaded onto an aircraft. These requirements have affected the process of moving baggage through an airport. Prior to changes in the bag screening process, each airline had its own baggage make-up area. Currently, TSA is encouraging the use of a centralized bag screening area for airports of this size, resulting in a single outbound baggage room, which is shared by all airlines. This change in process results in the airlines having a greatly reduced need for individual baggage make-up areas, and an increased usage of a shared outbound tug drive.

There is currently no interior space for baggage make-up to occur, so existing baggage processing occurs on the apron outside the bag screening area. This results in a situation in which airline workers and baggage are exposed to weather during the process of loading baggage carts. In addition, the door from the bag screening area must remain open while baggage is loaded onto carts, which leaves the door open for an extended amount of time. This results in the loss of conditioned air from the building to the outside environment, as well as presenting the opportunity for fumes from aircraft and ground service equipment to enter the building.

Since a consolidated baggage system was not generally recommended for an airport of this size in the past, FAA Advisory Circulars do not provide size recommendations for an enclosed common use outbound baggage room. The recommended size for the outbound baggage room is based on size and maneuverability of tugs and the baggage conveyance and staging areas. The recommended size for an enclosed outbound baggage area for current facility requirements are 1,900 square feet, and for 2030 is 3,200 square feet. This enclosed area is minimally conditioned and acts as a weather lock, preventing conditioned air from escaping the building as well as fumes from aircraft and Ground Service Equipment (GSE) from entering the building.

#### 4.3.1.5 Concessionaire Services

Terminal concessionaire services are defined as all commercial, revenue-producing functions that serve the public. These services provide food, beverage and retail options to travellers on both the sterile and non-sterile side of the checkpoint. Sterile areas are those spaces that are located past the security checkpoint, which are only accessible to ticketed passengers and authorized personnel. Non-sterile or public areas are the universally accessible areas, which are located before the security checkpoint. Concession services on the non-sterile side of the checkpoint are often utilized not only by passengers, but also by non-passengers who are at the airport to drop off or pick up passengers. Concession services on the sterile side of the checkpoint not only contribute to passenger convenience, but are often necessary for their well-being since passengers are often unable to leave the sterile portion of the terminal in order to find food and other necessities, once they have passed through the security checkpoint.

Prior to the security measures instituted after the events of 9/11/2001, food service amenities were traditionally located close to the entry of the terminal. Now, however, the security checkpoint effectively divides the airport into two distinct parts: the sterile and non-sterile areas. This has resulted in many existing food service amenities being unavailable to passengers who have passed through the security checkpoint. This is the case at MHK. Additionally, many airlines have reduced in-flight meal services. For these reasons, it is important for future airport terminal design to allow passengers to have food and beverage options available on the sterile side of the checkpoint. Vending areas supplement the staffed facilities, especially when flight times do not coincide with the operating hours of the concessions.

The existing combined area for food service, retail concessions and vending areas is approximately 380 square feet. The existing space for sterile vending is 25 square feet. Existing space for non-sterile food service and vending is 355 square feet. There is currently no retail service or sterile food service at this facility.

Recommendations for concession space is concurrent with Figure 6-9 of Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, which recommends approximately 1,840 square feet of overall concession area to meet current passenger levels and 1,920 square feet to meet projected 2030 passenger levels. Typically, the actual amount of food concession area will vary, depending on the individual concessionaire needs. Care should be taken in appropriately locating these services in sterile and non-sterile areas, and in working with concessionaires to appropriately size the spaces according to concessionaire needs. Note that it is not necessary for each of these services to be provided by separate venders.

#### 4.3.1.6 Car Rental


Car rental facilities at airport terminal buildings generally include an office area with a front counter and sufficient space in front of counters for queuing. Car rental facilities are typically located in close proximity to the baggage claim area, and in such a way as to provide easy access to the car rental parking area outside the building.

The existing car rental combined office and counter space is 377 square feet for two car rental companies. Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, recommends 80 square feet plus queuing space for each car rental, however, car rental companies typically prefer to have more space than this. The recommended current and 2030 facility requirements will accommodate up to three car rental facilities and calls for 400 square feet for car rental office space, 200 square feet for counter area and 170-180 square feet of queuing area. This is likely to be in conjunction with an off-site car rental quick turnaround (QTA) facility, which will provide additional office, storage and operational area, in addition to washing and fueling facilities to accommodate other requirements for the car rental companies.

### 4.3.2 Usable Area: Non-Revenue Generating Space

These are areas that directly support the function and operation of the airport in its primary purpose, the conveyance of passengers and baggage. These areas include publicly accessible portions of the terminal building such as lobby and seating areas, circulation, public restrooms, passenger queuing areas, and security checkpoints.

Non-revenue generating spaces are addressed individually in the following sections.

#### 4.3.2.1 Restrooms

In public buildings, restroom sizes are dependent on the number of fixtures dictated by local building codes. However, airport restrooms are typically sized more generously to accommodate carry-on bags and to facilitate peak traffic occurrences. In addition, the number of fixtures is increased due to high intensity use directly before and after flights. It is necessary to locate restrooms in both sterile and non-sterile areas, and near high-use facilities, such as the hold room, the baggage claim area and security checkpoint.

At MHK, the existing non-sterile restrooms are located between the front entry and the car rental area. The existing area for non-sterile restrooms is 547 square feet, with 5 fixtures each for men and women. The existing sterile restroom is a single-use room that is 65 square feet. Recommendations for current facility requirements are for 1,550 square feet and, for projected 2030 facility requirements, a total of 1,700 square feet. In addition, it is recommended to provide companion care restrooms at both the sterile and non-sterile sides of the checkpoint.

#### 4.3.2.2 Circulation

Circulation in an airport terminal building allows pedestrian access to each area within the terminal and ties functional elements together. Circulation is the building's hallways and corridors, which usually have ancillary uses and adjacent activities. These activities include seating, drinking fountains, vending machines, and Flight Information Display System (FIDS) monitors all of which can impede the flow of pedestrians through the area, reducing the effective width of the space.

The existing amount of circulation area is 2,300 square feet. This consists of the front entrance lobby and a perpendicular corridor, connecting the various interior spaces together. It should be noted that effective width of the corridor is approximately 8 feet wide, which restricts circulation at peak times, causing congestion near the car rental counters.

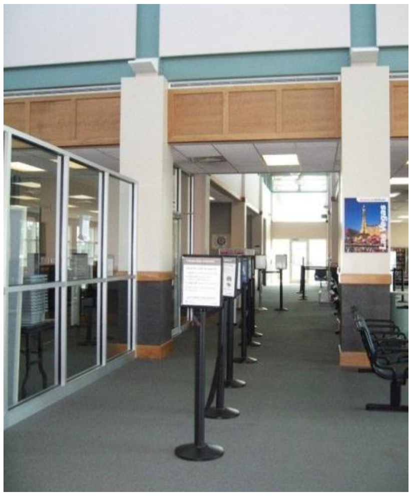
Circulation space needs will depend upon the layout of the facility and the flow of passengers though the various processing points. Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, notes that 20-30% of overall terminal area is typically used for circulation. This high ratio for circulation space is typical for airports since all walkways must be designed for peak use, even though high volume traffic is sporadic. Using lower ratios will compromise the efficiency of building egress and public circulation at times of peak use. The current recommended amount of overall circulation area is 9,850 square feet. The amount of recommended overall circulation area for the year 2030 is 12,300 square feet. In addition, it is recommended to increase the effective minimum width of future major circulation corridors to a minimum of 15 feet.

#### 4.3.2.3 Seating or Public Waiting

Space for public seating is provided on the non-sterile side of the checkpoint, in close proximity to concessions and bag claim areas, as well as near the exit lane of the checkpoint. These spaces are provided for passengers and associated visitors, including well-wishers and meeters/greeters. These areas are particularly important at MHK, due to its proximity to Ft. Riley, and the large number of military personnel and family members who use this facility. In airports such as MHK, which have a high proportion of locally originating passengers, there is a large number of visitors who use the non-sterile public seating and waiting areas.

The existing public seating area is 1,209 square feet. Recommendations for the amount of area for public seating are concurrent with Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, which recommends roughly 1,800 square feet for current facility requirements and 2,130 square feet for 2030 facility requirements.

#### 4.3.2.4 Passenger Queuing Areas



FAA Advisory Circulars express the importance of providing adequate space in locations where passenger queuing occurs, such as ticketing, car rental, security checkpoint. This should be accomplished in a way that prevents queuing from interfering with other terminal functions, such as seating and circulation. Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, recommends a minimum of 10 feet of queuing space in front of car rental counters and 1,400 square feet of area in front of ticket counters for an airport experiencing the projected number of peak hour enplaned passengers for MHK. Additional space in front of ticketing counters should be provided for ticketing kiosks. Queuing areas for ticketing and car rental offices have been previously addressed.

The TSA Checkpoint Design Guide recommends a minimum of 300 square feet per checkpoint lane. The existing checkpoint has approximately 350 square feet of queuing space, however, this is space stanchioned off from an area that was intended to be circulation space. This condition has led to congestion at peak times. While the checkpoint function is not the responsibility of the airport, areas that are directly before or after the checkpoint are airport responsibility. Prior experience at airports of this size has shown us that TSA and the airlines often prefer to open a checkpoint shortly before a scheduled flight. This practice often leads to long passenger queues, which occur in front of the checkpoint before it opens. Without adequate space and stanchions, passengers will customarily queue in a straight line, perpendicular to the checkpoint, which impinges adjacent circulation areas. The recommended amount of floor area for current and year 2030 facility requirements is for a minimum of 750 square feet of queuing area. In addition, the adjacent area for circulation should be generous enough to allow cross traffic and overflow queuing.

### 4.3.2.5 Baggage Claim Area and Claim Devices

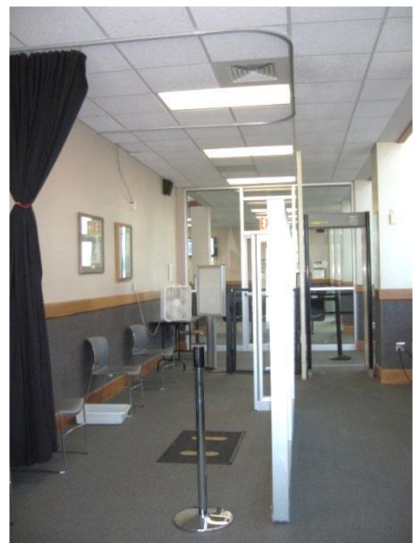
The baggage claim public area provides circulation space for passengers to retrieve bags from the baggage claim device and also provides space for telephone banks, information kiosks, hotel boards and other passenger-related conveniences. Sufficient space should be provided in this area, since meeters/greeters will often arrange to meet passengers in the bag claim area. In an airport of this size, passengers will usually arrive at the bag claim area before the baggage is able to be off-loaded from the aircraft. As a result, perceived wait time for baggage is likely to be longer than actual wait time particularly after a long flight, since a passenger will arrive in the bag claim area before the bags can be unloaded from the aircraft. It is important for passengers to have access to seating in order to pass the wait time comfortably.

The existing bag claim area is 865 square feet. Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, recommends 1,700 square feet to meet 2030 facility demand, however this is no longer accurate since passengers generally have more baggage in today's market than they did when the Circular was written. ACRP Report 25 recommends a space around the claim device that is approximately 15 feet wide to allow sufficient space to unload bags from the baggage claim device. This allowance for space around the claim device, in turn, determines the amount of area to meet current and year 2030 requirements is 4,000 square feet.

The existing baggage claim device is an elongated oval mechanized flatbed claim device with about 55 lineal feet of active claim frontage. Baggage belt length requirements can vary from location to location, and are influenced by types of passengers and changes to airline policy relating to checked baggage fees. Bag claim device frontage requirements at this airport are likely to vary for each flight: military or college passengers who are frequent users of the airport, commonly have larger bags than business or pleasure passengers. In addition, the length of belt should accommodate TSA and airline operational requirements, which require that all baggage is in the non-sterile area prior to turning the claim device off. The projected 2030 requirements, as described by AC 150/5360-9, Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations, call for 65 lineal feet of effective claim frontage; however, since passengers carry more baggage today than when the AC was developed, this standard is outdated.

The recommendations for baggage claim device lengths are based the consultant team's previous experience and ACRP Report 25, which provides a reference of 12 to 18 inches for the amount of space per bag. The recommended lengths are determined by estimating the number of peak hour terminating passengers with bags, applying a length of belt per bag and a multiplier to account for bags being removed from and loaded onto the belt at the same time. The current need for bag belt length is approximately 195 lineal feet, and the year 2030 needs are for approximately 220 lineal feet. Recommendations to meet current needs are to add a new claim device with 120 feet of frontage, and to keep the existing claim device with 55 feet of frontage in service. This is expected to fall somewhat short of current needs, but will be a sizeable improvement over existing conditions. Future recommendations are to install a second claim device with 120 feet of frontage, for a total of 240 lineal feet of frontage. This is expected to be roughly 9% more overall length than needed, however the recommendation for two of the same-sized devices is driven by the overall layout of the baggage claim area. The layouts of both circulation and building structure are typically more efficient when the claim devices are the same length than when they are different lengths.

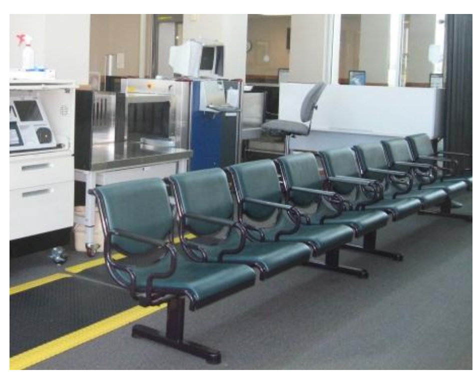
### 4.3.2.6 Security Checkpoint



Location and design are critical to the performance of the security checkpoint, and the efficiency with which it operates often leaves a lasting impression on passengers. The existing checkpoint occupies approximately 650 square feet, and does not have a specific room for private screening. Existing space limitations do not allow sufficient space for divesture and recomposure of personal belongings.

Based on increased enplanement numbers at MHK, it is expected that TSA will upgrade the existing checkpoint equipment in the future, replacing aging equipment, and increasing the rate of checkpoint throughput. The installation of new checkpoint screening equipment will require more space than the existing equipment currently occupies. The TSA's Checkpoint Design Guide shows a standard size for a two-lane checkpoint of about 62'x28', (1,736 square feet), though additional space at the divest table, which occurs prior to screening, and the recomposure area after screening will assist to make the checkpoint run efficiently. 2,000 SF is recommended for the combined checkpoint and divesture area.

### 4.3.2.7 Passenger Hold Room



The passenger hold rooms or departure lounges are provided near the gates, and hold passengers in an area after clearing the security checkpoint and before boarding the aircraft. The TSA requires that hold rooms are within sterile areas of the passenger terminal. These areas provide passenger seating, airline agent podiums for ticket collection, last minute baggage check-in, deplaning aisles, and enplaning passenger queuing aisles.

The existing hold room is undersized for current needs at 1,852 square feet. The code analysis in the Inventory chapter indicated that there is space for 130 occupants in the portion of the room that does not contain the security equipment, however, once internal circulation associated with the security checkpoint has been factored in, the remaining space, (approximately 1,500 SF), is able to accommodate roughly 60 seats. The largest charters that use MHK have approximately 200 seats. Due to the lack of facilities, the passengers of these large flights are unable to be processed inside the terminal building. Instead, they are screened as they pass directly between a bus and the aircraft, without waiting in the hold room. This method is not ideal, since the passengers who are first in line will wait on the aircraft for an extended amount of time while other passengers are screened. Table 5-3 of Advisory Circular 150/5360-13 recommends roughly 3,000-3,800 square feet of hold room area to meet current and year 2030 facility requirements, based on the expected aircraft mix. The recommended amount of hold room floor area for both current and year 2030 is approximately 3,400 SF. In addition, it is recommended that sufficient space is provided in the future for checkpoint-related functions to occur within the checkpoint area.

### 4.3.2.8 Passenger Boarding Bridge


Passengers at MHK currently board the aircraft through use of a boarding ramp. While this type of passenger boarding can offer some flexibility in aircraft parking positions, it has the disadvantages of being inaccessible to mobility-impaired passengers and labor-intensive for airline gate agents, who must monitor and assist in the loading of passengers onto the aircraft. In addition, passengers and gate agents are exposed to weather in this process. A passenger boarding bridge, (PBB), provides a sheltered, secure connection between the terminal building and the aircraft. The PBB can also provide electrical and HVAC service to the aircraft, allowing the aircraft to turn off engines at the gate. In order for bridges to function at MHK, the pivot point at the rotunda is required to be 3 to 4 feet above the apron surface. Floor ramping to reach the rotunda can occur within the building footprint, or it can occur in a fixed bridge portion of the passenger boarding bridge. To meet ADA requirements, this ramp will need to be 36 to 48 feet long.

Providing a passenger boarding bridge would play an important role in increasing the perception of the facility and greatly improve safety, comfort and security of passengers. In addition, providing a PBB would expedite deplaning of passengers. Under the current situation with no PBB, all passengers must remain on the aircraft until the valet luggage is unloaded and moved to the aircraft door. This is necessary to ensure passengers are not waiting on the aircraft parking apron for their valet luggage to be unloaded as this could compromise safety and security. For these reasons, the installation of passenger boarding bridges is recommended at MHK. Passenger boarding bridges installed should be capable of serving both scheduled regional jets and the larger, charter narrow body aircraft at one bridge location. The types of aircraft served by the second bridge will depend on future aircraft scheduled. If regional jets continue to be the predominant aircraft in the future, the second PBB can be designed to primarily serve regional jets.

### 4.3.2.9 Inbound Baggage

The inbound baggage area is typically an enclosed area in which baggage is unloaded from carts onto the non-public side of the bag claim device. When the claim device is set in motion, bags rotate from the non-public inbound baggage side to the public baggage claim area. This enclosed area is minimally conditioned and acts as a weather lock, preventing conditioned air from escaping the building and aircraft/GSE fumes from entering the building.

**Sample of a tug drive**
**Chippewa Valley Regional Airport**

The existing inbound baggage area is too small to provide the benefits of a weather lock at 268 square feet. FAA Advisory Circulars do not provide size recommendations for an enclosed inbound tug drive, since weather protection is not beneficial in all climates. The recommended size for the inbound baggage room is based on size and maneuverability of baggage tugs and the size of baggage conveyance equipment and offload areas. The current and 2030 facility requirements for the inbound baggage area is 2,500 square feet, and provides a space that acts as an airlock and provides weather protection while unloading baggage from carts to the claim device.

**Inbound Baggage Room**
**Manhattan Regional**

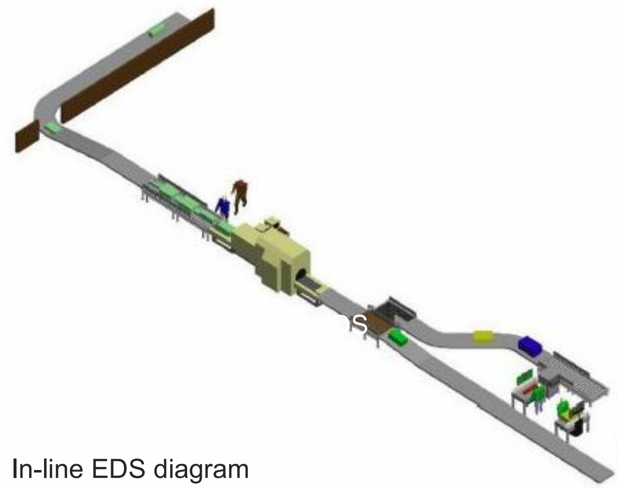
### 4.3.2.10 Bag Screening and Baggage Handling System

As mentioned above, in the outbound baggage section, the TSA requires all baggage to be screened before it is brought into the baggage make-up area and loaded onto an aircraft. For reasons of efficiency, this screening typically occurs in a single location in the terminal and has led to widespread use of consolidated baggage handling systems at most airports.

ETD Baggage Screening


TSA baggage screening currently takes place in an 814 square feet remote room, using explosive trace detection, (ETD). The checked baggage is manually carried or carted into this room from the adjacent ticket counters. Due to increased enplanements, it is expected that TSA will change from ETD bag screening to an Explosives Detection System, (EDS). Since widespread centralized bag screening was not generally recommended for an airport of this size in the past, FAA Advisory Circulars do not provide size recommendations for the baggage screening room and instead this number is provided by TSA based on the size of bag screening equipment. The recommended size for a baggage screening room for current facility requirements are 900 square feet, and for 2030 facility requirements are 1,120 square feet.

The type of bag screening system recommended is a simple, in-line EDS system in which baggage is conveyed directly from the ticket counter to baggage screening. Once screened, the baggage is then conveyed to the baggage make-up area where airline personnel will load the baggage onto a cart. Previously, outbound baggage handling equipment was owned and maintained by each airline. A consolidated baggage handling system becomes the responsibility of the airport.


In-line EDS diagram

### 4.3.3 Non-Usable Area and Building Support

Non-usable areas and building support areas are primary building support spaces, which are necessary for the building to function and maintained. They include space for utilities such as electrical and mechanical systems, as well as space for functional building support such as maintenance and janitor rooms.

#### 4.3.3.1 Building Support Spaces: Building System and Maintenance

Building systems, such as heating, cooling, lighting and plumbing are required to make the terminal functional. In order to realize the unique functional needs of the facility, an effective airport terminal design will coordinate building support requirements with staff during design. Maintenance expectations should also be closely coordinated with the airport staff, since they have long-reaching impacts on the performance of the building in the future.

The existing area for building support space is 256 square feet. FAA guidelines recommend that 15-20 percent of the building's overall area for is allocated for building support space. The amount of space required to meet current demand is 3,100 square feet and year 2030 facility requirements are for 3,650 square feet of building support space. Note that both of these amounts refer to floor area only, and not space for utilities that occurs above the ceiling or outside the building footprint. The design phase will locate chases, dictate width of walls and size of structure. In addition, note that areas shown for spaces in this report do not include chases, walls or structure, which FAA suggests is typically 9% of overall building area.

### 4.3.3.2 Receiving Area / Loading Dock

Receiving areas or loading docks at an airport of this size serves both terminal maintenance and concessions. Advisory Circulars advise use of loading areas, but do not provide size recommendations. ACRP Report 25 recommends a designated loading area, which is away from the front curb, in order to avoid adding delivery vehicle traffic to the terminal curb. Trash receptacles or compactors are also typically co-located with the loading area.

Currently, deliveries occur at the front curb or at one of the side public entrances. It is recommended that the airport consider addition of a dedicated loading area in the future, to separate service vehicle traffic from passenger vehicle traffic. Recommendations for current and 2030 facility requirements call for 300 square feet for a loading room that is to be located in an area that is not accessible or visible to the general public.

### 4.3.3.3 Building Walls and Structure

Building structure and other non-usable space typically occupies 5-10 percent of the gross square footage of an airport terminal building. This includes wall thicknesses and chases that are not accounted for in square footage take-offs.

The existing passenger terminal facility has about 12,670 square feet of overall space. Roughly 1,000 square feet of that space is occupied by walls and structure. Assuming an overall building area of 38,500 square feet, as proposed to meet current facility requirements, the amount of space occupied by building walls and structure would be approximately 3,100 square feet of that area. In a building with 45,600 square feet of area, as proposed to meet year 2030 facility requirements, building walls and structure will occupy 3,600 square feet of that area.

### 4.3.3.4 Airport Administration

Airport management space consists of office space for airport staff, and often provides flexible space that can be used for an incident control center or for a meeting room. This space can be located either inside or outside of the terminal building. Currently, there is 720 square feet of space for airport administration located inside the terminal though, in the future, this space can be relocated to a remote building.

## 4.4 Conclusion for Analysis of Existing Terminal Building

The analysis of existing terminal building performance and projected future performance shows that the terminal building is undersized to meet current facility requirements. As passenger enplanement numbers continue to grow, there will be increased pressure on facility performance. Many of the existing spaces are inadequate for projected airport operations, though the amount of increased space required is not proportional to existing areas. A majority of the recommendations for current facility requirements are only incrementally different or even the same as the recommendations for year 2030 facility requirements. This is because the step from existing facilities to meeting current facility requirements is much larger than the step from current needs to 2030 facility requirements. In addition, many spaces, such as car rental offices and the security checkpoint grow in steps, once certain thresholds are met.

Areas most deficient include the following:

- Baggage Claim
- Airline ticket counters and ATOs
- Concessionaire services
- Restrooms
- Circulation walkways
- Passenger queuing areas
- Security checkpoint
- Building support spaces

**Table 4-2** compiles all of the recommendations for current and year 2030 space requirements, along with the sizes of existing areas

**Table 4-2. Manhattan Regional Airport – Terminal Building Space Inventory**

| Area Description | Existing Area (SF) | Current Required Area (SF) | Year 2030 Required Area (SF) |
|---|---|---|---|
| TSA Security Checkpoint | 644 | 2,000 | 2,000 |
| TSA Office * | 150 | 350 | 350 |
| Checkpoint Exit Lane | 0 | 200 | 200 |
| Checkpoint Queuing | 350 | 750 | 750 |
| Public Circulation – Non-Sterile & Sterile | 2,297 | 9,750 | 12,150 |
| Public Restrooms | 718 | 1,550 | 1,700 |
| Public Waiting | 1,209 | 1,800 | 2,130 |
| Public Business Lounge | 0 | 70 | 70 |
| Hold Room, (+ticket lift) | 1,852 | 3,400 | 3,530 |
| Baggage Claim | 865 | 4,000 | 4,000 |
| Inbound Baggage | 268 | 2,500 | 2,500 |
| Oversized Bags / Circulation | 0 | 250 | 250 |
| Outbound Baggage | 0 | 1,900 | 3,200 |
| Airline Ticket Office | 551 | 900 | 1,400 |
| Ticket Counter Area | 187 | 500 | 850 |
| Ticketing Queue | 106 | 1,400 | 2,400 |
| Rental Car Office | 0 | 400 | 400 |
| Rental Car Counter Area | 377 | 200 | 200 |
| Rental Car Queue | 58 | 170 | 180 |
| Sterile Concessions / Vending | 25 | 800 | 780 |
| Public Concessions / Vending | 355 | 1,040 | 1,140 |
| TSA Baggage Screening | 814 | 900 | 1,120 |
| TSA Ops / Office | 0 | 80 | 110 |
| Wheelchair Storage | 0 | 10 | 10 |
| Local Law Enforcement | 0 | 80 | 80 |
| Receiving | 0 | 300 | 300 |
| Plumb / Mech / Elec / Comm / Janitor / Storage | 256 | 3100 | 3,650 |
| Airport Administration | 720 | 0 | 0 |
| Circulation - Non-Public, Non-Sterile, & Sterile | 0 | 100 | 150 |
| Chases | 39 | ** | ** |
| Building Structure | 979 | ** | ** |
| **Total Area** | **12,670** | **38,500** | **45,600** |
| *existing offsite area not included in total<br>**areas included in areas above | | | |

## 4.5 Additional Information: Passenger Amenities and Technology


While some of the recommendations for changes to the facilities are the result of shortfalls, others will improve operational performance. At this point in time, for example, operational performance can be improved by advancements made in technology and energy efficient construction. Technology is adopted to optimize the functioning of airport terminals. Goals for technology include: Improving facility cost efficiency, making travel more efficient for passengers, as well as improving sustainability. Here are some examples of technology that have recently impacted airport terminals along with a brief discussion of associated impacts:

- Electronic Ticketing: Increased use of electronic tickets and ticket machines is likely to continue reducing demand for ticket agents, and relieving congestion at associated queuing areas. This is likely to affect the overall form of airports, since there will be no need for large ticketing halls. In the near future, expansive space formerly associated with ticket lobbies may be shifted to the bag claim or checkpoint areas, where people now spend more time. Reduced need for ticketing would change traditional layout of airports, and passengers could be dropped off in a location that gave direct access to the checkpoint.

- Self-Bag Check: A self-bag check allows passengers who arrive at the airport with tickets to check baggage without standing in line at ticket counters. This reduces queuing congestion at the ticket lobby. A self-bag check may need to be staffed, and may function in a similar manner to curbside bag check in, except that it occurs inside the airport terminal instead of outside. A passenger bag check is best located in an area in close proximity to the checkpoint.

- Remote Bag Check: Allows passengers to check bags at off-airport locations such as hotels, convention centers and car rental facilities. These bags are delivered to the airport, where they are merged into the airport baggage system. An airport employing remote bag check would require a location for vehicles carrying these bags to bring them to the airport, where they must be screened by TSA before they are merged into the rest of the airport bag system.

- Radio Frequency Identification (RFID): This in-line baggage tag tracking system involves use of a baggage tag with both printed information and an imbedded RFID chip. The chip is read and routed by the baggage system. This technology is being implemented at airports, including Las Vegas, Los Angeles, and Denver, as well as for cargo shipping facilities including Wal-Mart and the US Department of Defense. In the future it is possible that frequent fliers will have a permanent bag tag with a unique RFID identification that will be accepted at many airports.

- Accommodation traveler expectations: Many travelers expect electronic amenities at airport terminals. This includes availability of charging stations for cell phones and computers, Wi-Fi access, and an airport internet interface that will enable passengers to access airport-specific information electronically. While these technologies may not directly change an existing space, the changing expectations of travelers should be considered in upcoming projects.

- Common Use Facilities: Many existing airline facilities, such as gates, hold rooms, and ticket counters are currently utilized exclusively use by a single airline. Often, these facilities are not used continuously over the course of a day. Common use technology enables an airport operator to make these spaces and resources available for use by multiple airlines at different scheduled times. This allows a more efficient use of facilities and increases the capacity of the airport without necessarily increasing the amount of gates, hold rooms, concourses, ticket counters or terminal space. Disadvantages for airlines relating to common use facilities include: less autonomy and more reliance on non-airline staff, less opportunity for branding, a need to train airline staff to use the facilities. Airline advantages include: cost savings relating to renting facilities only when needed, and flexibility of facilities for new service and emergencies. ACRP Synthesis 8, Common Use Facilities and Equipment at Airports describes the following facilities, which have the potential to be common use systems:


Advanced Flight Information Display System, (FIDS): Advanced display techniques allow use of airline logos. It can list real time information pertaining to the flight: arrival/departure time, gate number, bag claim number, and remarks pertaining to the flight, such as delays or gate changes. This system allows for different information to be displayed in different locations, and would dovetail well into a wayfinding and/or common use gate management project. It does not require a layout change to the airport, but would involve a significant information system upgrade. Locations for displays include: ticket lobby, in secure corridor directly after checkpoint, waiting areas, and online access. This system can integrate visual paging and advertising programs.

CUTE (Common Use Terminal Equipment): Implementation of CUTE began at various airports in 1984. This system enables integration with airport systems such as flight information display and dynamic signage. Since a technical specification was not implemented, a number of proprietary operating platforms and implementation methods exist. Airlines using CUTE are required to have a different passenger processing application for use on each platform.

CUPPS (Common Use Passenger Processing System): This is a fully integrated common use system, for use with check in kiosks, ticket counters, gates, boarding controls and information displays. CUPPS is similar to CUTE, (above), except that it utilizes a standardized interface for common use platforms, which is accessible to all airlines. It simplifies procurement, installation, use and maintenance of the common use model.

CUSS (Common Use Self Service): An industry standard, airport provided, check-in kiosk system that allows passengers access to multiple airlines, while preserving airline brand identity.

Gate Management System: A system that guides an aircraft to a gate, reports actual aircraft arrival and departure times, tracks gate utilization, and provides billing accordingly. This system reduces the need for marshallers and reduces congestion on the apron and at gates.

Common use may include any facility that is used by passengers or that services aircraft: baggage claim devices, parking facilities, building physical plant, use of preconditioned air and ground power at gates.

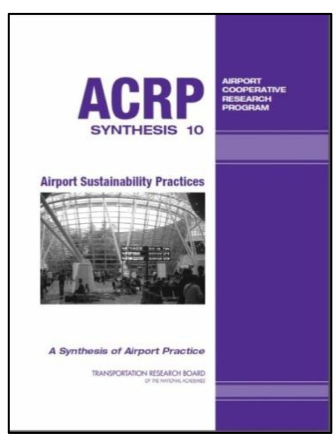
## 4.6 Energy Efficiency

In the past, producing an energy-efficient project has typically been voluntary, but it is becoming increasingly common that a certain level of energy-efficiency in a project is required by federal, state, or local regulations. This not only benefits communities and the environment, it also makes good business sense, since an energy-efficient facility will have reduced utility expenses and operation costs. An example of energy-efficiency in a site project is to use lighting that requires less electricity than conventional lighting. In a building, examples include managing energy use in the building systems and controlling heat gain or loss through the walls, windows, doors, floors and roofs.

Many programs and resources exist to encourage the implementation of sustainable projects at airports. Examples of these are listed below:

- The FAA's VALE program, which provides AIP funding and expedites the environmental review process for qualified projects that will result in a reduction of aircraft emissions or energy demand at a national level.

- Publications by the Transportation Research Board's Airport Cooperative Research Program, including Airport Sustainability Practices (Synthesis 10), Guidebook for Improving Environmental Performance at Small Airports (02-13) and Sustainable Airport Construction Practices (08-01).



- The Sustainable Aviation Guidance Alliance (SAGA) is a coalition of aviation interests formed to assist airport operators in planning, implementing, and maintaining a sustainability program. To this end, SAGA created the Sustainable Aviation Resource Guide: Planning, Implementing, and Maintaining a Sustainability Program at Airports. In addition, the SAGA website serves as a central repository for airport sustainability guidelines and documents.

## 4.7 Parking Lot: Demand Capacity and Facility Requirements

### 4.7.1 Demand Capacity Analysis

Planning for parking is a critical component when determining future terminal area needs, due to the large amount of parking infrastructure required within close proximity to the terminal building. To provide data used to forecast passenger parking needs, average daily "car count" data in the short-term and long-term lots have been collected by MHK staff from February thru October of 2011. These daily average counts of vehicles were used to compare the parking supply to enplanements and to provide a baseline for future planning.

Using the collected parked car data for February thru October, along with peak monthly enplanement data during this same time frame, a correlation between passenger enplanements to vehicles parked at the airport was calculated. This calculated ratio is assuming that future trends of parking and monthly enplanement levels over this same time frame are going to proportionally remain the same. For instance, the peak parking demand at the airport was the third week of March over spring break week at 311 cars. From the monthly enplanement data the peak enplanements, for the same period, were in October at a level of 4,961 passengers. If you take the peak monthly vehicles and divide them by the daily peak monthly enplanement, this will give the baseline ratio to project future parking needs. Example, the peak daily number of cars counted in the long term lot at 311 cars was divided by the peak monthly daily enplanement from October at 4,961 passengers in 31 days or 160 passengers per day. Thus the peak long-term ratio of passengers to cars is 311 vehicles/160 passengers per day equaling 1.94 cars per passenger per day. This ratio shows that passengers are gone for multiple days thus the number of cars in the lot exceeds the number of passengers flying out each day. This calculation was also performed on the data gathered for the short-term lot where a peak usage of 32 vehicles/ by the 160 passengers per day equated to a ratio of 0.19 vehicles per passenger per day. **Table 4-3** lists the average vehicles being parked at the Airport from February through October as well as the monthly enplanements in this same time frame.

