CHAPTER 5: AIRPORT DEVELOPMENT ALTERNATIVES

Introduction

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Grand Forks International Airport (GFK). The objective of this chapter is to clearly document the recommended airport development that meets the needs of airport users, as well as the strategic vision of the Grand Forks Regional Airport Authority.

Alternatives evaluated for this study are based on comparing existing conditions with demand/facility requirements reviewed in detail in the previous chapters. Potential impacts of each alternative considered are discussed and used to help the airport select a preferred alternative(s) to be shown on the Airport Layout Plan.

Alternatives outlined are split into functional facility areas:

- Airfield Facilities
- Passenger Terminal Complex
- Air Cargo
- General Aviation
- Landside Facilities
- Support & Other Facilities

A Preferred Development Strategy based on the preferred alternatives is summarized at the end of this chapter. This preliminary plan provides a guideline for implementation based on identified needs and priorities. The detailed plan to implement the preferred alternative(s) is discussed in **Chapter 6: Implementation & Compatibility**.

Evaluation Process

Steps

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to the latest information and input. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* identifies an alternatives analysis process to progressively screen alternatives to identify a recommended development plan. The process includes these steps:

1. **Identify** the functional airport elements that will be analyzed as primary and secondary elements. Include a "no action" alternative for comparative purposes.
2. **Evaluate** each alternative in an initial screening process to determine the ability for each to meet basic objectives. Criteria used to evaluate alternatives include operational performance, best planning tenets, environmental and fiscal factors. No weighting factors were used through the evaluation process because weighting factors by their nature create a bias, and impedes the ability to truly consider the complexities of planning decisions.
3. **Select** preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. Preferred alternatives are combined into a single recommended alternative with refinements made as needed.

Review & Approval

The alternatives evaluation process is the most collaborative portion of the master plan study. The alternatives were reviewed and refined through meetings with Authority staff, agency representatives

and the study's focus groups. The preferred alternatives were presented to the public for review and comment at a public open house held on [DATE]. The recommended alternative was presented and approved by the Grand Forks Regional Airport Authority Board on [DATE].

Evaluation Criteria

Evaluation criteria is developed to determine the relative strength and weaknesses of the alternatives. FAA AC 150/5070-6B identifies criteria that would be examined in any alternatives evaluation. Using this guidance and local considerations, airport-specific criteria has been formulated. The alternative evaluation criteria utilized for this study is as follows:

Operational Performance

This factor evaluates how well the airport operates as a functional system. These include:

- **Capacity** to meet forecasted activity demands within and beyond the planning horizon
- **Capability** to meet FAA design standards to safely accommodate the critical design aircraft
- **Efficiency** to accommodate alternative elements as a combined airport system

Best Planning Tenets and Other Factors

This factor involves determining the relative strengths and weaknesses of the alternatives. The following tenets are typically considered:

- Conformance to industry best practices for safety and security
- Conforms to the intent of FAA design standards and other guidelines
- Provides for the highest and best on- and off-airport land use
- Allows for forecast growth and growth beyond the planning horizon
- Provides flexibility to react to unforeseen changes
- Conforms to the airport sponsor's strategic vision
- Conforms to appropriate local, regional, and state transportation and other plans
- Technically feasible, constructible, and implementable
- Socially and politically feasible
- Satisfies airport user needs

Environmental Factors

The potential effects of the alternatives upon the natural and built environment is an important consideration. These factors are evaluated early in the process to determine whether alternatives are likely trigger impacts to comply with the National Environmental Policy Act (NEPA), or if additional alternatives need to be considered. The following environmental resource categories applicable to this study include:

- Compatible Land Use
- Section 4(f)
- Fish, Wildlife, and Plants
- Floodplains, Wetlands
- Light Emissions and Visual Effects
- Noise
- Socioeconomic
- Historical and Cultural Resources

Fiscal Factors

A fiscal analysis is necessary to determine if the alternative fits within the financial resources of the airport, as well as potential federal and state funding partners. Preparing rough planning-level development cost estimates is an effective way to compare alternatives. Evaluating the ability for the airport sponsor to finance each alternative is also important as it will provide an indication of the feasibility of proposed development. Fiscal factors to be reviewed in this study include:

- Total Planning-Level Project Cost
- Ability to Receive FAA and/or State funding
- Ability to Fund Local Share

Airfield Development Alternatives

Development alternatives for airfield facilities includes the runways and taxiways. Alternatives organized by proposed actions include:

- Targeted Improvements
- Series "A": Primary Runway 17R-35L
- Series "B": Runway 9L-27R
- Series "C": Capacity-Driven Secondary General Aviation Runway
- Series "D": Other Secondary General Aviation Runways
- Taxiway System

An analysis of development alternatives to accommodate the airfield facility requirements is described in the following sections. A preferred alternative is identified only after all series are evaluated because not all impacts are independent of one another.

Needs Summary

The airfield is vital to the airport's core infrastructure for accommodating aircraft operations. The following section summarizes major airfield facility requirement findings:

- **Primary Runway 17R-35L**
  - Plan for major rehabilitation or reconstruction within the next 6 to 10 years
  - Strengthen runway pavement to accommodate regular use of heavier aircraft (ACN: 51)
  - Meet ARC C-III design standards for the future and ultimate configurations
  - Maintain a runway length between 7,300 and 7,500 feet for the future design aircraft
  - Plan for an ultimate runway extension to 8,000 feet
  - Upgrade Runway 17R approach to achieve lower visibility minimums (3/4 mile)
  - Preserve Runway 35L approach to ultimately accommodate a Category II ILS (1/4 mile)
- **Runway 9L-27R**
  - Enhance runway infrastructure to eliminate converging traffic in east-west flow
  - Extend runway to 6,700 feet for design aircraft fleet (CRJ-900, dry/wet runway)
  - Widen runway to 150 feet for ARC C-III design aircraft greater than 150,000 pounds
  - Strengthen runway to accommodate regular use of heavier aircraft (ACN: 51)
  - Upgrade the Runway 9L approach to achieve lower visibility minimums (3/4 mile)
- **Secondary Runways**
  - Enhance Runway 17L-35R to accommodate instrument approaches (1 mile)
  - Maintain Runway 9R-27L as visual runway for flight training operations
  - Plan for additional capacity-driven visual runway to increase airfield capacity
- **Taxiway System**
  - Maintain a 50-foot wide Taxiway A for future and ultimate TDG-3 design aircraft
  - Upgrade Taxiway B to accommodate regular use of TDG-3 air carrier aircraft
  - Strengthen portions of Taxiway A, B and connector taxiways for the design aircraft fleet (Airbus A320)
  - Construct holding bays and run-up areas to improve overall airfield flow and capacity
  - Remove direct taxiway access from aprons to runways

Targeted Improvements

Regardless of other preferred airside development, the following targeted improvements identified below are recommended to enhance the airfield to meet existing facility requirements.

- Construct bypass taxiways at runway ends and/or holding bays to enhance traffic flow

- Remove/realign direct access taxiways from aprons to runways (Taxiway A3, A4, A5, B1, C1)
- Relocate airfield service road from Runway 9L Object Free Area (OFA)
- Remove natural growth obstructions to Runway 17L-35R Object Free Area (OFA)

Targeted improvements are recommended when existing facilities are planned for reconstruction and/or reach the end of their useful life. See **Figure 5-1** for the No Build scenario with targeted improvements.

Series "A": Primary Runway 17R-35L

RUNWAY CLOSURE MITIGATION OPTIONS

During the initial phase of this study, options were reviewed to address operational mitigation if Runway 17R-35L required a significant closure for reconstruction. This would leave the airport without an air carrier-capable runway. The next longest runway is only 4,206 feet long and cannot safely accommodate scheduled passenger service aircraft. This would result in most large aircraft to cease operations at GFK unless other airfield infrastructure and/or operational improvements are made. Alternatives are explored to address the issue of maintaining air carrier service.

Since the initial analysis was completed, a pavement core analysis showed the runway will likely not require major work for at least another 6-10 years. Further evaluation should be completed in the next 5 years to determine the necessary work scope and runway closure duration.

This Master Plan study evaluated the feasibility of three primary runway closure mitigation frameworks:

No Mitigation

This option would close Runway 17L-35R during major rehabilitation/reconstruction without any on-site mitigation. Local passenger airline service would cease during that time. Airline passengers would be served from alternative airports (e.g. Fargo, Devils Lake, Thief River Falls, Winnipeg).

Advantages:

- No additional direct capital or operating costs to airport

Disadvantages:

- Long-term loss of passenger and business traffic services
- Significant inconvenience to passengers to drive to alternative airport
- Significant loss in revenue to airport and other on-airport businesses
- Risk in permanently losing passengers to competing airports
- Reduced north-south airfield capacity for UND flight training
- Least desirable option to Airport Authority

Mitigate On-Site

This alternative would utilize other airfield infrastructure (existing or new) to maintain air carrier service at GFK while Runway 17R-35L is unavailable during construction. Specific options will be reviewed in the alternatives section, which also may provide long-term solutions to facility requirements. Examples include upgrading Taxiway A for use as a temporary runway.

Advantages:

- Retains air service for existing customers with minimal closures
- Opportunity to correct other infrastructure issues or provide needed enhancements
- Most desirable option for Airport Authority

Disadvantages:

- Highest capital cost to complete work
- Adds project complexity

Mitigate Off-Site

This option proposes to utilize GFAFB to maintain local airline service. Per GFAFB officials, utilizing the main GFAFB apron is no longer an option as security requirements would be immense. Using the southwest "alert" apron was proposed as the security requirements are less demanding. This land is leased to Grand Forks County and managed by Grand Sky Development for Unmanned Aerial Vehicle (UAS) purposes. Grand Sky representatives were open to the possibility of accommodating this traffic. Improvements would need to be made to the site to accommodate passengers and a lease agreement negotiated. Although inconvenient, this is an option to retain air service for the Grand Forks area.

Advantages:

- Retains air service for existing customers
- Lower total cost as compared to on-site mitigation

Disadvantages:

- Additional passenger lead-times required to maintain airline schedules
- Challenging coordination with airlines, TSA, Grand Sky, and Military
- High direct costs to airport to shuttle passengers and equipment to/from GFAFB
- Some lost airport revenue because of reduced demand
- Inconvenient for passengers, which may incentivize them to drive to alternate airports
- Per conversations with TSA, the use of the GFAFB/Grand Sky location while feasible, is not practical. This option would require substantial changes to security protocol, and induce significant delays.

Table 5-1 below summarizes the proposed runway closure mitigation options.

Table 5-1 – GFK Primary Runway Closure Mitigation Options

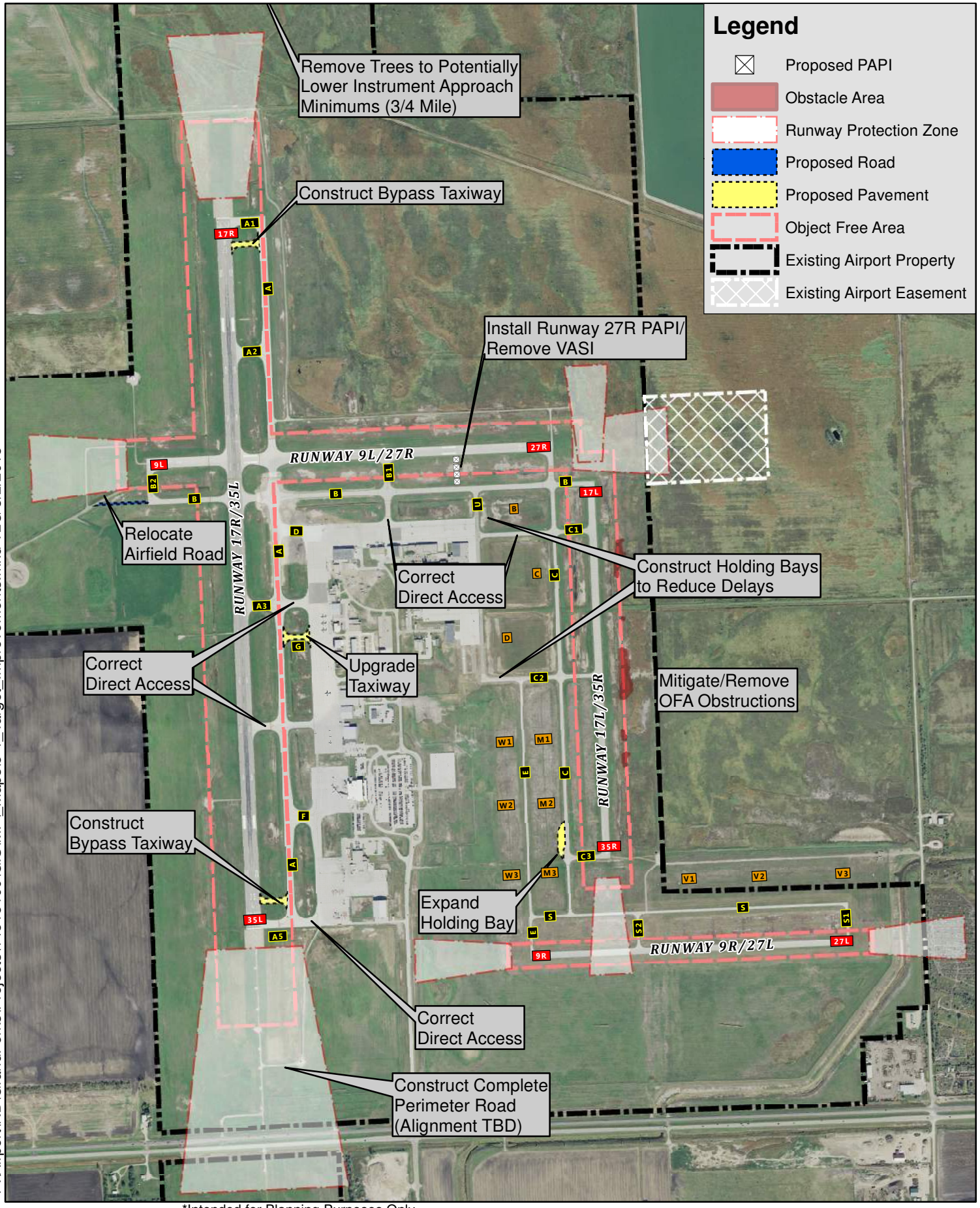
Factor	No Mitigation	On-Site Mitigation	Off-Site Mitigation
Proposed Action(s)	Reconstruct/Close Runway (25-38 weeks)	Reconstruct Runway Other Enhancements	Reconstruct/Close Runway (25-38 weeks), Use GFAFB
Operational Performance	Airline Passengers Use Alternative Airports, Reduced Airfield Capacity	No Change	Passengers Utilize GFK but Additional Time Required to Shuttle Passengers
Safety & Standards	Meets Standards	Meets Standards	Meets Standards
Other Planning Tenets	Does Not Satisfy Other Airport Facility Needs	Satisfies Other Airport Facility Needs	Requires Significant Lead-Times and Coordination
Environmental	No Additional Impacts	Specific Options Require Evaluation	Minimal Additional Impacts
Fiscal*	Add'l Capital Costs: $0 Other Costs: $9.1 million	Add'l Capital Costs: $20 - $40 million ($1-2 million local share) Other Costs: $400,000	Add'l Capital Costs: $0 Other Costs: $9.8 million
Preferred Mitigation Strategy?	**NO**	**YES**	**NO**

** Other costs include loss of revenue, increased operational expenses, and indirect passenger time value cost.*
Source: KLJ Analysis

Recommendation

The preferred option is to seek on-site mitigation for any extended primary closure. The airport sponsor does not want to proceed without mitigation because the impacts to air service are too excessive temporarily and may lead to permanent loss of service. Off-site mitigation is very complex

and would result in a significant inconvenience to the travelling public. On-site mitigation options are costly but would also provide a permanent solution to existing facility deficiencies. Specific on-site mitigation options are evaluated in the subsequent primary runway configuration options.



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*Intended for Planning Purposes Only

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Grand Forks International Airport
Figure 5-1:
Targeted Airfield Improvements

SHORT-TERM RUNWAY ALTERNATIVES

Options are presented below to address the future needs of Runway 17R-35L, which includes maintaining the runway pavement. The recommended runway length is between 7,300 and 7,500 feet depending on specific aircraft performance needs. Each primary runway alternative is described and evaluated below to address the short-term needs through the next 6 to 10 years.

Do Nothing

This "no action" scenario provides a baseline to evaluate options. No action at GFK means the runway section and surface pavement condition will further deteriorate. Pavements would not be maintained to a safe and serviceable condition per FAA requirements. This alternative would result in frequent closures of the runway due to unsafe conditions, costly maintenance, and unplanned temporary suspension of air service. **This alternative is not recommended for further consideration because it does not meet facility requirements for runway length or pavement condition.**

Runway Length Changes

The existing runway length exceeds the minimum future need by 50 feet. Shortening the runway does not provide a savings in capital costs when the movement of ILS navigational aids is factored. Although beneficial for potential new airline service, a 150-foot extension to 7,500 feet would also require the movement of ILS navigational aids on either end of Runway 17R-35L. The cost for a 150-foot runway extension and associated improvements is estimated at $4.8 million. A runway extension to 7,500 feet is also not justified in the short-term in this study. **Maintaining the existing primary runway length is recommended in the short-term for this study.**

Runway Rehabilitation

This alternative evaluates maintaining the existing surface of Runway 17R-35L resulting in minimal closures to air traffic. Although runway rehabilitation (i.e. mill & overlay) would minimize cost and runway downtime, this action does not provide a sustainable long-term solution to address the runway pavement section. This would further delay an inevitable pavement reconstruction.

The development cost to perform a 6" mill & 6" asphalt overlay of Runway 17R-35L is $8.5 million. The runway underwent a mill & overlay in 2001 and was closed for 45 days. The runway closure can be as short as 30 days if 24-hour work is considered. **This alternative is recommended for further consideration at a minimum.**

Runway Reconstruction

This alternative would reconstruct the Runway 17R-35L pavement section in the future resulting in a significant runway closure. This action provides a sustainable solution to address any runway pavement section deficiencies. Options include other mitigation including constructing a new runway alignment or upgrading Taxiway A for use as a temporary runway.

During this planning study, a pavement core analysis revealed that Runway 17R-35L can likely be maintained for at least another 6 to 10 years. Pavement cores and an engineering analysis are recommended in the next 5 years to confirm the action plan. The cost to reconstruct Runway 17R-35L is estimated to be $41 million. **This alternative is recommended for further consideration if the runway section deteriorates in the next five years.**

Preferred Alternative

The preferred future primary runway alternative is to maintain the runway and perform surface rehabilitation, or reconstruction if deemed necessary. The final decision on the future runway rehabilitation will be made after an in-depth engineering analysis is performed in the next five years.

FUTURE RUNWAY ALTERNATIVES

Options are presented below to address the long-term needs of Runway 17R-35L in the 11 to 20-year period. This analysis assumes reconstructing the runway pavement section, which presents an opportunity to explore other runway configurations to improve overall airfield design and maintain operations during construction.

Alternative A1: Existing Runway 17R-35L Alignment

This alternative evaluates reconstructing Runway 17R-35L on its existing alignment and maintaining the existing runway length of 7,350 feet. It does not include any on-site mitigation to accommodate air carrier aircraft when the runway is under construction. The development cost to reconstruct Runway 17L-35R along the existing alignment over a two to three-year period is estimated at $41.0 million. See **Figure 5-2.**

This option assumes a complete runway closure. An option to reconstruct the runway in sections to keep air carrier traffic operational was reviewed, but is not feasible due to the short length remaining.

Advantages:

- Meets future facility requirements (reconstruct Runway 17R-35L, runway length)
- Minimizes project cost by preserving existing infrastructure (e.g. lighting, taxiways)
- No new potentially incompatible land uses in Runway Protection Zones with extension to north

Disadvantages:

- Results in long-term primary runway closure (330 total days over 2-3 years)
- No on-site option to minimize air service disruptions
- Additional passenger time to travel to alternative airports
- Risk of long-term passenger diversion to other competing airports

Alternative A2: Upgrade Taxiway to Temporary Runway

This alternative reconstructs Runway 17R-35L on the existing alignment and utilizes on-site mitigation. Taxiway A is upgraded to be used as a temporary 7,350-foot long and 100-foot wide runway. This action includes widening the taxiway by a total of 25 feet to meet width standards. The cost to reconstruct Taxiway A to meet runway design standards is an additional $18.9 million over the cost to reconstruct Runway 17R-35L. See **Figure 5-3.**

Advantages:

- Meets future facility requirements (reconstruct Runway 17R-35L, minimal runway length)
- Provides on-site option to minimize air service disruptions
- No new potentially incompatible land uses in Runway Protection Zones with extension to north

Disadvantages:

- FAA Modification to Design Standards for the Runway Object Free Area of the design aircraft (Airbus A320) needed to minimize aircraft parking restrictions along aprons.
- Buildings within temporary Runway Visibility Zone, which limits the use of Runway 9L-27R when ATCT is closed
- Additional project cost to upgrade Taxiway A before the end of its useful life for temporary use ($18.9 million)
- Wetland impacts to upgrade Taxiway A safety area for temporary runway use (5.2 acres)

Alternative A3: Upgrade Taxiway to Temporary Runway (Declared Distances)

This alternative is a variation of Alternative A2 to incorporate the use of declared distances along Taxiway A for temporary runway use while Runway 17R-35L is under construction. The adjustment of

available runway lengths is completed to mitigate wetland impacts. The resulting available runway lengths is approximately 6,450 feet in takeoff/landing distance for temporary Runway 35L, and approximately 6,850 feet for temporary Runway 17R. See **Figure 5-4.**

Advantages:

- Meets future facility requirements (reconstruct Runway 17R/35L, minimal runway length)
- Provides on-site option to minimize air service disruptions
- Avoids most wetland impacts of upgrading taxiway to temporary runway (0.2 acres)
- No new potentially incompatible land uses in Runway Protection Zones with extension to north

Disadvantages:

- FAA Modification to Design Standards for the Runway Object Free Area of the design aircraft (Airbus A320) needed to minimize aircraft parking restrictions along aprons.
- Buildings within temporary Runway Visibility Zone, which limits the use of Runway 9L-27R when ATCT is closed
- Use of declared distances is less than existing runway length which will likely have an operational impact on certain flights
- Additional project cost to upgrade Taxiway A before the end of its useful life for temporary use
- Temporary runway length does not meet full facility requirements any may restrict operations

Alternative A4: Construct New Primary Runway Alignment, Convert Old Runway to Taxiway

This alternative proposes constructing a new primary runway (7,300' x 150') aligned 550 feet to the west and parallel of the existing Runway 17R-35L. The distance of separation was based on the dimension of the two RSA's plus an additional 50 feet for construction equipment to complete grading without entering the active runway RSA. This provides sufficient setback to use the existing runway without limitation. The existing Runway 17R-35L would be used during construction, then undergo a mill & overlay to convert into a parallel taxiway. Runway 9L-27R would require an extension of 200 feet to hold multiple aircraft outside of the Runway Safety Area for the new Runway 17R-35L. The total project cost is $72.4 million, an additional $31.4 million over the cost to reconstruct Runway 17L-35R in Alternative A1. See **Figure 5-5.**

Advantages:

- Meets minimal future runway length facility requirements
- Provides on-site option to minimize air service disruptions
- New runway alignment provides additional development opportunities to expand west aprons
- Opportunity to remove U.S. Highway 2 from existing Runway 35L Runway Protection Zone
- Opportunity to extend runway to meet full future facility needs

Disadvantages:

- Additional project cost to construct new runway alignment
- Wetland impacts for new runway alignment (8.6 acres)
- Land acquisition required for new runway alignment (57.5 acres)
- Additional pavement for the airport to maintain
- VOR station and adjacent equipment would need to be relocated or an FAA Modification to Design Standards approved (VOR is 465 feet from new runway centerline, 500 feet required)

Alternative A4 - Interim Build: Construct New Primary Runway Alignment, Remove Old Runway

A variation of Alternative A4, this alternative proposes an interim buildout that utilizes the existing Taxiway A to maximize use of its remaining life. The changes include completely removing old Runway 17R-35L and utilizing existing Taxiway A as a parallel taxiway. The runway-to-taxiway centerline distance increases to 950 feet for the majority of the length. The existing Runway 17R-35L would be used during construction, then removed at the end of the project. The Interim Build project cost is

reduced to $64.7 million. The Interim Build delays the final taxiway buildout and in turn reduces the initial cost by $7.7 million. See **Figure 5-6.** When Taxiway A pavement requires reconstruction the existing taxiway pavement would be removed and rebuilt in the alignment of Alternative A4.

Advantages of Interim Build:

- Reduces overall pavement area by removing existing Runway instead of utilizing as new parallel taxiway, resulting in $7.7 million in project cost savings

Disadvantages of Interim Build:

- Longer taxi times to and from runway
- Time needed for snow removal and maintenance operations increased.

Alternative A4 and the Interim Build will minimize operational impacts with the sequence reducing project costs. They shall proceed for further consideration.

Alternative Impact Summary

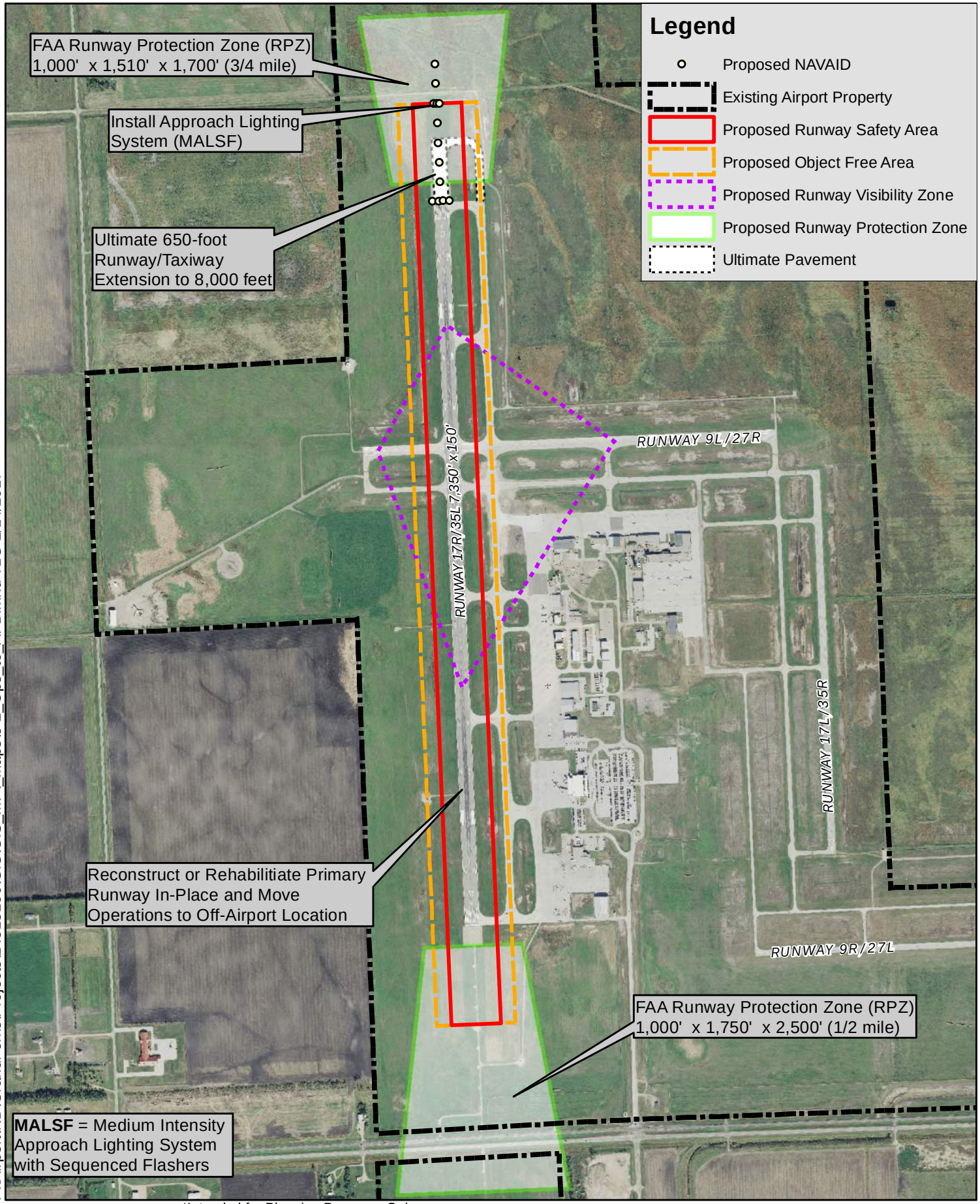
A summary of impacts is depicted in **Table 5-2**. The following alternatives will proceed ahead for further consideration in combination with Series "B" alternatives for Runway 9L-27R:

- Alternative A1: Existing Runway 17R-35L Alignment (7,350 feet or 7,500 feet)
- Alternative A4: Construct New Primary Runway Alignment, Convert Old Runway to Taxiway
- Alternative A4 - Interim Build: Construct New Primary Runway Alignment, Remove Old Runway

The airport sponsor would proceed with Alternative A1 only if on-site mitigation can be accomplished with an improvement to Runway 9L-27R to support air carrier operations. These alternatives are evaluated in Series "B". Alternative A4 would proceed ahead only if improvements to Runway 9L-27R are not addressed, because it provides on-site mitigation at the least cost.

Alternatives A2 and A3 are dismissed by the airport sponsor because the temporary runway adds a significant project cost for temporary use, and/or it also does not meet FAA design standards during construction.

See **Table 5-10** for a full alternatives analysis for Series "A" and "B" alternatives.



