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INTERNATIONAL AIRPORT

Chapter 5

Terminal Alternatives

Missoula International Airport
Master Plan Update

Prepared for

Missoula County Airport Authority

OCTOBER 2008

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Contents

CHAPTER 5

Terminal Alternatives

The terminal complex defines a major land use for the airport, and is the image most people associate with Missoula International Airport (MSO). As discussed in Chapter 3, the current terminal building has been expanded numerous times but still functions at a less than desirable level for some activities. As passenger activity grows, the terminal complex must be expanded, putting further pressure on the existing facilities. The landside facilities (parking and circulation) also require improvement, and are evaluated under a separate task. This chapter discusses alternate locations and concepts for accommodating the near and long range needs of the passenger terminal complex.

5.1 Terminal Development Concepts

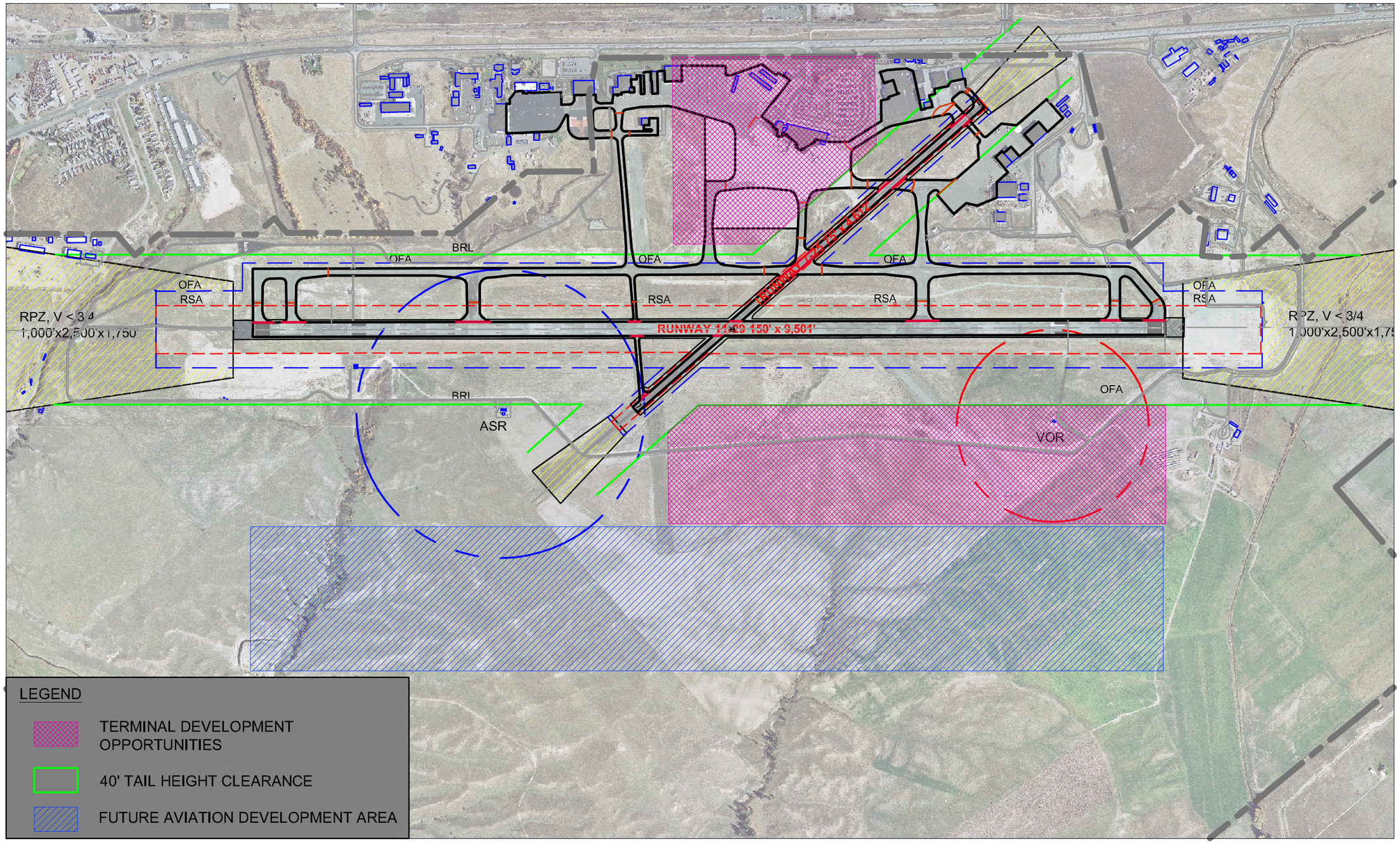
As a first step in defining terminal concepts, development opportunity areas were identified. There are two major areas as illustrated in **Exhibit 5-1:**

- The existing terminal area bounded by the terminal access roads on the north; Taxiway F on the west; and the building restriction lines for Runway 11/29 and Runway 7/25 on the south and east.
- A new midfield site south of Runway 11/29, extending to a new post-planning-period parallel runway; and east of the restricted zones for Runway 7/25. The site would also contain the proposed air traffic control tower (ATCT).

5.1.1 Typical Terminal Configurations

Three typical configurations were developed to test the potentials of the two opportunity areas. Each configuration reflected potential long-term terminal facility requirements. Different configurations could be more appropriate for each opportunity area.

- Each configuration has 10-12 typical aircraft design group (ADG) III narrowbody gates (B737-800 with winglets).
- All have a similar size and arrangement of ticketing and bag claim facilities on a single level with security and concessions located in the center.
- The curbsides have four lanes adjacent to the terminal to provide a double parking lane, weaving lane, and a lane for through traffic. It has been shown that this configuration works best for all except the smallest airports.
- Holdrooms are on the second floor of the concourse(s) with operations and support spaces on the apron level.
- Ticketing, bag claim, and gates can expand independently of each other.
- For a given number of gates, maximum walking distances for originating passengers are similar.



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Terminal Development Opportunity Areas

Exhibit 5-1

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These typical terminal configurations are illustrated in **Exhibit 5-2** and discussed below.

Linear Configuration:

- Aircraft are arranged in a single flight line.
- The concourse is single-loaded for gates but may have concessions on the other side.

Possible advantages:

- Good for sites with limited depth for development.
- Aircraft pushbacks are independent from adjacent gates.
- Passenger orientation is good. This is most similar to existing terminal (on the upper level).

Possible disadvantages:

- Single-loaded concourse requires more circulation space than double-loaded concourses for the same number of gates.
- Depending on orientation and number of connecting taxiways, aircraft maneuvering can be limited.

Double-loaded pier with holdrooms and concessions on both sides:

- Two flight lines each with half of the gates.

Possible advantages:

- Good for deep sites and/or limited width.
- Aircraft pushbacks are independent on each side.
- Opportunity for concessions exist close to most gates in the pier.

Possible disadvantages:

- Expansion potential is limited to 12-14 gates before walking distances and aircraft flow on each taxilane become an issue.

Double Pier Configuration:

- Two double-loaded piers with holdrooms and concessions on both sides.
- Four flight lines each with 1/4 of the gates.
- Single taxilane between piers.

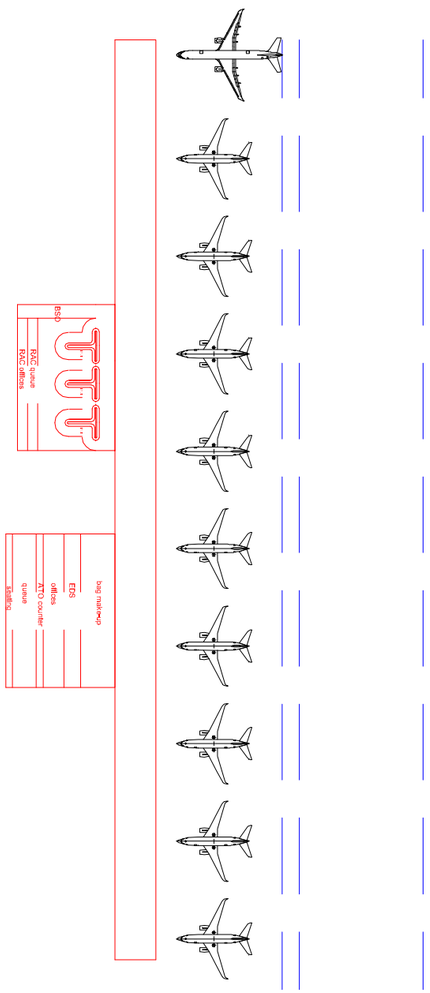
Possible advantages:

- Good for sites with few constraints.
- Most expansion potential while limiting maximum walking distances.
- Taxilane depths are short; half of gates have minimal taxi flow issues.

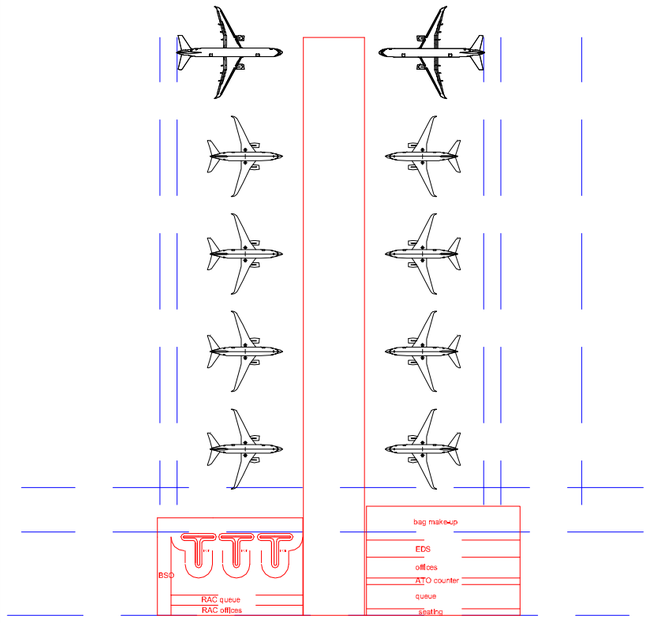
Possible disadvantages:

- Internal gates have dependent push-backs against those on opposite pier. This can be mitigated by dual taxilanes between piers at the cost of a wider terminal footprint and longer connecting corridors.
- Requires duplication of concessions and restrooms near gates.