**Table 4-3. Manhattan Regional Airport – Baseline Parking Requirements**

| Month (2011) | Monthly Enplanements | Peak # Cars Long Term | Peak # Cars Short Term |
|---|---|---|---|
| February | 3444 | 194 | 29 |
| March – spring break | 4179 | 311 | 25 |
| April | 4464 | 187 | 28 |
| May | 4753 | 234 | 26 |
| June | 4675 | 219 | 26 |
| July | 4542 | 251 | 27 |
| August | 4630 | 239 | 32 |
| September | 4644 | 210 | 29 |
| October | 4961 | 187 | 28 |

**Table 4-4. Manhattan Regional Airport – Short-Term Parking**

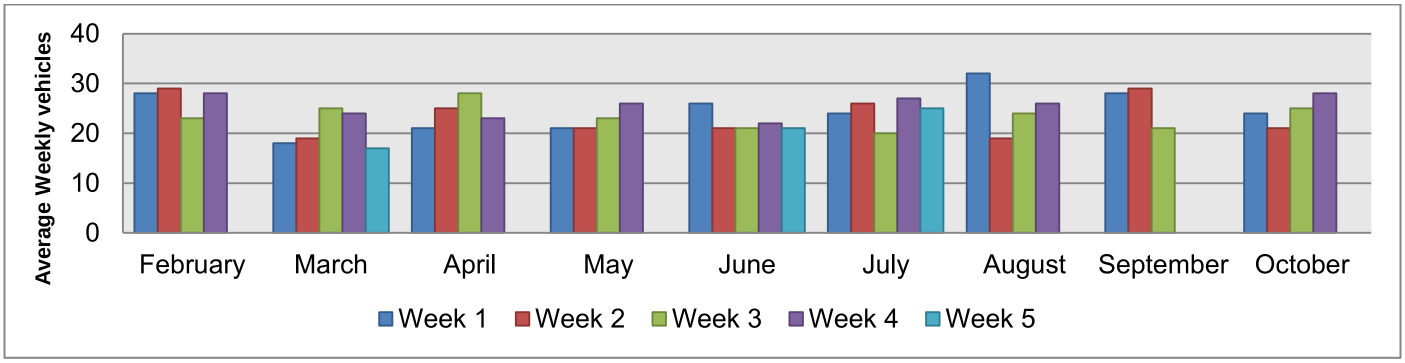



**Table 4-5. Manhattan Regional Airport – Long-Term Parking**

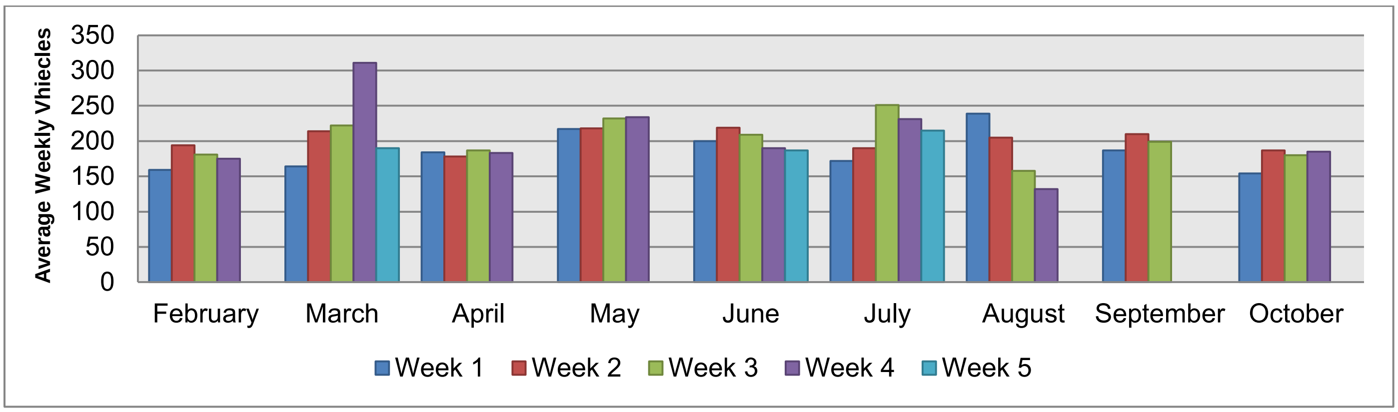



**Table 4-4** and **Table 4-5** show graphically the weekly average number of vehicles that were parked in the short-term and long-term lots. This quickly illustrates spikes in the data and also shows with the current level of airline service from American Airlines, that there is a relatively uniform number of parking stalls required for passengers.

As the Airport continues to gather weekly car counts of parked vehicles in their respective lots these ratios can be adjusted and refined to continually improve projections.

### 4.7.2 Facility Requirements

To forecast long-term and short-term parking spaces needed for the year 2015, the projected peak monthly enplanement for 2015 (7,220) was divided by 31 days for the month then multiplied by the ratio of enplaning passengers to parked cars (1.94) to equal 451 spaces. Space was then added by increasing the total number of stalls by 10% for circulation. Circulation space is needed so that drivers are not searching for the last available stall in the perspective lots. This process resulted in a final total of 496 long-term spaces and 49 short-term spaces for parking needs in 2015. Both quantities are reflected in **Table 4-6** for the future projected growth.

**Table 4-6. Manhattan Regional Airport – Projected Stalls Required**

| Year | Peak Monthly Enplanements | Long Term Peak Stalls Required | 10% Circulation Space |
|---|---|---|---|
| **2011** | 5,576 | 349 | 384 |
| **2012** | 6,476 | 405 | 446 |
| **2015** | 7,220 | 451 | 497 |
| **2020** | 8,312 | 520 | 572 |
| **2025** | 9,269 | 580 | 638 |
| **2030** | 10,149 | 635 | 699 |

Peak month ratio = 1.94 spaces/pax/day

| Year | Peak Monthly Enplanements | Short Term Peak Stalls Required | 10% Circulation Space |
|---|---|---|---|
| **2011** | 5,576 | 35 | 38 |
| **2012** | 6,476 | 40 | 44 |
| **2015** | 7,220 | 44 | 49 |
| **2020** | 8,312 | 51 | 56 |
| **2025** | 9,269 | 57 | 63 |
| **2030** | 10,149 | 63 | 70 |

Peak month ratio =0 .19 spaces/pax/day.

The above results serve as estimates of parking requirements MHK can expect to experience in the future based on current enplanement forecasts and continued free parking. If paid parking is implemented, the airport's parking demand may experience slower growth as people may get a ride to the airport or use alternate transportation. Another unknown factor is the number of people who park at the airport for the safety and convenience of the location but do not actually use the airport. These people may not park at the airport in the future if a parking fee is implemented.

Other parking requirements that need to be included in the total parking need analysis are the spaces for employees and for the businesses within and near the terminal. Two rental car companies currently supply vehicles for passengers as they deplane for their travel needs. Hertz is estimated in using 20 spaces and Enterprise uses 10. It was noted from the Airport manager that Enterprise currently uses an off airport ready lot to help stage their vehicles and only brings out cars when they are needed at the Airport. There is discussion of possibly putting a ready car facility adjacent to the airport to help with cleaning and fueling of vehicles which will also possibly help with capacity demands at the terminal. With the projected growth of the Airport by 2030 it is anticipated that the future need for these companies at current service levels will increase to a total of approximately 50 stalls for both companies based on current usage vs. future enplanements.

Other parking needs that were reviewed and accounted for was General Aviation, (Kansas Air Center) TSA staff, Airport staff, Airline staff, and control tower personnel. Currently there are a total of 35 stalls needed to meet current demand of the listed entities. It is assumed that the Kansas Air Center will be relocated from its current facility, adjacent to the control tower, to the eastern side of the airport by the general aviation hangar complex. The timing of this move has not yet been projected thus this entity will need parking in the short term planning timeline but not needed for the 2030 projection levels. Currently the level of parking needed for all the above entities is 31 stalls.

When projecting the 2015 terminal and control tower personnel support needs it is estimated that the current needs may not change substantially. Airport staff and maintenance personnel may need 6 versus the current 4 spaces. Rental car employees may need 4 spaces, two for each company. The control tower currently has 4 stalls for their employees. The TSA may need an estimated 8 stalls for their personnel and the airlines may need 6 for their staff if a second Airline may start service at the Airport. There is also a need for visitor parking to all the listed above entities which would account for another estimated 10 stalls. Thus the estimated parking need for support and staff personnel, working at or around the terminal area, is projected to be 42 stalls for 2015 needs. Currently the phasing and projected future parking layouts accommodate 50 vehicles to the 2030 enplanement levels.

In summary, as viewed in **Table 4-7**, the total number of stalls needed for passengers, businesses and other entities working at the Airport for the 2015 enplanement level is 580 spaces and 794 spaces for 2030 forecasted passenger levels.

**Table 4-7. Manhattan Regional Airport – Parking Summary**

| Parking Area | Existing | 2015 | 2030 |
|---|---|---|---|
| Short Term | 40 | 49 | 70 |
| Long Term | 209 | 497 | 699 |
| Terminal Support and Employee Parking | 50 | 50 | 50 |
| Rental | 30 | 52 | 72 |
| Total | 329 | 648 | 891 |

# 4.8 Aircraft Gate and Apron Requirements

## 4.8.1 Aircraft Gates

The gates are designated doors in the terminal building that passengers pass through in order to load and unload from aircraft. Currently, MHK uses a single gate and passengers are ground-boarded to and from the aircraft. Future gate requirements are influenced by the number of aircraft requiring access to gates at a time.

### 4.8.1.1 Current Schedule

The airline schedule, for Manhattan Regional Airport, starting on November 17, 2011, serves as the basis for the aircraft gate and apron needs and is shown in **Table 4-8.** As shown in the table, the greatest apron space requirement is from the number of remain overnight (RON) aircraft. RON aircraft are aircraft that arrive late in the day, remain on the apron overnight and then depart early the next morning. MHK currently has two American Airline RON aircraft that arrive at 2115 and 2135 and then depart at 0635 and 0700 the next morning. The two American Airline flights require two parking positions but only one gate as American Airlines would likely only staff enough flight crew personnel to board one aircraft at a time. Additional times when there could be two scheduled aircraft on the apron at MHK is when the noon arrival is early and lands prior to the 11:55 departure.

**Table 4-8. November 17, 2011 Schedule**

**November 17 Schedule Carrier/Ramp Chart**

| Arrivals | | | Departures | | |
|---|---|---|---|---|---|
| **Carrier** | **Origin** | **Arr time** | **Carrier** | **Dest** | **Dep Time** |
| AA | | | AA | DFW | 0635 |
| AA | | | AA | ORD | 0700 |
| AA | DFW | 1125 | AA | DFW | 1155 |
| AA | ORD | 1200 | AA | ORD | 1240 |
| AA | DFW | 1615 | AA | DFW | 1650 |
| AA | ORD | 2115 | AA | | |
| AA | DFW | 2135 | AA | | |

Source: www.flymhk.com
Service is provided on ERJ-140 and ERJ-145 Regional Jet Aircraft.

Charter activities that use the terminal area at MHK are significant due to the number of Kansas State University athletic charters that utilize the airport. Most of the charter activity occurs during the school year between August and May. During these periods charter operations, related to the university, average roughly 1 to 2 charters per week and range from regional jet aircraft with 40 to 50 seats to operations by narrow body aircraft such as the B737 and B757 with 150 to 200 seats. Large jet operations tend to be heavier in the fall with athletic charters for football teams and regional jet operations tend to be heavier in the winter with athletic charters for basketball. For current needs, it is assumed that a charter aircraft may need to utilize the apron and gates at the same time as the two scheduled flights.

#### 4.8.1.2 Future Apron and Gate Requirements

It is a strong possibility that an additional airline could enter the MHK market in the near future with the airline schedule having an aircraft arriving late and remaining overnight. See **Table 4-9** for a possible airline schedule. Another carrier that could possibly enter the MHK market in the near future would be a carrier with scheduled service to a leisure destination.

**Table 4-9. Future Airline Schedule**

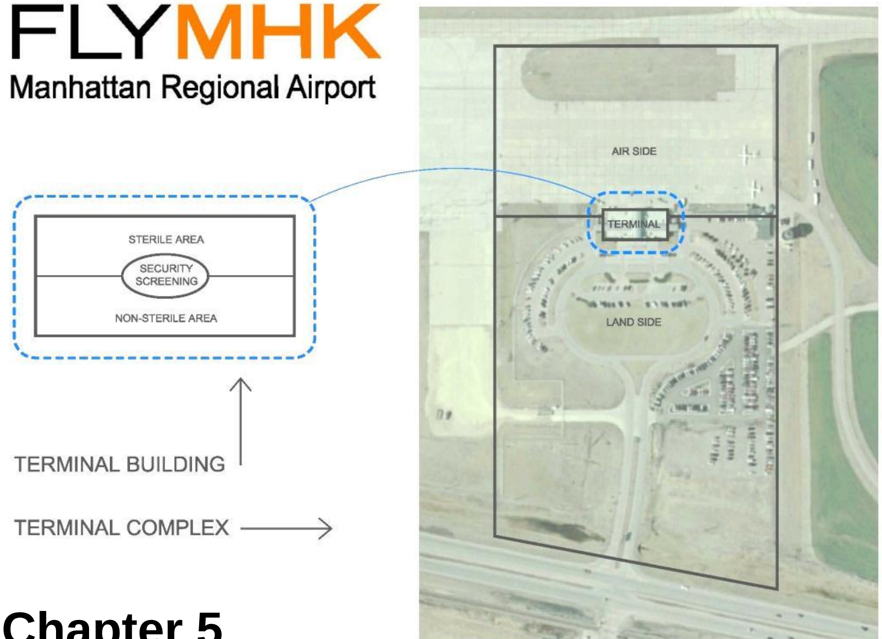
**Carrier Schedule/Ramp Chart with Second Airline**

| Arrivals | | | Departures | | |
|---|---|---|---|---|---|
| **Carrier** | **Origin** | **Arr time** | **Carrier** | **Dest** | **Dep Time** |
| | | | AA | DFW | 0635 |
| | | | FUTURE | FUTURE | 0655 |
| AA | | | AA | ORD | 0700 |
| AA | DFW | 1125 | AA | DFW | 1155 |
| AA | ORD | 1200 | AA | ORD | 1240 |
| FUTURE | FUTURE | 1250 | FUTURE | FUTURE | 1335 |
| AA | DFW | 1615 | AA | DFW | 1650 |
| AA | ORD | 2115 | AA | | |
| AA | DFW | 2135 | AA | | |
| FUTURE | FUTURE | 2200 | | | |

As shown in **Table 4-10,** analysis indicates that three parking positions and two gates are currently required to support aircraft using the terminal building. If a second airline were added in the near future, the charter aircraft could be scheduled after the morning departures and therefore 2 gates and 3 parking positions would still be needed. It is projected that three gates and 4 parking positions may be required at the 111,111 annual passenger enplanement level. A check was completed to analyze how the gate projections compared with information in AC 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities. The AC shows that for approximately 50,000 enplanements, 2 gates are needed with a jump to 3 gates at the 100,000 enplanement level. Four gates are needed at the 200,000 enplanement level which is outside this planning period.

**Table 4-10. Aircraft Gate and Parking Position Requirements**

| Year | Annual Enplanements Demand Level | Gates Needed | Represents | Parking Positions Needed | Represents |
|---|---|---|---|---|---|
| 2011 | 64,920 | 2 | AA<br>charter | 3 | AA<br>AA<br>charter |
| 2015 | 81,531 | 2 | AA<br>unknown airline | 3 | AA<br>AA<br>unknown airline |
| 2030 | 111,111 | 3 | AA<br>unknown airline<br>charter | 4 | AA<br>AA<br>unknown airline<br>charter |




# Chapter 5

# Alternatives and Alternatives Analysis

## Introduction

The arrangement of an airport terminal complex is based on functional relationships between its different components. These components include the land side, (vehicle access and parking), the terminal building, and the air side, (aircraft access and parking). Likewise, inside the terminal building, the arrangement of spaces is also based on functional relationships. The primary functional components of the terminal building include the non-sterile area, security screening, and the sterile area. All of these components interact with a number of adjacent spaces, which often have interrelated functions. As a result, it is important to generate and study alternative layouts in order to determine the most beneficial overall arrangement for the Airport.

This chapter will follow the process of developing alternative layouts of both the terminal complex and terminal building; exploring and, finally, identifying the options that best meet projected facility requirements. The layouts will be assessed for expected aeronautical utility, fiscal feasibility and operational performance. In addition, comments on constraints and opportunities of the alternatives as discussed in public and airport user meetings will be noted. Through this process, a recommended alternative will emerge and will be described in detail.

This chapter is organized into the following sections:

- Terminal Building
- Parking and Vehicle Access
- Terminal Apron

## 5.1 Terminal Building: Evaluation of Alternatives

The first step in the development of alternative layouts for both the airport terminal complex and the airport terminal building is to assess the existing layout for overall operational performance. In the assessment of site layout alternatives, and of building layout alternatives, the capacity for meeting functional objectives like efficiency and comfort is evaluated, as is the ability of the layout to accommodate future activity levels. As part of the review of existing information, prior airport master plan documents are consulted in order to provide a back ground for current decisions.

Next, criteria are established to enable comparison of the alternative layouts. For airport terminal buildings, considerations for evaluating layouts will include safety, security, FAA and TSA design standards, flexibility to adjust to unforeseen future changes, technical feasibility, cost, and satisfaction of user expectations. Additional criteria for evaluating the building's performance will include many issues that are specific to the airport, such as business relationships, future vision of the airport sponsor, consideration of environmental features existing condition of the facility, and operational impact of construction. In addition, considerations for buildings in general, such as constructability and phasing, will be applied to the evaluation of the layout. All of these criteria are used to assess the layouts, in an effort to determine which one offers the best overall arrangement for the Airport.

Evaluation criteria for establishing optimal terminal building site:

- Location of existing airfield: The terminal building location in relationship to the airfield is the most critical of all the relationships of the terminal complex. It is beneficial for the terminal to be located in such a way as to provide easy transition for aircraft from the airfield to the building. The terminal proximity to the airfield will influence the length of time needed to taxi between the airfield and the terminal building and consequent overall travel time for passengers. In addition, the terminal proximity to the airfield will affect the amount of fuel consumed and fumes created while an aircraft moves between the airfield and the terminal building. The amount of fuel consumed in the taxiing process will, consequently, affect operating cost for the airline.

- Location of existing utility connections: When utilities are relocated, there are cost premiums for site work and installation of support infrastructure. In addition, there is often complicated construction phasing which must allow existing utilities to remain functional while construction is progressing.

- Location of existing public access roadways: An upgrade of highway K-18 is currently under construction, which will improve vehicle access to the terminal area. A relocation of the entry drive would increase cost and impact both design and construction schedules.

- Overall project cost: The overall and incremental costs are to be appropriate for what is gained and proportionally reasonable across the project. In addition, renovations will need to be financed through sponsor and FAA funds.

### 5.1.1 Previous Planning Documents

It is relevant to review previous planning documents in order to provide a history of proposed changes to the building layout that have been considered in the past, as well as providing back ground information that have precipitated the proposals.

The 2002 master plan update contained the following information and recommendations:

- Determined that a majority of the existing terminal building components were adequately sized for the forecasted enplanements in 2002, but proposed some reorganization of existing space to improve passenger flow.

- Proposed changes for the hold room that included the removal of the restaurant to provide more space to the departure lounge and proposed the addition of a passenger boarding bridge.

- Proposed changes to the arrangement of space at the airline and airport administration office area.

- Proposed security changes for screening passengers and baggage, resulting from the events of 9-11-2001. Guidelines for these processes were not yet fully developed or implemented at the time the 2002 master plan update was produced.

The 2009 master plan update contained the following information and recommendations:
Departure lounge and security renovations were made after the 2009 master plan, adding a restroom and seating space to the departure lounge and replacement of concessions by vending. The change added more space to the departure lounge, in order to provide sufficient seating for the American Eagle Service.

- Offered provisions for a baggage screening equipment upgrade, expecting that the TSA would be providing new baggage screening equipment to MHK, changing the screening equipment from Explosives Trace Detection (ETD) to Explosive Detection System (EDS).

- Proposed a passenger boarding bridge connection addition: If a boarding bridge is added to the facility, it will require a ramped connection from the building to the rotunda of the bridge. This ramping can be accomplished through use of a piece of equipment, similar in construction to the boarding bridge, or it can occur within the footprint of the building.

- Proposed renovations to passenger ticketing, airline office and TSA baggage screening area: The existing TSA baggage screening room is in a location that was originally intended for airline offices. This proposal removes the airport administration area and restores some space to the airline office area and the baggage claim area and provides space for expected TSA baggage screening equipment.

- Proposed an outbound baggage enclosure: This provides a weather-enclosed space for loading of baggage onto baggage carts and prevents loss of conditioned air to the exterior environment.

- Proposed an addition to the public waiting area: This proposed addition was to provide sufficient seating to passengers, as they wait for the security checkpoint to open, and to the meeters/greeters, as they wait for passengers to arrive.

- Proposed an office and restroom addition: The proposed additions addresses projected area shortfalls, allocating space for car rental offices, airport administration or TSA offices and restrooms.

- Baggage claim room addition: The proposed addition provides additional space and a new baggage claim device to baggage claim area, in order to accommodate the forecasted passenger increase.

- Proposed reconfiguration of hold room and security checkpoint: The proposed reconfiguration is to provide sufficient seating in the hold room to accommodate the number of seats, (50), on the design aircraft at the time, the EMB-145.

While scheduled operations have changed in a different manner than was predicted by the 2009 master plan update, many of the spaces that were previously identified as undersized are still in need of renovation or expansion.

### 5.1.2 Existing Airport Terminal Location: Opportunities and Constraints

The airport terminal building is the primary point of interface between landside and airside activities. As a result, planning to meet future facility requirements must include a review of the adjacency relationships and external influences that impact the passengers, the airport and the airlines. This review begins with an assessment of opportunities and constraints to the existing terminal area, focusing first on site issues. Once the location and general configuration of the terminal complex have been determined, the internal arrangement within the primary components can be explored.

**Opportunities**

Opportunities for cost savings exist in continuing use of the existing facilities. The following opportunities to development of the terminal building on the existing site were identified when developing alternatives:

- Airfield access: The efficiency of airfield operations will consequently drive the overall efficiency of the airport. The airfield, with its spatial requirements and maneuvering clearances, has more impact on the configuration of the terminal complex than either the terminal building or land side. The existing relationship between the airfield and the terminal complex at MHK is efficient and it is beneficial to maintain it.

- Airport ground access system: the airport access road system connects the interior airport roads to the local and regional roadway system. At MHK, this system is the primary way in which the public arrives at the airport. It includes the access roadways, sidewalks, and curb front loading and unloading lanes. The airport is located in close proximity to K-18, which provides efficient access to the airport. In addition, the reconstruction of State Hwy K-18 will improve access to the airport.

- Parking lot location: the existing parking lot location is in an optimal location, directly adjacent to the terminal building. Facility requirements show that there is demand for providing additional parking, and that there is opportunity to expand parking in its existing location.

- Utility connections: existing utilities, including water, sewerage, natural gas and electric power offer both opportunities and constraints in a terminal building renovation. The record drawings for the existing facilities show that many utility connections occur to the southwest of the existing building, including electrical, gas and some storm water. Domestic water, sewer and additional storm water connections occur southwest of the main entry. There is efficiency in reusing existing utilities for small additions to a building, however, if a renovation is significant, existing utilities lines are often insufficient to manage the increased demand. When this is the case, it is more efficient to install new utility lines and connections, which are sized to meet programmed and anticipated future needs.

**Constraints**

The following constraints to development of the terminal building on the existing site were identified when developing alternatives:

- The airport must remain operational: In an effort to serve the traveling public, it is necessary that the Airport remain fully operational while alterations and additions are made to the terminal building. In addition, it is required that the facility maintains security measures and follows proper airport operational procedures during construction.

- State Highway K-18: this highway is approximately parallel to runway 3/21 and is located southeast of the existing terminal building. An extensive upgrade of K-18 is currently under construction, which will relocate the highway slightly to the southeast from its existing location near the airport. The existing highway near the airport will become a service road, and the public drive entrance to terminal building will remain in its existing location. The vehicle access to the terminal building and public parking is to be coordinated with the upgrade of K-18.

- Public vehicle parking lot and access: the terminal parking lot is located between highway K-18 and the terminal building, with the access road for loading and unloading passengers being located approximately 48 feet from the front face of the terminal building. As previously identified, the existing vehicle parking and access are insufficient. The expansion of parking and access should be accomplished in conjunction with an expansion to the terminal building. In addition, it should be noted that municipal sewer and water connections and lines associated with the terminal, Fixed Base Operator (FBO) and Air Traffic Control Tower (ATCT) are located in close proximity to the parking lot roadways.

- Military apron: Fort Riley has constructed this apron for the staging and loading of aircraft, and continues to use it on a regular basis. It is located directly adjacent to the parking area, to the south of the terminal building.

- Building electrical system: the area located between the military apron and the terminal building contains the terminal building connections to the power utility. This is also the location of the emergency power generator. It should be noted that this generator is for backup power at the terminal building, while the generator at the ATCT is used to power the runway and taxiway lighting in the event of a power outage.

- Additional building utility lines and connections: record drawings show that gas and some storm water connections occur to the southwest of the existing building. Water, sanitary sewer and some storm connections occur southwest of the main entry and some of these lines run below the existing terminal curb. The location of these lines and connections should be considered in any renovation to the airport terminal complex.

- Building height limitations: the terminal building height will be influenced by vertical restrictions such as the control tower sight line and "view shadows" must be coordinated with the FAA. Additionally, there will be building height restrictions, due to proximity to runways.

- Building restriction line, (BRL): located approximately 24 feet off the existing face of the terminal building, this line establishes the extent to which a 50 foot high building can grow to the air side.

- Air traffic control tower, (ATCT): located to the northeast of the terminal building. For purposes of this exercise, this facility is to remain in place. The ATCT has FAA security regulations, primarily controlling public vehicle access, location of security fence and view to the airfield, which need to be considered in any exercise that affects the area adjacent to the building.

- Fixed base operator, (FBO): the Kansas Air Center is the primary FBO and is located to the northeast of the terminal building, between the ATCT and the terminal building. As stated in chapter 4, Demand Capacity Analysis and Determination of Facility Requirements, the need for aircraft parking at both the terminal building and the FBO is expected to increase in the future, leading to significant aircraft parking and circulation congestion at the apron. The limitation for aircraft parking in this location has led to exploration of relocating the FBO to the general aviation area near the end of Runway 31. The existing FBO aircraft parking is separated from the terminal aircraft parking only by a stripe, painted on the apron. For future growth, TSA recommends a greater separation between FBO and terminal aircraft parking. This 3,200 SF building that is owned by the Airport could be repurposed to a use that does not impact passenger circulation or require apron area for aircraft parking.

### 5.1.3 Facility Requirements Review

The need for additional facilities is driven by capacity shortfalls, revised operational requirements, or a change to the airport's strategic vision. In order to determine if demand for additional facilities exists, an assessment was made of the existing facility’s ability to meet both current and future expectations. Many of the existing spaces are inadequate for current and projected operations, due to deficiencies of space or of facilities.

The Demand Capacity and Determination of Facility Requirements chapter identified the following elements in need of improvement at MHK:

Primary deficiencies include the following:

- The amount of concessionaire services, and associated space
- The amount of restrooms in sterile and non-sterile areas, and associated space
- The amount and width of public circulation walkways
- The amount of space for passenger queuing at ticketing, car rental and the security checkpoint
- The amount of space for the security checkpoint
- The amount of space and facilities at airline ticket counters and offices
- The amount of space for building support spaces
- The amount of space at baggage claim, and length of baggage claim device
- The amount of vehicle parking
- The amount of aircraft parking and dedicated apron space

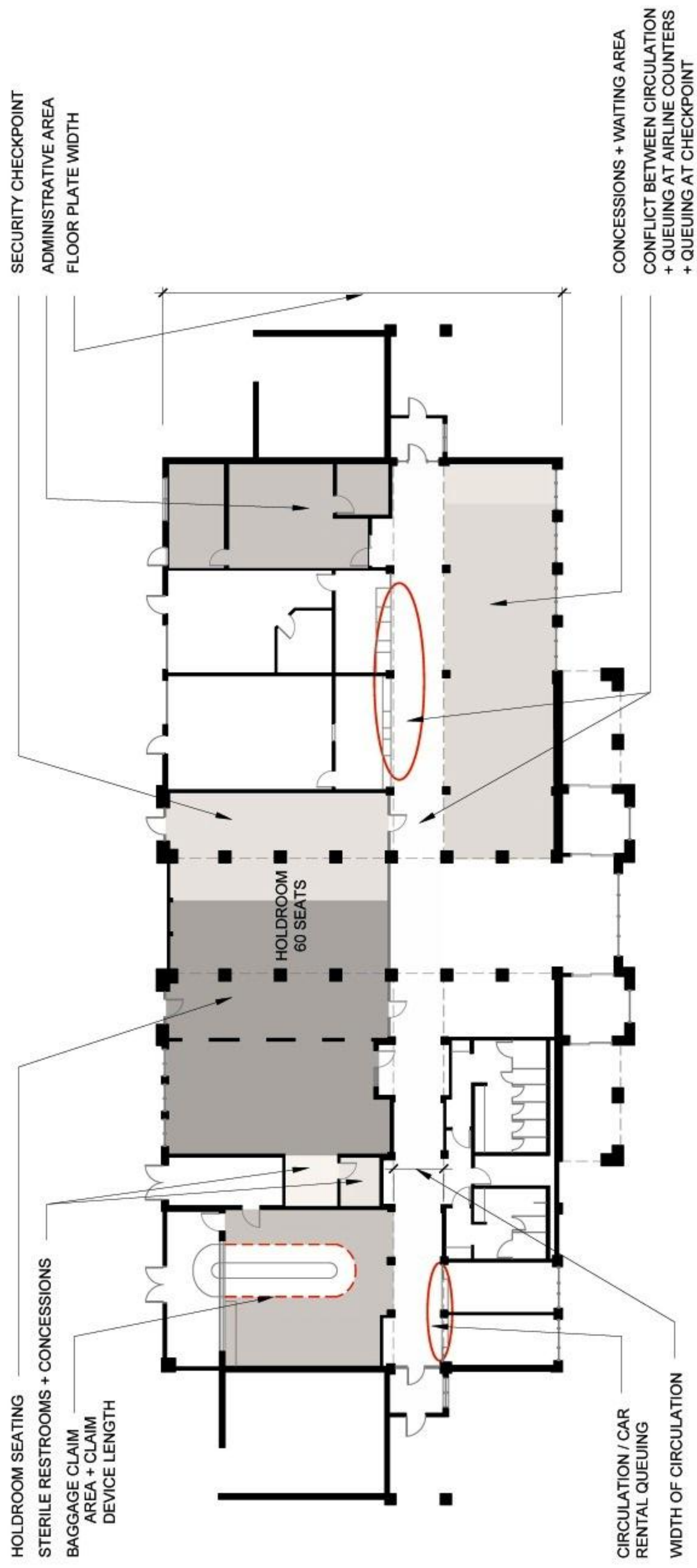
Secondary deficiencies include the following:

- Lack of an exit lane at the checkpoint, which would allow for improved monitoring of deplaning passengers

- The amount of space in a suitable location for meeters/greeters to wait for passengers to arrive

- The amount of space in a suitable location for passengers to wait for the checkpoint to open. Note that the checkpoint typically opens 45 minutes before a flight is due to departure.

The existing layout, showing existing space deficiencies, is shown on the following floor plan.


SECURITY CHECKPOINT
ADMINISTRATIVE AREA
FLOOR PLATE WIDTH
CONCESSIONS + WAITING AREA
CONFLICT BETWEEN CIRCULATION
+ QUEUING AT AIRLINE COUNTERS
+ QUEUING AT CHECKPOINT
HOLDROOM
60 SEATS
HOLDROOM SEATING
STERILE RESTROOMS + CONCESSIONS
BAGGAGE CLAIM
AREA + CLAIM
DEVICE LENGTH
CIRCULATION / CAR
RENTAL QUEUING
WIDTH OF CIRCULATION

### 5.1.4 Development of Alternative Layouts

In the development of alternative layouts, it is important to involve entities that represent different interests at the Airport. These entities include airport administration and maintenance, airport tenants, airport users, the public and the consultant team, all of whom offer different points of view. All of these entities were involved in the process of reviewing the proposed layouts, and provided input at various meetings, where they reviewed the progress of facility requirements and alternative plan layouts.

A kickoff meeting was held early in the planning process, involving the airport administration, tenants, airport users, stakeholders and the TSA. An airport user meeting was held, which provided insight into passenger expectations for the airport. The airport maintenance staff was consulted and various points during the planning process. There were additional meetings with the tenants, including the airline and car rental companies, to get input and keep them informed of discussion topics. Planning Advisory Committee (PAC) workshops were held periodically during the alternative development phase to inform the committee and public and get feedback on proposed plan layout alternatives. In addition, two City Commission work sessions were attended to present terminal area master plan information and gain commissioner and public feedback. As a result of the input provided, a number of layouts were developed and evaluated in order to ascertain the layout's ability for meeting the operational expectations for the airport.

## 5.2 Terminal Building Layout Alternatives

### 5.2.1 Preliminary Alternatives

Before exploring layout alternatives, it is important to establish the location of the terminal area complex site in a general or regional sense. In this step, the optimal location for the terminal area complex is determined in relationship to existing roadways, airfield, and utilities.

Preliminary alternatives considered:

1. Construction of a new terminal building in a new location.

   This alternative was eliminated quickly, due to the following factors:

   - The existing site is the optimal location for the terminal area complex, due to its proximity to both the vehicle access system and airfield infrastructure.
   - It would be more costly to relocate utilities, airfield and roadway access than to remain in the same location.
   - The environmental impact of a new terminal in a different location would need to be determined, with related environmental review process considered for schedule impacts.

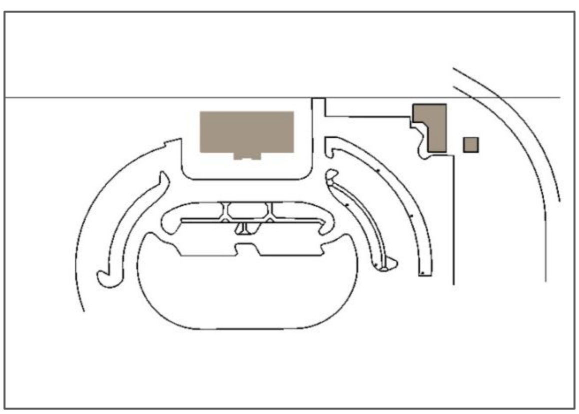
2. Construction of a new terminal building adjacent to the existing location.
   This alternative was eliminated quickly, due to the following factors:
   - The existing site does not have sufficient space to support both the existing terminal and a new terminal.
   - With a large portion of the site occupied by a recently expanded military airside apron, there would be insufficient space for the amount of construction staging and access that is necessary to complete such a project.

3. Alteration of the existing terminal building in the existing location.
   This alternative was chosen, due to the following factors:
   - The existing site is the optimal location for the terminal area complex, due to its close proximity to both the vehicle access system and airfield infrastructure.
   - It would be more costly to relocate utilities, airfield infrastructure and roadway access than to remain in the same location.