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*Intended for Planning Purposes Only

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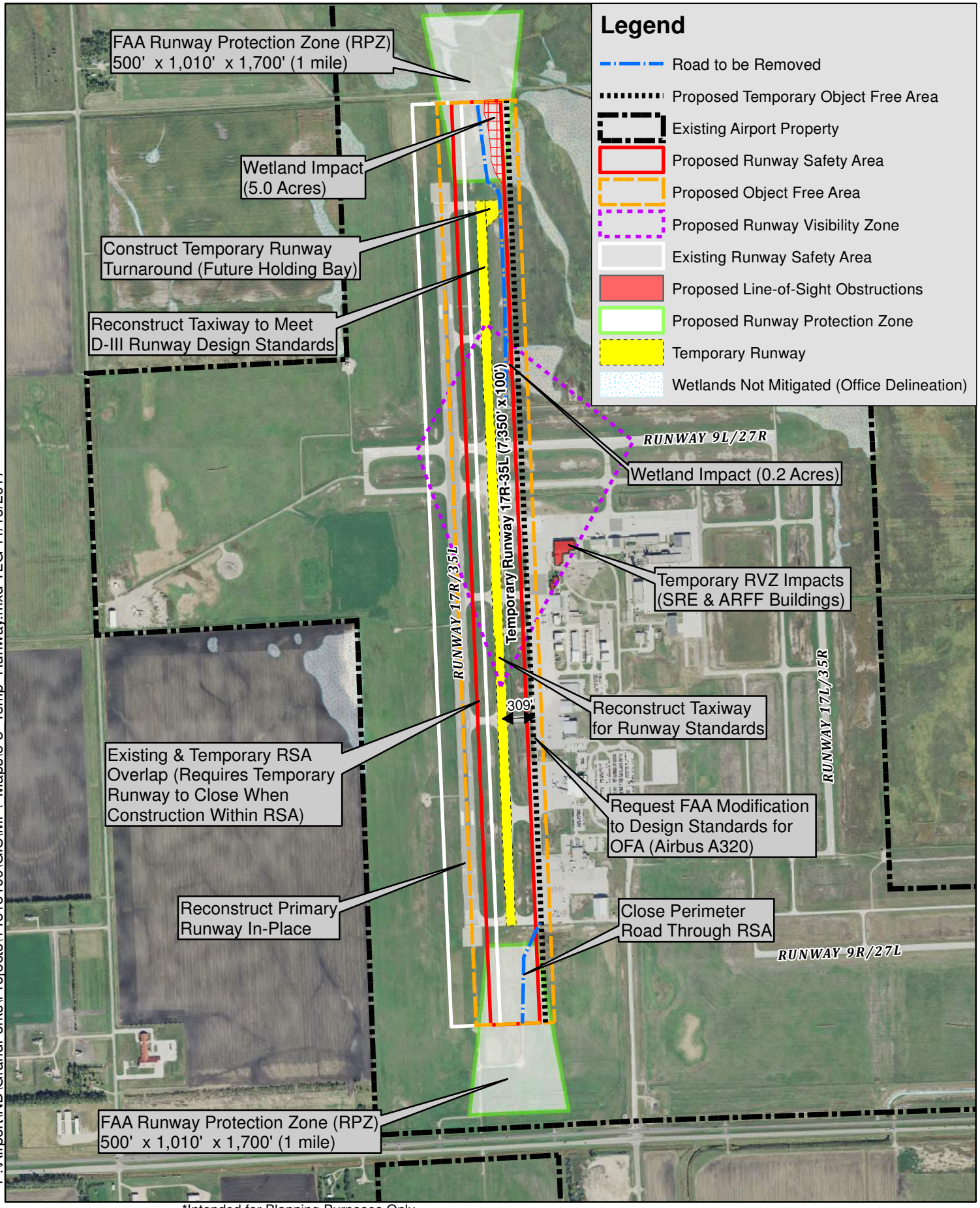
Grand Forks International Airport
Figure 5-2:
Alternative A1 -
Existing 17L/35R Alignment



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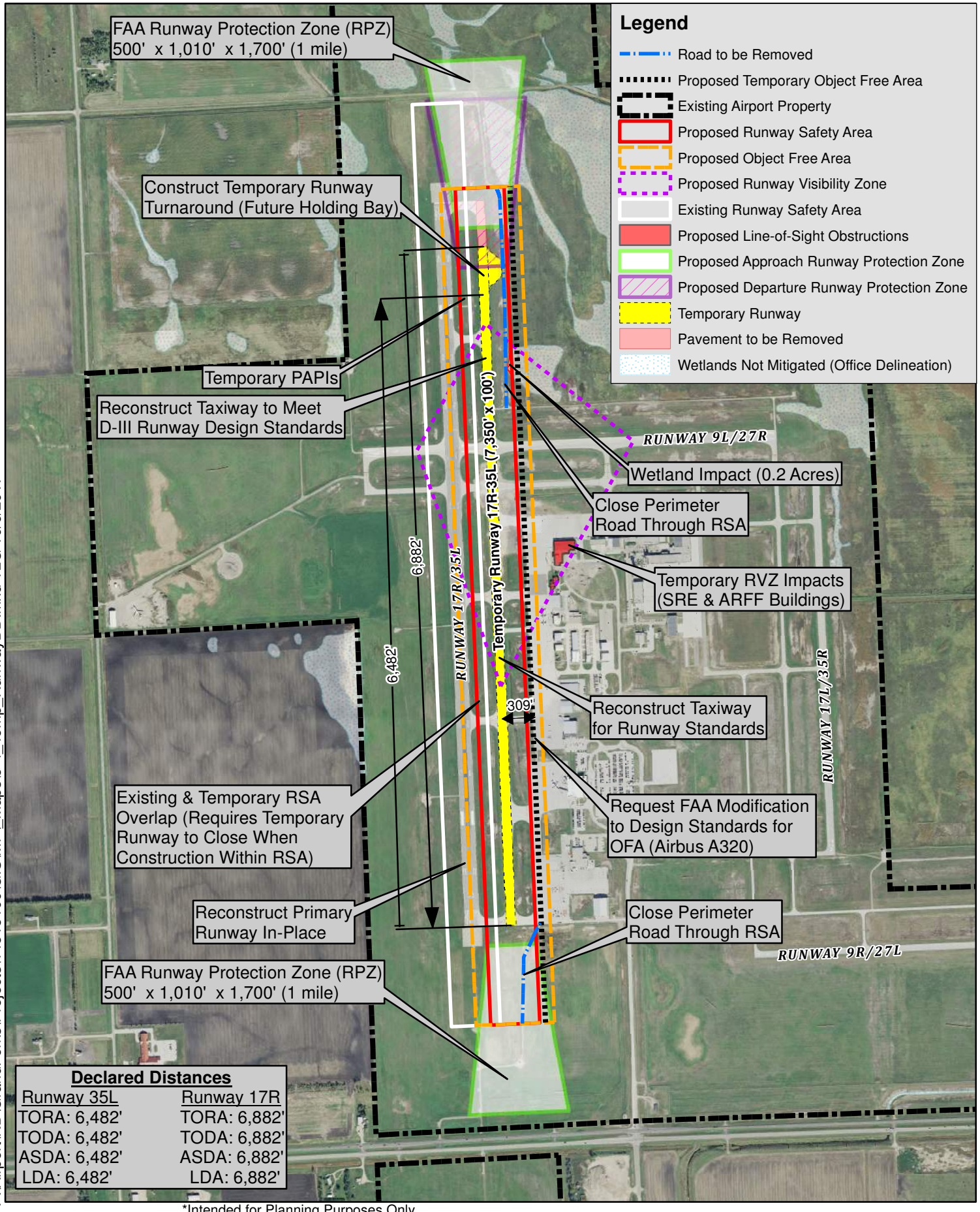
Grand Forks International Airport
Figure 5-3:
Alternative A2 -
Upgrade Taxiway to
Temporary Runway



Declared Distances

Runway 35L	Runway 17R
TORA: 6,482'	TORA: 6,882'
TODA: 6,482'	TODA: 6,882'
ASDA: 6,482'	ASDA: 6,882'
LDA: 6,482'	LDA: 6,882'

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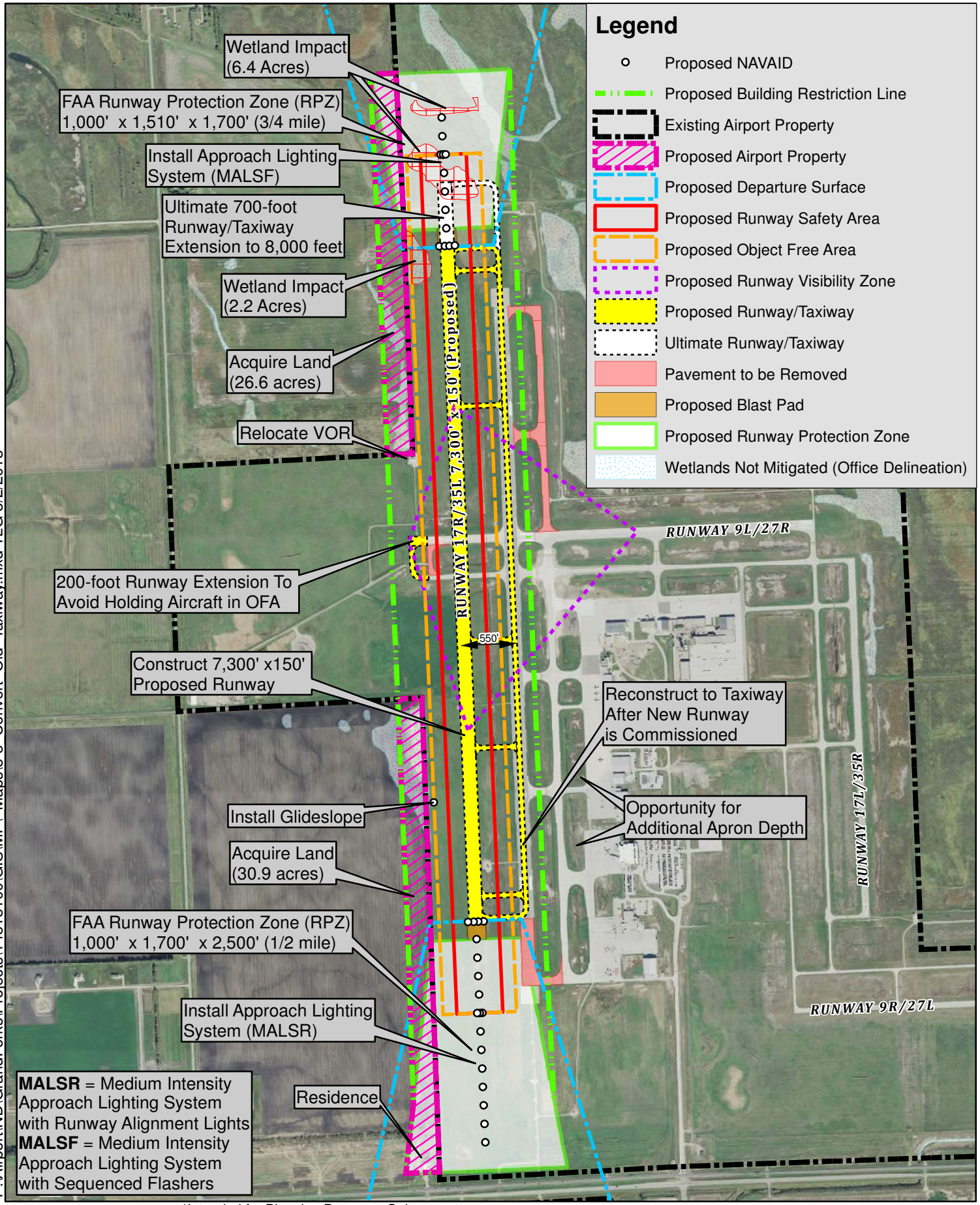
Grand Forks International Airport
Figure 5-4:
Alternative A3 - Upgrade Taxiway to Temporary Runway (Declared Distances)



P:\Airport\ND\GrandForks\Projects\14515100\GIS\MP\ Maps\5-5 Convert Old Taxiway.mxd TLG 3/2/2018

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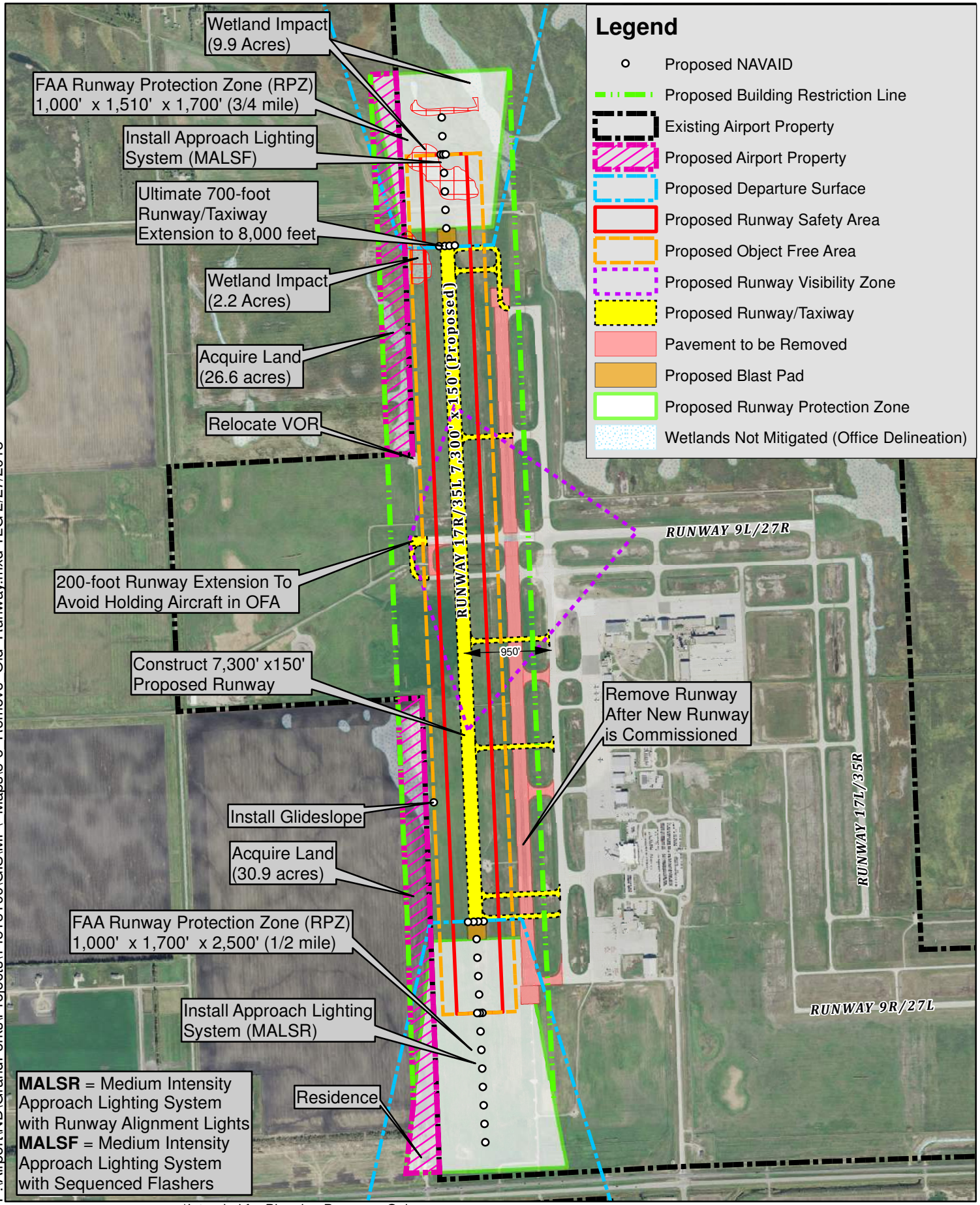
Grand Forks International Airport
Figure 5-5:
Alternative A4
Construct New Primary Runway
Convert Old Runway to Taxiway



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*Intended for Planning Purposes Only

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Grand Forks International Airport
Figure 5-6:
Alternative A4 - Interim Build
Construct New Primary Runway
Remove Old Runway

Table 5-2 – Series "A" Alternatives Impact Summary

Factor	No Action	Alternative A1	Alternative A2	Alternative A3	Alternative A4	Alternative A4 - Interim Build
Proposed Action(s)	None	Reconstruct Runway 17R-35L on Existing Alignment (7,350' x 150')	Reconstruct Runway 17R-35L (7,350' x 150'), Convert Taxiway A as Temporary Runway	Reconstruct Runway 17R-35L (7,350' x 150'), Convert Taxiway A to Temporary Runway w/ Declared Distances	Construct New Runway 17R-35L (7,300' x 150'), Convert Runway to Taxiway, Extend Runway 9L-27R (200')	Construct New Runway 17R-35L (7,300' x 150'), Remove Runway, Extend Runway 9L-27R (200')
Operational Performance	No On-Site Operational Mitigation During Construction	No On-Site Operational Mitigation During Construction (25-38 Weeks)	Air Carrier Operational Mitigation During Construction (7,350'), Minimal Closures	Air Carrier Operational Mitigation During Construction, Declared Distances (6,850'/6,450'), Minimal Closures	Air Carrier Operational Mitigation During Construction (7,350'), Minimal Closures	Air Carrier Operational Mitigation During Construction (7,350'), Minimal Closures, Longer Taxi Times
Safety & Standards	Pavement Condition to Deteriorate	Meets Facility Requirements & FAA Design Standards	FAA Modification to Design Standards Needed for Temporary Runway, Buildings within Visibility Zone	FAA Modification to Design Standards Needed for Temporary Runway, Buildings within Visibility Zone	Meets Facility Requirements & FAA Design Standards, Clears Runway 35L RPZ	Meets Facility Requirements & FAA Design Standards, Clears Runway 35L RPZ
Other Planning Tenets	Unplanned Runway Closures Likely	No Change	Limits Expansion of West Apron (same as present)	Limits Expansion of West Apron (same as present)	Reconstructs Taxiway A Before Needed, More Total Pavement, Relocate VOR Station	VOR Station Must Be Relocated to Meet Design Standards
Environmental	Wetland: 0 acres Land: 0 acres	Wetland: 0 acres Land: 0 acres	Wetland: 5.2 acres Land: 0 acres	Wetland: 0.2 acres Land: 0 acres	Wetland: 8.6 acres Land: 57.5 acres + 1 Residence	Wetland: 8.6 acres Land: 57.5 acres + 1 Residence
Fiscal*	$0	$41 million	$60 million	$60 million	$73 million**	$65 million**
Preferred Alternative(s) to Move Forward?	**NO**	**YES**	**NO**	**NO**	**YES**	**YES**

**Capital improvement costs, **Does not include 200-foot Runway 9L-27R extension for comparative purposes with Series "B" alternatives*
Source: KLJ Analysis

PRIMARY RUNWAY APPROACH ALTERNATIVES

Runway 35L Approach

The existing Runway 35L ILS approach is Category I (CAT-I) with visibility minimums as low as ½ mile (2400 RVR). GFK is not accessible for an average of 3.4 days on an annual basis. Alternatives to enhance this approach include:

1. Maintain CAT-I ILS minimums (1/2 mile – 2400 RVR)
2. Lower CAT-I ILS minimums (3/8 mile – 1800 RVR)
3. Upgrade ILS approach to CAT-II (1/4 mile – 1200 RVR)

Lowering CAT-I ILS minimums to 1800 RVR requires in-pavement runway centerline and touchdown zone lighting at GFK. This action requires FAA approval.

Enhancing the approach to a CAT-II ILS would reduce airport inaccessibility by 52 percent, or about 2 days per year. Additional infrastructure needed includes upgrading the ALS to an ALSF system, providing in-pavement lighting and installing additional RVR reporting stations. These improvements appear to be compatible with the airport's configuration, however it is difficult to justify through the traditional AIP funding process and would require a BCA of 1.0 to have FAA takeover of maintenance.

Table 5-3 – Runway 35L Approach Options

Factor	Alternative 1	Alternative 2	Alternative 3
Proposed Action(s)	Maintain CAT-I ILS (1/2 mile - 2400 RVR)	Lower CAT-I ILS minimums (3/8 mile - 1800 RVR)	Upgrade to CAT-II ILS (1/4 mile - 1200 RVR)
Operational Performance	Airport inaccessible for 3.4 days per year	Airport inaccessible for between 2-3 days per year (estimated)	Airport inaccessible for 2 days per year
Safety & Standards	Meets FAA Standards	In-Pavement Centerline and Touchdown Zone Lighting Required	ALSF, In-Pavement Lighting, Additional RVR Stations and Standby Power Required
Other Planning Tenets	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration
Environmental	No Significant New Impacts Anticipated	No Significant New Impacts Anticipated	No Significant New Impacts Anticipated
Fiscal	$0	$2.3 million* (Combined with Runway Reconstruction Project)	$3.8 million* (Likely Not Justified for FAA AIP Funding)
Preferred Alternative?	**NO**	**YES**	**NO**

*Source: KLJ Analysis, *Assumes combined with Runway 17R-35L reconstruction project, otherwise additional cost*

Table 5-3 provides a summary of the Runway 35L approach options. Planning for 1800 RVR minimums on Runway 35L is recommended because it would provide some operational performance enhancements without the cost of upgrading to a full CAT-II ILS. Depicting facilities on the ALP to preserve for an ultimate Runway 35L CAT-II ILS approach is still recommended.

Runway 17R Approach

The existing Runway 17R vertically-guided GPS/LPV instrument approach has visibility minimums as low as 1 mile. Alternatives to improve this approach include:

1. Maintain 1 mile
2. Lower GPS/LPV minimums to as low as ¾ mile
3. Upgrade to precision approach with minimums as low as ½ mile

Lowering minimums to ¾ mile would provide 5 percent of additional airport utility. Approach minimums as low as ¾ mile require additional clear approach airspace areas and a larger Runway Protection Zone (RPZ). There are no obvious approach surface obstructions and the expanded RPZ

would remain within airport property. No approach lighting system (ALS) is needed to achieve ¾ mile according to FAA Flight Procedures Office. An ALS does allow pilots to descend 100 feet lower than the published height above touchdown (HAT), increasing the likelihood of visually capturing the runway and landing in poor weather. A 1,400-foot long ALS to the existing Runway 17R end appears to have some wetland impacts, depending on the preferred future runway end location. A MALSF installed for the existing runway 17R end would have up to 1.9 acres of wetland impacts inside the inner-approach OFZ.

Upgrading to a precision approach would provide 19 percent of additional airport utility. Approach minimums as low as 1/2 mile require precision approach standards, including a 2,500-foot long RPZ. There are no inner-approach surface obstructions and the larger RPZ would remain within airport property. A full ALS would be required. A 2,400-foot long ALS appears to have wetland impacts. A ground-based glideslope and localizer system would be needed for a traditional CAT-I ILS, however FAA is no longer installing new CAT-I ILS systems. A Precision GPS approach should be expected with this option.

Table 5-4 – Runway 17R Approach Options

Factor	Alternative 1	Alternative 2	Alternative 3
Proposed Action(s)	Maintain Non-Precision Approach (1 mile)	Enhance Non-Precision Approach (3/4 mile)	Upgrade to Precision Approach (1/2 mile)
Operational Performance	No additional airport utility	5 percent increase in airport accessibility	19 percent increase in airport accessibility
Safety & Standards	Meets FAA Standards	Meets FAA Standards, Optional 1,400' Approach Lighting System	2,400' Approach Lighting System Required
Other Planning Tenets	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration
Environmental	No Significant New Impacts Anticipated	Some Wetland Impacts (depending on runway end location)	Likely Wetland Impacts (depending on runway end location) and Land Acquisition
Fiscal*	$0	$800,000 for Optional ALS (MALSF)	$1,000,000 (Likely Not Justified for FAA AIP Funding)
Preferred Alternative?	**NO**	**YES**	**NO**

*Source: KLJ Analysis, *Standalone project costs*

Table 5-4 provides a summary of the Runway 17R approach options. Based on the analysis, proceeding with ¾ mile approach minimums to Runway 17R in the future is recommended as there are no significant impacts and the benefit exceeds the cost from the airport sponsor's perspective. Installing a 1,400-foot ALS to Runway 17R approach is also recommended to further increase airport utility.

ULTIMATE RUNWAY ALTERNATIVES

The ultimate recommended runway length is 8,000 feet to serve large business jets at 90 percent useful load and unrestricted Airbus A320 operations. Runway 17R-35L is constrained by natural and man-made environmental features. Assuming the existing runway alignment remains, below are the alternatives to achieve ultimate primary runway length needs:

1. Maintain Runway 17R-35L Length (7,350 feet or 7,500 feet)
2. Extend Runway 17R-35L to the South (8,000 feet)
3. Extend Runway 17R-35L to the North (8,000 feet)

Maintaining the existing runway length is not recommended for long-term facility planning as it limits the utility of the airport to serve its forecasted ultimate users.

U.S. Highway 2 runs through the existing RPZ on south end, located about 2,100 feet from the Runway 35L end. Any runway extension to the south would locate the runway end closer to the roadway. FAA

requires additional review if certain land uses, including roadways, are introduced into the RPZ. An extension to the south would also require the glideslope, ALS and ASOS to be relocated.

A runway extension to the north would have fewer overall impacts. The localizer antenna would need to be relocated. There would likely be wetland impacts from grading the extended Runway Safety Area. This alternative continues to allow for enhanced instrument approaches to Runway 17R.

Table 5-5 – Ultimate Runway Extension Options

Factor*	Alternative 1	Alternative 2	Alternative 3
Proposed Action(s)	Maintain Existing/Future Runway 17R-35L Length	Extend Runway 17R-35L to South (8,000 feet)	Extend Runway 17R-35L to North (8,000 feet)
Operational Performance	Runway Length for CRJ-200 and CRJ-900 Regional Jet Aircraft, Most Airbus A319/A320	Provides Sufficient Runway Length for Large Business Jets at 90% Load, or Airbus A320 at 100% Load	Provides Sufficient Runway Length for Large Business Jets at 90% Load, or Airbus A320 at 100% Load
Safety & Standards	Meets FAA Design Standards; Highway 2 within RPZ Remains	Meets FAA Design Standards; Additional Portions of Highway 2 Introduced into RPZ	Meets FAA Design Standards; Highway 2 within RPZ Remains
Other Planning Tenets	Runway 35L End Does Not Trigger Further Analysis	FAA RPZ Analysis Required, Requires Relocation of Glideslope and Approach Lighting	Runway 35L End Does Not Trigger Further Analysis; Requires Relocation of Localizer Antenna
Environmental	Wetland Impact: 0 acres Land Acquisition: 0 acres	Wetland Impact: 2.0 acres Land Acquisition: 54 acres	Wetland Impact: 5.0 acres Land Acquisition: 0 acres
Fiscal	No Additional Cost	$10.2 million	$9.0 million
Preferred Alternative?	**NO**	**NO**	**YES**

Source: KLJ Analysis
**Impacts evaluated based on existing runway alignment in addition to future actions*

Preserving a Runway 17R-35L extension to the north to achieve the ultimate runway length need of 8,000 feet is recommended. A runway extension to the north is also compatible with a runway alignment shift to the west as presented in Alternatives A4, but would require additional land acquisition. Any extension to the south would introduce new portions of U.S. Highway 2 into the FAA RPZ.

Table 5-6 below summarizes the recommendations for the primary runway.

Table 5-6 – Primary Runway Recommendations

Runway	Phase	Improvements
17R-35L	Future	Reconstruct and strengthen (ACN: 51) runway
17R-35L	Future	Extend runway north to 7,500 feet (if needed)
35L	Future	Install in-pavement lights to lower approach minimums to 1800 RVR
17R	Ultimate	Lower approach minimums to no lower than ¾ mile, Install MALSF
17R-35L	Ultimate	Extend runway north to 8,000 feet

Source: KLJ Analysis

Series "B": Runway 9L-27R

Runway 9L-27R is currently 4,206' x 100' and designed for ARC B-II aircraft. There is a need to upgrade this runway to become a secondary air carrier runway accommodating ARC C-III aircraft with dimensions of 6,700' x 150'. This would improve safety, reduce delays, and eliminate converging operations when small aircraft are required to fly an east-west flow traffic pattern during east-west wind conditions. This runway is required for the airport to achieve wind coverage for ARC A-II/B-II aircraft (13.0 knots).

FUTURE RUNWAY ALTERNATIVES

Each Runway 9L-27R alternative is described and evaluated, with an emphasis on addressing the short-term and future needs (0-10 Years).

Do Nothing

No action on Runway 9L-27R would continue to accommodate less demanding ARC B-II aircraft such as small business jets with the existing 4,206-foot runway length. Existing converging traffic issues remain with large aircraft operating on the primary north-south runway during an east-west flow used by small aircraft. This also results in no enhancement to airfield capacity. Aircraft delays in an east-west flow configuration would continue to worsen over time.

Advantages:

- Lowest project cost

Disadvantages:

- Runway 9L-27R would not accommodate larger aircraft to mitigate existing issues
- Does not address east/west flow configuration safety concerns or overall airfield capacity
- As described in the Chapter 4: Facility Requirements, East-west flow delays would result in over $6 million in annual ground and airspace delay costs

A Do Nothing alternative is not recommended by the sponsor for further consideration because it does not meet facility requirements and causes excessive delays.

Extend Runway 9L-27R to the East

This option evaluates extending Runway 9L-27R to the east to achieve the recommended length for an air carrier aircraft. A limiting factor is the Runway Visibility Zone (RVZ). The ARFF/SRE complex penetrates a modified RVZ if the Runway 27R end is moved only 23 feet to the east. Impacts of introducing this object into the RVZ include Runway 9L-27R being closed when the ATCT is closed, which would impact air carrier flights operate at GFK when the ATCT is closed. In addition, extending the runway to the east would result in non-standard runway intersection design with Runway 17L end, and result in significant wetland impacts.

Advantages:

- Reduces potential impact to the west, including relocating County Highway 5

Disadvantages:

- Existing buildings would penetrate Runway Visibility Zone, requiring runway to be closed when airport traffic control tower is not operational
- Non-standard intersection design with Runway 17L end
- Any extension to the east triggers additional land acquisition
- Potential for significant wetland impacts
- Locates Runway 27R end closer to potential wildlife attractant

Because of these impacts, all options to extend Runway 9L-27R to the east are not recommended for further consideration by the airport sponsor.

Alternative B1: Extend Runway 9L-27R to the West (6,700 feet)

This alternative considers extending Runway 9L-27R by 2,494-feet to the west for a total runway length of 6,700 feet assuming visibility minimums as low as ¾ mile. The runway would also be widened for ARC C-III aircraft and strengthened for an Airbus A320 airplane. This length would accommodate the CRJ-900 and Airbus A320 airplanes in dry and wet runway conditions. Converging traffic would be eliminated when small aircraft are flying visually in an east-west traffic pattern. This configuration

would also improve airfield safety and reduce ATCT workload. Peak flow delays would be reduced from 5.5 minutes per aircraft to 1.9 minutes per aircraft.

Significant impacts include land acquisition and relocating County Highway 5. Relocation is triggered when the runway is extended to the west for a total length of at least 5,850 feet. A separate analysis is needed to determine if a relocated County Highway 5 through the RPZ is acceptable.

In this alternative, the runway could also be used while Runway 17R/35L is under construction. The short-term development cost to extend and strengthen Runway 9L/27R is estimated at $53.8 million. This is in addition to the $41.0 million cost to reconstruct Runway 17R/35L. See **Figure 5-7.**

Advantages:

- Meets facility requirements to accommodate air carrier aircraft
- Eliminates converging traffic during east-west flow configuration
- Reduces airfield delays, improves operational efficiency and airfield safety
- Provides on-site option to minimize air service disruptions

Disadvantages:

- Overall project cost to extend, widen, and strengthen runway for air carrier use ($53.8 million)
- Results in short-term runway closure for intersection work (+/- 8 days)
- Wetland impacts for runway and approach lighting system (11.7 acres)
- Land acquisition required for runway extension and approach upgrades to ¾ mile (83.3 acres)
- Additional pavement for the airport to maintain

This alternative is recommended for further consideration by the airport sponsor.

Alternative B2: Extend Runway 9L-27R to the West (5,500 feet)

This alternative considers lengthening Runway 9L/27R to the west to accommodate 75 percent of the business jet aircraft fleet with a wet/slippery runway according to FAA runway length standards. This would enhance airfield safety by providing sufficient wind coverage for up to ARC B-II corporate aircraft during crosswind situations. There would be substantial use from ARC A-II and B-II aircraft if an east-west flow is used at 8-knots crosswind component per local ATC standard procedures. This runway length does not accommodate air carrier aircraft.

An upgraded instrument approach with minimums as low as ¾ mile was explored. Although County Highway 5 would remain outside of the Runway 9L RPZ with a 1-mile approach, the RPZ for a ¾ mile approach would encompass the roadway. Airspace clearance standards over the existing road can be met. The relocation of County Highway 5 may not be necessary subject to FAA approval, however, further study would be necessary.

A total runway length of 5,586 feet is needed for the future Runway 9L end to match with the ultimate Alternative C1 parallel taxiway assuming a 50-foot taxiway width to serve TDG-3 aircraft.

Advantages:

- Provide sufficient runway length for most business jet aircraft, roughly half of the “large” aircraft to use GFK
- Reduces potential impact to the west including roadway and land acquisition impacts
- Minimal wetland impact
- Lower project cost versus extending to 6,700 feet, widening and strengthening runway
- Provides some safety enhancement by removing corporate traffic from a converging traffic pattern during east-west traffic flow
- A 1-mile approach to Runway 9L does not introduce County Highway 5 into the new RPZ

Disadvantages:

- Runway 9L/27R would not accommodate ARC C-III air carrier aircraft to mitigate existing issues
- Runway length and width requirements for air carrier aircraft not met
- Does not completely address overall airfield capacity and east-west flow configuration concerns
- Introduces a non-intersecting Alternative C1 (new runway) into the Runway Safety Area (RSA)
- A ¾ mile approach to Runway 9L introduces County Highway 5 into RPZ
- Land acquisition required for 9L-27R upgrades to ¾ mile (44.2 acres)

The cost to acquire land, construct a 1,380' x 100' extension to Runway 9L/27R to achieve 5,500 feet with ¾ mile approaches, a Runway 9L MALSF and no roadway relocation is $15.6 million.

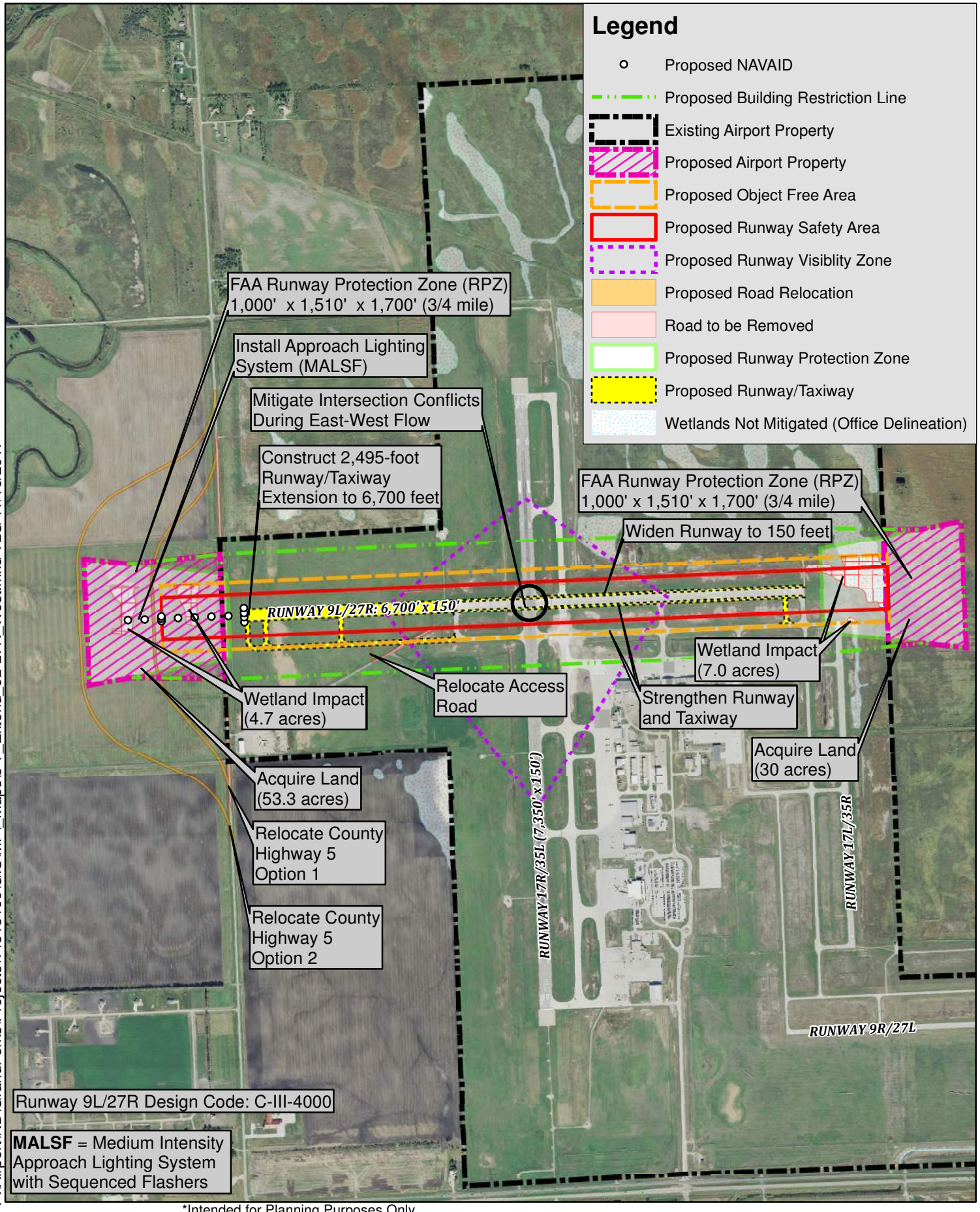
Alternative B2 is identified for further consideration, however is not recommended by the sponsor now because it does not meet airport facility requirements to maximize airfield configuration safety and efficiency.

