DES MOINES
International Airport

ADDENDUM TO:
Terminal Area Concept Plan Technical Report
November 2016
# Preliminaries

## DIRECTORY

<table>
<thead>
<tr>
<th>Client</th>
<th>Consultant</th>
<th>Sub-Consultants</th>
</tr>
</thead>
</table>
| Des Moines International Airport  
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Des Moines, Iowa 50321-2854 | HNTB Corp.  
715 Kirk  
Kansas City, MO 64105 | BNIM  
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LT Leon Associates |
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- Process
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- Campus Zoning - East
- East Concept Overview
- Campus Zoning - South
- South Concept Overview
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1.1 Background
A Terminal Area Concept Plan was completed for the Des Moines Airport Authority in September 2014 by LeighFisher. For that plan, potential new terminal sites were investigated at the existing terminal area (east quadrant) and the south quadrant of the airport. The concept plan recommended development of a future terminal site at the south quadrant.
In March 2016, the Authority hired HNTB to restudy components of the concept plan, in part due to differing site conditions. This report, which was prepared as an addendum to LeighFisher’s Terminal Area Concept Plan Technical Report, describes the changes in conditions, the study process and the recommended future direction.

1.2 Process
The study was performed through a series of charrette-style workshops with the Authority. An open dialogue was utilized to determine all concepts that could achieve the goals of the program. A “pros-cons” analysis was used to guide the Authority through the decision-making process that kept the following criteria in mind:

- Functional and Efficient circulation
- Creates a zoned Master Plan for the entire airport campus
- Concepts that connect the airport to the community and create a “sense of place”
- Flexible Phasing/Construction – initial and ultimate
- Minimizing relocation of existing buildings/tenants and infrastructure
- Avoid the Iowa Air National Guard (IANG) site on the north quadrant
- Meets all requirements (terminal, airside and landside)
- Cost Effective

1.3 Master Plan
One of the largest changes over the two year duration was utilization of the overall site. The previous study concluded that a portion of the existing Iowa Air National Guard (IANG) site in the north quadrant could be utilized for relocation of tenants to clear the south quadrant site for the new terminal. For this new report, the IANG site was deemed “off-limits”. A comprehensive review of the entire airport campus was developed and planning concepts were developed for both the south and east quadrants.

This report is an addendum to the 2014 Leigh Fisher Report. An update was required to accommodate several master plan variables that have changed, namely, the “off-limits” restrictions of the IANG site.

The addendum was developed through charrette workshops with the Authority and includes:
- Rezoned airport campus options
- East and South Terminal Concepts
Addendum to Terminal Area Concept Plan Technical Report

Chapter 1  CONCEPT REFINEMENT - EAST CONCEPT

Figure 1.3 East Concept Zoning

Figure 1.4 East Concept Overview

1.4 Campus Zoning - East

The East Option requires the least amount of changes to the overall zoning plan. The new terminal will utilize the existing terminal campus, therefore, many of the current utilities can remain in place. The new zoning plan will primarily enlarge certain tenant sites, including the GA / T-Hangars, the GA / Corporate and the Airline Maintenance Spaces in the South Quadrant. The GA / T-Hangar and GA / Corporate sites are placed so that they can expand as needed in the future. Specific advantages to the east site include:

- Ability to keep the passenger terminal in a completely separate quadrant
- Less relocation of the current tenants
- Maintains the connection to downtown by keeping the Fleur Drive address.

1.5 East Concept Overview

Terminal – Major adjustments to the East concept from the previous study include the overall site orientation/rotation to be nearer to the existing terminal so that walking distances to and from the parking garages could be minimized. This slight rotation maximizes the landside area for future growth without intercepting any of the new roadways. It also places the southern end of the new concourse as close as possible to the existing concourses, while still maintaining proper construction clearances. This will assist with the phasing of the concept.

Airside - This design integrates 14 gate positions at the completion of Phase 1 and 10 Remain Over Night (RON) hardstands. It corrects an Airfield Runway Incursion Mitigation (RIM) problem while taking advantage of the added room for the three new deice pads and four RON positions on the east side of the site while avoiding the containment site.

Landside - Phase 1 also includes the construction of a new parking garage adjacent to the existing garage, which will hold approximately 870 spaces for rental and short term parking. A new pedestrian bridge will safely connect passengers flowing to and from the new terminal, and a route will be provided for passengers to get to the bus stop located on Fleur Drive. Additionally, Phase 1 incorporates a new entry from Fleur Drive, a new entry plaza to segregate parking, a new roadway loop and curb in front of the landside terminal, a new long term lot, short term hourly lot, an exit plaza and a new loading dock off of the northeast service road.

Phase 2 – Phase 2 expansion would be an extension of the uniform curve set in place by Phase 1. Phase 2 will include new concourse space, hold rooms, restrooms, concessions and apron space. Four more aircraft gates will be added with the new extension. A new parking lot south of the landside terminal can be utilized for employees or as a VIP lot before the ultimate buildout is completed. The ultimate buildout will accommodate 23 aircraft.

Figure 1.5 East Concept Overview

KEY POINTS

EAST CONCEPT:

Zoning:
- Re-uses and expands the existing facilities
- Keeps passenger terminal in a separate quadrant, keeping the Fleur Drive address

New Terminal:
- Minimizes walking distances
- Orientation & building form maximizes airside and landside expansion capabilities
- Phasing will retain full operation during construction

Airside:
- 14 gate positions (Phase 1)
- 10 RON hardstands
- 3 new deice pads
- Corrected RIM issues

Landside:
- New parking garage & surface lots
- New pedestrian bridge
- New Fleur Drive entry
- Roadway improvements

Phase 2:
- 18 gate positions
- Ultimate buildout: 23 positions
KEY POINTS
Addendum to Terminal Area Concept Plan Technical Report

1.6 Campus Zoning - South

The South Option, which was the previously selected preferred location, provides more flexibility for future expansion and ultimately can accommodate at least ten more aircraft than the East Option. However, the additional 10 contact gates would not be needed within the life cycle of the terminal building and therefore makes both sites similar for ultimate buildout potential.

The new south site will require many of the current tenants to be relocated, generating a much higher project cost than the East Option. The South Option will also require a new taxiway, which adds significantly to the project cost. Other disadvantages include:

- Disconnection of the terminal site from Fleur Drive
- Separation of the terminal site from the existing passenger garages in the East Quadrant
- Proximity of the passenger terminal to airline maintenance, GA/T-Hangars and air support sites creates un-needed congestion for vehicular and aircraft movement.

1.7 South Concept Overview

Terminal – The south quadrant option is located directly to the southeast of the previous 2012 preferred alternative site. Primary factors for this adjustment were to lower costs by reducing the amount of landside infrastructure and existing tenant/building relocation. The terminal diagram would be primarily a single loaded concourse except at the ends of the concourse. A linear terminal diagram could be utilized and easy for passenger wayfinding and airline/airport operations. All required contact gates are included. The southern site has significant grade changes, which pose additional constraints to the overall site and ultimately will increase the cost of the project. The South Option’s new terminal is offset from Fleur Drive, one of the main arterial streets from downtown. This may benefit the traffic flow on Fleur, but the new site becomes disconnected from the community with its new address on Army Post Road. Views to downtown and the approach to the airport are obstructed by the other necessary facilities that will be relocated to the East Quadrant. This greatly contrasts the direct visual connection of the airside terminal in the East Option to Fleur Drive and downtown Des Moines, potentially reducing the connection to the community that the current site possesses.

Landside - This new concept is located as close to the Army Post Road as possible, which will help to minimize infrastructure costs and shorten the overall drive to the terminal. A new intersection would be required at Army Post Road with a new entry road to the terminal site. Existing parking facilities in the east quadrant can still be maintained in this concept, but this will require a shuttle to the new terminal. Additional parking (structured and surface) would also be required directly at the new terminal site in the south as well. A tunnel would connect the new terminal to the new parking structure due to the parking being located at a lower elevation on the site.

Airside – The FAA would require a new parallel taxiway along the NW/SE runway for safety purposes to eliminate aircraft taxi across the active runway. A new deice pad accommodating 3 aircraft is included on the southern quadrant. The previous preferred alternative assumed reuse of the majority of the existing cargo apron currently located at the site. In order to maintain proper slope away from the new terminal building, much of the apron from the new terminal out to the Ground Service Vehicle road would need to be replaced, thus, not saving as much of the existing pavement as once determined.
Chapter 1 | EAST OPTION SELECTED

1.8 Conclusion & Next Steps

On October 11, 2016, the Board approved the East quadrant as the preferred site terminal location. The costs for these alternatives are shown in Figure 1.8. These are program costs, which include hard construction costs and soft costs including contingency, project management and design fees, etc.

Over the next year, the Authority and HNTB Team will conduct a terminal programming study that will provide detailed requirements for the entire east quadrant program (terminal, airside and landside) that includes input from all major stakeholders. The deliverable will include a Program Definition Document (PDD) that will be a guiding document to be used by the future Design Team and Contractors.

Figure 1.7 Comparison Matrix Chart

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<th>East</th>
<th>South</th>
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<td>Functional / Efficient</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pride / Community</td>
<td>✓</td>
<td>—</td>
</tr>
<tr>
<td>(Connection to Fleur + Downtown)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Expansion Capability</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(Ultimate Buildout)</td>
<td>(25 Gates)</td>
<td>(33 Gates)</td>
</tr>
<tr>
<td>Zoning</td>
<td>✓</td>
<td>—</td>
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<tr>
<td>(Connection to Fleur + Downtown)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEW Parking Required</td>
<td>✓</td>
<td>—</td>
</tr>
<tr>
<td>(3,346 total req'd - Phase 1)</td>
<td>(1,069)</td>
<td>(3,346)</td>
</tr>
<tr>
<td>NEW Taxiway Required</td>
<td>✓</td>
<td>YES</td>
</tr>
<tr>
<td>Avoids IANG site</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cost</td>
<td>✓</td>
<td>—</td>
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</table>

Figure 1.8 Total Project Cost Comparison

<table>
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<th>Concept</th>
<th>Total Cost</th>
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<tr>
<td>East</td>
<td>$ 491,000,000</td>
</tr>
<tr>
<td>South</td>
<td>$ 618,000,000</td>
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</tbody>
</table>

KEY POINTS

The East Concept has been selected for further development.

The Authority and HNTB will conduct a terminal programming study and produce a PDD over the next year.
Chapter 2

Existing Conditions

- Airport Overview
- General Findings and Approach
- Existing Iowa Air National Guard (IANG) Facilities
2.1 Airport Overview
For 2015, Des Moines International Airport was ranked as the 84th largest passenger airport in the United States. In August 2016, the Airport was served by three mainline passenger airlines and three low-cost carrier airlines, which together provided nonstop service to 19 destinations, an increase of four destinations over August 2013. The Airport continues to be served by two national all-cargo airlines – FedEx and UPS – plus regional feeder cargo airlines.

2.2 General Findings and Approach
Existing Buildings identified in the Leigh Fisher Technical Report remain in place, with one exception. Building 36, the 12,150 square foot South Executive “T” Hangar, has been removed from the South Quadrant of the Airport (Figure 2.1.) There have been no significant changes to the functions housed in the remaining buildings.

2.3 Existing Iowa Air National Guard (IANG) Facilities
The Iowa Air National Guard continues to lease approximately 170 acres of airport property on the north side of the Airport. The current expectation is for the IANG to remain in that location. If part of that area becomes available to the Airport, future corporate aviation facilities could be located there, immediately west of the current General Aviation/Corporate area.
Chapter 3  Aviation Demand Forecast

- Forecast Approach
- Forecast Summary
- Historical Aviation Activity
- Review of Annual Passenger Enplanement Forecast
- Review of Annual Passenger Departure and Fleet Mix Forecast
- Peak Activity Forecasts
- Gate and Remain Overnight Parking Requirements
- Total Aircraft Operations
- Forecast Review - Summary
Chapter 3 | AVIATION DEMAND FORECAST

3.1. Forecast Approach

The purpose of the analysis described in this section was to perform a general review of the methodologies, assumptions and resulting forecasts in the Des Moines International Airport (DSM) Terminal Area Concept Plan (LFA Forecast) for appropriateness. The intent of the review was to identify any inconsistencies or departures in current trends from the forecasts and to provide a recommendation on whether the forecasts should be redone.

The focus of the review was on the forecast elements most relevant to the terminal plan, specifically passenger forecasts, passenger aircraft and fleet forecasts, peak activity forecasts, and contact gate and remain overnight hardstand requirements.

3.2. Forecast Summary

The economic assumptions used in the LFA Forecast published in 2014 are still applicable. Essentially, the world and U.S. economies are still growing at a moderate rate, employment is increasing and unemployment levels are steady, and inflation is under control. The airline industry is financially healthy and still practicing capacity management. Fuel prices have fallen more than expected but are expected to increase again by both the FAA and the U.S. Department of Energy.

Since the original forecast assumptions are generally sound and still applicable and the annual passenger enplanement forecast is tracking well a complete revision of the forecast is not recommended. However, some industry trends, such as changes in fleet mix resulting in increases in average aircraft size, have occurred faster than anticipated. In these instances, adjustments reflecting new base year levels are recommended.

Understanding that fluctuations in airport activity above and below long term trends have occurred in the past and are expected to continue to occur in the future, a 5 percent deviation threshold was used when evaluating the forecasts. Forecast elements for which actual (2015) activity levels were within 5 percent of the forecast were assumed to be on track and were therefore not adjusted. Conversely, forecast elements for which actual (2015) activity levels differed from the forecast by more than 5 percent were adjusted by applying the LFA forecast growth rate to the most recent actual activity level.

3.3 Historical Aviation Activity

Figures 3.1 and 3.2 provide historical passenger enplanements and aircraft operations at DSM over the past twenty-five years. Since the most recent downturn in 2008-2009, enplanements have grown rapidly. The 2016 estimate is extrapolated from data through August and currently shows a year over year growth rate of 5.1 percent. However, the rate of growth has been declining in recent months (2.1 percent in July and 2.8 percent in August) so it is likely that when 2016 is complete, the growth rate will be slightly below 5 percent.

