Building a Better World for All of Us®

MEETING AGENDA

RE: Taxiway and Apron Network
Technical Advisory Committee Meeting #1

Date of Meeting: December 3, 2019

Project Manager: Kaci Nowicki

Time of Meeting: 8:00 a.m.

SEH No.: 150733 16.00

Location of Meeting: Duluth International Airport, Amatuzio Room

Attendees:

Duluth Airport Authority
SEH
City of Duluth
Minnesota Air National Guard 148th Fighter Wing
Duluth International Airport Tenant Association (DIATA)
Cirrus Aircraft
Military Affairs Committee – Duluth Chamber of Commerce
Hermantown Chamber of Commerce
Federal Aviation Administration (FAA)
Minnesota Department of Transportation (MnDOT)
Citizens Committee for Environmental Concern
Airport commercial operators (airlines and cargo carriers)
Lake Superior College
General aviation tenants
Lake Superior Helicopters

I. **Existing taxiway network and aprons – current conditions and use**
   A. Introduction to the DLH taxiway and apron system
   B. How do users use the taxiway system?
      1. What segments are heavily used?
      2. Which segments are used by large aircraft?
      3. For aircraft exiting the runway, which connectors are most frequently used (when landing on each end, considering various aircraft types)?
   C. How do you use the apron system?
      1. How is each ramp used? By who, what types of aircraft?
      2. Where do large aircraft park?
   D. Vehicle operations on the airport

II. **Stakeholder feedback on taxiway and apron system**
   A. What wouldn't you change?
   B. Are there areas where stakeholder needs are not being met?
   C. Are there areas of congestion?
   D. What areas, if any, are confusing to aircraft or vehicles?
   E. Could any taxiway connectors be better utilized if relocated? Or are there additional connectors that are needed?
   F. Is there sufficient aircraft parking?
   G. General discussion/feedback on taxiway and apron system

III. **Taxiway and apron design standards**
   A. Introduction to taxiway and apron design principles
   B. DLH design standards evaluation summary

IV. **Next steps**

This is an in-person meeting. However, if you are unable to attend in person, a call-in number and GoTo meeting have been set up. The login information is included below.

DLH Taxiway and Aircraft Parking TAC Meeting #1

Tue, Dec 3, 2019 8:00 AM - 10:00 AM CST

Please join my meeting from your computer, tablet or smartphone.
https://global.gotomeeting.com/join/270797925

Join the conference call:
Date/Time: Tuesday, December 3, 2019 8:00am (Central Time)

External Call in Number: 612.284.1533 (Toll Free: 855.838.6933)

External Audio Conference Room: 3

External and Internal Pass Code: 369#

New to GoToMeeting? Get the app now and be ready when your first meeting starts:
https://global.gotomeeting.com/install/270797925

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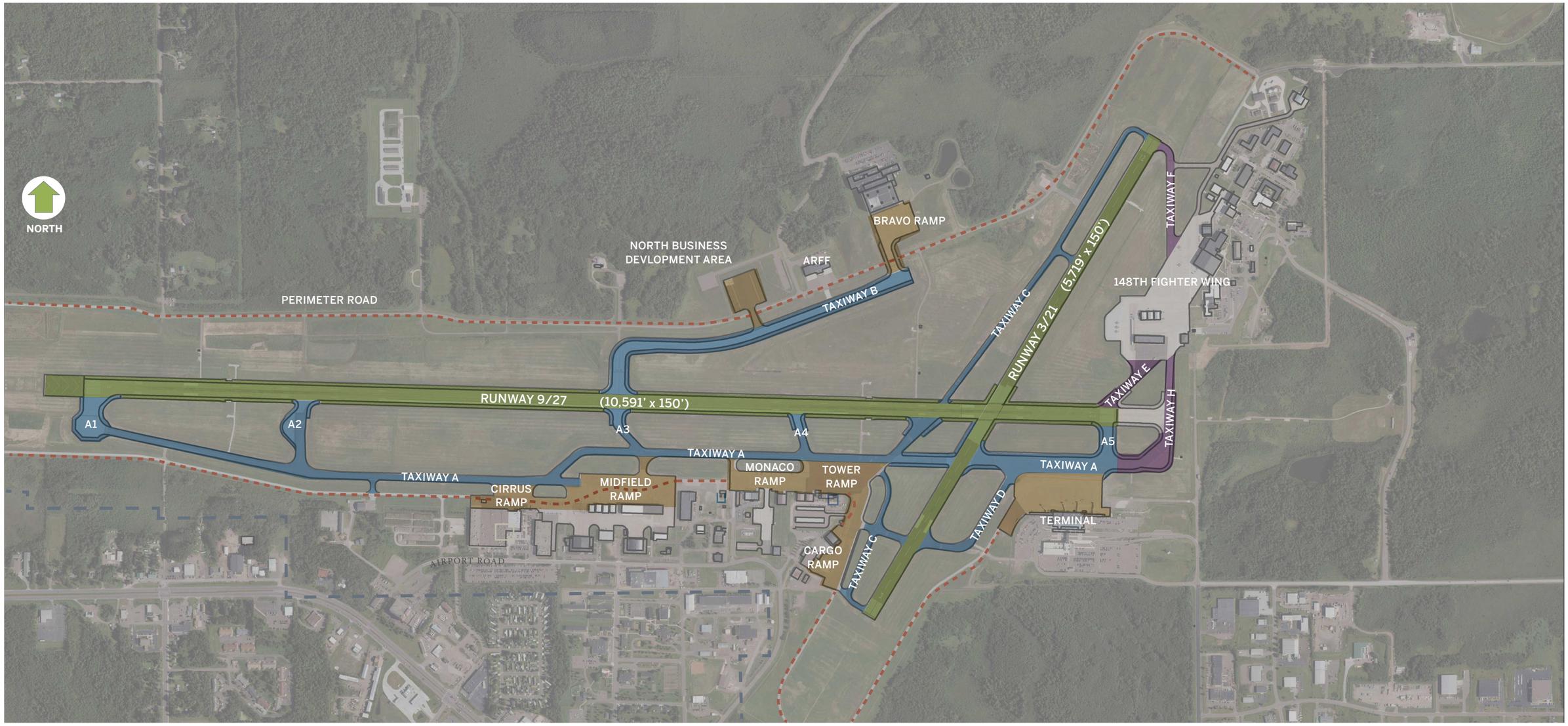
DULUTH INTERNATIONAL AIRPORT

OVERVIEW



APRON	MILITARY USE ONLY
RUNWAY	PERIMETER AND VEHICLE ROADWAY
TAXIWAY	

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Duluth Airport Master Plan

Taxiway Network and Apron Parking Technical Advisory Committee (TAC) Meeting #1

December 3, 2019

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Introductions

Tom Werner C.M.
Executive Director
Duluth Airport Authority
twerner@duluthairport.com

Kaci Nowicki
Project Manager/Sr. Aviation Planner
SEH
knowicki@sehinc.com

Introductions

- Name
- Organization
- Role

Kick off meeting agenda

- Welcome and introductions
- Taxiway and apron network
  - Existing condition & use
  - Stakeholder feedback discussion
  - Design standards review

Meeting Goal: Identify problems/challenges that need to be solved.

DLH Taxiway & Apron Network Existing Condition and Use

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Taxiway Network Overview

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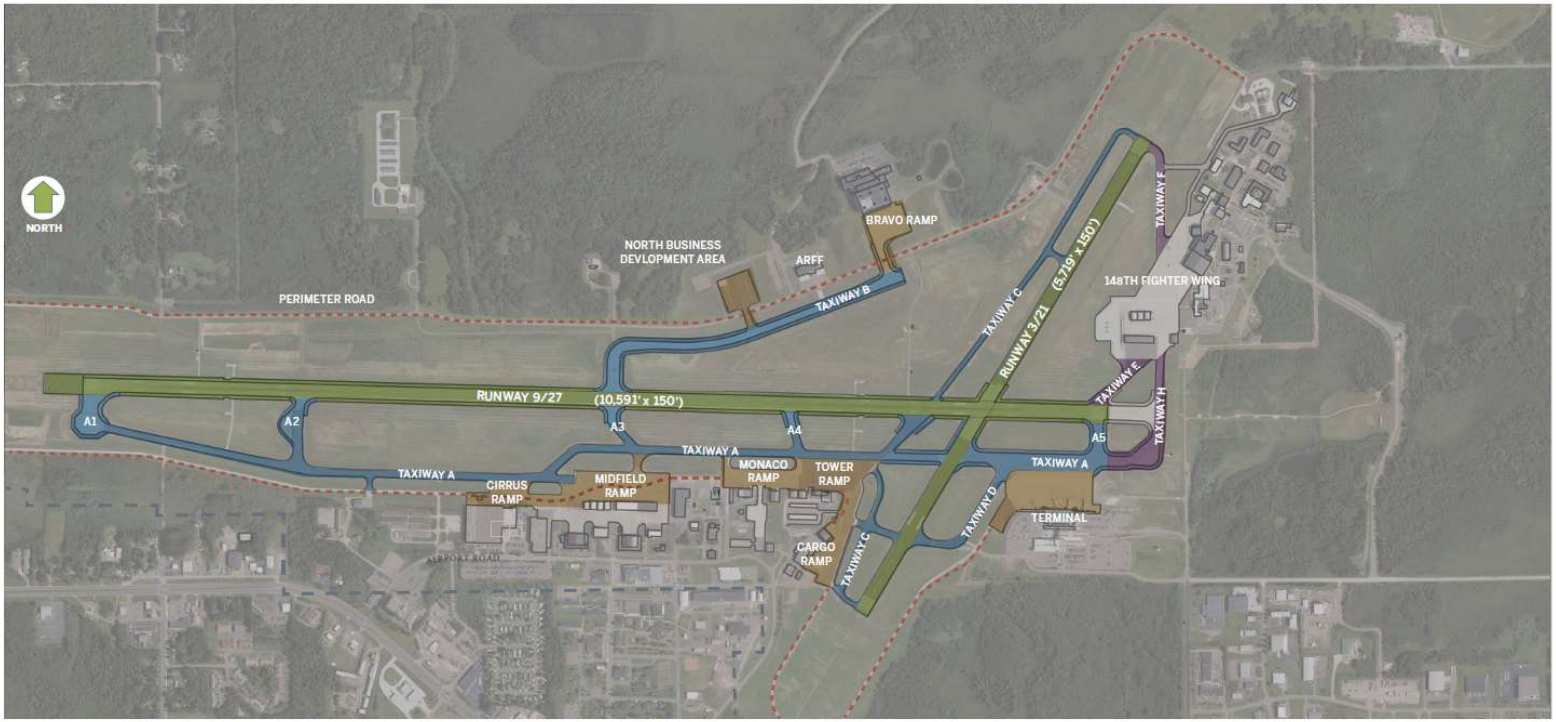