Table 5-7 – Series "B" Alternatives Impact Summary

Factor*	Do Nothing	Alternative B1	Alternative B2
Proposed Action(s)	Maintain Runway 9L-27R (4,206' x 100')	Reconstruct, Extend, Widen and Strengthen Runway 9L-27R to 6,700' x 150'	Extend Runway 9L-27R West to 5,586' x 100'
Operational Performance	Length Limits use to up to Turboprop Aircraft	Provides Runway Length for Existing Fleet When Wet/Dry	Provide Runway Length for Business Jet Aircraft
Safety & Standards	Meets FAA Design Standards for up to ARC B-II Aircraft Only	Meets FAA Design Standards for ARC C-III Air Carrier Aircraft	Meets FAA Design Standards for up to ARC B-II Aircraft Only, Alternative C1 within Runway 9L RSA
Other Planning Tenets	Does Not Mitigate Converging Traffic During East-West Flow	Enhances Safety By Eliminating Converging Traffic	Provides Some Mitigation of Converging Traffic During East-West Flow
Environmental	Wetland Impact: 0 acres Land Acquisition: 0 acres	Wetland Impact: 11.7 ac Land Acquisition: 83.3 ac Relocate Highway 5	Land Acquisition: 44.2 ac FAA Approval for County Highway 5 to Remain
Fiscal	No Additional Cost	$53.8 million	$15.6 million
Preferred Alternative?	**NO**	**YES**	**NO**

Source: KLJ Analysis
**Impacts evaluated based on existing runway alignment in addition to future actions*

A possible enhancement to Alternative B2 is to remove the overlapping, non-intersecting runway. Per FAA, "if the RSA for one runway overlaps onto the full-strength pavement of a second runway or taxiway, the chance of a runway/taxiway incursion incident in increased." To avoid this configuration at GFK, the Runway 9L end must be extended further west to intersect with the planned north-south capacity runway as shown in Alternative C1. Total runway length needed is **6,044 feet** to accommodate an aircraft holding at Runway 9L outside of the new capacity runway obstacle free zone. This option increases safety and runway length, however increases project cost, land acquisition, and may trigger the relocation of County Highway 5 to meet FAA design standards. At this length, upgrading the runway to C-III design standards should be explored.



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*Intended for Planning Purposes Only

N

0 500 1,000 2,000 Feet

Grand Forks International Airport
Figure 5-7:
Alternative B1 -
Upgrade Runway 9L/27R
for Air Carriers

Preferred Alternative

Because Alternative B1 provides the benefit of improving airfield safety and reducing airfield delays, it shall proceed as the sponsor's preferred alternative. Significant federal funding support is required for implementation. The alternative also provides an on-site operational mitigation solution for primary Runway 17R-35L closures, allowing air carrier service to continue during most airfield construction activities.

APPROACH ALTERNATIVES

Runway 9L-27R Approach

Runway 9L and 27R have published vertically-guided GPS/LPV instrument approaches with visibility minimums as low as 1 mile. Alternatives to improve this these approaches include:

1. Maintain 1 mile both ends
2. Lower GPS/LPV minimums on Runway 9L to as low as ¾ mile
3. Lower GPS/LPV minimums on Runway 9L and 27R to as low as ¾ mile

Improving weather minimums to Runway 9L-27R is recommended if it is compatible and the runway supports air carrier operations.

The preferred runway end to improve is Runway 9L. Lowering minimums on Runway 9L to ¾ mile would provide an additional 6.3 percent of airport utility, where lowering Runway 27R to ¾ mile provides 2.7 percent of additional utility. An approach lighting system (ALS) would allow pilots to fly as low as 100 feet above the runway elevation, which further increases airport accessibility. Enhancing Runway 9L is recommended because of the increase to overall airport utility.

To achieve ¾ mile visibility minimums to Runway 9L, an additional 28 acres of land acquisition is required for the RPZ and the building restriction line versus a 1-mile approach in Alternative B1. A 1,400-foot long ALS can be accommodated on the Runway 9L end, however, there would be 2.6 acres of wetland impacts required for an ALS with a 6,700-foot runway length. The existing service road north of the runway may also need to be relocated approximately 570 feet from runway centerline to clear FAR Part 77 transitional airspace.

Lowering minimums on Runway 27R to ¾ mile is also an option for the airport. The runway would meet design standards for a ¾ mile approach. A larger RPZ requires an additional 1.4 acres of land acquisition outside of the building restriction line over undeveloped land. Installing an ALS would have a significant wetland impact and not increase airport utility significantly, therefore an ALS to Runway 27R end is not recommended. No other design standards are affected provided the runway is upgraded for air carrier use.

Table 5-8 – Runway 9L-27R Approach Options (Alternative B1)

Factor	Alternative 1	Alternative 2	Alternative 3
Proposed Action(s)	Maintain Approach Minimums of 1 mile	Lower Runway 9L Minimums to 3/4 mile with Alt. B1 Runway Extension	Lower Runway 9L and 27R Minimums to 3/4 mile with Alt. B1 Runway Extension
Operational Performance	No additional airport utility	6.3 percent increase in airport accessibility (9L)	Add'l 2.7 percent increase in accessibility (27R)
Safety & Standards	Meets FAA Standards	Introduces County Road 5 into future Runway 9L RPZ	Same as Alternative 2
Other Planning Tenets	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration	Compatible with Preferred Runway Configuration
Environmental	No New Impacts (Baseline)	ALS Wetland Impacts (2.6 acres), Perimeter Road Wetland Impacts, Additional Land Acquisition for ¾ mile (28 acres)	Alt. 2 Impacts plus 1.4 acres of Additional Land Acquisition
Fiscal	$0 (Baseline)	$800,000 for ALS (MALSF) $350,000 for Additional Land Acquisition	Alt. 2 Impacts plus $25,000 for Land
Preferred Alternative?	**NO**	**YES**	**YES**

*Source: KLJ Analysis; *Triggered by Runway Extension*

Alternative 3 is recommended to upgrade the Runway 9L and 27R approaches to ¾ mile to increase runway utility. It is recommended to install an approach lighting system to the Runway 9L end to enhance airport utility and avoid environmental impacts triggered by an approach lighting system to Runway 27R.

Table 5-9 – Runway 9L-27R Recommendations

Runway	Phase	Improvements
9L-27R	Future	Extend runway by 2,495' to West (6,700' x 100')
9L-27R	Future	Widen runway by 50' to 150'
9L-27R	Future	Strengthen runway for ACN 51 aircraft
9L	Future	Lower approach minimums to no lower than ¾ mile, install approach lighting system (MALSF)
27R	Future	Lower approach minimums to no lower than ¾ mile

Source: KLJ Analysis

Preferred Alternative

A summary of impacts of Series "A" and Series "B" alternatives is depicted in **Table 5-10**. The preferred short-term airfield alternative is Alternative B1 followed by Alternative A1. The airport sponsor selected this combination of alternatives because:

- Upgrading Runway 9L-27R enhances airfield safety by eliminating converging air traffic operations
- Upgrading Runway 9L-27R reduces peak future flow pattern delays by 3.6 minutes per aircraft
- Enhancing Runway 9L-27R for air carrier use provides immediate airport operational flexibility when Runway 17R-35L is closed
- The measured direct and indirect costs of an extended Runway 17R-35L closure exceed the capital improvement local share investment for a runway reconstruction
- GFK passenger air service is maintained on-site during construction but for a planned suspension of service when work occurs on the runway intersection.
- Although there is a significant investment required, the improvements will enhance safety, preserve airport pavements, and reduce delays for the flying public.

Table 5-10 – Series "A" & Series "B" Combined Short-Term Runway Alternatives Analysis

Category	Maintain	Alternative A1	Alternative A4 (Interim)	Alternative B1
Key Alternative Features				
Runway 17R-35L Action	None	**Rehabilitate or Reconstruct Runway**	**Demolish & Replace**	N/A
Runway 17R-35L Dimensions, Strength	7,350' x 150', PCN: 39	7,350' x 150', PCN: 51	**7,300' x 150'; PCN: 51**	N/A
Runway 9L-27R Action	None	N/A	**Extend (N/A with Alt. B1)**	**Upgrade for Regular Air Carrier Use**
Runway 9L-27R Dimensions, Strength	4,205' x 100' (Existing)	N/A	**4,400' x 100' (N/A with Alt. B1)**	**6,700' x 150'; PCN: 51**
Taxiway A Action	None	None	None	N/A
Other Action(s)	None	None	**Construct New 17R-35L Alignment**	None
Operational Performance (Capacity, Capability, and Efficiency)				
Capacity to Meet Forecasted Demands	No	Some	Some	Yes
Future Peak East-West Flow Delays per Aircraft*	5.5 minutes	5.5 minutes	5.5 minutes	1.9 minutes
Airfield Configuration Efficiency & Safety	**Safety Concerns during East/West Traffic Flow Pattern**	**Safety Concerns during East/West Traffic Flow Pattern**	**Safety Concerns during East/West Traffic Flow Pattern**	Enhances Safety by Eliminating Converging Traffic
Capability to Meet Basic FAA Design Standards	**No (Pavement Condition)**	Yes	Yes	Yes
Best Planning Tenets and Other Factors				
Temporary GFK Air Service Impact	**Off-Site Mitigation or Service Suspension**	Off-Site Mitigation or Service Suspension** During Reconstruction	On-Site Mitigation (Existing Runway)	On-Site Mitigation
Temporary Air Carrier Runway Closure Impacts	Several days per Pavement Event	Up to 330 Days (2-3 Years)** - Reconst. Up to 90 Days (1 Year) – Rehab.	0 Days	8 days (24-Hour Work)
Passenger Convenience	Unpredictable Service Disruptions	Long-Term Service Changes** - Reconst. Short-Term Service Changes - Rehab	No Service Disruption	Predictable Service Disruption
Land Use/Airspace Compatibility	No Change Over Existing	No Change Over Existing	Minimal Additional Impacts	Appears Compatible
Long-Term Operational Flexibility	No Change Over Existing	No Change Over Existing	No Change Over Existing	Ability to Immediately Utilize An Air Carrier Runway if Primary Closed
Long-Term Development Flexibility	No Change Over Existing	No Change Over Existing	Expanded Apron Opportunities	Provides Access to a Potential 5th Runway
Conforms with Sponsor's Strategic Vision	No	Yes	Yes	Yes
Social and Political Feasibility	**Unacceptable**	Appears Acceptable	Appears Acceptable	Challenging
Environmental				
Roadway Impacts	None	None	None	Relocate County Highway 5
Wetland Impacts	None	None	8.6 acres	11.9 acres
Land Acquisition Impacts	None	None	57.5 acres	83.3 acres
Residential Impacts	None	None	Acquire 1 Residence	None
Noise Considerations	No Change Over Existing	No Significant Changes	No Significant Changes	No Significant Impacts; Flight Patterns on North Side of City when in East-West flow
Fiscal Factors				
Estimated Total Capital Improvement Cost	None	$10.6 million - Rehabilitation $41.0 million – Reconstruction	$64.6 million***	$53.8 million****
Ability to Compete for FAA Funding Participation	Emergency Maintenance Costs May Not be Eligible	Project Competes Well but FAA Share is Significant	Rehabilitation Project Competes Well but FAA Share is Significant	Requires Significant Political Support
Other Direct Costs / Lost Airport Revenue	$300,000 for Full-Depth Repair $52,000 Per Closure Day	$3.1 million to use GFAFB (Reconst.)	$0	$57,000 for Closure Period
Other Indirect Costs (Passenger Time Value)	$44,000 Per Closure Day	$6.7 million to use GFAFB (Reconst.)	$0	$352,000 for Closure Period
Ability for Sponsor to Fund Local Share	Challenging	Challenging	Challenging	Challenging
Recommendation				
Preferred Alternative?	**NO**	**YES (w/ Alternative B1)**	**NO**	**YES**

Source: KLJ Analysis
**Based on comparing PAL 4 unconstrained forecasted operations with calculated Annual Service Volume for east-west flow pattern with crossing traffic (106% Capacity Level)*
***No impact if Alternative B1 implemented first*
****Cost does not include 200-foot extension the Runway 9L-27R*
*****Cost does not include rehabilitation/reconstruction of Runway 17R/35L*

Series "C": Capacity-Driven General Aviation Runway

BACKGROUND

The existing airport exceeds 80 percent of total annual capacity, causing nearly $1.6 million in delay costs to operators annually. Capacity improvements are recommended to be planned at 60 percent and implemented at 80 percent. Airfield delays cause a constrained aviation activity forecast. Airfield capacity improvements are needed now to meet unconstrained demands.

The most significant infrastructure improvement that can be made to reduce delays is to construct a new general aviation runway for small aircraft aligned with the prevailing north-south wind. This 5th runway is calculated to increase total GFK airfield capacity by 44 percent.

Long-term proposed actions evaluated include:

- Construct 3,300' x 60' runway for ARC A-I/B-I small aircraft to increase airfield capacity and reduce operational delays

RUNWAY ALTERNATIVES

Do Nothing

No action on constructing a capacity-driven runway would cause existing delays to increase. The PAL 4 unconstrained activity forecast increases the capacity level to 97 percent with over $3.2 million in annual delay costs. This would double annual delay costs to operators. No capital investment would be expended and compatible land use would not be protected.

Advantages:

- No additional capital investment required
- Does not require any new land acquisition

Disadvantages:

- Does not address airfield facility needs to meet current and forecasted aviation activity
- Existing peak delays will grow from 1.7 to 3.0 minutes per aircraft
- Capacity level increases to 97 percent resulting in $3.2 million in annual delay costs

A Do Nothing alternative is not recommended by the sponsor for further consideration because it does not meet facility requirements and results in excessive delays to continue.

Alternative C1: Construct North-South Runway West of Runway 17R-35L

This option evaluates constructing a north-south runway on the west side of GFK. The runway would be 3,300' x 60' to meet ARC A-I/B-I small aircraft needs. The runway centerline is located 2,500' to the west of Runway 17R-35L to meet separation recommendations for simultaneous radar departures and wake turbulence. A full parallel taxiway would be constructed to maximize capacity. See **Figure 5-8**.

Advantages:

- Meets current and forecasted aviation activity needs
- Average annual delay decreases from 1.7 to 0.5 minutes per aircraft
- Reduces aircraft delays costs by $868,000 per year, resulting in a positive benefit-cost ratio in less than 10 years
- Meets minimum runway separation requirements for simultaneous radar departures
- No wetland impacts
- Avoids introducing 20th Avenue Northeast within the Runway Protection Zone
- Compatible with Alternative B1

Disadvantages:

- Requires capital investment ($450,000 local share)
- Requires new land acquisition (42.6 acres)
- Introduces more frequent aircraft noise to residential area 0.7 miles southwest of airport

This alternative would cost an estimated $9.0 million with supporting taxiway infrastructure. It is envisioned this runway would be used primarily for flight training operations within the traffic pattern. This alternative also is compatible with an extension to Runway 9L-27R (Alternative B1) and the Alternative A1 to keep the existing Runway 17R-35L alignment. **Alternative C1 is recommended for further consideration.**

Other Options

Another option reviewed was shifting the proposed west runway complex (Alternative C1) further to the south to locate the north runway end closer to the ATCT for visibility purposes. This option was dismissed from further consideration to preserve an existing controlled access road to the south of the runway end to access an ultimate west terminal development area. This location would also increase noise impacts to residential properties. ATCT visibility impacts were considered when siting the proposed new ATCT.

An east runway complex was also considered. A runway located 2,500' to the east of Runway 17L-35R was dismissed due to significant wetland impacts and proximity to existing wildlife attractants.

Table 5-11 – GFK Capacity Runway Options

Factor	Do Nothing	Alternative C1
Proposed Action(s)	No Action	Construct 3,300' x 60' North-South Runway to West, Northerly Option
Operational Performance	Average Annual Delays Increase from 1.5 to 3.0 Minutes per Aircraft, Resulting in $3.2 million Delays Costs Annually	Increases Total Airfield Capacity by 44 Percent, Reduces Average Annual Delay Costs by $868,000
Safety & Standards	Recommended FAA Capacity Standards Not Met	Meets FAA Design Standards for Simultaneous Radar Departures
Other Planning Tenets	Likely Restricts Growth of UND Aerospace to Train Pilots	Avoids Introducing Public Roads Into RPZ
Environmental	No Change	Land Acquisition (42.6 Acres), No Significant Wetland Impacts Anticipated
Fiscal	None	$9.0 million
Preferred Alternative?	**NO**	**YES**

Source: KLJ Analysis

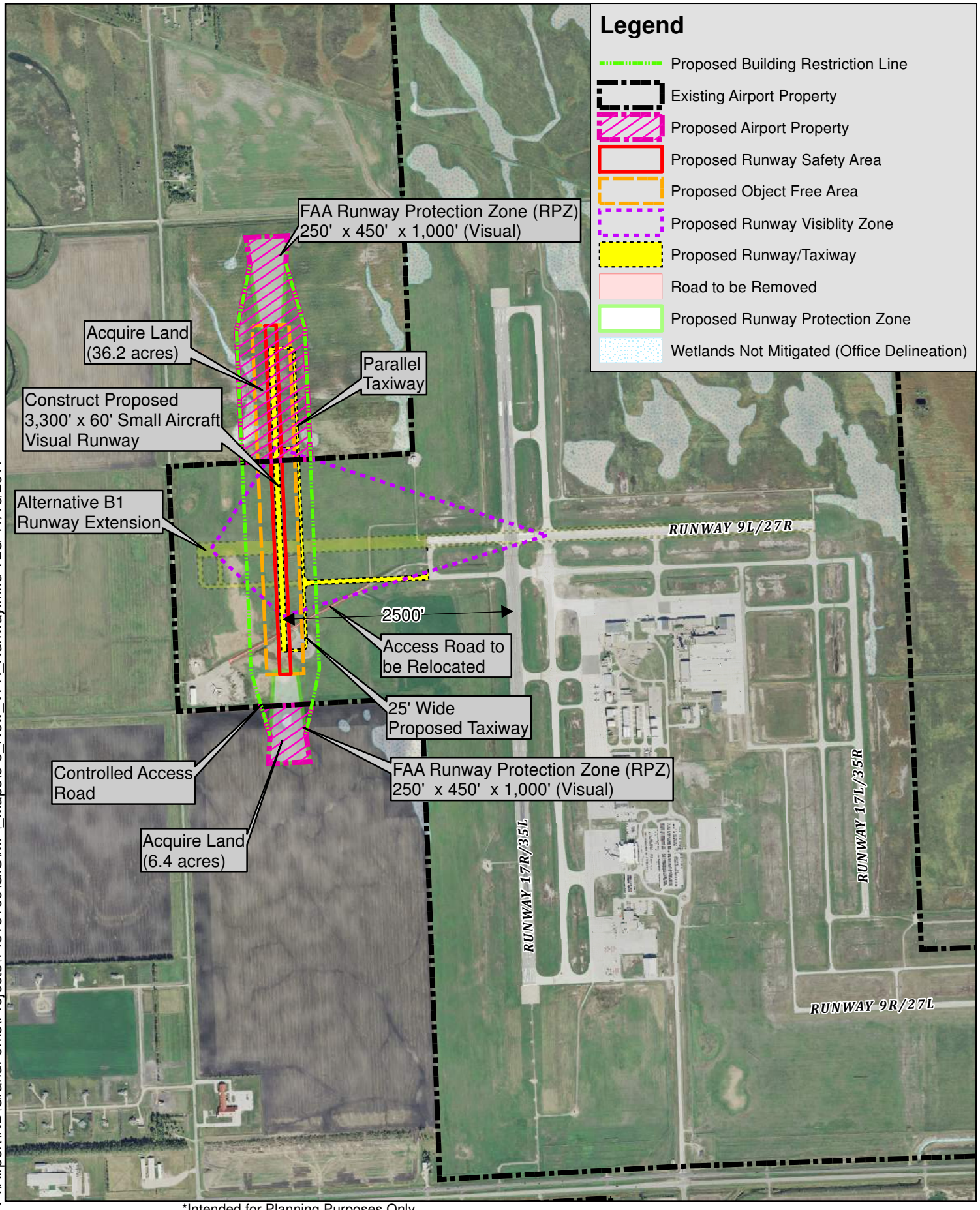
PREFERRED ALTERNATIVE

The preferred alternative is to preserve Alternative C1 as development on the ALP. The airport considers this a lower priority airfield improvement as compared to air carrier runway needs. Implementation is subject to available funding; although needed now it may not be implemented through the long-term.

Table 5-12 – Capacity-Driven General Aviation Runway Recommendations

Runway	Improvements
18-36	Construct visual ARC A-I/B-I small aircraft Runway (3,300' x 60') located 2,500' west of existing Runway 17R-35L with a full-length parallel taxiway

Source: KLJ Analysis



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*Intended for Planning Purposes Only

N

0 500 1,000 2,000

Feet

Grand Forks International Airport
Figure 5-8:
Alternative C1 -
Construct Capacity-Driven
Visual Runway

Series "D": Other General Aviation Runways

BACKGROUND

Runway 17L-35R is the airport's second north-south parallel runway, and is largely used for training purposes. New aircraft based in the east general aviation development area constructed in 2017 would also prefer to utilize this runway. This runway is 3,901' x 75' and is designed for ARC B-II Small aircraft. The runway meets length and width standards. There is no planned change to the design standards or runway dimensions. Upgrading visual approaches to non-precision is recommended for alternatives evaluation. The Runway 17L-35R Object Free Area (OFA) should be cleared of vegetation to meet FAA design standards.

Runway 9R-27L provides crosswind coverage for small aircraft. As with Runway 17L-35R, this runway is used for flight training purposes during an east-west flow pattern. This runway is used as a capacity runway with visual approaches only. The runway is 3,300' x 60' and is designed for ARC A-I/B-I Small aircraft. There is no planned change to the design standards, runway dimensions, or approach procedures. The Runway 27L RPZ is not fully controlled by the airport sponsor, however it is not recommended for acquisition in fee ownership due to environmental considerations.

Short-term proposed actions include:

- Clear vegetation from Runway 17L-35R Object Free Area
- Implement non-precision instrument approach (1 mile) to Runway 17L-35R to increase airport utility

APPROACH ALTERNATIVES

Enhancing the Runway 17L and 35R approaches were reviewed. Each runway end is currently designed for visual approach procedures. Enhanced approaches are evaluated to maximize the airport's operational utility in instrument meteorological conditions (IMC). Alternatives to establish an instrument approach include:

1. Maintain Visual Approaches
2. Establish GPS/LPV approach on Runway 35R to as low as 1 mile
3. Establish GPS/LPV approach on Runway 17L to as low as 1 mile

Maintaining visual approaches to both runway ends would allow the airport to continue operations as they have historically. This would require aircraft to utilize Runway 17R-35L or Runway 9L-27R during IMC. As general aviation hangar development continues on the east side of the airport, more users will experience significant taxi times while operating on Runway 17R-35L during IMC. For this reason, maintaining Runway 17L-35R with visual approaches is not recommended.

Establishing a non-precision instrument approach (1 mile) to Runway 35R or 17L would enhance the usability of the airport when operating in the north flow configuration and in IMC conditions. The new approach would not increase overall airport accessibility.

There are no known airspace obstructions that penetrate the applicable standards to implement the approach. Airfield design standards are met. The addition of this GPS approach would require an upgrade of runway markings. No other FAA design standards change.

There is no operational need for Runway 17L-35R to be designed with instrument approaches less than 1 mile. This would also trigger the Runway Protection Zone size increasing from 8.1 acres to 49.0 acres for each runway end.

See **Table 5-13** for the alternatives analysis.

Table 5-13 – Runway 17L-35R Approach Options

Factor	Alternative 1	Alternative 2	Alternative 3
Proposed Action(s)	Maintain Existing Visual Approaches	Implement Non-Precision Approach to Runway 35R (1 mile)	Implement Non-Precision Approach to Runway 17L (1 mile)
Operational Performance	Aircraft In East GA Area Continue to Use Air Carrier Runways for Instrument Approaches, Increasing Taxiing Times	Provide Instrument Approaches to East Side of Airport to Minimize Taxi Time	Provide Instrument Approaches to East Side of Airport to Minimize Taxi Time
Safety & Standards	Overlapping Runway 17L-35R and 9L-27R Safety Areas Remain (Acceptable)	FAA Design Standards Met, Overlapping RSAs Remain	FAA Design Standards Met, Overlapping RSAs Remain
Other Planning Tenets	Compatible with Preferred Runway Configurations	Compatible with Preferred Runway Configurations	Compatible with Preferred Runway Configurations
Environmental	No Change	No Significant New Impacts Anticipated	No Significant New Impacts Anticipated
Fiscal	$0	$30,000 (New Markings)	$30,000 (New Markings)
Preferred Alternative?	**NO**	**YES**	**YES**

Source: KLJ Analysis

Because the infrastructure can easily meet standards, it is recommended the airport plan for non-precision GPS approach procedures (no lower than 1 mile) on both the Runway 17L and 35R ends.

Table 5-14 – Other General Aviation Runway Recommendations

Runway	Improvements
35R	Implement Non-Precision Instrument Approach (as low as 1 mile)
17L	Implement Non-Precision Instrument Approach (as low as 1 mile)

Source: KLJ Analysis

See **Figure 5-9** for a graphical depiction of the preferred runway and taxiway system configuration.

Taxiway System

BACKGROUND

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. Proposed actions include:

- Remove runway "direct access" by modifying taxiway locations when pavement is reconstructed
- Construct holding bays and/or bypass taxiways to improve airfield flow and reduce delays
- Strengthen portions of Taxiway A to accommodate the design aircraft for Runway 17R-35L (ACN: 51) at reconstruction
- Strengthen Taxiway B (PCN: 28) and connector taxiways to accommodate the future design aircraft for Runway 9L-27R (PCN: 51)

An evaluation of development considerations for the GFK taxiway system is described below.

DIRECT ACCESS REMOVAL

Direct access from an apron to a runway should be corrected per FAA airport design standards to reduce the risk of runway incursions. Taxiway A3, A4, A5, B1 and C1 have direct access to Runways and are recommended to be corrected. Correcting this pavement geometry involves removing pavement when it is due for reconstruction and constructing an alternative taxiway alignment. The revised taxiway geometry should be reviewed concurrently with any apron development alternatives. Modifying runway exit taxiways is discouraged unless there is a facility need or if no other feasible alternative exists.

Table 5-15 – Direct Access Removal Recommendations

Taxiway	Improvement
A3	Remove Taxiway A3 East of Taxiway A, Upgrade Taxiway G
A4	Relocate Taxiway A4 East of Taxiway A
A5	Remove or Relocate Taxiway A5
B1	Relocate Taxiway B1 South of Taxiway B
C1	Relocate Taxiway C1 West of Taxiway C

Source: KLJ Analysis

ENTRANCE/EXIT TAXIWAYS

Entrance/exit taxiways are critical to enhancing airfield capacity by minimizing runway occupancy time. The design hour operations are 151 currently, or approximately 75 per hour for each parallel runway. The location and configuration of entrance/exit taxiways are ideal per local ATCT staff. Based on this information, no configuration changes are recommended for existing GFK runways.

High speed exit taxiway should be considered at airports with a higher percentage of large aircraft. Due to the predominant small aircraft fleet mix, maintaining standard 90-degree exit taxiways is recommended. No high-speed exit taxiways are recommended for GFK.

BYPASS TAXIWAYS & HOLDING BAYS

Bypass taxiways enhance traffic flow and flexibility for steady streams of departing aircraft. When a single aircraft is not ready for departure (e.g. receiving an IFR clearance, holding for sequencing delays at destination, etc.), a bypass taxiway allows other aircraft to utilize an open taxiway for departure flow. These are typically considered for runways serving large aircraft.

Holding bays also enhance traffic flow and flexibility by providing a standing space for one or multiple aircraft. Providing holding bays instead of bypass taxiways can enhance capacity. These pavement areas provide a space for aircraft performing pre-flight checks or awaiting clearance, without blocking the main taxiway. A holding bay should be provided when peak runway operations reach 30 per hour – this threshold has been achieved for all runways at GFK.

Options for constructing bypass taxiways and/or holding bays to improve capacity and flow at key airfield areas was evaluated.

- Runway 35L and 17R Ends – These runway ends are used by large aircraft, and some small UND flight training aircraft when the airport is in a north-south flow. A bypass taxiway will enhance traffic flow for a mix of aircraft types. There is not sufficient space to build a holding bay near Runway 35L end. **An ADG-III bypass taxiway is recommended for each runway end**; small aircraft holding bays are recommended near Bravo and Charlie aprons per local stakeholders.
- Runway 9L and 27R Ends – This runway is used by small UND flight training aircraft when the airport is in an east-west flow pattern, which would occur roughly 25% of the time in the future. Runway 9L-27R will also serve air carrier aircraft when it is extended in the future. At that time, a bypass taxiway would enhance traffic flow for a mix of aircraft types when in an east flow pattern. **When Runway 9L-27R is extended, an ADG-III bypass taxiway is recommended for each runway end**; small aircraft holding bays are recommended near Bravo and Charlie aprons per local stakeholders.
- UND Bravo Apron – GFK ATCT desires holding bays primarily for UND engine run-ups to be in a non-movement area. It is recommended one holding bay be located on the north side of the Bravo apron and accommodate up to six ADG-I aircraft at one time. Aircraft departing the holding bay would be ready for departure sequencing without delay. In general, aircraft departing Runway 17R-35L and 9L-27R to exit the area would use this holding bay. **A holding**

bay on the north side of Bravo apron is recommended to increase capacity and reduce airside delays.