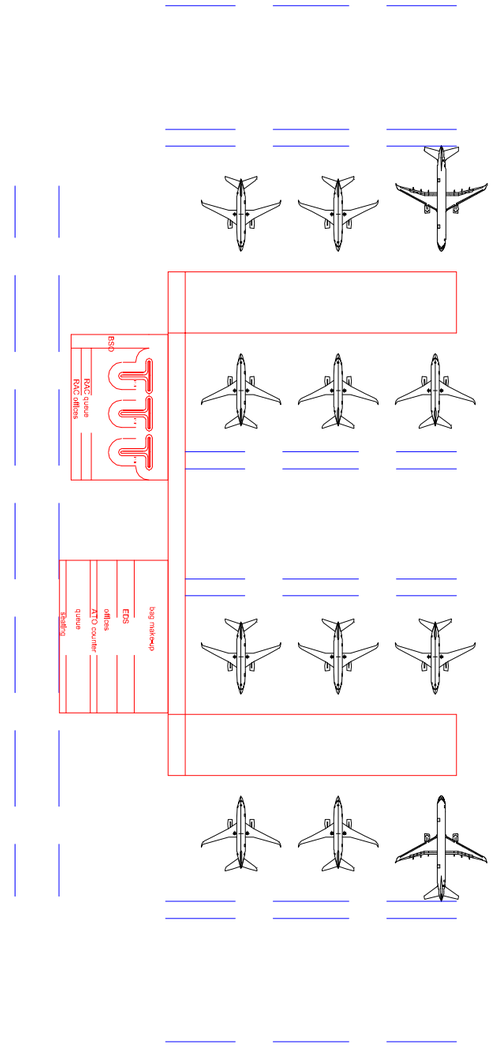
LINEAR



DOUBLE LOADED PIER



DOUBLE PIER



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Typical Terminal Configurations

Exhibit 5-2

5.1.2 Preliminary Analysis of Existing Terminal Site Opportunity Area

Two concepts were evaluated for the existing site - the single and double pier. These were positioned to the west side of the site to take maximum advantage of the depth of the site on that side and avoid - to the extent possible - interference with the existing terminal. Although a linear concept could also be used, the deep configuration of the site and the adjacent GA development would not normally favor a linear concept.

Single Pier (Exhibit 5-3)

The location would be west of existing terminal, with the terminal taxilane aligned with Taxiway F. This location would allow the single pier terminal to be developed in a single phase with an overnight move into the new terminal. After relocation, the existing terminal could be demolished or converted for other uses.

Advantages:

- Allows construction to occur while keeping existing terminal in operation.
- Could allow existing terminal to remain for other functions as needed.

Disadvantages:

- Some encroachment of GA area for landside access and possible ticketing expansion.
- Possible expansion of bag claim would require some demolition of existing building in future phases.

Double Pier (Exhibit 5-4)

The location would be west of, and overlapping the existing terminal. This would require three major construction phases:

1. Build new ticketing wing, security, and 6 gates west pier. Operate the west pier and ticketing wing while maintaining existing bag claim.
2. Demolish most of existing terminal, but keep bag claim in operation. Build new bag claim and east pier.
3. Open new bag claim and east pier. Demolish remainder of existing terminal.

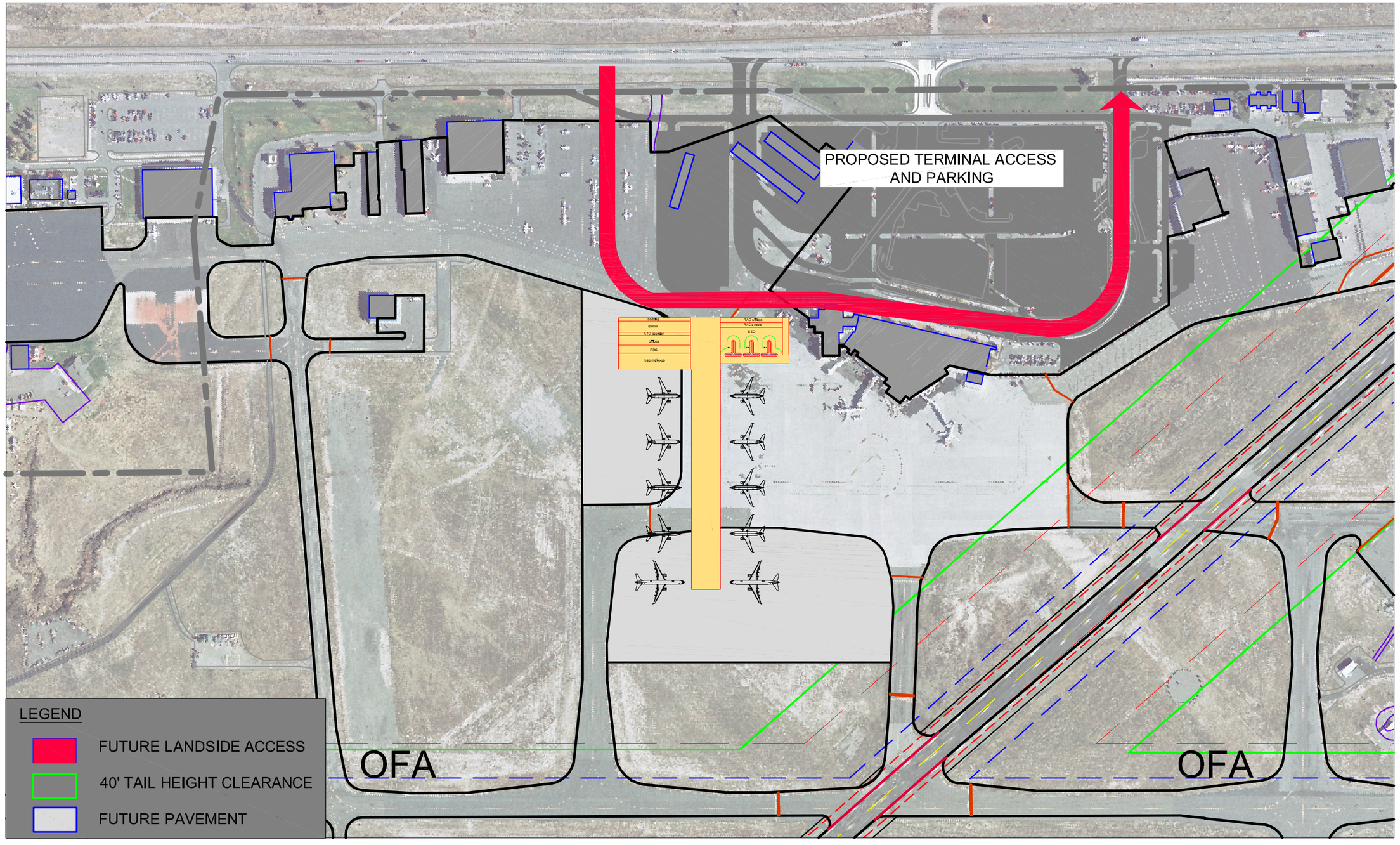
Advantages:

- Most expansion potential for existing site.

Disadvantages:

- Complex phasing to maintain operations in existing terminal.
- Impacts GA area for west pier aircraft parking and taxilane.

Based on this preliminary analysis, and the estimated demand for gates over the planning period, the single pier concept was considered the preferred new terminal option for the existing site. The double pier concept was not carried forward for further analysis. It should be noted, however, that a new single pier terminal, if sited properly, could be expanded into a double pier configuration in the future if required.



True North

1" = 300'

150' 0 300'

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Existing Site Single Pier

Exhibit 5-3

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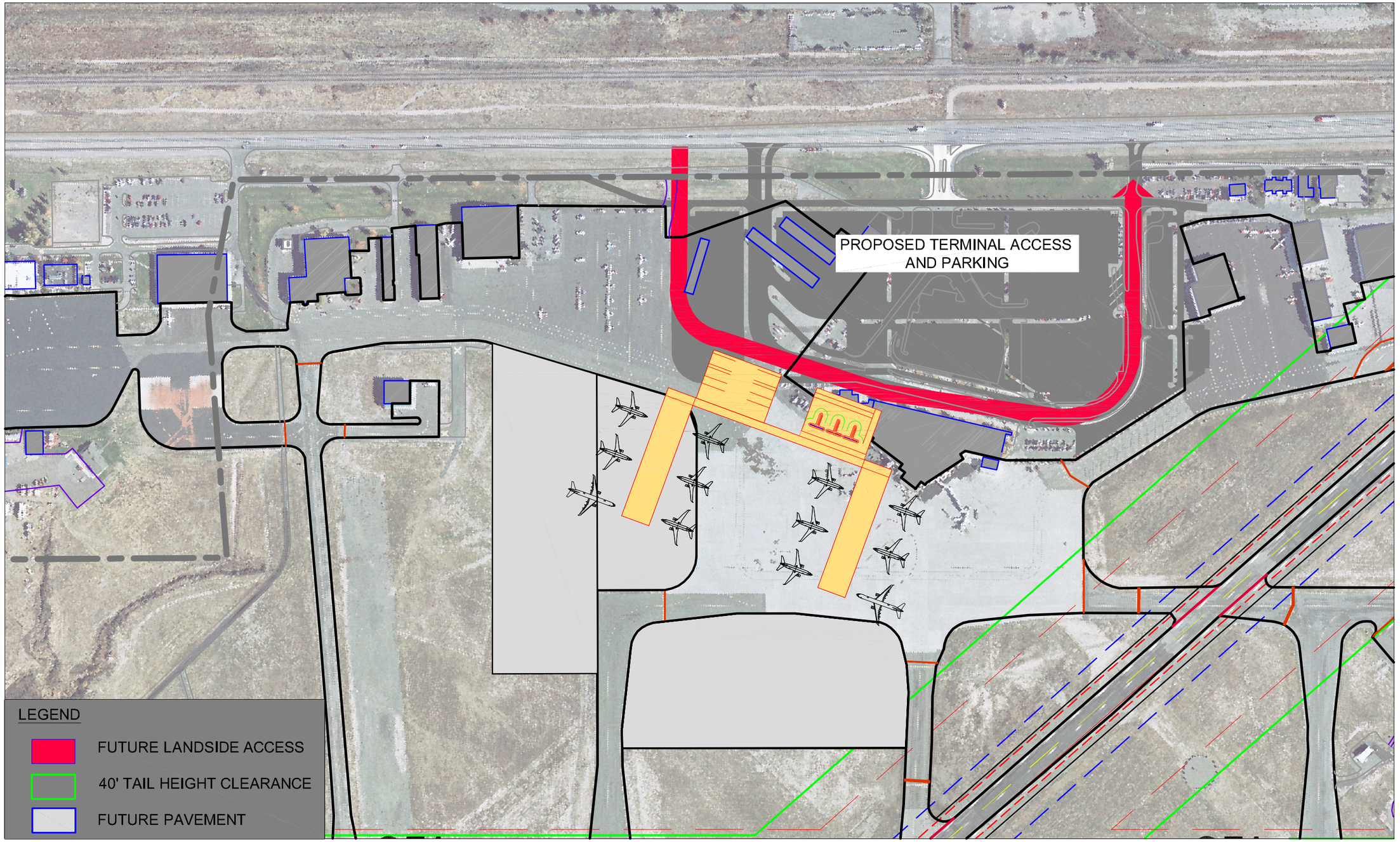

TRUE NORTH

1" = 300'

150' 0 300'

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Existing Site Double Pier

Exhibit 5-4

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5.1.3 Preliminary Analysis of the Midfield Terminal Site Opportunity Area

The use of the midfield site assumes that a new ATCT will be built and have direct roadway access from the east. All concepts involve a new terminal built initially as a single phase "green field" site with an overnight move from the existing terminal complex. These concepts would also require all new landside facilities to support the terminal. The midfield site would allow the broadest range of terminal concepts and maximum growth potential. Three general locations and configurations were considered:

- West of ATCT, double pier
- North of ATCT, single pier
- West of ATCT, single pier

West of ATCT, Double pier (Exhibit 5-5)

The location would be west of the proposed ATCT. The extended safety areas of Runway 7/25 would act as the western boundary. The ATCT would be located within the landside parking area.

Advantages:

- Most expansion potential - in excess of 20 gates.