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TAXIWAY	

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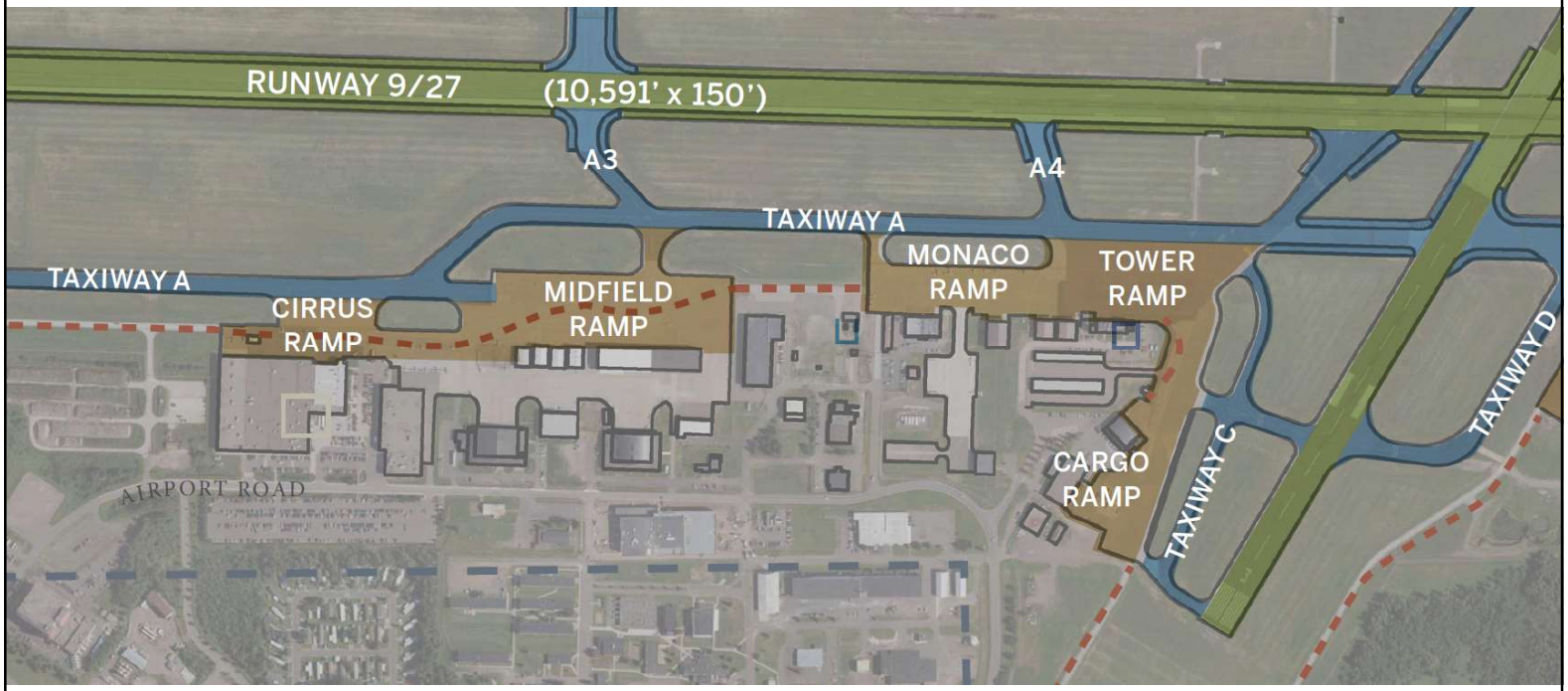
Apron Parking Overview



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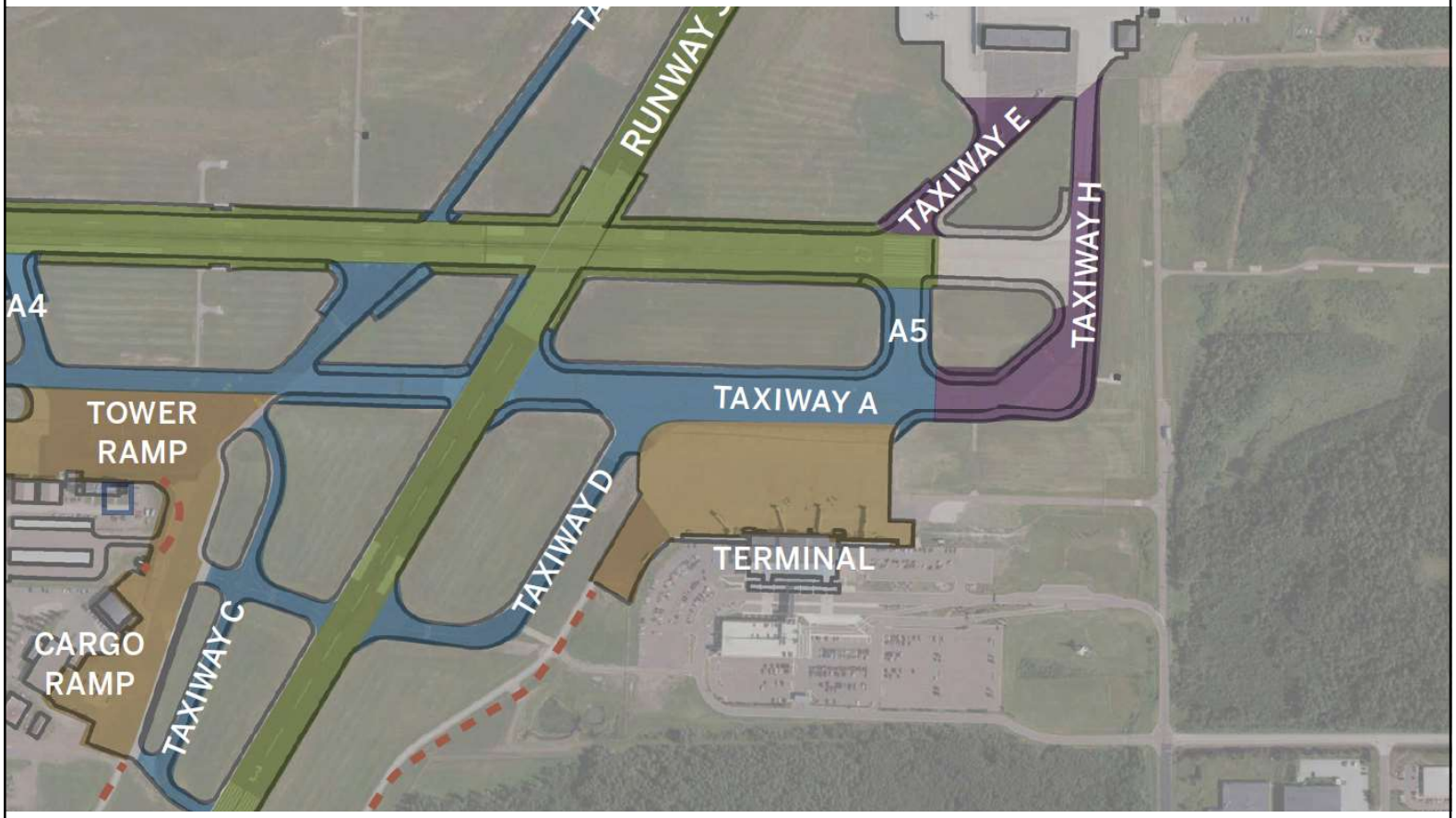

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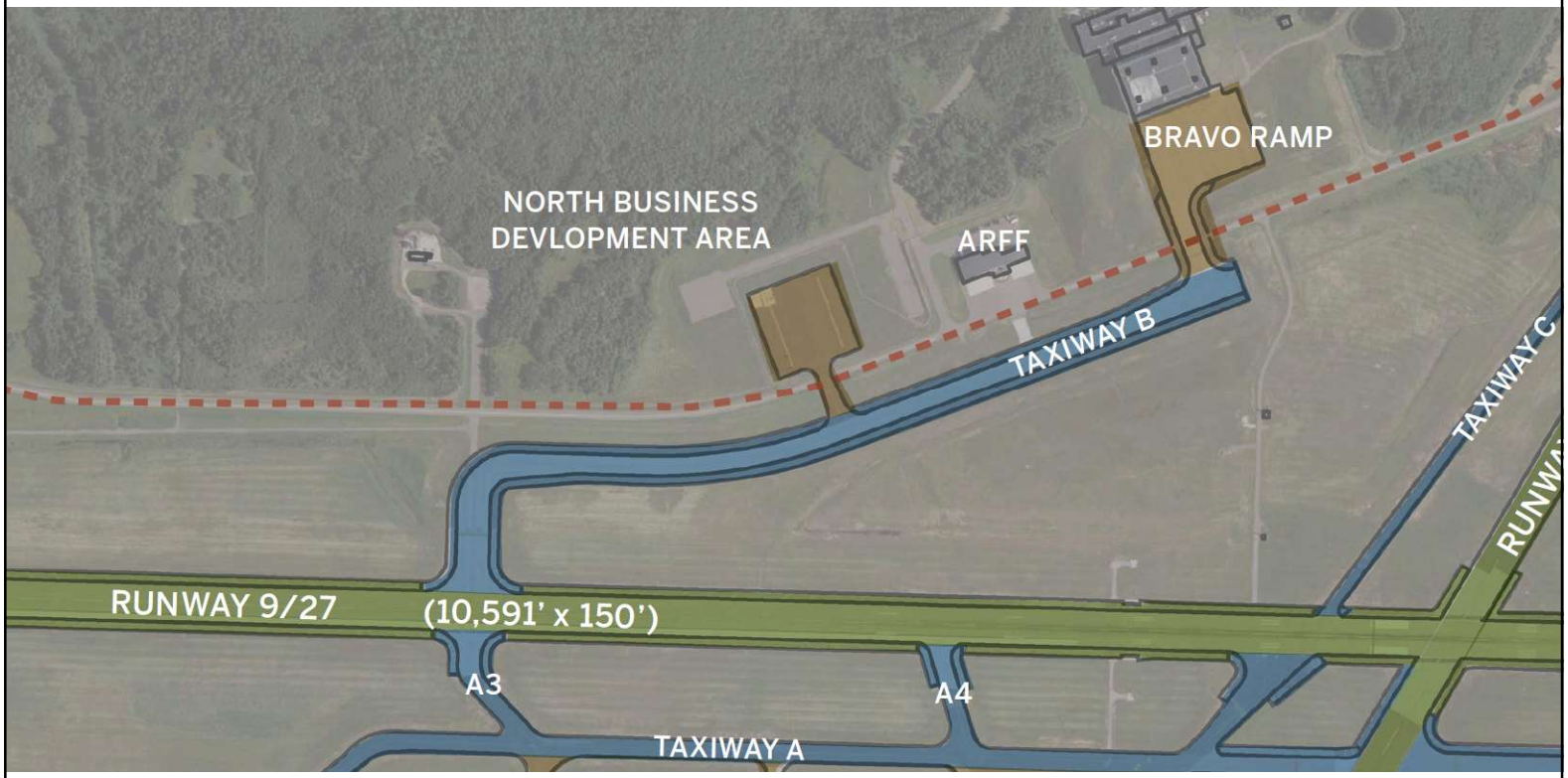