- UND Charlie Apron – GFK ATCT desires holding bays primarily for UND engine run-ups to be in a non-movement area. It is recommended a second holding bay be located on the east side of the Charlie apron and accommodate up to six ADG-I aircraft at one time. Aircraft departing the holding bay would be ready for departure sequencing without delay. In general, aircraft departing Runway 17L-35R and 9R-27L for local traffic pattern work would use this holding bay. **A holding bay on the east side of Charlie apron is recommended to increase capacity and reduce airside delays.**
- Runway 35R End - There is a small holding bay on the west side of the Taxiway C3 and Taxiway C intersection. This area is very frequently used for aircraft conducting run up operations while still allowing aircraft behind them to bypass and use the runway. This does not meet required Taxiway Object Free Area (TOFA) requirements for an ADG-II aircraft. This runway end is used most frequently by flight training traffic for traffic pattern circuits, but is anticipated to serve small corporate aircraft in the future. As such, this runway end currently and will continue to experience high levels of congestion with aircraft lining up. **Expansion of the existing holding bay capable of accommodating up to six ADG-I aircraft is recommended.**
- Runway 17L End – There is no holding bay at this runway end. This runway end is used most frequently by flight training traffic for traffic pattern circuits. As such, this runway end experiences high levels of congestion with aircraft lining up. The only available space for a holding bay would be on the south side of Taxiway B, west of Taxiway C. **Constructing a new holding bay capable of accommodating up to four ADG-I aircraft is recommended.** This should be designed to have sufficient ADG-III setbacks along Taxiway B.
- Runway 9R and 27L Ends – There is no holding bay for aircraft on this runway end. Utilizing other holding bays is recommended to save on wide expands of pavement. **An expanded holding bay on Taxiway C at C3 is recommended to also serve aircraft run-up operations for this runway.**

SUMMARY

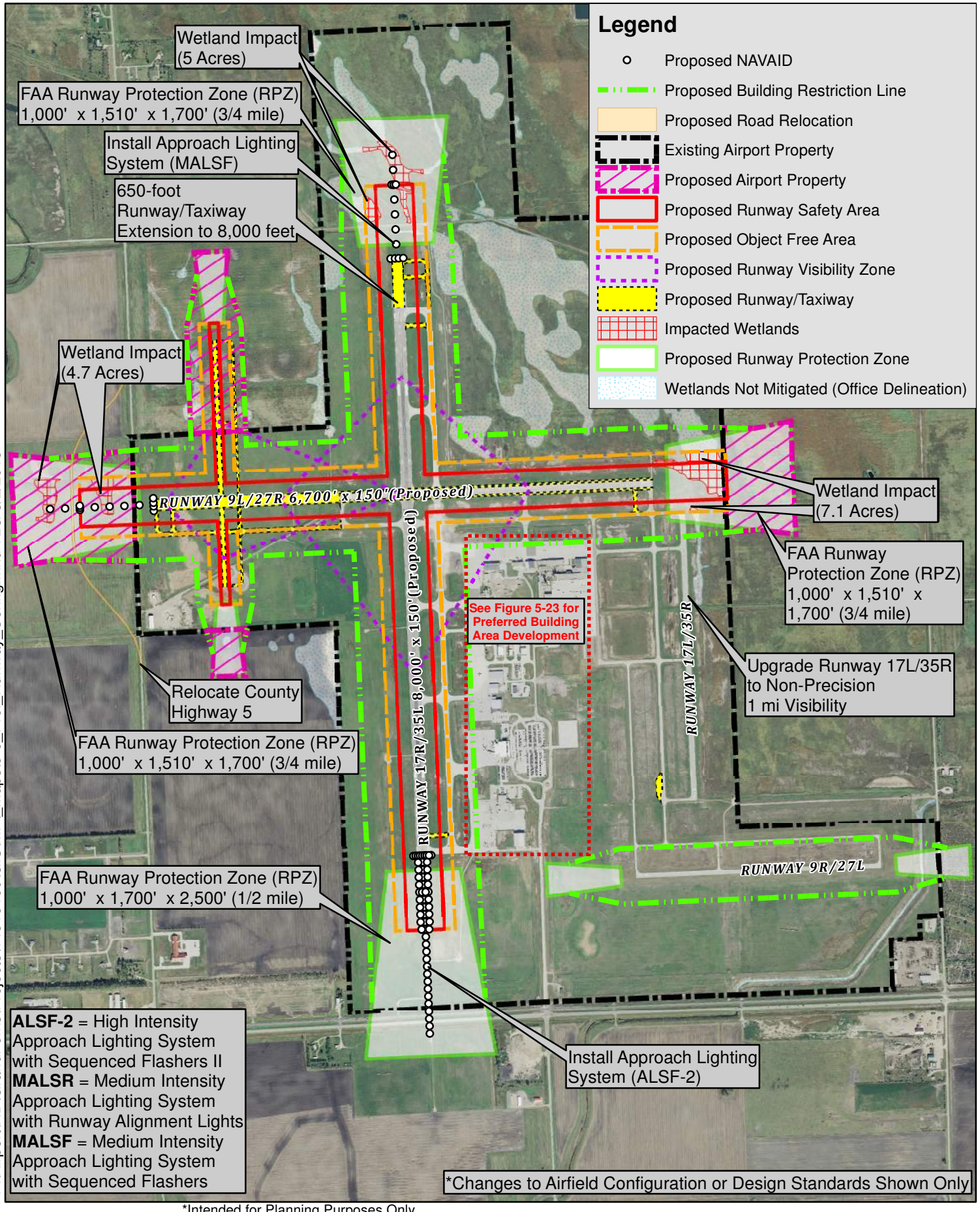
See **Table 5-16** for a listing of recommended exit taxiway improvements to depict on the Airport Layout Plan. Actual implementation will be prioritized based on need and available funding.

Table 5-16 – Taxiway Recommendations

Location	Improvements
Taxiway A (Sec. 35), A1, A2, A3, A4, A5	Strengthen to Accommodate Regular Air Carrier Aircraft (PCN: 51)
Taxiway B, B1	Strengthen to Accommodate Regular Air Carrier Aircraft (PCN: 51)
Runway 35L End	Construct ADG-III bypass taxiway at runway end
Runway 17R End	Construct ADG-III bypass taxiway and/or holding bay at runway end
Bravo Apron	Construct holding bay for six ADG-I aircraft with ADG-II setbacks
Charlie Apron	Construct holding bay for six ADG-I aircraft with ADG-II setbacks
Taxiway C	Expand existing holding bay for six ADG-I aircraft with ADG-II setbacks
Taxiway B	Construct holding bay for four ADG-I aircraft with ADG-III setbacks
Runway 27R	Construct ADG-III bypass taxiway at runway end
Runway 9L End	Construct ADG-III bypass taxiway at runway end

Source: KLJ Analysis

See **Figure 5-9** for a graphical depiction of the preferred runway and taxiway system configuration.



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*Intended for Planning Purposes Only

KLJ

N

0 1,000 2,000 4,000 Feet

Grand Forks International Airport
Figure 5-9:
Preferred Airfield Configuration

Passenger Terminal Complex

The passenger terminal complex provides the necessary infrastructure to accommodate scheduled and unscheduled commercial passenger operations. Accommodating passenger needs is vital to provide adequate level of service for the growing air needs for the Grand Forks region. Development alternatives for the Passenger Terminal Complex reviewed the following infrastructure elements:

- Terminal Building
- Terminal Apron

An analysis of development alternatives to accommodate facility requirements is described in the following sections. A preferred alternative is identified only after all series are evaluated because not all impacts are independent of one another.

Alternatives

TERMINAL BUILDING

Background

The passenger terminal building was opened in 2011 and generally meets existing passenger needs. From 2011-2015, the total number of passengers has increased by nearly 25 percent with higher seat capacity aircraft operating regularly. The terminal building and apron was generally designed for smaller regional jets.

Short-term PAL 1 facility needs that should be considered to meet passenger demands include:

- Expand passenger waiting holdroom and increase available seating
- Increase overall concourse circulation width
- Expand baggage make-up area to accommodate larger aircraft
- Increase overall baggage claim device frontage for peak arriving aircraft types
- Consider third passenger boarding bridge for irregular operations

Additional long-term proposed actions through PAL 4 include:

- Accommodate four gates and consider four passenger boarding bridges
- Construct a new airline ticket office for another airline
- Expand baggage screening area to meet TSA requirements
- Expand security checkpoint
- Expand total holdroom area and seats to accommodate four gates
- Increase total aircraft frontage space
- Increase rental car office area for another vendor

The underlying theme with all terminal complex recommendations is space. Additional space is recommended throughout the terminal building and apron area. To attain the additional space, options must be explored on expanding the exterior walls of the terminal building. Working with JLG Architects, alternatives were presented to the airport and airport stakeholders to identify an adequate solution for both short-term and long-term airport needs.

Development Direction

Terminal building concepts need to consider a geometrically constrained complex. Concepts were evaluated to determine the preferred terminal building development direction.

Do Nothing

This is the base alternative assuming the existing terminal were to remain as-is. Existing constraints would continue, particularly in the secure departure holdroom.

Advantages:

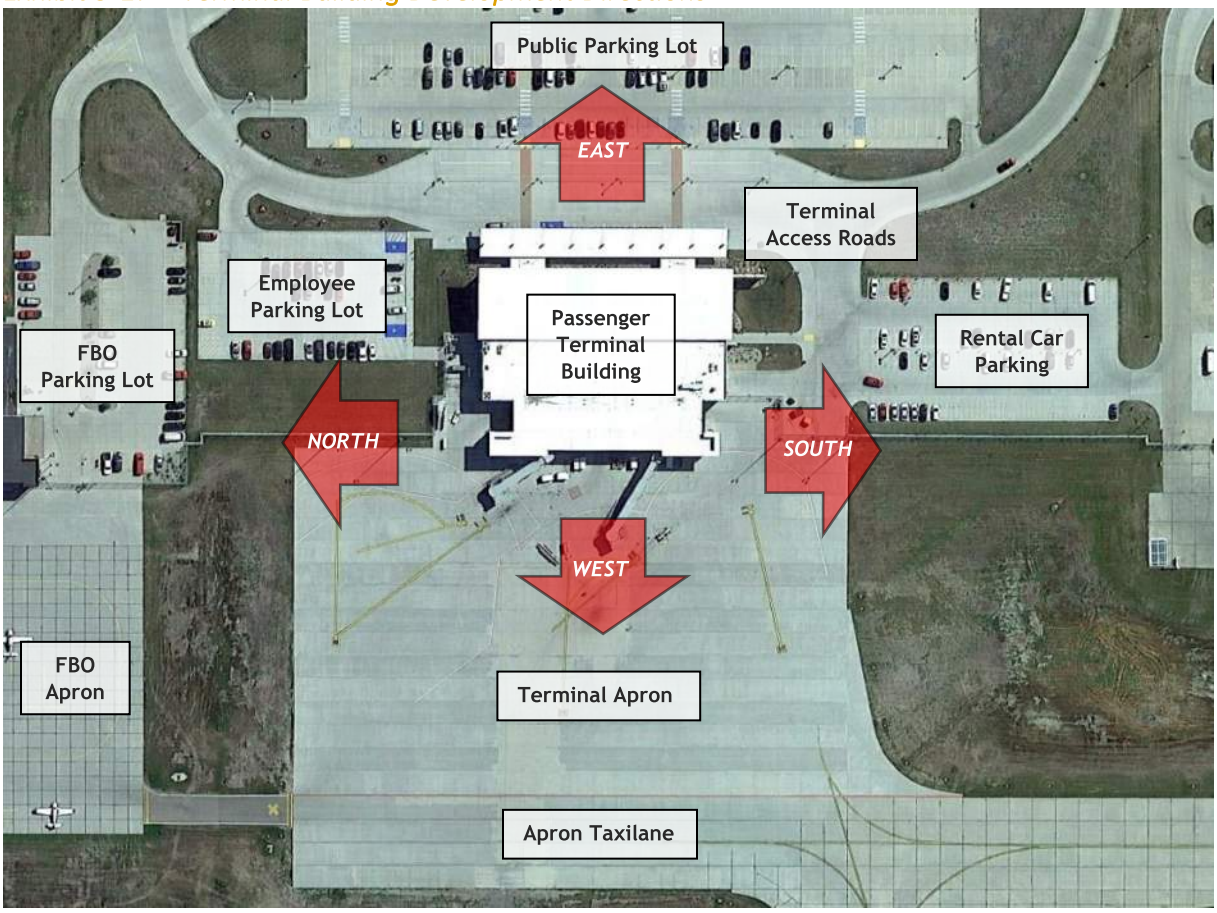
- No additional direct capital or operating costs to airport

Disadvantages:

- Does not meet any recommended short-term or long-term passenger needs
- Does not align with Airport Authority strategy

This do nothing alternative limits opportunities to meet passenger demands which is not recommended.

Exhibit 5-17 – Terminal Building Development Directions



Source: KLJ Analysis

North Development

The north edge of the terminal building is located adjacent to the employee parking lot and only 260 feet from the edge of the FBO complex. The existing aircraft apron was constructed as far north as possible without impacting FBO operations. The terminal building's utilities are also located on the north side of the building which impacts expandability cost. Impacts to the FBO would be costly.

Advantages:

- Small expansion is compatible with existing building layout and apron

Disadvantages:

- Proximity to FBO complex limits building and apron expansion opportunities without significant reconfiguration
- Need to work around terminal building mechanical room; some utilities likely impacted with expansion in this direction
- Possible size reduction and/or relocation of employee parking lot

Although limited terminal building expansion could occur to the north, a large-scale north expansion is not recommended.

South Development

Facilities to the south of the existing terminal building include an airside access road, shipping/receiving area, and the rental car ready/return parking spaces. Within the building, a bar/restaurant/gift shop is located on the south end of the holdroom.

Advantages:

- Expansion is generally compatible with existing building layout and apron
- Expandable apron area to the south to accommodate aircraft

Disadvantages:

- Requires relocation of airside access road
- Possible rental car ready/return parking lot size reduction or relocation
- Requires some interior layout changes but generally compatible

Terminal building development options to the south are recommended, particularly those that require an apron expansion.

West Development

The aircraft parking apron is located immediately to the west of the terminal building. There is limited apron depth which affects aircraft maneuvering. The edge of the terminal building is located 630 feet from the parallel taxiway centerline.

Advantages:

- Expansion likely can be compatible with existing building layout and apron
- Provides additional passenger holdroom depth in short-term

Disadvantages:

- Requires additional setbacks for parked aircraft; westward apron expansion is constrained by the parallel taxiway
- A significant westward expansion could affect the existing taxiway configuration and ATCT line of sight to aircraft movement areas
- Depending on the fleet mix, deicing operations could be difficult given apron depth constraints.

Although limited terminal building expansion could occur to the west, a large-scale westward expansion is not recommended.

East Development

The terminal building access road and parking lots are located directly to the east of the terminal building. In addition, the geothermal grid is located under the parking lot which limits building development. Any expansion to the east to meet needs would require major interior renovations.

Advantages:

- Provides additional non-secure area depth, although not needed now

Disadvantages:

- Requires terminal building access road and parking lot relocation
- Impacts to existing geothermal grid utilities under parking lot

Terminal development to the east is not recommended.

Table 5-18 – Terminal Building Development Direction Options

Factor	Do Nothing	North	South	West	East
Short-Term Strategy?	NO	YES	YES	YES	NO
Long-Term Strategy?	NO	NO	YES	NO	NO

Source: KLJ Analysis

In summary, terminal building expansion alternatives to the north, west and south are recommended to be explored based on site compatibility. Significant long-term expansions should be planned to the south due to fewer potential infrastructure, fiscal and operational impacts.

Terminal Building Expansion

Expansion opportunities were reviewed to help determine the sequence of GFK terminal building development to meet needs.

North Expansion

North building expansion alternatives were reviewed. A 60-foot building expansion near the apron provides up to 7,000 square feet (SF) of total additional space over two floors. Expansion to the north provides additional passenger holdroom seating for irregular operations and an opportunity to install a third dedicated passenger boarding bridge (PBB). The existing stairwell would have to be relocated for circulation. No apron expansion is required as the PBB would serve an existing aircraft parking position. On the ground floor, the additional 3,500 SF of enclosed space provides storage for ground service equipment.

A 40-foot north building expansion near the ticketing wing provides approximately 4,500 SF of space on the first floor with 2,800 SF of space on the second floor. The first floor would be dedicated for additional ticketing, airline office and mechanical room space. The second floor provides office space for relocated TSA offices affected by a security checkpoint expansion. The expansion footprint is compatible with the existing green space north of the terminal without impacting the existing employee parking lot.

West Expansion

A westward terminal building expansion would increase depth of the holdrooms, which is considered the highest priority need. This would accommodate space needs for peak passengers, as well as increase baggage handling and general storage space.

A 30-foot increase in building depth provides an additional 3,500 SF of second floor space for approximately 70 additional holdroom seats and circulation to meet PAL 3 needs. Existing PBBs would need to be relocated. Parked aircraft would be compatible. The enclosed ground floor space provides additional 1,400 SF of enclosed storage space, and 2,100 SF of space in the baggage handling area. This space provides the opportunity to realign the baggage makeup carousel to provide more efficient two-sided access and circulation.

South Expansion

Expanding the terminal building to the south provides an opportunity to construct a holdroom and additional gate with dedicated PBB. When combined with the west expansion, this provides up to 5,600 SF of new space on the second floor for a holdroom, circulation and relocated bar/concession area. The existing stairwell may have to be relocated. On the ground floor, the additional space provides additional equipment storage and circulation space.

An optional terminal addition to provide Federal Inspection Services (FIS) for U.S. Customs and Border Protection was explored. This two-level addition to the south provides 9,200 SF of space on each level for FIS facilities, lobby and relocated rental car concessions. This plan was developed for the airport in 2013 and refined in this study. The upper level includes a partitioned international arrivals area, restrooms, primary customs processing, and relocated airport administration offices. The lower level includes secondary customs processing, secure baggage claim device, relocated car rental counters and international arrivals lobby space.

Interior Utilization

The existing baggage claim device can be expanded within the existing terminal footprint without affecting other facilities. A new baggage claim device expansion provides a total of 180 linear feet of claim frontage to meet peak aircraft needs.

As building expansions are planned, this provides opportunities to reutilize existing space. A north expansion of the ticketing wing provides the opportunity to expand the security checkpoint to the north by relocating TSA offices to the expansion area.

A building expansion to the west creates additional depth that could provide additional baggage screening space, as required for TSA processing equipment.

Preferred Alternatives & Sequencing

There is 50,900 SF of net expandable building space opportunities to meet terminal building demands through the end of the planning period and beyond.

Short-term needs include additional holdroom depth which warrants a west concourse expansion. Additional storage needs can also be met with this development. An additional PBB for irregular operations is best accommodated with a north expansion near the apron. The following sequence was selected to best meet short-term terminal facility needs at GFK:

<u>Short-Term Terminal Building Development (0-10 Years)</u>

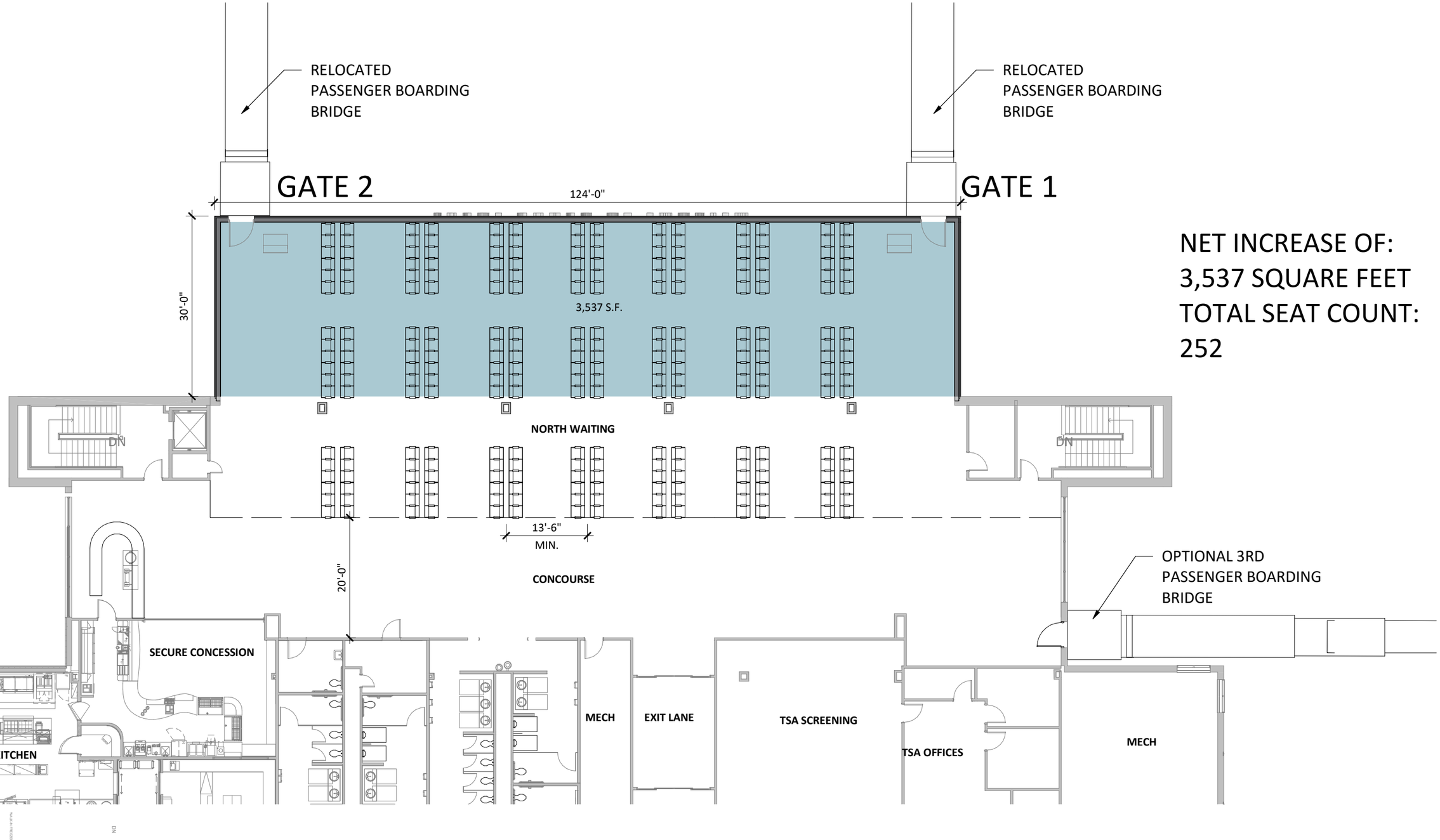
- Phase 1: West Concourse Expansion (7,000 SF)
  - Expand Holdroom, Improve Circulation, Expand Baggage Makeup, Expand Storage
- Phase 2: North Concourse Expansion (7,000 SF)
  - Expand Holdroom, Add 3rd Passenger Boarding Bridge, Expand Storage
- Expand Baggage Carousel

Short-term development sequencing is described in **Table 5-19**. **Figures 5-10** through **5-13** graphically depict the layouts of the short-term preferred terminal building alternative.

Table 5-19 – Recommended Short-Term Terminal Building Expansion Phases

Factor	Existing	Phase 1: West	Phase 2: North
Building Expansion Size (est.)	-	7,000 SF	7,000 SF
Total Net Building Size	50,000 SF	57,000 SF (+7,000)	64,000 SF (+7,000)
Expansion Scope	-	Expand Holdroom, Expand Baggage Makeup	Expand Holdroom, Add 3rd PBB,
Triggering Event	-	Simultaneous 76-seat and 177-seat aircraft departures*	Irregular Operations Gate
Total Boarding Bridges	2	2	3 (+1)
Holdroom Area	4,200 SY	6,800 SY (+2,600)	9,200 SY (+2,400)
Holdroom Seats	180	252 (+72)	360 (+108)
Holdroom Circulation Width	10 feet	20 feet (+10)	20 feet
Building Impacts	-	Relocated PBBs	Relocated Stairwell
Apron Impacts	-	Expand 600 SY to South	None
ATCT Line of Sight Impacts	Clear	Verify Clear During Design	Verify Clear During Design
Other Facility Impacts	-	None	None
Estimated Building Cost	-	$2.8 million	$3.7 million

Source: KLJ Analysis
**Terminal holdroom area currently deficient by 300 SF*



NET INCREASE OF:
3,537 SQUARE FEET
TOTAL SEAT COUNT:
252

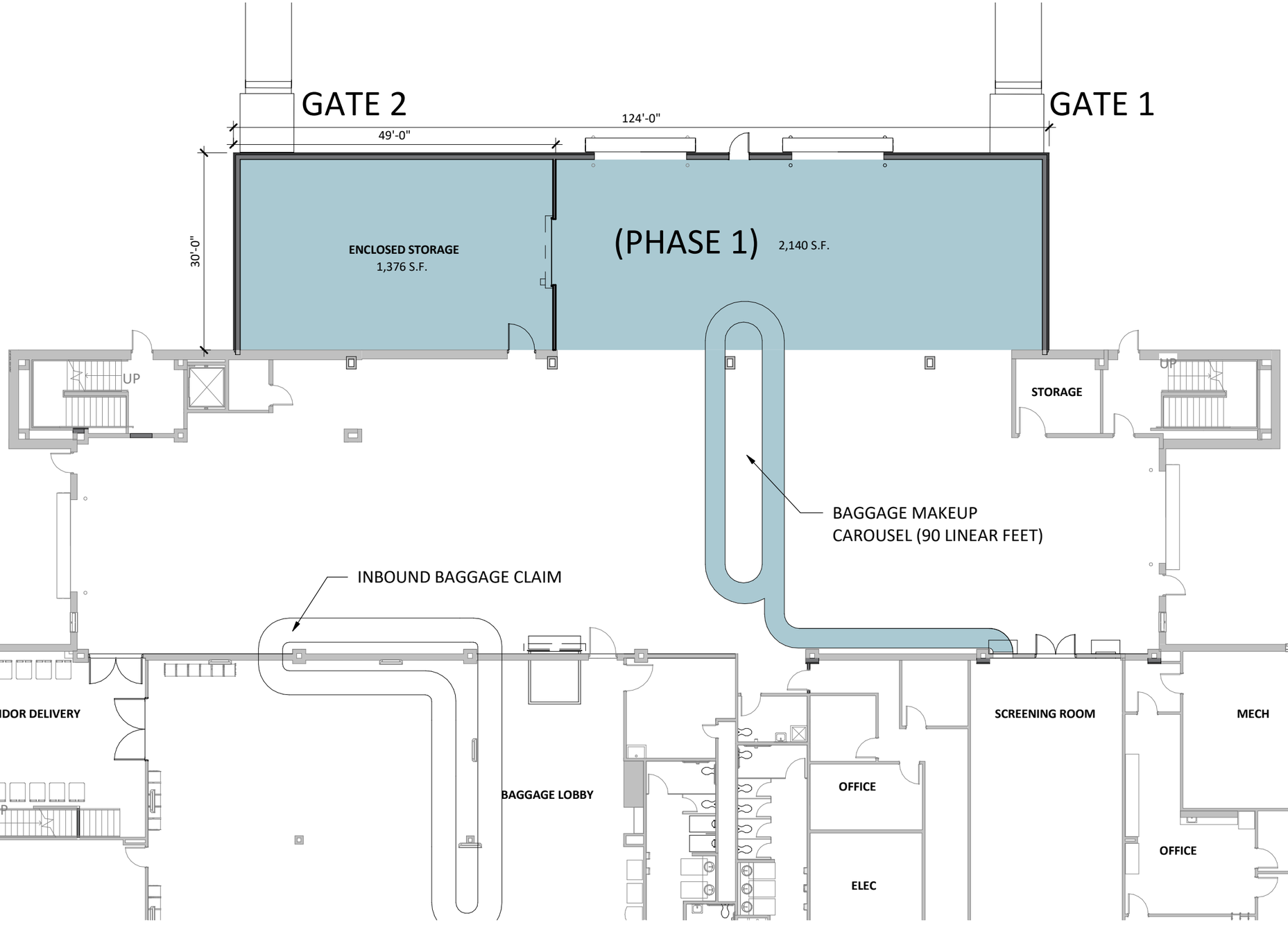
GFK TERMINAL MASTER PLAN

TERMINAL EXPANSION CONCEPT (PHASE 1) - SECOND FLOOR

0 8 16 32

Figure 5-10

JLG
DESIGN FOR LIFE



GFK TERMINAL MASTER PLAN

TERMINAL EXPANSION CONCEPT (PHASE 1) - FIRST FLOOR

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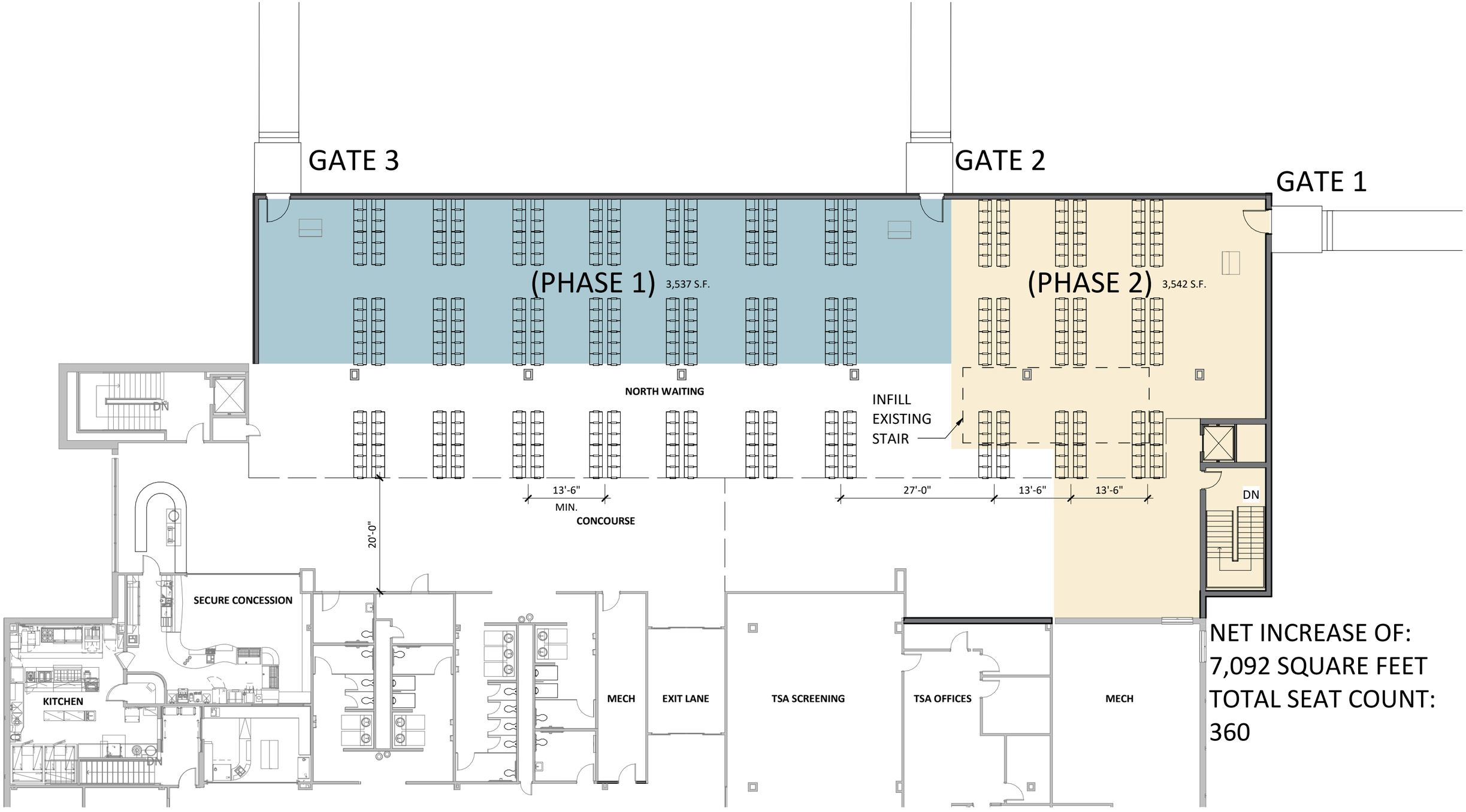
0 8 16 32

Figure 5-11

JLG
DESIGN FOR LIFE



NET INCREASE OF:
7,092 SQUARE FEET
TOTAL SEAT COUNT:
360

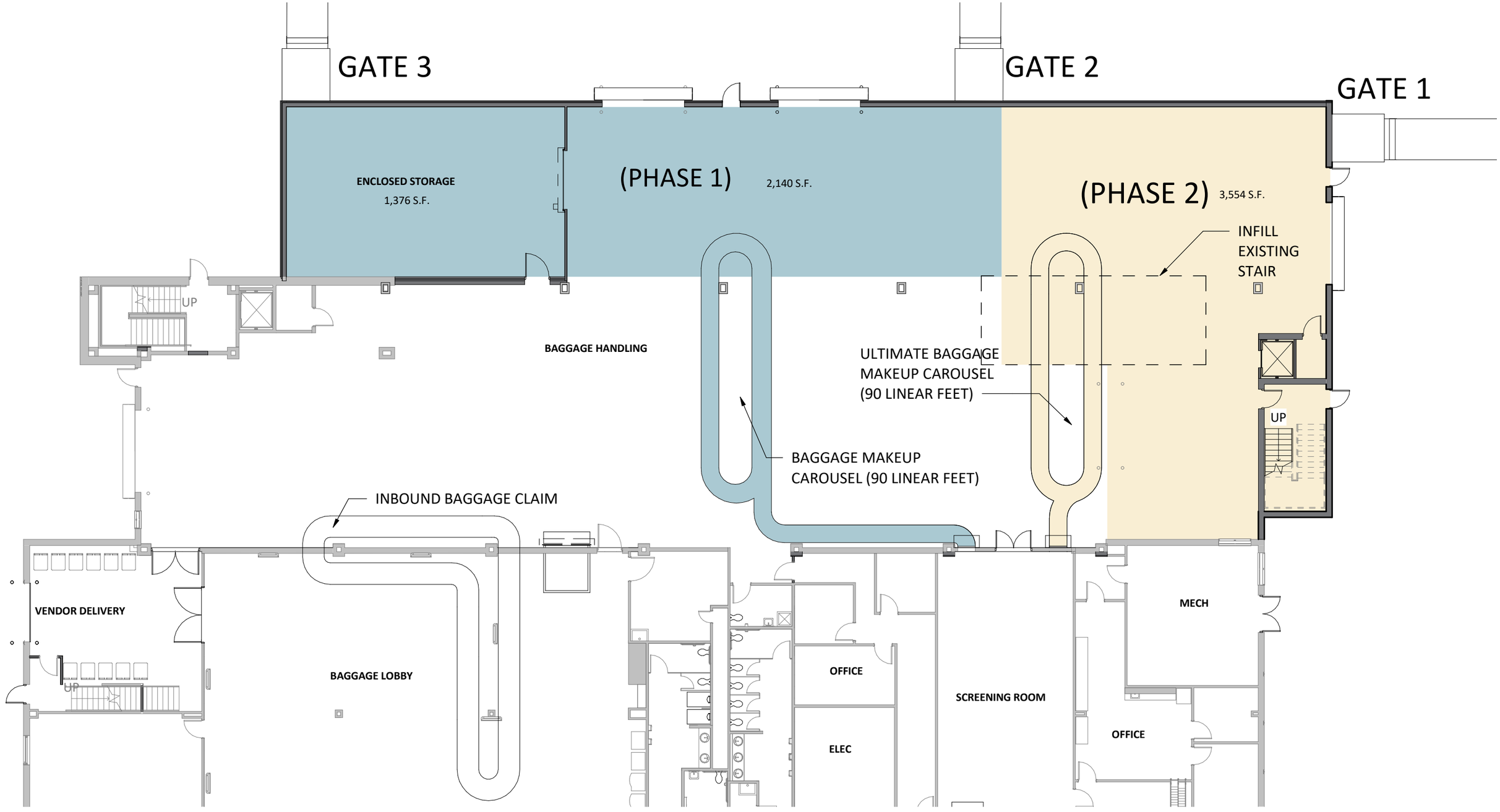
GFK TERMINAL MASTER PLAN

NORTH TERMINAL EXPANSION CONCEPT - SECOND FLOOR

0 8 16 32

Figure 5-12

JLG
DESIGN FOR LIFE



GFK TERMINAL MASTER PLAN

NORTH TERMINAL EXPANSION CONCEPT - FIRST FLOOR

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0 8 16 32

Figure 5-13

JLG
DESIGN FOR LIFE

Long-term needs include additional gates, which can be accommodated with a south expansion. After considering the opportunities created with short-term terminal building development, the following sequence was selected to best meet long-term & ultimate evolving facility needs at GFK:

Long-Term & Ultimate Terminal Building Development (11-20+ Years)

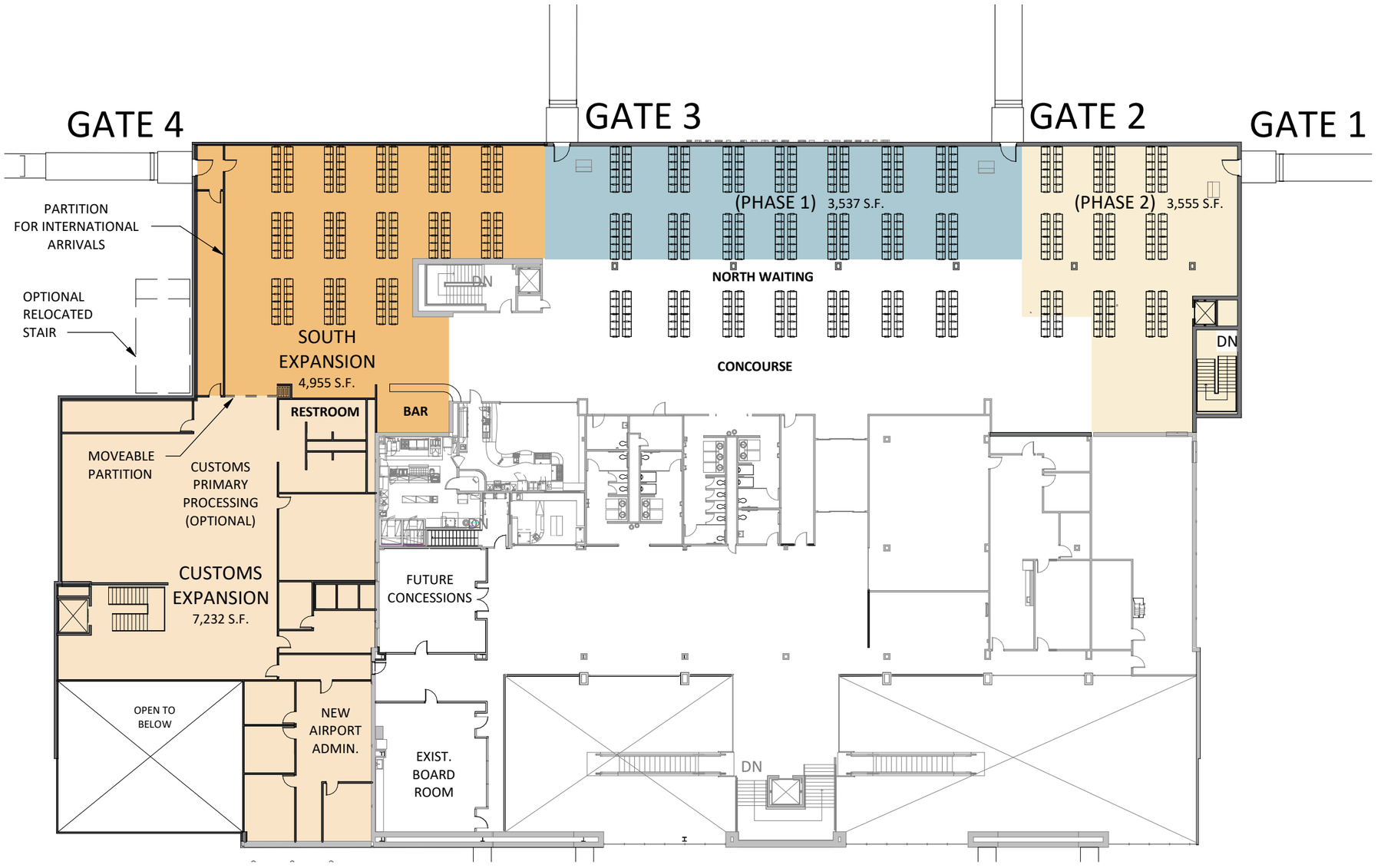
- South Concourse Expansion – Domestic (11,200 SF)
  - Add 4th Gate/Passenger Boarding Bridge, Expand Holdroom, Expand Baggage Claim
- North Ticketing Expansion (7,300 SF)
  - Expand Ticketing, Expand Airline Offices, Expand Security Checkpoint
- South Expansion – International/FIS (18,400 SF)
  - Add Federal Inspection Services (FIS) - Optional

Exhibits 5-14 through **5-17** graphically depict the layouts of the long-term and ultimate preferred terminal building alternative. The ultimate net terminal building square footage to enhance the function of the terminal building for planning purposes is 100,900 SF.

Table 5-20 – Recommended Long-Term Terminal Building Expansion Phases

Factor	South	North Landside	Ultimate
Building Expansion Size (est.)	11,200 SF	7,300 SF	18,400 SF
Expansion Scope	Expand Holdroom, Add South Gate, Expand Baggage Claim	Expand Ticketing Area, Expand Offices, Expand Sec. Checkpoint	Construct Federal Inspection Services, Relocate Concessions
Project Prerequisites	Phase 1: West	None	South Expansion
Triggering Event	200,000 Enplanements	170,000 Enplanements or 3rd Airline	Int'l Arrival Need
Additional Boarding Bridges	1	0	0
Additional Holdroom Area	3,200 SF	0	0
Additional Ticketing Area	0	2,000 SF	0
Additional Checkpoint Lines	0	1	0
Federal Inspection Services	No	No	Yes
Additional Apron Impacts	5,900 SY Expansion with Taxiway	None	None
Additional Building Impacts	Stairwell Relocation	Interior Reconfiguration	Second Baggage Claim Rental Car and Delivery Facility Relocation
ATCT Line of Sight Impacts	Verify Clear	Likely None	Likely None
Other Facility Impacts	Access Road Relocation	Utility Relocations	Parking Lot Relocation
Estimated Building Cost	$4.6 million	$2.5 million	$6.2 million

Source: KLJ Analysis



GFK TERMINAL MASTER PLAN

SOUTH TERMINAL EXPANSION CONCEPT - SECOND FLOOR

0 15 30 60

Figure 5-14

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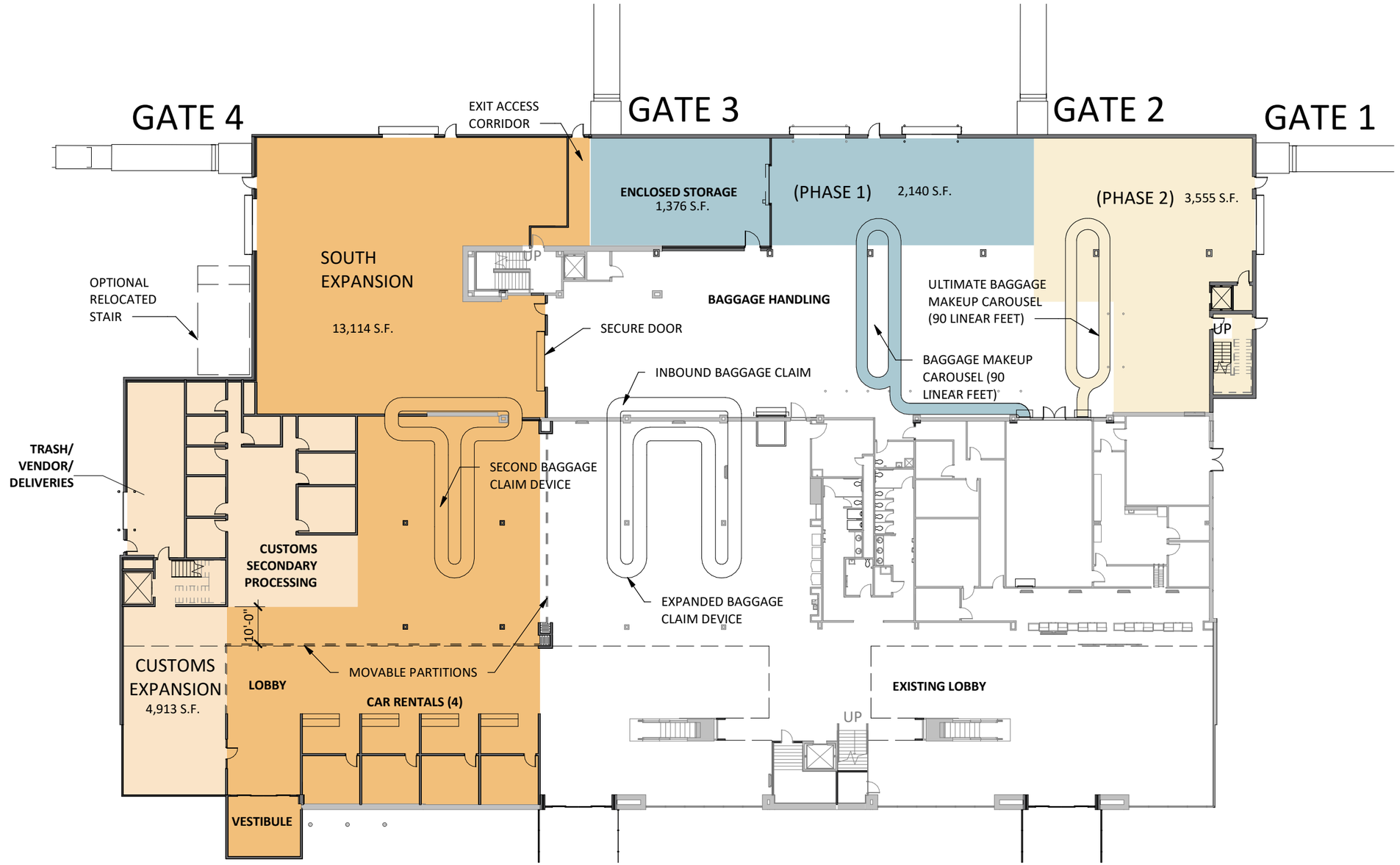

GFK TERMINAL MASTER PLAN

SOUTH TERMINAL EXPANSION CONCEPT - FIRST FLOOR

0 15 30 60

Figure 5-15

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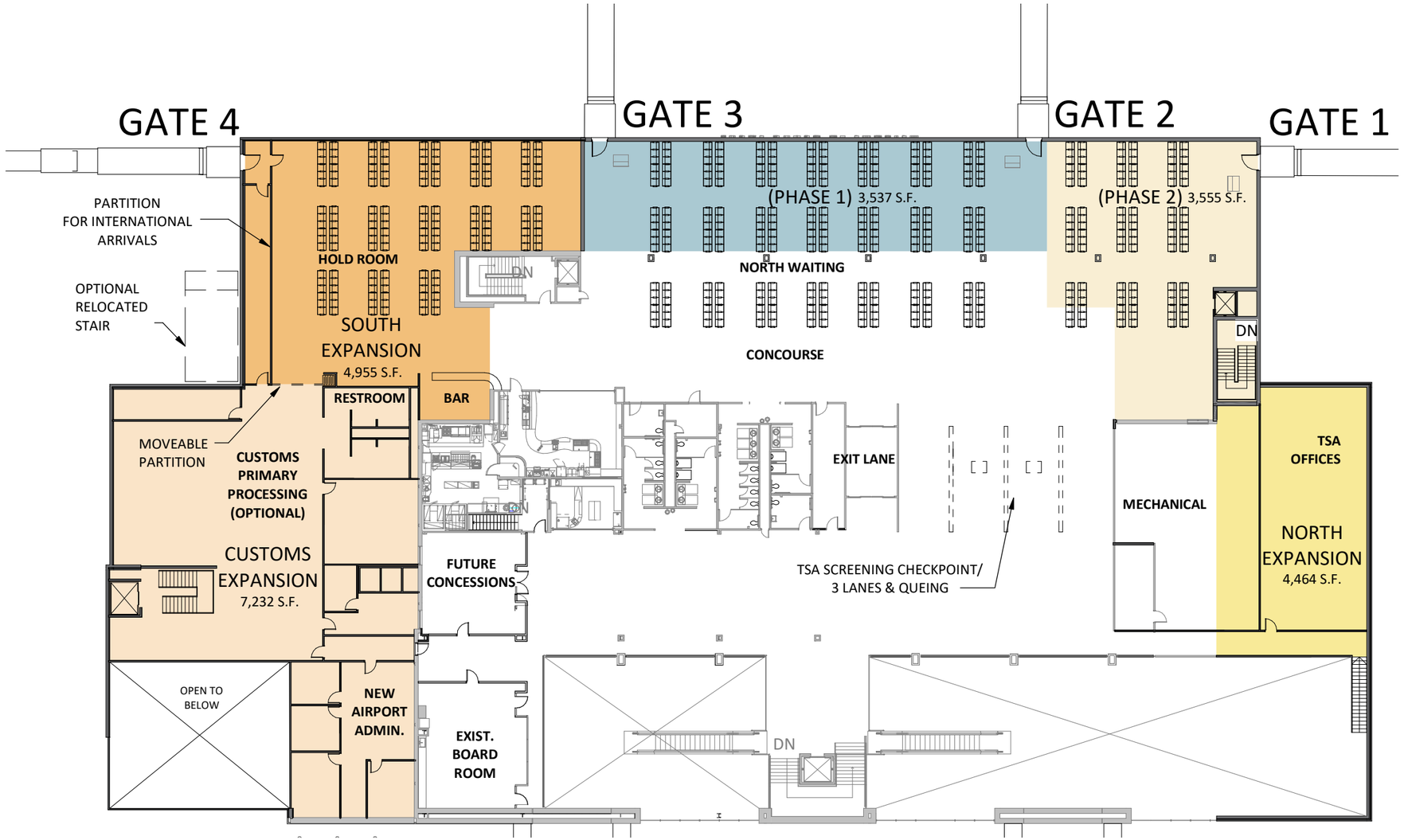

GFK TERMINAL MASTER PLAN

ULTIMATE TERMINAL CONCEPT - SECOND FLOOR

0 15 30 60

Figure 5-16

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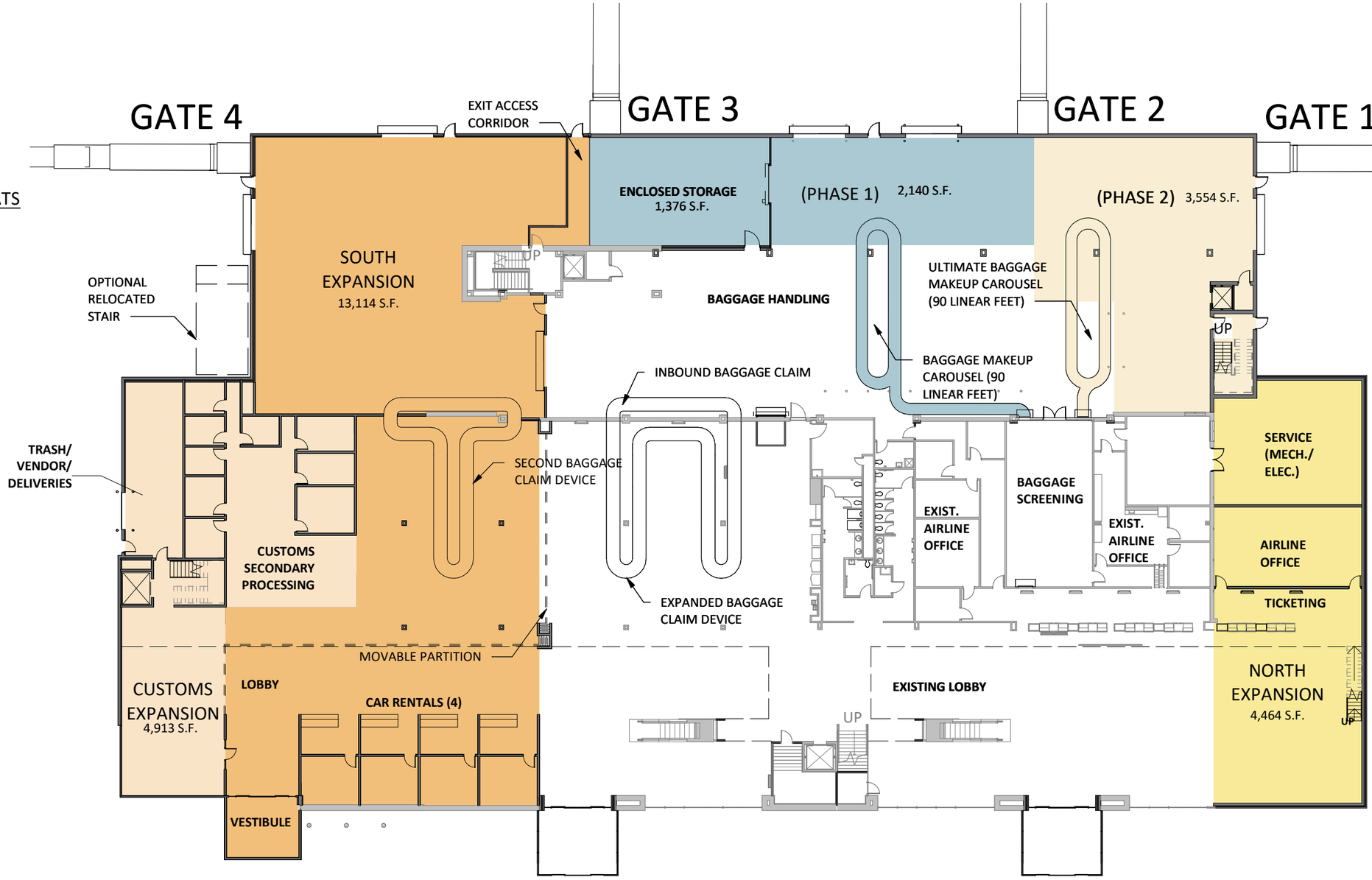
PHASE	ADD'L S.F.	TOTAL SEATS
PHASE 1	7,065 S.F.	252 SEATS
PHASE 2	7,096 S.F	360 SEATS
SOUTH EXPANSION	18,069 S.F.	516 SEATS
CUSTOMS FACILITY	12,145 S.F.	
NORTH EXPANSION	7,251 S.F.	



GFK TERMINAL MASTER PLAN

ULTIMATE TERMINAL CONCEPT - FIRST FLOOR

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0 15 30 60

Figure 5-17

DESIGN FOR LIFE

TERMINAL APRON

Background

The terminal apron needs to be designed to accommodate the safe movement and circulation of aircraft serving the passenger terminal building. Considerations include geometric clearances to meet FAA design standards, and jet blast. The current apron area does not have adequate maneuvering space for more than one aircraft during pushback or deicing operations. Complex pushback procedures are required for the north gate. This causes undesirable aircraft delays and congestion. The terminal apron was constructed with the new facility in 2011 and was generally designed for smaller regional aircraft.

Short-term PAL 1 facility needs that should be considered to meet demands include:

- Expand apron depth to accommodate regular use of design aircraft
- Add secondary access point to reduce delays when two or more aircraft are operating
- Locate a multi-use aircraft deicing and remain overnight parking (RON) apron near terminal facility to open terminal building gates

Additional long-term proposed actions through PAL 4 include:

- Add additional parking position and passenger boarding bridge to meet demand and better accommodate irregular operations
- Accommodate changing fleet mix at gate parking positions
- Accommodate growing ground service equipment (GSE) storage
- Straighten aircraft parking alignments to reduce complex pushback operations
- Adjust vehicle access road alignment to reduce vehicle conflict with aircraft pushback operations

Terminal Apron Alternatives

Do Nothing

A no action alternative is a baseline scenario where no further improvements are made to the terminal apron. This scenario accommodates the existing fleet mix for aircraft gate parking with adequate apron width however it remains deficient in apron depth. As the fleet mix evolves to PAL 4 the apron width will also be deficient. Existing constraints would continue.

Advantages:

- No additional direct capital or operating costs to airport

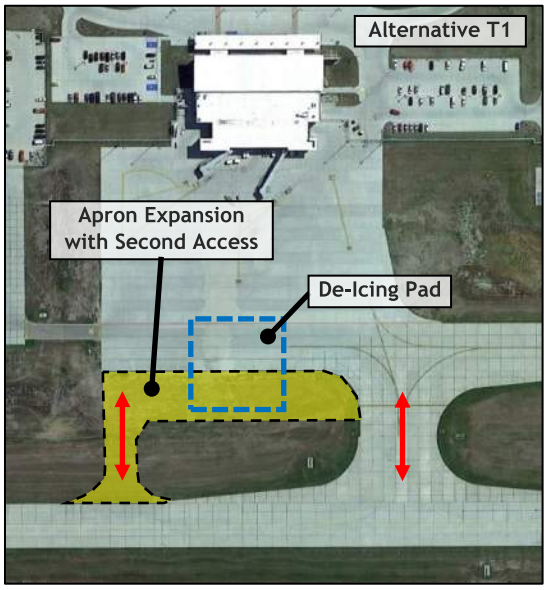
Disadvantages:

- Aircraft parking positions inaccessible during deicing or irregular operations
- Existing apron depth and single access remains deficient for multiple aircraft
- Future aircraft parking needs not accommodated
- Does not meet recommended passenger terminal building expansion needs
- Does not align with Airport Authority strategy

A do nothing alternative does not resolve the existing constraints and is not recommended for further consideration.

Alternative T1: West Apron Expansion with Second Access

Alternative T1 expands apron to the west by 75 feet and provides a secondary access point to the apron. The west expansion and second access point improves the maneuverability of multiple aircraft. An aircraft deicing area on the west side of the apron, between the two taxiway access points, accommodates up to an ADG-IV aircraft.



Advantages:

- Provides sufficient apron depth and a second access point for multiple aircraft maneuvering
- Provides separate aircraft de-icing pad away from gates
- Lower capital costs as compared to other apron options

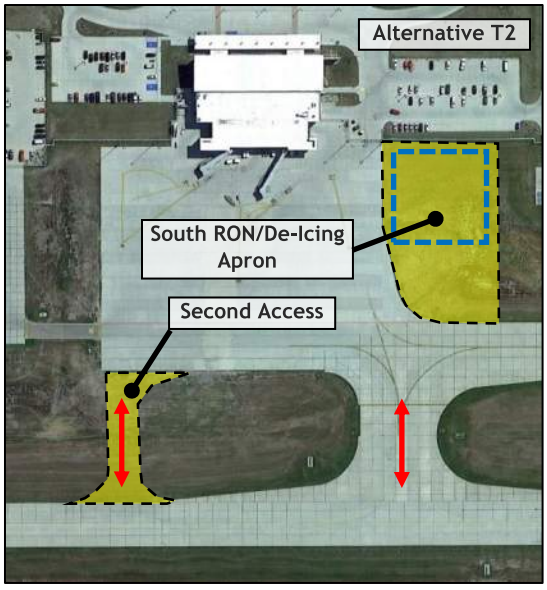
Disadvantages:

- Does not accommodate any new remain overnight (RON) or irregular operations
- The central parking position (Gate 2A) is inaccessible during deicing operations
- Potential for low visibility conditions on taxiway from deicing fluid spray

This alternative provides a potential interim solution but is not recommended as a long-term solution as it does not meet all long-term facility needs.

Alternative T2: South Deicing/RON Apron Expansion with Second Access

Alternative T2 expands apron length by 200 feet and provides a secondary access point to the apron. An aircraft deicing / RON area on the south side of the apron accommodates two ADG-III aircraft parked or one ADG-IV deicing operation. The alternative would allow free access to and from all the gates while aircraft deicing operations occur on the south apron. If the south expansion were selected for the passenger terminal building the apron would tie-in with the new development.



Advantages:

- Provides separate apron for aircraft de-icing, RON or irregular operations away from gates
- Deicing pad location allows access to all parking positions
- Provides a second access point for multiple aircraft maneuvering
- Compatible with a future south terminal building expansion
- Lower capital costs as compared to other apron options

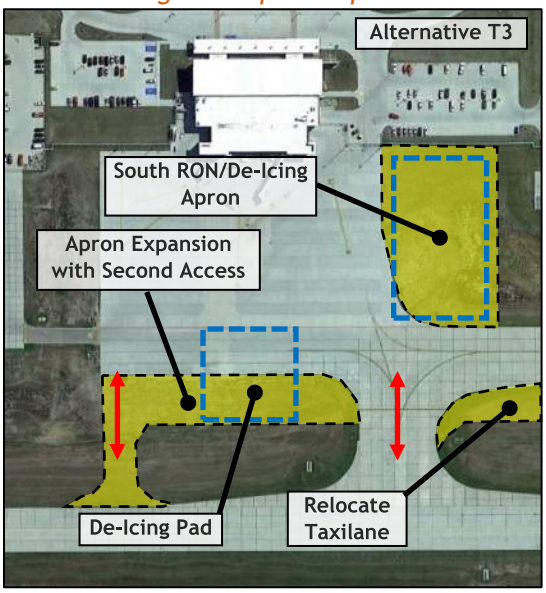
Disadvantages:

- Insufficient apron depth is not addressed
- Potential impacts to rental car lot from jet blast and/or de-icing fluid spray
- Complex pushback procedure to deicing location, increasing risk for airlines

Although a south apron expansion provides additional capacity, this alternative does not meet apron depth requirements and is not recommended as a long-term solution.

Alternative T3: West Apron Expansion with Second Access, South Deicing/RON Apron Expansion

Alternative T3 combines Alternatives T1 and T2. This alternative extends the current apron to the west by 75 feet and to the south by 200 feet, while adding a secondary access point to the apron. Aircraft deicing would occur on the west side of the apron, between the two taxiway access points, and on the south apron each accommodating up to an ADG-IV aircraft. The south apron can support two ADG-III parked aircraft for RON or irregular operations.



Advantages:

- Provides sufficient apron depth and a second access point for multiple aircraft maneuvering
- Provides separate aircraft de-icing pad away from gates
- Provides separate apron for two aircraft de-icing, RON or irregular operations (2 aircraft)
- Compatible with a future south terminal building expansion

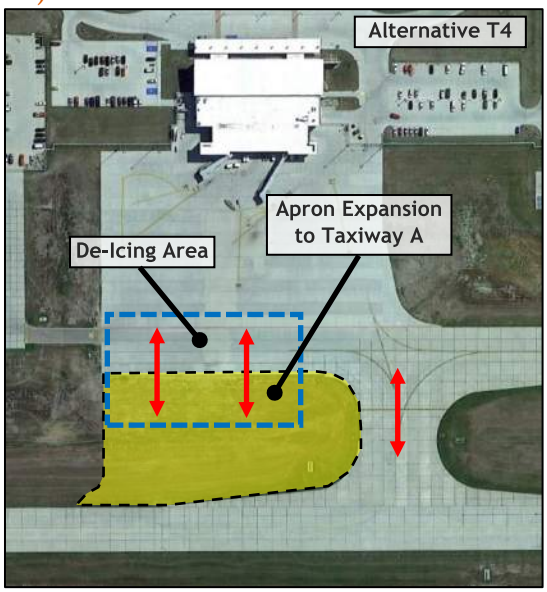
Disadvantages:

- Potential impacts to rental car lot from de-icing fluid spray if south apron used for de-icing
- The central parking position (Gate 2A) is inaccessible during deicing operations occurring on west De-icing Pad.
- Potential for low visibility conditions on taxiway from deicing fluid spray
- Requires new taxilane construction to provide space for two ADG-III aircraft in west apron area
- Higher cost than Alternatives T1 and T2 options

This alternative is recommended for further consideration as it meets short-term needs and is compatible with long-term needs.

Alternative T4: West Apron Expansion to Taxiway A (Filled-in)

Alternative T4 expands the apron to the west by 225 feet all the way to Taxiway A filling in the grass island. Each gate would have direct access in and out making other gates free when an aircraft is deicing. Pushback operations would be simplified with minimal turns. Two aircraft deicing areas are located directly west of the north and middle gate accommodating a Boeing 757 and ADG-III aircraft. Existing Taxiway F would remain for access to cargo apron and south terminal gate.



Advantages:

- Provides sufficient apron depth
- Provides paved access to Taxiway A for individual aircraft maneuvering to and from the gate
- Provides separate aircraft de-icing pad for two aircraft away from gates

Disadvantages:

- Does not meet RON or IROPS needs as parked aircraft would block access to gates
- Highest cost alternative

Due to the cost, this alternative is recommended for further consideration as an ultimate build-out condition.

Preferred Alternative & Sequencing

The preferred alternative is a combination of Alternatives T3 and T4 broken down into a sequence that considers the developments of the terminal building. Generally, Alternative T3 represents the future development while the full build-out in T4 represents the ultimate development. This best utilizes available space and meets facility requirements with phased development as needs dictate. The future development provides a secondary access to the apron and a deicing facility to the west of the terminal with the flexibility to develop additional RON/IROPs parking or aircraft deicing to the south. Ultimate development would fill in the remaining island between the apron and Taxiway A with pavement providing an additional deicing location capacity and simplified pushback operations.