Disadvantages:

- ATCT in parking lot reduces highest value parking spaces or convenience. Further shift of terminal west would reduce gate expansion potential beyond 20 gates.

North of ATCT, Single pier option A (Exhibit 5-6)

The location would be north of the proposed ATCT. This would separate the ATCT from the landside parking areas.

Advantages:

- Public parking is not affected by ATCT or its employee parking.

Disadvantages:

- Expansion potential limited by Runways 7/25 and 11/29.
- Concept is not the most optimal building layout for a midfield site.

West of ATCT, Single pier B option B (Exhibit 5-7)

The location would be west of the proposed ATCT. As with the double pier concept, the ATCT would be within the landside parking area.

Advantages:

- Gate expansion potential is greater than the single pier option A, depending on distance of terminal from ATCT.

Disadvantages:

- ATCT in parking lot reduces highest value parking spaces. Further shift of terminal west would reduce gate expansion potential.

BRL
OFA
OFA
OFA
800'
RSA
RSA
RUNWAY 7-25 75' x 4
RUNWAY 11-29 150' x 9,501'
750'
TAXIWAY - W= 75'
BRL
ASR
PROPOSED
ATCT LOCATION
*2800'
BRL
OFA
OFA
RSA
RSA
RUNWAY 11R-29L 150' x 9,501'

LEGEND

- FUTURE LANDSIDE ACCESS
- 40' TAIL HEIGHT CLEARANCE
- FUTURE PAVEMENT
- AVIATION DEVELOPMENT

TRUE NORTH

1" = 500'

250' 0 500'

* For development purposes, this concept assumes a runway separation of 2800'

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Midfield Site Double Pier

Exhibit 5-5

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BRL
OFA
OFA
OFA
800'
RSA
RSA
RUNWAY 7-25 75' x 4,6
RUNWAY 11-29 150' x 9,501'
750'
TAXIWAY - W= 75'
BRL
ASR
VOR
PROPOSED
ATCT LOCATION
*2800'
BRL
OFA
OFA
RSA
RSA
RUNWAY 11R-29L 150' x 9,501'

LEGEND

- FUTURE LANDSIDE ACCESS
- 40' TAIL HEIGHT CLEARANCE
- FUTURE PAVEMENT
- AVIATION DEVELOPMENT

TRUE NORTH

1" = 500'

250' 0 500'

* For development purposes, this concept assumes a runway separation of 2800'

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Midfield Site Single Pier A

Exhibit 5-6

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BRL
OFA
OFA
OFA
800'
RSA
RSA
RUNWAY 7-25 75
RUNWAY 11-29 150' x 9,501'
750'
TAXIWAY - W= 75'
BRL
ASR
PROPOSED
ATCT LOCATION
*2800'
BRL
OFA
OFA
RSA
RSA
RUNWAY 11R-29L 150' x 9,501'

LEGEND

- FUTURE LANDSIDE ACCESS
- 40' TAIL HEIGHT CLEARANCE
- FUTURE PAVEMENT
- AVIATION DEVELOPMENT

TRUE NORTH

1" = 500'

250' 0 500'

* For development purposes, this concept assumes a runway separation of 2800'

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Midfield Site Single Pier B

Exhibit 5-7

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Based on this preliminary analysis, the double pier concept was considered the preferred option for the midfield site. It provides the most potential capacity which would likely be needed when, and if, the airport requires a parallel runway configuration. The single pier concepts do not take advantage of the potential of the midfield site to the same degree.

However, the Master Plan forecasts do not project a need for a parallel runway during the 20 year planning period. Thus, it is recommended that the Airport expand or replace the terminal within the existing site and adjacent GA areas within the planning period. The midfield site should be preserved for its long-term potential as a terminal if needed. Siting of the relocated ATCT should consider a potential terminal to allow this future development. The midfield site also has potential for FBO development which should be considered in the over-all land use planning for the Airport.

5.2 Terminal Building Expansion Alternatives

As noted in Chapter 3 – *Passenger Terminal Demand capacity and Facility Requirements* - the more significant deficiencies in the existing terminal are:

- Baggage make-up and airline operations
- Checked baggage screening and ticket lobby
- Baggage claim and baggage off-load
- Secure concessions

While other areas would also require expansion to meet forecast growth, these areas are presently inadequate and result in decreased passenger level of service (LOS) and inefficient airline operations. There is also no unused airline space so that new service must be handled by incumbent carriers.

Within the existing terminal area there are various ways to provide additional capacity for growth:

- The existing terminal building can continue to be expanded and improved.
- A new terminal can be constructed.
- Some combination of these two extremes.

Four expansion/replacement alternatives have been studied which represent this range of possibilities and would meet (to various degrees) the projected terminal facility requirements.

5.2.1 Alternative 1 - Expansion of the Existing Terminal

The objective of Alternative 1 is to address these deficiencies with a minimal expansion of the existing terminal building and provide opportunities for new airlines. As shown in **Exhibit 5-8,** the primary features of Alternative 1 are:

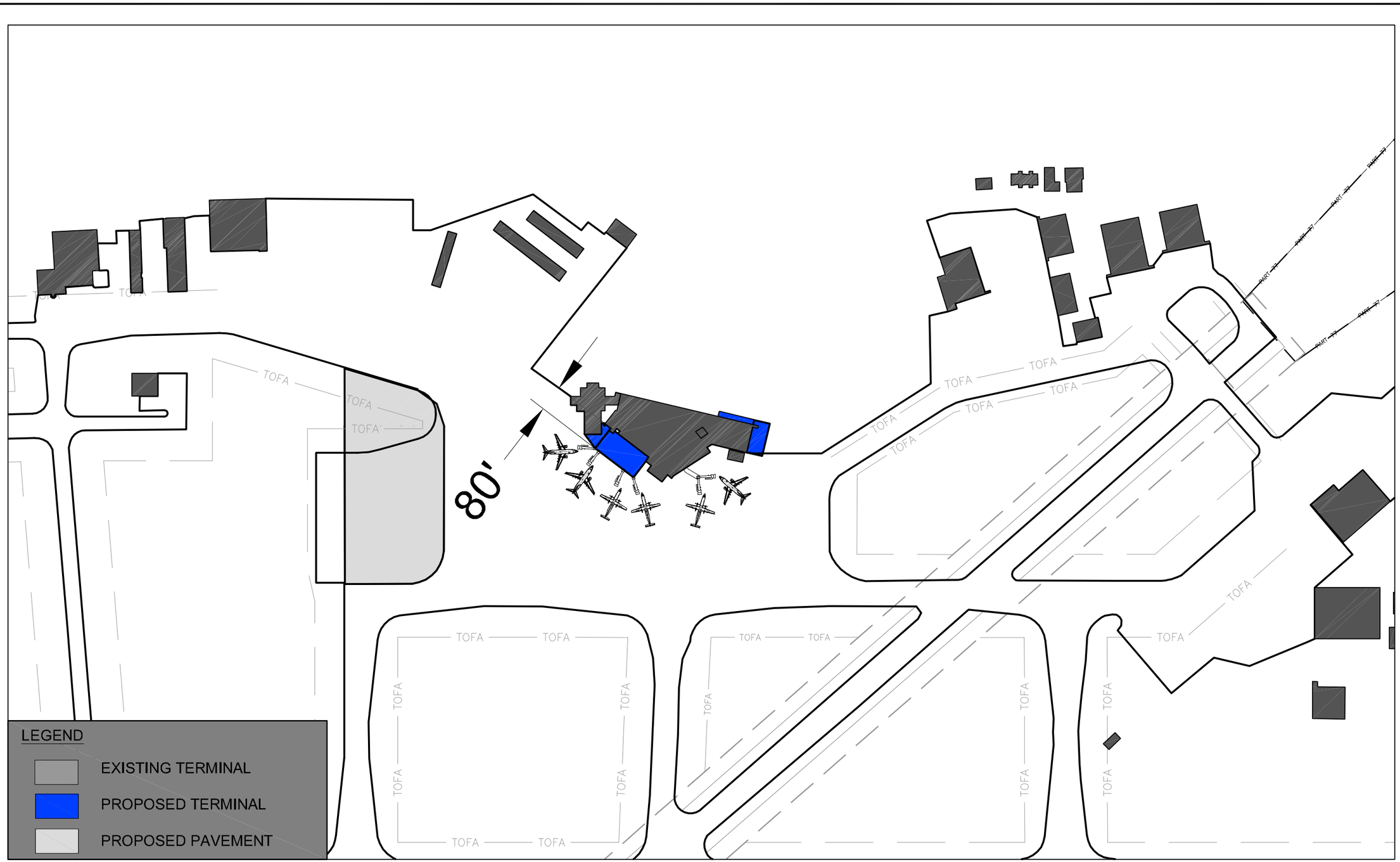
- A two level expansion (bump-out) of the terminal running the width of the current airline bag make-up area, and extending approximately 80 feet deep into the existing apron. The expansion would connect to the security screening checkpoint (SSCP) addition at the second level with a new escalator.

- The ground floor would contain new bag make-up areas, checked bag screening (EDS), and airline operations/offices. This will also allow the EDS equipment to be removed from the ticket lobby. With additional office areas, the full width of the ticket lobby (approximately 160 feet) would be reconfigured for Airline Ticket Operations (ATO) counters.
- The upper level would contain expanded holdrooms and secure side concessions. As illustrated in the Exhibit, this configuration would convert the existing Gate #3 to a fixed walkway with two loading bridges, and replace Gates #1 and #2 with four new loading bridge gates. All gates would then have second level boarding potential.
- For consistency with the terminal facilities requirements and other alternatives, full ADG III aircraft are shown (Q400 and B737-800) with a 25-foot wing tip clearance. It is possible to have other configurations with smaller regional jets (RJs) and/or turboprops which yield one or more additional gates. The configuration shown matches the forecast gate demand for the 2013 forecast activity level.
- The baggage area needs to be expanded so that bag trains can pass in the off-load area to fully utilize the claim units, new space for additional RAC counters need to be added, and circulation clearance needs to be maintained in front of the bag claims. This can be accomplished in three ways:
  - Expansion Option 1: Demolish and replace the adjacent ARFF building to provide room for the necessary bump-out so bag trains can pass. This requires replacement of the single-bay ARFF. The terminal also needs to be extended east to accommodate counter space for additional RACs.
  - Expansion Option 2: Bump out to the maximum distance possible to the curbfront without impacting the roadway (approximately 35 feet), shift the bag claim units away from the bag off-load area to provide space for bag trains to pass behind the bag claim units. This would also provide enough room to accommodate new RAC counter space and circulation clearance in the new bump-out. The 35-foot extension cuts-off the curbfront and disrupts passengers from walking to the rental car area (designated in the *Landside Master Plan* as future Premium/VIP spaces).
  - Expansion Option 3: Bump out to the curbfront (approximately 15-20 feet) to provide room to shift the bag claim units away from the bag off-load area so that two bag trains can pass each other behind the bag claim units. The terminal also needs to be extended east to accommodate counter space for additional RACs. This option would not cut-off the curbfront and disrupt passengers from walking to the rental car area.
- Although not required from a pure capacity perspective, it would be recommended that escalators be added from both the SSCP to the upper level holdroom, and from the holdroom down to the security exit next to the ticket counter. The SSCP configuration would also need to be revised to accommodate a third lane as originally planned.
- The remainder of the terminal would be upgraded in terms of mechanical systems and other life-cycle replacements as required, but would not change functionally. Passenger flow would not be changed.