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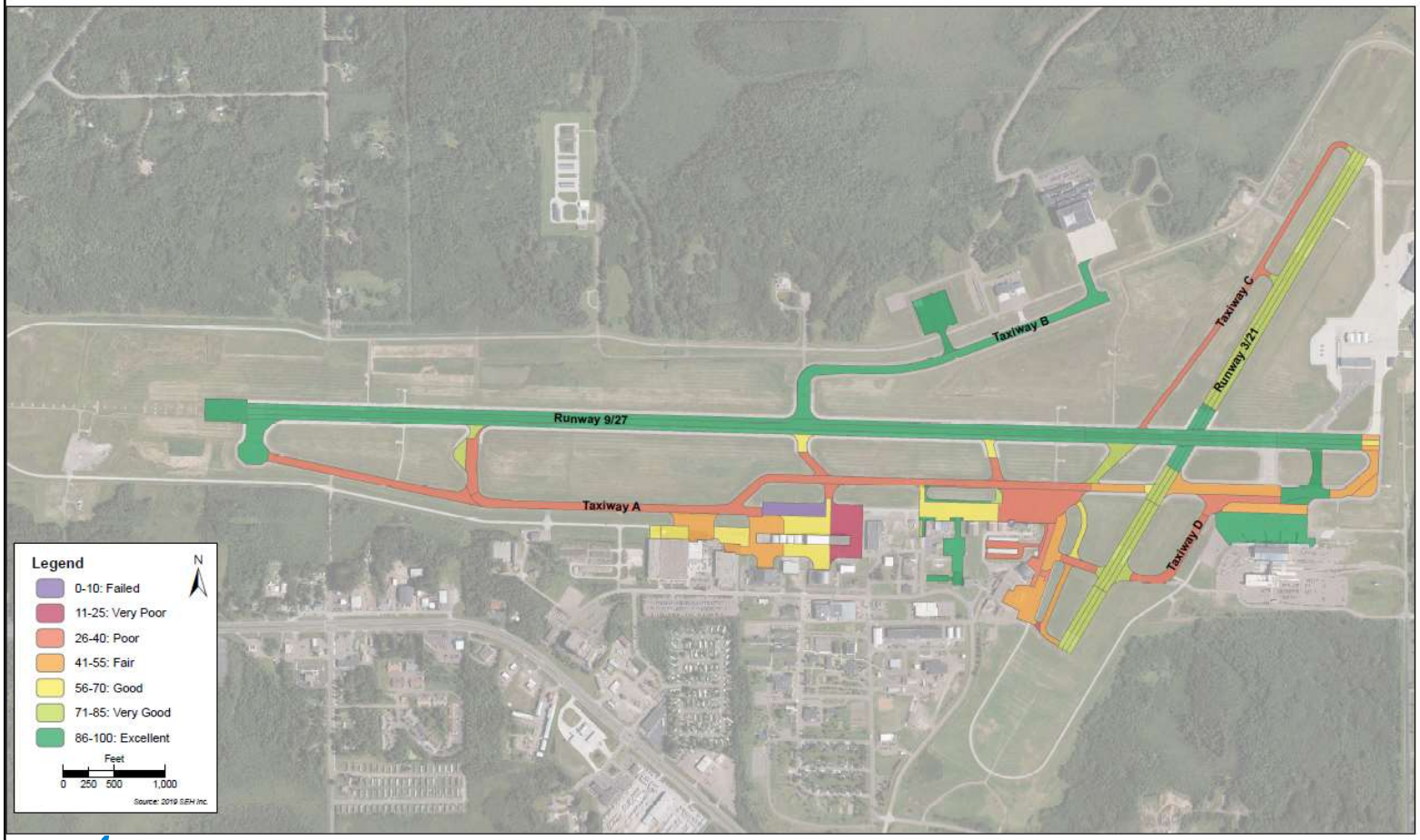
Pavement Condition



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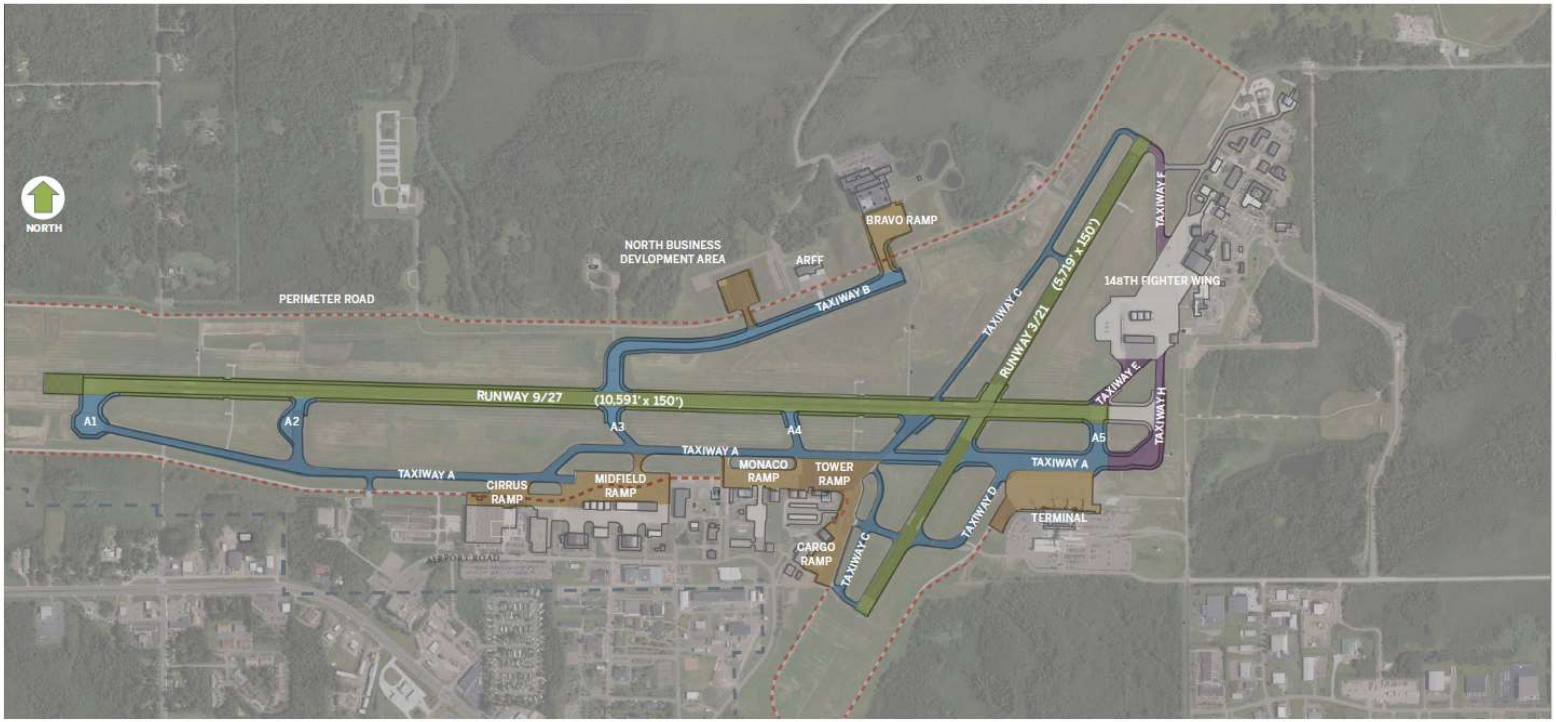

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TAXIWAY
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What segments are heavily used?

What segments are used by large aircraft?

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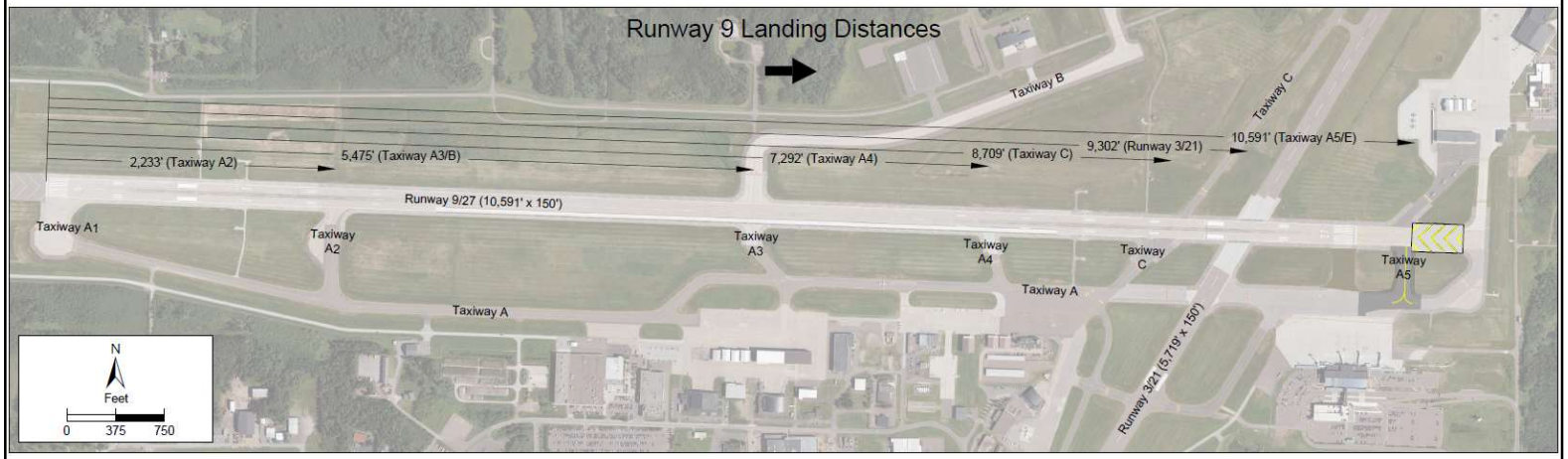
Runway 9/27 - Connector taxiway usage



Runway 9 – What connectors are used the most by?