Historical aircraft operations at DSM have been declining over the past twenty-five years. Most of the decline has been in the air taxi/commuter, general aviation, and military categories. Commuter operations have gone down as air carriers have increasingly transitioned from small turboprop aircraft to larger 50, 70 and 76-seat jets. The decline in general aviation has mirrored a national decline in general aviation activity, especially recreational and personal flying.

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**Figure 3.1 Historical Passenger Enplanements**

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<th>Year</th>
<th>Passenger Enplanements (a)</th>
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<td>1990</td>
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<td>1992</td>
<td>747,757</td>
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<td>1993</td>
<td>703,127</td>
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</tr>
<tr>
<td>1994</td>
<td>707,204</td>
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<tr>
<td>1995</td>
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<td>13.5%</td>
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<td>1997</td>
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<td>1998</td>
<td>861,523</td>
<td>0.2%</td>
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<td>1999</td>
<td>885,175</td>
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<td>2000</td>
<td>876,018</td>
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<tr>
<td>2001</td>
<td>820,741</td>
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<td>2002</td>
<td>883,190</td>
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<td>2003</td>
<td>911,063</td>
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<td>2005</td>
<td>951,604</td>
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<td>2008</td>
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<td>875,625</td>
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<td>2016</td>
<td>1,240,983</td>
<td>5.1%</td>
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**Compounded Annual Growth Rate**

- 1990-2015: 2.0%
- 2009-2015: 5.1%

(a) LFA, Terminal Area Concept Plan, Appendix A, Table 3-2, and Des Moines Airport Authority Traffic Statistics.
(b) Extrapolated from January through August data.

Sources: As noted and HNTB analysis.
Figure 3.2 Historical Aircraft Operations

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<th>Year</th>
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<th>Air Taxi/Commuter</th>
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<td>87,908</td>
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<td>42,245</td>
<td>4,490</td>
<td>110,982</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>15,784</td>
<td>44,262</td>
<td>60,046</td>
<td>37,301</td>
<td>3,568</td>
<td>100,915</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>17,741</td>
<td>38,161</td>
<td>55,902</td>
<td>36,981</td>
<td>2,955</td>
<td>95,858</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>15,978</td>
<td>34,891</td>
<td>50,869</td>
<td>32,308</td>
<td>3,787</td>
<td>86,964</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>15,707</td>
<td>31,442</td>
<td>47,149</td>
<td>32,795</td>
<td>3,992</td>
<td>83,936</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>16,022</td>
<td>30,634</td>
<td>46,656</td>
<td>33,045</td>
<td>4,202</td>
<td>83,903</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>19,626</td>
<td>24,574</td>
<td>44,200</td>
<td>31,962</td>
<td>3,874</td>
<td>79,836</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>20,514</td>
<td>22,617</td>
<td>43,131</td>
<td>30,432</td>
<td>2,882</td>
<td>76,445</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>23,353</td>
<td>18,286</td>
<td>41,639</td>
<td>27,077</td>
<td>811</td>
<td>69,527</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>28,354</td>
<td>11,402</td>
<td>39,756</td>
<td>28,075</td>
<td>1,556</td>
<td>69,387</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>27,996</td>
<td>12,610</td>
<td>40,606</td>
<td>27,563</td>
<td>1,620</td>
<td>80,183</td>
<td></td>
</tr>
</tbody>
</table>

Compounded Annual Growth Rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td>0.1%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

(a) LFA, Terminal Area Concept Plan, Appendix A, Table 5-1, and FAA OPSNET database.
(b) Extrapolated from January through August data.

Sources: As noted and HNTB analysis.
3.4. Review of Annual Passenger Enplanement Forecast

Figures 3.3 and 3.4 provide a comparison of actual enplanement levels with interpolated levels from the LFA forecast. As shown, actual enplanements are tracking slightly higher than forecast enplanements, through August 2016. The difference is less than 5 percent however; therefore, no adjustment to the forecast is recommended. Another consideration is that oil prices are projected to recover over the next several years. This will drive air fares higher, and thereby reduce the growth in passenger demand.

**Figure 3.3 Annual Passenger Enplanement Forecast**

<table>
<thead>
<tr>
<th>Year</th>
<th>LFA Forecast (a)</th>
<th>Actual (b)</th>
<th>Variance</th>
<th>Recommended (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1,162,448</td>
<td>1,180,764</td>
<td>1.6%</td>
<td>1,180,764</td>
</tr>
<tr>
<td>2016</td>
<td>1,191,298</td>
<td>1,240,983</td>
<td>4.2%</td>
<td>1,240,983</td>
</tr>
<tr>
<td>2017</td>
<td>1,218,600</td>
<td>1,218,600</td>
<td></td>
<td>1,218,600</td>
</tr>
<tr>
<td>2018</td>
<td>1,248,997</td>
<td>1,248,997</td>
<td></td>
<td>1,248,997</td>
</tr>
<tr>
<td>2022</td>
<td>1,350,700</td>
<td>1,350,700</td>
<td></td>
<td>1,350,700</td>
</tr>
<tr>
<td>2027</td>
<td>1,497,064</td>
<td>1,497,064</td>
<td></td>
<td>1,497,064</td>
</tr>
<tr>
<td>2032</td>
<td>1,660,300</td>
<td>1,660,300</td>
<td></td>
<td>1,660,300</td>
</tr>
<tr>
<td>2042</td>
<td>2,045,117</td>
<td>2,045,117</td>
<td></td>
<td>2,045,117</td>
</tr>
</tbody>
</table>

**Compounded Annual Growth Rate**

- 2015-2042: 2.1%

(a) LFA, Terminal Area Concept Plan. 2015 and 2016 interpolated.
(b) Table X.1.
(c) Since variance is less than 5 percent, LFA forecast recommended without adjustment.

**Figure 3.4 Annual Passenger Enplanement Forecast**

Sources: As noted and HNTB analysis.
3.5 Review of Passenger Aircraft Departure and Fleet Mix Forecasts

Figures 3.5 and 3.6 provide a comparison of actual passenger aircraft departures and the associated LFA forecast. In contrast to passenger enplanements, aircraft departures are tracking 9.0 percent below the forecast. Since the difference is greater than 5.0 percent, the forecast was adjusted to reflect a lower base year level as shown in the table and exhibit. The reason that aircraft departures are tracking behind LFA forecast levels is that the transition to larger aircraft, specifically the transition from 50-seat to 70- and 76-seat regional jets, is occurring faster than originally anticipated.

Figures 3.7 and 3.8 compare the actual 2015 and 2016 passenger aircraft fleet with the LFA forecast. As shown, the narrow-body aircraft projection is tracking well. However, actual large (more than 60 seats) regional jet aircraft departures are tracking significantly above the forecast whereas small (less than 60 seats) regional jet aircraft departures are tracking well below the forecast.

### Figure 3.5 Annual Passenger Aircraft Departure Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>LFA Forecast (a)</th>
<th>Actual (b)</th>
<th>Variance (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>17,509</td>
<td>15,930</td>
<td>-9.0%</td>
</tr>
<tr>
<td>2016</td>
<td>17,827</td>
<td>16,220</td>
<td>-5.1%</td>
</tr>
<tr>
<td>2017</td>
<td>18,146</td>
<td>16,510</td>
<td>-10.1%</td>
</tr>
<tr>
<td>2018</td>
<td>18,465</td>
<td>16,800</td>
<td>-12.4%</td>
</tr>
<tr>
<td>2022</td>
<td>19,538</td>
<td>17,776</td>
<td>-9.1%</td>
</tr>
<tr>
<td>2027</td>
<td>20,879</td>
<td>18,997</td>
<td>-9.5%</td>
</tr>
<tr>
<td>2032</td>
<td>23,125</td>
<td>21,040</td>
<td>-9.4%</td>
</tr>
<tr>
<td>2042</td>
<td>27,616</td>
<td>25,126</td>
<td>-9.1%</td>
</tr>
</tbody>
</table>

**Compounded Annual Growth Rate**

- 2015-2042: 1.7%

(a) LFA, Terminal Area Concept Plan. 2015 and 2016 interpolated.  
(b) US DOT T100 database as compiled by Database Products, Inc.  
(c) Since variance is greater than 5 percent, recommended forecast is LFA forecast adjusted by 2015 variance.

Sources: As noted and HNTB analysis.

### Figure 3.7 Passenger Aircraft Fleet Mix Comparison

<table>
<thead>
<tr>
<th>Year</th>
<th>Narrow-Body (a)</th>
<th>RJ More than 60 seats (a)</th>
<th>RJ less than 60 seats (a)</th>
<th>Total (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>21.5%</td>
<td>26.0%</td>
<td>52.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2016</td>
<td>26.6%</td>
<td>30.4%</td>
<td>43.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2017</td>
<td>29.1%</td>
<td>32.5%</td>
<td>40.4%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2018</td>
<td>31.6%</td>
<td>34.7%</td>
<td>33.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2022</td>
<td>32.1%</td>
<td>35.8%</td>
<td>32.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2027</td>
<td>34.1%</td>
<td>40.1%</td>
<td>25.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2032</td>
<td>36.6%</td>
<td>47.9%</td>
<td>15.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2042</td>
<td>39.4%</td>
<td>55.0%</td>
<td>5.5%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Narrow-Body (b)</th>
<th>RJ More than 60 seats (b)</th>
<th>RJ less than 60 seats (b)</th>
<th>Total (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>29.3%</td>
<td>47.7%</td>
<td>23.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>2016</td>
<td>33.2%</td>
<td>41.3%</td>
<td>25.5%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Compounded Annual Growth Rate**

- 2015-2042: 1.7%

(a) Leigh/Fisher, Terminal Area Concept Plan, Appendix A, Table 6-7. Intermediate years interpolated and percentages adjusted to reflect only passenger carrier fleet.  
(b) US DOT T100 annual data as compiled by Database Products for 2015 and Official Airline Guide for June 2016.

Sources: As noted and HNTB analysis.

### Key Points
- Accelerated changes from small RJs to large RJs have resulted in reduced passenger aircraft operations.
- The reduced level of operations was carried forward into an adjusted lower aircraft operations forecast.
3.5 (continued) Review of Passenger Aircraft Departure and Fleet Mix Forecasts

Figure 3.9 provides a summary comparison of the existing fleet mix along with the LFA forecast through 2032. As shown, the current mix of large and small regional jets is very similar to the mix originally projected for 2022.

### Figure 3.9 Summary of Passenger Fleet Projections

<table>
<thead>
<tr>
<th></th>
<th>2015 Fleet</th>
<th>2016 Fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projected (a)</td>
<td>Actual (b)</td>
</tr>
<tr>
<td>Narrowbody</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A318</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>A319</td>
<td>4.6%</td>
<td>4.9%</td>
</tr>
<tr>
<td>A320/neo</td>
<td>2.7%</td>
<td>2.5%</td>
</tr>
<tr>
<td>ERJ-190 (d)</td>
<td>2.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>CS300 (d)</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>B717</td>
<td>0.0%</td>
<td>4.2%</td>
</tr>
<tr>
<td>B737-300</td>
<td>0.1%</td>
<td>0.3%</td>
</tr>
<tr>
<td>B737-700</td>
<td>5.0%</td>
<td>6.6%</td>
</tr>
<tr>
<td>B737-800</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td>B737 MAX</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>B737-900</td>
<td>0.0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>B757-200/300</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>MD-80/88/83</td>
<td>10.5%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>26.6%</td>
<td>29.3%</td>
</tr>
<tr>
<td>RJ More than 60 seats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRJ-700</td>
<td>9.3%</td>
<td>17.5%</td>
</tr>
<tr>
<td>CRJ-900</td>
<td>13.7%</td>
<td>26.1%</td>
</tr>
<tr>
<td>ERJ-170</td>
<td>7.3%</td>
<td>3.6%</td>
</tr>
<tr>
<td>ERJ-175</td>
<td>0.0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>30.4%</td>
<td>47.7%</td>
</tr>
<tr>
<td>RJ less than 60 seats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRJ-100/200</td>
<td>11.9%</td>
<td>9.5%</td>
</tr>
<tr>
<td>ERJ-135</td>
<td>12.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>ERJ-145 (44 seats)</td>
<td>7.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>ERJ-145 (50 seats)</td>
<td>10.8%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>43.1%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

(a) Leigh/Fisher, Terminal Area Concept Plan, Appendix A, Table 6-7. Intermediate years interpolated and percentages adjusted to reflect only passenger carrier fleet.
(b) USDOT T100 annual data as compiled by Database Products.
(c) June 2016 data from Official Airline Guide.
(d) Included with RJs in Terminal Area Concept Plan.

Sources: As noted and HNTB analysis.

---

**Figure 3.8 Passenger Aircraft Fleet Mix Comparison**

**Figure 3.9 Summary of Passenger Fleet Projections**

**KEY POINTS**

- Regional jets with more than 60 seats accounted for almost half of total passenger aircraft operations at DSM in 2015.
Chapter 3 | AVIATION DEMAND FORECAST

3.6. Peak Activity Forecasts

The appropriate sizing of most terminal building facilities is dependent on peak period passenger forecasts. Figures 3.10 through 3.13 compare current (June 2016) peak hour enplanement, deplanements, and enplanement plus deplanements forecasts with the original projections prepared by LFA. As shown, current peak hour deplanements vary from the forecasts by less than 5 percent, and therefore the forecasts were not adjusted. Peak hour enplanements and total passengers (enplanements plus deplanements) vary from the forecast by more than 5 percent, and they were therefore adjusted to reflect the lower base year numbers.