Considering the terminal building developments, the following sequence was selected to best meet the evolving needs at GFK:

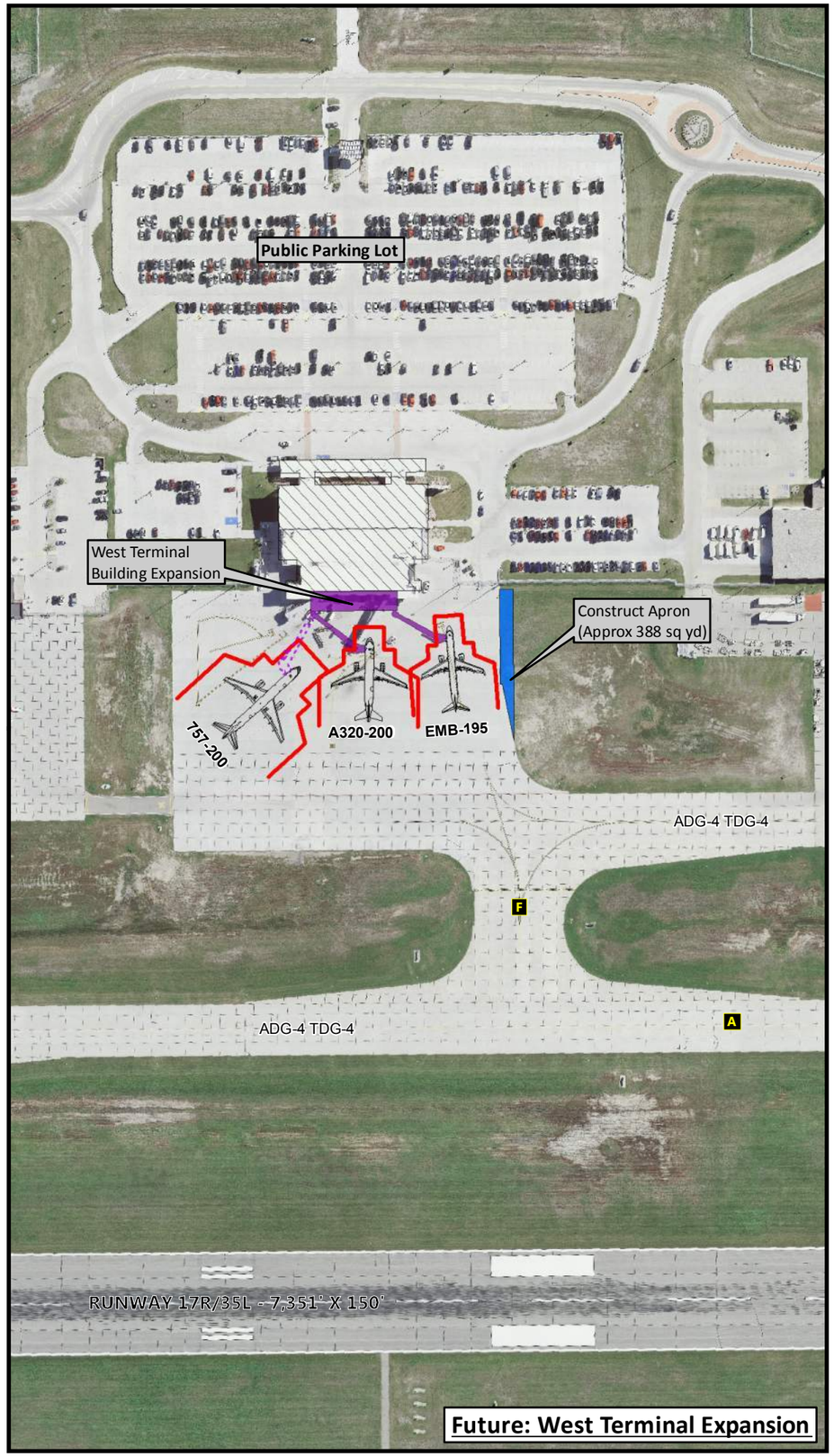
- Future: West Terminal Building Expansion
  - Adjust gate location parking when terminal building expands west
  - When PAL 4 fleet mix of parked aircraft occurs, additional pavement added to south of apron to allow ground support vehicles access around wingtip of aircraft
- Future: West Apron Expansion
  - Expand apron pavement to the west as depicted in Alternative T3.
- Future: South Apron Expansion
  - Expand apron pavement to the south as depicted in Alternative T3.
  - South apron expansion transitions to gate parking as terminal building expansions to the north and south occur adding additional gates (total of 4 gates)
- Ultimate: Apron and Terminal Expansion
  - Expand apron pavement to Taxiway A as depicted in Alternative T4.
  - Straighten alignment of taxilane to air cargo apron

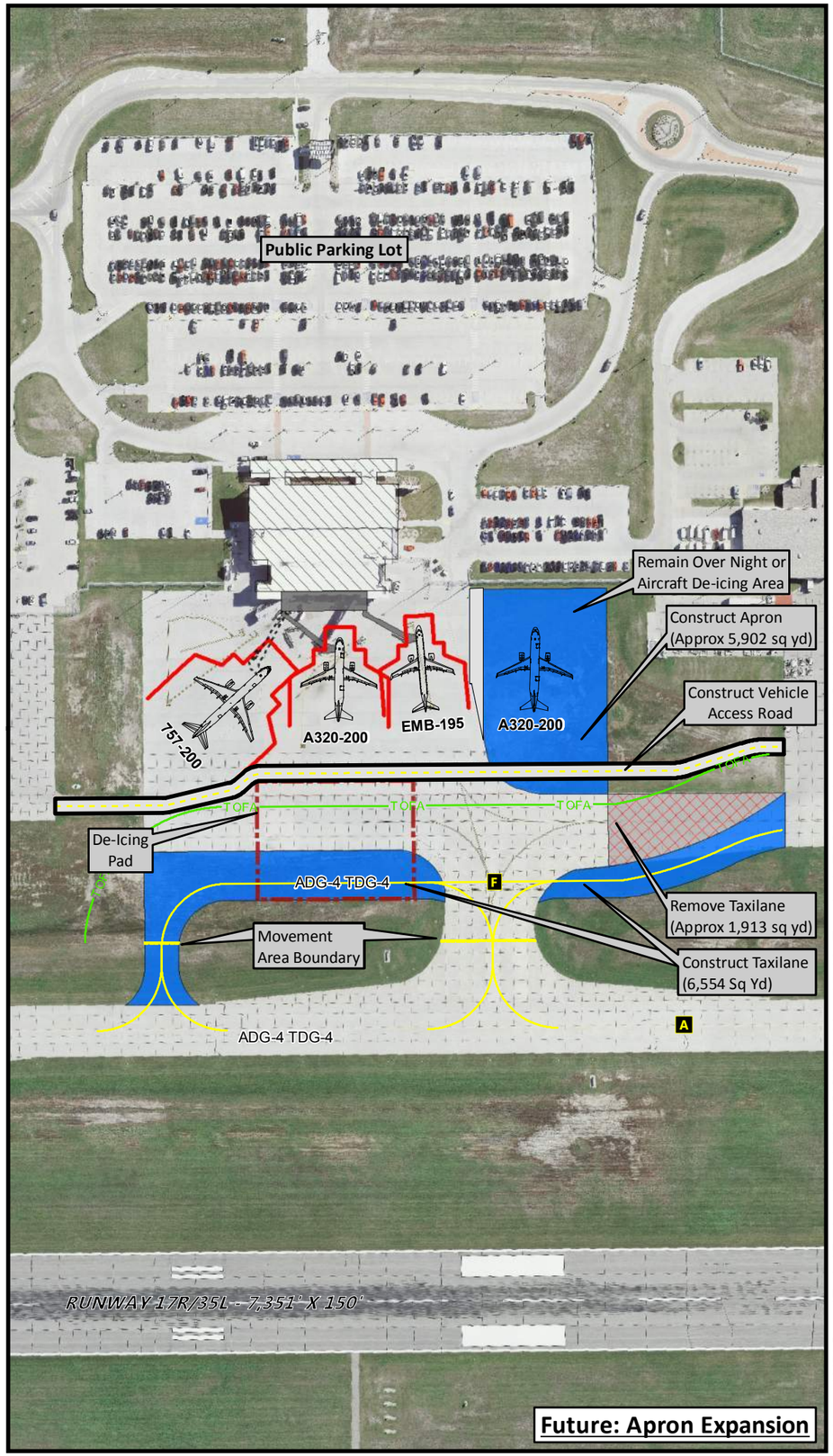
Table 5-21 – Recommended Terminal Apron Expansion Phases

Factor	Future: West Terminal	Future: West Apron	Future: South Apron	Ultimate
Expansion Direction(s)	South	West	South	West
Apron Expansion Size*	400 SY	4,600 SY	5,900 SY	5,600 SY
Expansion Purpose(s)	Ground Support Vehicle Maneuvering	Improved Aircraft Maneuvering and De-Icing Operations	Capacity or RON/IROPS/De-Icing	Straight In/Out Gate Operations
Triggering Event(s)	PAL 4 Fleet Mix or West Terminal Expansion	Simultaneous Aircraft/Gate Operations	South Terminal Expansion or Need for RON Parking	Multiple Aircraft De-Icing Operations
Other Facility Impacts	None	None	Realign Taxilane to Air Cargo Apron	Realign Taxilane to Air Cargo Apron (Optional)
Estimated Cost	$400,000	$1.5 million	$1.9 million	$1.8 million

*Source: KLJ Analysis; *Includes access taxiway*

Figures 5-18 and **5-19** graphically depict the sequence of the preferred terminal building and apron alternatives.





Legend

- Aircraft Gate Parking
- TOFA — Taxiway Object Free Area
- Taxiway/Taxilane Centerline
- Access Road
- Aircraft De-Icing Area
- Pavement Construction
- Pavement To Be Removed
- Terminal Building Expansion

N

0 100 200 400 Feet

*Intended for Planning Purposes Only

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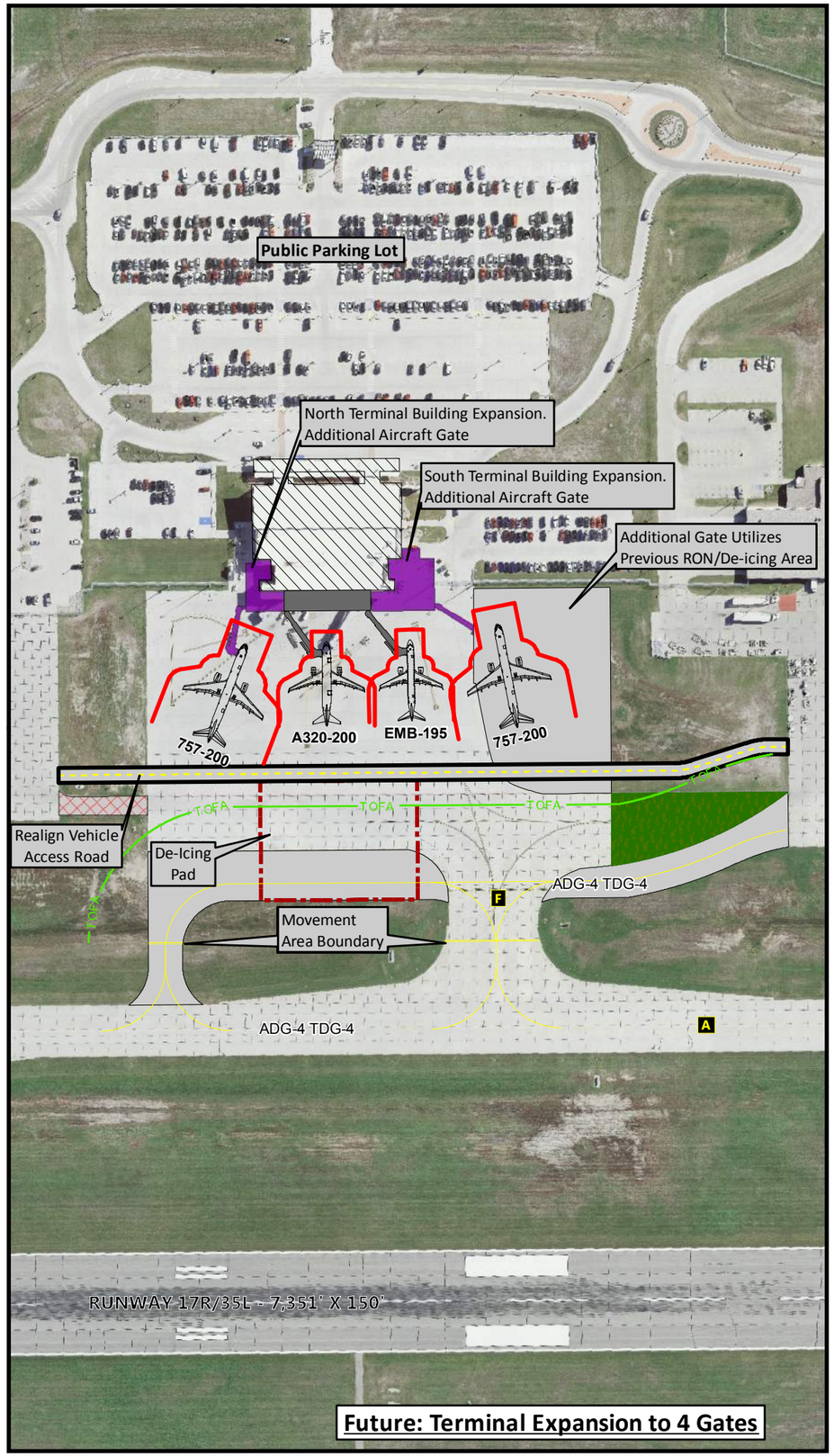
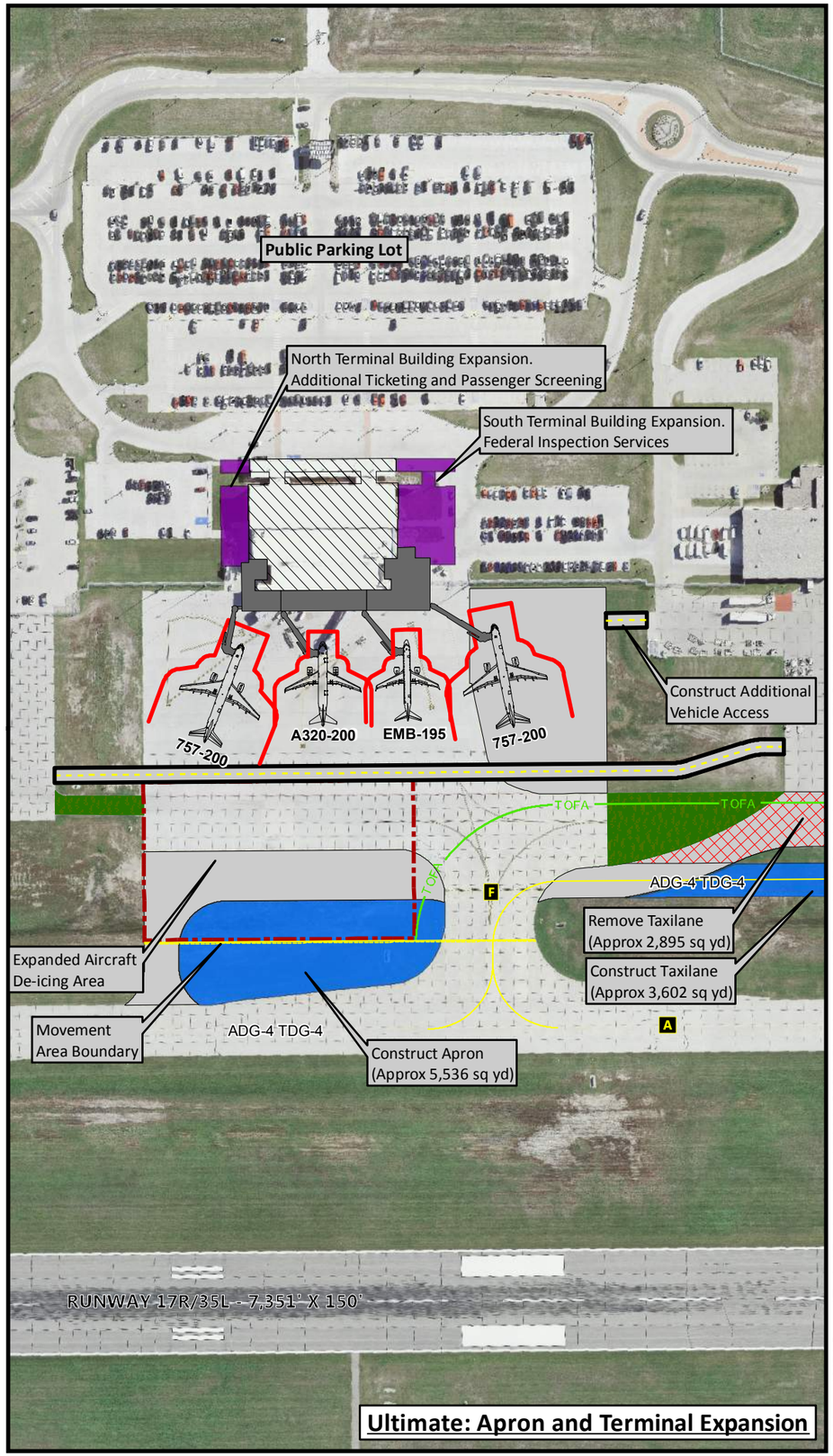
KLJ

Grand Forks International Airport
Figure 5-18:
Passenger Terminal Area
Future



Future: Terminal Expansion to 4 Gates



Ultimate: Apron and Terminal Expansion

Legend

- Aircraft Gate Parking
- TOFA — Taxiway Object Free Area
- Taxiway/Taxilane Centerline
- Access Road
- Aircraft De-Icing Area
- Terminal Building Expansion
- Pavement to be Removed
- Pavement Construction

N

0 100 200 400 Feet

*Intended for Planning Purposes Only

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KLJ

Grand Forks International Airport
Figure 5-19:
Passenger Terminal Area
Future / Ultimate

Air Cargo

Background

Historically, GFK has been a regional hub for one mainline cargo airline and various regional feeder aircraft. FedEx announced the closing of their operations at GFK with the final operation occurring on October 31, 2016. Based on this information, the following section summarizes key air cargo facility requirement findings:

- **With FedEx's moving their regional hub from GFK, air cargo space meets the remaining local air cargo needs through PAL 4.**
- **Consolidate air cargo activities on the airport to the dedicated air cargo complex.**

FedEx will no longer have its regional hub at GFK and the new critical design aircraft will be an Airplane Design Group II aircraft. The forecasted enplaned/deplaned cargo numbers will decrease to 598,000 pounds annually, a decrease of over 98 percent from cargo hub activity. The airport has since created a committee to work on possible re-utilizing uses of the air cargo facilities to attract business that would create sustainable airport revenue into the future.

Concepts

The air cargo area was reviewed to be reconfigured for smaller air cargo aircraft, maximize airside development around the existing pavements, and provide compatible development space to the south for other types of potential aeronautical development. Additional development to the south was explored without encroaching upon the primary runway FAA Approach and Departure Surfaces. No other alternatives were analyzed in detail.

Recommendation

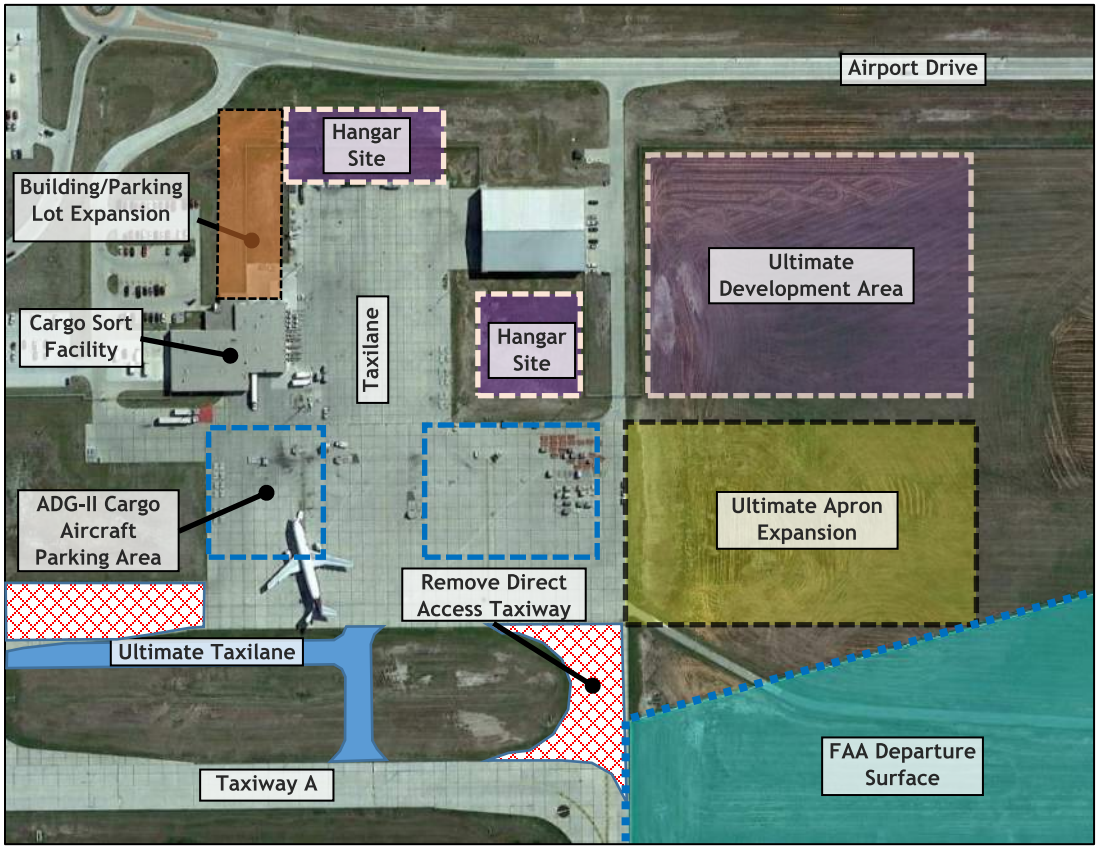
The current cargo processing and storage building more than meets any anticipated all-cargo needs. Space should be allocated to move the remaining air cargo sorting operations from the Alpha Apron to the cargo facility. Certain portions of the building may be able to be reutilized without impacting cargo operations. It is recommended a portion of the aircraft apron, accommodating up to three simultaneous all-cargo ADG-II parked aircraft, should be preserved to meet remaining and anticipated future all-cargo demand.

A few targeted enhancements to the existing plan were reviewed with consideration being made to maximize the flexibility while reducing investment in infrastructure. The following targeted improvements are recommended to be incorporated into the terminal area plan.

- Expand the existing sorting facility to the east along the commuter apron. While the existing facility is sufficient for all-cargo sorting needs, an expansion provides additional apron frontage and indoor square footage to meet needs if facility houses multiple users in the future. The site would utilize existing parking lot as well as new lot.
- Develop a new hangar facility site to the west of the existing aircraft storage hangar on the south side of the air cargo apron. This improvement maximizes the use of existing apron pavement.
- Develop a new facility site lot along east edge of the existing commuter apron. This will preserve an additional facility site to maximize use of existing apron pavement. New vehicle parking lot to the north required to meet parking needs for facility.
- Expand the new facility site lot south of the main apron to the west. This provide flexibility for larger commercial operator needing a larger facility space.
- Reduce the depth of main apron south expansion to maintain utility but minimize new pavement infrastructure.
- Eliminate direct access from apron to Runway 17R-35L.

The recommended revised air cargo complex plan is shown graphically in **Exhibit 5-22** and **Figure 5-24**.

Exhibit 5-22 – Recommended Air Cargo Complex Development Concept



Source: KLJ Analysis

General Aviation

Requirements Summary

In the constrained forecast scenario, GFK is forecasted to see growth in general aviation (GA) operations and based aircraft, particularly with activities tied to business turboprop and turbojet aircraft. UND operations are constrained based on many factors including airfield capacity, airspace restrictions, and the ability to staff enough Certified Flight Instructors (CFIs). Corporate GA and recreational fliers are both growing at GFK.

The following section summarizes key general aviation facility requirement findings:

- Plan for an additional 99,000 square feet of aircraft storage space (24 percent) to meet PAL 4 forecasted based aircraft and fleet mix demand.
- Develop the west GA area for larger/corporate aircraft and the east GA area for smaller aircraft consistent with the 2014 Terminal Area Plan.
- Increase transient aircraft storage by nearly 50 percent to 39,000 square feet to accommodate transient aircraft types who may desire hangar storage.
- Reconfigure aircraft parking space to meet FAA standards. Total usable transient apron space however is sufficient to accommodate UND and non-UND parked aircraft demand through PAL 4.

2014 Terminal Area Plan

In 2014, GFK conducted a study of the terminal area to review providing additional aircraft storage space that was flexible to accommodate future demand of GA based aircraft. One key driver for the study was re-developing land surrounding the old terminal building to the highest and best use. Another key driver of the study was addressing existing T-hangars on the west side of the airfield that had exceeded their useful life, and did not meet FAA taxilane design standards.

A strategy of locating smaller aircraft on the east side of the building area, and large aircraft on the west side was identified as the overall solution. This east-side development area would house the relocated smaller GA aircraft, and allow the existing west-side footprint to be reconstructed in a layout more conducive to larger corporate-type GA development. This plan best utilizes space for future growth opportunities with pavement on the west-side of the airfield servicing larger/heavier aircraft. Meanwhile, the east-side hangar development relocates smaller aircraft that do not need heavier pavement infrastructure. The existing runway and taxiway complex on the east side of the airport accommodate small aircraft up to 12,500 pounds. Other development identified in the plan includes redeveloping the area to the south of the old terminal into a larger building area reserved for a large commercial tenant.

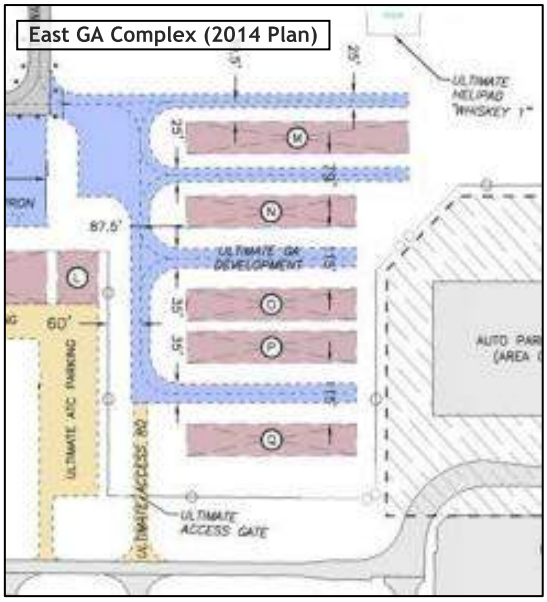
The planning principles from the 2014 terminal area plan is still recommended to carry forward, with enhancements made to meet new considerations identified in this study.

East GA Complex

2014 TERMINAL AREA PLAN

The plan currently in place focuses on locating replacement small aircraft facilities to the east side of the airfield where pavements are designed for aircraft less than 12,500 pounds. Ultimate build-out provides 102,000 square feet (SF) of aircraft storage space with a mix of traditional box hangars and nested T-hangar development.

This transition would begin once the east GA infrastructure development is completed, and facilities able to accommodate the demanded storage are constructed. At the time of this study the earthwork, underground utilities, and taxilane pavement have been completed.



NEW CONSIDERATIONS

The east GA construction project has commenced with expected completion of taxilane infrastructure in 2017.

Airport master plan study focus group meetings with airport staff and GA tenants reviewed the existing plan and identified possible improvements for consideration. A self-service fueling facility and arrival/departure facility near the development was desired. Additional recommendations were; wash-bay or water source, additional ADG-II aircraft storage options and nearby restrooms.

Development to the north of the east GA development area was once designed around a replacement ATCT location. Site selection and planning for a new ATCT was initiated by the FAA in early 2017. None of the three feasible ATCT sites selected are immediately adjacent to the east GA development area. This opens new opportunities to locate box hangars along the north side of the GA taxilane for ADG-II aircraft up to 12,500 pounds.

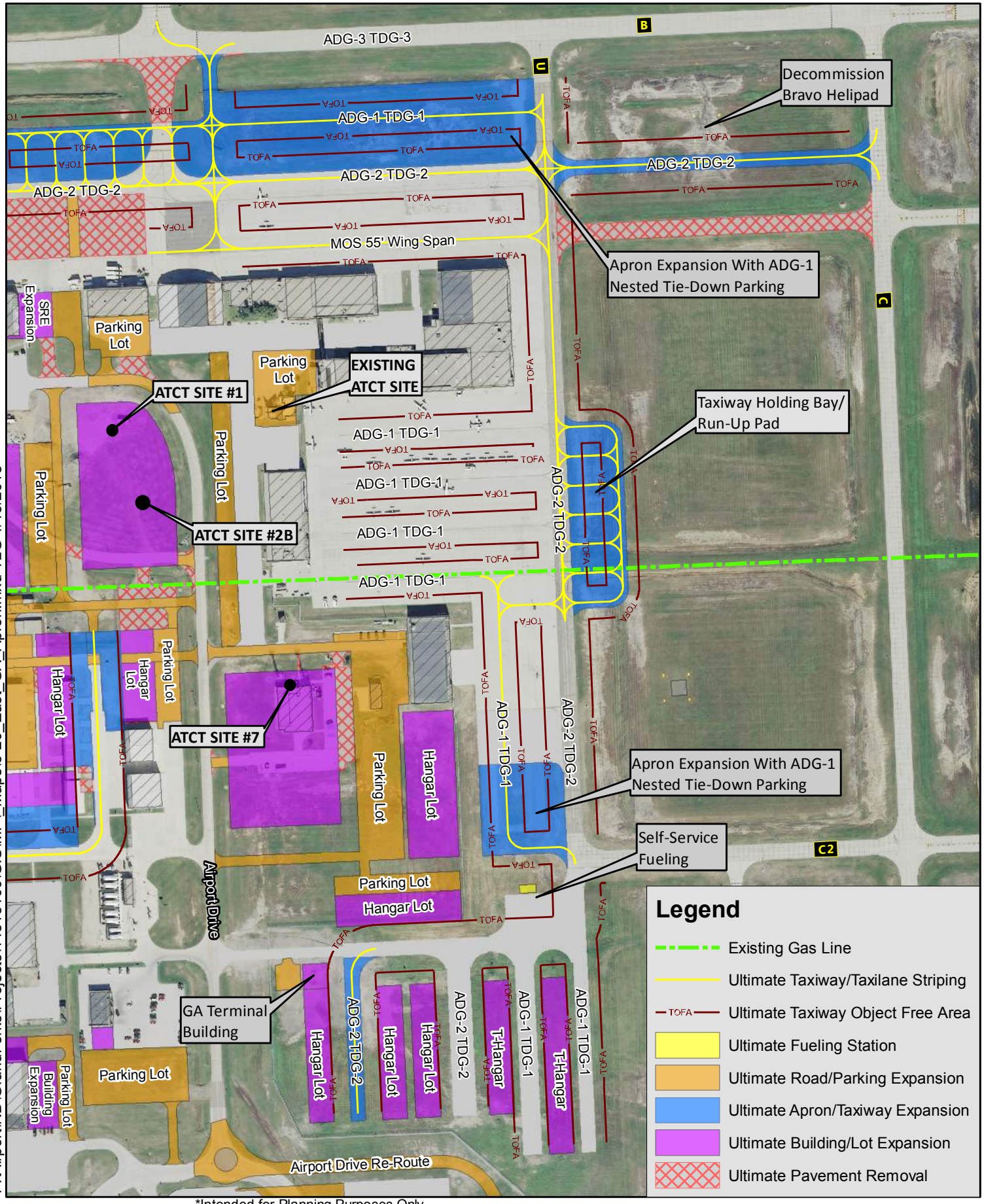
CONCEPTS

The following enhancements to the 2014 plan were evaluated during the master plan study:

- **Self-Service Fueling**: Incorporate self-service fueling facility at north east corner of development utilizing existing designed pavement and accommodating the fueling of ADG-I aircraft while maintaining taxilane clearance for taxiing aircraft.
- **GA Terminal Building**: Locate a GA terminal building at north end of west hangar. The facility would be the conveniently located next to the entrance of the complex and provide vehicle parking from the existing access road. Additionally, the facility would be near an existing water source utility that could feasibly provide water to the facility for washing of aircraft.
- **North Hangar Lots**: Additional hangar lots in the former location of the ATCT site would provide for an additional 18,000 SF of ADG-II aircraft storage space.

RECOMMENDATION

It is recommended the enhancements be incorporated into the updated Airport Layout Plan. This area provides 120,000 square feet of small aircraft storage space. **Figure 5-20, East General Aviation Plan** depicts the revised plan with enhancements.



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*Intended for Planning Purposes Only

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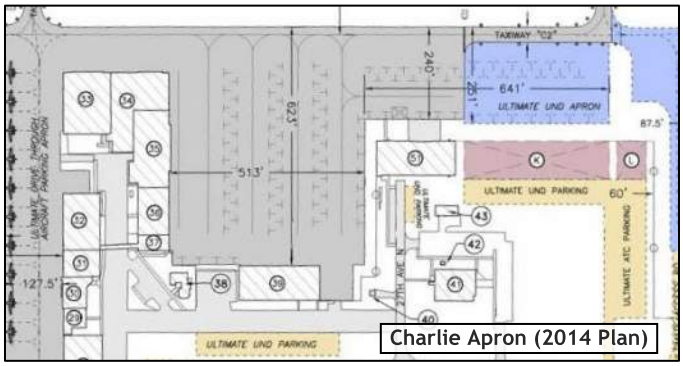
0 100 200 400 Feet

Grand Forks International Airport
Figure 5-20:
General Aviation Apron
(East)

Charlie Apron

2014 TERMINAL AREA PLAN

The Charlie Apron is the primary parking location of ADG-I single-engine and helicopter flight training aircraft for UND. The 2014 plan focuses development of apron and facilities further to the south to increase parking and indoor storage capacity. During the summer of 2016 the majority of Charlie Apron was reconstructed with the remaining crack sealed, and the helicopter parking apron was expanded by 200 feet further south.



Charlie Apron (2014 Plan)

NEW CONSIDERATIONS

Aircraft run-up locations outside of the movement area were desired by the university and ATCT for fixed wing training aircraft to perform run-up operations prior to taxiing to the runway. Aircraft departing the holding bay would be ready for departure sequencing without delay.

Site selection and planning for a new ATCT was initiated by the FAA in early 2017. One of the three preferred sites to be preserved is the location of the former flight service station (FSS) building. The impacts of the site restrict building and apron developments around the UND helicopter hangar and the facility location of the FAA tech operations which currently resides in the FSS building. This ATCT site must be preserved; however, the plan can be modified in the future if the ATCT is built is another location.

CONCEPTS

The following were evaluated as enhancements to the 2014 Terminal Area Plan:

- Expand the apron to the south to the limits of the east GA complex to increase UND aircraft parking capacity.
- Construct an aircraft run-up complex for up to six ADG-I aircraft on east side of Charlie Apron which allows aircraft to perform run-up prior to ATCT sequencing. Other locations were evaluated but dismissed by ATCT and UND Aerospace officials.
- Additional hangar facility lot on south edge of Charlie Apron and west edge of expanded apron to accommodate additional indoor aircraft storage. A new hangar along the south edge of the Charlie apron was dismissed due to concerns with compatibility with a new ATCT facility.
- Preserve a 360’ x 260’ site for a new ATCT, base building, parking and vehicle access at the site of the former FSS as part of the FAA’s ATCT site selection and planning program. This replaces the location identified in the 2014 plan.
- Adjust building area roadways and parking lot to improve vehicle maneuverability and accommodate expanded facilities.