The growth limitations on Alternative 1 are the number and mix of gates; the width/depth of the ticket lobby; and the ability to accommodate new airlines.

As noted in Chapter 3, all of the airlines presently using check-in kiosks have these configured in-line with the ATO counter. Thus, there is a small shortfall (10 feet) of ATO counter length at present which would grow over time even as the number of passengers using kiosks increase. However, if 20-30 percent of the kiosks were located elsewhere in the ticket lobby (primarily used by passengers without checked bags), the ATO counter length would be less.

By expanding the airline offices and operations spaces, there is also the opportunity to reconfigure the ATO counters to fully utilize the approximate 160-foot-long frontage for check-in functions and possibly increase the depth of the ticket lobby. This would relocate some airline offices that are along the ATO counter to locations behind the counter. The existing depth of the lobby at the east end, however, does limit the ability to accommodate kiosks and passenger queues if the current ATO counter location is maintained.



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Terminal Alternative 1

Exhibit 5-8

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5.2.2 Alternative 1A - Expansion of the Existing Terminal

The major capacity limitation of Alternative 1 is the number of gates: the 2013 forecast horizon is for 6 gates. Because the other functional elements could be expanded to beyond 2018 requirements, a second gate configuration was studied.

As shown in **Exhibit 5-9,** by adding a 100-foot-long pier, 8 gates can be accommodated. The 25-fooot wide pier would be only for circulation to the gates. All of the holdroom space, concessions and restrooms would be within the bump-out.

The other difference from Alternative 1 is that the bump-out would be 110 feet deep, to accommodate the additional baggage make-up and operations spaces associated with the additional gates. This, plus a full reconfiguration of the approximate 160-foot wide ticket lobby should provide sufficient space to meet the 2028 forecast requirements. In other aspects, the alternative is the same as Alternative 1.

5.2.3 Alternative 2 - New Ticketing Wing and Concourse

Prior to initiating the Master Plan Study, the Airport built an addition to the terminal to accommodate a new SSCP. The location and orientation of this addition was to serve as the first phase of a terminal redevelopment. Alternative 2 (**Exhibit 5-10**) takes this previous approach (as described by Airport Management) and sizes it consistently with the Master Plan forecasts and terminal facilities requirements for the long range High forecast (9 gates). The primary features of this alternative are:

- Check-in, ATO, baggage make-up, and baggage screening would be relocated to a new single level building directly west of, and connected to, the SSCP addition.
- A new 90-foot wide double-loaded, two-level concourse would extend south from the SSCP. As part of the concourse addition, escalators for departing passengers would be added. All of the gates and secure concessions would be relocated to the new concourse. Airline operations and terminal support would be on the apron level.
- Non-secure concessions would be relocated from the existing terminal to the ground level between the SSCP and ticketing building and/or along the north (curb) side of the SSCP connector. It is not considered economically viable to operate these concessions in their existing locations since they would be so far removed from the passenger flows.
- Baggage claim, rental car counters, and restrooms would be relocated to the western portion of the existing terminal building to be in better proximity to the gates. An arriving passenger corridor with escalator and elevator would connect the new concourse to the existing terminal to bypass the SSCP addition. Claim units need to be located to minimize restrictions to passenger flow. Due to the way the terminal has been expanded over the years, the multiple column grids make this bag claim area difficult to build and operate efficiently. See **Exhibits 5-11 a, b,** and **c**.
  - Claim concept A has 2, 130 LF flat plate claim units oriented along the east/west axis of the original terminal structural grid. In order for the bag off-load area to clear the stairs and mechanical spaces, and provide a clear passenger exiting flow, the rental car counters and offices would be built out into the service yard between the terminal and the SSCP addition.

  - Claim concept B has 2, 130 LF flat plate claim units oriented along the north/south axis of the original terminal structural grid. In this configuration, the rental car counters are located in a 'ground transportation lobby' with its own exit from the terminal.
  - Claim concept C is similar to concept B, but uses remote-feed, sloped bed claim units.

- Airport offices and other functions would remain in current locations. Vacated terminal spaces would either be converted to other uses or demolished.
- As with Alternatives 1 and 1A, the existing terminal systems would need to be upgraded and replaced as necessary to provide a similar life cycle as the new construction for those portions which remain in use.

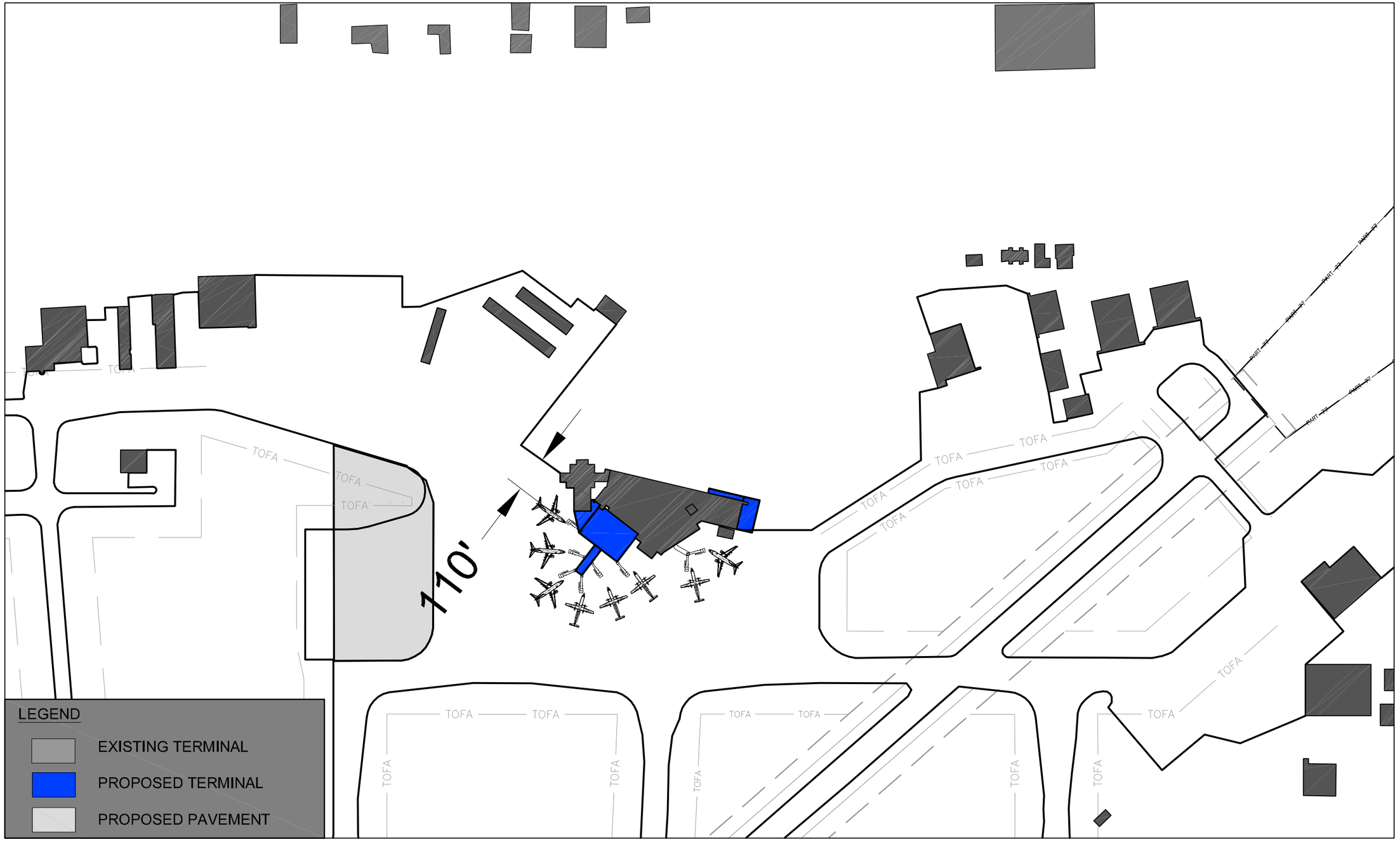
Alternative 2 is a hybrid of mostly new construction and reuse of a portion of the existing building. As such, it can meet the High forecast of the Master Plan and have some room for further expansion of gates and ticketing. Baggage claim expansion is limited by the structural restrictions of re-using the existing terminal.

5.2.4 Alternative 3 - New Replacement Terminal

Alternative 3 further refines the single pier concept for a new terminal as generally described in Section 5.1.2. As with Alternative 2, it is sized consistently with the Master Plan forecasts and terminal facilities requirements for the long-range High forecast (9 gates). The site plan and relationship to the existing terminal is shown in **Exhibit 5-12**. The general interior concept is illustrated in **Exhibit 5-13**. The primary features of this alternative are:

- Check-in, ATO, baggage make-up, and baggage screening would be located on the ground level of the western portion of the terminal. Airport and TSA offices would be located on the second level over the airline offices and bag make-up area.
- Baggage claim, rental car counters, and airline baggage service offices would be located in the eastern portion of the terminal. The Exhibit shows three claim units, although two are projected to be needed for the High forecast. However, it may be cost effective to build the space for a third claim unit initially rather than expand later.
- Connecting the two halves of the landside would be a lobby area containing non-secure restrooms and terminal support functions on the ground level. A vertical circulation core (escalators, stairs, and elevators) would provide access to the upper level.
- The upper level of the connector would contain the non-secure retail and food/beverage concessions as well as a meeter/greeter area. Public access would also be provided to the airport offices. The SSCP and its queuing area would define the beginning of the concourse and the secure area of the terminal.
- A 90-foot wide double-loaded, two-level concourse would contain all of the gates and secure concessions. Airline operations and terminal support would be on the apron level. The aircraft parking configuration shown leaves the end of the concourse open for future expansion.

There are no programmed uses for the existing terminal in Alternative 3. The building can be modified for other uses if needed and economically feasible without affecting the operation of the new terminal. Otherwise, the building can be demolished and the area converted to parking or landside functions.