Figure 3.10 Peak Hour Enplanement Forecasts

Figure 3.11 Peak Hour Deplanement Forecasts

Figure 3.12 Peak Hour Passenger Movement Forecasts

Figure 3.13 Peak Hour Passenger Forecasts

<table>
<thead>
<tr>
<th>Year</th>
<th>LFA Forecast (a)</th>
<th>Actual (b)</th>
<th>Variance</th>
<th>LFA Forecast (c)</th>
<th>Actual (d)</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>779</td>
<td>550</td>
<td>-29.6%</td>
<td>925</td>
<td>823</td>
<td>-13.7%</td>
</tr>
<tr>
<td>2016</td>
<td>804</td>
<td>566</td>
<td>-29.6%</td>
<td>568</td>
<td>566</td>
<td>-1.7%</td>
</tr>
<tr>
<td>2017</td>
<td>828</td>
<td>585</td>
<td>-13.7%</td>
<td>823</td>
<td>823</td>
<td>-13.7%</td>
</tr>
<tr>
<td>2018</td>
<td>853</td>
<td>602</td>
<td>-13.7%</td>
<td>873</td>
<td>873</td>
<td>-13.7%</td>
</tr>
<tr>
<td>2022</td>
<td>928</td>
<td>654</td>
<td>-13.7%</td>
<td>935</td>
<td>935</td>
<td>-13.7%</td>
</tr>
<tr>
<td>2027</td>
<td>1,022</td>
<td>720</td>
<td>-13.7%</td>
<td>1,046</td>
<td>1,046</td>
<td>-13.7%</td>
</tr>
<tr>
<td>2032</td>
<td>1,147</td>
<td>807</td>
<td>-13.7%</td>
<td>1,174</td>
<td>1,174</td>
<td>-13.7%</td>
</tr>
</tbody>
</table>

Compounded Annual Growth Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2042</td>
<td></td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Sources: As noted and HNTB analysis.

KEY POINTS

• Peak hour deplanement forecasts are tracking closely
• Peak hour enplanement and total passenger forecasts were adjusted downward to reflect lower base year levels.
3.7. Gate and Remain Overnight Parking Requirements

This subsection contains a review of the LFA projected gate and remain overnight (RON) parking requirements and provides adjustments to the forecast where necessary. Gate and RON requirements depend, in large part, on the passenger aircraft departure forecast. Since actual passenger aircraft departures have varied significantly from the LFA forecast, an updated gate and RON requirement forecast was prepared based on the new aircraft departure projections. Updated base year gate and RON requirements were based on an analysis of the June 2016 airline schedules. The updated gate and RON requirement projections incorporated the following assumptions:

- Current gate use patterns would continue:
  - Preferential for United, Delta, American, and Southwest
  - Common use for smaller carriers
  - Turns per gate will continue at 2015 levels
  - Ratio of RON requirements to passenger aircraft departures will continue at 2015 levels.
  - No extra allowance for charter flights or irregular operations

Figure 3.14 provides the updated gate and RON forecasts and Figures 3.15 and 3.16 compare the updated forecasts with the original estimates in the LFA forecast. As shown, the updated gate requirements are slightly lower than the original forecast. The RON requirements, however, are higher by 2042.

Figure 3.14 Estimated Gate and RON Requirements

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger Aircraft Departures</th>
<th>Contact Gates</th>
<th>RON Positions</th>
<th>Total Parking Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>16,873</td>
<td>11</td>
<td>-</td>
<td>17</td>
</tr>
<tr>
<td>2015</td>
<td>17,509</td>
<td>11.4</td>
<td>-</td>
<td>17.4</td>
</tr>
<tr>
<td>2016</td>
<td>17,827</td>
<td>11.6</td>
<td>-</td>
<td>17.6</td>
</tr>
<tr>
<td>2017</td>
<td>18,146</td>
<td>12</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>2018</td>
<td>18,465</td>
<td>12</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>2022</td>
<td>20,879</td>
<td>13</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>2027</td>
<td>23,125</td>
<td>15</td>
<td>9</td>
<td>24</td>
</tr>
<tr>
<td>2032</td>
<td>27,616</td>
<td>18</td>
<td>8</td>
<td>26</td>
</tr>
</tbody>
</table>

Figure 3.15 Contact Gate Requirements

Figure 3.16 RON Requirements (Contact Gates + Handstands)
### 3.8 Total Aircraft Operations

Figures 3.17 and 3.18 compare actual operations with the LFA forecast of operations for the major activity categories, including commercial (air carrier plus air taxi), general aviation and military. In instances where the variance was greater than 5 percent, the forecasts were adjusted by applying the original LFA growth rates to the updated base year numbers. All of the major categories were revised downwards. As a result, the updated forecast for 2032 is 80,243 operations, approximately 9 percent lower than the original LFA forecast.

#### Figure 3.17 Total Aircraft Operations Forecasts

<table>
<thead>
<tr>
<th>Year</th>
<th>LFA Forecast (a)</th>
<th>Actual/Adjusted (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Carrier</td>
<td>19,626</td>
<td>21,200</td>
</tr>
<tr>
<td>Air Taxi</td>
<td>24,574</td>
<td>20,900</td>
</tr>
<tr>
<td>Subtotal Commercial</td>
<td>44,100</td>
<td>42,100</td>
</tr>
<tr>
<td>General Aviation</td>
<td>31,062</td>
<td>29,410</td>
</tr>
<tr>
<td>Military</td>
<td>3,874</td>
<td>3,800</td>
</tr>
<tr>
<td>Total Operations</td>
<td>80,036</td>
<td>75,100</td>
</tr>
<tr>
<td>Air Carrier</td>
<td>19,626</td>
<td>20,514</td>
</tr>
<tr>
<td>Air Taxi</td>
<td>24,574</td>
<td>22,617</td>
</tr>
<tr>
<td>Subtotal Commercial</td>
<td>44,100</td>
<td>43,131</td>
</tr>
<tr>
<td>General Aviation</td>
<td>31,062</td>
<td>30,432</td>
</tr>
<tr>
<td>Military</td>
<td>3,874</td>
<td>2,882</td>
</tr>
<tr>
<td>Total Operations</td>
<td>80,036</td>
<td>76,445</td>
</tr>
</tbody>
</table>

#### Figure 3.18 Total Aircraft Operations Forecast

The review and analyses above indicate that the LFA forecast methodologies and assumptions are generally sound and the annual passenger enplanement forecasts are on track. Some industry trends such as average aircraft size and fleet mix have occurred faster than originally anticipated and has resulted in a lower operations and gate requirements forecast. As a result, no adjustment is recommended for the annual passenger or peak hour deplanement forecasts. However, because there have been material variances from actual and forecast levels, adjustments are recommended for passenger aircraft operations, peak hour operations, peak hour passenger, and gate and RON requirements forecasts.

#### 3.9 Forecast Review - Summary

The review and analyses above indicate that the LFA forecast methodologies and assumptions are generally sound and the annual passenger enplanement forecasts are on track. Some industry trends such as average aircraft size and fleet mix have occurred faster than originally anticipated and has resulted in a lower operations and gate requirements forecast. As a result, no adjustment is recommended for the annual passenger or peak hour deplanement forecasts. However, because there have been material variances from actual and forecast levels, adjustments are recommended for passenger aircraft operations, peak hour operations, peak hour passenger, and gate and RON requirements forecasts.
Chapter 4: Facilities Requirements Analysis

- Ground Transportation and Parking Requirements
- Roadways and Curbside
- Rental Car Facilities and Hold Lot
- Existing and Future Critical Aircraft
- Runway Design Code
- Taxiways
- Runway Incursion Mitigation
- Airspace Considerations/NAVAID Critical Areas
- Deicing Pad
- Design Criteria - Width of Deicing Positions
- Design Criteria - Length of Deicing Positions
Chapter 4 | GROUND TRANSPORTATION REQUIREMENTS

4.1 Ground Transportation and Parking Requirements

Parking requirements are based on existing utilization by the parking facility, grown at the rate of expected passenger traffic growth. Overall assumptions and requirements for future 3.0 MAP and 4.0 MAP are the same as presented in the LeighFisher report including the application of a 10% circulation factor to estimate requirements from the base demand. An updated detailed breakdown of existing demand by parking facility is provided in Table 4.1. Demand is based on the average occupancies in the peak parking month of June 2015. Future public parking requirements broken out by parking type are summarized in Table 4.2. Employee parking is also estimated to increase relative to overall passenger growth. Future employee parking requirements are summarized in Table 4.3.

Table 4.1 Existing Public Parking Utilization

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Short-Term</th>
<th>Average Percent Occupied</th>
<th>Occupied Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Spaces</td>
<td>341</td>
<td>62.8%</td>
<td>214</td>
</tr>
<tr>
<td>Long-Term</td>
<td>1,732</td>
<td>84.2%</td>
<td>1,459</td>
</tr>
<tr>
<td>Economy 1</td>
<td>848</td>
<td>51.9%</td>
<td>440</td>
</tr>
<tr>
<td>Economy 2</td>
<td>668</td>
<td>83.1%</td>
<td>547</td>
</tr>
<tr>
<td>Economy 3</td>
<td>379</td>
<td>68.6%</td>
<td>260</td>
</tr>
<tr>
<td>Economy 4 (public overflow)</td>
<td>300</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>4,258</td>
<td></td>
<td>2,920</td>
</tr>
</tbody>
</table>

Table 4.2 Public Parking Requirement

<table>
<thead>
<tr>
<th>Requirement (Spaces)</th>
<th>3 MAP (2027)</th>
<th>4 MAP (2042)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>374</td>
<td>498</td>
</tr>
<tr>
<td>Long-Term</td>
<td>2,548</td>
<td>3,398</td>
</tr>
<tr>
<td>Economy Close-in (Lots 2 &amp; 3)</td>
<td>1,409</td>
<td>1,879</td>
</tr>
<tr>
<td>Economy Remote (Lots 1 &amp; 4)</td>
<td>768</td>
<td>1,025</td>
</tr>
<tr>
<td>Total Public Parking Spaces</td>
<td>5,100</td>
<td>6,800</td>
</tr>
</tbody>
</table>

Table 4.3 Employee Parking Requirement

<table>
<thead>
<tr>
<th>Requirement (Spaces)</th>
<th>3 MAP (2027)</th>
<th>4 MAP (2042)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td>300</td>
<td>400</td>
</tr>
</tbody>
</table>

4.2 Roadways and Curbside

Curbside requirements are based on peak hour operations. The updated passenger forecast estimates a decrease in peak hour passengers through the planning horizon. The curbside requirements have been updated in Table 4.4 to show the current curbside requirements, reflecting both existing and recommended dwell times. Vehicle dwell times, or the time a vehicle stays on the curb to load and unload passengers, has a direct correlation to the amount of curb length required. Currently the average dwell time recorded for private vehicles is 3 minutes for vehicles dropping off departing passengers and 8.7 minutes for vehicles picking up arriving passengers. If vehicle activity on the curb is restricted to active loading and unloading only through stricter enforcement the required curb length would be reduced. Table 4.4 shows the curbside requirements with a recommended 3-minute dwell time for private vehicles to represent active loading and unloading only. Roadway requirements are consistent with the LeighFisher report.

Table 4.4 Curbside Length Requirement

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Existing Supply</th>
<th>3 MAP (2027)</th>
<th>4 MAP (2042)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Curb</td>
<td>545 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirement existing dwell times</td>
<td>550 feet</td>
<td>675 feet</td>
<td></td>
</tr>
<tr>
<td>Requirement 3 min dwell times</td>
<td>325 feet</td>
<td>400 feet</td>
<td></td>
</tr>
<tr>
<td>Outer Curb</td>
<td>571 feet</td>
<td>610 feet</td>
<td>730 feet</td>
</tr>
</tbody>
</table>

4.3 Rental Car Facilities and Hold Lot

Note that the number of existing rental car ready-return spaces currently provided in the terminal area has increased from 370 spaces in 2014, when the LeighFisher report was completed, to 435 spaces today.

Rental car facilities and commercial vehicle hold lot requirements are consistent with the LeighFisher report. New co-located ready-return facilities will allow efficiencies in rental car ready-return operations.

KEY POINTS

- Chapter 4 includes any changes in assumptions for Program Requirements from the previous 2014 report.
- Terminal Program Requirements will be further developed during Task Order No. 2 (Terminal Programming Study)
- Existing rental car ready-return spaces have increased since 2014.
4.4 Existing and Future Critical Aircraft

The FAA defines the critical aircraft for an airport as the aircraft representing a combination of the most demanding Airport Reference Code (ARC) with greater than 500 annual operations. DSM’s existing critical aircraft is the Boeing 767-300, with an ARC passenger designation of D-IV and a Taxiway Design Group (TDG) of 5. The B767-300 has a maximum takeoff weight of 412,000 lbs and is primarily used for cargo operations at DSM. The terminal area is designed to meet Airplane Design Group (ADG) IV standards due to scheduled passenger operations by the B757-200 and other ADG IV aircraft. There is no anticipated critical aircraft change expected in the future. Table 4.5 summarizes the dimension standards of the critical aircraft.

<table>
<thead>
<tr>
<th></th>
<th>B757-200 (Passenger)</th>
<th>B767-300 (Cargo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>155.2'</td>
<td>180.1'</td>
</tr>
<tr>
<td>Wingspan</td>
<td>134.6'</td>
<td>156.2'</td>
</tr>
<tr>
<td>Tail Height</td>
<td>45.1'</td>
<td>52.6'</td>
</tr>
<tr>
<td>Maximum Take-off Weight</td>
<td>255,000 lbs</td>
<td>412,000 lbs</td>
</tr>
<tr>
<td>Approach Speed</td>
<td>137 kts</td>
<td>145 kts</td>
</tr>
<tr>
<td>Aircraft Approach Category</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Airplane Design Group</td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td>Taxiway Design Group</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

4.5 Runway Design Code

The FAA defines a Runway Design Code (RDC) for every runway that is in the National Airspace System (NAS). The RDC identifies the existing and future design elements of a runway and is made up of three components: Airplane Design Group (ADG), Aircraft Approach Category (AAC), and approach visibility minimums for a specific runway’s critical aircraft. The AAC identifies the range of final approach speeds that can be accommodated by the runway. The ADG is a function of the wingspan and tail height dimensions of the critical aircraft. The approach visibility minimum is defined as the approved minimum horizontal and vertical visibility that the specific runway accommodates. The RDC is written as a combination of the three elements: AAC/ADG/Approach Visibility Minimum. Table 4.6 summarizes the RDC designations at DSM.