- Small aircraft
- Jet GA aircraft
- Commercial aircraft
- Military aircraft (various types)

Are there locations where an additional connector would be beneficial?

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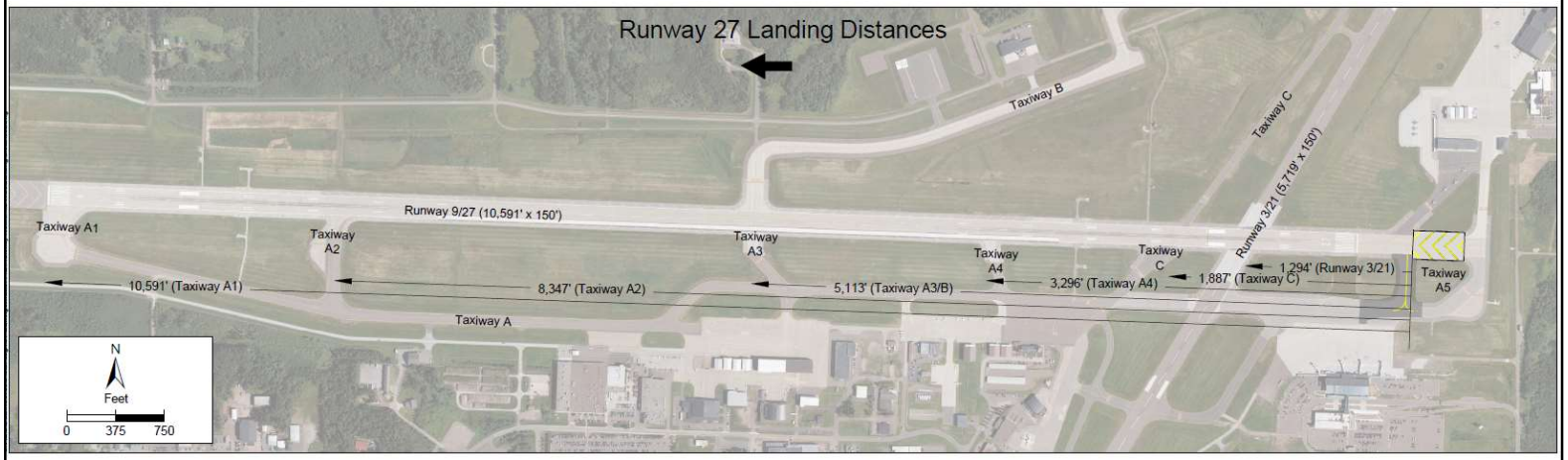
Runway 9/27 - Connector taxiway usage



Runway 27 – What connectors are used the most by?

- Small aircraft
- Jet GA aircraft
- Commercial aircraft
- Military aircraft (various types)

Are there locations where an additional connector would be beneficial?

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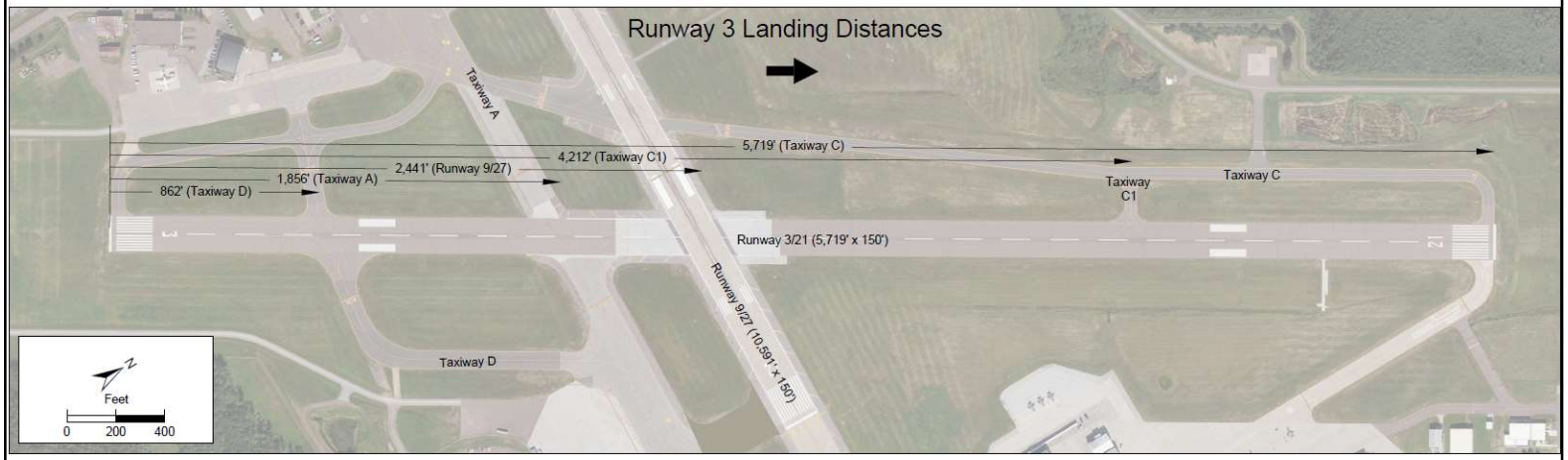
Runway 3/21 - Connector taxiway usage



Runway 3 – What connectors are used the most by?

- Small aircraft
- Jet GA aircraft
- Commercial aircraft
- Military aircraft (various types)

Are there locations where an additional connector would be beneficial?

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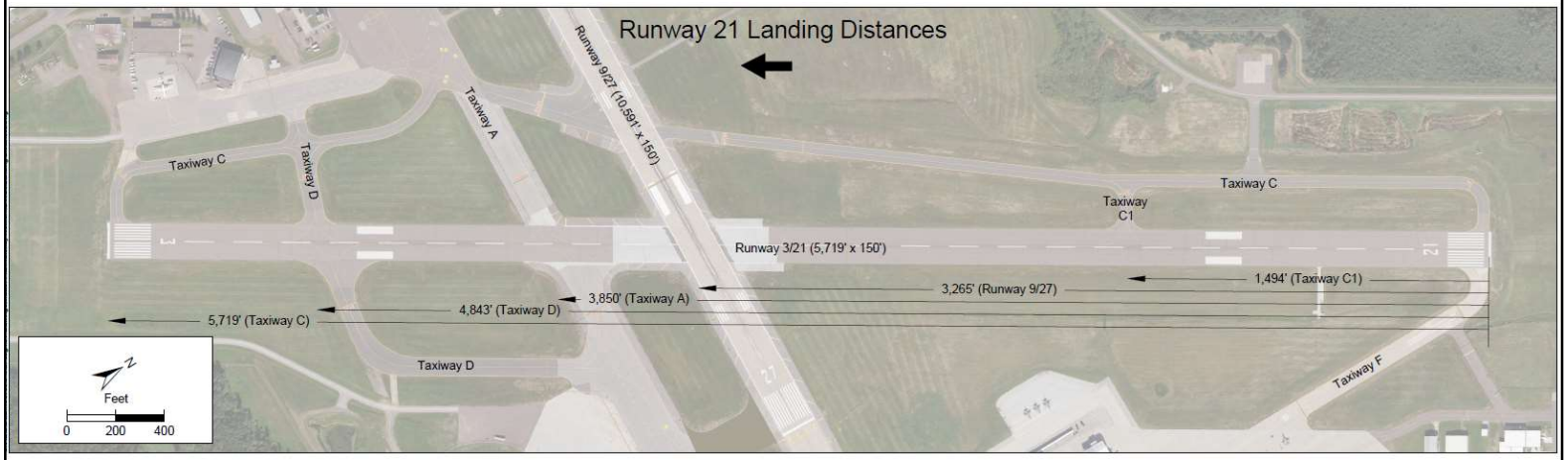
Runway 3/21 - Connector taxiway usage



Runway 21 – What connectors are used the most by?

- Small aircraft
- Jet GA aircraft
- Commercial aircraft
- Military aircraft (various types)

Are there locations where an additional connector would be beneficial?

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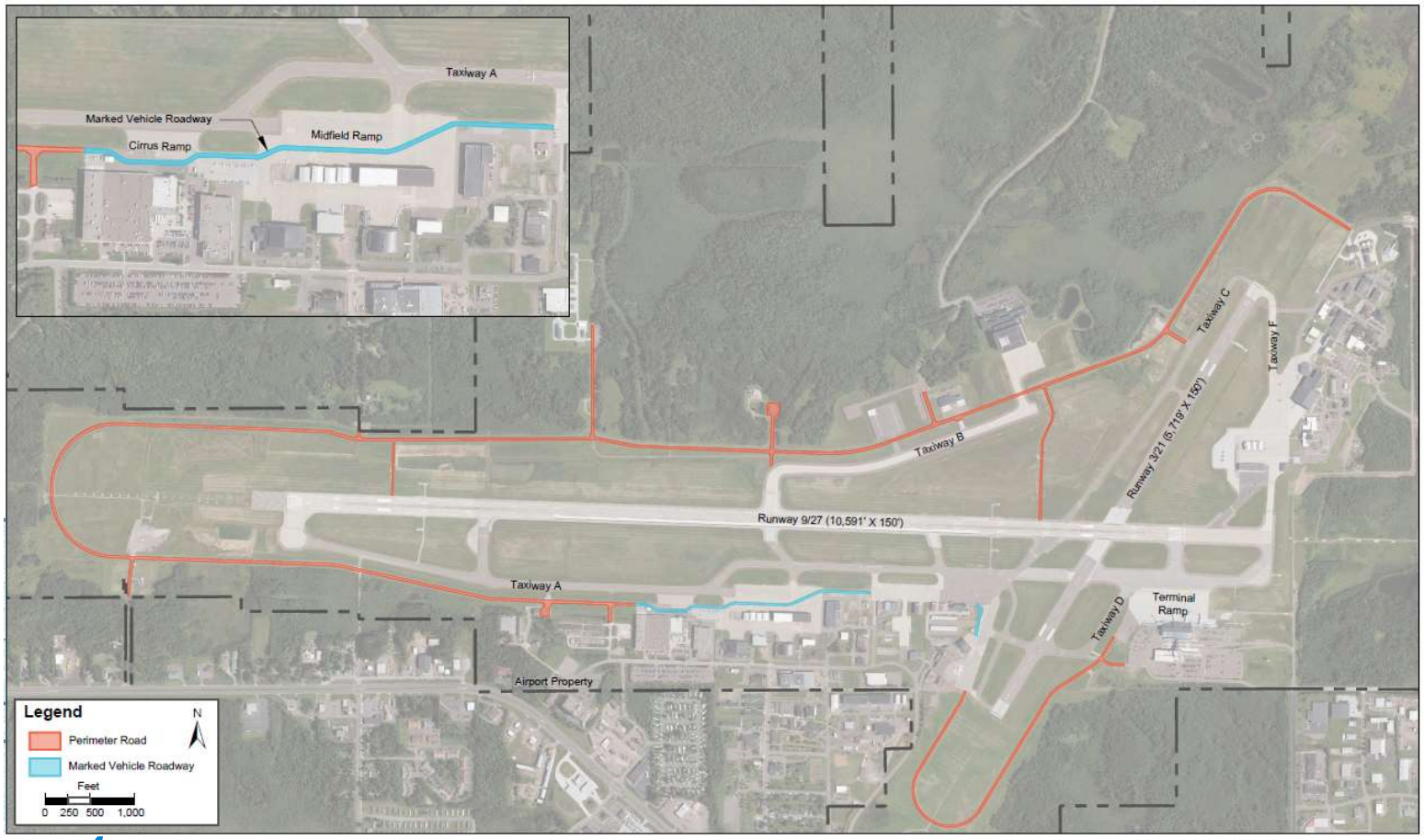
Vehicle Operations on Taxiways and