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Terminal Alternative 1A

Exhibit 5-9

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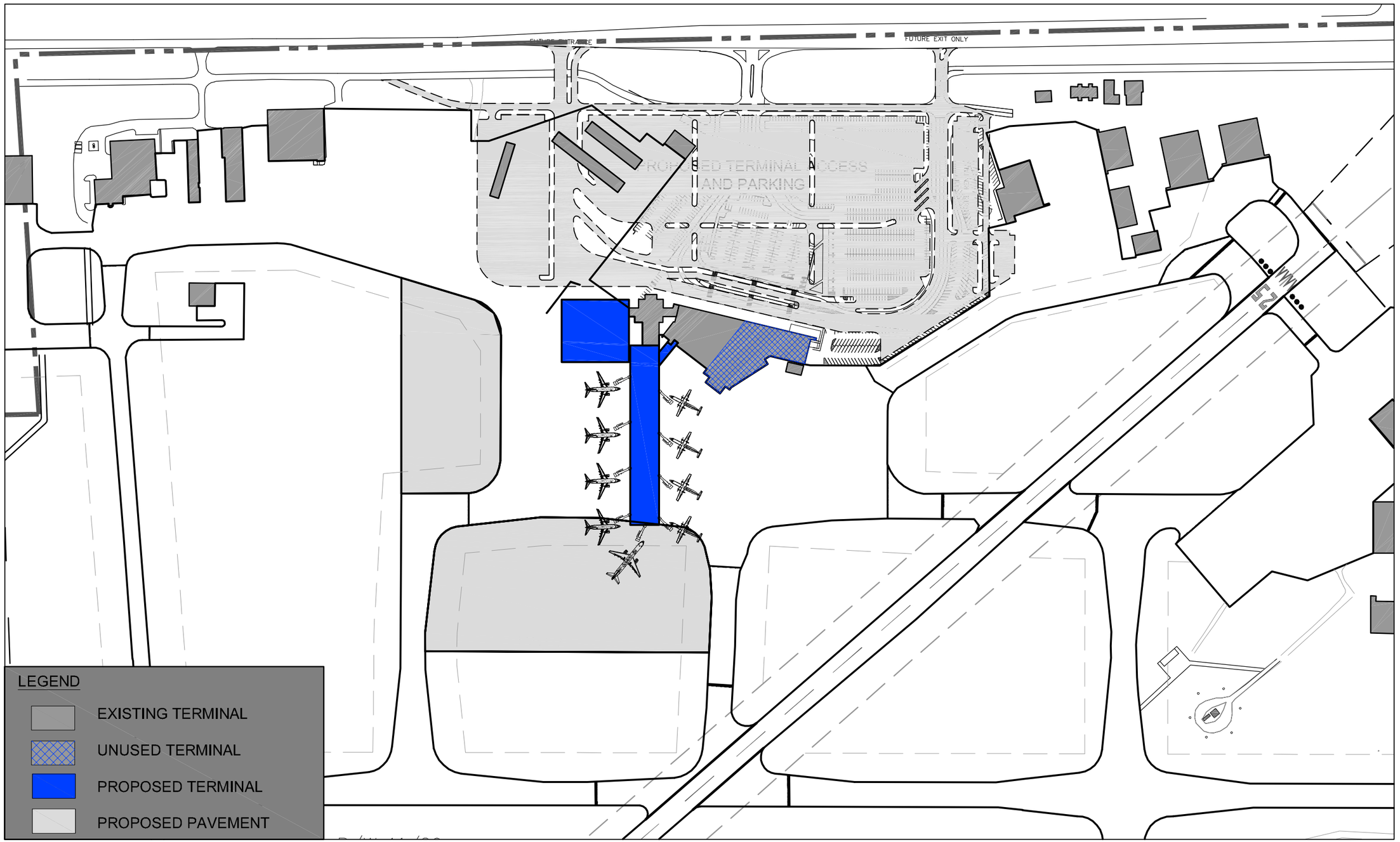

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Terminal Alternative 2

Exhibit 5-10

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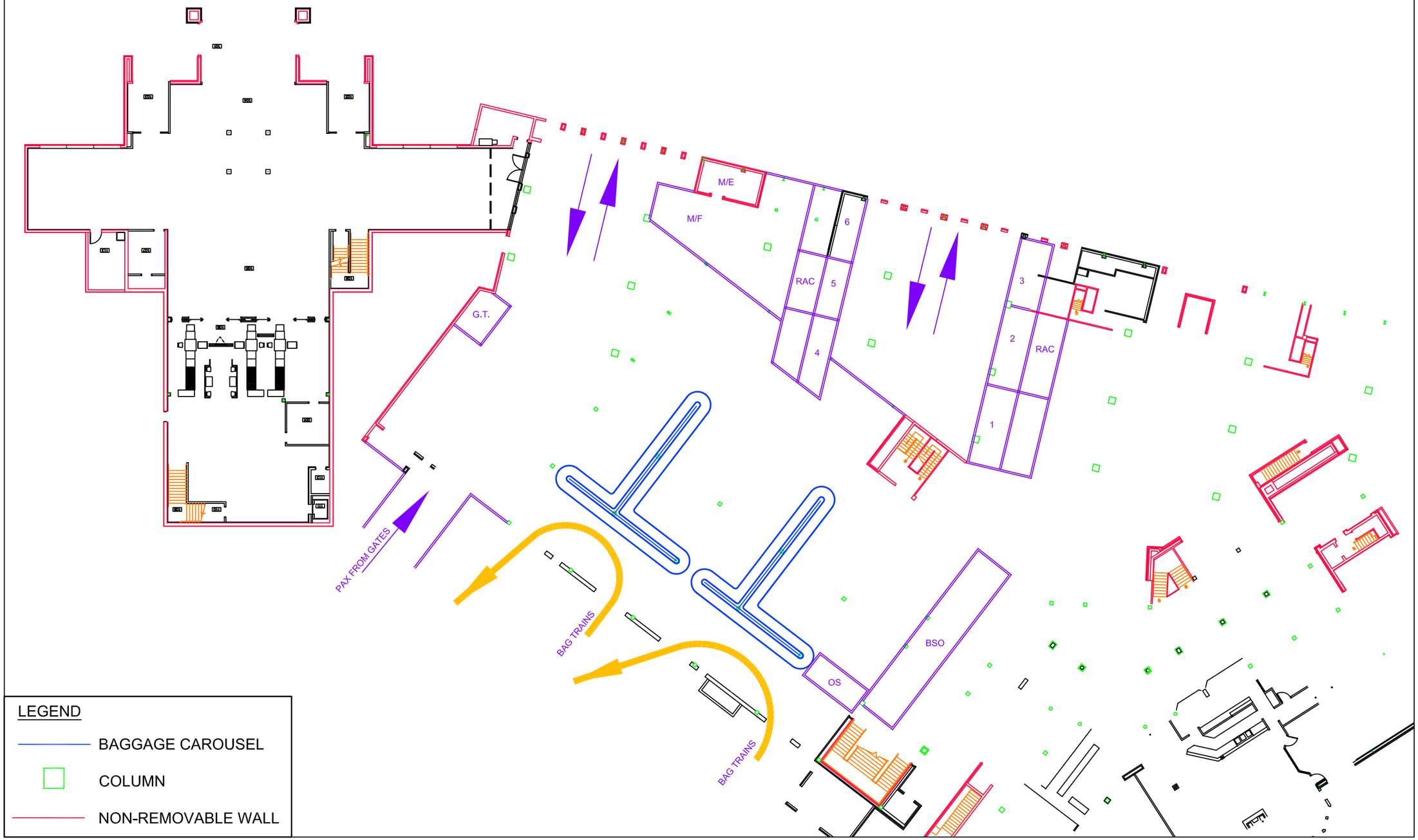
Bag Claim Concept A

Exhibit 5-11A



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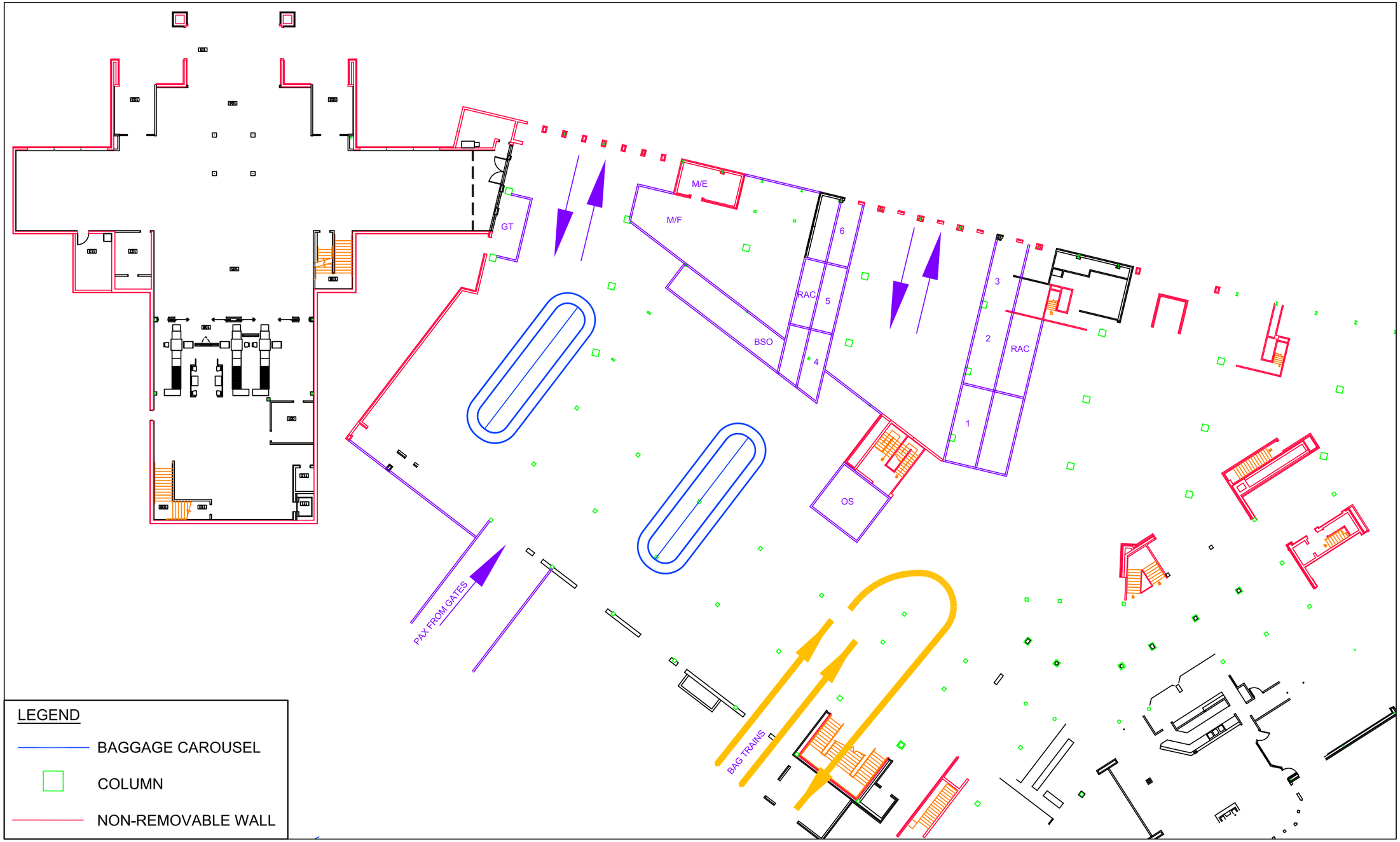
CH2MHILL

Missoula International Airport Master Plan Update

Bag Claim Concept B

Exhibit 5-11B



LEGEND

- BAGGAGE CAROUSEL
- COLUMN
- NON-REMOVABLE WALL

True North

1" = 30'

15' 0 30'

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Missoula International Airport Master Plan Update

Bag Claim Concept C

Exhibit 5-11C

LwDefault: 0.010 Colortable: CH2M ALP BY LWT.ctb LTScale: 1.0000 Last Saved: 7/9/2009 2:36 PM Plotted On: 7/9/2009 2:44 PM

FUTURE ENTRANCE

FUTURE EXIT ONLY

PROPOSED TERMINAL ACCESS AND PARKING

LEGEND

- EXISTING TERMINAL
- UNUSED TERMINAL
- PROPOSED TERMINAL
- PROPOSED PAVEMENT

True North

1" = 300'

150 0 300

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Missoula International Airport Master Plan Update