<table>
<thead>
<tr>
<th>Runway</th>
<th>RDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>D/IV/2400</td>
</tr>
<tr>
<td>23</td>
<td>D/IV/5000</td>
</tr>
<tr>
<td>13</td>
<td>D/IV/2400</td>
</tr>
<tr>
<td>31</td>
<td>D/IV/1200</td>
</tr>
</tbody>
</table>

4.6 Taxiways

Taxiways provide a network of pavement for aircraft to move around the airfield, connecting various airfield components and providing access to the runways and aircraft aprons. Taxiways are part of the movement area, which is an area under control by Air Traffic Control (ATC). Taxiways connect aircraft parking positions with taxiways and are generally not part of the movement area. The geometrical design standards for taxiways and taxilanes are derived from the ADG and the Taxiway Design Group (TDG). Similar to the ADG, the FAA has defined the TDG to determine taxiway/taxilane width standards, fillet radii, and some taxiway/taxilane separations. TDG is based on the undercarriage dimensions of the critical aircraft (main gear width and main gear to cockpit distance). DSM’s critical TDG is 5 which is representative of the B767-300 aircraft. The RDC defines most of the separation standards and clearance offsets. Tables 4.7 and 4.8 compare DSM’s taxiway/taxilane dimensional standards.

<table>
<thead>
<tr>
<th></th>
<th>TDG 3</th>
<th>TDG 4</th>
<th>TDG 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxiway Width</td>
<td>50'</td>
<td>50'</td>
<td>75'</td>
</tr>
<tr>
<td>Taxiway Edge Safety Margin</td>
<td>10'</td>
<td>10'</td>
<td>15'</td>
</tr>
<tr>
<td>Taxiway Shoulder Width</td>
<td>20'</td>
<td>20'</td>
<td>30'</td>
</tr>
<tr>
<td>Taxiway Fillet Dimensions</td>
<td>variable</td>
<td>variable</td>
<td>variable</td>
</tr>
<tr>
<td>Representative Aircraft</td>
<td>B737-800/900</td>
<td>B757-200</td>
<td>B767-300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ADG III</th>
<th>ADG IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxiway/Taxilane Safety Area</td>
<td>118'</td>
<td>171'</td>
</tr>
<tr>
<td>Taxiway Object Free Area</td>
<td>186'</td>
<td>259'</td>
</tr>
<tr>
<td>Taxilane Object Free Area</td>
<td>162'</td>
<td>225'</td>
</tr>
<tr>
<td>Taxiway to Parallel Taxiway</td>
<td>152'</td>
<td>215'</td>
</tr>
<tr>
<td>Taxiway to FOMO</td>
<td>93'</td>
<td>129.5'</td>
</tr>
<tr>
<td>Taxilane to Parallel Taxilane</td>
<td>140'</td>
<td>198'</td>
</tr>
<tr>
<td>Taxilane to FOMO</td>
<td>81'</td>
<td>112.5'</td>
</tr>
</tbody>
</table>

FOMO – Fixed or movable object
Chapter 4 | AIRSIDE FACILITIES REQUIREMENTS ANALYSIS

4.7 Runway Incursion Mitigation

The most recent update to the FAA’s Airport Design AC 150/5300-13A, change 1, consolidated a variety of recent research findings related to airfield safety. Previously airfield safety enhancement bulletins had been published in FAA orders and engineering briefs. The research correlates existing design geometries with incursion history as well as the future trends in airfield geometry that can result in incursions and have broadly identified them as:

- Complex runway intersections
- Runways beginning near the intersection of a crossing runway
- High energy intersections
- Misaligned runway arrival thresholds
- Complex taxiway intersections
- Extra-wide taxiway pavements
- Runway crossings that lead directly into a ramp
- Direct runway crossings, and
- Entrance taxiways to runways or aligned taxiways.

The alternatives discussed further in Chapter 5 will make sure not to introduce these incompatible geometries. Figure 4.9 highlights the areas of concern.

Figure 4.9 Runway Incursion Mitigation Areas

4.8 Airspace Considerations/NAVAID Critical Areas

Imaginary surfaces such as FAR Part 77 and TERPS are used to determine obstructions to navigational airspace. The exact configuration of these surfaces vary based upon the runway’s type of approach/departure. Obstructions are objects that penetrate these surfaces and there are mitigative measures such as obstruction lighting, removal, and/or relocation. To the extent feasible, future obstructions should be kept clear of these surfaces. Objects such as gated or parked aircraft, buildings, and light poles should be kept clear of these surfaces. Chapter 5 will summarize any known impacts to these surfaces.

4.9 Deicing Pad

Based on discussions with the airport, it was determined that there is a future need for up to three deicing positions. These deicing pads should be able to accommodate two ADG-III aircraft and one B757-200 aircraft simultaneously. From a demand/capacity standpoint, the alternative analysis will show a footprint for these three deicing positions. The following section explains the design criteria used to develop the template for these pads.

4.10 Design Criteria – Width of Deicing Positions

The width of each deicing position is based on Table 3-1 of Advisory Circular (AC) 150/5300-14C and assumes that the deicing area will be defined as a non-movement area during deicing events, meaning that the deicing pad will not be under direct Air Traffic control. According to the AC, the width of each parking position is dimensioned from centerline of aircraft deicing position to centerline of the adjacent aircraft deicing position. The separation distance provides for two Vehicle Maneuvering Areas (VMA) of 12.5 feet each and a Vehicle Safety Zone (VSZ) of 10 feet.

The VSZ is for parked vehicles before and after deicing operations and is defined by red crosshatched pavement markings. The VSZ is where deicing trucks would typically stage while an aircraft taxis into and out of a position. Ten feet is the minimum allowable width per the AC. A width of 10 feet allows vehicles to be parked end-to-end (based on an 8.5-foot-wide vehicle), however, a 10-foot-wide VSZ does not allow added space for error under potentially dark and inclement weather conditions that are likely to be experienced at the deicing pads. Because of this, HNTB recommends 12.5-foot-wide VSZ widths to provide an additional margin of safety during deicing operations.

The width of an ADG III pad is 187 feet which allows for the 12.5-foot-wide VMA's and VSZ's. The width for the B757-200 aircraft specific pad is 207 feet.

4.11 Design Criteria – Length of Deicing Positions

The length of each position is based on the fuselage length of the most demanding aircraft expected to have regular operations at DSM plus the 12.5-foot-wide VMA’s which allow service vehicles to maneuver around the entire aircraft and stay within the pad limits.

Several ADG III lengths were reviewed to protect for the longest aircraft. It was determined that the MD 90-30 length of 153 feet is an appropriate length to use for the two standard ADG III positions. Adding the two 12.5-foot-wide VMA’s increases the total length of the ADG III pads to 178 feet. However, it is likely that the three pads will be collocated as is shown on the alternatives in Chapter 5. The B757-200 length is only slightly longer at 155 feet and therefore the total length of 180 feet with the added 12.5-foot-wide VMA’s was used for all three deicing pads.
Chapter 5: Concept Alternatives Analysis

- Introduction
- General Findings and Approach
- Option 1 (East) Concept
- Option 2 (East) Concept
- Option 3 (East) Concept
- Option 4 (South) Concept
- East: Creating a Zoned Campus
- East Overview
- East Phase 1 - Aircraft Requirements
- East Phase 2 - Aircraft Requirements
- East Option Ultimate Buildout
- Ground Transportation & Parking Breakout
- Relocated Buildings - East Concept (South Quadrant)
- South Overall Zoning - Option 1
- South Overall Zoning - Option 2
- South Overview
- South Phasing
- South Phase 1 - Aircraft Requirements
- South Phase 2 - Aircraft Requirements
- South Ultimate Buildout
- South Parking & Ground Transportation
- South Relocated Buildings
- Master Planning Comparison
- Project Cost Comparison
5.1. Introduction
This section of the addendum documents the analysis performed from early conceptual planning, through the shortlist process and with the final alternatives for both the south and east sites. These concepts were developed as an enhancement of the previous 2014 study, given the new constraints on the project sites. A major change to the site constraint is that the Iowa Air National Guard (IANG) is remaining in place. This means that the north quadrant is not available for relocation of the buildings from other parts of the airport.

5.2. General Findings and Approach
The approach to the revalidation process was to look at the airport campus as a whole. Given the new constraints and program requirements, a holistic look at all of the various components was reviewed. A zoned campus was created to allow for separation of public/passenger circulation from airport and airline operations. Creating this masterplan also ensures that a clear roadmap for future growth is identified, that is subdivided properly, and that the preferred terminal concept is respected beyond opening day of the terminal.

This analysis includes layout of the following general categories:
- Passenger Terminal
- Air Cargo
- Airline Maintenance
- GA / Corporate
- GA / T-Hangars
- Airport Support
- Iowa Air National Guard (IANG)

Figures 5.1 and 5.2 illustrate the zoning diagrams for the south and east quadrants.

Upon shortlist of a functional and efficient campus zoning diagram, conceptual studies for the siting of the terminal were produced. Within a charrette style worksession, the HNTB team generated site concept studies for both of the shortlisted quadrants (south and east) that include:
- Terminal
- Airside
  - Aircraft parking positions (contact and hardstand)
  - Deice pads
  - Storm water control building
  - Existing RIM (Runway incursion mitigation) issues

Multiple concept sketches were developed and three concepts for the east and one concept for the south were shortlisted for further refinement. Figures 5.3 through 5.6 illustrate these initial concept sketches.
KEY POINTS

The internal team has studied several options to determine the better uses of both sites.

1. East Quadrant (Options 1-3)
2. South Quadrant (Option 4)

Concepts include:
- Terminal Siting
- Roadways
- Airfield Constraints
- Future Considerations
- Initial Phasing/Construction
- Relocated Buildings
- Avoid the IANG Site

Options 1 and 4 were shortlisted for further study.
5.3. Option 1 (East) Concept (shortlisted)

Figures 5.7 and 5.8 represent the first option for a new terminal complex within the East Quadrant. The orientation, placement on the site, and curvilinear form of this design makes it one of the most flexible, cost efficient and sustainable options. This site was the option most similar to the previous “preferred east alternative” produced during the 2014 study.

This concept is different than the previous study site as it allows the existing terminal to remain operational during construction and the new terminal could be constructed in one phase which is critical to efficiency, operations and passenger level of service. Additionally, the placement of the building provides a visual connection to downtown Des Moines (north), which helps with wayfinding for passengers driving to the airport. The building form accommodates the fourteen aircraft required for Phase 1 (the last two aircraft gates will open after the existing Concourse C is demolished) and will extend to eighteen gates once Phase 2 is complete. The ultimate buildout will be constructed from the southeast end of the concourse utilizing the existing concourse area.

This option provides a direct, easy connection for passengers to and from the new and existing parking garages. The departing passengers will enter through a central location in the building and will have minimal walking distances to their gates. The new terminal roadway loop is also maximized for future parking potential.

This is a sustainable option because it attempts to reuse existing utilities, parking structures, apron and taxiways to the full potential.

This option was shortlisted because of its flexibility, cost efficiency, and ability to re-use existing facilities.

5.4. Option 2 (East) Concept

Option 2 for the east quadrant terminal design offers similar benefits to that of Option 1. Its site placement and orientation are advantageous for wayfinding, cost-savings, and operations. However, figures 5.9 and 5.10 display a more linear building form. Future phases will then bend the concourse to the south in the area of the existing concourses. One advantage to this diagram is the straight, intuitive path of travel from the parking garages to the landside terminal (direct path north to south). However, the entry point is no longer central to the overall form and walking distances to each of the gates vary. In addition, this form’s landside expansion capability is obstructed by the adjacent roadways and has slightly less landside parking capacity potential in the future.

This option can support fourteen aircraft for Phase 1 with two of the positions opening after the existing Concourse C is demolished. Four more aircraft will be added in Phase 2, totaling 18 gates for this terminal option. Ultimate buildout capabilities have not been studied for this option.

Like Option 1, this design will be able to reuse existing utilities, parking structures, apron and taxiways.

This concept was not shortlisted because it does not have the flexibility to expand its landside terminal and the ultimate concourse form was not as elegant and intuitive from a passenger circulation point of view.
Chapter 5  CONCEPTS - PROCESS

5.5. Option 3 (East) Concept

Figures 5.11 and 5.12 show the third concept for the East Quadrant. The main advantage of this design is that the existing terminal can remain fully operational during construction. In the first and second East Quadrant options, all of the east gates at the existing Concourse C would need to be closed when the phased apron work is completed, but remain operational during the majority of the overall construction period which was a large advantage to this scheme. This scheme also required the least amount of apron repaving, grading, and other civil work. From an interior planning perspective, the scheme allows for the largest central concession core with the closest walking distance to the gates. All gates would have great visibility to the central concession core which would maximize revenue generation for the airport.

However, there are several disadvantages to this design. Although the form can still accommodate the same amount of aircraft as the previous two options, the building would constrict the landside site considerably, disabling any expansion capabilities. The passenger pick-up and drop off curbs are also very limited in length.

Construction for Phase 2 cannot begin until the existing landside terminal is completely demolished. The building shape is inefficient for the site because the ultimate south expansion accommodates less potential contact gates. Additionally, there would be a considerable amount of unused apron space west of the new terminal. However, this design can accommodate for 14 RON positions, which is several more than both of the other east options.

This option was not shortlisted because of the constrictive nature of the building form.

5.6. Option 4 (South) Concept (shortlisted)

The fourth option provides a completely different design approach. Instead of re-using the existing campus, this concept places the new terminal in the south quadrant similar to the previously selected preferred alternative from 2014. The new site offers numerous advantages, including the most flexibility, most expansion capability, and no impacts to the existing passengers. The phasing for this option is far less complicated because construction can be completed without impacting the existing facility. The site itself is larger than the site in the east, so the new terminal could eventually hold 33 aircraft – 10 more than any of the options in the east. Wayfinding for passengers is simple and easy once on the campus, but the address is no longer on the main arterial street connecting to the downtown area.

The concept was developed in an attempt to minimize the additional landside infrastructure required in comparison to the previous preferred alternative. While this was accomplished, the scheme did not take into account the large “canyon” or steep topography as you develop directly north of Army Post Road. Other disadvantages of this option include the inability to re-use existing structures, utilities and apron space. Many of the existing airline operations and maintenance buildings in the south quadrant would need to be demolished and relocated. Because this site is south of the existing runway, a new taxiway would be needed to move planes safely and efficiently to the new terminal. Consequently, this option would be considerably more expensive than any of the east options.