RECOMMENDATION

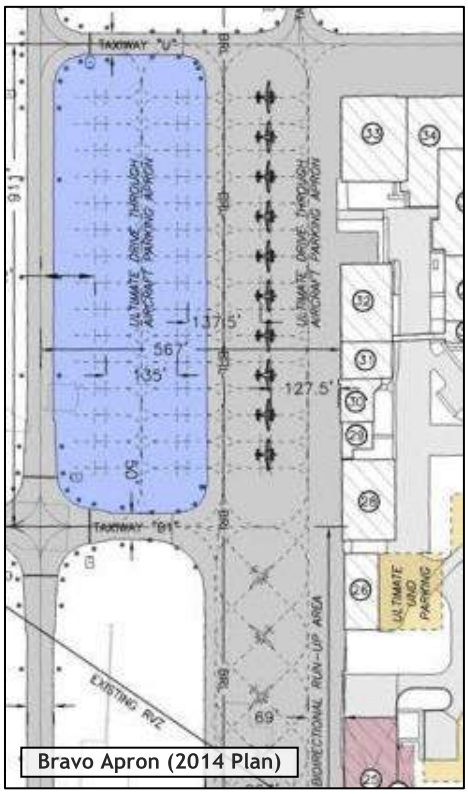
It is recommended the enhancements be incorporated into the updated Airport Layout Plan. **Figure 5-20** depicts the revised plan with enhancements.

Bravo Apron

2014 TERMINAL AREA PLAN

The Bravo apron is used by UND for the maneuvering and parking of their aircraft, with nested aircraft tie-downs. The university expressed they do not like the design of nested tie-down spots because of increased potential for aircraft damage, and pose a greater safety concern for such a high operation area. Additionally, the university and ATCT desire a location for fixed-wing training aircraft to perform run-up operations prior to taxiing to the runway. Aircraft departing the holding bay would be ready for departure sequencing without delay.

The plan adopted in 2014 expanded the apron pavement out to the edge of Taxiway B to the north, with three taxilanes with drive-through parking locations. The plan also included a bi-directional aircraft run-up location on the west side of Bravo Apron.



Bravo Apron (2014 Plan)

NEW CONSIDERATIONS

Since constructing the new SRE/ARFF facility the airport has noticed an environmental impact on communications and workforce comfort from the high noise operations adjacent to the facility. The airport desires a new location for run-up operations within the ATCT non-movement area.

In addition, upgrading Runway 9L-27R to RDC C-III design standards limits aircraft parking within 500 feet of the runway centerline. Taxiway B is planned to accommodate ADG-III aircraft which requires a 186-foot wide object free area. These two design standards will affect the ultimate expandability of aircraft parking along the Bravo apron.

Taxiways B1 and C1 will need to be relocated when it is reconstructed to eliminate direct access from the Bravo apron to the runway environment. The new taxiway alignment should be located to enhance overall flow and maneuverability on Bravo apron.

The taxilanes meet ADG-I design standards, however there are based ADG-II aircraft in adjacent hangars. Concepts that accommodate ADG-II aircraft parking and taxilanes should be considered.

CONCEPTS

The following concepts were evaluated as potential enhancements to the 2014 Terminal Area Plan:

- Extend Bravo apron to provide either nested or “drive-through” aircraft parking positions to accommodate mostly ADG-I flight training aircraft, but also accommodate ADG-II aircraft operated by UND.
- Consider an ADG-II taxiway near the buildings on the south side of the Bravo apron to provide sufficient ADG-II taxilane object free area (OFA) clearances for based aircraft. A full 115-foot TOFA results in a north side parking area penetrating the future Taxiway B taxiway OFA and Runway to Parking Area separation, without restricting equipment parked near the hangars. An 86-foot taxilane OFA provides a minimum level of safety for 55-foot wingspan aircraft but requires an FAA Modification to Design Standards (MOS).

- Realign Taxiway C1 with the north edge of the existing Bravo apron to meet airfield safety standards, and develop a continuous west-east ADG-II taxilane connecting the two sides of the airport in an ATCT non-movement area.
- Construct an aircraft run-up complex on north side of apron near existing Taxiway B1 which allows up to six ADG-I aircraft to perform run-up prior to ATCT sequencing. Location is further from the occupied portions of SRE/ARFF buildings to reduce environmental impacts. Other locations to the east were reviewed but dismissed by ATCT and UND Aerospace staff for Bravo apron use.
- Remove apron pavement on west side which reduces rehabilitation and maintenance costs. The Runway Visibility Zone restrictions for parked aircraft limits pavement usage. Maintain taxilane along north edge to provide efficient taxi flow as well as providing vehicular access roads to SRE/ARFF buildings and vehicle gate.

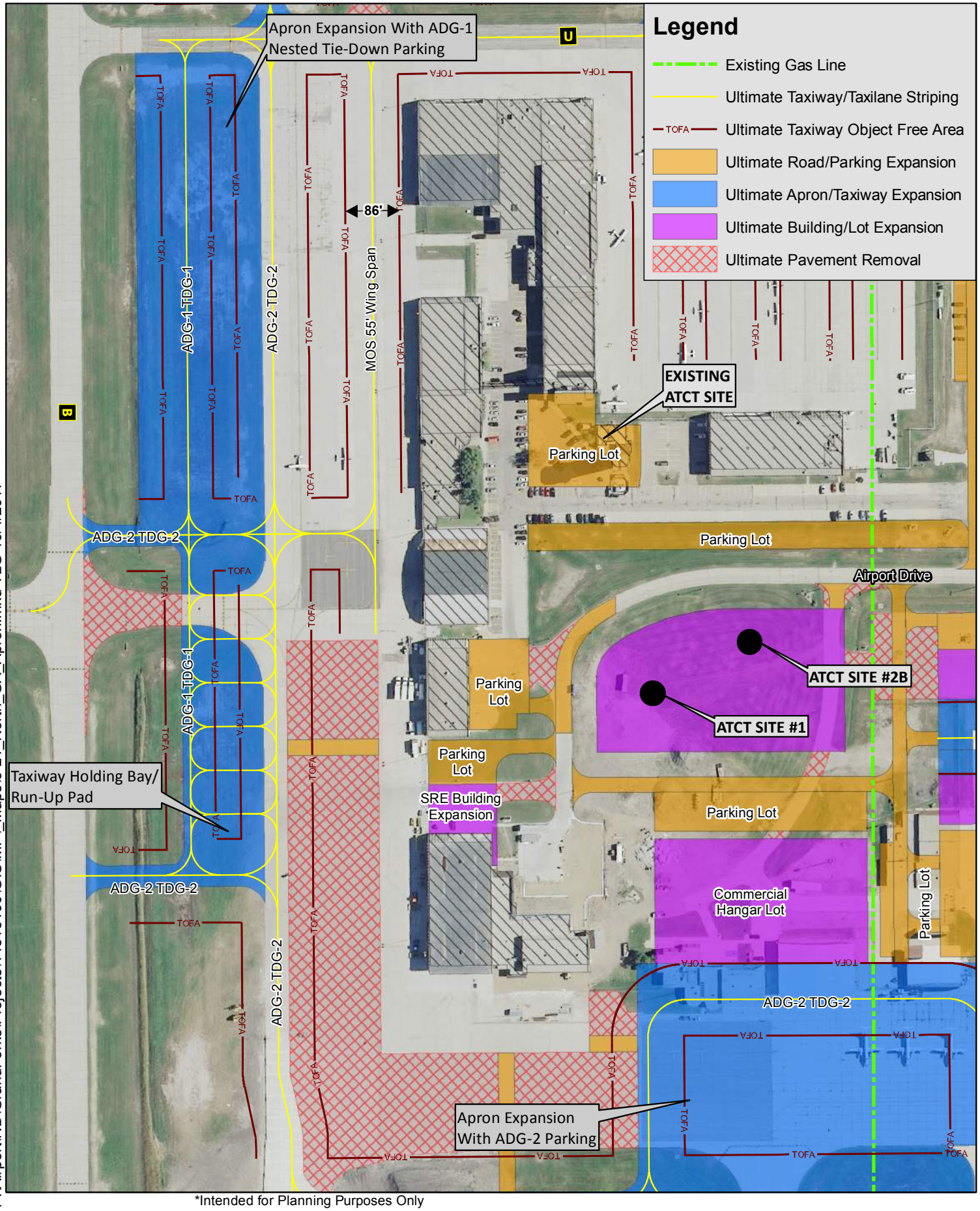
RECOMMENDATION

It is recommended the following enhancements be incorporated into the updated Airport Layout Plan:

- Extend Bravo apron to the north by 16,600 SY to increase aircraft parking frontage by 16 percent.
- Provide three rows of aircraft parking, enhance maneuverability with the option for ADG-I and ADG-II "drive-through" aircraft parking positions.[1]
- Provide one continuous ADG-II taxilane connecting the east and west sides of the airfield.
- Construct 9,900 SY of apron and taxiway pavement for an aircraft holding bay and two ADG-II/TDG-2 connecting taxiways.
- Remove Taxiway B1 (replaced by holding bay and two connecting taxiways)
- Remove and relocate Taxiway C1 (795' x 35').
- Remove a total of 20,477 SY of unneeded apron pavements.

Figure 5-21, North General Aviation Plan depicts the revised plan with enhancements.

[1] Requires Modification to Standards for Aircraft with 55' wingspans



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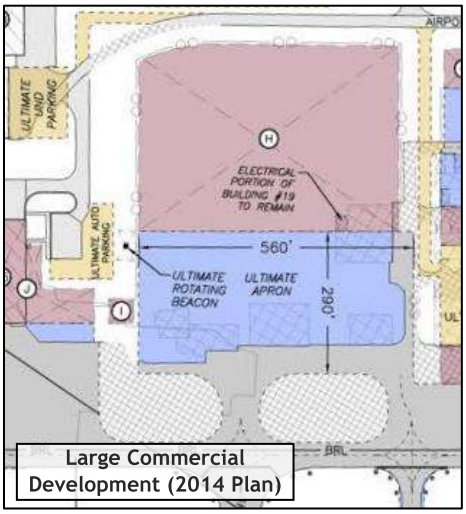
Grand Forks International Airport
Figure 5-21:
General Aviation Apron (North)

Large Commercial Development

2014 TERMINAL AREA PLAN

The plan framework was to demolish structures and facilities that have reached the end of their useful lives and replace it with an open lot for a large commercial operator. Facilities requiring demolition and replacement include the old ARFF Station and U.S. Customs and Border Protection (CBP) facilities, old SRE building, Mass Hangar #2, Air Cargo Hangar, and the old terminal economy parking lot. This plan preserves approximately a 530' x 380' lot for a large aeronautical commercial operator with apron and access taxiways. The framework is to provide a flexible space for multiple uses. The old electrical building in the old SRE building is to remain as the cost of relocation could be costly because of relocating all associated electrical systems tied into the vault.



Large Commercial Development (2014 Plan)

NEW CONSIDERATIONS

The ATCT site selection process identified two sites within this development area because of its ideal controller line-of-sight to the airfield. A site of approximately 2 acres has been preserved in the location of the former terminal parking lot to the east of the large commercial development area. This impacts the depth available for commercial development.

The location of an old Jet-A pipeline was identified during this planning study. Although this line is not currently in use, setbacks should be considered to avoid any new structures from being sited over the pipeline.

The primary runway lighting needs replacement soon, which provides the opportunity to relocate the electrical building. This would eliminate development constraints in the commercial area.

CONCEPTS

The following enhancements to the original 2014 plan were evaluated during the master plan study:

- Split the large commercial lot into an east and west portion to accommodate two of the three ATCT preferred sites. The east portion would be reserved for the ATCT site with access from Airport Drive, while the west portion would provide building lots with apron access. Provide a public access roadway between the two portions.
- Limit building lot development to the south to provide adequate setback from the Jet-A pipeline. Roadway or parking lot construction over the pipeline was deemed acceptable.
- Shift the building lot to the west in line with the new ARFF/SRE building complex, providing additional building space and preserving airside access like the existing FBO apron. Various lot sizes were considered, with a 340' x 200' (+/- 1.5 acre) lot identified as the preferred option. This would be sized for a potential large commercial development at the airport. Larger development could be located near the existing air cargo complex.
- Remove the electrical vault from the development area to free building lot constraints. A near-term runway lighting replacement project will incorporate the replacement vault on the west side of the airfield.
- Add a taxilane on west side of apron running parallel to Taxiway A that allows aircraft to move between locations along apron outside of the ATCT movement area.

- Relocate CBP facilities. Locations considered included near the existing facility, near the current FBO facility, and adjacent to the commercial terminal. A location between FBO apron and the terminal apron was preferred for closer proximity to GA and commercial operations.
- Provide expandability for the current SRE building to the east, with a relocated access road.
- Eliminate extra pavement in front of the ARFF/SRE complex and replace with controlled access roads.

RECOMMENDATION

It is recommended the concepts be incorporated into the Terminal Area Plan. **Figure 5-22, West General Aviation Plan** depicts the revised plan with enhancements.

West Corporate GA Complex

2014 TERMINAL AREA PLAN

The existing west GA area houses several small GA aircraft in T-hangars, larger mass parking hangars, and a few corporate box hangars. There are several areas that do not meet FAA airport design standards. Many of these buildings and pavements have also reached the end of their useful life and need rehabilitation in the next few years.

West Corporate GA Hangars (2014 Plan)

The central concept of the 2014 plan is that corporate aircraft development would be in the west GA area along and near the alpha apron where pavements are designed to accommodate the larger and heavier aircraft. These corporate hangar lots have an additional 60-foot setback from the taxilane object free area to accommodate an aircraft in front of the hangar and still allow for a clear taxilane. Smaller aircraft in T-hangars would be located on the east side of the airfield. The transition would begin once the east GA infrastructure development is completed, which would initiate the removal of existing T-Hangars and mass storage hangars on the west side of the terminal area.

NEW CONSIDERATIONS

Several objects were found to penetrate the existing ADG-II taxilane object free area (TOFA) near the existing corporate hangars, including a fence, card reader, de-icing tanks and electrical box. A solution needs to be evaluated in this study.

The size of the automobile parking lot was reviewed. New industry guidance recommends the parking lot be sized to provide 1 vehicle stall for each 1,000 SF of hangar floor space. A revised configuration should be considered to accommodate parking demands if the hangar space changes.

A larger 100-foot deep hangar space was considered for west-facing lots adjacent to the alpha apron. A dedicated hangar taxilane is also recommended. The need for a full 60-foot setback also should be re-evaluated to maximize aircraft storage space considering the lack of expandable space in the area.

With planning for a replacement ATCT now ongoing, the configuration must be compatible with both the existing and future ATCT controller line-of-sight to the airfield movement areas. Aircraft along Taxiway A and holding at the edge of the alpha apron must be visible. A maximum hangar height of 30 feet was assumed which is consistent with other corporate hangars at the airport. Line-of-sight restrictions are a consideration the further west and south hangars are located.

Another consideration was repurposing the northernmost east-west taxilane as an access road in the future, and considering ultimate expansion to the north for additional space.

Construction has begun on the east GA area with pavement being completed in summer of 2017. Following the construction of the hangars, the transition of the corporate hangar area can commence. Two of the mass aircraft storage hangars have since been removed by the Airport consistent with the 2014 plan.

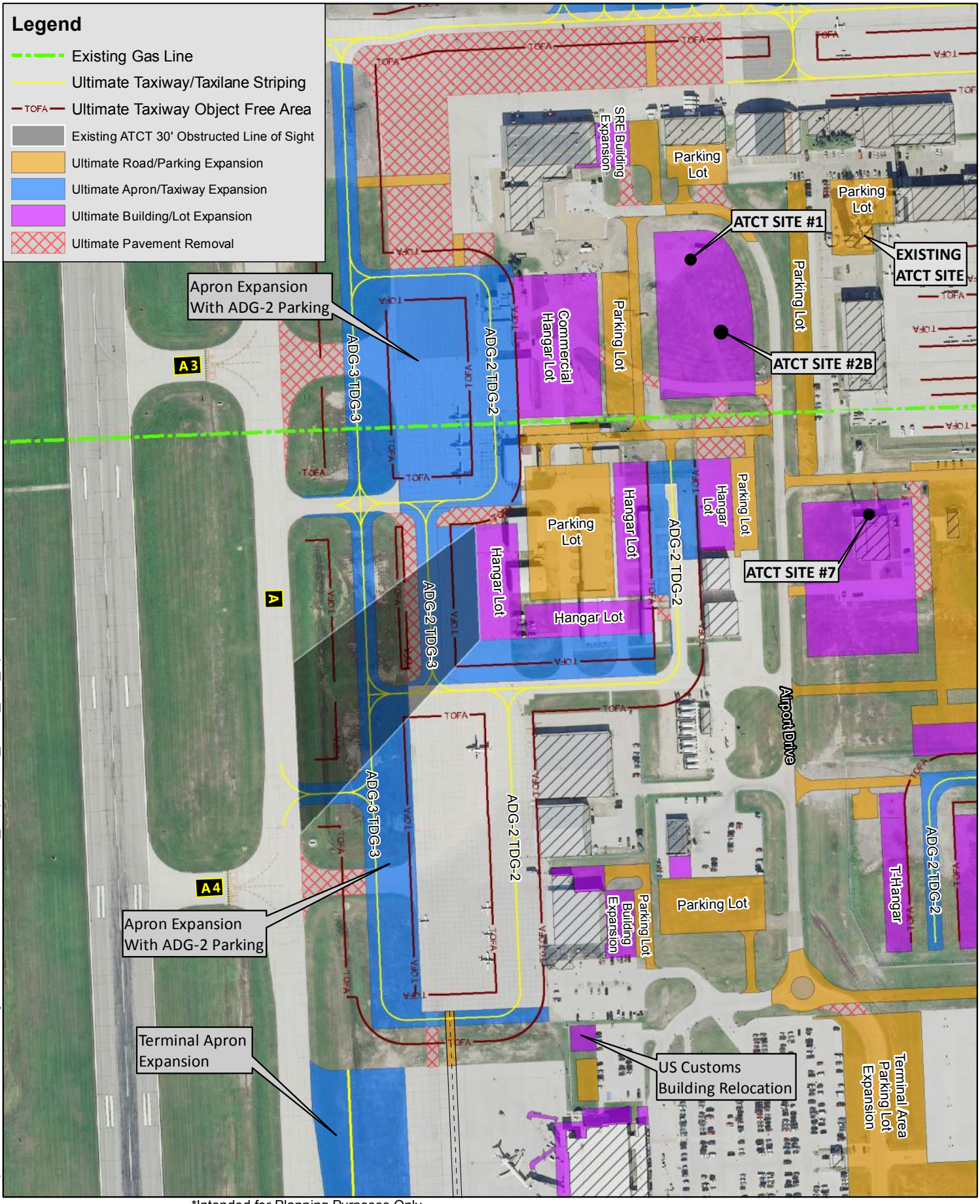
CONCEPTS

The following concepts to the original 2014 plan were evaluated during this master plan study:

- **Option 1**: Provide up to 62,000 SF of new aircraft storage space. Shift taxilane centerline to the west to meet ADG-II TOFA standards. Continue 60-foot hangar building setback from TOFA. Preserve 80-foot hangar depth along alpha apron frontage with dedicated taxilane. Provide parking lot for approximately 75 spaces. Utilize existing taxilane as controlled access road.
- **Option 2**: Provide up to 65,400 SF of new aircraft storage space. Shift taxilane centerline to the west to meet ADG-II TOFA standards. Remove 60-foot hangar building setback from TOFA along east side hangars to provide additional aircraft parking space. Increase hangar depth to 100-feet along alpha apron frontage with dedicated taxilane. Provide parking lot for approximately 93 spaces. Utilize existing taxilane as controlled access road.
- **Option 3**: As a variation to Option 2, construct replacement east-west access road further north to accommodate 17,600 SF of additional aircraft storage space (total 83,000 SF) with additional parking spaces.
- **Option 4**: Provide up to 66,400 SF of new aircraft storage space. Maintain existing taxilane centerline and request FAA Modification to Design Standards (MOS) for a maximum 60-foot wingspan aircraft to clear the TOFA. Remove 60-foot hangar building setback from TOFA along east side hangars to provide additional aircraft parking space. Increase hangar depth to 100-feet along alpha apron frontage with dedicated taxilane. Provide parking lot for approximately 94 spaces. Utilize existing taxilane as controlled access road.
- **Option 5**: Provide up to 84,400 SF of new aircraft storage space. Construct east-west access road further north. Shift taxilane centerline to the west to meet ADG-II TOFA standards. Preserve the 60-foot hangar building setback from TOFA in all areas. Maintain 80-foot hangar depth along alpha apron frontage with dedicated taxilane. Provide parking lot for approximately 83 spaces stretched further north.

RECOMMENDATION

The airport sponsor selected Option 2 (future) and Option 3 (ultimate) because of its ability to maximize hangar space, meet OFA requirements, meet parking needs, and provide ultimate expandability. This concept shall be incorporated into the Terminal Area Plan. **Figure 5-22** depicts the revised plan with enhancements.



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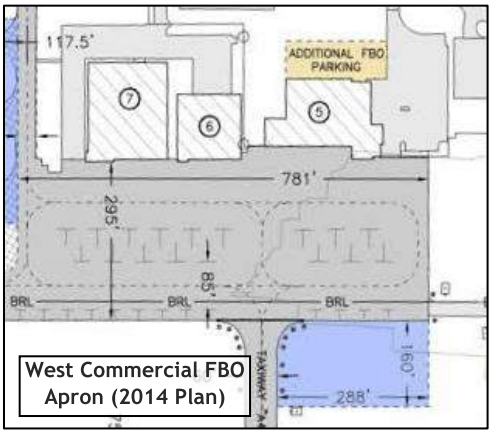
Grand Forks International Airport
Figure 5-22:
General Aviation Apron
(West)

West Commercial FBO Apron



West Commercial FBO Apron (2014 Plan)

2014 TERMINAL AREA PLAN

The limited depth of the GA apron in front of the FBO complex is constricting with a wide mix of aircraft fleet up to ADG-III large charter aircraft. The 2014 plan expands the apron in front of the FBO and south of Taxiway A4 to the west to allow for free movement and handling of the larger aircraft without relocating the smaller planes.

NEW CONSIDERATIONS

Current FAA design standards do not allow taxiways to provide direct access from the apron to the runway. The existing Taxiway A4 will need to be relocated during reconstruction, which will impact the currently planned apron expansion. Additionally, the air ambulance operator has seen expanded growth in recent years which demands more apron space.

The CBP facility attached to the old ARFF station will require a new location when the facility is demolished. The current plan has the facility placed adjacent to its current location however the airport desires the new facility to be positioned near both the GA apron and the passenger terminal facility. A new General Aviation Facility (GAF) requires approximately 3,000 SF of space to meet CBP requirements.

CONCEPTS

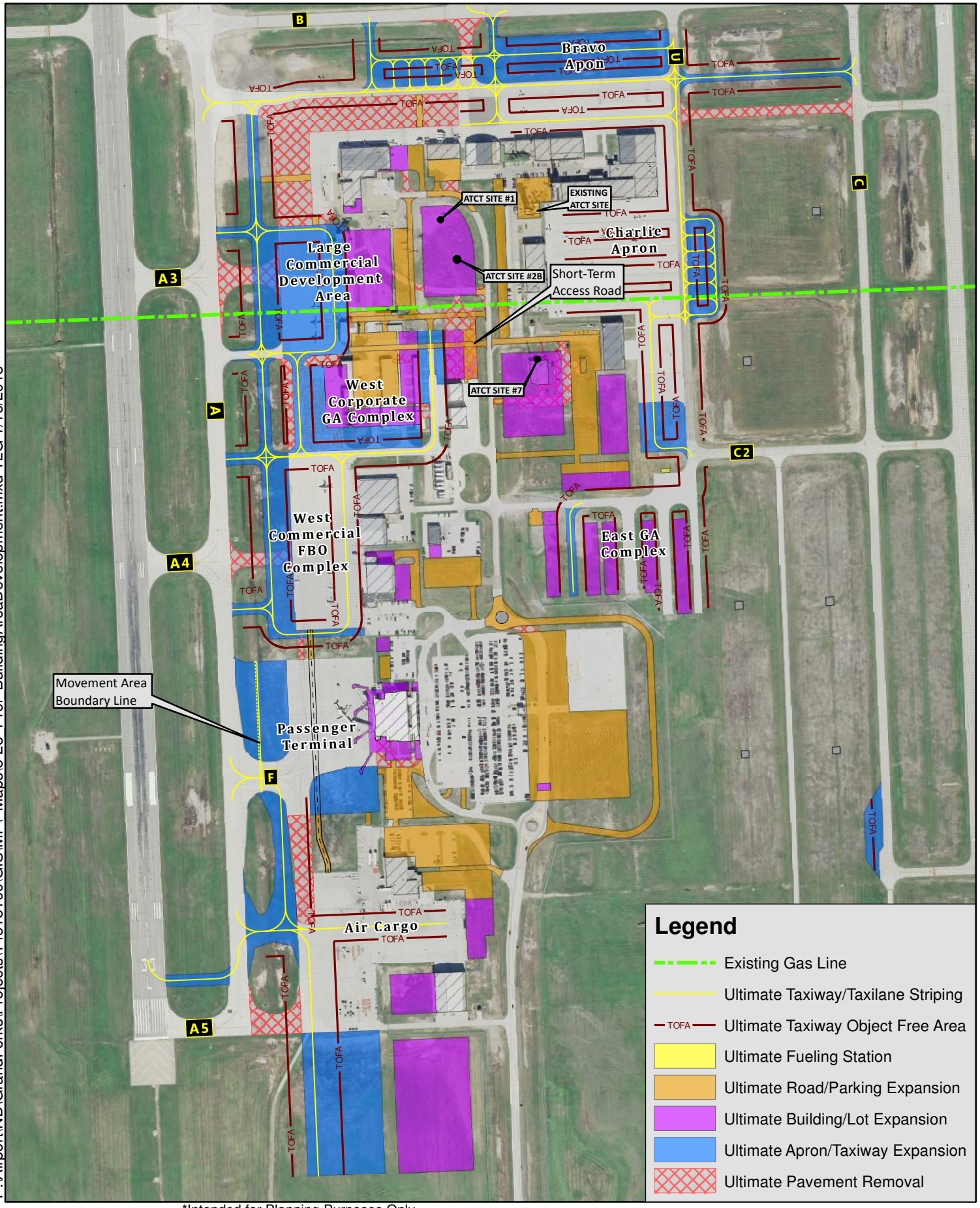
The following were evaluated in this study as enhancements to the 2014 Terminal Area Plan:

- Relocate the portion of Taxiway A4 connected to the apron by 215 feet to the north to eliminate direct access to meet FAA design standards. Relocation of Taxiway A4 to the runway is not recommended as the tower prefers the existing runway turnoff locations.
- Provide a 125-foot wide apron expansion along the entire apron with ADG-III and ADG-II taxilanes around the perimeter of the apron surrounding aircraft parking. This configuration provides flexibility for parking a varying aircraft fleet mix while facilitating movement of larger aircraft.
- Add a taxilane on west side of apron running parallel to Taxiway A that allows aircraft to move between locations along apron without impacting movement area sequencing. Meet ADG-IV taxiway separation requirements with Taxiway A.
- Locate the CBP facility between the FBO and passenger terminal to provide a closer proximity to the different types of arriving international operations. A small parking lot expansion would be needed. The southeastern most aircraft parking location on the FBO apron would be reserved for CBP arrivals. Expand the FBO apron by approximately 35 feet to the south to locate aircraft parking and taxilane closer to relocated CBP facility.
- Preserve for an FBO building expansion to the east to provide additional indoor aircraft and support equipment storage with additional parking and access connecting to the existing access road.

RECOMMENDATION

It is recommended the enhancements be incorporated into the Terminal Area Plan. **Figure 5-22** depicts the revised plan with enhancements.

The overall general aviation development plan is shown in **Figure 5-23, Preferred Building Area Development**



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*Intended for Planning Purposes Only

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Grand Forks International Airport
Figure 5-23:
Preferred Building Area Development

Landside Facilities

Requirements Summary

The following section summarizes key landside facility requirement findings:

- **Additional public parking supply needed after PAL 2, with an additional 260 spaces needed to meet average peak month demand by PAL 4. Individual peaks may exceed supply before PAL 2.**
- **Additional rental car ready/return spaces are projected to be needed after PAL 1. There is currently a deficiency in on-site rental car storage parking to meet demand.**
- **Additional employee parking spaces may be needed after PAL 2.**

Terminal Curbside & Access

The passenger terminal curbside area meets the projected facility requirements providing an adequate level of service. All existing terminal building frontage is utilized for curbside. An expansion of the total curbside frontage with a south terminal building expansion would increase curbside length by 60 feet for a total of 350 feet. This would maintain the existing level of service to serve increased passenger activity levels at GFK in the future. No changes to the terminal access flow is needed to meet future activity levels.

The existing passenger terminal access road configuration provides an acceptable level of service for the planning period.

Automobile Parking

NEW CONSIDERATIONS

GFK has been constructing additional surface public parking lots to meet growing needs since the last master plan study. The airport expanded the existing public lots to the east to add 130 parking spaces in 2012 to meet peak parking needs. This project maximized parking in areas near the terminal to the west of Airport Drive. Short-term and long-term parking lots were combined to maximize space utilization. The 50-space employee parking lot was constructed in 2012.

The airport then constructed an additional 247-space economic Lot C in 2014 to the east of the existing parking and Airport Drive to accommodate additional peak parking needs. This was consistent with the planning at the time. Total public parking capacity is now 962 spaces which will only meet average peak period demands through PAL 2 (182,500 annual enplanements).

The only opportunity for additional expandable surface parking space on-airport without impacting Airport Drive is to the south of Lot C (Phase 1). Additional space can be added if Airport Drive is relocated to the east of all surface parking (Ultimate). All other surrounding land areas are assumed to be utilized for other uses. Surface parking evaluations in this section assume 350 square feet per space.

Beyond the passenger terminal complex, additional parking is needed to accommodate staff, students and visitors to UND Aerospace facilities.

CONCEPTS

Due to existing site constraints, few alternatives were evaluated for surface parking. A parking structure was dismissed due to overall cost, and availability of surface space. The existing plan will be enhanced to maximize surface parking opportunities. **Exhibit 5-23** graphically depicts the recommended surface parking concepts.

Public Parking Expansion (Phase 1)

Phase 1 development expands Lot C to the south to provide additional long-term and economy surface parking capacity. Proposed dimensions are 250-feet deep by 385-feet long providing an estimated additional 275 parking stalls over 2.2 acres of pavement. This expansion alone would exceed PAL 4 needs and be sufficient to accommodate average peak parking demands for up to 234,000 annual passenger enplanements.

Ultimate Public Parking Expansion

Ultimate surface parking development requires the relocation of Airport Drive to the east. A total of 870 linear feet (LF) of the roadway would be replaced with 1,900 LF of new roadway with a new north roundabout. The portion of Airport Drive connecting to the south terminal area roundabout would be repurposed as a new single parking exit point. Airport Drive is in very good condition therefore relocation is not recommended until well into the future as additional parking needs arise.

The relocation of Airport Drive provides another 3.0 acres of available surface parking space accommodating approximately 370 additional stalls. Ultimate public surface parking capacity under this plan is about 1,600 spaces which is enough to accommodate peak needs through 305,000 enplanements.

Employee Parking

By PAL 4 or if GFK does attract a third airline, the employee parking lot is anticipated to be at capacity. Expansion opportunities are limited because of the preferred location of the CBP facility is nearby. A parking lot expansion of approximately 15 spaces is possible. CBP parking could also be accommodated at in the FBO lot.

Rental Car Ready-Return Parking

Rental car ready/return parking at GFK should be near the south end of the airport terminal building where rental car concessions are based. The existing lot provides 88 spaces but there is demand for additional spaces by PAL 2 (170,000 enplanements), and 25 additional spaces by PAL 4 (220,000 enplanements). There are few long-term expansion opportunities with the existing lot because of the future expanded aircraft parking apron to the west, expanded terminal building to the north, air cargo complex to the south and the angled airport terminal road to the east. Parking space are likely to be lost when the terminal building is expanded to the south.

A nominal parking lot expansion is available to the east, however would this may be less cost effective than other options. It is also possible to construct the south terminal apron expansion early and utilize as a parking lot, but this is not a long-term solution. Utilizing the southernmost portion of Lot A as a secondary rental car ready-return lot (33 spaces) would provide additional space to meet future needs. Additional parking lot access points and barriers/curb are needed to separate this area from pay parking lots. Rental car operators may have to be separated between lots. This also reduces the number of available pay parking spaces in the short-term parking lot area. The parking lot to the former FedEx sorting facility (72 spaces) may also be utilized while the use for the facility is in transition. Other options including using the south half of the short-term lot to meet the needs (116 spaces), which would provide opportunities to convert the existing ready-return lot into another use.