Terminal Alternative 3

Exhibit 5-12

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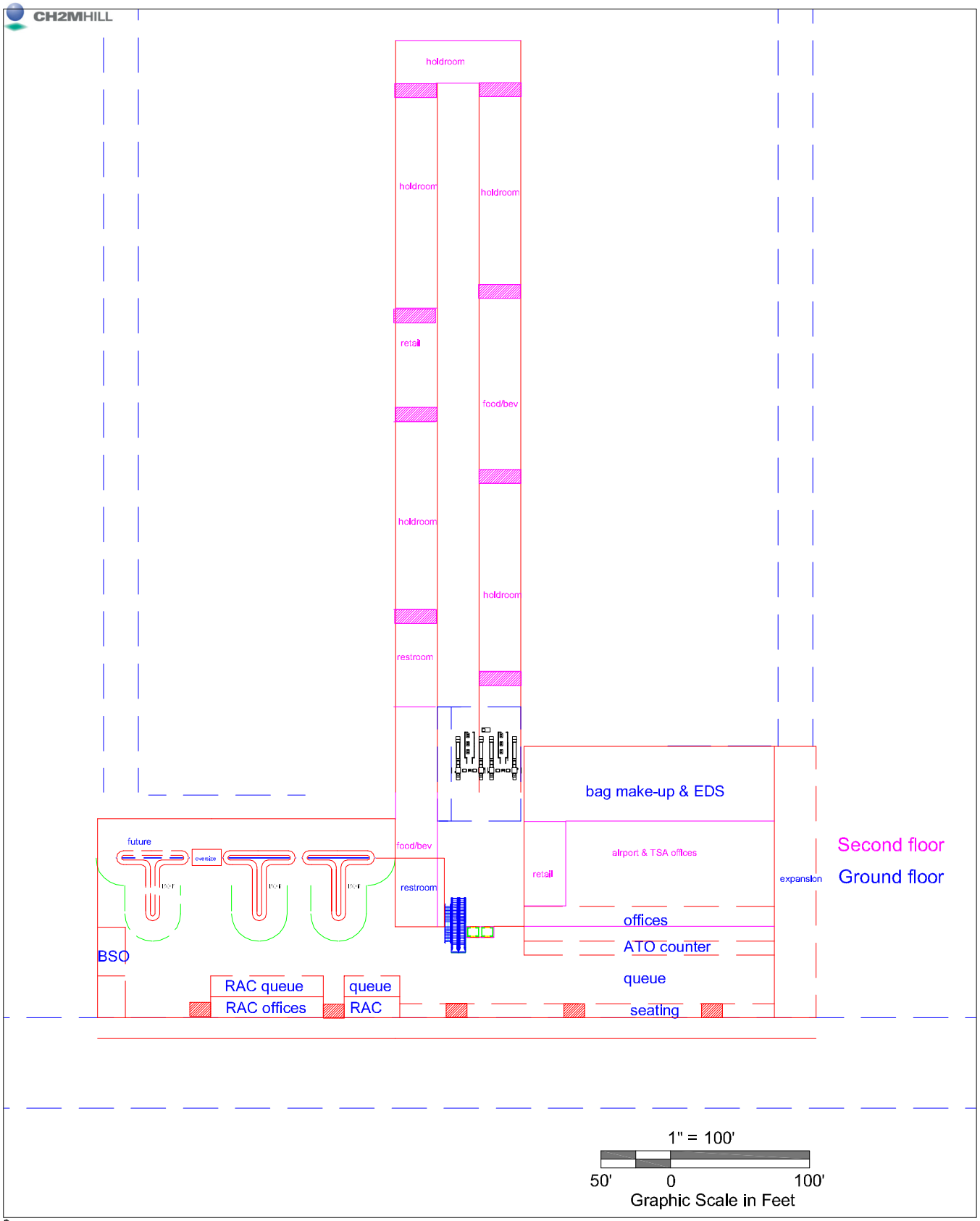
Prepared by:

CH2MHILL



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Missoula Airport Master Plan Update

Alternative 3 Interior

Exhibit

5-13

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5.2.5 Evaluation of Alternatives

The evaluation of these alternatives has been based on seven key areas:

- Ability to meet forecast facilities requirements for gates, terminal, and landside.
- Aircraft maneuvering and ramp operations.
- Passenger level of service (flow, wayfinding/orientation, and walking distances).
- Ability to be phased incrementally.
- Phasing of construction and ability to continue operations construction.
- General Capital Cost and operational cost.
- Long-term suitability to meet demands beyond the Master Plan timeframe (2028).

Ability to meet forecast facilities requirements for gates, terminal and landside

All of the alternatives would have similar curb locations and could achieve similar amounts of passenger, rental car, and employee parking. Differences would be in terms of gate and terminal capacities.

Alt. 1 — Limited to 6 gates (2013 forecast demand). Ticket counters, airline offices, operations, and baggage handling would be in proportion to the 2013 requirements, but could be expanded. Baggage claim could meet 2028 requirements.

Alt 1A — 8 gates (2028 forecast demand). Ticket counters, airline offices, operations and baggage handling would also meet 2028 requirements. Baggage claim could meet 2028 requirements.

Alt 2 — 9 gates (2028 high forecast demand). Ticket counters, airline offices, operations and baggage handling would also meet 2028 high requirements. Baggage claim could meet 2028 (and possibly 2028 high) requirements depending on configuration and additional study.

Alt 3 — 9 gates (2028 high forecast demand). All facilities would meet 2028 high requirements.

Aircraft maneuvering and ramp operations

All of the alternatives are shown with a 25-foot wingtip clearances. Adequate ramp space is shown for all gates to accommodate ground service equipment staging and maneuvering. Differences would be in terms of percent of gates with loading bridge potential, and push-back vs. power-out.

Alt. 1 — Most similar to existing conditions. All push-back gates. All gates can have loading bridges if Gate #3 is modified.

Alt 1A — Similar to existing conditions. All push-back gates. All gates can have loading bridges if Gate #3 is modified.

Alt 2 New double loaded pier allows potential for power-out operations by smaller aircraft from the outer east side gates. All gates can have loading bridges.

Alt 3 New double loaded pier allows potential for power-out operations by smaller aircraft from all gates. All gates can have loading bridges.

Passenger level of service (flow, wayfinding/orientation, and walking distances)

Maximum walking distances were estimated based on following the most direct path based on the concept plans. For departing passengers this is from the furthest end of the ticket counter to the entry of the loading bridge of the furthest gate. For arriving passengers it is the distance from the loading bridge to the first bag claim unit.

Alt 1 Maximum departing distance is approximately 670 feet for departures and 490 feet for arrivals. For departing passengers this does not include the additional level change for passengers using the ground level holdroom for Gate #5.

Departing passenger flow is not very direct and wayfinding is poor involving back-tracking to and from the new SSCP addition. The flow also does not expose the passengers to the landside food/beverage concession.

Arriving passenger flow also is not very direct and requires passengers to make a number of turns in the terminal to reach the claim area.

At this time there are no escalators to or from the second level. The ability to retrofit these would have a significant impact on the level of service.

Alt 1A Maximum departing distance is approximately 720 feet for departures and 560 feet for arrivals. For departing passengers this does not include the additional level change for passengers using the ground level holdroom for Gate #5.

Departing passenger flow is not very direct and wayfinding is poor involving back-tracking to and from the new SSCP addition. The flow also does not expose the passengers to the landside food/beverage concession.

Arriving passenger flow also is not very direct and requires passengers to make a number of turns in the terminal to reach the claim area.

At this time there are no escalators to or from the second level. The ability to retrofit these would have a significant impact on the level of service.

Alt 2 Maximum departing distance (for 8 gates) is approximately 870 feet for departures and 650 feet for arrivals.

Departing passenger flow is direct and wayfinding to the new SSCP addition should be good. The degree to which the flow exposes the passengers to the landside concessions would depend on how well these can be integrated into either the new ticketing building or the SSCP addition.

Arriving passenger flow also reasonably direct to reach the claim area. After that point, the configuration of the claim area and pathways through the existing columns would determine passenger wayfinding needs.

Escalators and elevators would be provided for level changes in both departing and arriving flows. Elevators are assumed for regional airlines which do not use loading bridges.

Alt 3 Maximum departing distance (for 8 gates) is approximately 820 feet for departures and 710 feet for arrivals.

Departing passenger flow is direct and wayfinding to the gates would require minimal signage. All passengers would be exposed to landside concessions.

Arriving passenger flow direct and requires minimal signage to reach the claim area. Passengers could also exit directly to the curb and parking without going through the bag claim area.

Escalators and elevators would be provided for level changes in both departing and arriving flows. Elevators are assumed for regional airlines which do not use loading bridges.

Ability to be phased incrementally

Incremental phasing considers the ways capacity can be added without fully implementing the alternative. The impacts of construction on operations (with and without incremental phases) is considered separately.

Alt 1 The bump-out portion of the alternative could be developed in two halves: replacement of Gate #1 and replacement of Gate #2. Each half would gain one gate, and allow the associated ticket counters, and airline spaces to be expanded at the same time.

Baggage claim expansion/reconfiguration could proceed independently of the bump-out.

Alt 1A The bump-out portion of the alternative could be developed in two phases: replacement of Gate #1 and replacement of Gate #2. The pier would likely be built to its full length in the first phase, allowing a net gain of one or two gates. When the second phase is completed, the holdrooms and other related spaces would then allow the full number of gates to be activated. The associated ticket counters, and airline spaces could expanded at the same time as each phase.

Baggage claim expansion/reconfiguration could proceed independently of the bump-out.

Alt 2 This alternative is not very adaptable to incremental phasing. It is possible to build a portion of the new ticketing building, but ticketing would then be in two locations. At a minimum, the new concourse would remove both Gates #1 and 2, so the concourse would need to replace these, plus whatever

net increase in gates is required. Gates would then be split between the new concourse and existing Gates #3 and 5 requiring secure concessions in two locations.

Baggage claim would have to remain in the existing location until all ticketing is located in the new portion of the terminal. Thus, incremental expansion/reconfiguration is not practical.

Alt 3 This alternative is not very adaptable to incremental phasing. Since the differences in facilities requirements between the 2013 and 2028 forecast activity levels are relatively small (except for gates), it is probably not cost effective to build, say 130 feet of the ticketing building width for 2013 and then expand it by 30 feet later for 2028. Building a shorter concourse initially (6-7 gates) and then extending it later (to 8-9 gates) is, however, reasonable incremental phasing.

Phasing of construction and continuing to operate during construction

Airports must continue to operate during construction. Some projects can be built in ways which minimize disruption, or optimally have no impact on daily operations. Other types of project phasing require temporary replacement of existing facilities, or a reduction in capacity during construction.

Alt 1 Implementing this alternative would have large impacts on airline operations. It is likely that it would be constructed in two phases: replacement of Gate #1 and replacement of Gate #2. The order is not significant at this level of analysis since each has similar impacts, but it is likely that Gate #1 would be replaced first to provide the direct connection to the SSCP in the first phase.

The first phase would remove an existing loading bridge gate, and build half of the bump-out directly adjacent to the outbound baggage rooms of two airlines. This would require temporary ground loading of that aircraft and routing of baggage tugs through or around the construction zone. When completed, the ticket counters could be reconfigured to take advantage of the new operations and office spaces.