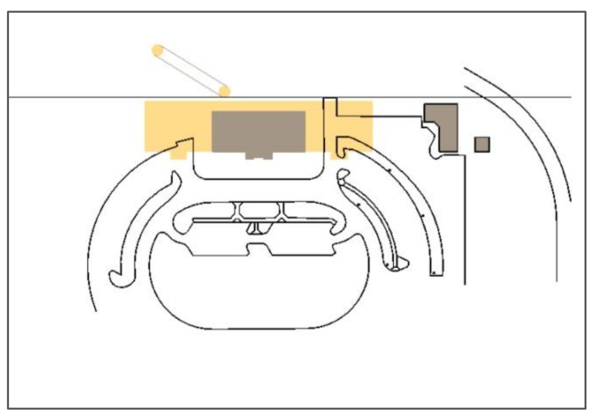
### 5.2.2 Alternative Layouts, Round 1

The initial round of alternatives in terminal planning tends to be broad, focusing on general relationships of the components of the terminal area. In addition, it tends to focus primarily on site issues relating to the terminal, air side and land side. Many layouts were generated in an effort to consider feasible plan relationships. All of the alternatives that were explored involved expanding the existing terminal building, as recommended in the preliminary review of terminal complex location.

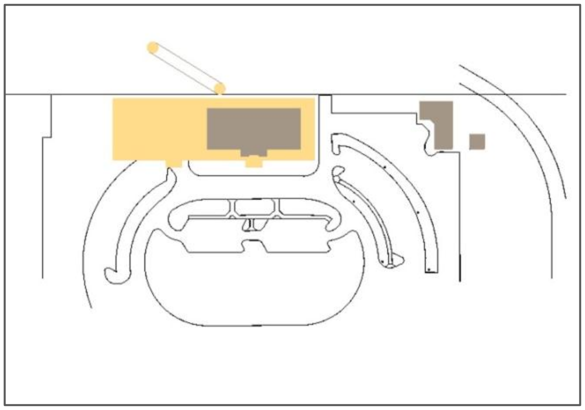
The most viable preliminary layouts are shown in the following illustrations.



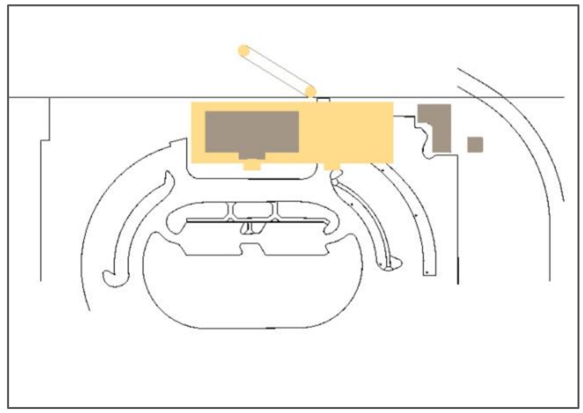
**Existing Layout**



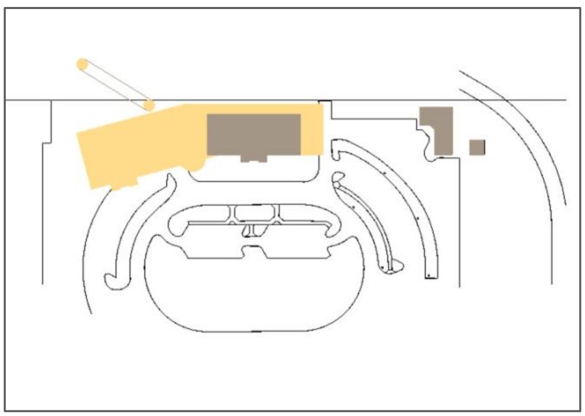
**Option 1**



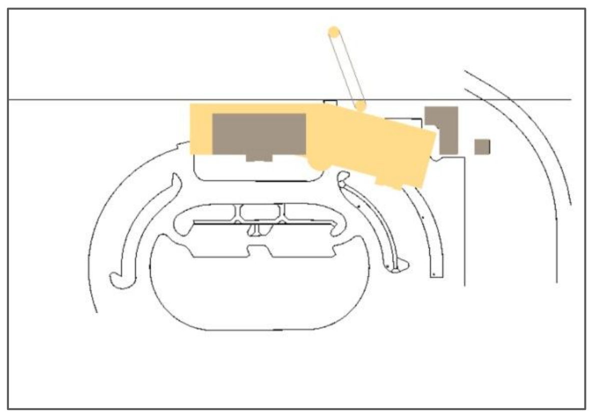
**Option 2A**



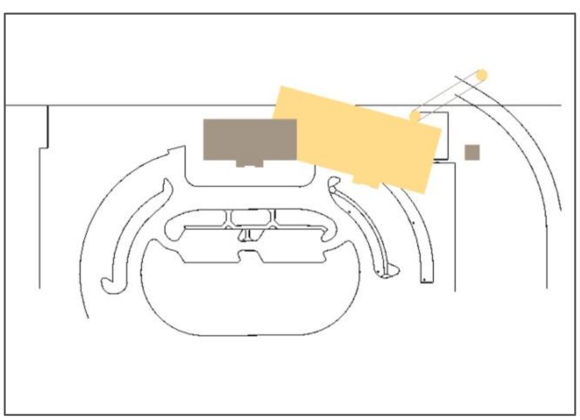
**Option 2A**



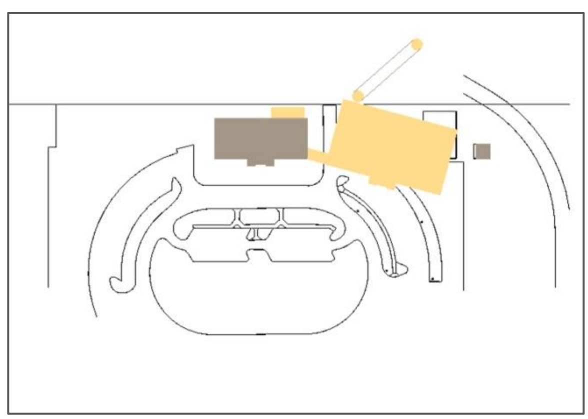
**Option 3A**



**Option 3B**



**Option 4**



**Option 5**

The goals for round 1 of alternatives and discussion of the goals by the stakeholders and PAC committee are listed below:

- Estimate the size of the terminal building and present to users for feedback
  - When presented with a rough size of the terminal, based on 2030 facility requirements, the community and airport users were somewhat surprised by how large the footprint appeared, though they confirmed that existing facilities were quite cramped at times of peak use. It was discussed that it is due to a high amount of cooperation between airport users that the existing airport functions as well as it does, despite the terminal being undersized.

- Explore site implications of adding the proposed amount of space to the existing building
  - The diagrams helped to show the impact of having a larger building on the existing site. This made the constraints more evident, showing the impact to the existing terminal and FBO buildings, vehicle parking and vehicle access.
  - Discussion of the impact to the operation of the FBO occurred, and it was requested that the planning team, airport administration, and FBO tenant discuss options for the FBO.
  - A question was asked about adding a second floor to the terminal building. Two key discussion points on why this would be inefficient included: the impact on existing structural system, and the need of additional space for vertical circulation such as stairs, escalators and elevators was large compared to the amount of space gained. In addition, initial and ongoing maintenance costs for the elevator and/or escalator would be prohibitive.

- Discuss the community's preference in preserving or not preserving all or part of the existing terminal building
  - The existing building has been a symbol of the Airport to the community. When questioned on sentiments of preserving the building, general consensus was that it is still relatively new and that the planning team should explore implications of preserving portions of it.

The layouts above prompted following discussions:

- TSA opens the security checkpoint approximately 45 minutes prior to flights, which causes a significant amount of congestion at the public side of the checkpoint. This procedure will increase the amount of space required for both checkpoint queuing and for seating in the non-sterile area outside of the checkpoint.

- Car rental tenants will require space both outside and inside the terminal building. The planning team worked to establish the optimal location of rental car offices in relationship to the parking lot and parking lot access drive, as well as to determine the optimal location for the car rental offices within the terminal building. It was determined that the most favorable overall location for these offices is similar to their existing location, since it will allow optimal access to both rental car parking on the site and to deplaning passengers within the building. These assumptions were later verified with airport administration and with car rental tenants.

- Construction of airport administration offices is ineligible for FAA funding, which prompted discussion within the planning team, and later with airport administration, regarding the preferred location of the airport administration offices. These discussions led to the removal of the administration space from the terminal building to a remote location.

### 5.2.3 Alternative Layouts, Round 2

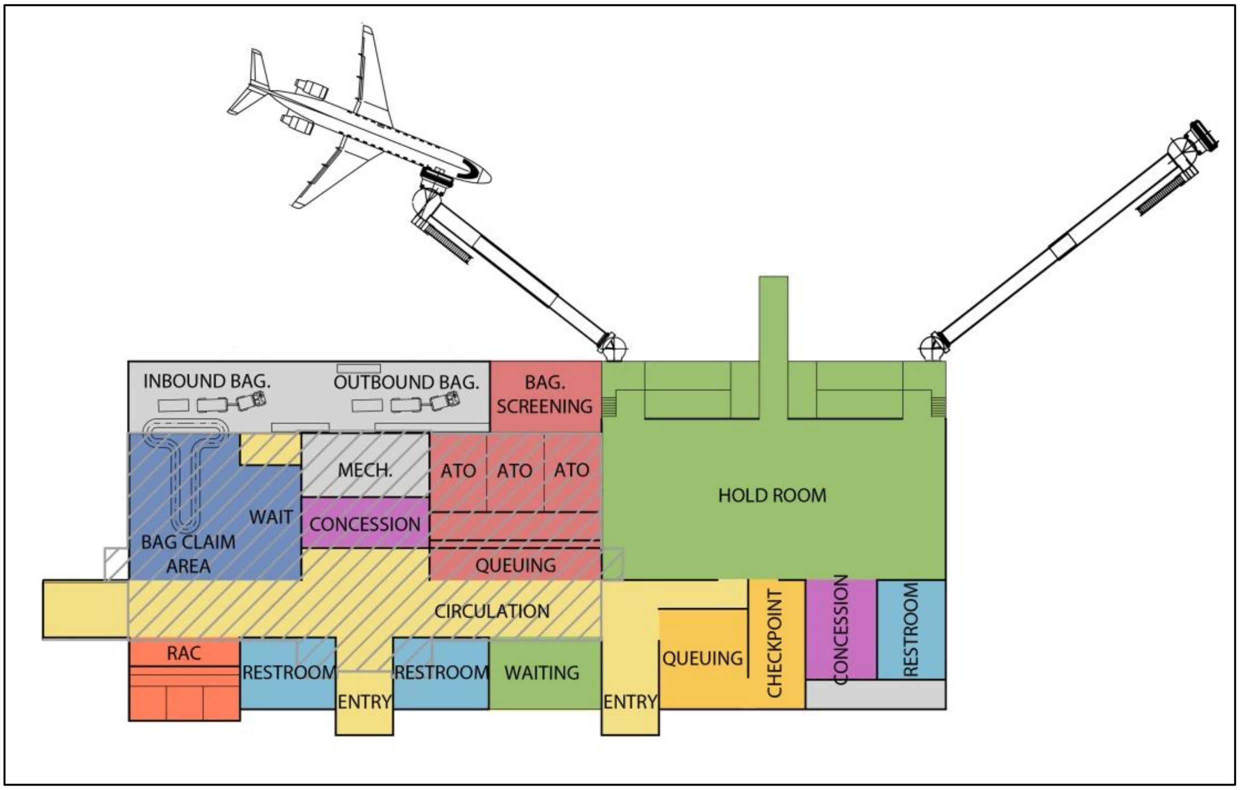
For the second round of alternative layouts, three space diagrams were developed to meet 2015 facility requirements as identified in Chapter 4, Demand Capacity Analysis and Determination of Facility Requirements. Additionally, input from stakeholders and airport staff was considered in development of layout diagrams. All of these diagrams address the primary deficiencies, which were identified earlier in this chapter. This round of alternatives focused on the relationships between the interior components, or adjacencies, within the terminal as identified in the secondary deficiencies, also listed earlier in this chapter. Two of the layouts included preserving the existing façade; one locating the façade on the interior of the building and the other keeping the façade on the exterior of the building, while a third option showed a layout that eliminated the existing façade altogether.

Goals for round 2 of alternatives and discussion of the goals are listed below:

- To continue the discussion on modification of the existing building.
- To establish a rough layout of primary internal elements and adjacencies of terminal building as identified above, and to present the options to users for feedback.
- To discuss future conflicts between the terminal and FBO aircraft parking and the recommendation that the FBO should be relocated in future.
- To establish some general adjacencies between areas. All spaces in an airport have a functional relationship with other areas, and become more efficient in their operation when they are located in close proximity or adjacent to each other.

  Key adjacencies include:
  - Exit lane relationship to the security checkpoint
  - Exit lane relationship to baggage claim
  - A location for meeters / greeters to wait for arriving passengers
  - A location for passengers to wait for the security checkpoint to open
  - Checkpoint relationship to the hold room
  - Airline ticketing relationship to checkpoint
  - General configuration for efficiency and constructability

**Round 2, Alternative 1**




This alternative explored the idea of making the building footprint compact. It accomplishes this primarily by limiting the amount of space that is dedicated to the main circulation walkway, and making the airline baggage operation more centralized than is typical. The airline operations area is compact, making it efficient to move baggage between the airline offices, the baggage screening area and outbound baggage room. The baggage path is simple, since the baggage screening room is directly adjacent to both the ATOs and the outbound portion of the baggage room. The inbound and outbound baggage rooms are combined into a single room, reducing the amount of space required for baggage tug circulation. The airline ticket offices are located directly between the hold room and the combined inbound / outbound baggage room, allowing quick access for airline employees to both spaces. Ramps to bring passengers to the passenger boarding bridge (PBB) rotundas are located within the building footprint to improve the passenger experience instead of ramps that occur inside the boarding bridge tunnels. The location of the hold room, at one end of the building, offers the option for straightforward expansion of the hold room and gates in the future, however, adding the circulation space necessary to access the future hold room would prove to be operationally complicated, since it would disrupt the recently-built checkpoint, queuing, secure concession and restrooms.

Advantages and disadvantages of Alternative 1 layout, when analyzed for optimal adjacencies of internal areas:

- Adjacency of the exit lane to the security checkpoint: The exit lane is near the checkpoint, but not directly adjacent to it, making it a good way for TSA to monitor the exit lane, but not optimal. The preferred location of the exit lane is directly adjacent to the checkpoint so that TSA can easily monitor it.

- Adjacency of the exit lane to the baggage claim area: The exit lane is not adjacent to baggage claim area, which will increase walking time from deplanement to baggage claim. A disadvantage is that it will cause congestion in circulation area. An advantage is that deplaned passengers will wait less time at baggage claim device, since they will spend more time walking to baggage claim.

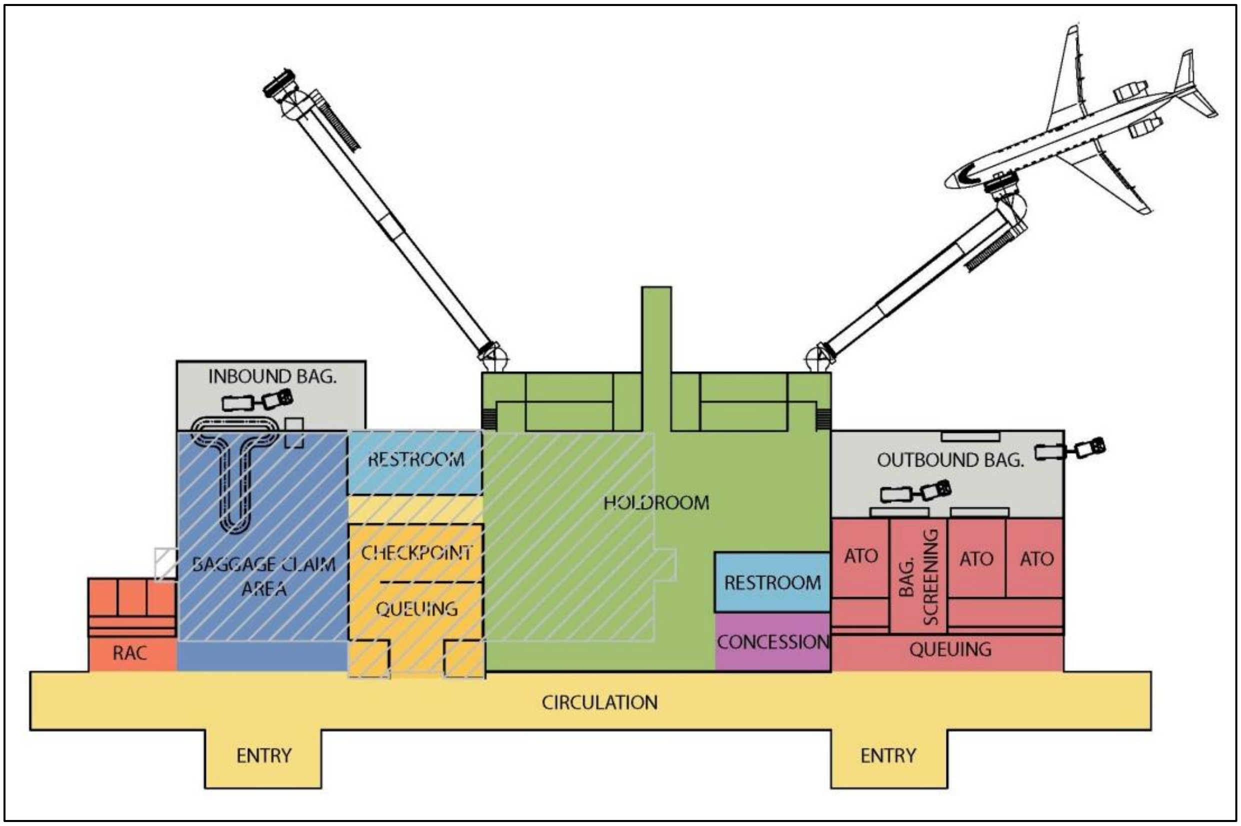
- Providing sufficient space in correct location for meeters/greeters: This plan layout provides an area for seating near baggage claim.

- Providing sufficient space in correct location for passengers waiting for checkpoint to open: This layout provides seating near security checkpoint, although this is not an optional location since it is on the opposite of the main circulation pathway and would create congestion when the checkpoint opened.

- Location of hold room: This layout allows the holdroom to be added on to easily in future, though the location of the hold room at one side of terminal is not traditional location, at the center of the terminal building. One advantage of this relationship is that it provides easy access to the hold room by passengers who check in remotely and do not need to use ticket counters prior to entering the checkpoint.

- Location of airline ticket offices (ATOs): This layout places the ATOs in the center of the building, adjacent to the baggage screening room, the combined inbound / outbound baggage room and the hold room. An advantage of this layout is that allows some airline operational efficiencies by colocating the spaces that are involved with processing baggage. In addition, this arrangement achieves some baggage conveying system efficiency by requiring a relatively short amount of conveyor. A disadvantage is that it will be difficult to add space to the ATOs in the future since this would require a significant amount of plan reconfiguration that would affect adjacent areas.
- General configuration for efficiency and constructability: This is a compact plan, and it reduces the amount of overall space needed for circulation, which results in a smaller overall building. A significant disadvantage is that a future addition to the building would be complicated, incurring a disproportionate amount of cost and construction sequencing.

**Round 2, Alternative 2**




This layout explored the idea of making the main circulation walkway the central focus of the plan. Car rental offices and amenities, such as public restrooms and concessions are relocated from the typical location at the front of the building to the opposite side of the circulation walkway. This adjacency to the curb front allows the circulation area to have direct visual connection with the curb along its entire length. The orientation of the car rental office, facing the parking lot, allows employees working at the counters to have a direct view to the rental car parking area, making it easy to monitor the lot. The existing façade remains in place and the building additions enclose it, where it becomes the entry to the security checkpoint. With the visual openness of the circulation area directly adjacent to it, both the public concession area and the entry to the checkpoint would be clear and easily identifiable. The exit lane in this layout connects the hold room directly to the baggage claim area, reducing the amount of congestion that can occur in circulation areas when deplaning passengers exit the checkpoint and move to the baggage claim area. There is a single concession area that has a sterile and non-sterile side. For security reasons, these sides would not be contiguous except in utilities, which would reduce cost. Gate ramps are located outside the building footprint and become pieces of equipment, which would also reduce cost.

Advantages and disadvantages of Alternative 2 layout, when analyzed for optimal adjacencies of internal areas:

- Exit lane to checkpoint: The exit lane is directly adjacent to the checkpoint, making it an optimal way for TSA to monitor the exit lane.

- Exit lane to baggage claim area: The exit lane is directly adjacent to the baggage claim area, making it efficient for deplaning passengers to collect baggage without walking far. An advantage to this relationship is that it will not cause congestion in the circulation area. A disadvantage is that deplaned passengers will arrive in the baggage claim area a significant amount of time before the baggage can be unloaded from the aircraft.

- Providing sufficient space in correct location for meeters/greeters: This layout provides seating in the optimal location, which is directly adjacent to the baggage claim, between the baggage claim and building entry.

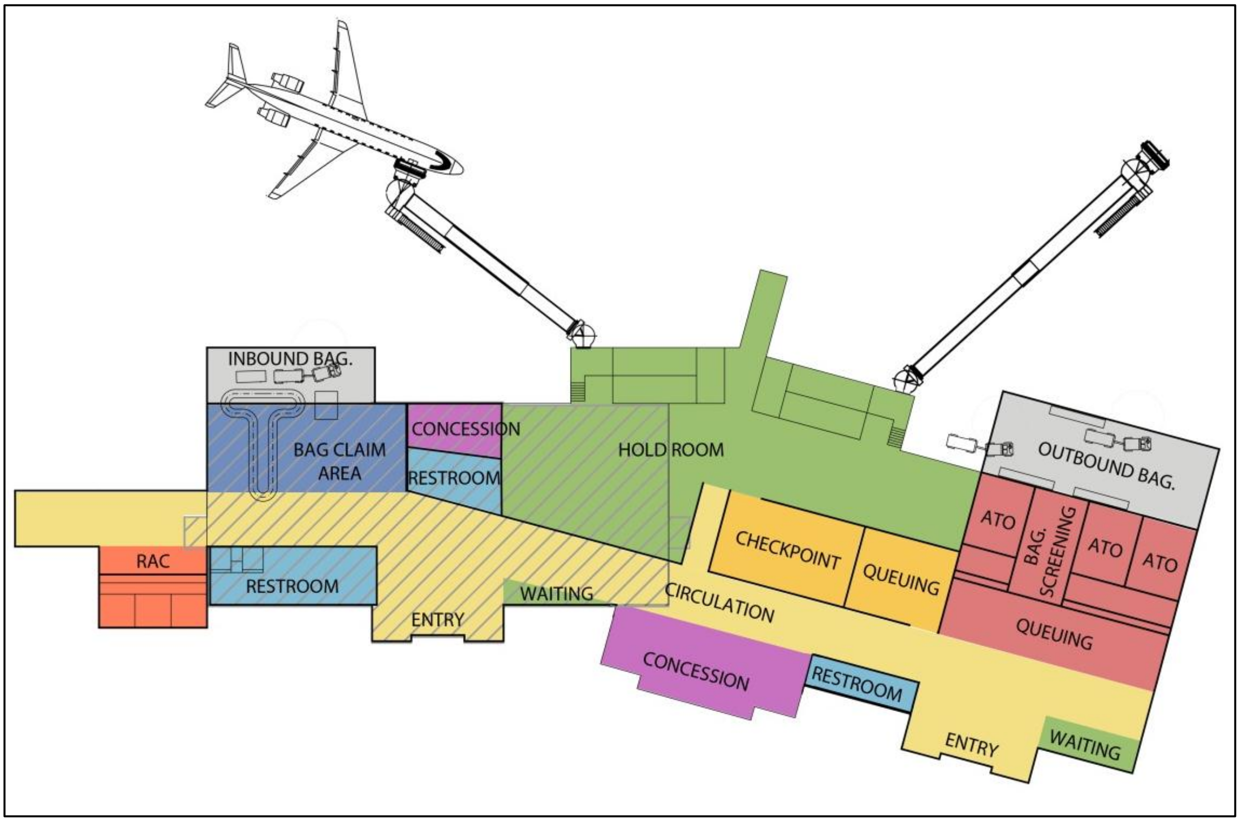
- Providing sufficient space in correct location for waiting for checkpoint to open: Seating in this option occurs at perimeter of the main circulation walkway, and not in a room. This not an optimal relationship, since it does not allow sufficient space for passengers to gather in front of the checkpoint.

- Location of hold room: The hold room is in the center of plan, which is a traditional location for an airport of this size, though it should be noted that the depth of hold room is not optimal for circulation within it or for airport operations.

- Location of ATOs: The baggage security screening is between two of the airline spaces, which is a good relationship, allowing baggage to move efficiently from the ticket counter to the baggage screening, then to the outbound bag room. An advantage is that it will be easy to add space to the ATOs in the future.

- General configuration for efficiency and constructability: The configuration of this plan, with straight circulation, would allow for relatively simple future expansion to the terminal building. The car rental offices are arranged so that employees can monitor the parking lot from the front counter. Alteration of the existing building is minimized, and the existing façade is used as the new entry to the security checkpoint.

**Round 2, Alternative 3**




The unusual element of this layout is that the addition to the building is at an angle to the existing building. This is to allow the building to step back from the apron on the air side, in an effort to increase space at the apron. Despite the angled portion of the building, the locations of most primary airport components are very common for an airport of this size: ticketing/passenger drop off functions occur first in sequence of the drive lane, and baggage claim/passenger pick-up occur second. The existing façade remains one of two main entries to the building, and design elements of the second entry could reference the architectural detail of the existing facade. Similar to alternative 2, the hold room is in the back-center of the plan. Located front-center is the concession and checkpoint area. The exit lane discharges to a concession node, which is the nucleus or grand space of the building. The checkpoint is part of the grand space, improving the passenger experience.

Advantages and disadvantages of Alternative 3 layout, when analyzed for optimal adjacencies of internal areas:

- Exit lane to checkpoint: The exit lane is directly adjacent to the checkpoint, making it an optimal way for TSA to monitor the exit lane.

- Exit lane to baggage claim area: The exit lane is a short distance from the baggage claim area, making it fairly convenient for deplaning passengers to collect baggage. A wider circulation walkway in the area between the exit lane and the baggage claim device will mitigate congestion in the circulation walkway.

- Providing sufficient space in correct location for meeters/greeters: This layout provides seating directly adjacent to the baggage claim, between the baggage claim and the building entry, which is a beneficial relationship.

- Providing sufficient space in correct location for waiting for checkpoint to open: This layout does not provide sufficient seating near the security checkpoint. Seating in this option occurs at the perimeter of the main circulation walkway or in the concession area.

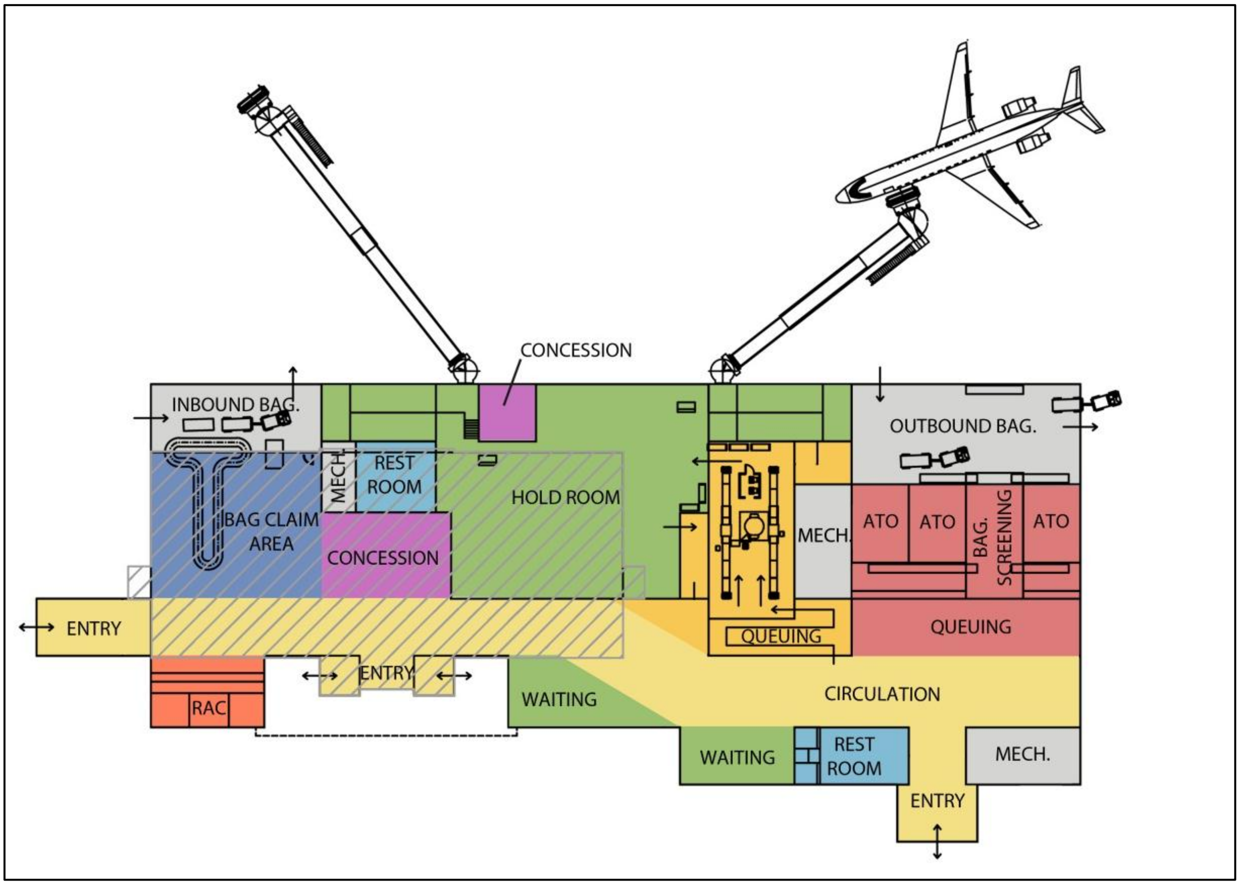
- Location of hold room: The hold room is in the center of plan, which is a traditional location for an airport of this size. A regular, contiguous space would allow passengers to circulate better than the "L" shape shown in this layout.

- Location of ATOs: The baggage screening occurs between two of the airline spaces, which is a good relationship, allowing baggage to move in a direct route from the ticket counter to the baggage screening room to the outbound baggage room. A disadvantage of this arrangement is that the ATOs are located on what is typically known as the "arrivals" end of the building, making the layout familiar to passengers who may not have used this specific airport. An advantage of this layout is that it will be easy to add space to the ATOs in the future.

- General configuration for efficiency and constructability: The configuration of this plan would allow an addition at either end in the future. Alteration of the existing building is minimized and this layout uses the existing façade as one of two main entries to the building.

These plan alternatives were explored with the city commission, the PAC committee and the airport administration. Alternative 1 was dismissed because it limited future expansion. Elements of Alternatives 2 and 3 were explored in round 3, as were some ideas that were generated during discussions of the round 2 diagrams. Additionally, a consensus was reached for preserving the appearance of the terminal building by continuing the use of locally-available limestone as the primary exterior material. A preliminary round 3 plan was developed in order to verify the understanding comments from the stakeholders. This layout was further refined in round 3.

**Preliminary Round 3 layout:**




### 5.2.4 Alternative Layouts, Round 3 – Preliminary Preferred Layout

The preliminary preferred layout combines the more successful elements of alternatives 2 and 3 from round 2, though it resembles the alternative 2 layout the most. The ramps to the passenger boarding bridges are located inside the hold room, similar to round 2, alternative 1. The checkpoint and exit lane are in a similar configuration to round 2, alternative 3, except that the hold room shape is improved and the view from the hold room to the air side is improved. When analyzed, it was determined that angling the building away from the airfield, as shown in alternative 3 of round 2, did not provide enough additional ramp area to warrant a non-rectilinear footprint.

The spaces are more refined in this layout and the checkpoint size has been increased to provide areas for divesture and recomposure. The existing façade remains in place as one of the main entrances but a canopy is added to both protect users from the elements as they enter the building and to bring this part of the building face even with the proposed addition building face at the curb line. In order to provide ample queuing and circulation space, the depth of the building from air side to land side has been increased at the addition. On the sterile side of the security checkpoint, the restroom and concession have been grouped together and located to one side of the hold room in way that allows the holdroom space to be consolidated.

On the non-sterile side of the building, two different types of public seating areas have been provided near the checkpoint queuing area. One area will allow passengers to wait for the checkpoint to open within view of it, while the other will allow passengers to wait in more private room. The circulation area directly outside of the checkpoint is widened to prevent congestion from occurring near the checkpoint queuing area. In order to relieve congestion at the car rental area as well, space for queuing and circulation have been added directly in front of the car rental counters. The concession areas have been provided at both the non-sterile and the sterile side of the checkpoint, as had been requested by airport passengers. The restrooms have increased in size in both the sterile and non-sterile areas, and the restroom fixture count has been increased to meet future requirements.

Advantages and disadvantages of the preferred alternative internal layout:

- Exit lane to checkpoint: The exit lane is directly adjacent to the checkpoint, making it an optimal way for the TSA to monitor the exit lane.

- Exit lane to baggage claim area: The exit lane is directly adjacent to a public waiting area, which is in turn directly adjacent to the baggage claim area, making it efficient for deplaning passengers to collect baggage and meet people who are there to collect them. An advantage of this arrangement is that it will not cause congestion in the circulation area. A disadvantage is that deplaned passengers will arrive in the baggage claim area a significant amount of time before the baggage can be unloaded from the aircraft.