Rental Car Storage Parking & QTA

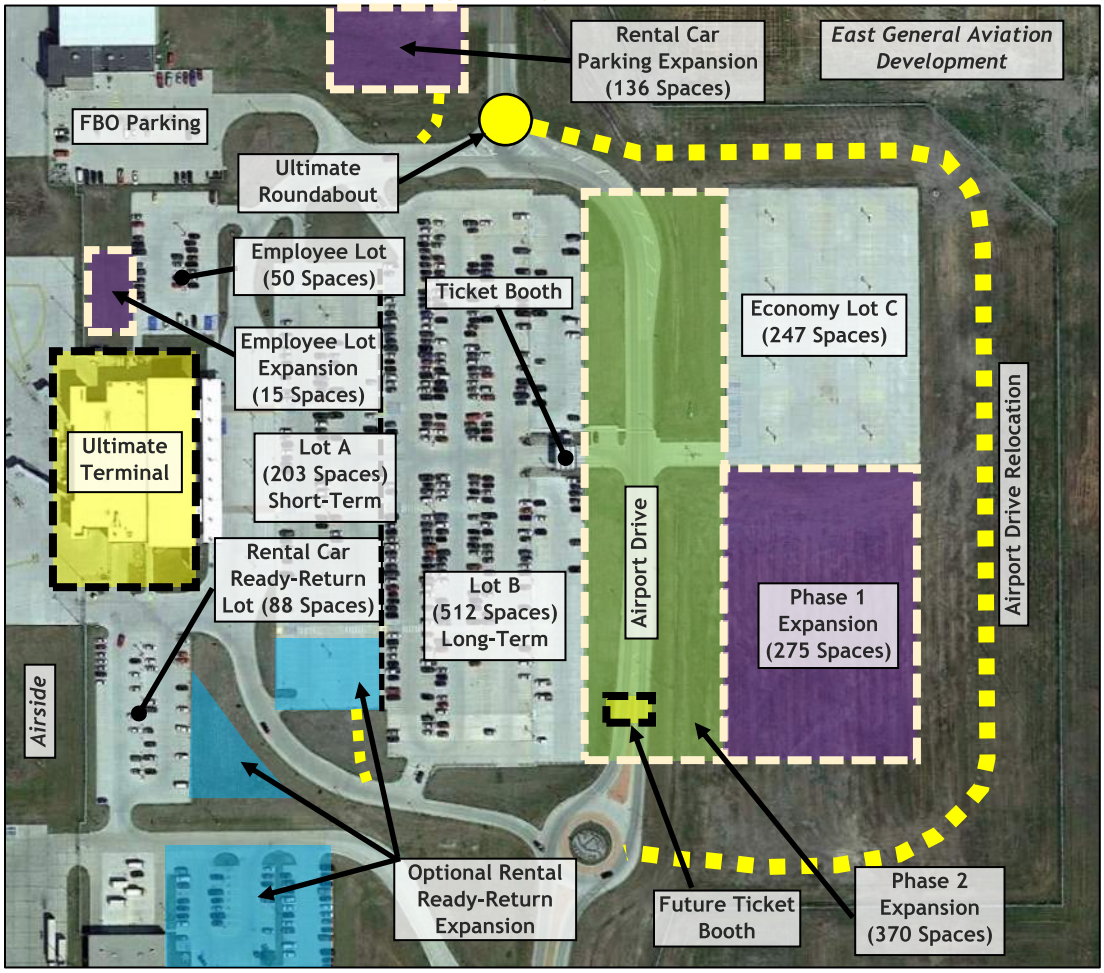
The existing 83-space rental car storage lot does not meet the highest peak demands. An additional 142 spaces are needed to satisfy rental car operator demands as enplanements increase beyond 200,000 annually. There is available space for a 1.1-acre rental car storage parking expansion on the south side of the Quick Turn Facility (QTA) which will provide 136 new spaces and nearly satisfy PAL 4 demands. There is no additional expansion space to the north or east. A westward expansion would encroach on future FBO development space. This type of parking, however, could be accomplished off-site by rental car operators but would not be as efficient.

The QTA facility is of sufficient size to meet the needs through the forecast period, however an expansion to the south is recommended to be preserved on the ALP for development flexibility.

UND Aerospace

Parking lot expansion opportunities to serve existing UND facilities include another two rows of parking to the west of the existing north-south lot. This 700-foot long by 45-foot wide pavement expansion would increase parking by about 150 spaces if the entire parking lot is reconstructed. This expansion will require drainage improvements. Other parking expansions are possible on the west side of the UND lot near the SRE complex, and around the existing ATCT site if a new tower site is selected and the existing ATCT facilities are demolished. Any new UND facilities to the south of the Charlie Apron should be designed to handle adequate parking for staff, students and visitors.

Exhibit 5-23 – Terminal Area Parking Concepts



Source: KLJ Analysis

RECOMMENDATIONS

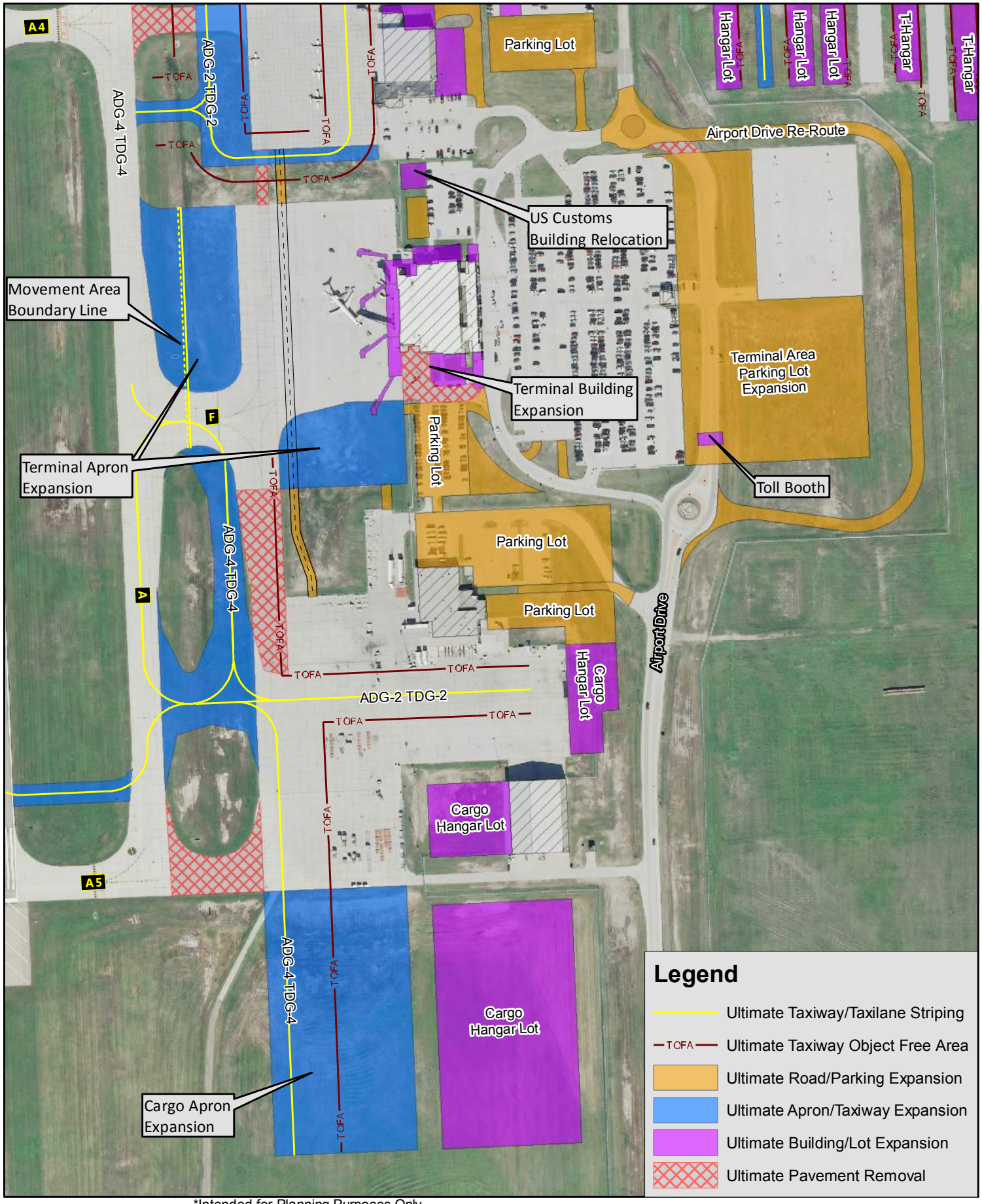
Maximizing surface parking throughout the airport and relocating Airport Drive is recommended for the ultimate configuration. Converting a portion of Lot A for expanded rental car ready-return parking is also recommended to meet needs. The airport sponsor will incorporate the preferred concepts into the ALP to maximize surface parking opportunities. The ultimate build-out configuration is shown in **Figure 5-24, Terminal / Cargo Complex**.

Ground Access & Circulation

U.S. Highway 2 provides access to Airport Drive. Airport Drive once provided public vehicle circulation around the north side of the building development to serve the old passenger terminal complex. Today, the road terminates at the ARFF/SRE complex. The public circulation to all existing airport facilities is currently adequate, however new access roads will be needed to serve new development. Areas that will require new access from Airport Drive and dedicated parking lots include:

- Large Commercial Development Area
- West Corporate GA Complex
- Future ATCT Site
- Future UND Development (south of Charlie Apron)
- Future Air Cargo Complex / Aeronautical Development

There appears to be available space to accommodate additional landside roadways to serve future facilities. Open space should also be preserved in landside areas to facilitate snow removal and storage from ground access roads and parking lots.



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*Intended for Planning Purposes Only

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Grand Forks International Airport
Figure 5-24:
Terminal / Cargo Complex

Support & Other Facilities

Requirements Summary

The following section summarizes key support and other facility requirements:

- **Construct self-serve fuel facility for east GA complex**
- **Expand Snow Removal Equipment (SRE) Building in the future**
- **Replacement Customs and Border Protection (CBP) General Aviation Facility (GAF)**
- **Construct a full internal airfield access road outside of all Object Free Areas (OFA)**
- **Explore compatible non-aeronautical land uses on-airport to support economic development**

Fueling Facilities

The existing fuel farm is surrounded by built development however has expandability to the west to nearly double in fuel capacity if needed. This expandability is adequate to accommodate even more significant increases in forecast fuel consumption in the future.

The design and construction of the east GA complex includes a pavement area on the north side dedicated for self-service fueling operations to meet recommended facility needs. This 150' x 100' pad will allow aircraft to fuel outside of the taxilane object free areas. The fuel station will be constructed on the north side in the future as shown in **Figure 5-20, East General Aviation Plan.**

Aircraft Rescue and Fire Fighting (ARFF)

The GFK ARFF facility meets critical access requirements and emergency reporting requirements as outlined in FAR Part 139. It is anticipated GFK will remain Index B through the planning period, however the airport does see frequent operations in Index C aircraft (greater than 25 flights annually). GFK can meet Index C standards with the existing two-truck equipment and ARFF facility. Building expansion will be preserved to the south and to the east to accommodate additional equipment or space.

Airport Maintenance & Snow Removal

The existing SRE building will need to be expanded if additional airport equipment is acquired, such as a second runway broom. An 80-foot long by 100-foot wide building expansion is possible to the east which will preserve the existing center-aisle design. An expansion to the west would penetrate the Runway Visibility Zone (RVZ) and is not recommended. The access road and parking lot would also require relocation to serve the expansion.

Customs and Border Protection (CBP)

The existing Customs and Border Protection (CBP) facility has reached the end of its useful life and does not meet current CBP space requirements for a General Aviation Facility (GAF). CBP needs a planned long-term location as the current facility is slated for demolition in the near-term. CBP sizing standards require approximately 3,000 SF of building space to meet General Aviation Facility (GAF) sizing requirements. Alternatives considered were:

1. Existing Complex (south of ARFF station)
2. West FBO Complex
3. Passenger Terminal Complex

Although locating a GAF within the existing complex can be compatible with other development, this location was not recommended because it segregates international arrivals from an FBO. This requires

passengers to clear customs then taxi to the FBO for aeronautical services. A GAF facility close to an FBO is recommended.

Two other locations were evaluated – 1) attached to existing AvFlight FBO building and 2) a stand-alone building adjacent to the west of the passenger terminal employee parking lot. Although a GAF attached to the FBO is ideal for proximity, the airport feels a permanent facility favors one FBO over another, if the airport were to have more than one FBO. It also does not efficiently serve occasional arriving charter aircraft in the passenger terminal. A stand-alone facility is recommended that can be constructed to meet CBP requirements and serve both the West GA FBO complex and passenger terminal building. Expanded parking is needed that would not interfere with other passenger terminal facility needs.

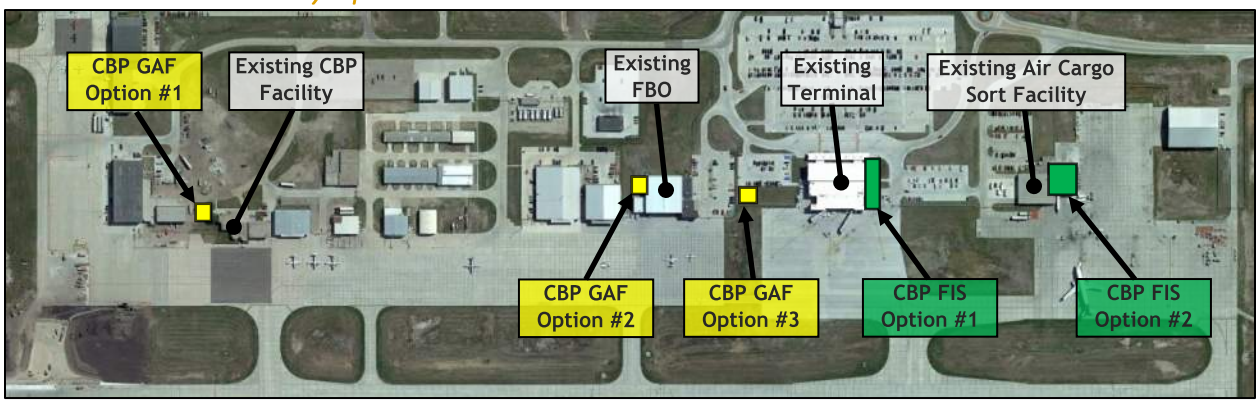
In addition, the airport desires identification of Federal Inspection Services (FIS) facility to serve up to 200 arriving international passengers per hour. An FIS will require 11,000 SF of space to meet CBP requirements for a small airport facility. Alternatives for an international arrivals facility included:

1. Existing passenger terminal building
2. Existing air cargo sort facility

The stand-alone option was not recommended because the cost to rehabilitate the sort facility would be high, and other uses could benefit from this existing space. An FIS facility located at the south portion of the passenger terminal building is recommended to provide access to a dedicated passenger boarding bridge and co-locate with arriving baggage facilities.

See **Exhibit 5-24** for the graphical location of CBP facility options considered.

Exhibit 5-24 – CBP Facility Options



Source: KLJ Analysis

Security, Access & Wildlife

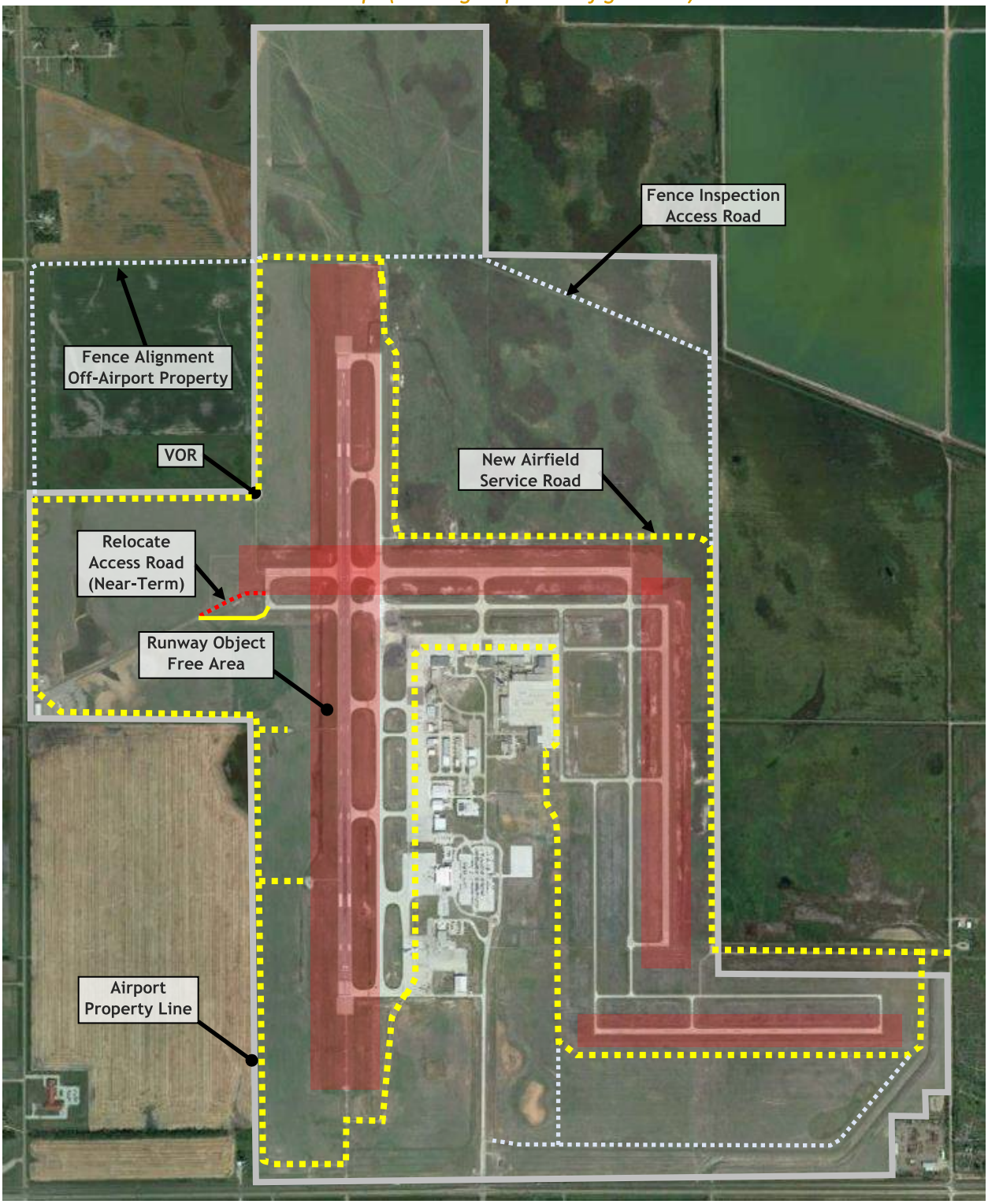
It is recommended the airport plan for an airport perimeter road around the preferred airfield development shown on the ALP. An airport perimeter road would allow for security and wildlife fence inspections, and access to other quadrants of the airfield without the need to enter any ATCT movement areas or use public roads. This would both minimize any potential safety risk and increase efficiencies of airport operations. See **Figure 5-25** for a proposed alignment concept of a perimeter road and fence inspection roadways in the preferred airfield development configuration. Use of existing access roads and elevated runs were preferred to avoid significant impacts to wetlands particularly in the north and northeast sections of the airfield. An access easement may also be required in the northwest quadrant where the existing fence does not follow the airport property boundary.

The existing ARFF/operations access road that heads west from the west side of Taxiway B penetrates the Runway 9L-27R Object Free Area (OFA). The airport should relocate this road outside of the OFA to meet FAA design standards. See **Exhibit 5-25** for a roadway concept for the existing airfield configuration.

Dedicated on-airport service roads provide ground vehicles with a pathway from one portion of the apron to another. Service roads should be marked and outside of taxiway object free areas in high activity areas at GFK such as the passenger terminal apron. Other non-movement apron or taxilane pavements can be used for vehicles in lower activity areas. One area where apron pavement can be removed and replaced with services roads is around the ARFF/SRE complex. This will minimize airside pavement.

The existing perimeter fence is in good condition and consists mostly of 10-foot high chain-link fencing with a few short runs of 8-foot high fencing. While the perimeter fence is an effective exclusion barrier for most wildlife, some small mammals have been able to access the airfield by crawling under the fence. A bottom apron is recommended along the entire existing fence alignment or at a minimum, areas where mammals are known to access the airfield. The fence alignment should also be adjusted as needed to meet FAA design standards for future runway configurations.

Exhibit 5-25 – Perimeter Road Concept (Existing Airport Configuration)



Source: KLJ Analysis

Other Aeronautical/Non-Aeronautical Development

AERONAUTICAL

Other aeronautical development areas were explored in this master plan study. These lands are intended for development by a commercial business requiring aeronautical access. One area identified in the GA section of this report includes land to the south of the ARFF/SRE complex. If a new ATCT is constructed, up to 2.6 acres can be developed for building and parking. This area is prime real estate for a large commercial operator. If an ATCT is not constructed in the central portion of the terminal area, then an additional 2.5 acres can be added to the aeronautical lot or converted for non-aeronautical use.

Other aeronautical development is concentrated in the area by the air cargo complex. The departure of a major cargo tenant opens the area for new development opportunities. In this area, a total of approximately 28 acres of land is located inside the airport perimeter fence yet outside of aeronautical protection areas. The land is recommended for potential other aeronautical development. Any development needs to be reviewed for compatibility with the Runway 9R approach. See **Exhibit 5-26** for a depiction of potential other aeronautical development areas at GFK.

NON-AERONAUTICAL

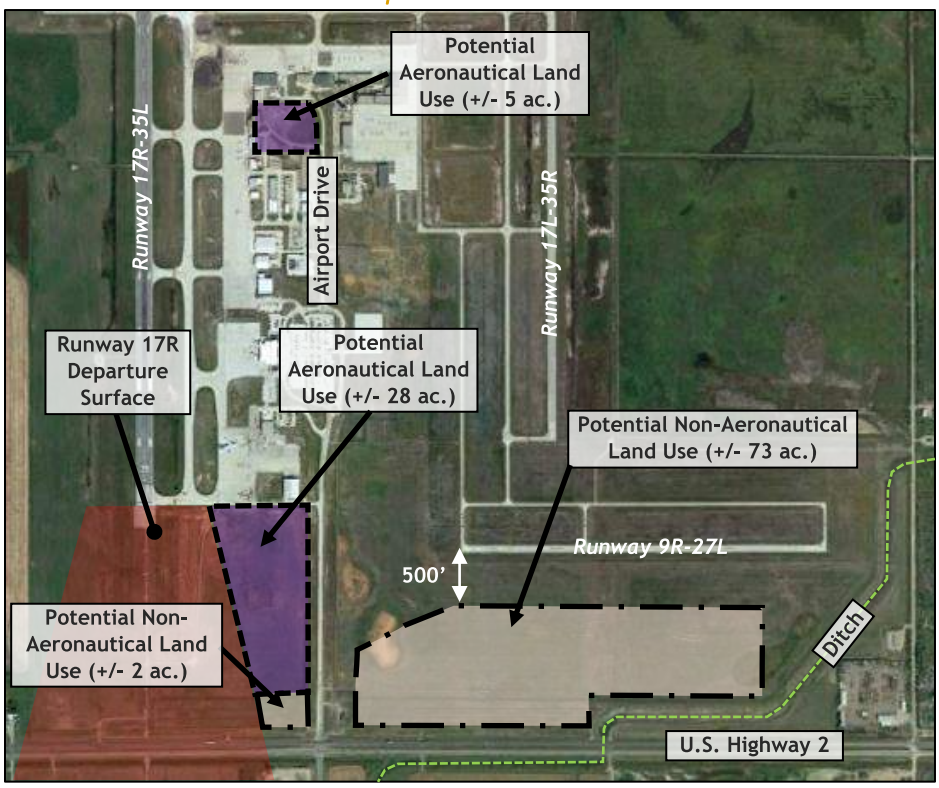
GFK's Foreign Trade Zone (FTZ) #103 has recently been expanded under an alternative site framework to include all of Grand Forks County. The grantee is now the Grand Forks Region Economic Development Corporation. FTZs reduce the cost of international commerce thus provide competitive advantages for businesses.

Non-aeronautical land uses can be acceptable on airport lands not needed for aeronautical development or protection. One potential development area is on the north side of U.S. Highway 2, south of Runway 9R-27L. Approximately 73 acres of property is located outside of aeronautical protection areas. This area enjoys over 2,000 feet of direct frontage with U.S. Highway 2 which could be attractive to developers. This area will be identified in the ALP. Any development needs to be reviewed for airport land use compatibility, however, commercial or light industrial development could be acceptable.

An additional 2 acres area on the northwest corner of Airport Drive and U.S. Highway 2 is also a potential candidate for non-aeronautical use with its prime location outside of the FAA Departure Surface for Runway 17R. If an ATCT is not constructed in the central portion of the terminal area, then an additional 2.5 acres with no direct access to the airfield could be made available for an acceptable non-aeronautical use.

Non-aeronautical development areas must be shown on the ALP and approved by FAA. All non-aeronautical development is required to be shown on the Airport Layout Plan and approved by FAA through a land release or concurrent land use agreement. See **Exhibit 5-26** for a depiction of potential non-aeronautical development areas at GFK.

Exhibit 5-26 – Potential Development Areas



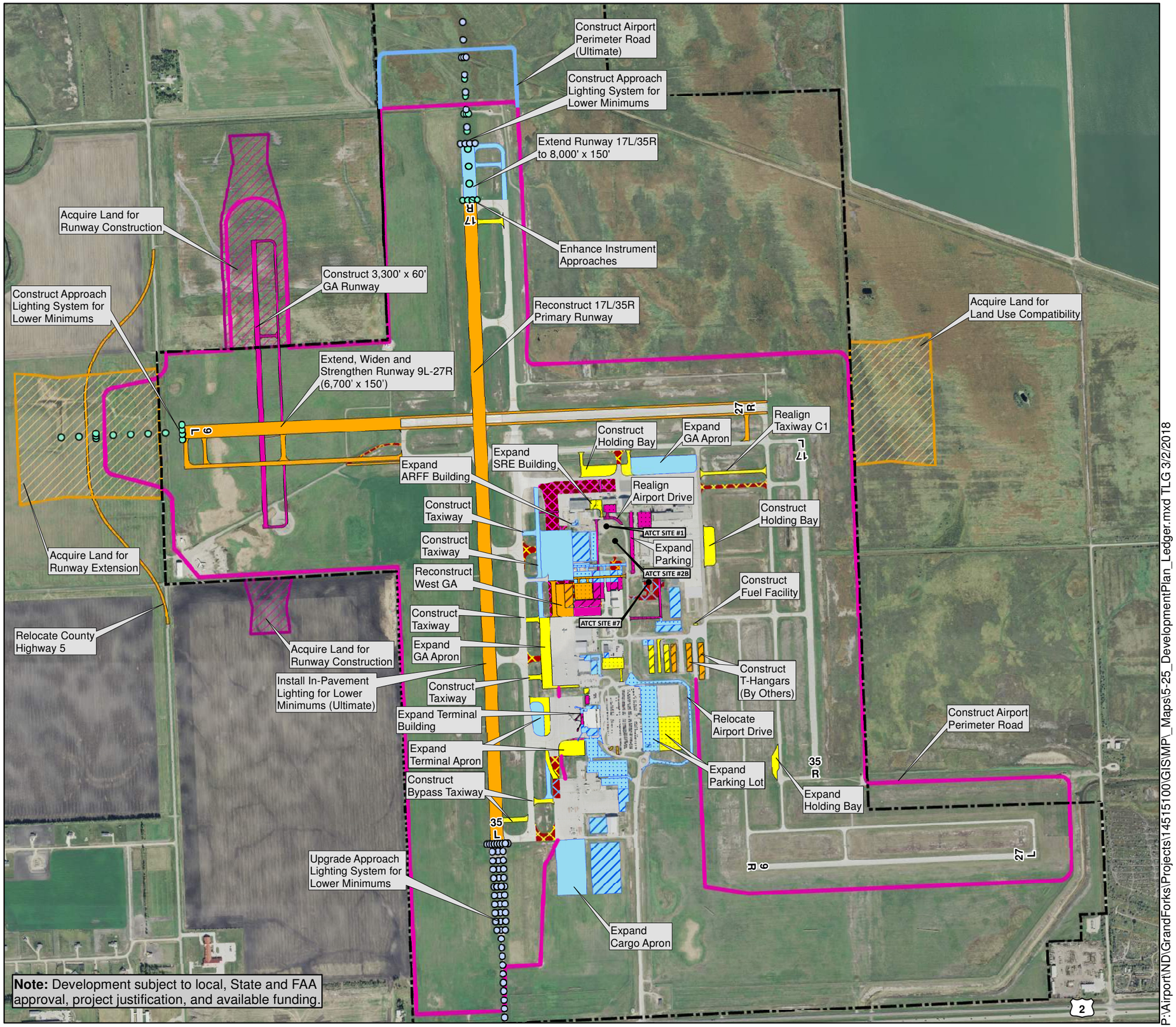
Source: KLJ Analysis

Summary

The recommended priority actions through the next 10 years, or PAL 2, includes the following:

- Rehabilitate or reconstruct Runway 17R-35L in-place (7,350' x 150')
- Extend, widen and strengthen Runway 9L-27R for air carrier use (6,700' x 150')
- Strengthen Taxiway B as needed for air carrier aircraft
- Construct north-south GA capacity runway and taxiway (3,300' x 60')
- Improve instrument approaches to Runway 17R, 9L and 27R (as low as 3/4 mile)
- Establish instrument approach to Runway 17L-35R (as low as 1 mile)
- Expand the passenger terminal building to the west to meet peak hour requirements
- Expand the passenger terminal apron to the west and construct second taxiway access
- Construct a replacement Customs and Border Protection (CBP) facility
- Reconfigure west corporate GA area for ADG-II aircraft
- Construct an on-airport perimeter access road
- Enact a multi-jurisdictional airport land use compatibility/safety zoning ordinance

The combined preferred airport development plan is depicted graphically in **Figure 5-25, Recommended Development Plan**.



Note: Development subject to local, State and FAA approval, project justification, and available funding.

Legend

- Near-Term Development (0-5 Years)
- Future Development (6-10 Years)
- Long-Term Development (11-20 Years)
- Ultimate Development (20+ Years)

N

0 500 1,000 2,000 Feet

*Intended for Planning Purposes Only

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Grand Forks International Airport
Figure 5-25:
Recommended Development Plan

Preferred Development Strategy

Table 5-27, Preferred Development Strategy presents a draft airport development phasing plan. This serves as an overall summary of the preferred alternatives for each functional area. This plan is subject to change from refinements in **Chapter 6: Implementation & Compatibility** based on Airport Capital Improvement Plan (ACIP) financial considerations. The timing of improvements should be adjusted accordingly should activity levels change from the study forecast. The strategy assumes facility maintenance and rehabilitation will be completed as needed.

Table 5-27 – Preferred Development Strategy

	Near-Term 0-5 Years PAL 1	Future 6-10 Years PAL 2	Long-Term 11-20 Years PAL 3 & 4	Ultimate 20+ Years Beyond PAL 4
Airfield	• Rehabilitate or Reconstruct Runway 17R-35L (7,350' x 150') • Extend, Widen and Strengthen Runway 9L-27R (6,700' x 150') • Acquire Land	• Construct GA Runway (3,300' x 60') • Enhance Instrument Approaches	• Remove Apron-Taxiway Direct Access Points • Construct Bypass Taxiways	• Extend Runway 17R-35L (8,000' x 150') • Upgrade Runway 17R-35L to 1800 RVR or CAT-II
Passenger Terminal	*None*	• Expand Terminal Building to West (Phase I) • Expand Terminal Apron (Phase I)	• Expand Terminal Apron (Phase II) • Construct Apron Taxiway	• Expand Terminal Building to North (Phase II) • Expand Terminal Building to South (4 gates) • Expand Terminal Apron to West • Expand Ticketing Lobby & Security Checkpoint • Construct FIS Facility
Air Cargo	*None*	• Construct Infrastructure for New Development, as needed	*None*	• Extend Taxiway & Expand Apron for Aeronautical Development
General Aviation	• Construct T- Hangars • Reconstruct West GA Taxilanes, Construct Taxiway	• Construct Access Roads • Remove Old Apron Pavements • Construct CBP GAF Facility	• Expand FBO Apron • Construct Self-Service Fuel Facility • Construct Holding Bays	• Expand Bravo Apron
Landside Facilities	• Reconfigure Lot A for Rental Car Ready-Return Parking	• Expand Employee Parking Lot for CBP • Expand UND Parking • Reconstruct Airport Drive (North)	• Expand Rental Car Parking Lot • Expand Economy Parking Lot	• Relocate Airport Drive • Expand Terminal Parking Lots
Support & Other Facilities	• Develop Airport Zoning Ordinance	• Construct Airport Perimeter Road	• Expand SRE Building	• Expand ARFF Station

Source: KLJ Analysis