This option was ultimately shortlisted in concept, however, it was reworked in further iterations to avoid the topography issues as currently shown.
The first step in developing the East concept was to look holistically at the entire airport campus. Segregating dis-similar functions helps to eliminate conflicts in circulation (airfield and vehicular). The creation of a “zoned” campus was developed with all quadrants. One of the main advantages of the East Option is that little modification is needed to re-zone the airport’s campus. The following represents a description of the overall campus diagram and is illustrated on Figure 5.15.

**West Quadrant** – The quadrant is topography challenged and was deemed inappropriate due to the amount of utility and infrastructure relocation required.

**North Quadrant** – This quadrant is ultimately constrained by residential neighborhoods to the north. The newest constraint on the planning study was the requirement to retain the existing Iowa Air National Guard Site. The existing Corporate/GA campus will also remain. The new concept does not anticipate any impact to the north quadrant area.

**East Quadrant** - All of the passenger terminal functions are collected within the East Quadrant, nested between Runways 5/23 and 13/31 and Fleur Drive. Keeping all of the passengers in the East Quadrant is an advantage for several reasons: it separates and organizes airport functions, minimizes walking or travelling distances for passengers, and retains the connection to downtown via Fleur Drive. The existing GA campus on the northern portion of the east quadrant would move to the south quadrant to allow for the entire quadrant to be used for passenger/terminal functions.

**South Quadrant** - The southern boundary for the airport is Highway 5 (Army Post Road), so there is a substantial amount of room within the South Quadrant for its facilities to expand. This option includes an area for a future GA/Corporate campus (indicated in green in Figure 5.15) to the east side of the South Quadrant. The relocation of the DSM Flying Services Hangar, Signature Maintenance Building, Signature Storage Hangar and Signature E Office/Hangar to the South Quadrant is shown located in the west green area. GA / T-Hangar expansion is indicated in blue, and its placement provides ample room for expansion to the southwest. The airline maintenance building will remain.
5.8. East Overview

Option 1 represents the shortlisted concept for the East quadrant. Option 1, as shown in Figures 5.16 and 5.17, has a curvilinear facade and utilizes existing East Quadrant site amenities.

**Terminal** - Refinements to this concept include the site orientation/rotation from the initial concept to be nearer to the existing terminal so that walking distances to and from the parking garages could be minimized. This slight rotation maximizes the landside area for future growth without intercepting any of the new roadways. It also places the southern end of the new concourse as close as possible to the existing concourses, while still maintaining proper construction clearances. This will assist with the phasing of the concept.

**Airside** - This design integrates 14 gate positions at the completion of Phase 1 and 10 Remain Over Night (RON) hardstands. It corrects the Airfield Runway Incursion Mitigation (RIM) problem while taking advantage of the added room for the three new deice pads and four RON positions on the east side of the site (see figure 5.16) while avoiding the containment site.

**Landside** - Phase 1 also includes the construction of a new parking garage adjacent to the existing garage, which will hold approximately 870 spaces for rental and short term parking. A new pedestrian bridge (shown in green) will safely connect passengers flowing to and from the new terminal, and a route (shown dashed in yellow) will be provided for passengers to get to the bus stop located on Fleur Drive. Additionally, Phase 1 incorporates a new entry from Fleur Drive, a new entry plaza to segregate parking, a new roadway loop and curb in front of the landside terminal, a new long term lot, short term hourly lot, an exit plaza and a new loading dock off of the NE Service Road.

**Phase 2** – Phase 2 expansion would be an extension of the uniform curve set in place by Phase 1. Phase 2 will include new concourse space, hold rooms, restrooms, concessions and apron space. Four more aircraft gates will be added with the new extension. A new parking lot south of the landside terminal can be utilized for employees or as a VIP lot before the ultimate buildout is completed. The ultimate buildout will accommodate 23 aircraft.
5.9. East Phase 1 - Aircraft Requirements

The construction phasing for this design option will affect the availability of certain gate positions. While the existing Concourse C is being demolished, only the first 9 positions shown in Figure 5.18 will be operational. A temporary conditioned walkway/bridge would connect the new concourse to the existing concourse to provide the required contact gates during Concourse C demolition/apron paving. Existing Concourse A would continue to be utilized but all passengers would still process from landside (ticketing, security checkpoint and baggage) within the new terminal. The existing terminal will be replaced with new apron pavement in phases, first in Phase 1B, allowing positions 10 – 12 to be opened and then in Phase 1C, gates 13 and 14 will expand the aircraft capacity to 14 positions. This first phase will host the larger Group IV planes (for example, B757-220s) at gate positions 8 and 9. This option has room for 10 RON hardstands and three deice pad positions.

5.10. East Phase 2 - Aircraft Requirements

Phase 2 requires 17 gate positions minimum, and the concept design provides 18. When the concourse is expanded to the south, positions 12 through 14 will rotate to align with the elongated curve of the building’s east façade. Four new gates (15 through 18) can be added as a part of the expansion. They will curve around the new terminal’s south end as shown in Figure 5.19. During this phase, the East Quadrant can still accommodate 10 RON hardstands as well as the 3 deice positions.
5.11. East Option Ultimate Build-out

While planning the East concept, it is important to include provisions for the ultimate buildout. Essentially, how many gates can fit on the site before a new terminal would need to be developed. The ultimate contact gate count for the East concept is 23 aircraft. It is anticipated that this will maintain proper level of service until approximately 2060. At that point the terminal would reach the end of its practical life cycle and a new site would need to developed either way.

The area in orange represents the new apron pavement required to meet pavement slope criteria. The new addition will take over the hardstand positions 8 and 9 shown in previous diagrams but one of those can be relocated to the north to retain nine RON hardstands. Further runway and taxiway improvements may be required at this time.

The final expansion will extend mainly from the south side of the terminal and will grow the number of hold rooms, concessions, restrooms, and airline operation spaces available to the airport. The sharp curve will provide ample space for larger Group IV and V aircraft at positions 15 and 16 and altogether, the south expansion will house five new gate positions indicated in red.

A small addition to the northern tip of the airside terminal can accommodate one additional Group II aircraft. The new apron space for the north expansion will also supply room for another RON hardstand. It should be noted that this will be costly apron work as the site has a significant slope change as it goes to the east towards Fleur Drive.

The curvilinear façade for this concept is advantageous for the expansion capabilities within the landside site. The roadways and curb fronts can be expanded southwest, so that room for the new parking garage indicated in dashed orange on the plan can be constructed. This new garage will sit directly west of the pedestrian bridge indicated in green, making wayfinding to the landside terminal simple and the connection for passengers safe.
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5.12. Ground Transportation & Parking Breakout

To accommodate all of the required parking in Phase 1 of the terminal development, new parking will be required within the terminal area. Figure 5.21 summarizes the parking provided in the east alternative. All economy lots will remain and a new four level parking structure will be constructed across the curbside from the terminal, accommodating 694 short-term parking spaces on levels 2 through 4 and 176 rental car ready-return spaces on level 1 (Figure 5.22). The structure will connect to the existing north and south garages, as shown on Figure 5.23, which provide 1,618 long-term parking spaces. A new short term surface parking lot (Figure 5.24) serving hourly, meet-and-greeter and walk-up parking would be located adjacent to the structure with easy access to the terminal. The existing surface lot behind the north garage will remain and be expanded as shown in Figure 5.25, with an additional surface lot provided to the west once the existing terminal and curbside are removed. The lower levels of both the existing north garage and the new garage will be dedicated to rental car parking, providing approximately 421 spaces. All parkers and rental car customers will enter through a single entry plaza located off the entry road prior to the terminal curbside. All public parkers will exit on the south side of the terminal complex through a realigned exit plaza and rental car customers will exit the first floor of the garage directly onto the outbound roadway immediately past the terminal curbside.

The east terminal is located over the current employee parking lot and a new remote lot will be required to accommodate the employee parking demand. These spaces could be accommodated in Economy 1 or 4 until public parking demand increases and those spaces are needed.

Figure 5.21

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</tbody>
</table>

Figure 5.22. New Short Term Parking Structure

Figure 5.23. Long Term Structured Parking

KEY POINTS

- Additional parking required for Phase 1
- All economy lots to remain
- New four level parking structure: 694 short term spaces; 176 rental car ready-return spaces
- Existing parking structures to remain; connects with new structure.
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Figure 5.24. New Short term (Hourly) Surface Parking

Figure 5.25. Long-Term Surface

Figure 5.26. Rental Car Ready-Return

KEY POINTS

- New short term (hourly) surface lot
- Existing east long term parking to remain. Partial reconfiguration required.
- New west long term lot: 279 spaces
- Lower levels of both existing north & new garage dedicated to rental car parking - approx. 421 spaces.
5.13. Relocated Buildings - East Concept (South Quadrant)

For the East concept to become reality, there are enabling projects or relocations that would be required. The existing GA/Corporate hangars are located in the northern portion of the east quadrant and will move to the south as shown on Figure 5.27. The three critical tenants/buildings that will be relocated include:

- DSM Flying Services Hangar (25,000 SF)
- Honda Jet Facility (25,000 SF)
- Signature Building which includes storage, maintenance and the Signature E Office/Hangar (40,000 SF)

See Figure 5.27 for their new locations. New vehicular parking lots would be included in this construction as well as a new entry road that would provide a more direct and intuitive access route from Army Post Road to the new facilities.

Existing buildings 33, 34 and 35 will be demolished. Buildings 33 and 34 will be replaced. The new concept plan has accounted for additional future facilities indicated in purple on the plan, including a new GA campus to the east as well as new T hangars to the west. These will be incorporated with demand.

New apron would be required in Phase I to accommodate the relocated GA/Corporate tenants and a new taxiway entry would be included to eliminate an existing Runway Mitigation Incursion (RIM) issue.

For the East concept to become reality, there are enabling projects or relocations that would be required. The existing GA/Corporate hangars are located in the northern portion of the east quadrant and will move to the south as shown on Figure 5.27. The three critical tenants/buildings that will be relocated include:

- DSM Flying Services Hangar (25,000 SF)
- Honda Jet Facility (25,000 SF)
- Signature Building which includes storage, maintenance and the Signature E Office/Hangar (40,000 SF)

See Figure 5.27 for their new locations. New vehicular parking lots would be included in this construction as well as a new entry road that would provide a more direct and intuitive access route from Army Post Road to the new facilities.

Existing buildings 33, 34 and 35 will be demolished. Buildings 33 and 34 will be replaced. The new concept plan has accounted for additional future facilities indicated in purple on the plan, including a new GA campus to the east as well as new T hangars to the west. These will be incorporated with demand.

New apron would be required in Phase I to accommodate the relocated GA/Corporate tenants and a new taxiway entry would be included to eliminate an existing Runway Mitigation Incursion (RIM) issue.
Figure 5.28. East Overall Project Phasing
South Concept  5.14 - 5.22
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**Figure 5.29. South Overall Zoning - Option 1**

Similar to the East Concept, an overall zoning study was performed to investigate the most efficient use of the overall campus in order to provide a new terminal in the south quadrant that eliminates congestion for both vehicular and aircraft movement. Figure 5.29 depicts the first overall zoning option for the south concept. Option 1 and 2 both represent viable strategies for creating a new passenger terminal site in the South Quadrant, however, co-mingle with other airport uses more than the East Concept. Both south options require a new parallel taxiway to Runway 13/31 to safely move aircraft to and from the new south passenger terminal site. Additionally, these options avoid the Iowa Air National Guard Site in the North Quadrant.

In the first option, the passenger terminal is located in the South Quadrant, in a similar location to the previous preferred alternative in 2012. The existing parking structures in the East Quadrant would continue to be maintained but a shuttle route will be provided between the two quadrants. In Phase 1 and 2 of the new design, the existing GA/T-Hangars and Air Support facilities can remain in place, without a need for immediate expansion. The Airline Maintenance building that was previously located within the new passenger terminal site will need to be relocated to its position highlighted in orange. Additionally, the South Quadrant site will accommodate a new GA/Corporate campus near the southwest end of Runway 5/23 that has access to the Army Post Road. In Option 1, the Air Cargo campus will be relocated to the existing terminal site in the East Quadrant, indicated in pink in Figure 5.29.

**Figure 5.30. South Overall Zoning - Option 2**

5.14. South Overall Zoning - Option 1

5.15. South Overall Zoning - Option 2

**KEY POINTS**

**South Zoned Campus**
- Requires new parallel taxiway
- Terminal is not in a separate zone
- Avoids the IANG Site
- Options to move either cargo or Corporate GA to existing terminal site in east quadrant

**Option 1**
- Cargo relocated to East Quadrant
- Signature/DSMFS/Hondajet stay in East
- Corporate/GA in 3 quadrants

**Option 2**
- Cargo in South Quadrant
- Signature/DSMFS/Hondajet stay in East + future Corporate/GA at existing terminal site
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Figure 5.31. South Overall - Phase 1 Complete

5.16. South Overview

The south quadrant option is located directly to the southeast of the previous 2012 preferred alternative site. Primary factors for this adjustment were to lower costs by reducing the amount of landside infrastructure and existing tenant/building relocation.

Terminal – The terminal diagram would be primarily a single loaded concourse except at the ends of the concourse. A linear terminal diagram could be utilized and easy for passenger wayfinding and airline/airport operations. All required contact gates are included.

Landside - This new concept is located as close to the Army Post Road as possible, which will help to minimize infrastructure costs and shorten the overall drive to the terminal. A new intersection would be required at Army Post Road with a new entry road to the terminal site. Existing parking facilities in the east quadrant can still be maintained in this concept, but this will require a shuttle (as indicated in Figure 5.31) to the new terminal. Additional parking (structured and surface) would also be required directly at the new terminal site in the south as well. A tunnel would connect the new terminal to the new parking structure.

Airside – The FAA would require a new parallel taxiway along the NW/SE runway for safety purposes to eliminate aircraft taxi across the active runway. A new deice pad accommodating 3 aircraft is included on the southern quadrant. The previous preferred alternative assumed reuse of the majority of the existing cargo apron currently located at the site. In order to maintain proper slope away from the new terminal building, much of the apron from the new terminal out to the Ground Service Vehicle road would need to be replaced, thus, not saving as much of the existing pavement as once determined.