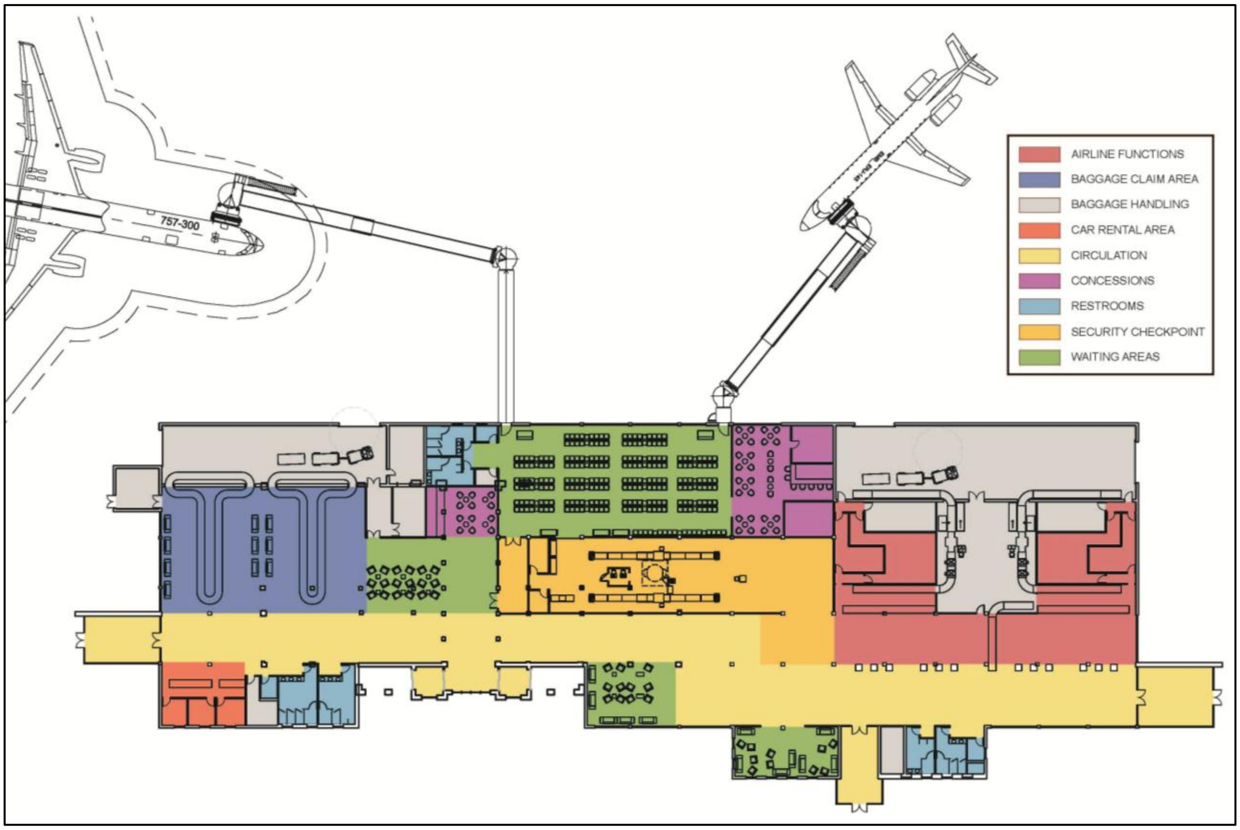
- Providing sufficient space in correct location for meeters/greeters: This layout provides ample seating directly adjacent to the baggage claim area.

- Providing sufficient space in correct location for waiting for checkpoint to open: This layout provides two different types of seating near the checkpoint, as was suggested at a Planning Advisory Committee meeting. One seating area is open to the circulation area and it is primarily intended for use by business and pleasure travelers. The other seating area is a room that offers some amount of privacy and it is primarily intended for use by members of the military who often have more private send-offs.

- Location of hold room: The hold room is in center of the plan, which is a traditional location for an airport of this size. The size and shape of the hold room is optimal for airline operations and circulation.

- Location of ATOs: In this layout, the baggage screening area is between two of the airline spaces. This is a good relationship, allowing baggage to move easily from the ticket counter to the baggage screening area to the outbound baggage room. An advantage of this layout is that it will be easy to add more space for the ATOs in the future.

- General configuration for efficiency and constructability: The configuration of this plan, with continuous circulation across the long direction of the building, would allow for future expansion. The car rental offices are located near the rental car parking lot, which is a beneficial layout for car rental operation. Alteration of the existing building is minimized and this alternate uses the existing façade as one of two main entries to the building.

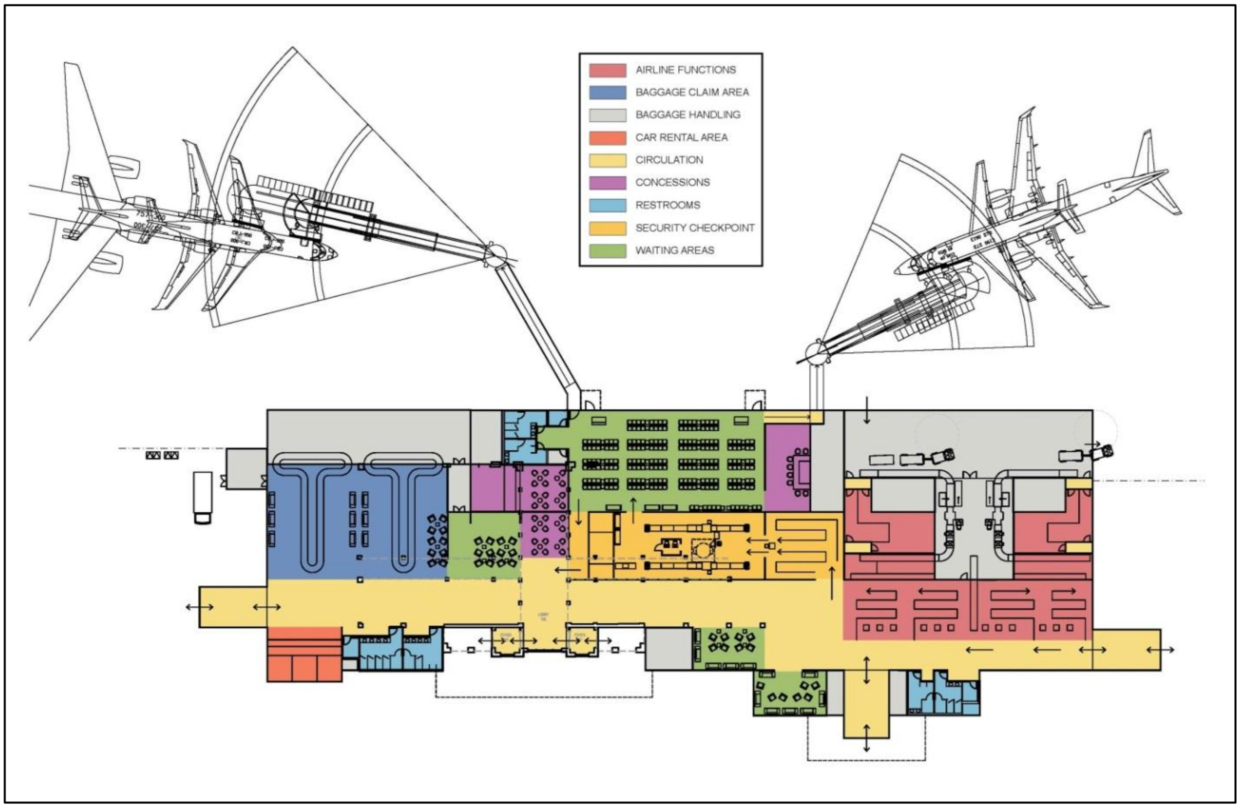



## 5.2.5 Alternative Layouts, Round 3 – Preferred Layout

With the general configuration of the layout largely determined, the task turns to examining the plan in greater detail and to refining functional internal relationships. The layout of space within the secondary areas is examined, now that the adjacencies between primary space components have been determined. As the interior arrangement is refined, the design of the layout is developed from a space diagram into a plan, and a phasing exercise begins to examine the logistics of construction and scheduling. In addition, the focus of layout exploration has changed from current or 2015 facility requirements to 2030 facility requirements. As a result, the layout that was proposed to meet current requirements has been incorporated into the phasing plan, where it will be shown as a step towards the 2030 facility requirements.

The most significant changes between the preliminary preferred layout and the preferred layout are in both improving the hold room functional layout, and in reconfiguring the security checkpoint. The checkpoint is elongated and reoriented in an effort to increase the amount of space made available for divesture before passenger security screening and for recomposure after security screening. In the hold room, the view to the air side from the hold room is preserved while a space has been created for the sterile concession that no longer intrudes into the hold room space. The layout of the holdroom is further improved by the removal of passenger boarding bridge ramps from inside the hold room to the exterior of the building, where they become pieces of equipment. With the hold room in its preferred location at the center of building, where it is constrained on all four sides, it would be beneficial to consider the value of sizing the hold room to allow flexibility in accommodating future growth.

Other changes have been made to the non-sterile areas. These layout refinements include changes to the baggage claim area, public waiting, and restrooms. A second baggage claim device and additional space are now shown in the baggage claim area, to better accommodate passenger baggage retrieval. Adjacent to the baggage claim area, a group of non-sterile public restrooms has been added, and an estimated number of restroom stalls is shown. Restrooms groups have now been provided in three distinct areas of the airport: prior to the security checkpoint, inside the sterile area and near baggage claim. In addition, each set of restrooms will provide a companion care restroom, which is intended for use by members of the public who require a single-use restroom. Near the checkpoint, a private send-off area for use by service members and family / well-wishers is refined, as is the open seating area for business and leisure travelers, who typically wait for the checkpoint to open within view of it. The non-sterile concession remains in the high bay area, though it is now pushed back from the existing entry, allowing space for the public waiting near baggage claim to grow. Consequently, the waiting area now has the ability to provide sufficient space for service members and greeters to meet after the service members have returned from a long deployment. This layout contains flexible circulation space for "spill over" at key points which will be of use at peak times, such as holidays, when the terminal building is very busy.




### 5.2.6 Final Layout, with revisions to passenger boarding bridges

Since the last meetings with stakeholders, several elements of the floor plan have been refined in order to improve the overall layout. Public restrooms near the baggage claim area have been enlarged and more fixtures have been added. General layouts of furniture, equipment and queuing paths have been indicated, in order to show circulation within the primary space components. Generous overhangs are located at the entries near the curb front which would provide shelter to passengers as they leave and enter the terminal building. Additional refinements to the passenger boarding bridges have resulted in improvements to the organization of the hold room, the sterile concession and aircraft parking on the apron.

**Table 5-1** compiles all of the proposed areas of the building space components for year 2030 as shown on the final layout above. In addition, the table shows the recommendations for areas that were provided in Chapter 4, Demand Capacity Analysis and Determination of Facility Requirements. The sizes of the existing building areas and the year 2015 proposed areas are shown on the table for comparison.

**Table 5-1. Manhattan Regional Airport – Terminal Building Proposed Areas**

| Area Description | Existing Area (SF) | Yr 2015 Required Area (SF) | Yr 2015 Proposed Area (SF) | Yr 2030 Required Area (SF) | Yr 2030 Proposed Area (SF) |
|---|---|---|---|---|---|
| TSA Security Checkpoint | 644 | 2,000 | 2,010 | 2,000 | 2,010 |
| TSA Office * | 150 | 350 | 330 | 350 | 330 |
| Checkpoint Exit Lane | 0 | 200 | 270 | 200 | 270 |
| Checkpoint Queuing | 350 | 750 | 1,050 | 750 | 1,050 |
| Public Circulation – Non-Sterile & Sterile | 2,297 | 9,750 | 10,930 | 12,150 | 11,935 |
| Public Restrooms | 718 | 1,550 | 1,725 | 1,700 | 1,725 |
| Public Waiting | 1,209 | 1,800 | 2,320 | 2,130 | 2,320 |
| Public Business Lounge | 0 | 70 | 0 | 70 | 0 |
| Hold Room, (+ticket lift) | 1,852 | 3,400 | 3,390 | 3,530 | 3,390 |
| Baggage Claim | 865 | 4,000 | 4,090 | 4,000 | 4,090 |
| Inbound Baggage | 268 | 2,500 | 2,160 | 2,500 | 2,160 |
| Oversized Bags / Circulation | 0 | 250 | 215 | 250 | 215 |
| Outbound Baggage | 0 | 1,900 | 1,800 | 3,200 | 3,290 |
| Airline Ticket Office | 551 | 900 | 790 | 1,400 | 1,495 |
| Ticket Counter Area | 187 | 500 | 465 | 850 | 875 |
| Ticketing Queue | 106 | 1,400 | 1,200 | 2,400 | 2,200 |
| Rental Car Office | 0 | 400 | 380 | 400 | 380 |
| Rental Car Counter Area | 377 | 200 | 230 | 200 | 230 |
| Rental Car Queue | 58 | 170 | 180 | 180 | 180 |
| Sterile Concessions / Vending | 25 | 800 | 785 | 780 | 785 |
| Public Concessions / Vending | 355 | 1,040 | 1,025 | 1,140 | 1,025 |
| TSA Baggage Screening | 814 | 900 | 900 | 1,120 | 1,570 |
| TSA Ops / Office | 0 | 80 | 0 | 110 | 0 |
| Wheelchair Storage | 0 | 10 | 65 | 10 | 65 |
| Local Law Enforcement | 0 | 80 | 0 | 80 | 0 |
| Receiving | 0 | 300 | 325 | 300 | 325 |
| Plumb / Mech / Elec / Comm / Janitor / Storage | 256 | 3,100 | 3,105 | 3,650 | 3,455 |
| Airport Administration | 720 | 0 | 0 | 0 | 0 |
| Circulation - Non-Public, Non-Sterile, & Sterile | 0 | 100 | 120 | 150 | 240 |
| Chases | 39 | ** | ** | ** | ** |
| Building Structure | 979 | ** | ** | ** | ** |
| **Total Area** | **12,670** | **38,500** | **39,860** | **45,600** | **45,610** |
| *existing offsite area not included in total<br>**areas included in areas above | | | | | |

## 5.3 Conclusion to Terminal Building Alternative Layout Development

The process of developing alternative layouts has led to a discussion on the relationships of components in the terminal area complex, and within the terminal building. The layouts were assessed for operational, environmental, and financial performance. Airport users have provided feedback on the merits and drawbacks of the various alternatives. Through this discussion, a preferred layout was chosen and developed.

The layouts of the terminal building and terminal complex will continue to develop and become more refined, as the planning process ends and the design process begins. In addition, the facility requirements of the airport will continue to change over time. As these requirements evolve, they will continue to affect the layout until construction is completed. Once renovation is complete, it is the built condition that must adapt to the changes in facility requirements until additional facility modifications become necessary in the future.

## 5.4 Terminal Building Construction Phasing

A terminal building is a complex environment with many interrelationships of operations. In order to minimize impact to these operations and inconvenience to passengers, an extensive terminal renovation is often broken into smaller pieces, each piece or phase having a distinct scope. This "phasing" often has triggering events which necessitate the start of the next stage of expansion. Examples of triggering events include the addition of another airline to the terminal building, or the arrival of new checkpoint screening equipment. At the end of each phase, the terminal must be fully functional until the next triggering event or funding opportunity occurs. It is important, therefore, that phasing addresses the most critical concerns first in the construction process and that resolution of less critical concerns follow, in descending importance.

While phasing adds an element of complication to a terminal renovation, it also adds the advantage of allowing the best use of available funding as it is revised annually. Similar to the construction process, the design process requires a significant amount of time to complete. For this reason, it is beneficial to consider implementing minor changes or interim measures, prior to completion of design, that prepare the facility for the larger renovation to follow.

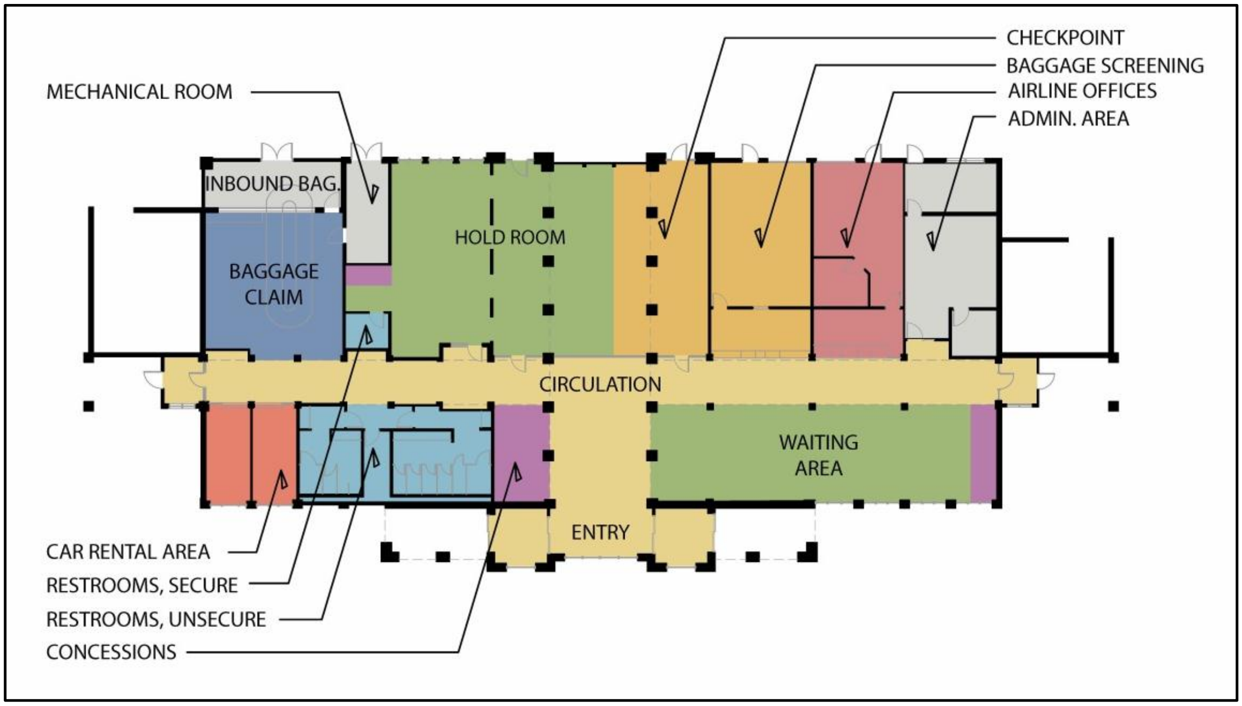



**FIGURE 5.1: EXISTING FLOOR PLAN**

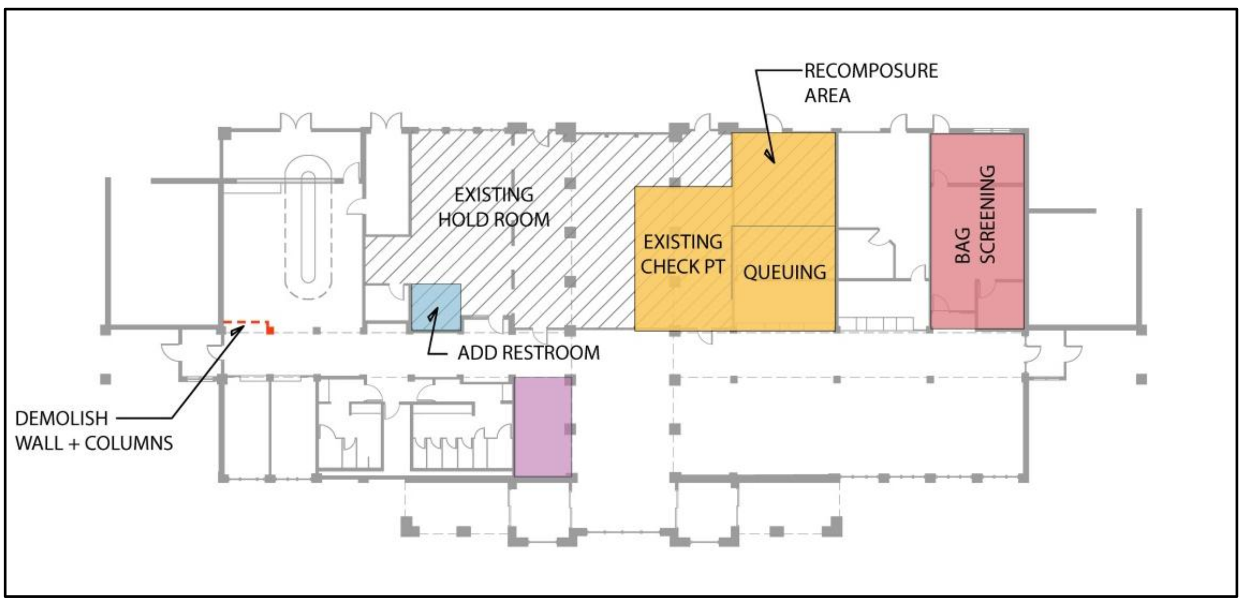



**FIGURE 5.2: INTERIM MEASURES FLOOR PLAN**

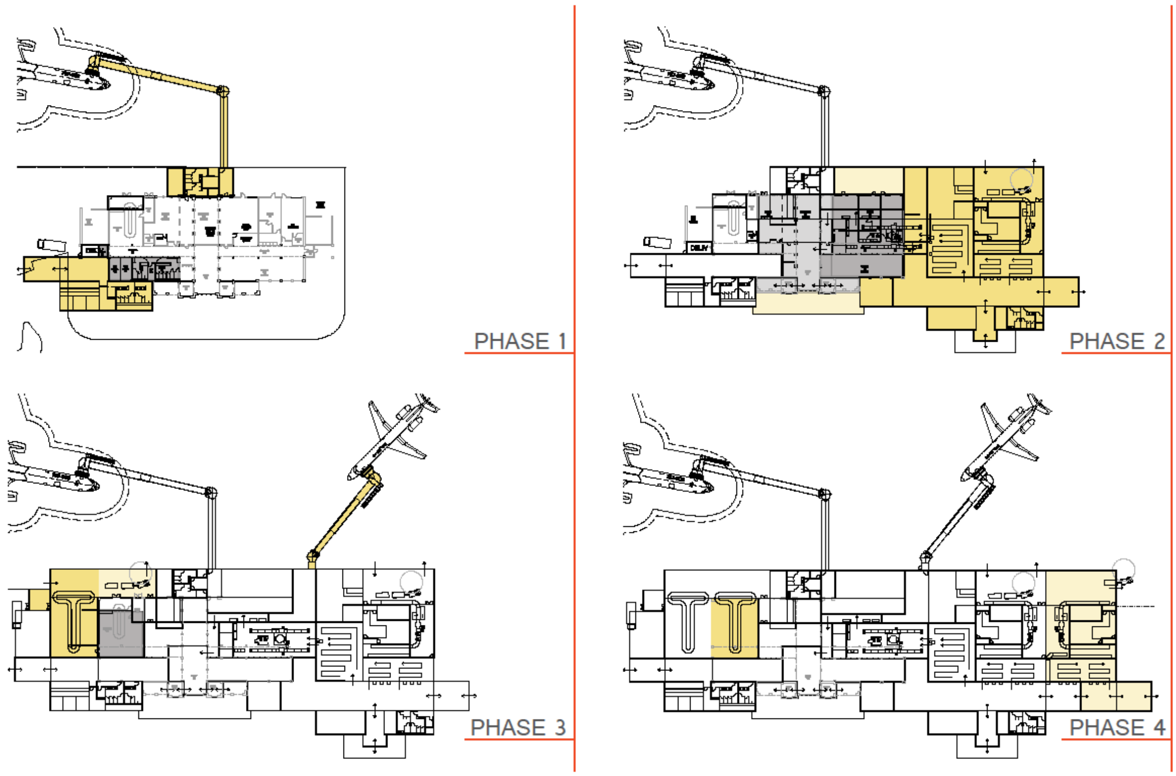
## 5.4.1 Interim Measures

As established in the Demand Capacity and Determination of Facility Requirements chapter, the size of the existing terminal building at Manhattan Regional Airport is significantly smaller than is needed to meet current requirements. The Interim Measures plan which is proposed above relieves some of the most critical problems with over-crowding. Recently, the Airport relocated the TSA offices to a location outside of the terminal building, which has already greatly improved access to the baggage claim device. In addition, a concession has been added, offering light meals on the non-sterile side of the checkpoint, as requested by airport users.

The goals of the Interim Measures plan are:

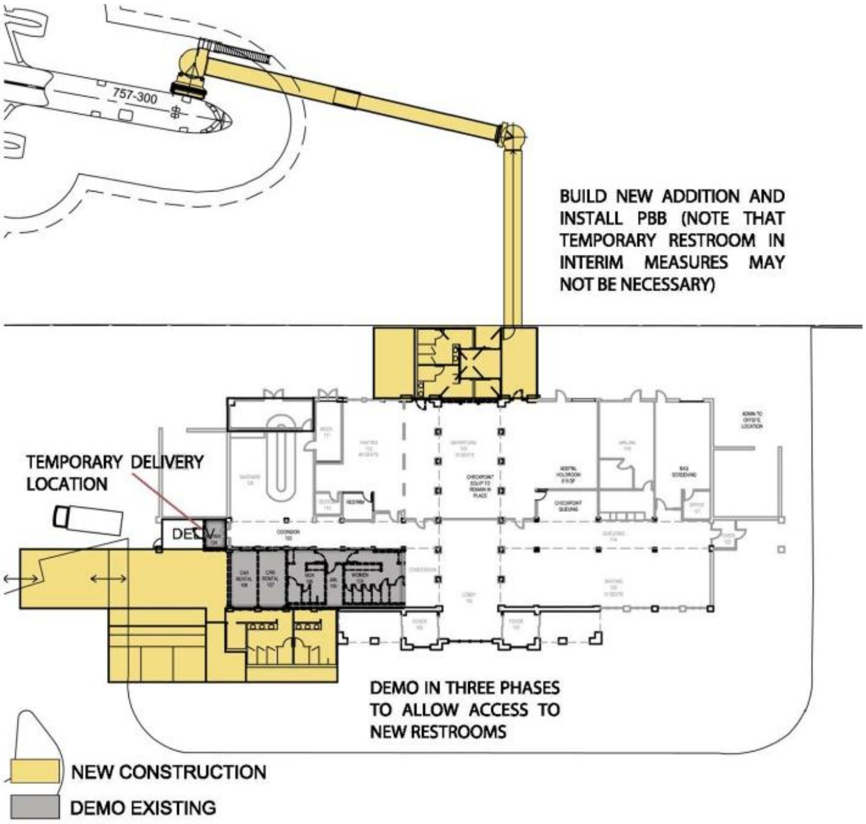
- To replace flooring, in order to maintain accessible circulation and allow effective maintenance.
- To relieve congestion near car rental and circulation area. This will involve removing a wall and a non-load bearing column that are directly in front of the car rental counters, in order to open up floor area.
- To provide a second restroom in the hold room. This is recommended, since the existing restroom is often times beyond capacity.
- To increase seating in the hold room and relieve congestion associated with the security checkpoint.

In order to reduce cost and complication during the expansion of the hold room, it is important to note that the security checkpoint is to remain in its existing location and that none of the equipment is to be moved. The space provided by removing the casework in front of the baggage screening room will increase the amount of space available for checkpoint queuing, and provide space for circulation. The airport administration offices will be relocated to an off-site location or temporary building, and baggage screening will be relocated to the area that is currently occupied by airport administration. The wall between existing baggage screening and the hold room will be removed to increase hold room floor area, providing additional space to the recomposure portion of the checkpoint.




### 5.4.2 Overall Construction Phasing

As mentioned above, phasing can be thought of as a defined sequence of construction events. This phasing exercise assumes that the recommended Interim Measures have been made, though actual coordination of new work with existing conditions will be performed during architectural design. Design is a fluid process, during which phases can be combined or reduced, depending on funding availability and triggering events. Phase 1 addresses some of the most immediate facility requirements of the terminal building.




**Phase 1**

Air side improvements:

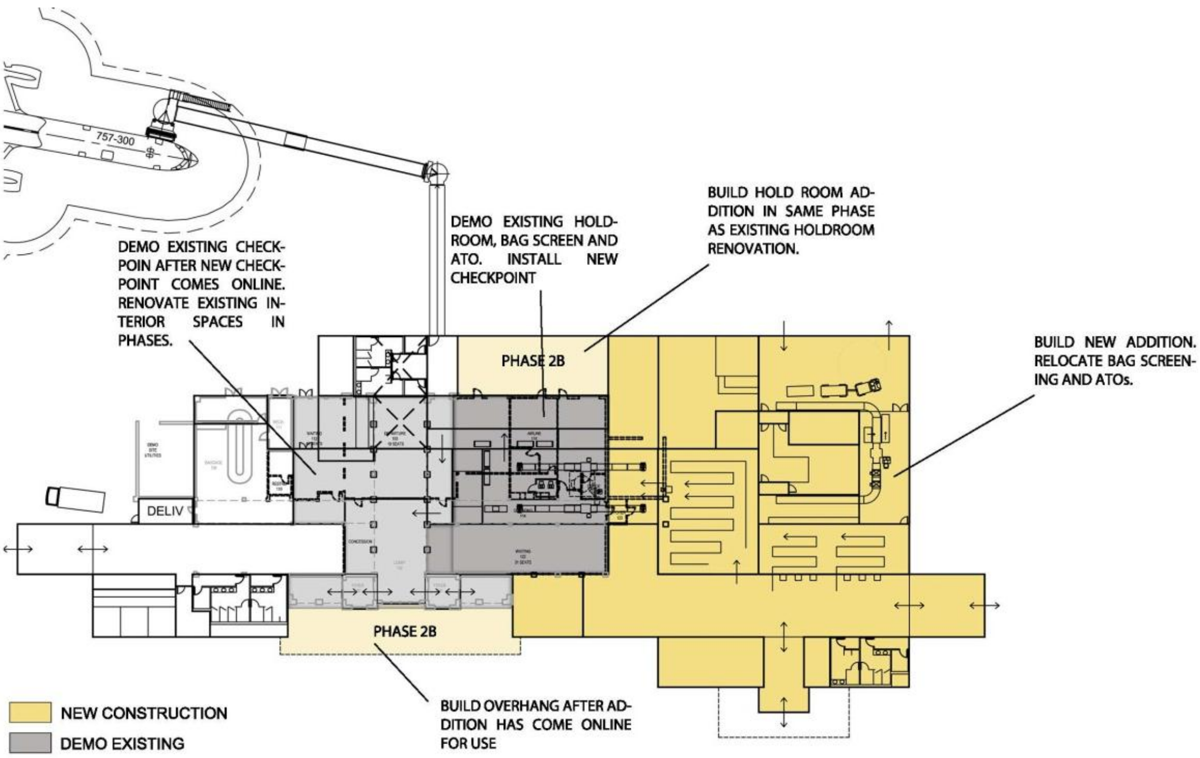
- Provide a new passenger boarding bridge, which is capable of serving all commercial and charter aircraft that access this airport, (757-300 to RJs).

- Provide new mechanical room and restrooms, (minimum of 3 fixtures each for men and women, and one companion-care restroom), at the hold room. Mechanical changes will prepare for next phase and work towards allowing demo of site utilities at southwest end of building. A mechanical room will be added at the first floor and a second floor mechanical space will be added above the new restrooms and in line with existing high bay space.

Land side improvements:

- Add new restrooms and car rental offices which, in turn, allow existing restrooms and car rental offices to be demolished, and provide additional space for circulation at baggage claim and circulation / queuing at car rental. The additional space can be used to increase seating area for concession.

- Provide a location for deliveries, away from the public curbside.



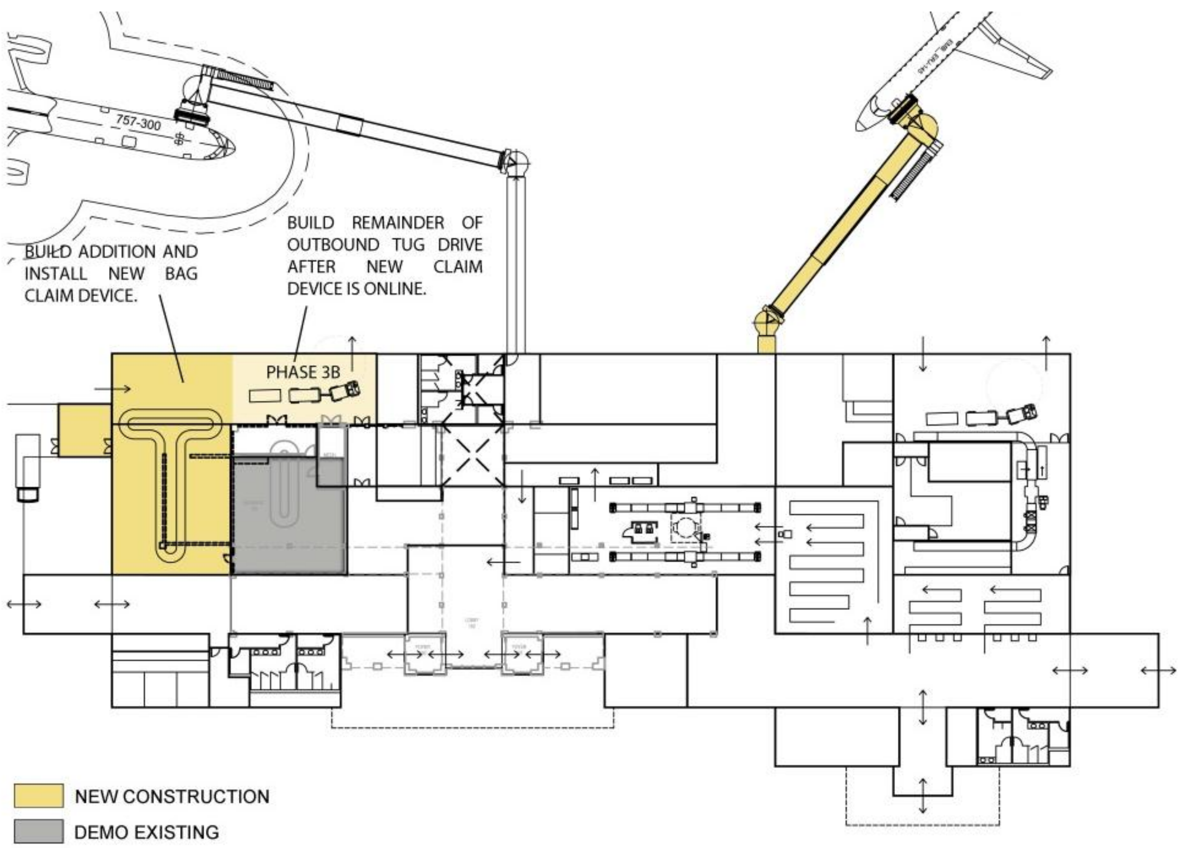

**Phase 2**

This is the largest of the phases, however interruptions in airport operations will be minimized in Phase 2, since a majority of the construction will occur outside of the existing building footprint. It is advisable for the FBO tenant to be relocated prior to beginning this phase, in order to provide space in the vicinity of the terminal building to be used for construction operations and staging. This addition will provide new mechanical space and a new electrical utility connection, allowing the existing one to be abandoned and opening up the southwest end of the building for a future addition. This, in turn, allows space for construction of a baggage claim area, with a larger baggage claim device.

A majority of Phase 2 consists of a large addition, which will be built on the north east side of the building. Construction of this addition will largely be independent of the interior operation of the existing terminal, until the point at which it is ready for occupancy. The addition will include an additional new public entry, allowing the use of one entry for passenger drop off and one entry for passenger pick up. The amount of space dedicated to circulation and public waiting will increase, as will the queuing areas at ticketing, as well as the security checkpoint. The addition will include an area for airline ticket offices and operations and a baggage screening room, with in-line baggage screening equipment. An outbound baggage room will offer a place for baggage to be staged and loaded in a location that is protected from weather events. In addition, the baggage room will act as an air lock, preventing conditioned air from escaping the building as well as fumes from ground service equipment and aircraft from entering the building. The addition will provide additional space for the hold room, and a space for a sterile concession.