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DLH Taxiway & Apron Network Stakeholder Feedback

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Discussion

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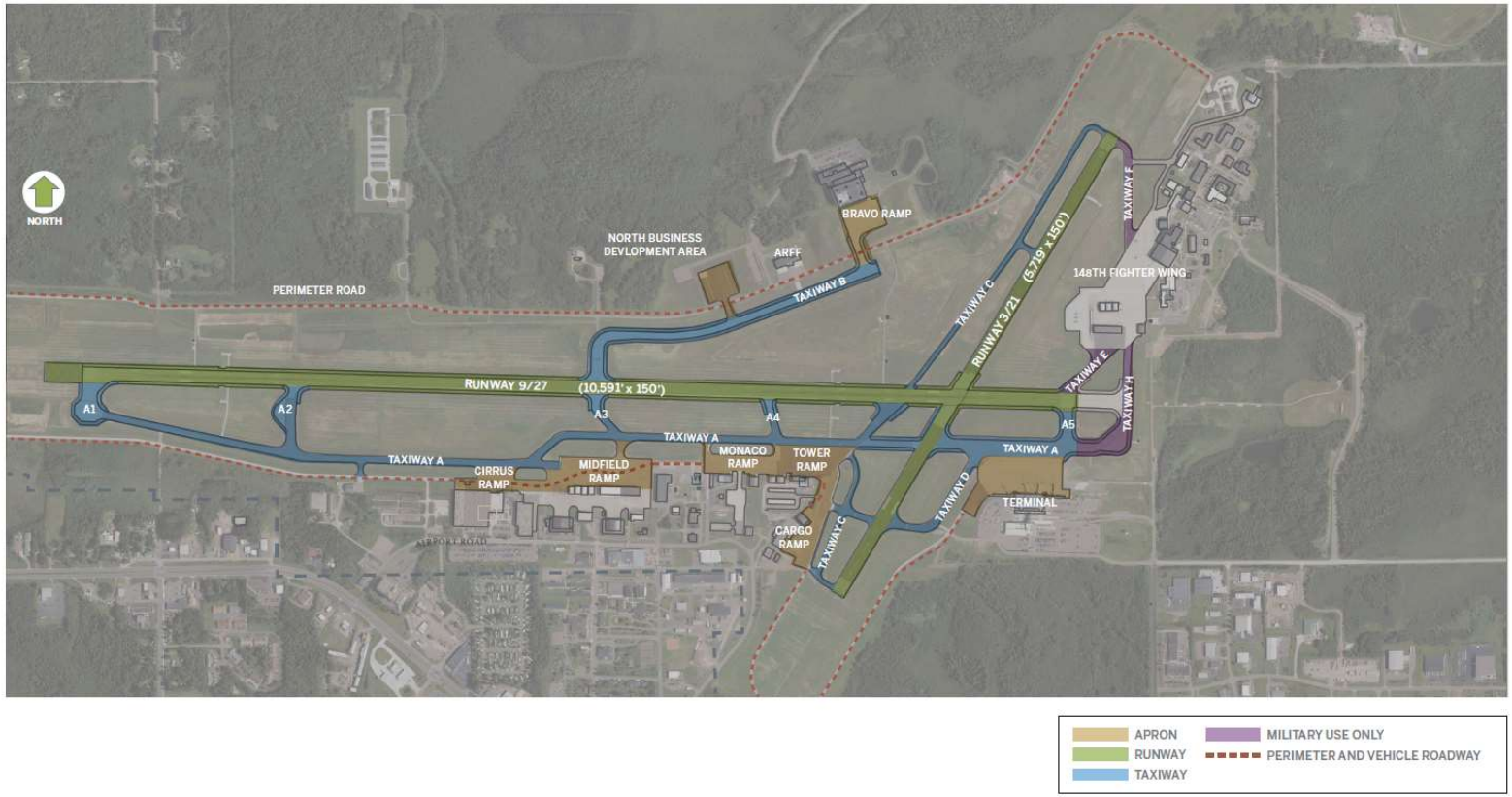

APRON
RUNWAY
TAXIWAY
MILITARY USE ONLY
PERIMETER AND VEHICLE ROADWAY

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DLH Runway Incursion & Surface Incidents

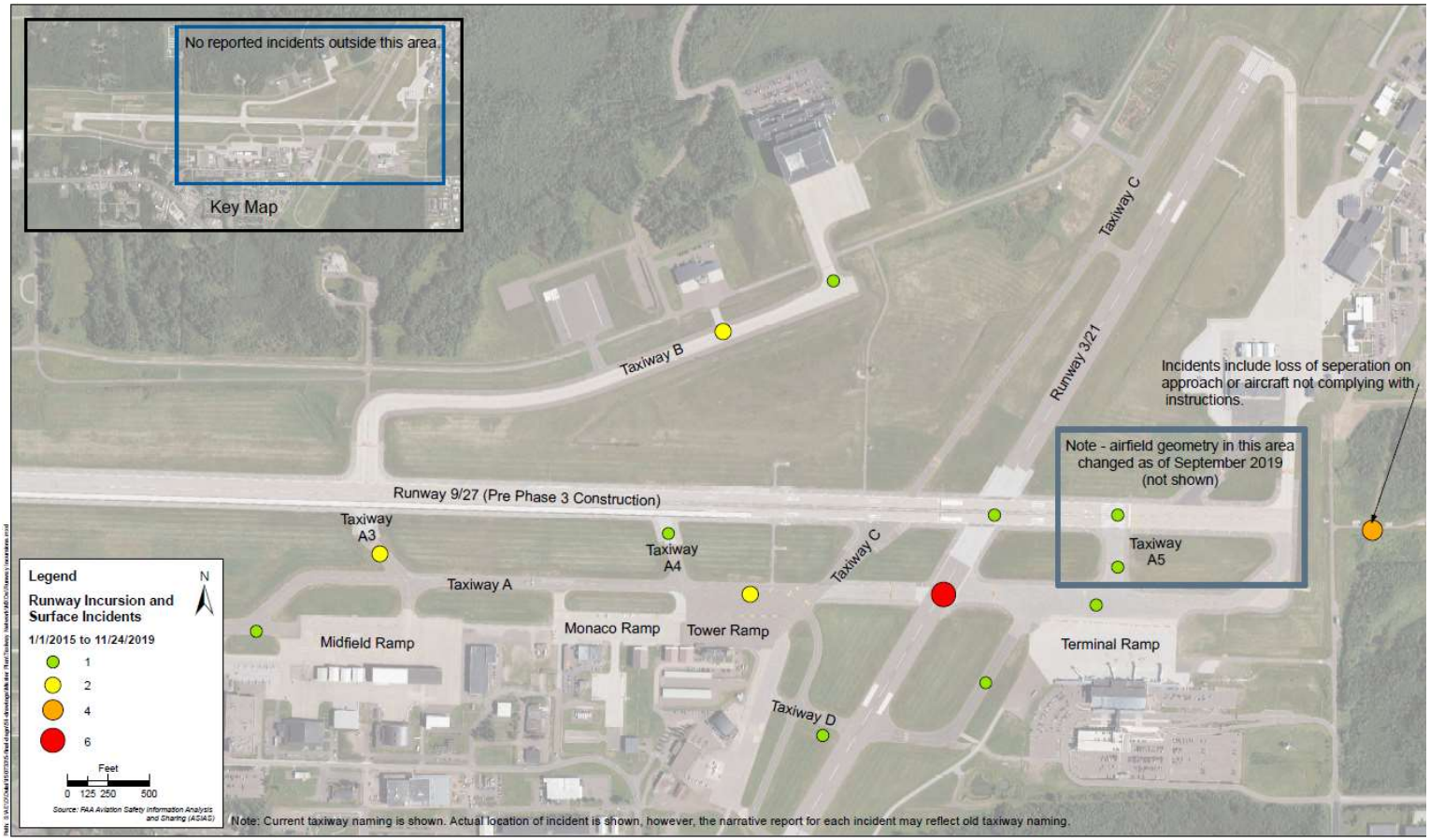
- Runway Incursion: the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft.

- Surface Incident: an unauthorized or unapproved movement within the designated movement area (excluding runway incursions) or an occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight.