The southern site has significant grade changes, which poses additional constraints to the overall site and ultimately will increase the cost of the project.

The South Option’s new terminal is offset from Fleur Drive, one of the main arterial streets from downtown. This may benefit the traffic flow on Fleur, but the new site becomes disconnected from the community with its new address on Army Post Road. Views to downtown and the approach to the airport are obstructed by the other necessary facilities that will be relocated to the East Quadrant. This greatly contrasts the direct visual connection of the airside terminal in the East Option to Fleur Drive and downtown Des Moines potentially reducing the connection to the community that the currently site possesses.

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5.17. South Phasing

Phasing for the south concept is relatively simple because the existing east terminal can remain fully operational during construction. The project can also be built in one phase which may help to expedite the overall duration of construction. Additionally, passengers will not be impacted by construction of the new development.

Before construction begins, a few of the roads and structures in the south quadrant will need to be demolished and relocated. (These are indicated in dashed red in Figure 5.32.) The area represented in green can be maintained, however, the existing airline maintenance building would be relocated to the west of the T-Hangar site. Since SW 28 Street will be demolished to make way for the new roadway loop, a new road to those facilities will need to be provided (dashed orange) to segregate passenger vehicular circulation from GA and other tenant use. The south quadrant already has a large amount of apron space in the northern corner of the site, but a substantial amount of new apron is necessary further east, where the new terminal is sited and to the west, for new RON hardstand positions. New entries to the taxeways are necessary to correct RIM issues.

The South Option can re-use some of the existing parking garages in the east quadrant, but most of the terminal components will be brand-new. The airside and landside terminals will align with Runway 31, and a four level parking structure providing 2,736 spaces will reside behind it. Ultimately, more parking is required in this scheme, because the same number of parking stalls needs to be allocated directly at the new terminal (as in the east concept) to provide proper level of service to passengers. It is not acceptable to rely on the existing parking structure in the east quadrant as it creates longer wait times from car to gate and is a lower level of service. The airport would also need to operate the shuttle between the quadrants adding to O&M cost yearly. New surface parking will sit directly southeast, providing optional expansion capabilities for the new garage. A new roadway loop with pick-up, drop-off and bypass lanes will run between the parking garage and the terminal, connecting with entry and exit plazas to access parking. A new loading and trash dock will tuck behind the north end of the landside terminal, easily connecting to the existing facilities to the west and away from view from the public.

In the second phase, as shown in Figure 5.33, the concourse expands northwest along its same axis. The Phase 2 parking structure with 1,123 new spaces will attach to the rear of the garage constructed in the first phase. New T-Hangars and other GA facilities will be incorporated with demand and spread to the west.
5.18. South Phase 1 - Aircraft Requirements
Phase One requires a new facility with 13 gates and 7 RON hardstands. This scheme allots for 14 positions that start at the southeast end of the airside terminal and run northwest, parallel to the terminal’s façade and Runway 31. Since position 12 wraps around the northwest corner, a larger Group IV aircraft will fit at that gate. Positions 13 and 14 continue to wrap around the corner but will be rotated back in alignment with the terminal façade when Phase 2 is completed. This scheme also meets the required number of RON hardstands. They are located in the new apron space northwest of the terminal and partially on the existing cargo ramp. This phase also incorporates space for three deice pads, placed in the far north corner of the site. They can be easily accessed from the new taxiway parallel to Runway 31 and from the existing Taxiway P.

5.19. South Phase 2 - Aircraft Requirements
The aircraft needed will increase from thirteen in Phase 1 to seventeen in Phase 2. When the airside terminal is expanded northwest, it will be able to accommodate at least eighteen gates. Positions 1 through 15 will park perpendicular to the terminal’s northeast façade, while positions 16 through 18 wrap around the far northwest end. Position 16 will be the designated gate for the larger Group IV aircraft. The airside terminal expansion leaves room on the backside for three RON hardstands in addition to the seven in place from Phase 1. Figure 5.35 illustrates the site plan after Phase 2 completion.
5.20. South Ultimate Build-out

When required by demand, the south concept can be expanded to the northwest providing an ultimate buildout of 33 contact gates. The new expansion could include a new concession core as it turns to the west. Due to the potential walking distance to/from baggage and ticketing, we do not recommend concourse expansion beyond what is shown on Figure 5.36. The GA facilities that had been maintained in the first two phases will need to be demolished and relocated to a different site. The new expansion will extend as far northwest as possible, allowing room for a taxilane beyond the new northwest façade that parallels Runway 5. The taxilane will provide access to the new gate positions, the deice pad and RON positions 7 and 8. In addition, we expect that multiple improvements to the runways and taxiways will be necessary. Similar to the East concept we expect that this concept can be maintained through at least the 2060 year timeframe.

The new expansion will be able to accommodate as many as thirty-three aircraft, adding fifteen new positions from Phase 2. The larger Group IV aircraft will be located at the northwest and west convex corners of the building because of the additional length and wingspan space available. The RON hardstands will be relocated to face the T-Hangars on the west side of the site. There are no projected RON or parking requirements for the ultimate buildout. The future garage expansion has been highlighted in brown in Figure 5.36. This garage could project further southeast if needed.
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5.21. South Parking & Ground Transportation

As summarized on Figure 5.37, the parking provided within the terminal area in the South Alternative matches that provided in the East Alternative. A total of 3,346 parking and rental car spaces are provided in a new 2,733 space parking structure located in front of the terminal and a 613 space surface lot adjacent to the structure. Level two of the structure would accommodate 694 short-term parking spaces while 120 surface spaces serving hourly, meet-greeter and well-wisher, parkers are located at the front portion of the surface lot closest to the terminal (shown on Figure 5.38). An additional 1,618 long-term public parking spaces are provided in the parking structure with 493 spaces located in the surface lot behind hourly parking (shown on Figure 5.39). As shown in Figure 5.40, 421 rental car ready-return spaces are located on the first level of the parking structure. The total of new and existing exceeds that provided in the East Option, due to the need to provide sufficient new parking immediately adjacent to the new Terminal. All parkers will enter through a single entry plaza located off the inbound roadway and exit through a single exit plaza on the backside of the garage that connects to the outbound roadway. The rental car customers would have a separate entrance into the lower level of the garage from the outer curb and would exit onto the outbound roadway prior to the public parking exit plaza.

All parking within the existing terminal area, along with existing economy parking lots, would remain and serve as remote economy parking for the south terminal. Shuttles would be required to move passengers between the lots and the new south terminal. Employee parking would also be provided within these remote parking lots.

Expanded curbsides will be provided at the new terminal accommodating requirements for private vehicles along an inner curb adjacent to the terminal and commercial vehicle island curbside. A pullout for taxi staging near the curb is provided on the right side of the entry roadway, away from parking entrances, but would necessitate taxis pick-up to be located on the inner curbside.

Figure 5.37

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<th>Total Existing and New</th>
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KEY POINTS

- New parking structure - 2,733 spaces
- New short term hourly surface lot - 120 spaces
- New long term surface lot: 493 spaces
- All parking within East Quadrant to remain; shuttles required.
5.22. South Relocated Buildings

With the new terminal placement in the south quadrant, there are several buildings that must be relocated prior to the beginning of new terminal construction. The current air cargo and maintenance facilities are located on this site, so they must be moved to an efficient location elsewhere. In Figure 5.41, the new airline maintenance building location is highlighted in blue. The air cargo campus will be relocated to the east quadrant (dashed in orange) and must avoid the existing parking garage site. As shown in Figure 5.41, there are two options for the relocation of the Signature, DSM Flying Services, HondaJet and future services buildings: the first is in the east quadrant, alongside the cargo campus. The second option is at the southwest end of Runway 5/23.

Figure 5.42 shows an enlarged plan of option 2A (the Corporate/GA Campus with Signature, DSMFS & HondaJet.) It includes a new 40,000 SF signature building with the potential to expand another 30,000 SF; a new 25,000 SF HondaJet facility; a new 25,000 SF DSM Flying Services building; and four new 25,000 SF future corporate / GA facilities. Because of its location, this new campus has a direct connection to Taxiway P as well as the Army Post Road. There is also opportunity for future GA/Corporate growth based upon demand adjacent to this site. This would create a campus that could consolidate all GA/Corporate tenants into one site location.

**KEY POINTS**

- Rental Car Ready return located on Level 1 of new garage - 421 spaces
- South Relocated Buildings:
  - Airline maintenance building (#29) is demolished and relocated
  - New GA/Corporate campus:
    - Signature (40,000 SF)
    - DSM Flying Services (25,000 SF)
    - HondaJet (25,000 SF)
  - Future buildings (25,000 SF ea)
- Relocate Cargo
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Figure 5.43. Relocated Buildings - South Quadrant

As previously noted, the south option requires that several of the buildings be demolished before construction of the new terminal can begin. Building 29 (Figure 5.43), the 79,250 SF Aircraft Maintenance facility, will be relocated to the west side of the site (see the rectangular building indicated in blue.) Building 31 is the 12,300 SF South Cargo building. It will be relocated to the west side of the site adjacent to the new Building 29. Buildings 33 and 34 can remain with their adjacent parking lots, but building 35, the Cargo Air Sort & Office Building (UPS) will need to be relocated to the East Quadrant. Several of the roads leading to each of these facilities (highlighted in dashed red) will need to be removed. A new roadway, indicated in orange, will connect these buildings to the Army Post Road. The existing apron pavement to remain has been highlighted in dashed green, but the dark gray areas represent new pavement. The new entry to the taxiway has been pushed west, in alignment with the new T-Hangars and to eliminate existing RIM issues.

KEY POINTS

Demolish & relocate existing:
29. Aircraft Maintenance
31. South Cargo Building

Demolish:
35. UPS Cargo & Office

South Quadrant Site Improvements
- New Apron required in front of new building 29 & 31 locations
- Build new roadway from Army Post Road to segregate traffic from passengers
- Expand T-Hangars
- New Taxiway Entry
Figure 5.44. Overall Project Phasing

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KEY POINTS

Addendum to Terminal Area Concept Plan Technical Report

Chapter 5

Road map for all the projects and the potential sequence for construction.
Includes:

- Enabling projects (blue)
- Phase 1 (red)
- Phase 2 (green)
- Future (per demand)

ENABLING PROJECTS
- Demolition Buildings 307/308
- New South Parking Garage - Terrace Entry
- Rebuild Airline Maintenance
- New South Roadways
- Demolish Building D1
- Rebuild Demolition to new site
- Rebuild CBD Flying Services - Headset to new site

PASSenger activity levels (PAL): 1.5
- New 4000 sqft terminal
- New 12,000 sqft + renovated Bldg Central Building
- New embark area for 94 toilets
- New roadways + corridors
- New parking structure + level with rental car ready/return on first level
- New roadways inside/outside
- New surface lift
- New entry/exit
- New cell plaza
- Lot #1 - public parking to remain
- Lot #2 - public parking to remain
- Conv Lot #2 to employee parking
- Lot #4 - public parking to remain
- Existing parking + adjacent surface lots to remain
- Taxi road realignment
- Demolish existing terminal + concrete
- Rebuild Canopy to East quadrant

PASSenger activity levels (PAL): 2.0
- New concourse expansion to east/west for 4 additional gates
- Parking/Garage expansion
- New GAC Corporate Canopy (per demand)
- GAT Transfer expansion (per demand)
Concept Comparison 5.23 - 5.24
5.23. Master Planning Comparison

Projections for the Des Moines International Airport will require some alteration of the existing master plan indicated in Figure 5.45. The new passenger terminal must be designed for a minimum of thirteen contact gates in Phase 1 and have the capacity to expand to a minimum of seventeen gates for Phase 2. This requires a more efficient use of the existing site (East Option) or an entirely new location which will not constrain the terminal’s expansion (South Option.) The main goals for the master plan zoning are to avoid the Iowa Air National Guard site, segregate terminal traffic from other tenants, and provide future expansion capabilities. Both East and South Concepts shown in Figures 5.46 and 5.47 respectively meet those requirements.

The East Option requires the least amount of changes to the overall zoning plan. The new terminal will utilize the existing terminal campus, therefore, many of the current utilities can remain in place. The new zoning plan will primarily enlarge certain tenant sites, including the GA / T-Hangars, the GA / Corporate and the Airline Maintenance Spaces in the South Quadrant. The GA / T-Hangar and GA / Corporate sites are placed so that they can expand as needed in the future. Specific advantages to the east site include:

- Ability to keep the passenger terminal in a completely separate quadrant
- Less relocation of the current tenants
- Maintains the connection to downtown by keeping the Fleur Drive address.

The South Option, which was the previously selected preferred location, provides more flexibility for future expansion and ultimately can accommodate at least ten more aircraft than the East Option. However, the additional 10 contact gates would not be needed within the life cycle of the terminal building and therefore makes both sites similar for ultimate buildout potential.

The new south site will require many of the current tenants to be relocated, generating a much higher project cost than the East Option. The South Option will also require a new taxiway, which adds significantly to the project cost. Other disadvantages include:

- Disconnection of the terminal site from Fleur Drive
- Separation of the terminal site from the existing passenger garages in the East Quadrant
- Proximity of the passenger terminal to airline maintenance, GA/T-Hangars and air support sites creates un-needed congestion for vehicular and aircraft movement.
5.24. Project Cost Comparison

Projected Phase 1 costs for the East and West Options are shown in Figure 5.48. In addition to the projected construction costs, contingencies of 20% are included due to the conceptual level of the planning for these two options, along with allowances for project soft costs, to provide anticipated Total Program Costs. The Total Program Costs are approximately $491 million for the east Option, and $618 million for the South Option. Costs for the South Option are higher due to the significantly larger scope for the new parking structures and other site facilities. All of the costs shown are in 2016 dollars.