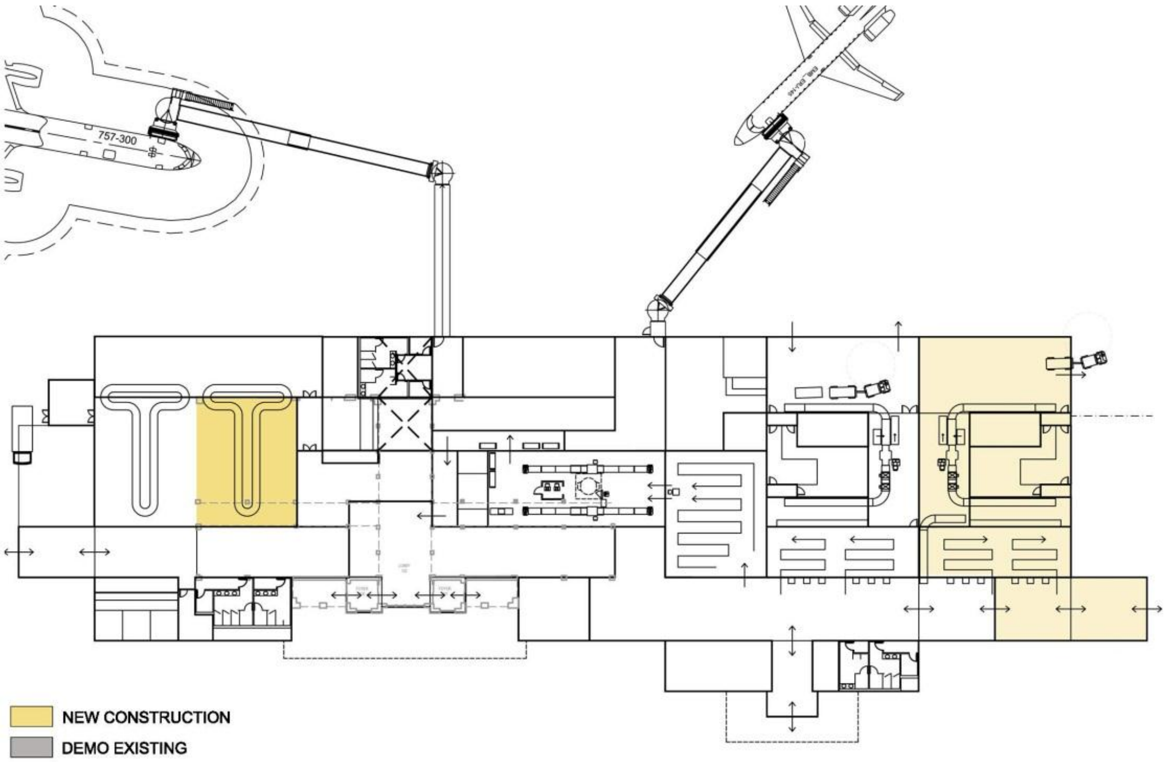
After construction of the addition is complete, the existing ATOs and checkpoint will be demolished and renovated, becoming new hold room space. The existing hold room, airline offices and security checkpoint will remain in use until the addition and checkpoint equipment installation are complete. Once the airline offices have been relocated, construction will begin on the hold room addition directly between the existing building near the airfield. Hold room functions will then expand into the new part of the building.

Once the addition is complete, the remaining public areas will be renovated. This renovation will feature new finishes, in addition to new roofing, roof insulation and energy-efficient windows. The existing non-sterile concession is left in place in this phase but can be relocated once the interior renovation is complete. With the new addition complete, the existing public entry will be renovated, adding canopy for weather protection.




**Phase 3, Current Facility Requirements**

This phase shows the floor plan that is planned to meet current facility requirements. Adding the new baggage claim device is now possible due to Phase 2 work, which allowed the existing electric, telecommunications and gas connections at the southwest side of the building to be abandoned. The new addition on the southwest side of the building will provide space for an enlarged baggage claim area as well as a longer claim device, which will be able to handle more than twice as many bags as the existing one handles. The existing baggage claim device remains in place, allowing flexibility in the baggage unloading process. Once the addition to the southwest is complete, the remainder of the inbound baggage room can be constructed.




**Phase 4, Future Facility Requirements**

Phase 4 implementation will be precipitated by triggering events, such as requiring a new baggage claim device or space for an additional airline to begin operation at MHK. In this phase, the existing baggage claim device is replaced by a larger one that, similar to the claim device added in phase 3, will be able to handle more than twice as many bags as the existing one. When more airline space is required inside the terminal building, the build out on the northwest end of the terminal will be constructed, adding area for airline offices as well as area for the associated baggage screening, outbound baggage room, ticketing queuing and public circulation.

# 5.5 Parking and Vehicle Access

## 5.5.1 Parking Goals

After evaluating the user information, reviewing the future demand capacity needs, and incorporating the observations of the pedestrian and vehicular traffic on the landside paved facilities, improvements to the existing parking configuration, capacities, and loop road are recommended. These improvements are needed to improve the overall flow of vehicles and pedestrians around the facility and to meet the current and future parking demands. To assist in guiding the designer, goals were developed to determine the priorities that the alternatives were to fulfill. These goals are as follows:

- Increase capacity of long-term and short-term parking areas.
- Provide for the terminal building to expand 20 feet southeast onto the existing loop road as it expands to meet future needs.
- Provide an alternate parking area for the general aviation users, TSA employees, airline personnel, tower controllers, and airport employees due to future terminal expansions eliminating the parking lot they currently use.
- Increase the security of the ATCT (Air Traffic Control Tower), by having airport employee parking closest to the ATCT instead of having public parking in close proximity to the ATCT.
- Phase in improvements to vehicular way finding to designated lot areas for the short-term, long-term, rental car, TSA, airline employee, airport employee, and air traffic control tower employee parking.
- Increase pedestrian safety within the parking lots through collection of passengers to a centralized sidewalk system and minimize pedestrian crossing of the access road.
- Increase curb frontage/room in front of the terminal building for passenger drop off and pick up.
- Allow for implementation of paid parking and revenue collection during any parking lot expansion phase.
- Reuse and/ or prolong the usage of as much existing infrastructure as possible in the new design.
- Provide construction phasing over a period of years to help with possible funding constraints while keep the remaining parking lots operational during construction.
- Provide access to the military ramp.

## 5.5.2 Parking Lot Concept

With the above goals in mind and after numerous iterations of terminal layouts combined with parking and roadway configurations a parking lot concept as well as two proposed phasing plans for the construction were developed. Input from stakeholders was also incorporated to arrive at the parking lot concept as shown below. The shown layout meets the designated criteria in the following ways:

- The layout incorporates all four (4) expansion phases for the terminal building and provides safe pedestrians access to and from parking areas as well as safe pedestrian circulation on the sidewalk in front of the terminal building.

- Increased capacity for parking is incorporated with parking expansion phasing achievable throughout.

- Existing infrastructure is utilized.

- The loop road system allows easy way finding and minimal signage to designated parking areas. There is one access point to long term parking, one access point to short term parking and one access point to the rental car lot making it easy for airport users who are rushed to easily find their designated parking area. The loop road also incorporates the parking in the interior of the loop road which is an excellent way to contain the parked cars in a revenue collection environment.

- The exit plaza provides separation between long term parking and short term parking allowing different revenue collection rates for short term parking and long term parking which will increase the amount of revenue collected. The exit plaza also provides one location for exit revenue collection equipment therefore minimizing costs associated with the installation and upkeep of equipment at multiple locations.

- The long length of loop road in front of the terminal building meets the needs for curb side space area for dropping off and picking up passengers.

- Employee and tenant parking is located in the lot nearest the ATCT providing a buffer between general public parking and the ATCT.

- Direct access is provided to the military apron through a separate entrance that would allow separation of military buses and trucks from the general public.

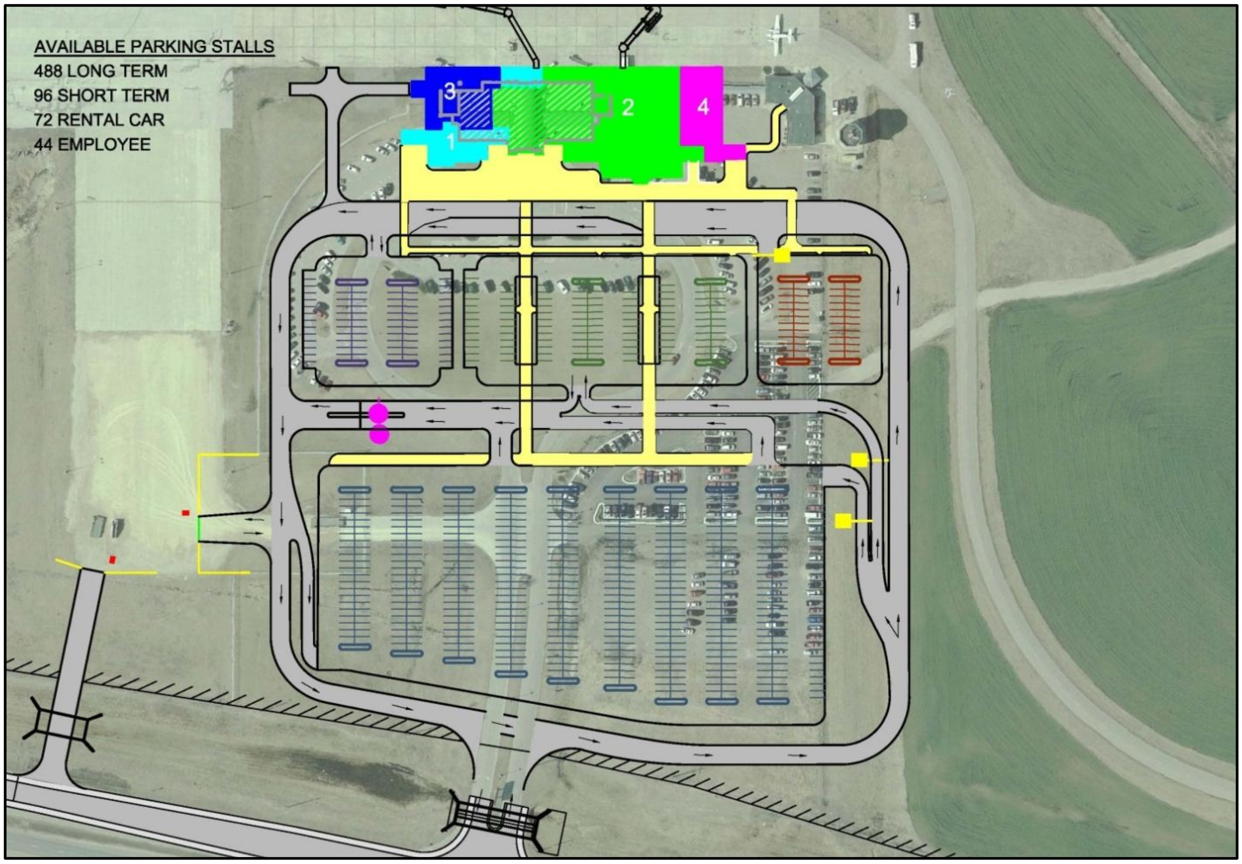
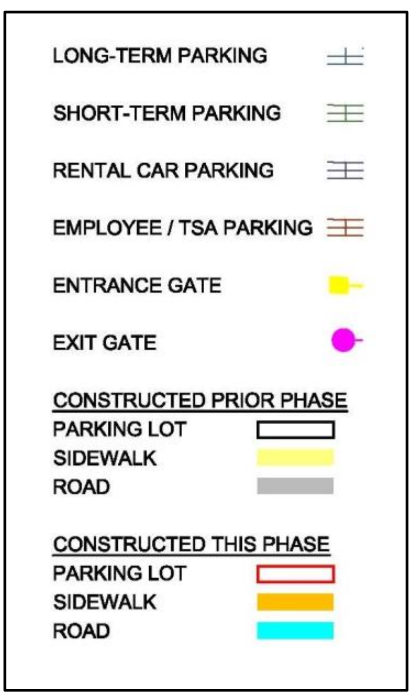



**FIGURE 5.3: PARKING LOT LAYOUT**

### 5.5.3 Construction Phasing




A phasing plan was completed to illustrate how the parking lot needs could be met while phasing construction, implementing revenue collection throughout the phases, serving customers at a high level of service and utilizing existing infrastructure. The parking lot construction was broken down into numerous phases to allow for construction as funding becomes available and when the need for additional parking occurs. Parking lot construction phases shown are flexible and can also be combined if more than one phase is needed.

The legend, on the left, can be used to easily discern the different parking areas identified during parking lot construction phasing: long-term, short term, rental car and employee/TSA parking. The entrance and exit gates are shown as yellow squares and pink circles, respectively. The parking lot features constructed during each construction phase can also be identified in the following Figures by utilizing the legend below. For example, the roadway is shown in blue during the phase it is recommended for construction and then in shown as gray once that construction phase has been completed.

Projections of parking facility demands indicate that there is a need for additional long term parking in the immediate future. Phases 1 thru 3 as shown in **Figure 5.4** should be constructed immediately to meet the parking needs associated with the current and very near forecasted enplanement levels.

The parking lot area outlined in red in the lower right of Figure 5.4 and labeled as Phase 1 has been a gravel overflow area in the past. It is anticipated that this area is being paved in the fall of 2011 to help with the current long-term parking demand. The light blue highlighted roadway on the left of the expanded parking areas is the start of the loop road that is needed for future vehicular circulation. It is anticipated that in the short term, the military can use the newly constructed portion of the loop road for access to their airfield access gate until such time that it is needed for vehicle circulation.

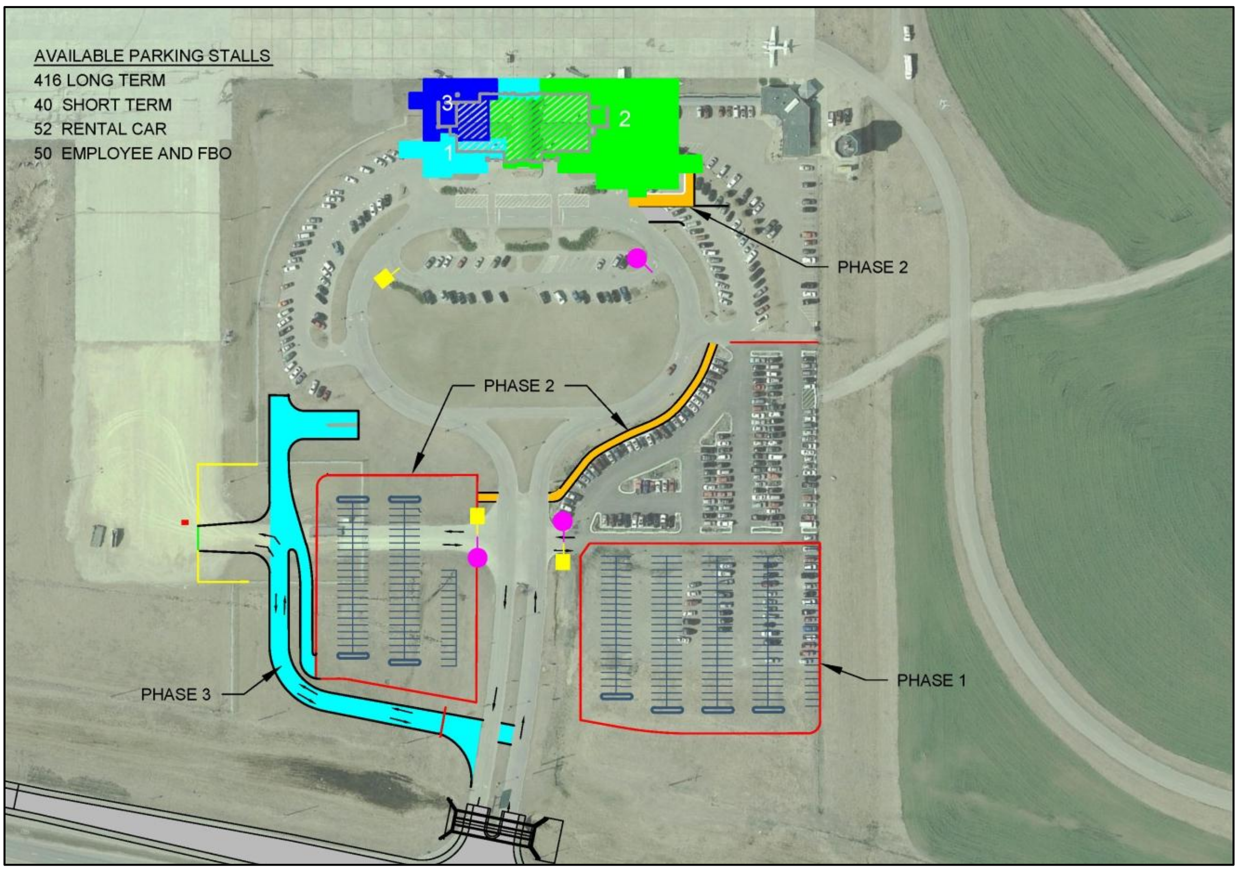



**FIGURE 5.4: PARKING LOT – PHASES 1, 2, 3**

The parking expansion area outlined in red and labeled as Phase 2 construction, is the second proposed long-term lot expansion. Adding this additional lot in the upcoming years will help in alleviating the long-term parking congestion. These additions will help in supplying parking for passengers until the enplanement levels reach 7,200 monthly enplaning passengers, based on current parking habits.

With these three phases completed, there is an opportunity for the Airport to collect revenue to assist in funding these changes and the next level of parking lot improvements. Gate arms and collection booths can be installed in three locations, two for the long-term lots and one in the short-term lot. These are viewed as yellow box's and purple circles at various locations on the alternatives. If these collection facilities are installed there may be changes in the amount of parking capacity that is needed. People may adjust their usage of the parking facilities if they are required to pay for parking at the Airport. More ride sharing will most likely be done along with more drop-offs and pick-ups at the terminal curb. With these possible changes in usage, timelines on future expansions may need to be adjusted. When or if paid parking is implemented, the monitoring of the occupancy levels in the parking lots should be continued to see if there is any significant change in parking demands.

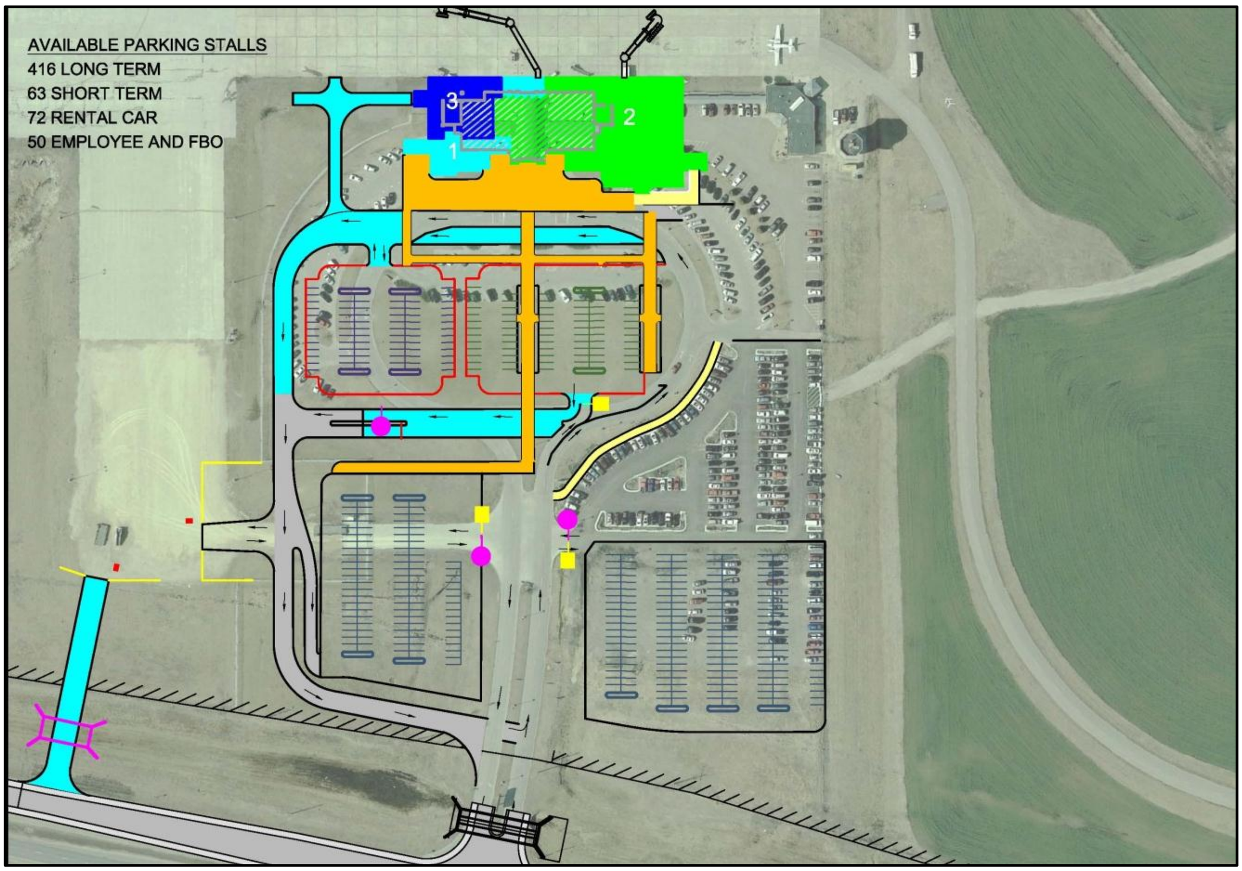



**FIGURE 5.5: PARKING LOT – PHASE 4**

Phase 4 as shown in **Figure 5.5** adds additional stalls for the rental car facilities and short-term parking facilities. It also adds onto the loop road and starts the pedestrian sidewalk system for passenger collection from the long-term lots. At this juncture it would be beneficial to relocate the military access off the loop road to its own access from K-18 to eliminate the need for heavier and larger military trucks and buses to travel around the entire loop road. A short roadway highlighted in blue and a culvert structure will be required for this access change.

After completion of construction of Phase 4, this study provides two options on which way to proceed with future parking expansions. The Airport can assess current parking utilization and needs and evaluate each option based on factors that will alter capacity needs. These factors include the possible addition of a new Airline, increased level of service from the existing airline carriers, implementation of paid parking, or an increase in charters utilizing the facilities. After reviewing all of these factors a course can be chosen on which direction the expansion is pursued.

Phase 5 thru 8 shows relocating the airside perimeter road during phase 5 to allow room for building the northeast portion of the parking lot loop road at the full build out location. With the loop road built to the far northeast, parking lot and space inside the loop road would be constructed as needs arise. An advantage to this phasing plan is that the loop road would be built in its final location. A disadvantage would be that the expense of moving the airport perimeter road would be incurred early in the parking lot construction process.

The Phasing for steps 5 through 8 are further described as follows:

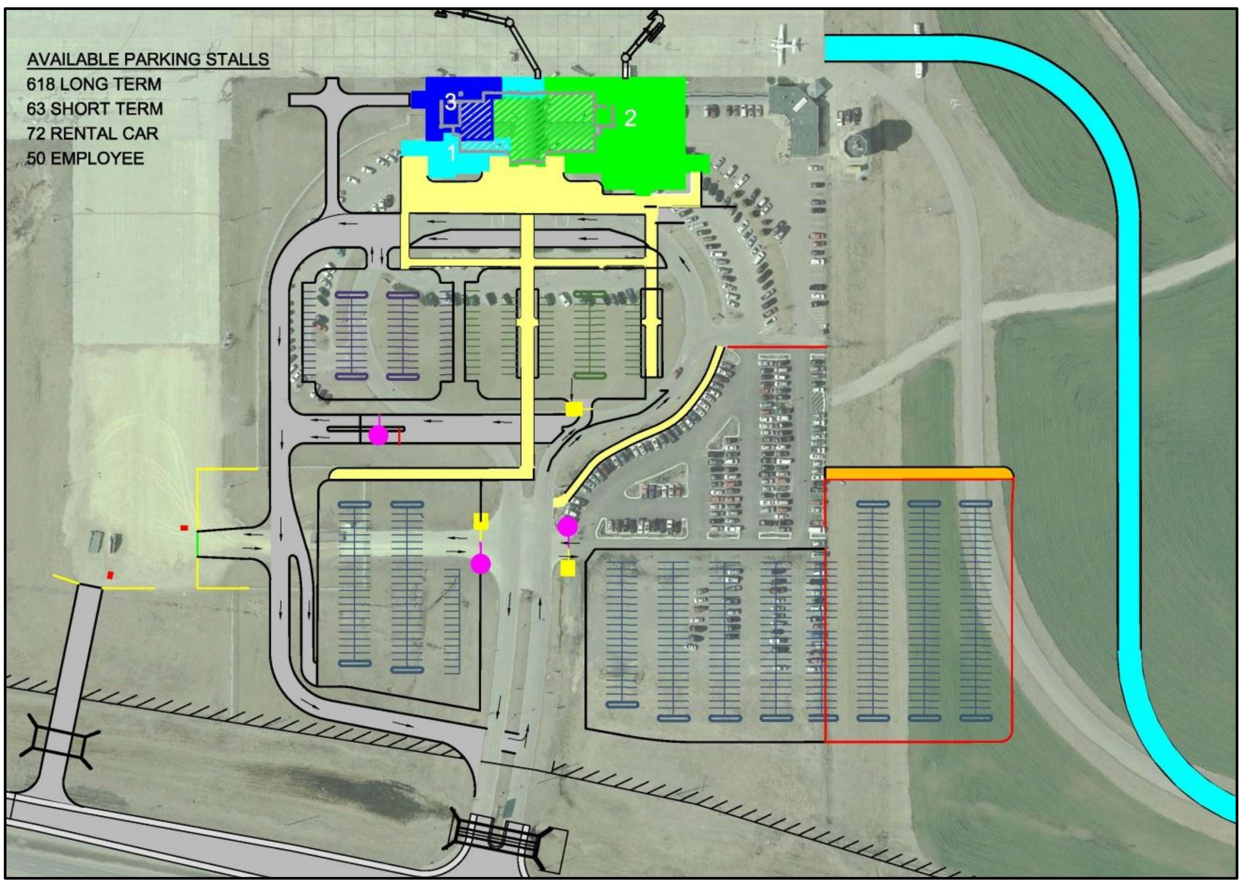



**FIGURE 5.6: PARKING LOT PHASE 5**

As viewed in **Figure 5.6** phase 5 consist of relocating the Airport perimeter road and an expansion of long-term parking. Relocation of the airport perimeter road is needed to provide this additional room.

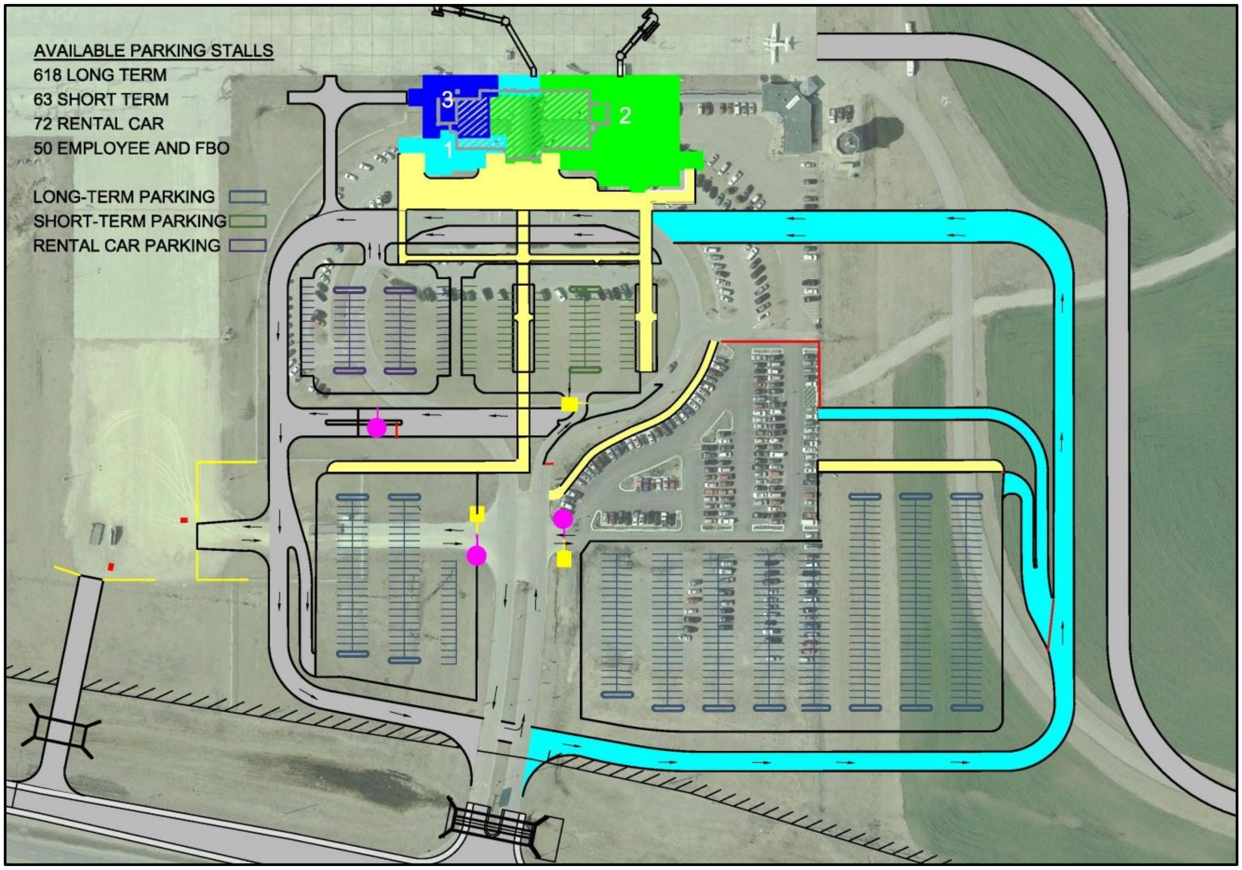



**FIGURE 5.7: PARKING LOT – PHASE 6**

**Figure 5.7** depicts phase 6, this phase constructs the loop road and sets the stage for the access to the long-term and short-term parking areas.

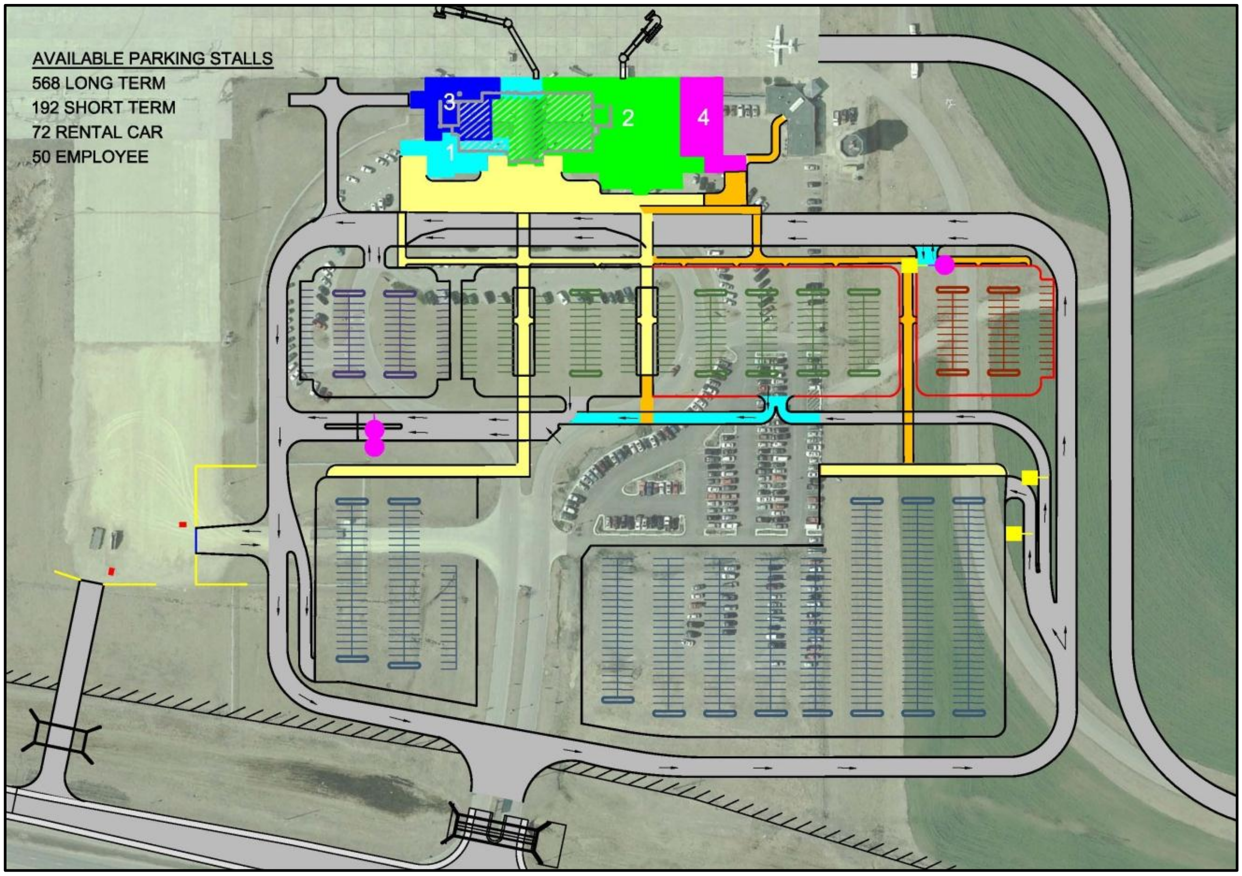



**FIGURE 5.8: PARKING LOT – PHASE 7**

**Figure 5.8** illustrates phase 7, which completes the loop road and expands the employee parking and short-term lots.

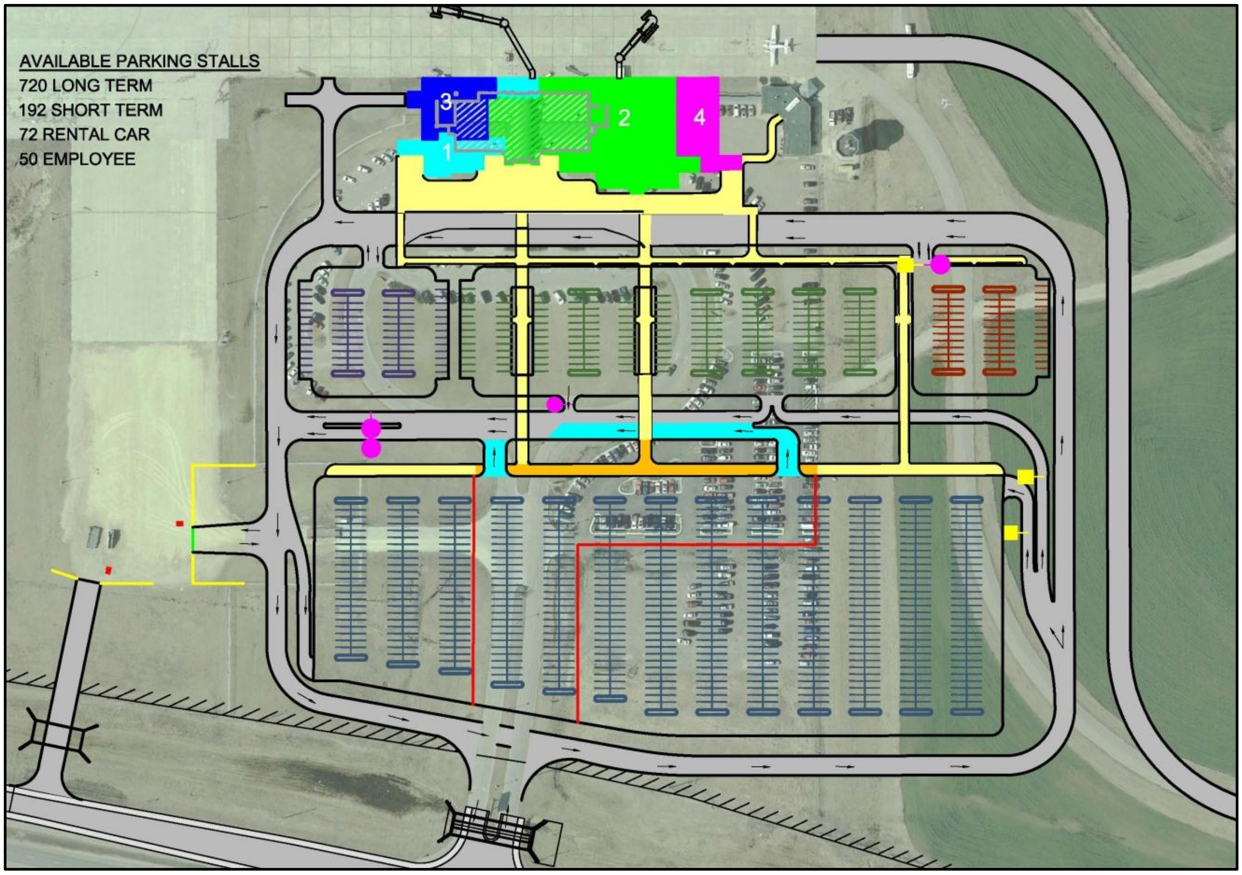



**FIGURE 5.9: PARKING LOT – PHASE 8**

**Figure 5.9** depicts phase 8, which completes the first potential construction phasing sequence.

A second construction phasing plan incorporates Phases 1 through 4 from above but then changes the phasing slightly during Phases 5A through 8A. Phases 5A through 8A as outlined in the figures below shows the completion of the loop road at the intermediate build out point. The loop road would then be relocated along with the perimeter road in the future as parking demand increased saving the expense of moving the airport perimeter road to a later date. An additional benefit of this alternative is the terminal loop road and improved organization and access into the parking lots is completed earlier. The downside to this alternative is that it requires a relocation of a portion of the constructed terminal loop road to be relocated in Phase 8A as parking demand increases. Following the second construction phasing plan (Phases 1, 2, 3, 4, 5A, 6A, 7A and 8A) would fit best with a slower growth rate for needed parking. The Phasing for steps 5A through 8A are further described as follows:

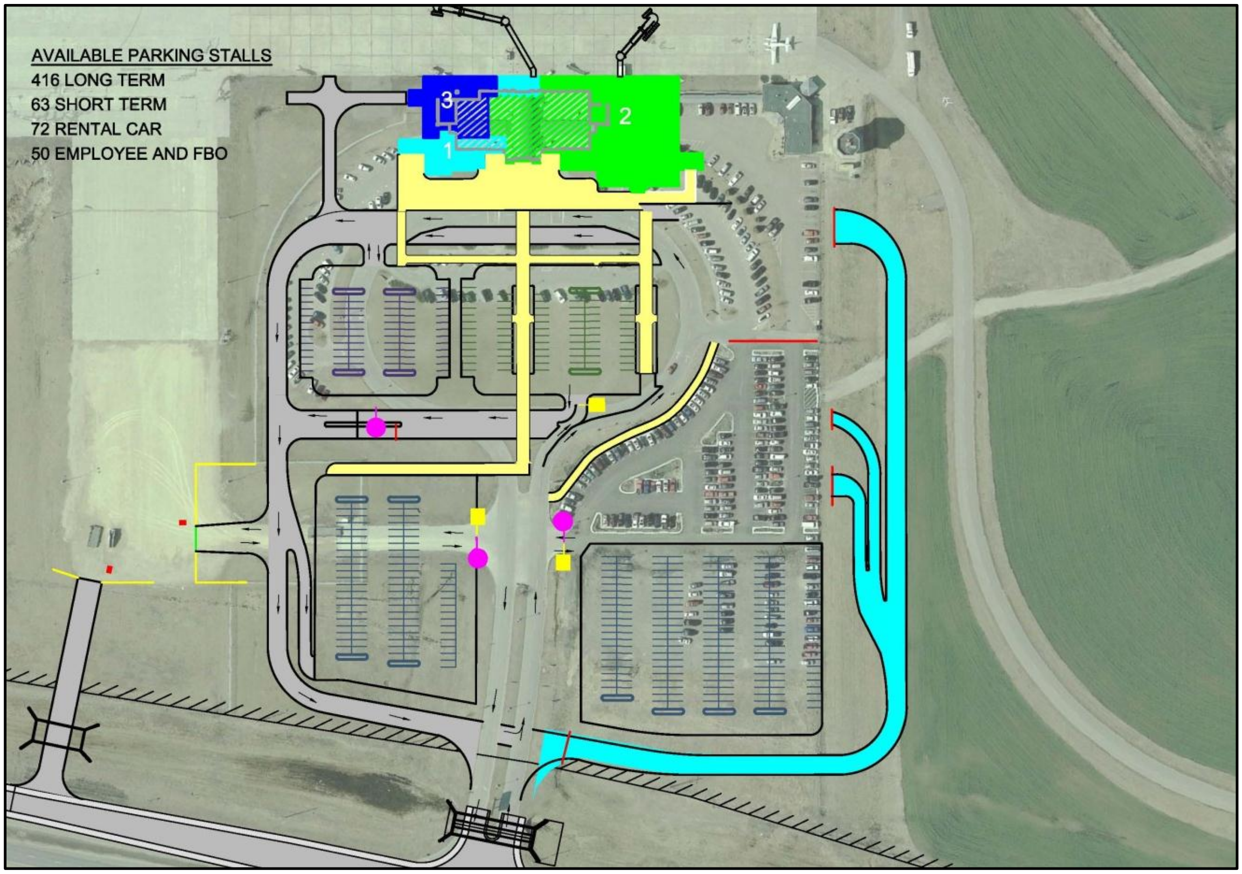



**FIGURE 5.10: PARKING LOT – PHASE 5A**

**Figure 5.10** depicts phase 5A, this phase constructs the majority of the loop road and sets the stage for the access to the long-term and short-term parking areas.

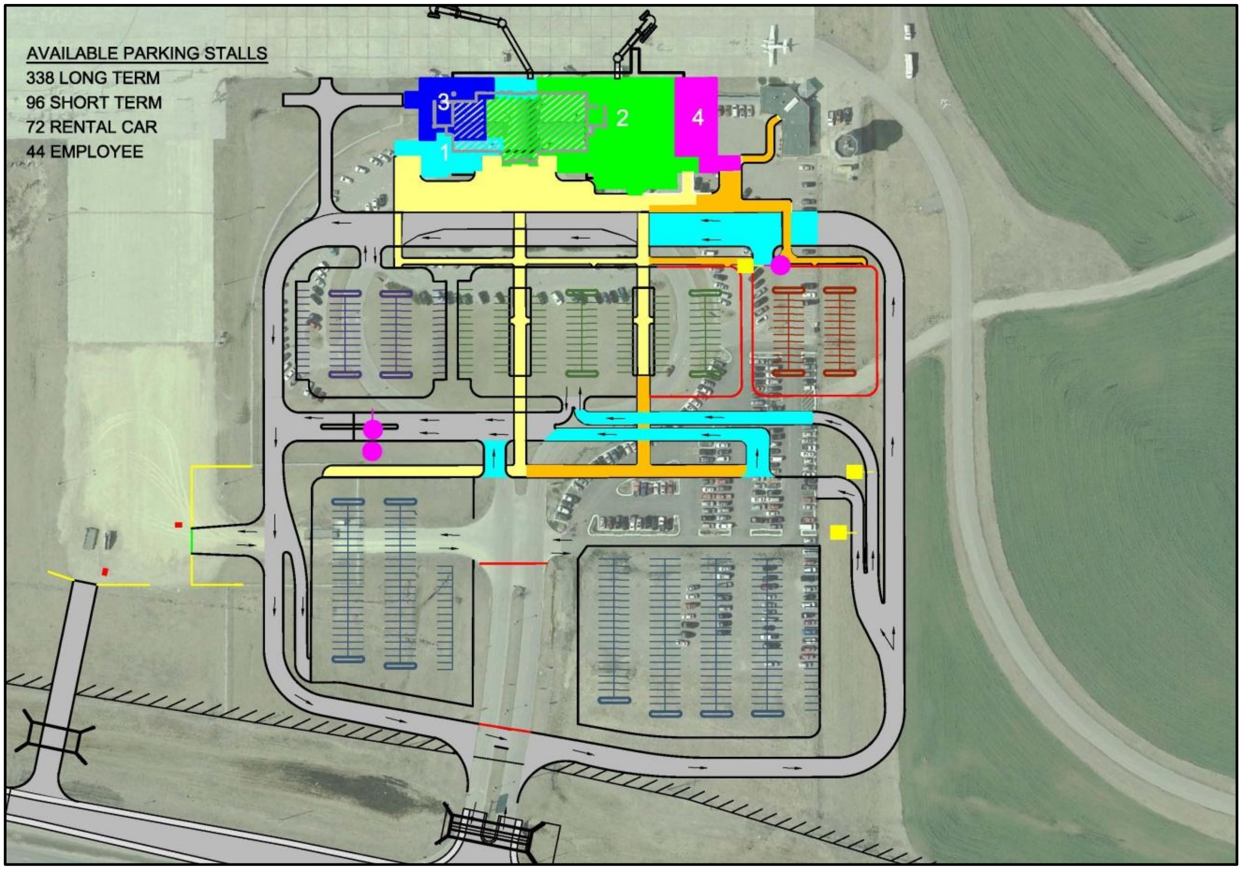



**FIGURE 5.11: PARKING LOT – PHASE 6A**

**Figure 5.11** depicts phase 6A, this phase completes the terminal loop roadway and completes the employee parking, short-term lots, and access to the long-term and short-term parking areas.

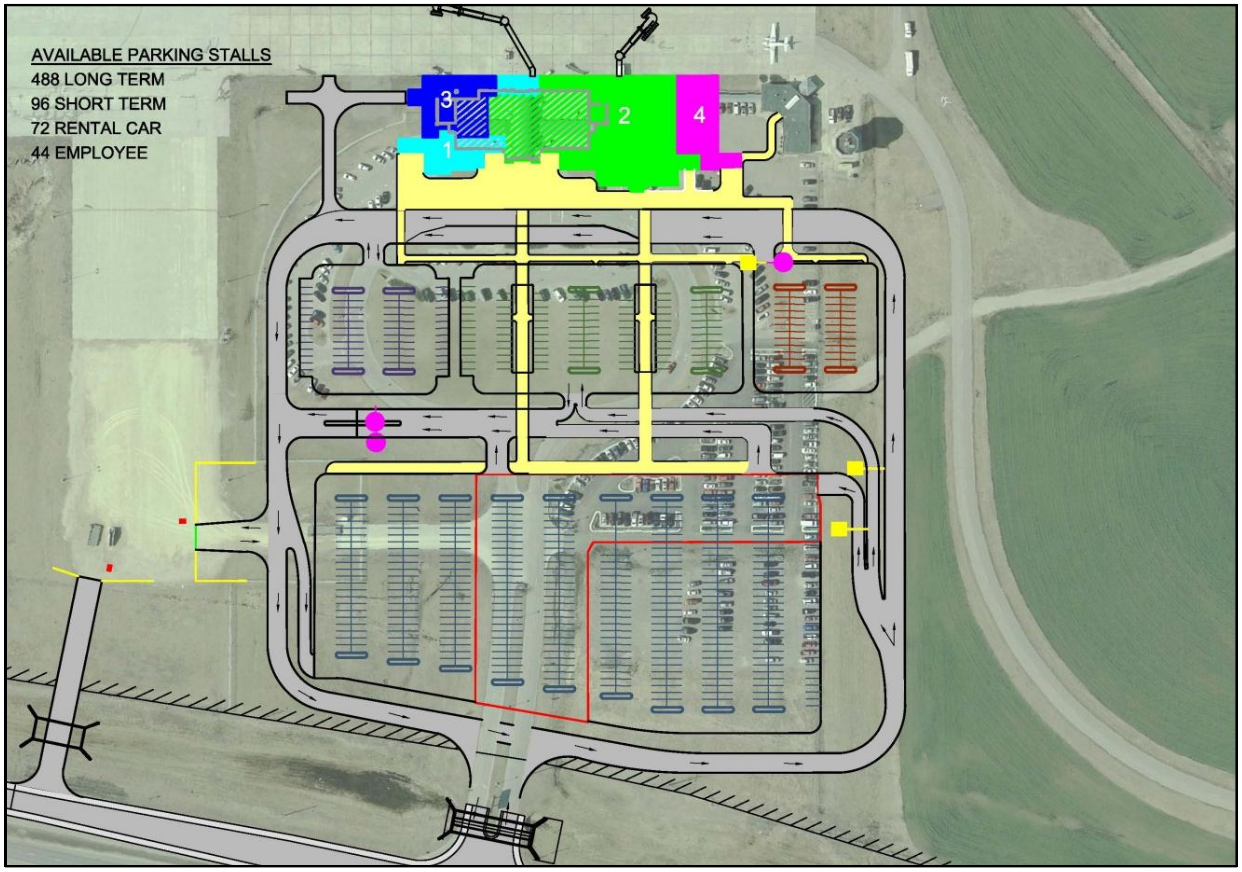



**FIGURE 5.12: PARKING LOT – PHASE 7A**

Phase 7A as viewed in **Figure 5.12** completes the long-term parking areas.

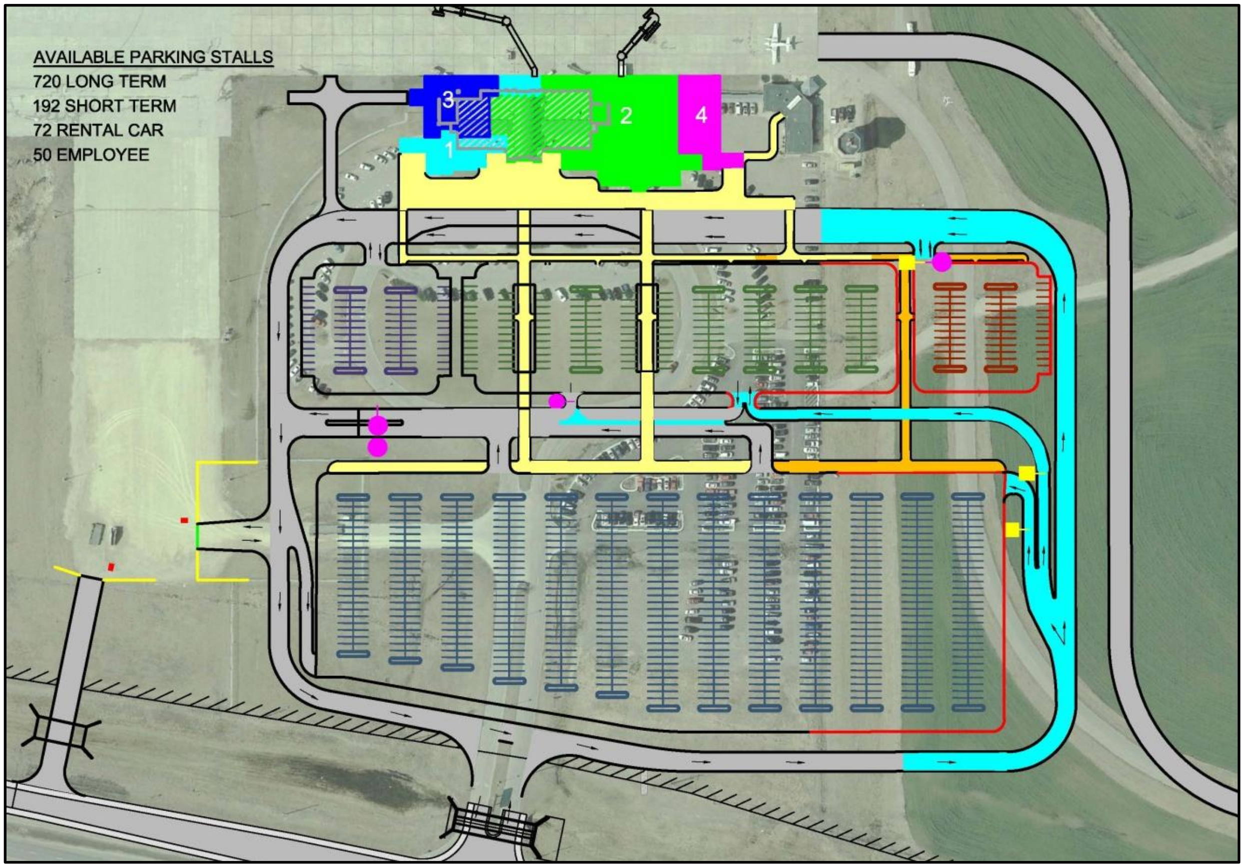



**FIGURE 5.13: PARKING LOT – PHASE 8A**

Phase 8A as viewed in **Figure 5.13** provides a large increase in parking provided from Phase 7A. It requires the relocation of the airport perimeter service road and the relocation of the terminal loop road to provide additional parking for the long-term and short-term lots.

Both of the phasing plans have been provided for flexibility for the Airport to adjust easily to future parking requirements needs. The table below shows the numbers of parking stalls provided after each construction phase.

**Table 5-2. Parking Stalls Provided**

| Phase | Total Stalls Provided | Phase | Total Stalls Provided |
|---|---|---|---|
| 1,2,3 | 558 | | |
| 4 | 601 | | |
| 5 | 803 | 5A | 601 |
| 6 | 803 | 6A | 550 |
| 7 | 882 | 7A | 700 |
| 8 | 1034 | 8A | 1034 |

As discussed in Chapter 4- Demand Capacity and Determination of Facility Requirements, it is anticipated that 648 total parking stalls will be needed by 2015 and 891 stalls will be needed by 2030 if paid parking is not implemented and the current parking growth rate is maintained. If paid parking is implemented the growth rate and need for parking may be slowed. Phase 5 at 803 stalls provided and Phase 7A at 700 stalls provided supplies the parking stalls needed for the 2015 need of 648 stalls. Phase 8 at 1034 stalls and Phase 8A at 1034 stalls both provide parking in excess of what is needed for the 2030 requirements at 891 stalls needed.

## 5.6 Commercial Apron

### 5.6.1 Existing Information

The 2009 master plan was reviewed for existing information related to the terminal aircraft parking apron at MHK. The existing master plan notes that adding a passenger boarding bridge to increase the level of service, especially during inclement weather would be beneficial. It also notes that parking is at a premium on the terminal apron with the FBO and commercial aircraft sharing the same space. Lastly, paving the grass island between the terminal apron and Taxiway A was noted as beneficial because it would expand capacity and improving the safety of the area.

### 5.6.2 Site Constraints

The existing terminal apron is constrained by the FBO and the associated general aviation aircraft on the apron. In addition, the military apron is a site constraint on the opposite side of the apron. While the airport can utilize the military apron for aircraft parking, the military has first right to the apron and the airport should not rely on this space for aircraft parking.

Another apron constraint is the nearby Taxiway A and the Object Free Area (OFA) for the taxiway which borders the commercial and military apron on the northwest side. The OFA is defined by AC 15-/5300-13, Airport Design, as follows: An area on the ground centered on the runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. Chapter 4 goes on to say the following: The taxiway and taxilane OFA clearing standards prohibit service vehicle roads, parked airplanes and above ground objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

The existing Object Free Area is shown in **Figure 5.14** and represents the line that aircraft cannot park past, nor can any part of an aircraft cross this line without first calling the ATCT for taxi clearance. This line is currently painted on the military and commercial apron is 160 feet from the Taxiway A centerline and represents the OFA needed for Airplane Design Group (ADG) V aircraft. ADG V aircraft are larger than the aircraft that typically uses the commercial apron which is verified by the existing Airport Layout Plan (ALP) which indicates that the airport has an ultimate design group aircraft of C-IV. The 2009 Master Plan also indicates that no ADG V aircraft are expected if MHK becomes the APOE with the C-130 (ADG IV) being the design group aircraft. For this reason, it is recommended that the ADG IV Object Free Area be used, with it being painted 129.5 feet from the Taxiway A centerline. This would allow more apron depth for aircraft parking and maneuvering. The ADG IV OFA is shown on **Figure 5.18**: Partially Paved Island.

### 5.6.3 Parking Configurations to Meet Forecasted Needs

**Figure 5.14** shows the 3 parking positions needed and 2 gates needed to meet the current needs as outlined in Chapter 4 – Demand Capacity Analysis and Determination of Facility Requirements. The larger boarding bridge on the south end of the apron would be capable of handling small regional jets and large narrow body jets such as a 757. The bridge on the north side of the apron will be capable of handling regional jets only. For the current need, the 757 is positioned near the apron edge and jet blast protection may be needed between the airside and landside if the 757 were to power out instead of being pushed back with a tug. The aircraft at the other two parking positions could also power out.

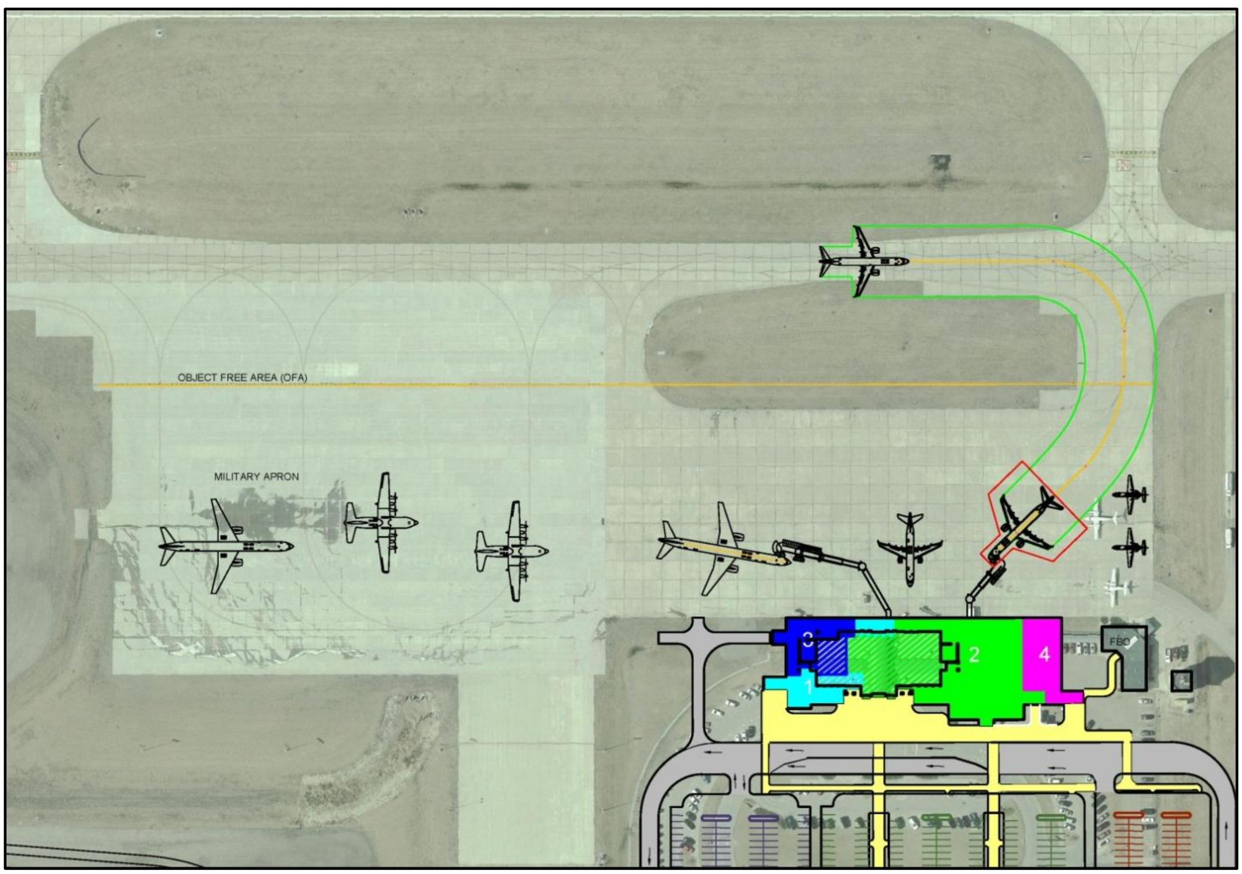



**FIGURE 5.14: PARKING POSITIONS TO MEET CURRENT NEED**

**Figure 5.15** shows parking for 4 aircraft to meet the future 2030 needs. Aircraft at the 2030 demand level could potentially be pushed back with a tug instead of powering out to allow for aircraft to be positioned in closer proximity to one another, thus reducing the distance of the ground loaded aircraft to the terminal building. Pushing back would also reduce jet blast concerns.

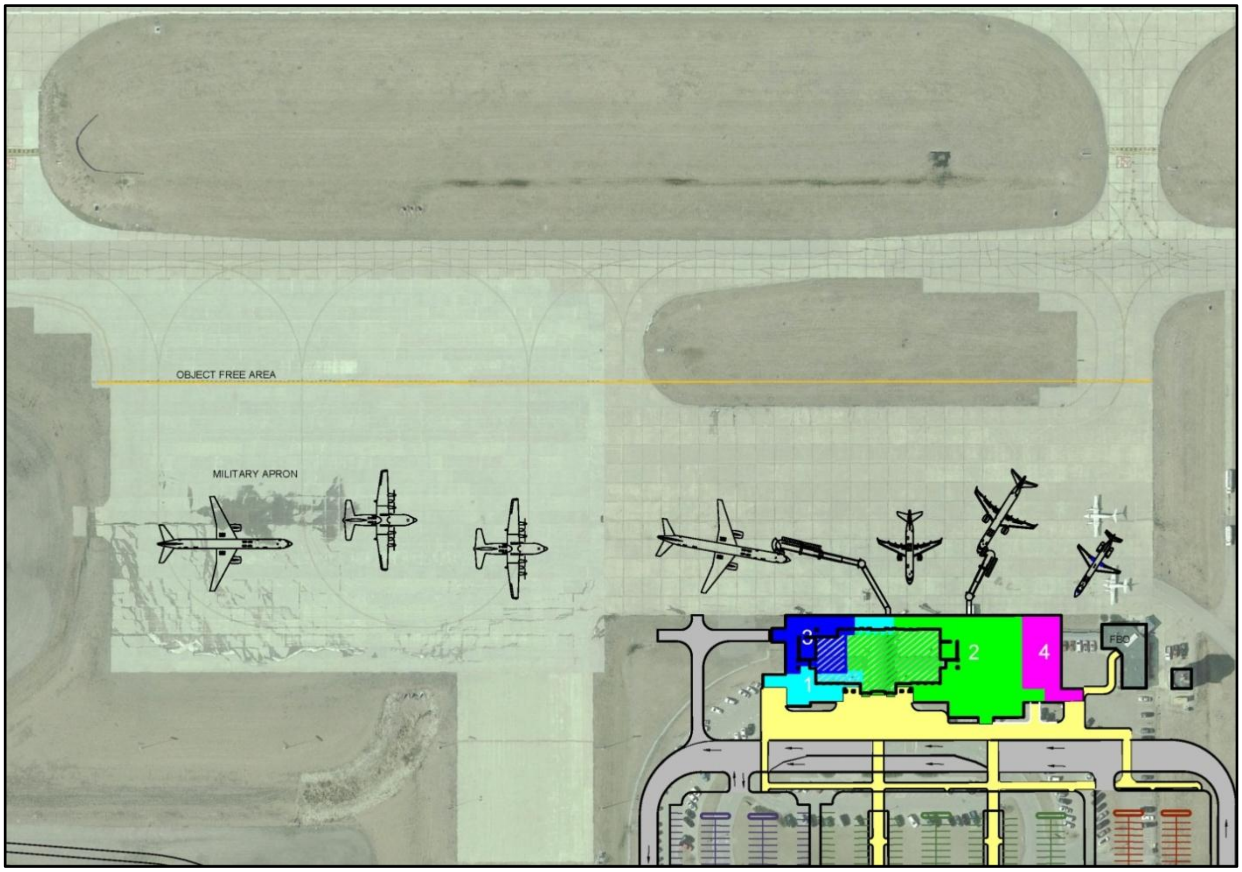



**FIGURE 5.15: PARKING POSITIONS FOR FUTURE NEED – 4 POSITIONS**

### 5.6.4 Paved Island

As shown in **Figure 5.16**, a preliminary layout was completed that depicted the entire grass island being paved. This layout was later revised to the layout in **Figure 5.18** after gaining feedback from the FAA at a Planning Advisory Committee meeting and the release of new guidance by the FAA which recommends against paving grass islands between aprons and taxiways. FAA Advisory Circular AC 150/5300-13 CHG 17 dated 9/30/2011 advises the following:

Do not construct wide throat taxiways leading directly from an apron to a taxiway that is parallel to a runway. Wide throat entrances contribute to lack of situational awareness by pilots and have contributed to runway incursion incidents. Pilots have the tendency to confuse wide expanse of pavement as part of an apron. **Figure 5.17** illustrates the wide-throat taxiway from an apron that the FAA advises against constructing.

Due to the comments and new guidance from the FAA, the drawing was revised as shown in Figure 5.18 which paves only a portion of the grass island to enhance aircraft maneuvering to the apron. This taxiway also enhances safety in the fact that it does not lead directly from the apron to the runway with pilots have to take purposeful maneuvers to enter the runway. During discussion with military representatives it was indicated that paving the grass island or a portion of the island to increase maneuvering room is something they wish to see in the future. While aircraft could maneuver in this space, parking is not allowed according to FAA standards because the parked aircraft would be inside the Object Free Area line.

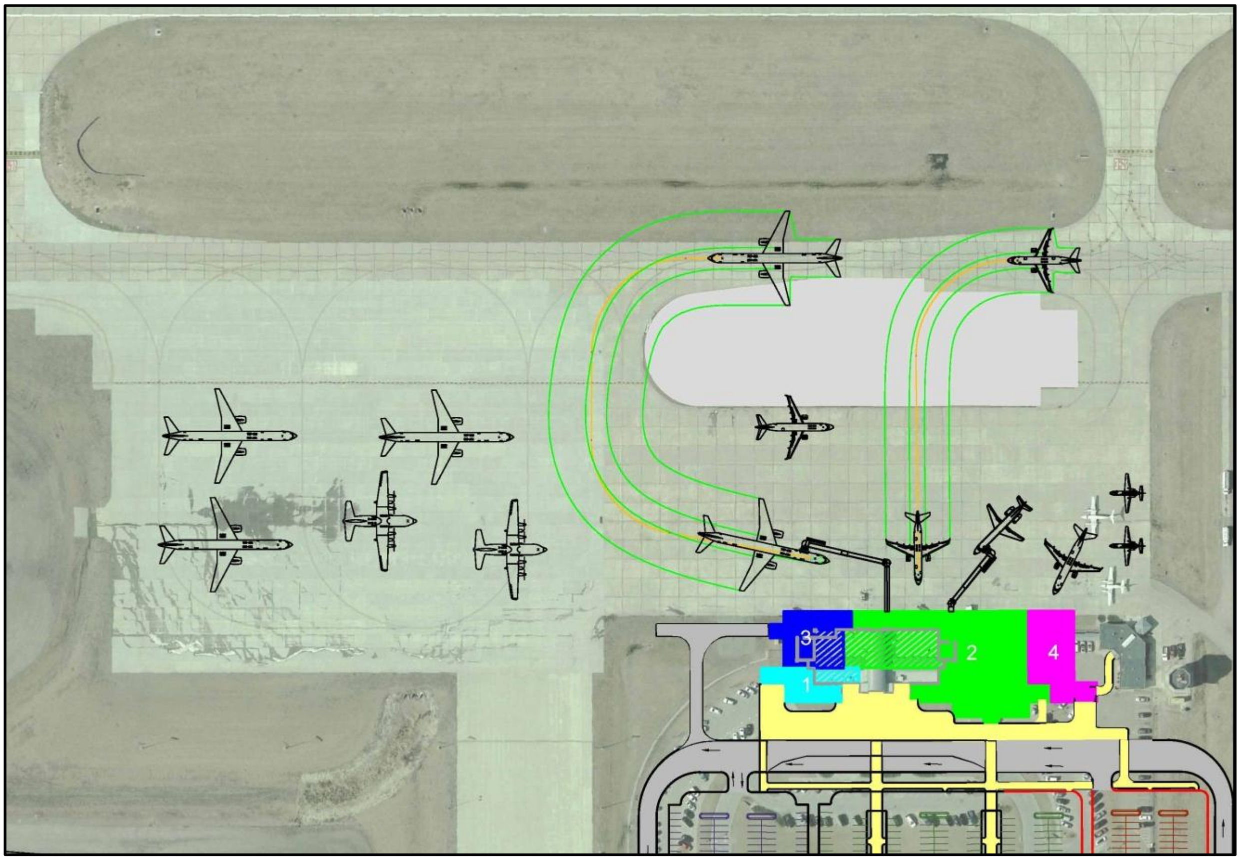
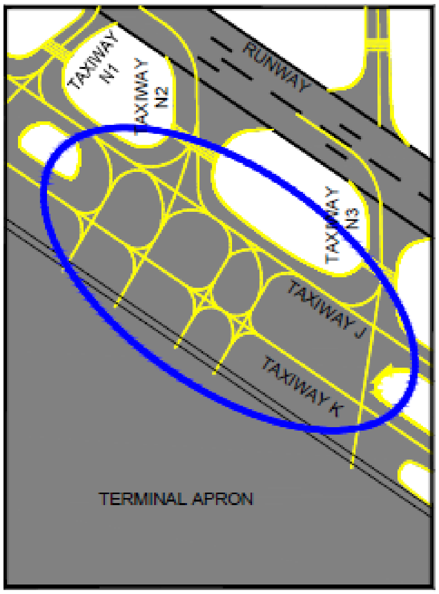



**FIGURE 5.16: PRELIMINARY PAVED ISLAND LAYOUT**




(b) Extra-wide throated taxiway without "No Taxi" islands leading from the apron directly to parallel taxiways and runways

**Figure 5.17: Problematic taxiway geometry that is not recommended for construction**

**Source; FAA AC 150/5300-13 Change 17 dated 09/30/2011**

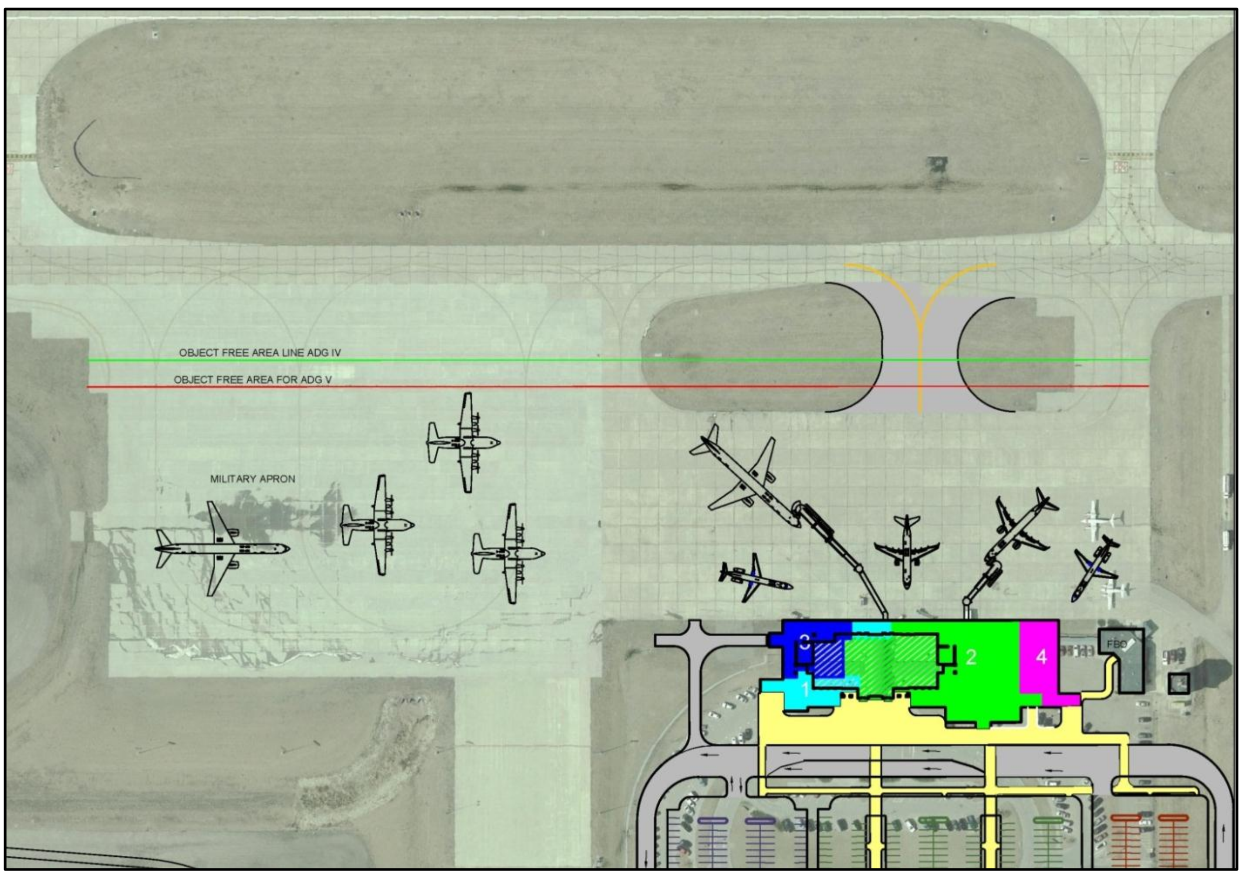



**FIGURE 5.18: PARTIALLY PAVED ISLAND TO AID IN AIRCRAFT MANEUVERING**

# 5.7 General Aviation Apron

## 5.7.1 FBO Apron

The increase in commercial service at MHK has increased congestion on the commercial apron and has often left the FBO with little room to park general aviation aircraft. Commercial airline representatives have also noted that the close proximity of the FBO and general aviation aircraft is something they are uncomfortable with and would like to see changed. In addition, the TSA and FAA recommend a separation of general aviation aircraft from commercial aircraft for security reasons.