The second phase would remove the second existing gate, but with the additional gate from phase 1 there would be no further reduction in loading bridge gate capacity.

If a common use baggage systems (or at least shared on a temporary basis), one or both airlines from phase 2 can temporarily share ATO and other space with the phase 1 airlines while their old space is expanded and the ticket counters reconfigured. This might involve multiple small phases and temporary moves.

At the end of the second major phase, the bump-out would be completed with the full number of gates.

The baggage claim expansion can be phased independently. Disruption would primarily be relocating the ARRF building. Baggage claim would also likely be in two phases. The first phase would expand the building. The second phase would deactivate and then reconfigure/expand the smaller claim unit.

Not included in this analysis is the unknown amount of operational impacts of modernizing other existing terminal systems.

Alt 1A Implementing this alternative would have large impacts on airline operations. It is likely that it would be constructed in two phases: replacement of Gate #1 and replacement of Gate #2. The order is not significant at this level of analysis since each has similar impacts, but it is likely that Gate #1 would be replaced first to provide the direct connection to the SSCP in the first phase.

The first phase would remove an existing loading bridge gate, build approximately 60 percent of the bump-out directly adjacent to the outbound baggage rooms of two airlines, and most, if not all of the pier. This would require temporary ground loading of that aircraft and routing of baggage tugs through or around the construction zone. When completed, the ticket counters could be reconfigured to take advantage of the new operations and office spaces. There would be a net gain of one or two gates depending on the balance of holdrooms to gates in the first phase.

The second phase would remove the second existing gate, but with the additional gates from phase 1 there would be no further reduction in loading bridge gate capacity from current conditions.

If a common use baggage systems (or at least shared on a temporary basis), one or both airlines from phase 2 can temporarily share ATO and other space with the phase 1 airlines while their old space is expanded and the ticket counters reconfigured. This might involve multiple small phases and temporary moves.

At the end of the second major phase, the bump-out would be completed with the full number of gates.

The baggage claim expansion can be phased independently. Disruption would primarily be relocating the ARRF building. Baggage claim would also likely be in two phases. The first phase would expand the building. The second phase would deactivate and then reconfigure/expand the smaller claim unit.

Not included in this analysis is the unknown amount of operational impacts of modernizing other existing terminal systems.

Alt 2 Implementing this alternative would have moderate impacts on airline operations as compared to Alternatives 1 and 1A. It is likely that it would be constructed in two major phases: construction of the new ticketing building

and concourse; and relocation of the baggage claim within the existing terminal building.

The first phase would construct the new ticketing building and concourse, and the connection to the existing SSCP addition. The ticketing building can be built without disruption to existing operations. However, the concourse site would remove Gate #1, and require a different lead-in for Gate #2. The concourse could be built to less than its final length, depending on the number of gates required at the time of construction. Initially, the west side of the concourse and the southern end of the east side would become active to allow the apron adjacent to the existing terminal to be repaved and possibly re-graded.

At the completion of phase 1, all of the ticketing and baggage make-up functions would transfer to the new building, and the gates to the new concourse. Baggage claim and rental car counters would remain in its existing location with a temporary exit through the SSCP and a marked passenger route through the existing terminal.

The second phase would clear existing uses from the western portion of the existing terminal and renovate that area for baggage claim, rental car counters and restrooms. The arriving passenger connection from the concourse would also be constructed. It is likely that the passenger flow through the renovation area would be changed one or more times during the renovation. When completed, the existing baggage claim area would be abandoned.

Not included in this analysis is the unknown amount of operational impacts of modernizing other existing terminal systems required to accommodate the baggage claim renovation area.

Alt 3 Implementing this alternative would have little to no impact on airline operations or gates. The new terminal is physically separate from the existing terminal, and the construction zone sufficiently far from the existing terminal to not require any gates to be deactivated. Depending on the sub-phases for apron paving, lead in lines for Gates #1, and possibly #2, may have to be re-aligned.

The alternative would be constructed in a single phase. At the end of the construction, all terminal functions would be transferred to the new building in an "overnight" move. Unless there are some significant apron transition issues along the east side of the new concourse, all gates would be available on opening day.

Any changes to the existing terminal for possible re-use would occur after the relocation and have no impact on terminal operations.

Costs - Capital (General) and Operational (Assessment)

At the Master Plan level of analysis, general capital costs are made at a high level in terms of gross square feet of terminal, square yards of apron, etc. Costs associated with temporary

airline relocations and renovation of existing spaces are more difficult to estimate without more detailed study, but general estimates can be made. Alternatives which continue to use the existing terminal also will incur building system upgrading costs which cannot be estimated at this time.

Table 5-1 summarizes the major capital cost components for each alternative, and lists the presently unknown costs which also must be considered. Care should be taken in using this table as each alternative may deliver different numbers of gates and have fewer or more unknown costs.

TABLE 5-1

Master Plan Terminal Alternatives Construction Cost Comparisons

Alternative 1 (6 gates)	**Quantity**	**Units**	**$/unit**	**Cost**
New Terminal Area 1/	30,750	SF	500	15,375,000
Renovated Public Areas (high level finishes)	9,200	SF	400	3,680,000
Renovated Operations Areas (low level finishes)	8,000	SF	300	2,400,000
Additional Loading Bridges	2	each	500,000	1,000,000
Bag Claim Conveyors	180	LF	1,800	324,000
Airline Temporary Relocation Costs				
Per Gate	0	each	100,000	0
Per Airline	2	each	50,000	100,000
New Aircraft Apron	4,374	SY	150	656,100
Existing Terminal Bldg Systems Upgrading	1	L.S.	unknown	0
Demolition of ARFF Building	1	L.S.	97,200	97,200
Replace ARFF Building	1	L.S.	450,000	450,000
Curb, road, and parking realignment	N/A	LF	N/A	N/A
subtotal				$24,082,300
Contingency (remodel)	25%			$1,520,000
Contingency (new)	15%			$2,700,345
Soft Costs : design & P.M.	15%			3,612,000
Total Project Cost Estimate				**$31,914,645**
Average Cost/gate	**6**	**gates**		**$5,319,000**

Alternative 1A (8 gates)	**Quantity**	**Units**	**$/unit**	**Cost**
New Terminal Area	43,350	SF	500	21,675,000
Renovated Public Areas (high level finishes)	9,200	SF	400	3,680,000
Renovated Operations Areas (low level finishes)	8,000	SF	300	2,400,000
Additional Loading Bridges	4	each	500,000	2,000,000
Bag Claim Conveyors	180	LF	1,800	324,000
Airline Temporary Relocation Costs				
Per Gate	2	each	100,000	0
Per Airline	2	each	50,000	100,000
New Aircraft Apron	4,374	SY	150	656,100
Existing Terminal Bldg Systems Upgrading	1	L.S.	unknown	0
Demolition of ARFF Building	1	L.S.	97,200	97,200
Replace ARFF Building	1	L.S.	450,000	450,000
Curb, road, and parking realignment	N/A	LF	N/A	N/A
subtotal				$31,382,300
Contingency (remodel)	25%			$1,520,000
Contingency (new)	15%			$3,795,345

TABLE 5-1

Master Plan Terminal Alternatives Construction Cost Comparisons

Soft Costs : design & P.M.	15%			4,707,000
Total Project Cost Estimate				**$41,404,645**
Average Cost/gate	**8**	**gates**		**$5,176,000**

Alternative 2 (8 gates)	**Quantity**	**Units**	**$/unit**	**Cost**
New Terminal Area	117,000	SF	500	58,500,000
Renovated Public Areas (high level finishes)	21,000	SF	400	8,400,000
Renovated Operations Areas (low level finishes)	3,500	SF	300	1,050,000
Additional Loading Bridges	5	each	500,000	2,500,000
Bag Claim Conveyors	360	LF	1,800	648,000
Airline Temporary Relocation Costs				
Per Gate	N/A	each	100,000	N/A
Per Airline	N/A	each	50,000	N/A
New Aircraft Apron	43,246	SY	150	6,486,900
Existing Terminal Bldg Systems Upgrading	1	L.S.	unknown	0
Demolition and replacement of ARRF bldg	N/A	L.S.	N/A	N/A
Curb, road, and parking realignment	N/A	LF	N/A	0
subtotal				$77,584,900
Contingency (remodel)	25%			$2,362,500
Contingency (new)	15%			$10,220,235
Soft Costs : design & P.M.	15%			11,638,000
Total Project Cost Estimate				**$101,805,635**
Average Cost/gate	**8**	**gates**		**$12,726,000**

Alternative 3 (8 gates)	**Quantity**	**Units**	**$/unit**	**Cost**
New Terminal Area (based on Program for 8 gates)	156,400	SF	500	78,200,000
Renovated Public Areas (high level finishes)	N/A	SF	400	N/A
Renovated Operations Areas (low level finishes)	N/A	SF	300	N/A
Additional Loading Bridges	5	each	500,000	2,500,000
Bag Claim Conveyors	incl. above	LF	1,800	N/A
Airline Temporary Relocation Costs				
Per Gate	N/A	each	100,000	N/A
Per Airline	N/A	each	50,000	N/A
New Aircraft Apron	43,246	SY	150	6,486,900
Existing Terminal Bldg Systems Upgrading	N/A	L.S.	N/A	N/A
Demolition and replacement of ARRF bldg	N/A	L.S.	N/A	N/A
Curb, road, and parking realignment	850	LF	18	15,300
subtotal				$87,202,200
Contingency (remodel)	25%			$0
Contingency (new)	15%			$13,080,330
Soft Costs : design & P.M.	15%			13,080,000
Total Project Cost Estimate				**$113,362,530**
Average Cost/gate	**8**	**gates**		**$14,170,000**

1/ Does not include movable furnishings.

2/ Site work around the building is costed under a separate contract.

3/ Does not include clearing, grubbing, grading, landscaping, signage, striping, or lighting.

TABLE 5-1
Master Plan Terminal Alternatives Construction Cost Comparisons
TBD - Estimates will be provided with final deliverable.
Prepared by: CH2M HILL, 2008.

Long-term suitability to meet demands beyond the Master Plan time frame (2028)

Although the Master Plan has a 20 year time horizon, and considers Base and High Forecasts, prudent planning should also look to potentials beyond the forecast period. In Section 5.1, it was recommended that the midfield site be preserved for potential long-term development. However, the longer range potential of the selected development option for the existing terminal area should also consider its potential to expand beyond the 20 year forecast since a considerable investment may be made.

Alt 1 This alternative has no expansion potential beyond the 6 gates.

Alt 1A The alternative could possibly be expanded beyond eight gates by extending the pier and the bump-out to provide additional airline support space and holdrooms. Baggage claim could also be expanded to the east. Walking distances would become much longer.

Alt 2 The alternative could be expanded for all functions except bag claim. It is questionable if the existing terminal could accommodate a third baggage claim without more structural modifications to the building.

Alt 3 This alternative could be expanded for all functions without impacts to ongoing operations.

5.2.6 Evaluation Summary

Alternative 1 is the most limited in terms of capacity and has a high level of disruption during construction, but can be expanded incrementally. Ultimately, the passenger level of service, while better, is not that much improved over what exists today.

Alternative 1A would have similar disruptions and level of service as Alternative 1, but has expansion capacity to the 2028 Master Plan forecast level. Capital costs per additional gate are relatively low (and less than Alternative 1). Upgrading and O&M costs for maintaining the existing building are not well understood at this time.