### Figure 5.48 Total Project Cost Comparison

<table>
<thead>
<tr>
<th>Project Category</th>
<th>East Option</th>
<th>South Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling Projects</td>
<td>$44,500,000</td>
<td>$67,500,000</td>
</tr>
<tr>
<td>Demolition</td>
<td>$32,250,000</td>
<td>$16,750,000</td>
</tr>
<tr>
<td>Terminal Building &amp; PBB’s</td>
<td>$132,500,000</td>
<td>$132,250,000</td>
</tr>
<tr>
<td>Airside Pavements etc.</td>
<td>$26,000,000</td>
<td>$49,500,000</td>
</tr>
<tr>
<td>Landside Structures and Paving</td>
<td>$39,000,000</td>
<td>$82,000,000</td>
</tr>
<tr>
<td>Utilities</td>
<td>$44,750,000</td>
<td>$53,250,000</td>
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<tr>
<td>Total Construction Costs</td>
<td>$318,500,000</td>
<td>$401,000,000</td>
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<tr>
<td>Contingency 20%</td>
<td>$63,750,000</td>
<td>$80,250,000</td>
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<tr>
<td>Total</td>
<td>$382,275,000</td>
<td>$481,250,000</td>
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<tr>
<td>Soft Costs 28.5%</td>
<td>$109,000,000</td>
<td>$137,000,000</td>
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<tr>
<td>Total Program Cost</td>
<td>$491,250,000</td>
<td>$618,250,000</td>
</tr>
</tbody>
</table>

East Concept vs. South Concept Costs:
- East saves a significant amount of money by utilizing existing apron, landside structures & utilities
- South Concept can be constructed in one phase, reducing the cost of complicated phasing and demolition work.
### GOALS

<table>
<thead>
<tr>
<th></th>
<th>EAST</th>
<th>SOUTH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional / Efficient</strong></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Pride / Community</strong> (Connection to Fleur + Downtown)</td>
<td>✔</td>
<td>—</td>
</tr>
<tr>
<td><strong>Future Expansion Capability</strong> (Ultimate Buildout)</td>
<td>—</td>
<td>(23 Gates) (33 Gates) ✔</td>
</tr>
<tr>
<td><strong>Zoning</strong> (Connection to Fleur + Downtown)</td>
<td>✔</td>
<td>—</td>
</tr>
<tr>
<td><strong>NEW Parking Required</strong> (3,346 total req’d - Phase 1)</td>
<td>✔</td>
<td>(399 Surface) (870 Garage)</td>
</tr>
<tr>
<td><strong>NEW Taxiway Required</strong></td>
<td>✔</td>
<td>(NO)  (YES) —</td>
</tr>
<tr>
<td><strong>Avoids IANG site</strong></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>✔</td>
<td>—</td>
</tr>
</tbody>
</table>

Figure 5.51. Comparison Matrix Chart

- Overall, the East Concept is the most advantageous for the new developments.
- The South Concept is able to accommodate more gates, but that growth to even 23 gates is not projected to occur until after 2060.
Chapter 6 Preferred Alternatives Refinements

• Campus Zoning
• Concept Overview
• Connection to Downtown
• Walking Distance Comparison
• Existing vs. New Terminal Comparison
• Phase I Aircraft
• Landside Zoning
• Parking Breakout
• Curbs
• Proposed Grading Plan
• Enabling Projects
• Phase 0 - Aircraft Requirements
• Phase 1 - Landside
• Phase 2 - Landside
• Phase 3 - Landside
• Phase 4 - Landside
• Phase 5 - Lanside
• Phase 5A - Airside Operations (Opening Day)
• Phase 6 - Landside (Full Airside Operation)
• Phase 7 - Airside (Full Airside Operation)
• Project Cost Analysis
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Chapter 6 | PREFERRED ALTERNATIVES REFINEMENTS - EAST CONCEPT

6.1. Campus Zoning

The Des Moines Airport and the HNTB Team presented both the South and East Options via a public forum on September 13 at the downtown Des Moines Library. The Des Moines Airport Board then approved the East quadrant as the new selected alternative moving forward at their October 11, 2016 board meeting. This chapter further details the final approved alternative.

As discussed in Chapter 5, one of the main advantages of the East Option is that little modification is needed to re-zone the airport’s campus. The following describes the entire airport campus by quadrant as shown on Figure 6.1.

West Quadrant – The quadrant is topography challenged and was deemed inappropriate due to the amount of utility and infrastructure relocation required.

North Quadrant – This quadrant is ultimately constrained by residential neighborhoods to the north. The newest constraint on the planning study was the requirement to retain the existing Iowa Air National Guard Site. The existing Corporate/GA campus will also remain. The new concept does not anticipate any impact to the north quadrant area.

East Quadrant – All of the passenger terminal functions are collected within the East Quadrant, nested between Runways 5/23 and 13/31 and Fleur Drive. Keeping all of the passengers in the East Quadrant is an advantage for several reasons: it separates and organizes airport functions, minimizes walking or travelling distances for passengers, and retains the connection to downtown via Fleur Drive. The existing GA campus on the northern portion of the east quadrant would move to the south quadrant to allow for the entire quadrant to be used for passenger/terminal functions.

South Quadrant – The southern boundary for the airport is Highway 5 (Army Post Road), so there is a substantial amount of room within the South Quadrant for its facilities to expand. This option includes an area for a future GA/Corporate campus (indicated in green in Figure 6.1) to the east side of the South Quadrant. The relocation of the DSM Flying Services Hangar, Signature Maintenance Building, Signature Storage Hangar and Signature E Office/Hangar to the South Quadrant is shown located within the west green area. GA / T-Hangar expansion is indicated in blue, and its placement provides ample room for expansion to the southwest. The airline maintenance building will remain.

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Figure 6.1. East Overall Zoning

KEY POINTS

EAST:
- Terminal Functions Only

SOUTH:
- Relocated Signature, DSMFS & HondaJet with other GA/Corporate future facilities
- Cargo maintained
- Airline Maintenance
- GA/ T-Hangars can expand

OVERALL ADVANTAGES:
- Avoid the IANG Site
- Separate terminal functions
6.2 Concept Overview

Terminal - Refinements to this concept include the site orientation/rotation from the initial concept to be nearer to the existing terminal so that walking distances to and from the parking garages could be minimized. This slight rotation maximizes the landside area for future growth without intercepting any of the new roadways. It also places the southern end of the new concourse as close as possible to the existing concourses, while still maintaining proper construction clearances. This will assist with the phasing of the concept.

Airside - This design integrates 14 gate positions at the completion of Phase 1 and 10 Remain Over Night (RON) hardstands. It corrects the Airfield Runway Incursion Mitigation (RIM) problem while taking advantage of the added room for the three new deice pads and four RON positions on the east side of the site (see Figure 6.2) while avoiding the containment site.

Landside - Phase 1 also includes the construction of a new parking garage adjacent to the existing garage, which will hold approximately 870 spaces for rental and short term parking. A new pedestrian bridge (shown in green) will safely connect passengers flowing to and from the new terminal, and a route (shown dashed in yellow) will be provided for passengers to get to the bus stop located on Fleur Drive. Additionally, Phase 1 incorporates a new entry from Fleur Drive, a new entry plaza to segregate parking, a new roadway loop and curb in front of the landside terminal, a new long term lot, short term hourly lot, an exit plaza and a new loading dock off of the NE Service Road.

Phase 2 – Phase 2 expansion would be an extension of the uniform curve set in place by Phase 1. Phase 2 will include new concourse space, hold rooms, restrooms, concessions and apron space. Four more aircraft gates will be added with the new extension. A new parking lot south of the landside terminal can be utilized for employees or as a VIP lot before the ultimate buildout is completed. The ultimate buildout will accommodate 23 aircraft.
6.3. Connection to Downtown

One of the major advantages to the East quadrant site is its ability to retain its address on Fleur Drive. As one of the main arterial streets coming from downtown, it provides a direct and quick 10 minute drive connection from downtown to the airport. This connection is meaningful because it provides an iconic, grandiose approach to the airport complex as you drive to the south, and could afford views from the new concourse to the downtown skyline and a semblance of familiarity for the residents of Des Moines. This connection provides a great “sense of place” for the new terminal and its patrons.

The new entry plaza off of Fleur Drive and roadway loop approaching the terminal will help with intuitive wayfinding for passengers because they can see their destination clearly while driving. Currently, the terminal is completely obstructed from view as you turn off of Fleur Drive and enter the campus along Cowles Drive. This approach creates a more impactful vehicular entry to the airport and helps to avoid confusion and uncertainty of where the terminal is located, which ultimately is also a safer airport campus.
6.4. Walking Distance Comparison

In order to effectively re-use the existing parking facilities on site, the new terminal was placed in its location to generate the shortest walking distances possible. The lineal footage from the furthest parking space in the existing garage to the entry of the landside terminal is roughly 1,110 LF. To help illustrate this distance, we compared the distance to a widely known building in the Des Moines area, the Jordan Creek Town Center. Figure 6.4 illustrates a simplified Jordan Creek Town Center plan overlaid on the East site to display the walking distance from two of the mall’s main tenants, Younkers to Dillards, which is roughly 1,085 LF. This comparison illustrates the longest walk passengers can expect given the current plan.

Figure 6.4. Comparison to Jordan Creek Town Center
6.5 Existing vs. New Terminal Comparison

While the requirements for the new terminal area (SF) are less than the existing terminal, the new terminal will allow for a more efficient use of less space while still allowing for future demand. The existing terminal and its additions were built during a different time that was not as reliant on technology. The airlines have greatly modified their operations and while the existing terminal has been well maintained to extend its useful life, current and future changes will continue to make it more difficult to operate in the existing building.

Airline Industry is changing:
- Larger aircraft
- Less 50 seat regional aircraft
- Larger regional (70 seat+) aircraft
- Recent entrants with larger aircraft (737) (Southwest, Allegiant)

Existing building constraints:
- Similar overall SF to proposed new terminal, but in the wrong places
- Concourses undersized to meet higher volume of people (hold rooms, concessions, restrooms)
- Security checkpoint width issues
- Ticketing and Baggage constraints

Figure 6.5 Terminal Comparison

| Existing Facility: | 272,900 SF |
| Required for Phase I: | 236,000 SF |
| Required for Phase II: | 315,500 SF |

| NEW TERMINAL: |
| Shortest gate: 465 LF |
| Farthest gate: 1,000 LF |
| Contact gates |

| EXISTING TERMINAL: |
| Shortest gate: 880 LF |
| Farthest gate: 1,200 LF |

- Inefficient layout
- Insufficient spaces
  - Holdrooms
  - Security Checkpoint
- Concessions
6.6. Phase 1 Aircraft

The preferred alternative (Figure 6.6) provides a flexible airside that contains the required 14 gates in Phase I. All contact gates can accommodate Group III (737-900 / A321) aircraft with two contact positions capable of larger Group IV aircraft. In addition, 10 RON aircraft can be accommodated (9 at Group III and 1 at Group II). One caveat, is that RON position 7 can only be used during non-deice conditions.

A new deice pad will be constructed at the west portion of the quadrant. The new pad can accommodate 3 aircraft positions. Two positions are sized for Group III with the third capable of handling a Group IV aircraft.

The underground storm/deice storage tank can be maintained with no change, however, the above ground Storm Water Control building must be moved slightly to the west to accommodate proper clearances for the new taxilane. The existing building is one-story and an approximately 15'x15' structure.

The existing northeast entry to Taxiway P will be slightly modified for proper access into the new terminal area. In addition, another entrypoint to Taxiway P will be demolished and rebuilt slightly farther to the northeast. This addresses two issues:

- Allows for the necessary area for the 3 deice pads to the southwest.
- Correct an existing Runway Mitigation Incursion (RIM) issue that will need to be addressed according to FAA.

Most of the southern portion of the quadrant can remain without change. Minor re-striping will be required from the terminal area to Taxiway D and near the new RON positions (8-9).
Chapter 6 | PREFERRED ALTERNATIVES REFINEMENTS - EAST CONCEPT

6.7. Landside Zoning

The landside for the preferred alternative (as shown on Figure 6.7) includes modifications to many elements on the property with the intent to provide easier, safer and more intuitive vehicular circulation.

Fleur Drive & Airport Entry/Exit - The existing airport entry intersection from Fleur Drive to Cowles Drive will be eliminated and all vehicles will go through one entarypoint located further to the south near the existing airport exit. Further coordination with City of Des Moines traffic engineering department will occur, but an additional lane will be required along Fleur for traffic to safely maneuver to an “off-lane” before making a gentle curve onto airport property just south of the existing detention pond. This new roadway will be one-way as it meets up with Duck Pond Road to the east of the existing parking garage complex. The northbound traffic from Fleur Drive to the airport will be at a new intersection near the existing exit intersection and will gently merge into the southbound traffic as it approaches Duck Pond Road. The existing exit to Fleur Drive will remain but with potential enlargement. This will be clarified during the next programming task in coordination with the City of Des Moines engineering department.

Roadway Loop - The roadway loop will provide the necessary driving distances for safe deceleration and decision-making for exit into the parking entry plaza or for separation of departure and arrival curbs. The backside of the roadway loop (post-terminal) will be maximized by moving to the west of the existing roadways when the existing terminal is demolished. One important factor to the new roadway system is that there are no intersections or 90 degree turns which make it more efficient for circulation flow but also for safety purposes.

Entry Plaza - The new terminal roadway loop was designed to maximize the potential parking capacity within the loop to ensure parking for future demand. A new entry plaza is planned with 5 entry lanes. All public parking and rental car returns will enter through this plaza with separate lanes per use. The existing entry plaza will be demolished in its entirety.

Surface Parking - A new short term (hourly) parking lot will be included just north of the new entry plaza and can accommodate 120 parking spaces. The existing long term lot (behind the existing garages) will be slightly modified to accommodate the new entry plaza. The layout will be modified so that the entire lot will include 214 parking stalls. Additionally, once the existing terminal is demolished, an additional 279 parking stalls can be developed.

Structured Parking – The existing parking structures will remain in their entirety and will become a mix of public long term structured spaces and rental car spaces. A 4 story parking structure will be built directly in front of the new terminal and connected via a conditioned over-the-road pedestrian bridge. The 870 parking stall garage will accommodate rental car (ready-return) spaces on level 1 and short term parking on levels 2-4. A vehicular ramp will be included on the northeast side of the garage to circulate through the levels and will be directly tied into the existing garage on each level.