Two alternative layouts have been assembled to address these concerns with both alternatives showing the general aviation aircraft and the FBO being relocated to the general aviation area on the east side of the Runway 31 approach.

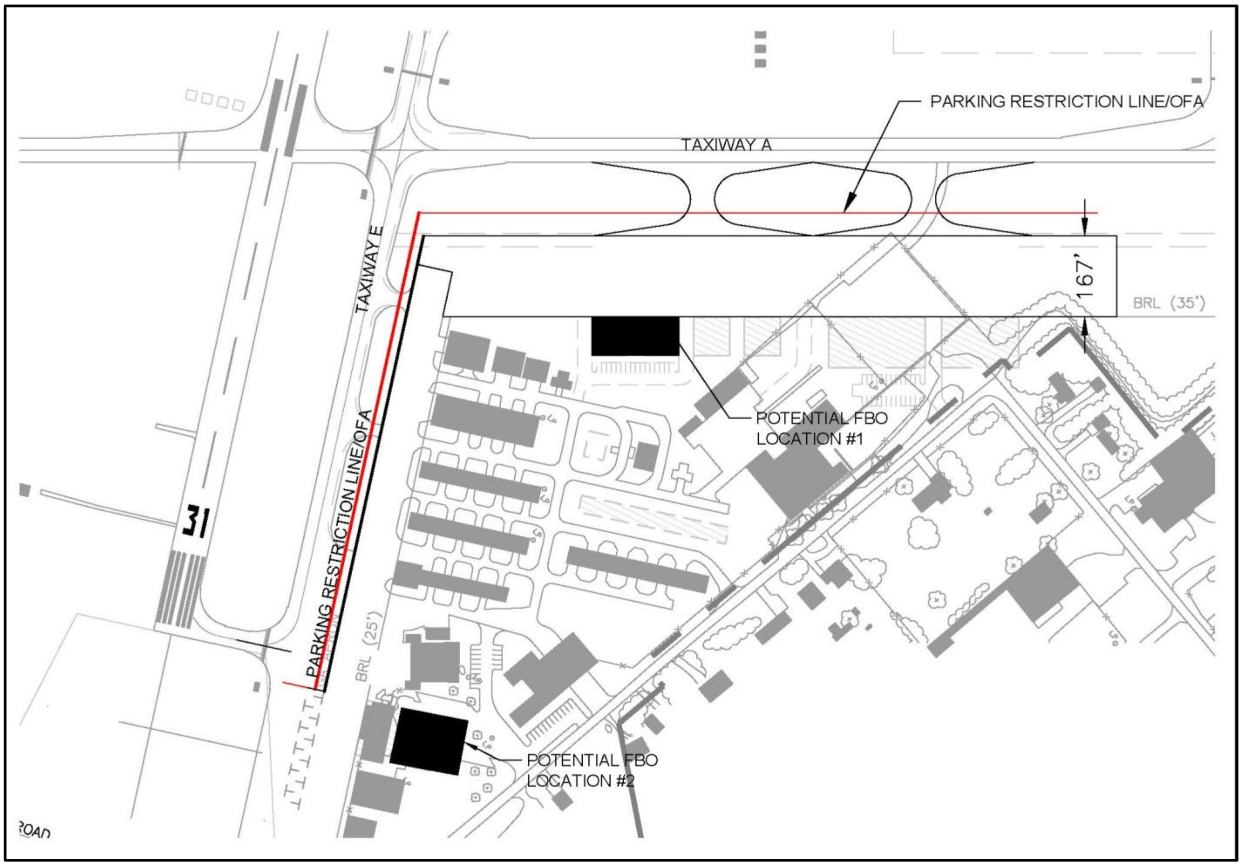



**FIGURE 5.19: FBO LOCATION #1 & #2**

## 5.7.2 Option 1 FBO Location

Option 1 shown on Figure 5.19 depicts the FBO being relocated to the general aviation side of the airport along Taxiway A on future apron. The FBO building would be located at the 35-foot Building Restriction Line (BRL). This location provides adequate depth to park aircraft and keep them outside of the Object

Free Area for Taxiway A if it is used for ADG IV aircraft and the runway is used for large commercial service and military aircraft. The apron depth provided is approximately 167 feet between the hangars and the edge of the apron. The entire apron in this vicinity measures approximately 235,000 square feet. A portion of the apron along Taxiway A could be paved as funding allows.

Option 2 shows the FBO located on the existing general aviation apron along Taxiway E. The former passenger terminal building built in 1958 that is currently unused would be demolished and the proposed FBO hangar would be constructed behind it. Setting the hangar back from the existing apron would allow for additional apron space in front of the FBO facility. Due to the shallow apron depth of 112 feet between the parking restriction line and the existing hangars on the apron edge, maneuvering aircraft in ADG II with wingspans up to 79 feet could be challenging. Larger aircraft in ADG III with wingspans up to 118 feet could not maneuver on the apron without entering the Taxiway E Object Free Area.

A general aviation subcommittee has been formed by the Airport Advisory Board to further study the general aviation area and work with the existing FBO to determine the development needs in the general aviation area. The Terminal Area Master Plan Advisory Committee formed for the Terminal Area Master Plan study recommended relocating the FBO to the general aviation side of the airport.

### 5.7.3 Apron Justification

Based on the FAA Central Region spreadsheet titled “Apron Size Calculations for Transient Aircraft” approximately 27,154 square yards (244,386 sf) of apron is justified for the year 2012. Approximately 966 square yards of tie down area exits on the existing east general aviation apron making a total of 26,188 square yards (235,692 square feet) of new apron justified for upcoming construction.

FLYMHK
Manhattan Regional Airport


# Chapter 6
# Development Area

## Introduction

Part of the scope of the Manhattan Airport Terminal Master Plan is to investigate opportunities for commercial development on the airport property. This development would occur at the proposed intersection of W56th Avenue and the proposed K-18 frontage road, which will be constructed with the K-18 project by the Kansas Department of Transportation (KDOT). The limits of the commercial development area will extend from W56th Avenue east to the existing terminal parking shown on **Figure 6.1**.

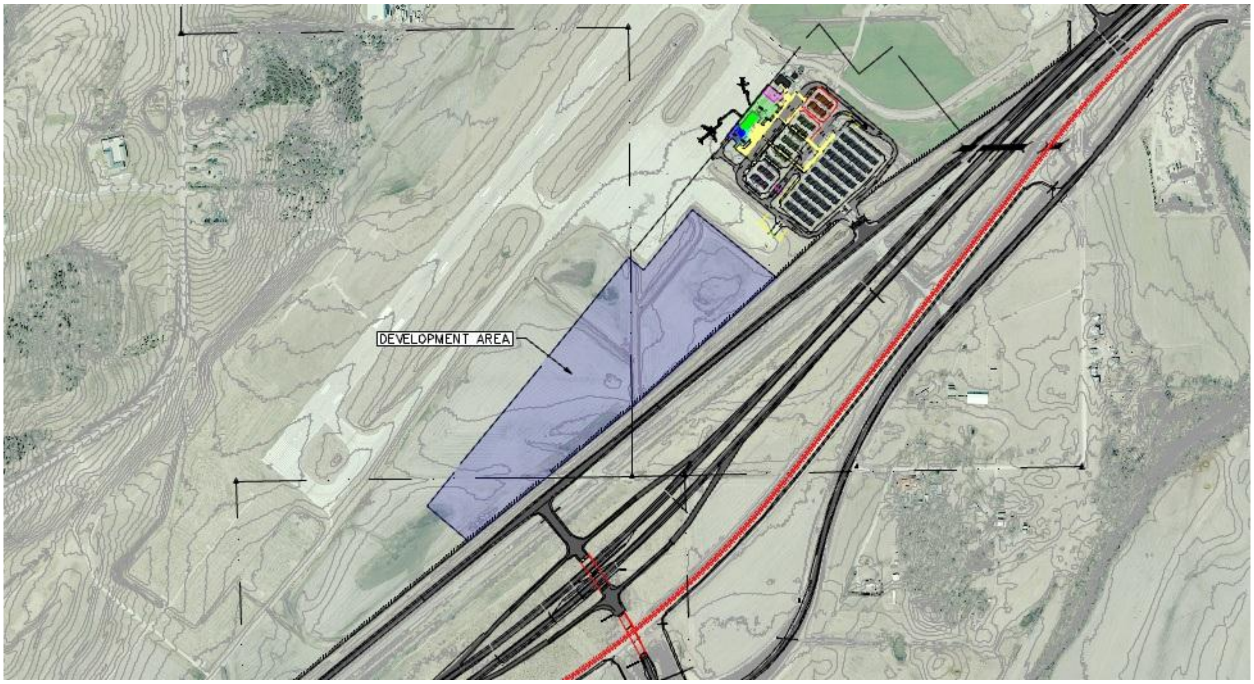



**FIGURE 6.1: DEVELOPMENT AREA**

This chapter will review the access for the proposed property, land ownership, possible commercial development lot layouts, the serviceability of utilities and infrastructure, and potential uses of the land.

## 6.1 Access

Existing access to K-18 within the study area is limited by the access breaks shown on the Manhattan Regional Airport Addition Plat dated March 2000 (see **Figure 6.6**, found at the end of this chapter) and the Access Management Process for KDOT. The existing breaks are as follows:

- 80 feet at Wildcat Creek Rd
- 80 feet ¼ Section Line of Sect 5 T11S R7E
- 97 feet North Line of Sect 5 T11S R7E
- 100 feet at the existing Terminal Park Entrance

At the conclusion of construction of K-18, the westbound lanes of the existing highway and associated KDOT right-of-way (R/W) will be released to the county as a frontage road to the new limited access highway (the eastbound lanes will be removed). Per discussion with KDOT, it was learned that they will not be preparing a legal description of the R/W to be released but will be transferring the westbound bound lanes (frontage road) by a physical features description.

The airport property has previously been annexed into the City of Manhattan but the proposed frontage R/W is not part of the City. Typically the access onto a county road would be governed by the county, but because the corridor falls under the Manhattan Urban Area Planning Board Boundary their regulations are used in this analysis for adding additional access breaks for the development area. Revising the access control would be accomplished through the platting and zoning process with the City of Manhattan.

The frontage road would be considered a “collector” and fall under the standards listed below:

*Excerpts from Section 10-207 and 10-208 Manhattan Urban Area Subdivision Regulations*
*10-207. STANDARDS FOR ACCESS MANAGEMENT*

*(A) Access Management. Access management includes the control of the spacing, location of driveways, side streets and intersections. Effective access management is essential to achieving safe and efficient traffic operations on the major street system. The amount of access should decrease as the functional classification of the street increases.*

*(B) Driveway and Street Spacing. Driveways to abutting property should be confined to local streets. Direct access to arterial and collector streets should be prohibited unless no reasonable alternative is available. There are two primary aspects to driveway spacing. One is the relationship of an intersecting side street or driveway relative to the intersection of arterial and collector streets. The other aspect is the relationship between intersecting local streets or driveways along an arterial or collector street. The following standards are hereby required:*

….

*(3) Along a collector street, no side street or driveway shall intersect the collector street within 300 feet of an intersecting arterial street, nor within 150 feet of an intersecting local street or driveway.*
*. . . .*

*10-208. STANDARDS FOR ACCESS TO ARTERIALS AND COLLECTORS.*

*(A) Access to Arterials and Collectors. Direct access to an arterial or collector, in the form of a private driveway, shall only be allowed when no other means of access is available. The City or County Engineer shall review the subdivision and make a recommendation to the MUAPB.*

The spacing for driveways and streets along a collector is not explicitly granted by the code. The recommended spacing, if access is granted, is 150 feet. In order to allow additional drives from the proposed commercial property an interior road has been considered for the development layouts. This interior road would be classified as a local street and would allow entances at a 75-foot interval. In addition, a layout with common drives from the frontage road (existing westbound K-18) was also explored.

## 6.2 Land Ownership

The FAA requires that the Airport retain ownership of airport land if it could ever be used for aeronautical purposes. This agreement is outlined in the grant assurances that the City agrees to comply with when it receives FAA funding. For this reason, the land designated for commercial development most likely could not be sold. Because the ownership of the land will stay with the City, a non-traditional agreement must be reached between the airport and a prospective business. One option for this agreement is a land lease between a business and airport. A second type of arrangement used is a long term land lease between a business and airport, with the airport collecting a portion of the gross sales.

## 6.3 Development Layouts

The area intended for commercial development may be used for aeronautical related business such as a gas station with a car wash to serve rental car customers and companies, a rental car quick turn-around facility, a rental car ready lot or a hotel for airport users. Non-aeronautical land uses may require analysis by FAA.

The proposed property would need to be re-platted. This would allow the city to review any proposed access breaks and vacate the existing access breaks. The property is zoned Airport Overlay District which allows any land use that is compatible with the operation of the Airport and is approved by the City Commission. The following sections discuss layouts reviewed with the planning advisory committee.

### 6.3.1 Layout 1

Layout 1 **(Figure 6.2)** provides an interior roadway exiting at the crossover of the proposed K-18 highway and connecting to the proposed ring road for the airport parking. The layout also provides a detention area to combine the drainage paths from the airfield into a single location to minimize the box structures to be constructed.

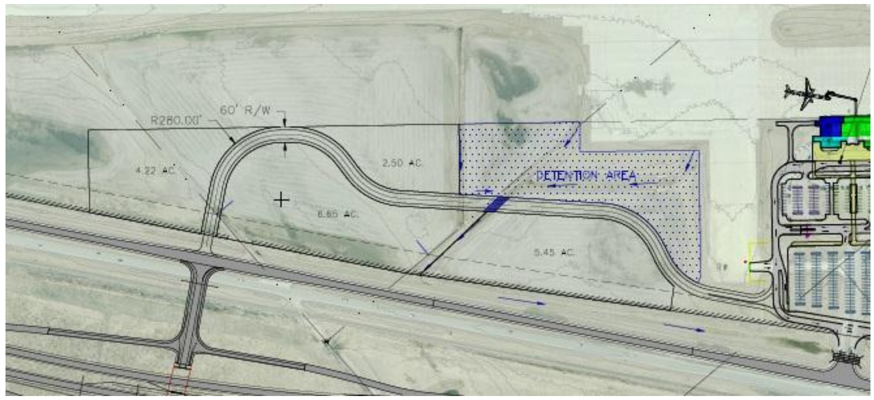



**FIGURE 6.2: LAYOUT 1**

An option of continuing the bisection of the planned commercial area to the frontage access area was analyzed but would require a stop condition because the radius of the centerline would become too small for larger vehicles.

The lot layout provides several size options for potential lessees and if the city chooses, several could be split in the future for more flexibility.

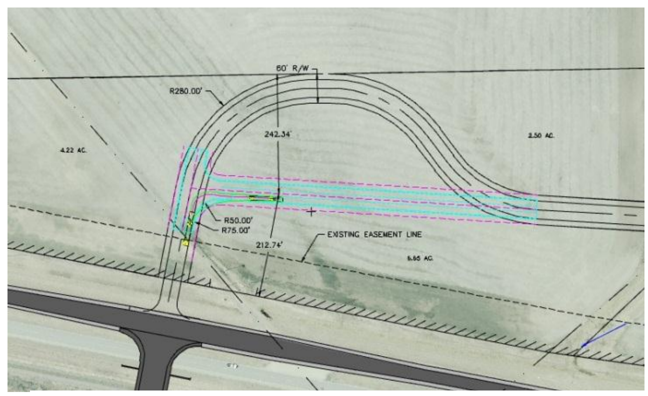



**FIGURE 6.3: INTERESTION IF DEVELOPMENT AREA IS BISECTED**

Layout 2 **(Figure 6.4)** has the same interior roadway configuration as Layout 1 but omits the detention area. This creates more useable land area but forces additional storm sewer boxes to address the storm water traversing the property. The proposed lot lines follow the drainage paths and limit the number of potential lot layouts.

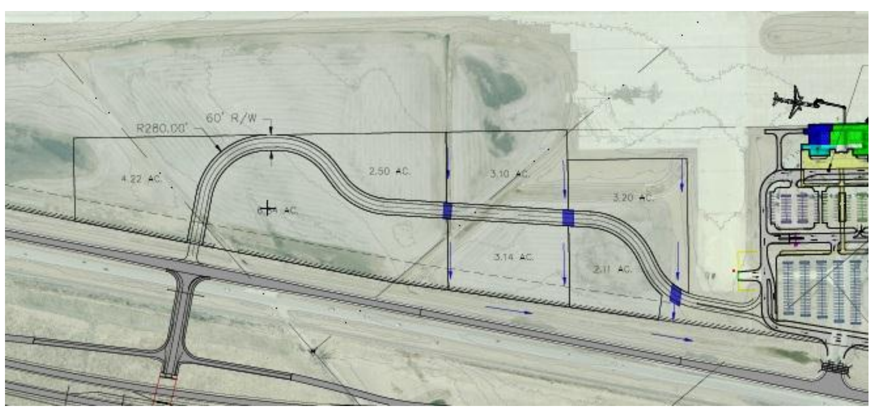



**FIGURE 6.4: LAYOUT 2**

### 6.3.2 Layout 3

Layout 3 **(Figure 6.5)** shows the property with no interior roadway. This allows the property to be developed in separate pieces and also allows the development depth (North to South) to be reduced to a single row of lots. Layout 3 keeps the lot depth short of the edge of the Army Deployment Apron extended edge which protects the ability to extend the apron at the same depth. Drainage from the airfield and within the lots would be achieved by directing storm water to drainage swales located between the lots.

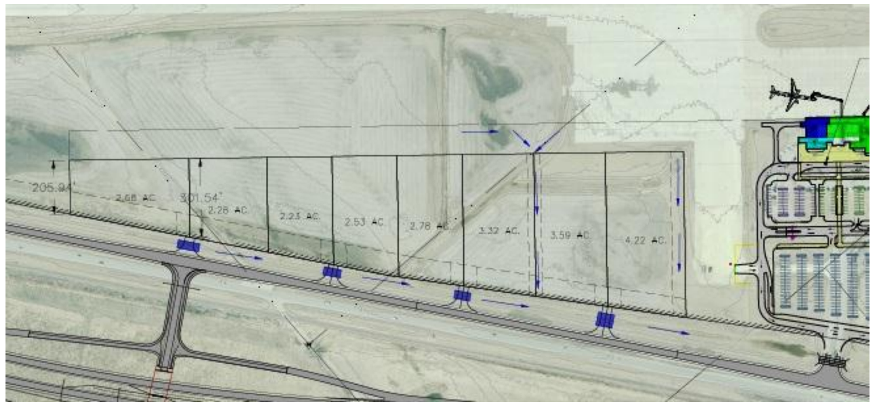


**FIGURE 6.5: LAYOUT 3**

This option requires multiple access points for the project which could be built as the need arises. The option is shown with 500-foot spacing of drives and approximately 250-foot wide lots. The drives would be common drives shared between two lots reducing the cost and increasing the spacing. Because of the close proximity and number of access drives, additional studies may need to be completed during preliminary engineering to ensure this section of the frontage road maintains a high level of safety for drivers. The City and County Engineers will review the proposed layouts and make recommendations to the Manhattan Urban Area Planning Board as part of the platting process.

### 6.3.3 Preferred Layout

Layout 3 is the preferred layout. Omitting the interior access road would reduce development costs and save more land for lots rather than roadway. The shorter lot depths also protect the ability of the Army Deployment apron to be further expanded at the same apron depth in the future. Layout 3 has a larger lot depth which is useful because the wide utility easement along K-18 reduces the buildable land on the front of the lots. An additional benefit of the preferred layout is that it provides frontage for all lots along the K-18 access road. Additional analysis of this layout may need to be performed during preliminary engineering to evaluate the access points and gain approval.

## 6.4 Utilities

### 6.4.1 Public Utilities

Both sewer and water would be extended from the terminal building area to the development area. Analysis of the Manhattan GIS as-built sewer depths (10' at SE Corner of the proposed parking area) show that the majority the acreage in the development area would need to be served by a lift station and interior gravity sewers.

A 12-inch water line serves the current airport buildings. This main and its extension should be analyzed for fire flows in the development area.

### 6.4.2 Storm Water

Flood Insurance Rate Map for Riley County Kansas and Incorporated Areas Map Number 20161C0343F revised February 4, 2005 designates the development as Zone X: Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1-foot or with drainage area less than 1 square mile; and areas protected by levees from a 1% annual chance flood or Areas determined to be outside the 0.2% annual channel floodplain. The Flood Insurance Rate Map, (**Figure 6.7**), can be found at the end of this chapter.

The proposed property has large existing drainage swales that cross the property from the airport to the highway ditch. The development layouts presented earlier in this chapter show several alternatives for routing storm water through the development area.

### 6.4.3 Private Utilities

Existing easements cover approximately 100' of depth along the existing R/W. This area would typically be designated as a building setback and shouldn't adversely affect the development potential of the proposed properties.

## 6.5 Potential Commercial Land Development

Recently constructed and future planned improvements to the K-18 corridor will provide increased exposure and access for business owners who may choose to occupy the commercial development area. Potential businesses located in the commercial development area could complement the airport and would need to be compatible with airport operations. Listed below are a few suggestions for business types that would be compatible with airport uses and could be located in the commercial development area.

**Joint Use Gas Station/Convenience Store with Car Wash**

The proposed lot sizes are adequate for a gas station/ convenience store with a car wash. The rental car companies have noted during tenant interviews that a business with close proximity to the airport for refueling and car washing would be welcome. Rental car customers have also expressed the need for a gas station near the airport for fueling rental cars prior to returning them.

**Consolidated Rental Car Quick Turn Around (QTA) Facility**

The commercial development location would be an ideal location for a rental car Quick Turn Around facility. The consolidated QTA facility would provide the amenities that are needed to complete basic maintenance and cleaning of rental cars in a location that is at the airport. The potential QTA facility could include fuel facilities, wash bays, vacuums, compressed air, carpet cleaning capabilities and windshield washer refilling. Other optional items that could be incorporated into a QTA facility would include maintenance bays with vehicle lifts and oil storage.

**Rental Car Ready Lot**

In lieu of using valuable parking space within the airport terminal parking lot, rental cars that are not immediately needed for customer use, could be stored at a rental car ready lot located within the commercial development area. The close proximity to the airport would make it ideal for quickly moving cars to the terminal building for customer use.

**Other Options**

Other business types that could complement the airport, some of which have been noted as such in the 2009 Master Plan, are kennel facilities, restaurants, mobile phone store, specialty book store, specialty electronic stores, hotels and light industrial facilities.

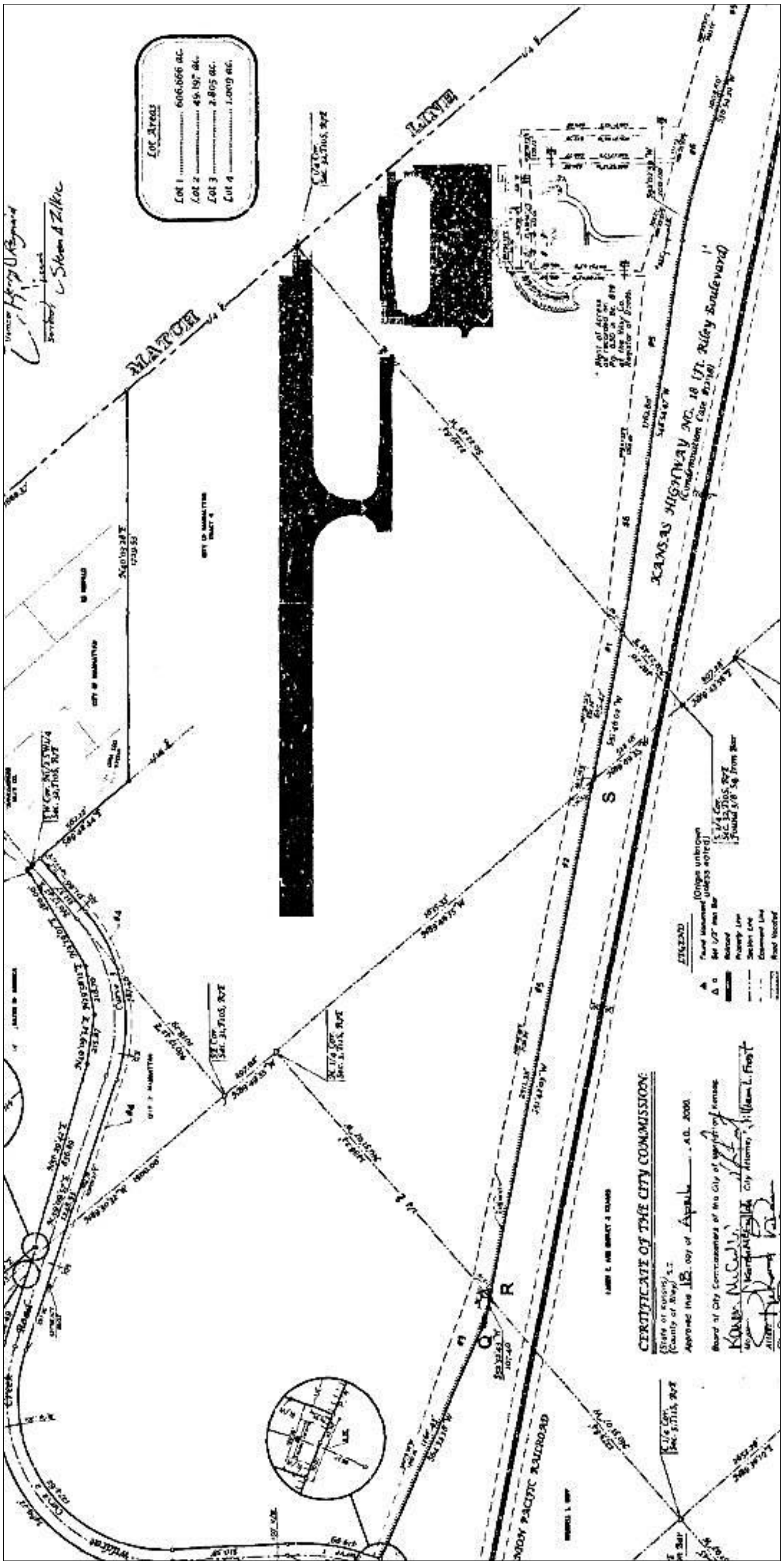



**Figure 6.6: Manhattan Regional Airport Addition Plat**

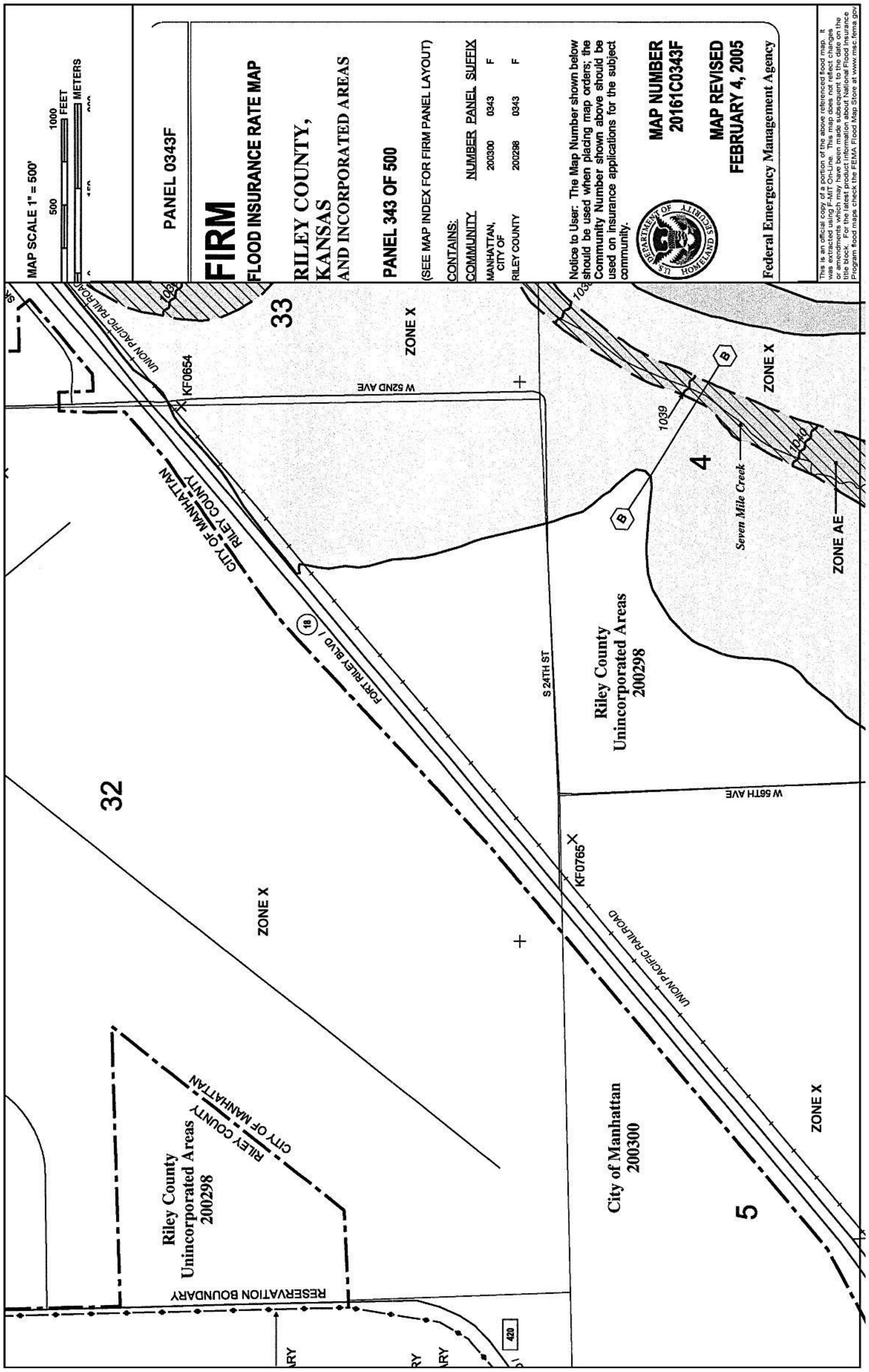



**Figure 6.7: Flood Insurance Rate Map (FIRM)**

FLYMHK
Manhattan Regional Airport

# Chapter 7
# Eligibility and Financial Analysis

## Introduction

This chapter of the Terminal Area Master Plan explores eligibility for federal FAA funding for the projects that have been recommended in this document, demonstrates MHK's ability to finance the project and discusses funding sources for the projects. The principal assumptions of this analysis are that the FAA continues their current capital funding programs and the Airport activity grows according to the aviation demand forecasts.

This chapter is organized into the following sections:

- Terminal Building Eligibility
- Funding Sources
- Cost Estimates
- Potential Funding Plan

## 7.1 Terminal Building Eligibility for FAA Funding

Now that a concept-level building plan and space summary table have been developed for the terminal building, it is possible to determine the project's eligibility for potentially receiving FAA funding. The proposed terminal building was assessed to determine which portions of it is FAA eligible, prorated, or ineligible for FAA funding. This determination was made based on FAA AC 150/5360-9, Order 5100.38C, Mead & Hunt's experience at similar airports, and guidance from the Kansas City Regional Federal Aviation Administration Office.

**Explanation and Examples of Funding Eligibility Categories for Terminal Buildings**

Below are explanations and examples of the different FAA funding eligibility categories for terminal buildings, which are shown on the following eligibility plan and applied to the proposed Manhattan Regional Airport terminal expansion plan.

- **Eligible Space, Building Components and Equipment**

  Eligible space is the terminal building space that is considered to be 100% eligible for FAA funding. Generally speaking, public space that is directly related to moving passengers or baggage is eligible. As is typical for small non-hub primary airports, a large portion of the space in the MHK terminal building is eligible for FAA funding. Building components that are considered to be 100% eligible for FAA funding include the walls, floors, roof, chases, etc that are required to construct the spaces that are eligible. Equipment that is considered to be 100% eligible is the equipment that is directly related to moving passengers or baggage.

  Examples of eligible space:
  - Public circulation
  - Baggage claim area
  - Public waiting / seating areas
  - Restrooms
  - Security checkpoint, (note that screening equipment is provided by TSA)
  - Sterile holdroom
  - Mechanical rooms with utilities that serve the public areas only

  Examples of eligible building components and equipment:
  - Walls, roof, floor, the complete exterior building envelope, and structure.
  - Vertical chases: Plumbing chases that serve the public restrooms.
  - Emergency Generator: An emergency generator that provides backup power to essential services in the event that primary power fails.
  - Baggage Handling Conveyors: The sole purpose of the baggage conveyors and baggage claim devices is to transfer baggage, making this equipment eligible.
  - Passenger Boarding Bridge: The sole purpose of the passenger boarding bridge is to allow passengers to board and disembark from an aircraft, making this equipment eligible.