DLH Runway Incursion & Surface Incidents

- Operational Incident:
  - Action of an Air Traffic Controller that results in less than required minimum separation between 2 or more aircraft, or between an aircraft and obstacles, (vehicles, equipment, personnel on runways) or clearing an aircraft to take off or land on a closed runway
- Pilot Deviation:
  - Action of a pilot that violates any Federal Aviation Regulation
- Vehicle/Pedestrian Deviation:
  - Pedestrians or vehicles entering any portion of the airport movement areas (runways/taxiways) without authorization from air traffic control

DLH Runway Incursion & Surface Incidents



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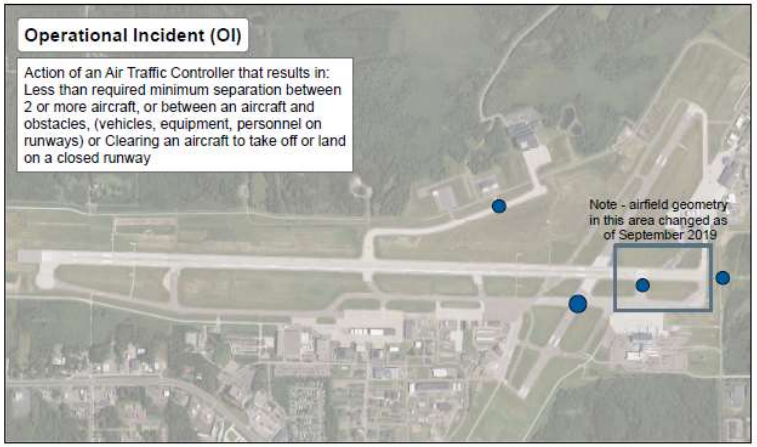

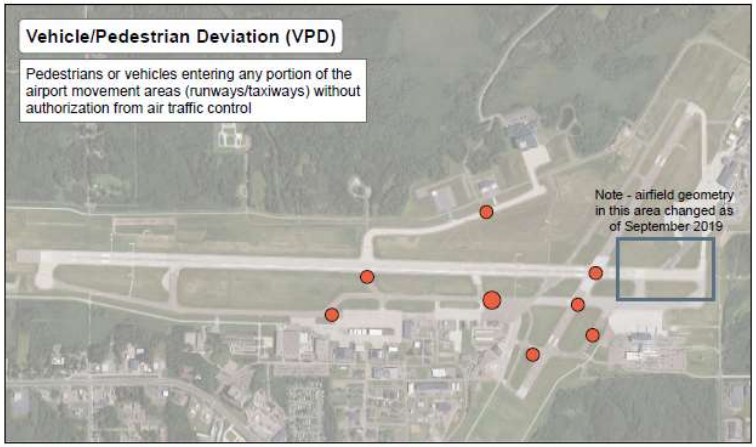

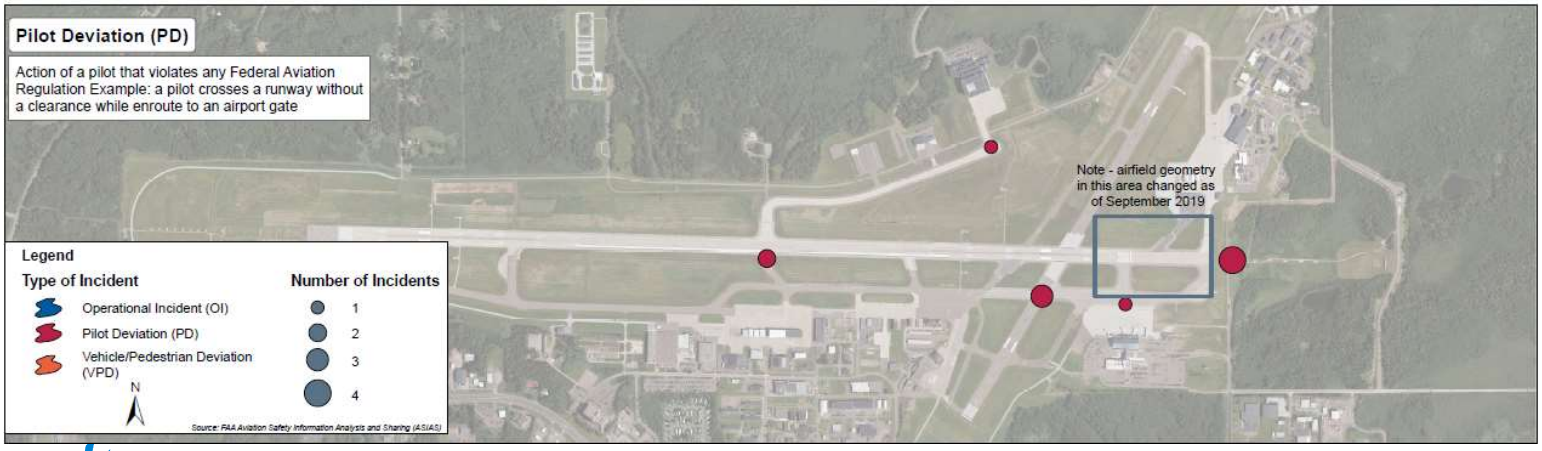

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Runway Safety Action Team (RSAT) Recent Action Items

Taxilane & Vehicle Roadway Intersection

- Fence can obscure view
- Vehicle stop sign added (2018)

Apron & Vehicle Roadway Intersection

- Aircraft have incorrectly used vehicle roadway as taxilane
- Pavement markings added (2018)

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Additional Feedback?

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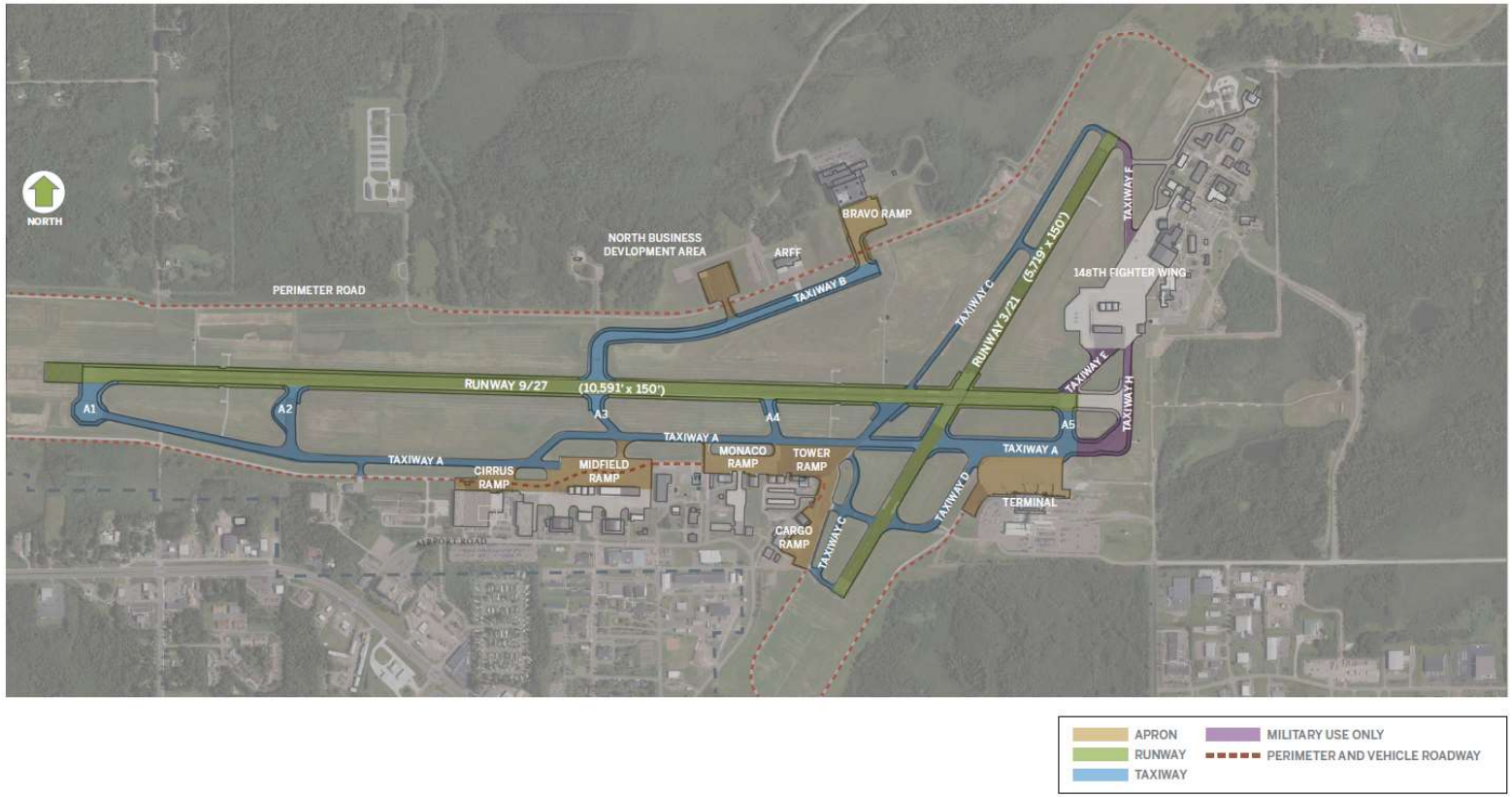

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Taxiway Design Standards Introduction

Airplane Design Group (ADG) and Taxiway Design Group (TDG)

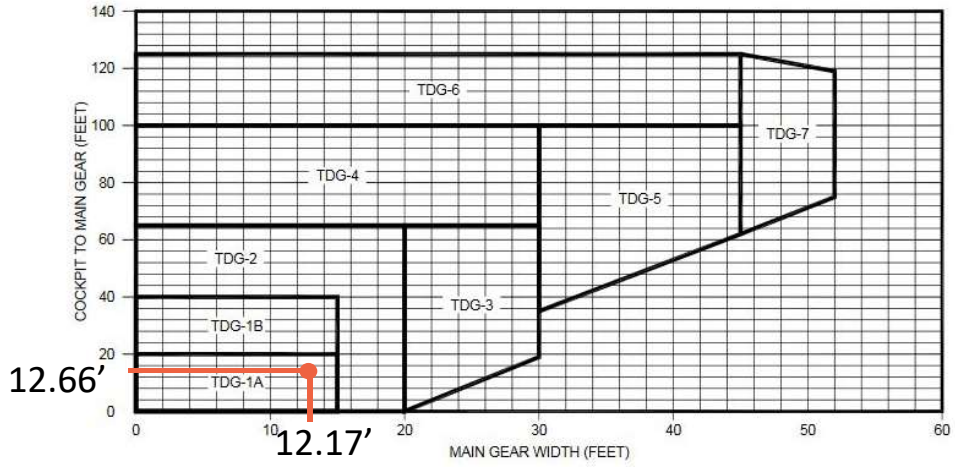
Aircraft Design Group (ADG) & Taxiway Design Group (TDG) Influence Design

- Aircraft Design Group (wingspan & tail height) influences separation standards

- Taxiway Design Group (main gear width & cockpit to main gear distance)
  influences pavement width and fillets