A consolidated rental car lobby is envisioned on the north face of the new parking structure. It will be the hub for all parking patrons (long and short term) to access the terminal via the over-the-road pedestrian bridge on level 2. All rental car counters will be located on level 1 of the lobby with easy access to the rental cars in the garage. No rental car counters or offices will be within the terminal building.

An additional conditioned pedestrian walkway is included along the west side of the existing garage that will connect the rental car lobby to the existing vertical circulation core (near the existing terminal to garage bridge). This walkway will also provide a connection to the new west surface parking lot.

Figure 6.7. East Overall Zoning
8.8. Parking Breakout

To accommodate all of the required parking in Phase 1 of the terminal development new parking will be required within the terminal area. Figure 6.8 summarizes the parking provided in the east alternative. All economy lots will remain and a new four level parking structure, across the curbside from the terminal, accommodating 694 short-term parking spaces on levels 2 through 4 and 176 rental car ready-return spaces on level 1 (Figure 6.9). The structure will connect to the existing north and south garages, as shown on Figure 6.7, which provide 1,618 long-term parking spaces. A new short term surface parking lot serving hourly, meeter-greeter and well-wisher, parkers would be located adjacent to the structure with easy access to the terminal. The existing surface lot behind the north garage will remain and be expanded with an additional surface lot provided to the west once the existing terminal and curbside are removed. The lower levels of both the existing north garage and the new garage will be dedicated to rental car parking, providing approximately 421 spaces. All parkers and rental car customers will enter through a single entry plaza located off the entry road prior to the terminal curbside. All public parkers will exit on the south side of the terminal complex through a realigned exit plaza and rental car customers will exit the first floor of the garage directly onto the outbound roadway immediately past the terminal curbside.

The east terminal is located over the current employee parking lot and a new remote lot will be required to accommodate the employee parking demand. These spaces could be accommodated in Economy 1 or 4 until public parking demand increases and those spaces are required to meet public demand.
6.9. Curbs

Expanded curbsides (Figure 6.10 and 6.11) will be provided at the new terminal accommodating requirements for private vehicles on an inner curbside adjacent to the terminal through Phase 2 and commercial vehicles on an island curbside through Phase 1. A pullout for taxi staging near the curb is provided on the left side of the entry roadway allowing taxis to remain on the outer curb and not cross the inbound roadway in front of the terminal opposed to how they operate today.

### Table: East Curb Lengths

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<thead>
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<th>Type</th>
<th>Required</th>
<th>Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Supply</td>
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<tr>
<td>Inner Curb</td>
<td>545 ft</td>
<td>550 feet</td>
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<tr>
<td>Requirement existing dwell times</td>
<td>550 feet</td>
<td>675 feet</td>
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<td>Requirement 3 min dwell times</td>
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<td>400 feet</td>
</tr>
<tr>
<td>Outer Curb</td>
<td>571 feet</td>
<td>610 feet</td>
</tr>
</tbody>
</table>
6.10. Proposed Grading Plan

The topography of the entire airport campus is quite diverse with fairly steep elevation changes. This will be a major component of the development of the terminal building site and how the new apron ties into the existing taxiway system. Figure 6.12 to the right illustrates an initial concept study of how to connect the new apron with the existing pavement and helped to determine the limits of new pavement for this concept (and ultimately the cost required). This concept included all 18 contact gates that are required for Phase II. Due to this steep slope, the terminal concourses may be required to include sloped ramps, similar to the existing facility. Further study of this will occur during Advanced Planning and Programming.

Additionally, the new roadway loop will gradually slope upwards to the new terminal curfront, while the parking within the loop could remain slightly lower. This may help with the “canyon affect” between the terminal and garage and allow more daylight into the terminal ticketing and baggage areas and emphasize the terminal’s physical prominence on the site.

Along Fleur Drive (near the new airside pavement), a retaining wall is conceptually shown to help with this vertical transition between the service road and the new airside pavement.

Figure 6.12. East Quadrant: Proposed Grading Plan
Figure 6.13. East Overall Phasing Diagram

**KEY POINTS**

- New 4-level parking structure
  - Rental car
  - Public Parking
  - Pedestrian bridge or tunnel

- Requires more new parking spaces than East Concept

- New entry and exit plazas

- Longer curbside

- Maximizes landside area for future growth

---

**Legend**

- Phase 1 Buildings
- Phase 2 Buildings
- Potential Future Corporate/GA
6.11. Phase Enabling Projects

Before Phase 1 can begin, multiple steps need to be taken to prepare the new terminal site for construction.

**GA/Corporate relocation** - Within the construction site fence, all GA facilities and utilities including Signature, DSM Flying Services and HondaJet will need to be demolished and relocated (see Figure 6.14).

**Employee Parking** - The employee parking will be relocated to Lot #3.

**Loading Dock** - The existing loading dock and storage areas located north of the landside terminal will be demolished. Many options were studied including modifications to an existing freight elevator within the existing building. The final solution is to allocate space in existing rental lot #1 immediately adjacent to the building and install a temporary storage structure on this site. Goods would then be transported to the terminal.

**Airside** - Three new deice pads and four RON hardstands (indicated in orange on Figure 6.14) will be installed during this phase to maintain the required number of hardstand positions.

**Passenger Boarding Bridge** - At the existing terminal, a new groundload jetbridge at gate A5 will be installed to make up for the loss of contact gates on Concourse C during construction (gates C2 and C4). The existing building already contains a lower level holdroom with restroom facilities. It is anticipated that DSM will acquire a used groundload jetbridge from a nearby airport for utilization during construction. Foundations and pavement marking will need to be completed as an enabling project.

**Utility Relocation & Site Grading** – Utilities relocation will be included and after the above relocations, the site will be cleared and regraded to the appropriate slopes.

6.12. Phase 0 - Aircraft Requirements

During construction, existing gates C2 and C4 will be closed due to proximity to the new terminal/concourse. This will leave 10 gate positions open during Phase 0 with 15 RON hardstands at the terminal and 5 additional hardstands to the south. At Gate A5, the enabling project to install the groundload jetbridge will help to retain the required contact gates for operation.
6.13. Relocated Buildings - (South Quadrant)

For the East concept to become reality, there are enabling projects or relocations that would be required. As shown in Section 6.11, the existing GA/Corporate hangars located in the northern portion of the east quadrant need to move to the south quadrant. The three critical tenants/buildings that will be relocated include:

- DSM Flying Services Hangar (25,000 SF)
- Honda Jet Facility (25,000 SF)
- Signature Building which includes storage, maintenance and the Signature E Office/Hangar

Figure 6.17. Relocated Buildings - East Concept (South Quadrant)

See Figure 6.17 for their new locations. New vehicular parking lots would be included in this construction as well as new entry road that would provide a more direct and intuitive access route from Army Post Road to the new facilities.

Existing buildings 33, 34 and 35 will be demolished. Buildings 33 and 34 will be replaced. The new concept plan has accounted for additional future facilities indicated in purple on the plan, including a new GA campus to the east as well as new T hangars to the west. These will be incorporated with demand.

New apron would be required in Phase I to accommodate the relocated GA/Corporate tenants and a new taxiway entry would be included to eliminate an existing Runway Incursion Mitigation (RIM) issue.

Figure 6.17. Relocated Buildings - East Concept (South Quadrant)
After the enabling projects are complete, the landside phasing will begin with the construction of a new entry at Fleur Drive. One of the existing airport exit lanes on Highview Drive will be removed so that the intersection can accommodate both entry and exit points to the airport. While this new entry is under construction, vehicle traffic indicated in green in Figure 6.18 will continue to enter off of Cowles Drive.

With the new entry in place at Highview Drive, Cowles Drive to the west of Fleur Drive can be demolished. During Phase 2, the northeast corner of the long term lot will also need to be removed. In its place, a temporary road will cut through the northeast corner of the lot to connect lanes from the new entry to the rest of the existing roadway loop (see C2 in Figure 6.19). Element C3 shows a new ticketing plaza to segregate short term hourly, garage, and long term lot parking. The new roadway loop’s construction will also commence during this phase (C4). It will wrap to the east of the new ticketing plaza and split into several lanes for drop off, pick up and bypass lanes. The new roadway loop will terminate in this phase at the existing roadway loop.
**KEY POINTS**

**Phase 3 - Landside**
- Demolish existing entry plaza & short term lot
- Construct long term lot expansion & new parking structure
- Complete new entry plaza & new roadway loop

**Phase 4 - Landside**
- Demolish Rental Lot 2
- Construct new exit plaza & new short term hourly lot
- Complete new parking structure & new long term layout

---

**6.16. Phase 3 - Landside**

During Phase 3 for the Landside, the existing entry plaza (D3) and short term lot (D4) indicated in Figure 6.20 will be demolished. The temporary road and part of the existing roadway loop to the north will be removed as well, and traffic will begin to flow through the newly completed roadway loop to the east of the entry plaza. New lanes will be constructed from that plaza to segregate traffic into the long term parking lot and existing garages. The long term parking lot will expand in alignment with the new entry plaza. During this phase, construction of the new parking garage across from the new terminal will begin. The laydown area to support construction of the new garage is shown to the northeast within the new roadway loop.

**6.17. Phase 4 - Landside**

When the new parking structure is completed, the new short term hourly lot (see C8 in Figure 6.21) can be constructed in place of the laydown area. Its boundaries will be offset from the roadway loop to the northeast.

On the south side of the site, the Rental Lot 2 that is adjacent to the existing parking garage will be demolished and a new exit plaza will be established in its place. This exit plaza will capture all of the traffic leaving from the lots and garages within the roadway loop. After cars are cleared to exit, they will turn to merge with the existing roadway loop on Highview Drive to exit the airport complex.
KEY POINTS

6.18. Phase 5 - Landside (Opening Day)
Phase 5 for the Landside work will begin on the opening day for the new terminal. As indicated by the green dashed line in Figure 6.22, the vehicular traffic will still flow south adjacent to the existing garages while the existing landside terminal (D6) is being demolished. The north wing of the airside terminal will also be removed during this phase. The remainder of the roadway loop (C9) will be constructed once the landside terminal demolition is complete. The northern piece of the new roadway loop will extend the lanes constructed during Phase 2 and will include drop off, pick-up and bypass lanes. The curb adjacent to the new loop will extend south for future demand.


Figure 6.23 represents the completion of Phase 1A for the airside terminal. The new terminal is open and demolition of the existing terminal will begin. The demolition phasing will start with the removal of the northern C-gates (D7.) All passengers will arrive through the new landside terminal and disperse to each of their gates. A temporary secure bridge (C10) will connect arriving and departing passengers using the remaining south A-gates in the existing terminal. As seen in the diagram, the first 9 gates are connected to the new terminal, while gates 10 – 14 are positioned at the old terminal. After the C-gates are demolished, new apron pavement (C11) will be poured to prepare for Phase 1B of the airside terminal development.

During Airside Phase 1B, the southern A-Gates old terminal building will be demolished. Gates 10 through 12 will be relocated to the new terminal once the new apron is complete. The new gates will face the new terminal’s northeast façade, in line with positions 1-9. During this phase, the temporary bridge will also be deconstructed.
Addendum to Terminal Area Concept Plan Technical Report

KEY POINTS

Phase 5 - Landside
- Demolish existing terminal curb front
- Construct long term parking lot expansion; pedestrian bridge connection to long term parking
- Complete full roadway loop

Phase 5 - Airside
- Remove temporary bridge
- Complete new apron

6.20. Phase 6 - Landside (Full Airside Operation)
During the final stage of landside construction, the existing terminal curb front and roadway loop will be demolished (D8 in Figure 6.24.) Traffic will be redirected to the recently completed west roadway loop. In the new open space, a long term surface parking lot will be constructed as an expansion of the long term lot to the east of the parking garage. Next, a new elevated pedestrian bridge (C13) will be added to connect pedestrians from the furthest parking space to the new landside terminal.

6.21. Phase 7 - Airside (Full Airside Operation)
Figure 6.25 represents the final completion of the airside terminal. After Phase 1B is completed, the Airside terminal will hold 12 gates. In the last phase, all remaining elements of the old terminal will be completely removed, including the temporary bridge (D9) and new pavement will be placed for positions 13 and 14 in the diagram.
6.22 Project Cost Analysis

Figure 6.25 shows the projected Phase 1 costs for the selected option for locating the new Terminal at the East Quadrant of the Airport. Construction costs are identified separately for the following areas:

- **Enabling Projects** include demolition and new buildings and related site work at the South Quadrant. The new buildings include those to replace the Des Moines Flying Services (including Honda Jet) and Signature facilities, which need to be removed from the East Quadrant prior to the start of construction of the new Terminal building.
- **Demolition costs** are for removal of site work and buildings at the East Quadrant.
- **Terminal Building costs** include the new 14 gate terminal building and the passenger boarding bridges.
- **Airside Pavements** include costs for apron paving, deicing pads, retaining walls and related site utilities and adjustments to the glycol management system.
- **Landside Structures and Paving** include parking garages, rental car facilities, surface parking lots, elevated walkways, changes to the parking entrances and exit plaza, roadway changes and retaining walls.
- **Utilities** includes costs for utility changes related to the landside structures and paving.

The Total Program Costs of approximately $491 million in 2016 dollars include a Contingency of 20% and Soft Costs of 28.5%.

<table>
<thead>
<tr>
<th>Table 6.25 Total Project Cost</th>
<th>East Option</th>
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<tr>
<td>Enabling Projects</td>
<td>$44,500,000</td>
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<tr>
<td>Demolition</td>
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<td>Terminal Building &amp; PBB’s</td>
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<td>Airside Pavements etc.</td>
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<td>Landside Structures and Paving</td>
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<td>Utilities</td>
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<tr>
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<tr>
<td><strong>Total Program Cost</strong></td>
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</tr>
</tbody>
</table>

Figure 6.26 East Massing
Chapter 7  Preliminary Financial Capacity

• Introduction
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7.1 Introduction
A Financial Feasibility Study will be completed for the East Option. This will be done as part of Detailed Programming, including development of the Program Definition Document, under Task Order No. 2.