Alternative 2 is not seen as a good option compared to the others. Capital costs are high and the time to implement would be longer than Alternative 3 due to the conversion of existing terminal space to new uses. The end result would not produce a terminal with as high a passenger level of service or long-term flexibility.

Alternative 3 is has the most advantages in terms of the Airport's long-term future. It is also the most expensive to build (since all functions would relocate to new space), but may be less expensive to operate. The Alternative also cannot be implemented in a phased manner.

A midfield terminal is not a feasible terminal expansion option because the new parallel runway is outside of the 20-year planning period. The midfield site should be preserved for its long-term potential as a terminal if needed. Siting of the relocated ATCT should consider a potential terminal to allow this future development.

5.2.7 Preferred Terminal Development

A purpose of long-range planning is to reserve all feasible options and avoid constructing a facility that would impede expansion opportunity in the future. Additionally, the intent of the MCAA is to maintain and enhance a high level of customer service, while maintaining a low cost per enplanement (CPE). **Exhibit 5-14** illustrates the range of potential industry scenarios that impact the terminal decision-making process, including high growth to low growth scenarios. This exhibit shows that the decision for future terminal development is influenced by many unknown factors in the industry, such as a new airline entering or exiting the MSO market, or the consolidation of airlines, or a change in airport fleet mixes. As shown, Alternatives 1 and 1A are viable solutions to most industry scenarios.

At MSO, the cost of upgrading the existing terminal versus the construction of a new terminal is also a deciding factor for long-term development. As shown in **Exhibit 5-15,** the flow chart differentiates between the cost of building expansion and renovation. As recommended, if the cost of renovating the existing terminal requires more than the MCAA is willing to spend on renovation and preservation of the existing terminal, the MCAA should consider the construction of a new terminal. Assuming the cost of repairs and upgrades to the existing terminal are significant, the Airport is faced with a major decision. The acceptance of the relatively lower initial cost and incremental phasing of Alternative 1A could commit the Airport's financial resources to the existing terminal, and possibly preclude the adoption of Alternative 3. A midfield site can not be justified during the planning period and, therefore, is not considered. In the uncertain air service environment, once sufficient investment is commenced on Alternative 1A, the level of political and fiscal involvement the airport is willing to spend in the terminal prior to "walking away" from that investment should be determined before locking into the existing building for the next 20 years.

Possible Implementation Strategy – Alternative 1(-)

If the costs to re-life the existing terminal for the long-term are high, but continuing with existing systems is acceptable for the next 5-8 years, there may be a two step approach to phasing and decision-making. This is referred to as Alt 1(-), and is illustrated in **Exhibit 5-16**.

Phase 1. To accommodate new air service entrants and add or improve 1 to 2 gates, some less extensive improvements can be made to provide the terminal with more operational and passenger space.

- Gates can be added by re-configuring aircraft parking with fixed walkways and dual bridges similar to the Alt 1/1A concept for Gate #3. This could occur at both Gates 2 and 3. If the aircraft expected to use these gates are in the large RJ seating capacity (70-

90 seats), the existing holdroom could have adequate capacity, although concessions would still require some expansion.

- A shed-type, single story structure could be added as an addition to the terminal onto the apron to allow for a reconfiguration of the baggage make-up area and relocation of EDS equipment out of the lobby. This would also likely require changes to Gate #1 or 2. However, it is also recommended that Gate #2 be reconfigured so as to leave the area around Gate #1 prepared for potential Phase 2 improvements.
- If sufficient space is provided in the shed expansion for some ATO offices, the ATO counter may be reconfigured to provide additional check-in positions.
- Improvements to the baggage claim system, particularly at the bag drop area, would not be ideal due to the impact the renovations would have upon the ARFF building.

Phase 2. After approximately 5 years, the Airport's traffic growth and over-all financial position can be re-evaluated to determine if a new terminal is the best option, or whether the full commitment to remaining in the existing terminal should be made.

- If the shed expansion in Phase 1 does not take more than half the apron frontage, then the initial construction phase of Alt 1A could occur in the other half of the apron to minimize the disruption of airline operations.
- If the decision to commit to a new terminal is made, the SSCP addition would have had 8-10 years of use (before the new terminal is operational) and the Phase 1 investments to be abandoned would be limited.

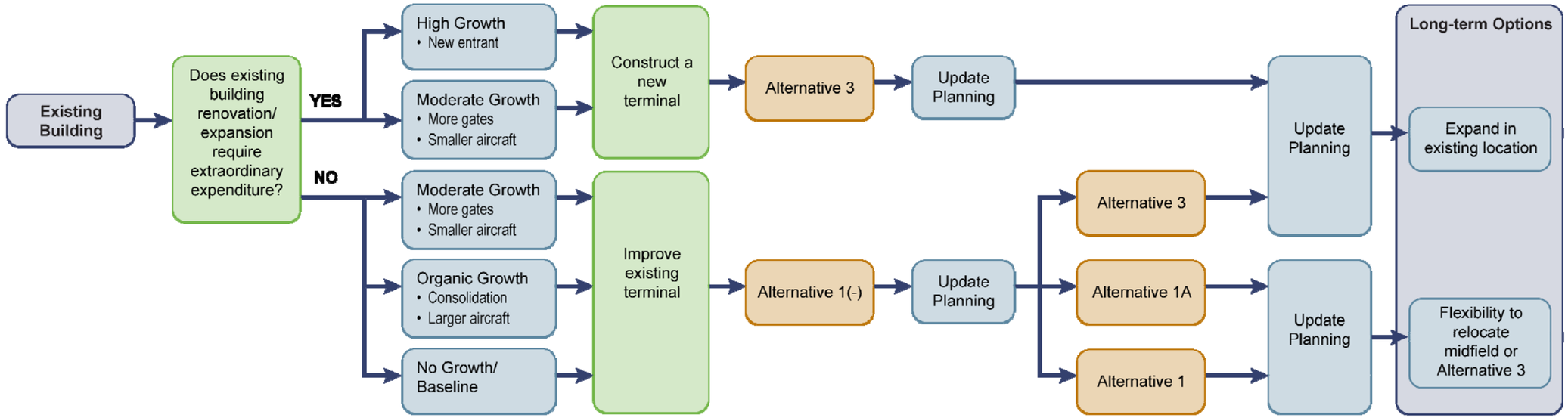
Terminal Decision Path Forward

Due to the unknown future industry scenarios, the path forward for terminal development is presented in **Exhibit 5-17**. As a first step, it is recommended that MCAA conduct a complete building conditions analysis to determine the ability and cost to upgrade the existing terminal systems. Providing the systems are able to support additions to the terminal, investment in the existing terminal for the near-term years is recommended. Alternative 1(-) allows the decision to renovate or rebuild to be postponed for 5 to 8 more years. Beyond this phasing alternative, Alternatives 1 and 1A provide the airport the ability to function in the existing terminal even longer, while providing greater leverage to respond to industry unknowns. By investing in the existing terminal, all long-term options remain available.

EXHIBIT 5-14
Potential Industry Scenarios

Growth Rates IF:	Potential Industry Scenarios SUCH AS:	Facility Shortfalls EFFECT ON EXISTING FACILITIES:	What Alternatives Work with the Scenario THEN IMPLEMENT:	What Alternatives Do Not Work with the Scenario DO NOT IMPLEMENT:
High Growth	**New Entrants**	• Ticket counter • Ticket lobby • Baggage claim unit • Baggage offload • Airline operations area • Secure concessions • Hold rooms • Security	**Alternative 3** • Provides most long-term flexibility • Better building layout than existing terminal • Highest level of customer service **Alternative 2** • Provides some long-term flexibility • Uses existing terminal • More disruptive than Alternative 3	**Alternative 1** • Capacity shortfall in gates, baggage handling area, airline operations area, holding room, etc. • Significant disruption of airline operations during construction **Alternative 1A** • Capacity shortfall in gates, baggage handling area, airline operations area, holding room, etc. • Significant disruption of airline operations during construction
Moderate Growth	**Smaller Aircraft**	• Number of gates • Baggage claim units • Baggage offload • Airline operations area • Secure concessions	**Alternative 1** • Fulfills maximum expansion requirements • Provides an increase in the number of gates • No expanson potential beyond the six gates **Alternative 1A** • Provides a small increase in passenger LOG • Fulfills minimum expansion requirements, and • Provides an increase in the number of gates to 2028 • Implementation can be phased	**Alternative 3** • Creates excess space above demand, including gates • Highest capital costs • Cannot be implemented in phases **Alternative 2** • Creates excess space above demand, including gates • Highest capital costs • Longest implementation time • High O&M costs • Baggage claim limited long-term • High level of passenger disruption • Reuse of current building
***Organic* Growth**	**Consolidation**	• Baggage claim units • Baggage offload • Airline operations area • Secure concessions	**Alternative 1** • Fulfills minimum expansion requirements • Does not create unusable terminal area	**Alternative 3** • Creates excess space above demand, including gates • Highest capital costs • Cannot be implemented in phases **Alternative 2** • Creates excess space above demand, including gates • High capital costs • Longest implementation time • High O&M costs • Baggage claim limited in long-term • High level of passenger disruption • Reuse of current building **Alternative 1A** • Constructs excess gates above demand • Significant disruption of airline operations during construction
	Larger Aircraft	• Ticket counter • Baggage claim units • Baggage offload • Airline operations area • Secure concessions • Hold rooms • Security	**Alternative 1** • Fulfills minimum expansion requirements • Provides an increase in the number of gates • No expansion potential beyond the six gates	**Alternative 3** • Creates excess space above demand, including gates • Highest capital costs • Cannot be implemented in phases **Alternative 2** • Creates excess space above demand, including gates • High capital costs • Longest implementation time • High O&M costs • Baggage claim limited in long-term • High level of passenger disruption • Reuse of current building **Alternative 1A** • Constructs excess gates above demand • Significant disruption of airline operations during construction
No Growth/ Baseline	**Loss of Carrier (assumed temporary)** **No Change/ Existing Conditions**	• Baggage claim units • Baggage offload • Airline operations area • Secure concessions	**Alternative 1** • Fulfills minimum expansion requirements • Does not create unuseable terminal area	**Alternative 3** • Creates excess space above demand, including gates **Alternative 2** • Creates excess space above demand, including gates • High level of passenger disruption • Reuse of current building **Alternative 1A** • Constructs excess gates above demand • Significant disruption of airline operations during construction

EXHIBIT 5-15
Terminal Decision Flow Chart



LEGEND

EXISTING TERMINAL

PROPOSED TERMINAL

PROPOSED PAVEMENT

TRUE NORTH

1" = 300'

150 0 300

File: P:\Airports\MSO-Missoula\CAD\MPU_EXHIBITS\MASTERPLAN\Chapter5_TerminalAlternatives\Terminal Alternative 1.dwg

CH2MHILL

Missoula International Airport Master Plan Update

Terminal Alternative 1 (-)

Exhibit 5-16

LwDefault: 0.004 Colortable: CH2M COLOR BY LWT.ctb LTScale: 1.0000 Last Saved: 10/22/2008 5:06 PM Plotted On: 10/24/2008 10:11 AM

EXHIBIT 5-17
Terminal Path Forward