See Figure 7 in your packet

Cessna Grand Caravan – ADG II / TDG 1A



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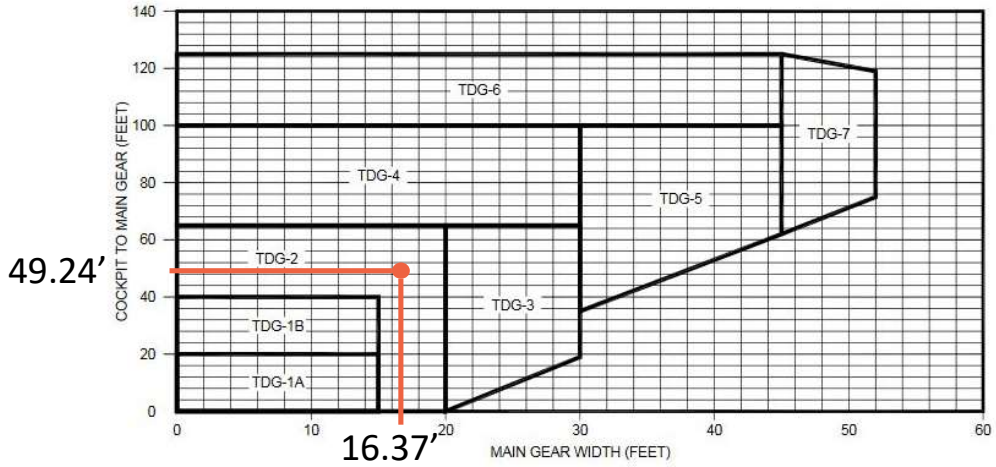
CRJ-700 – ADG II / TDG 2



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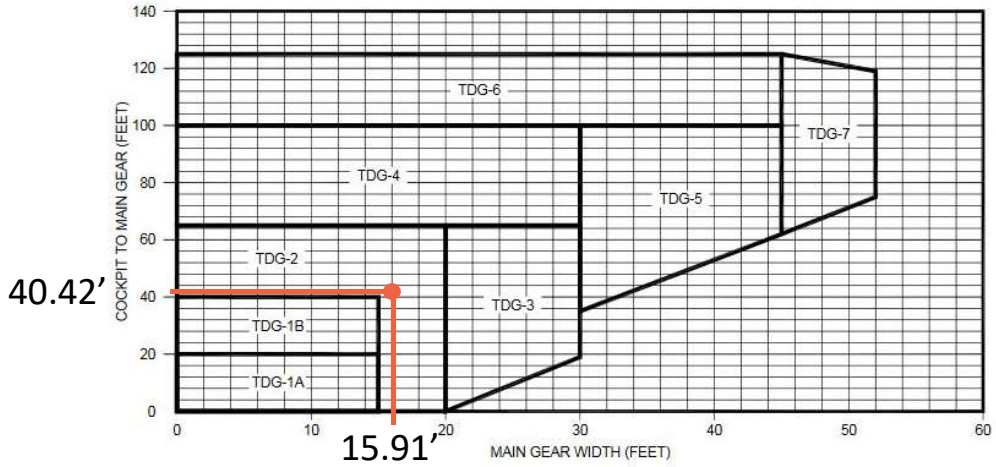
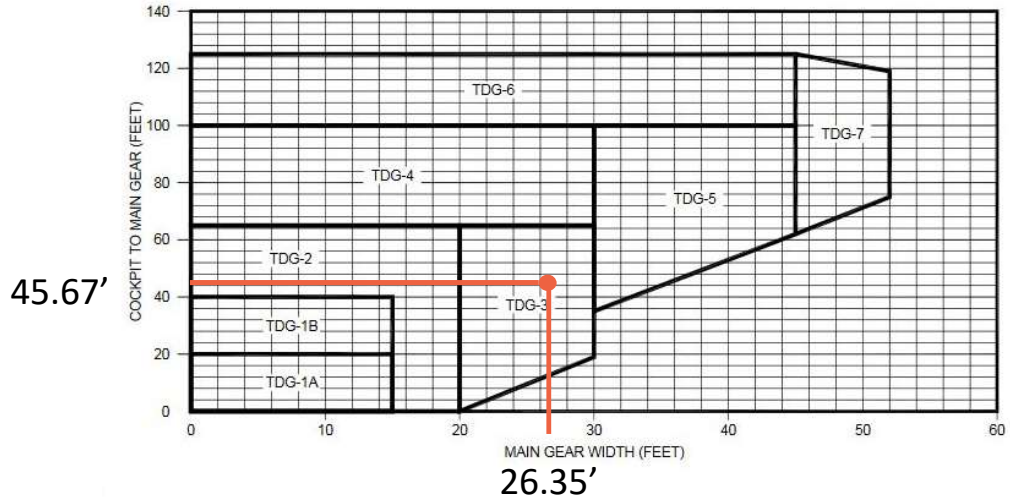
C-130 – ADG IV / TDG 2



KC-135 – ADG IV / TDG 3



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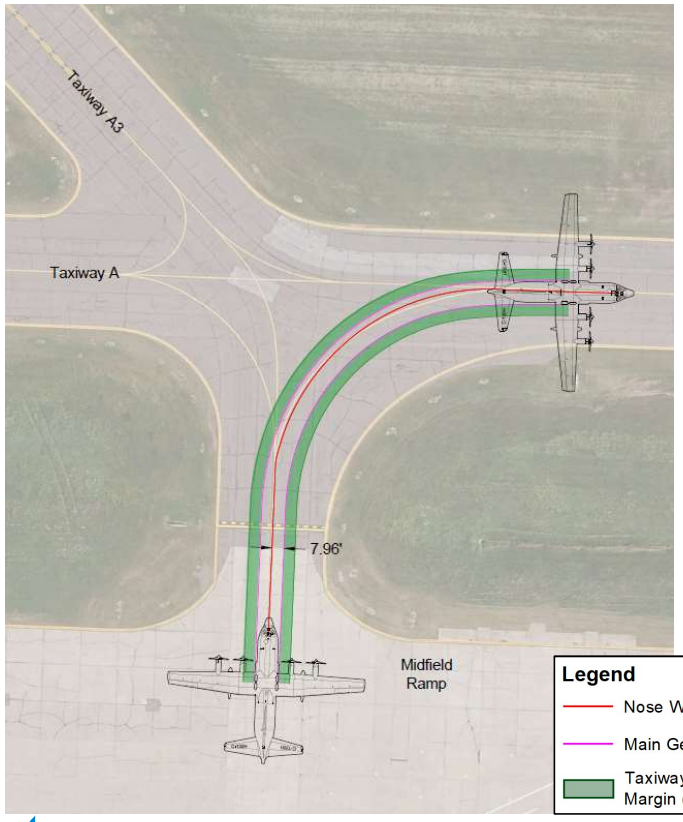
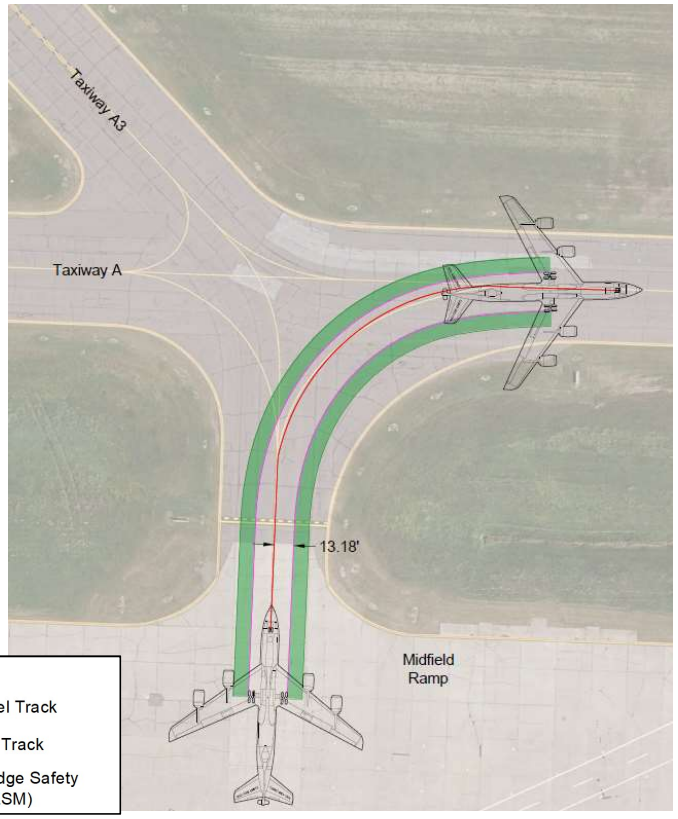
Taxiway Design Group (TDG) Comparison

C-130 (TDG 2)



KC-135 (367) (TDG 3)



Legend

- Nose Wheel Track
- Main Gear Track
- Taxiway Edge Safety Margin (TESM)

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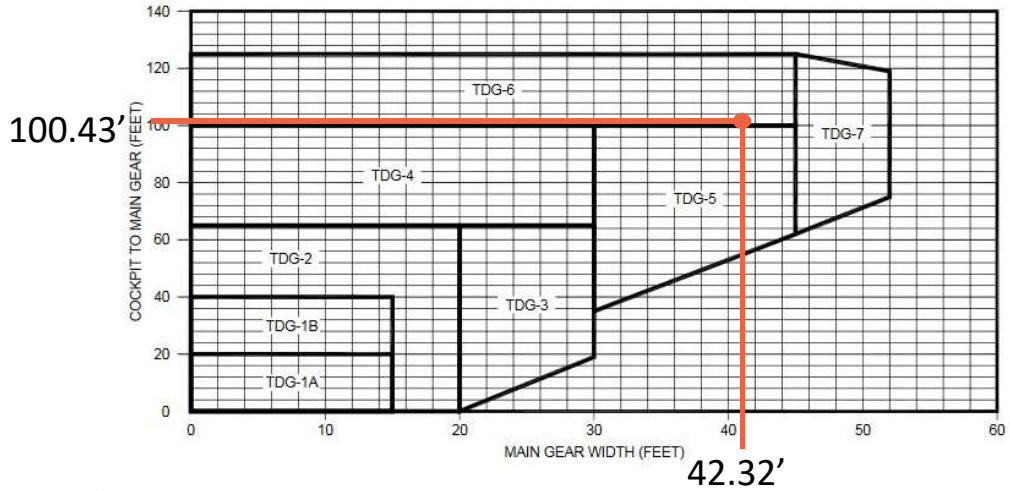
Boeing 777-300ER – ADG V / TDG 6