Eligible space is shown in tan on the eligibility floor plan as shown in **Figure 7.1**, and eligible equipment is shown in yellow.

- **Ineligible Space**

  Ineligible space is area inside the terminal building that is not eligible for AIP funding. Many ineligible spaces are integral to the terminal and/or overall airport operation but are not eligible because they are not directly related to moving passengers and baggage or are not public use areas.

  Ineligible spaces include the following:
  - Tenant storage
  - Baggage screening room
  - Inbound and outbound baggage rooms
  - Airport Administration offices

  Ineligible space is shown in gray on the eligibility floor plan in Figure 7.1.

- **Prorated Space and Building Components**

  Prorated, or partially eligible, is space that is eligible for FAA funding, but not 100% eligible. A typical example of prorated space is a utility room, which serves both eligible and ineligible spaces. In this case, only that portion of the room that is needed to serve the eligible spaces is itself eligible. This rate of proration is determined in one of three ways, which have been categorized below.

  The categories of proration and a corresponding list of prorated spaces follow:
  - Areas in which applying the proportion of eligible vs. ineligible space they serve is completed to determine eligibility.
    - Mechanical rooms with equipment that serves both public areas and leased areas
    - Utility rooms with utilities that serve both public areas and leased areas
    - Non-public circulation space
    - The mechanical vertical chases are prorated at the same percent as the mechanical and boiler rooms.

    Space that is prorated by percentage is shown in orange on the eligibility floor plan shown in Figure 7.1.

  - Areas in which public finishes are eligible but not tenant-provided items such as equipment or signage.
    - Airline ticket counter public areas
    - Car rental counter public areas
    - Concession public areas, when they are not leased and finishes are a continuation of adjacent public finishes

Space in which public finishes are eligible are shown in green on the eligibility floor plan in Figure 7.1.

- Areas in which the shell of a space is eligible, but tenant improvements are not.
  - Concession back of house areas
  - Airline ticket offices
  - Car rental offices
  - Concession leased areas that are accessible to the public.

Space in which only the shell is eligible is shown in blue on the eligibility floor plan shown in Figure 7.1.

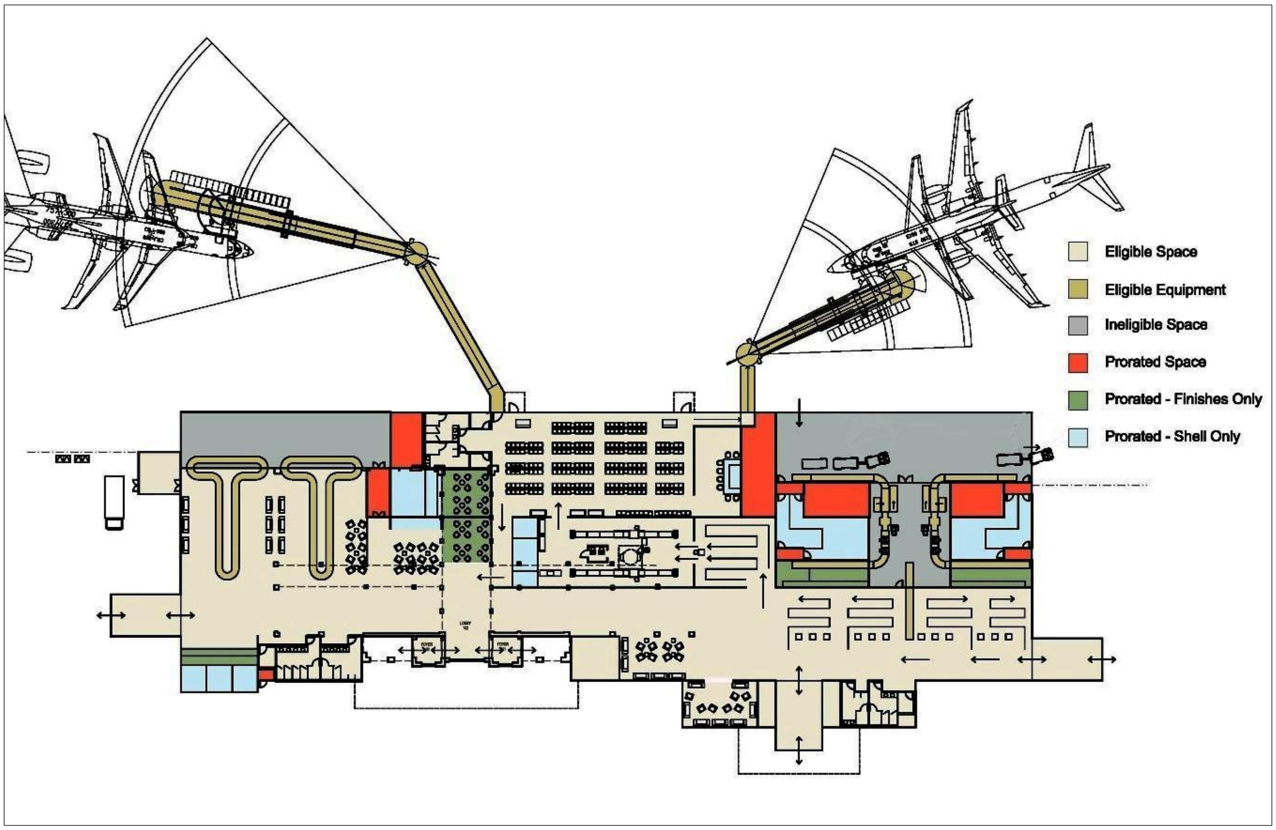



**FIGURE 7.1: ELIGIBILITY FLOOR PLAN**

**Final Layout Eligibility Plan and Status Table**

A review of the eligibility plan shows that a majority of the space on the floor plan consists of public spaces such as circulation, passenger queuing, restrooms, the security checkpoint, seating and the baggage claim area. Other areas shown include concessions, car rental offices, airline offices, baggage rooms, the baggage screening room, and utility rooms. Figure 7.1 shows the eligibility floor plan and **Table 7-1** the eligibility status table.

Overall, the building is 78% eligible as determined on a square foot-basis.

**Table 7-1. Manhattan Regional Airport – Terminal Building Space Eligibility Status**

| Area Description | Yr 2030 Proposed Area (SF) | Rate | Eligible (SF) | Ineligible (SF) |
|---|---|---|---|---|
| TSA Security Checkpoint | 2,010 | 100% | 2,010 | 0 |
| TSA Office * | 330 | 100% | 330 | 0 |
| Checkpoint Exit Lane | 270 | 100% | 270 | 0 |
| Checkpoint Queuing | 1,050 | 100% | 1,050 | 0 |
| Public Circulation – Non-Sterile & Sterile | 11,935 | 100% | 11,935 | 0 |
| Public Restrooms | 1,725 | 100% | 1,725 | 0 |
| Public Waiting | 2,320 | 100% | 2,320 | 0 |
| Public Business Lounge | 0 | 100% | 0 | 0 |
| Hold Room, (+ticket lift) | 3,390 | 100% | 3,390 | 0 |
| Baggage Claim | 4,090 | 100% | 4,090 | 0 |
| Inbound Baggage | 2,160 | 0% | 0 | 2,160 |
| Oversized Bags / Circulation | 215 | 100% | 215 | 0 |
| Outbound Baggage | 3,290 | 0% | 0 | 3,290 |
| Airline Ticket Office | 1,495 | 50% | 748 | 748 |
| Ticket Counter Area | 875 | 75% | 656 | 219 |
| Ticketing Queue | 2,200 | 100% | 2,200 | 0 |
| Rental Car Office | 380 | 33% | 127 | 253 |
| Rental Car Counter Area | 230 | 75% | 173 | 58 |
| Rental Car Queue | 180 | 100% | 180 | 0 |
| Sterile Concessions / Vending | 785 | 60% | 471 | 314 |
| Public Concessions / Vending | 1,025 | 60% | 615 | 410 |
| TSA Baggage Screening | 1,570 | 0% | 0 | 1,570 |
| TSA Ops / Office | 0 | 0% | 0 | 0 |
| Wheelchair Storage | 65 | 100% | 65 | 0 |
| Local Law Enforcement | 0 | 100% | 0 | 0 |
| Receiving / Janitor / Airport Storage | 325 | 100% | 325 | 0 |
| Plumb / Mech / Elec / Comm | 3,455 | 80% | 0 | 0 |
| Circulation - Non-Public, Non-Sterile, & Sterile | 240 | 0% | 216 | 24 |
| Airport Administration * | 0 | 0% | 0 | 0 |
| Chases | ** | 100% | 0 | 0 |
| Building Structure | ** | 100% | 0 | 0 |
| **Totals** | **45,610** | **78%** | **35,658** | **9,952** |
| *offsite area not included in total<br>**areas included in areas above | | | | |

## Cost and Eligibility of Major Equipment

The cost of major equipment will contribute significantly to the project cost, but is not accounted for in the square foot cost estimates. This equipment can include a number of high-cost items or systems that are eligible for FAA funding participation. For this project, the passenger boarding bridge equipment was identified as having significant impact on the project, so it was evaluated separately. The passenger boarding bridges are enclosed pedestrian connectors, which allow passengers to board or disembark an aircraft without going outside.

Since these items are directly related to the movement of passengers, this equipment is 100% eligible. The estimated cost for the two passenger boarding bridges is $1,750,000.

## Summary of Determination of Eligibility for FAA Funding

The amount of eligibility for the design portion of the project, with the exception of the passenger boarding bridges was determined to be 78%, while the eligibility for the two passenger boarding bridges is 100%. **Table 7-2** shows the overall project construction cost and eligibility percentages which will be used in the design of the project. The amount of FAA funding will be reduced and the local share increased, as the maximum percentage that the FAA can contribute to a project is 90% of the eligible costs. Consequently, 90% of the 78% eligible space may be funded by FAA.

The ultimate goal of the eligibility process is to determine the percent of the project cost, not necessarily the amount of terminal building area that is eligible for FAA funding. Once the project nears the end of the design stage, cost estimates can be applied to the design plans in order to determine a refined eligibility percentage for project construction. This revised eligibility amount is anticipated to be higher than 78%.

**Table 7-2: Eligible Construction Cost of Terminal Improvements**

| Category | % Eligible | Eligible | Ineligible | Total |
|---|---|---|---|---|
| Terminal Building Construction Cost | 78% | $ 8,741,450 | $ 2,440,113 | $ 11,181,564 |
| Passenger Boarding Bridges (PBBs) | 100% | $ 1,750,000 | $ - | $ 1,750,000 |
| **Total** | | **$ 10,491,450** | **$ 2,440,113** | **$ 12,931,564** |

Note: Construction costs include construction administration.

It should be noted that eligibility for FAA funding does not guarantee FAA participation in the funding of the project. Also, while tenant shells are eligible for FAA funding, the build-outs of the shells are not. In some cases the project provides the shell only for tenant spaces, leaving the build-out of that space for the tenant to design and construct as a separate project. In other cases, the airport may build out the space for the tenant. The amount of tenant build-out that is included in the scope of the project is ultimately determined through negotiations and discussions with tenants, and will affect both the project cost and the proportion of the cost that will be eligible for FAA funding.

Eligibility planning is an important step in the terminal planning process to determine the amount of potential FAA funding and the amount of funding that will needed to be provided by other sources. As the terminal area plan progresses into the design stages, spaces may vary from those outlined in this study. Revisions to the eligibility plan will be made during the design process, and the revised eligibility plan will be used to determine the amount of the project construction cost that will be eligible for FFA funding participation.

## 7.2 Funding Sources

The funding for the projects in the terminal area plan can be sought from four basic sources. These include:

- FAA Airport Improvement Funding (AIP) funds
- Passenger Facility Charge (PFC)
- Vehicle Parking Revenue
- Local Funding Sources
- Kansas Economic Development programs

### FAA Airport Improvement Program (AIP) funding

The FAA supports infrastructure improvements for all airports that are part of the National Plan of Integrated Airport Systems (NPIAS) through grants from its Airport Improvement Program (AIP). The federal government allocated approximately $3.7 billion to the AIP from the National Airport and Airway Trust Fund in FY 2011. The Trust Fund receives the excise tax revenues generated from domestic passenger ticket taxes, domestic flight segment taxes, international arrival and departure taxes, domestic waybill freight and mail taxes and aviation fuel taxes. Projects that are eligible for AIP funding include improvements related to enhancing airport safety, capacity, security, and environmental concerns.

AIP funding is comprised of entitlement funding and discretionary funding. Entitlement funding is the annual funding that the airport receives from the FAA based on the annual number of passengers that the airport enplanes each year. Discretionary funding is FAA funding that is a pool of funds the FAA distributes based on project need, priority ranking system and any legislative action.

Manhattan Regional Airport is currently eligible to receive an annual entitlement of $1,000,000 each year with the current legislation. Many of the projects are also eligible for FAA discretionary funding.

### Passenger Facility Charge (PFC) Funding

The Passenger Facility Charge (PFC) is a funding source administered by the FAA and collected by the airlines whereby commercial service airports may charge and collect a specific dollar amount on each ticket for each enplaned passenger. That amount is limited to a maximum of $4.50 per passenger that departs the airport with a revenue ticket (frequent flyer tickets and other non-revenue ticketed passengers are exempt from this charge). The money that is collected by the airlines is transferred to the airport minus a small administrative charge. This PFC funding can then be used to fund PFC eligible projects, which are identified in the PFC Application that the airport has filed and received FAA approval. Every PFC is tied to specific capital improvement projects that have been approved by the FAA. The fee expires when all of the money needed for the approved projects has been raised. However, new projects may be approved under a separate application.

The eligibility of specific elements of a project for PFC funding is similar to FAA funding in that the type of airport defines the specific eligibility requirements. PFC's may be used in the following ways:

- Pay all or part of the allowable cost of an FAA approved project
- Pay debt service and financing costs associated with bond issuance
- Combine PFC funds with AIP funds to accomplish an approved project
- Apply PFC funds to meet non-federal share of the cost of projects funded under the Federal Airport grant program

MHK is currently collecting a PFC amount of $4.50 per enplaned passenger and this charge is expected to continue. However, the Airport is collecting for past projects so there is no availability of PFC revenue for the next 2 years. Revenues based on enplanements as forecasted in Chapter 3 are shown in the **Table 7-3** with already dedicated PFC's shaded.

**Table 7-3: Estimates PFC Revenue based on Forecasted Enplanements**

| Calendar Year | Enplanements | Estimated PFC Collections |
|---|---|---|
| 2012 | 73,940 | $308,367 |
| 2013 | 76,444 | $318,810 |
| 2014 | 78,948 | $329,253 |
| 2015 | 81,451 | $339,691 |
| 2016 | 83,657 | $348,892 |
| 2017 | 85,863 | $358,092 |
| 2018 | 88,069 | $367,292 |
| 2019 | 90,275 | $376,492 |
| 2020 | 92,480 | $385,688 |
| 2021 | 94,413 | $393,749 |
| 2022 | 96,346 | $401,811 |
| 2023 | 98,279 | $409,873 |
| 2024 | 100,212 | $417,934 |
| 2025 | 102,143 | $425,987 |
| 2026 | 103,921 | $433,403 |
| 2027 | 105,699 | $440,818 |
| 2028 | 107,477 | $448,233 |
| 2029 | 109,255 | $455,648 |
| 2030 | 111,031 | $463,055 |

### Kansas Department of Transportation – Division of Aviation

According to Chapter 75, Article 50, Section 61, MHK is not eligible for state funds from the Kansas Department of Transportation, Division of Aviation to cover project costs due to the airports classification as a primary airport by the FAA.

### Kansas Department of Transportation – Economic Development Program

The Kansas DOT has a program that offers $10 million dollars of reimbursement grants for economic development each year. Any transportation project that can be shown to support job growth or capital investment in the State is eligible. A 25% sponsor match is required.

### Local Funding

Many local governments have programs that make funds available for airport projects. A local government may also decide to fund an airport project by issuing bonds and pay the bonds back with either PFC funds, airport revenue or general funds.

### Airport

The airport generates revenue from landing fees, tie-down fees, fuel flowage fees, FBO Building Rental fees, corporate hangar rental fees T-hangar Rental fees, and rental car concession fees. The 2009 Master Plan notes that the Airport's O&M costs are in excess of collected revenues and is expected to remain that way through the year 2022.

### Vehicle Parking Revenue

When paid parking is implemented, revenue generated can be applied to pay for the parking lot expansion and revenue collection equipment installation. Based on the average daily number of cars parked in the parking lot for most of 2011 at 226 cars, and applying the compound annual growth rate per year from the forecasted passenger enplanement growth rate, the revenue shown in **Table 7-4** could be collected assuming a 100% collection rate and a $4 per day charge or $2 per day. The running total shown does not include potential revenue collected in 2011 and 2012 as the revenue collection equipment may not be installed prior to 2013 due to the timing of the construction of the project. It is possible for the airport to collect a portion of the 2012 parking revenue if an honor system of paying for parking were implemented immediately.

The projected revenues do not include a different short term parking rate from that of the long term rate. Short term parking stalls often have a parking fee based on an hourly rate which combined with high car turnover, can result in greater daily revenue from that stall over a long term parking stall.

**Table 7-4: Potential Revenue from Paid Parking**

| | | $4 per day parking fee | | $2 per day parking fee | |
|---|---|---|---|---|---|
| Year | CAGR | Potential Revenue | Running Total | Potential Revenue | Running Total |
| 2011 | - | $329,960 | $0 | $164,980 | $0 |
| 2012 | - | $376,268 | $0 | $188,134 | $0 |
| 2013 | 3.28% | $388,601 | $388,601 | $194,300 | $194,300 |
| 2014 | 3.28% | $401,337 | $789,937 | $200,668 | $394,969 |
| 2015 | 3.28% | $414,491 | $1,204,428 | $207,245 | $602,214 |
| 2016 | 2.57% | $425,153 | $1,629,581 | $212,576 | $814,790 |
| 2017 | 2.57% | $436,089 | $2,065,670 | $218,045 | $1,032,835 |
| 2018 | 2.57% | $447,307 | $2,512,977 | $223,653 | $1,256,488 |
| 2019 | 2.57% | $458,813 | $2,971,790 | $229,407 | $1,485,895 |
| 2020 | 2.57% | $470,615 | $3,442,405 | $235,308 | $1,721,203 |
| 2021 | 2.01% | $480,063 | $3,922,468 | $240,032 | $1,961,234 |
| 2022 | 2.01% | $489,700 | $4,412,169 | $244,850 | $2,206,084 |
| 2023 | 2.01% | $499,531 | $4,911,700 | $249,766 | $2,455,850 |
| 2024 | 2.01% | $509,559 | $5,421,259 | $254,780 | $2,710,630 |
| 2025 | 2.01% | $519,789 | $5,941,048 | $259,894 | $2,970,524 |
| 2026 | 1.68% | $528,535 | $6,469,583 | $264,268 | $3,234,792 |
| 2027 | 1.68% | $537,429 | $7,007,012 | $268,715 | $3,503,506 |
| 2028 | 1.68% | $546,472 | $7,553,485 | $273,236 | $3,776,742 |
| 2029 | 1.68% | $555,668 | $8,109,153 | $277,834 | $4,054,576 |
| 2030 | 1.68% | $565,018 | $8,674,171 | $282,509 | $4,337,086 |

## Private Investments

Private sector investment is an important source of funding for some types of airport improvements. At MHK, private funding is most likely to be used to construct aircraft storage hangars, commercial development on airport property and fixed base operator facilities (FBO's).

The most common sources of funding for private sector development are commercial lending institutions and insurance companies. In the case of private development on public lands, these types of financing may be more difficult to obtain than a tradition commercial project because the borrower can encumber only the improvement as loan collateral. Therefore, careful attention to leasing policies and tenant contract negotiations is needed. It is essential that agreements be reached with the tenants that provide for adequate airport revenues and facility development, while encouraging private investment and satisfying tenants' borrowing requirements. Specifically, the lease term should be sufficient to allow reasonable investment amortization over the period of the agreement.

Those capital expenditures that are most appropriately constructed with private funds have been excluded from the cost estimates and the financial summaries.

### Rental Car Customer Facility Charges (CFC)

The Airport will be implementing through its rental car tenants, a fee per rental car transaction day called a Customer Facility Charge (CFC) to fund a future Quick Turn Around (QTA) rental car fueling and car wash facility. In the last several years, rental car CFCs have become a common funding source for this type of facility for many airports in the U.S. Generally, rental car companies favor this funding approach for needed facilities since it provides them with off-balance sheet financing. CFC revenues are assumed to be collected and used throughout the planning period for future rental car projects.

## 7.3 Cost Estimates

The following cost estimates for the parking lot expansion, terminal expansion, general aviation apron, and the terminal apron include engineering design, construction inspection, administration and estimated construction costs.

### Parking Lot

Parking lot cost estimates are provided in **Table 7-5** and **Table 7-6**. The costs incorporate revenue collection equipment and assume that the construction will be phased. If phases are combined, costs savings will be realized. Estimates for concrete and asphalt were both calculated with the concrete pavements being at the high cost range and asphalt at the lower. The cost estimates include costs for design, inspection, administration and a construction contingency.

**Table 7-5: Parking Lot Cost Estimate Phases 1 through 8**

| | Total Cost Range | | | Stalls Provided |
|---|---|---|---|---|
| Phase 1-3 | $2,440,000 | to | $2,790,000 | 558 |
| Phase 4 | $920,000 | to | $1,020,000 | 601 |
| Phase 5 | $1,000,000 | to | $1,160,000 | 803 |
| Phase 6 | $970,000 | to | $970,000 | 803 |
| Phase 7 | $830,000 | to | $1,030,000 | 882 |
| Phase 8 | $680,000 | to | $830,000 | 1034 |
| **Total** | **$6,840,000** | **to** | **$7,800,000** | |

**Table 7-6: Parking Lot Cost Estimate Phases 1A through 8A**

| | Total Cost Range | | | Stalls Provided |
|---|---|---|---|---|
| Phase 1-3 | $2,440,000 | to | $2,790,000 | 558 |
| Phase 4A | $920,000 | to | $1,020,000 | 601 |
| Phase 5A | $720,000 | to | $720,000 | 601 |
| Phase 6A | $850,000 | to | $1,010,000 | 550 |
| Phase 7A | $470,000 | to | $620,000 | 700 |
| Phase 8A | $1,860,000 | to | $2,100,000 | 1034 |
| **Total** | $7,260,000 | | $8,260,000 | |

### General Aviation Apron

The general aviation apron will cost approximately $1,960,000 for 100,000 square feet of pavement. The costs estimates are based on a pavement section for general aviation aircraft weighing less than 100,000 pounds.

### Terminal Apron

The cost of paving the entire grass island on the terminal apron is estimated at $1.8 million. The cost of paving only a taxiway through the grass island from the apron to Taxiway A is estimated at $758,000.

### Terminal Facility

The Terminal Building Design A cost as shown in **Table 7-7** includes the costs associated with schematic design, and design development for all of the terminal building phases. In addition, it includes bid documents for the Interim Construction and for Terminal Building phases 1 through 3. The Terminal Building Design B cost shown in Table 7-7 includes the costs for bid documents for Terminal Building Phase 4.

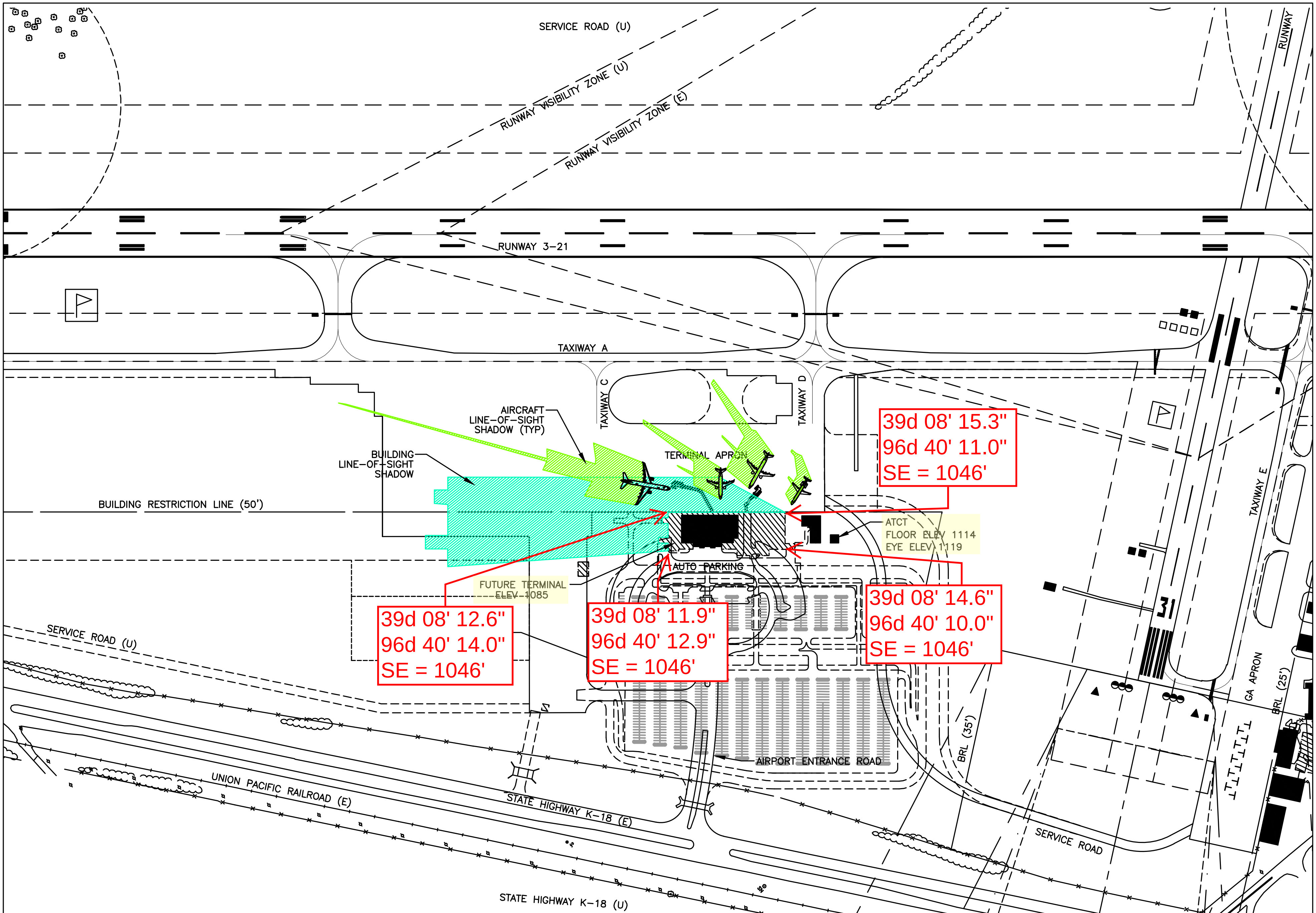
**Table 7-7: Terminal Building Cost Estimates**

| Terminal Building Phase | Total Cost |
|---|---|
| Terminal Building Design A | $1,280,126 |
| Construction and Admin: Terminal Building –Interim | $77,243 |
| Construction and Admin: Terminal Building -1 | $2,733,626 |
| Construction and Admin: Terminal Building -2 | $6,853,434 |
| Construction and Admin: Terminal Building -3 | $1,622,662 |
| Construction and Admin: Terminal Building -4 | $1,561,135 |
| Terminal Building Design B | $147,440 |
| **Total** | **$14,275,666** |

# Table 7-8: Draft ACIP, MHK 2012 to 2017

| | | | PFC or AIP Eligibility | | | | | Estimated Entitlement Funding | | | Estimated Non-Entitlement Funding | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Project | Total Cost | % Eligible | Amount Eligible | Not Eligible for PFC & AIP | max AIP contribution (90%) | PFC or Local Share (10%) | AIP Entitlement | Yr Entitlement Source | Balance | AIP Discretionary | PFC | KDOT Tworks | Airport/City |
| 2012 | Acquire Miscellaneous Land | $700,000 | 100% | $700,000 | $0 | $630,000 | $70,000 | $630,000 | 2010, 2011, 2012 | $1,980,290 | $0 | $0 | 0 | $70,000 |
| 2012 | Install Perimeter Fence | $484,210 | 100% | $484,210 | $0 | $435,789 | $48,421 | $435,789 | 2010, 2011, 2012 | $1,544,501 | $0 | $0 | 0 | $48,421 |
| 2012 | NEPA for Fence and GA Apron | $80,000 | 100% | $80,000 | $0 | $72,000 | $8,000 | $72,000 | 2010, 2011, 2012 | $1,472,501 | $0 | $0 | 0 | $8,000 |
| 2012 | 100,000 SF GA Apron Design (local funded, reimbursed by FAA later) | $194,868 | 100% | $194,868 | $0 | $175,381 | $19,487 | $0 | 2010, 2011, 2012 | $1,472,501 | $0 | $0 | 0 | $194,868 |
| 2012 | Terminal Building Design A | $1,280,126 | 78% | $998,498 | $281,628 | $898,648 | $99,850 | $898,648 | 2010, 2011, 2012 | $573,853 | $0 | $0 | 0 | $381,478 |
| 2012 | Terminal Building -Interim Construction | $77,243 | 78% | $60,250 | $16,993 | $54,225 | $6,025 | $54,225 | 2010, 2011, 2012 | $519,628 | $0 | $0 | 0 | $23,018 |
| 2012 | Parking: Phase 1-4A Design | $377,568 | 0% | $0 | $377,568 | $0 | $0 | $0 | - | $519,628 | $0 | $0 | 0 | $377,568 |
| 2012 | Parking: Phase 1-4A Construction | $3,432,432 | 0% | $0 | $3,432,432 | $0 | $0 | $0 | - | $519,628 | $0 | $0 | 0 | $3,432,432 |
| | **Subtotal 2012** | $6,626,447 | | | | | | $2,090,662 | | | $0 | $0 | 0 | $4,535,785 |
| 2013 | 100,000 SF GA Apron Design 2012 Reimburse by FAA in 2013 for 90% eligible amount | $0 | | | | | | $175,381 | - | $0 | $0 | $0 | $0 | -$175,381 |
| 2013 | 100,000 SF GA Apron Construction | $1,772,000 | 100% | $1,772,000 | $0 | $1,594,800 | $177,200 | $1,344,247 | 2012, 2013 | $0 | $250,553 | $0 | 0 | $177,200 |
| 2013 | Terminal Building -1 PBB Construction | $900,000 | 100% | $900,000 | $0 | $810,000 | $90,000 | $0 | - | $0 | $810,000 | $0 | 0 | $90,000 |
| 2013 | Terminal Building -1 Construction | $1,833,626 | 78% | $1,430,228 | $403,398 | $1,287,205 | $143,023 | $0 | - | $0 | $1,287,205 | $0 | 0 | $546,421 |
| 2013 | Wildlife Hazard Assessment | $105,263 | 100% | $105,263 | $0 | $94,737 | $10,526 | $0 | - | $0 | $94,737 | $0 | 0 | $10,526 |
| | **Subtotal 2013** | $4,610,889 | | | | | | $1,519,628 | | | $2,442,495 | $0 | $0 | $648,766 |
| 2014 | Terminal Building -2 Construction | $6,853,434 | 78% | $5,345,679 | $1,507,755 | $4,811,111 | $534,568 | $1,000,000 | 2014 | $0 | $3,811,111 | $0 | 0 | $2,042,323 |
| | **Subtotal 2014** | $6,853,434 | | | | | | $1,000,000 | | | $3,811,111 | $0 | $0 | $2,042,323 |
| 2015 | Acquire Aircraft Rescue & Fire Fighting Vehicle | $800,000 | 100% | $800,000 | $0 | $720,000 | $80,000 | $720,000 | 2015 | $280,000 | $0 | $0 | $0 | $80,000 |
| 2015 | Terminal Building -3 Construction PBB | $675,000 | 100% | $675,000 | $0 | $607,500 | $67,500 | $280,000 | 2015 | $0 | $327,500 | $0 | 0 | $67,500 |
| 2015 | Terminal Building -3 Construction | $947,662 | 78% | $739,176 | $208,486 | $665,259 | $73,918 | $0 | - | $0 | $665,259 | $0 | 0 | $282,403 |
| 2015 | Parking: Phase 5A-7A Design | $232,883 | 0% | $0 | $232,883 | $0 | $0 | $0 | - | $0 | $0 | $0 | 0 | $232,883 |
| 2015 | Parking: Phase 5A-7A Construction | $2,117,117 | 0% | $0 | $2,117,117 | $0 | $0 | $0 | - | $0 | $0 | $0 | 0 | $2,117,117 |
| | **Subtotal 2015** | $4,772,662 | | | | | | $1,000,000 | | | $992,759 | $0 | $0 | $2,779,903 |
| 2016 | Design Rehabilitate Runway 3/21 construction | $2,762,836 | 100% | $2,762,836 | $0 | $2,486,552 | $276,284 | $1,000,000 | 2016 | $0 | $1,486,552 | $0 | 0 | $276,284 |
| 2016 | Install Perimeter Fencing | $461,866 | 100% | $461,866 | $0 | $415,679 | $46,187 | $0 | - | $0 | $415,679 | $0 | 0 | $46,187 |
| | **Subtotal 2016** | $3,224,702 | | | | | | $1,000,000 | | | $1,902,232 | $0 | $0 | $322,470 |
| 2017 | Rehabilitate Runway 3/21 | $22,190,300 | 100% | $22,190,300 | $0 | $19,971,270 | $2,219,030 | $1,000,000 | 2017 | $0 | $18,971,270 | $1,219,030 | 0 | $1,000,000 |
| | Total 2012 through 2017 | $48,278,434 | | | | | | $7,610,290 | | | $28,119,866 | $1,219,030 | $0 | $11,329,248 |

# Appendix A




# ATCT LINE-OF-SIGHT SHADOWS

FLYMHK
Manhattan Regional Airport

2/6/2012 9:07:45 AM
X:\13463-00\11001\TECH\CADD\DRAWINGS\TERMINAL AREA MASTER PLAN\LINE-OF-SIGHT.DWG

U.S. Department
of Transportation

**Federal Aviation Administration**

Angela M. Muder
901 Locust
Kansas City, MO 64106

March 13, 2012

FAA
Attn: Jeff Deitering
901 Locust
Rm 364
Kansas City, MO 64106

RE: *(See attached Table 1 for referenced case(s))*
**FINAL DETERMINATION**

Table 1 - Letter Referenced Case(s)

| ASN | Prior ASN | Location | Latitude (NAD83) | Longitude (NAD83) | AGL (Feet) | AMSL (Feet) |
|---|---|---|---|---|---|---|
| 2012-ACE-165-NRA | | MANHATTAN, KS | 39-08-15.30N | 96-40-11.00W | 39 | 1085 |
| 2012-ACE-166-NRA | | MANHATTAN, KS | 39-08-14.60N | 96-40-10.00W | 39 | 1085 |
| 2012-ACE-167-NRA | | MANHATTAN, KS | 39-08-11.90N | 96-40-12.90W | 39 | 1085 |
| 2012-ACE-168-NRA | | MANHATTAN, KS | 39-08-12.60N | 96-40-14.00W | 39 | 1085 |

Description: Shadow information for proposed terminal expansion

We do not object to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction."

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

This determination expires on September 13, 2013 unless:
(a) extended, revised or terminated by the issuing office.

(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Angela M. Muder, (816) 329-2620, angela.muder@faa.gov.

Angela M. Muder
Specialist