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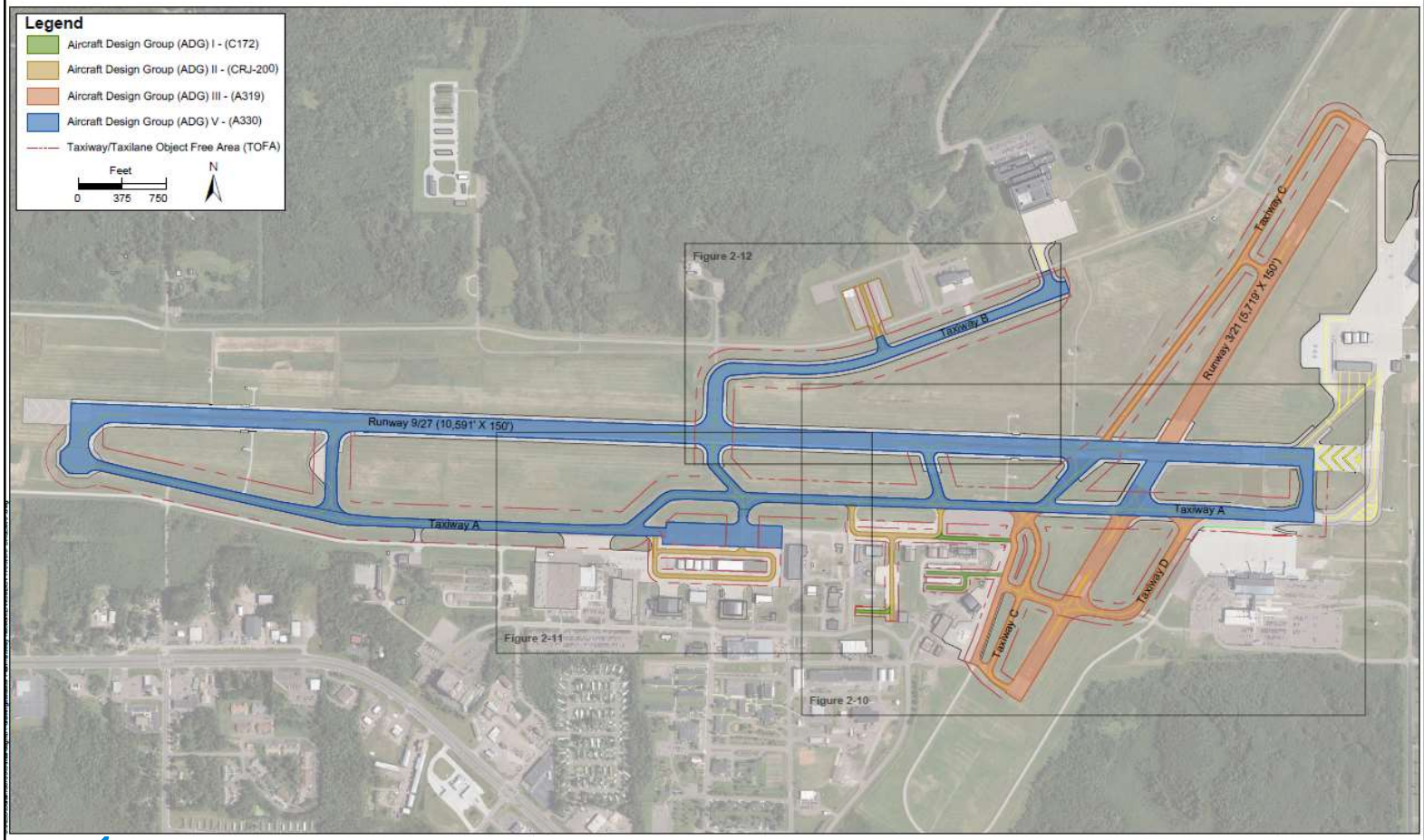
Taxiway Network – Aircraft Design Group



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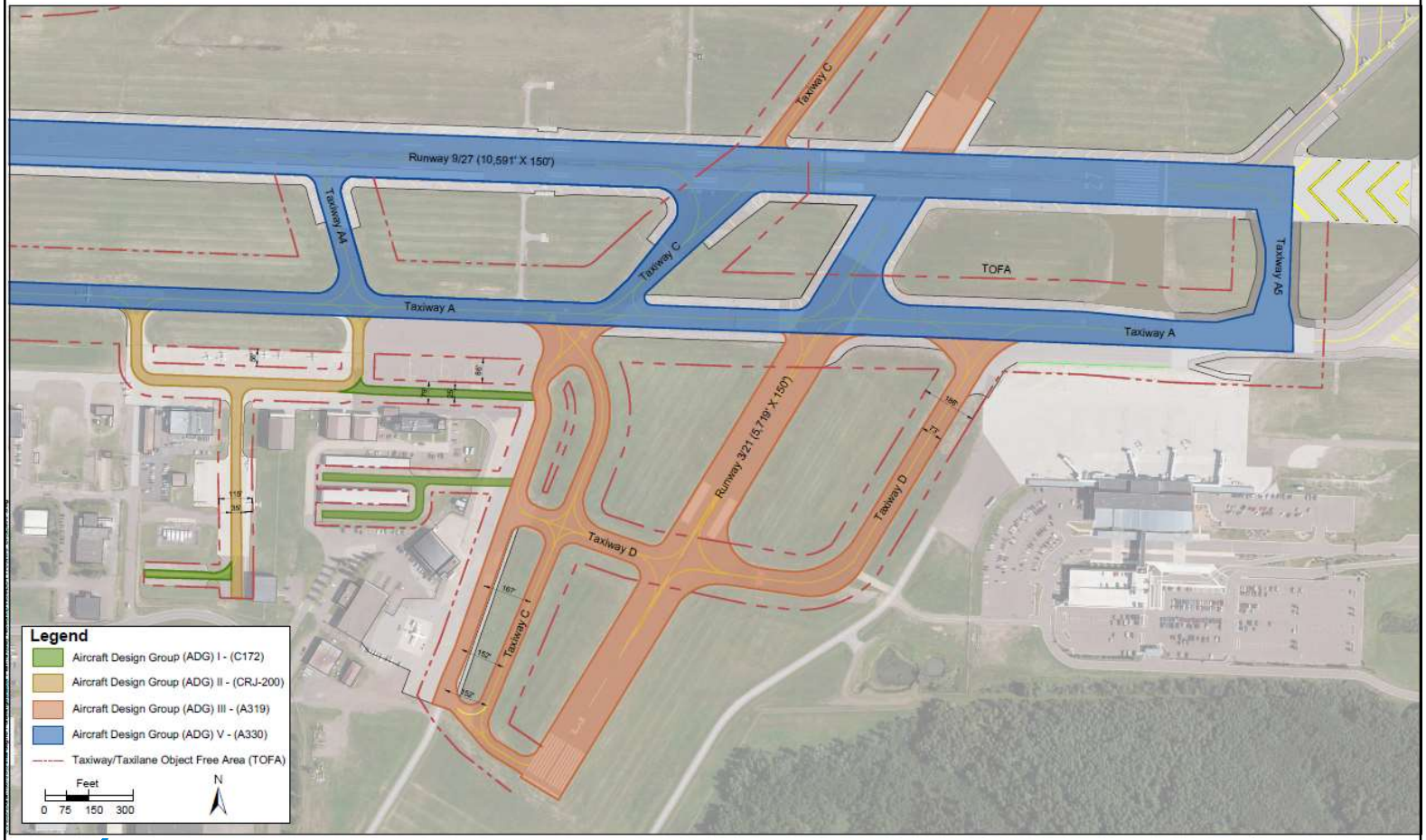
Taxiway Network – Aircraft Design Group



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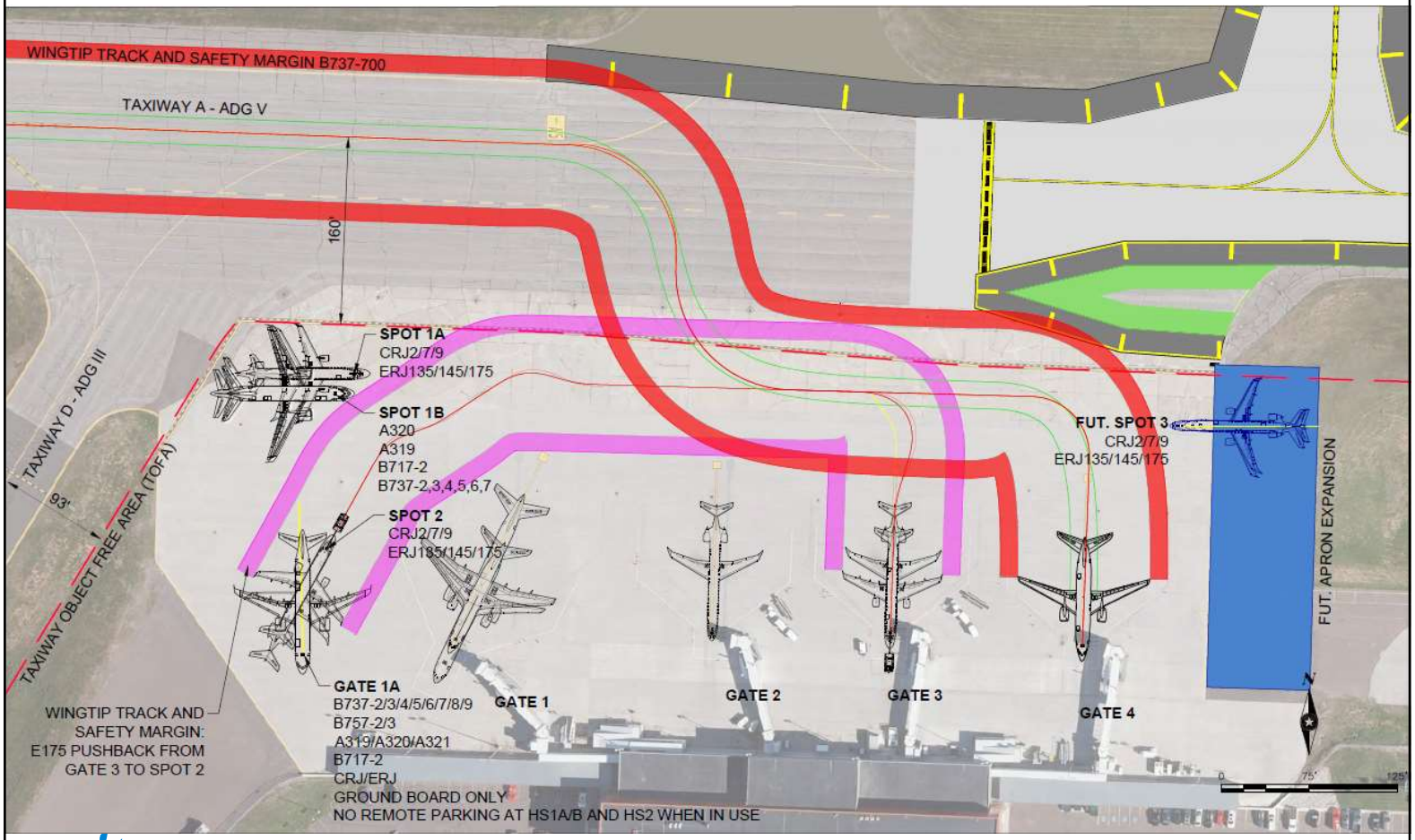
Taxiway Network – Aircraft Design Group



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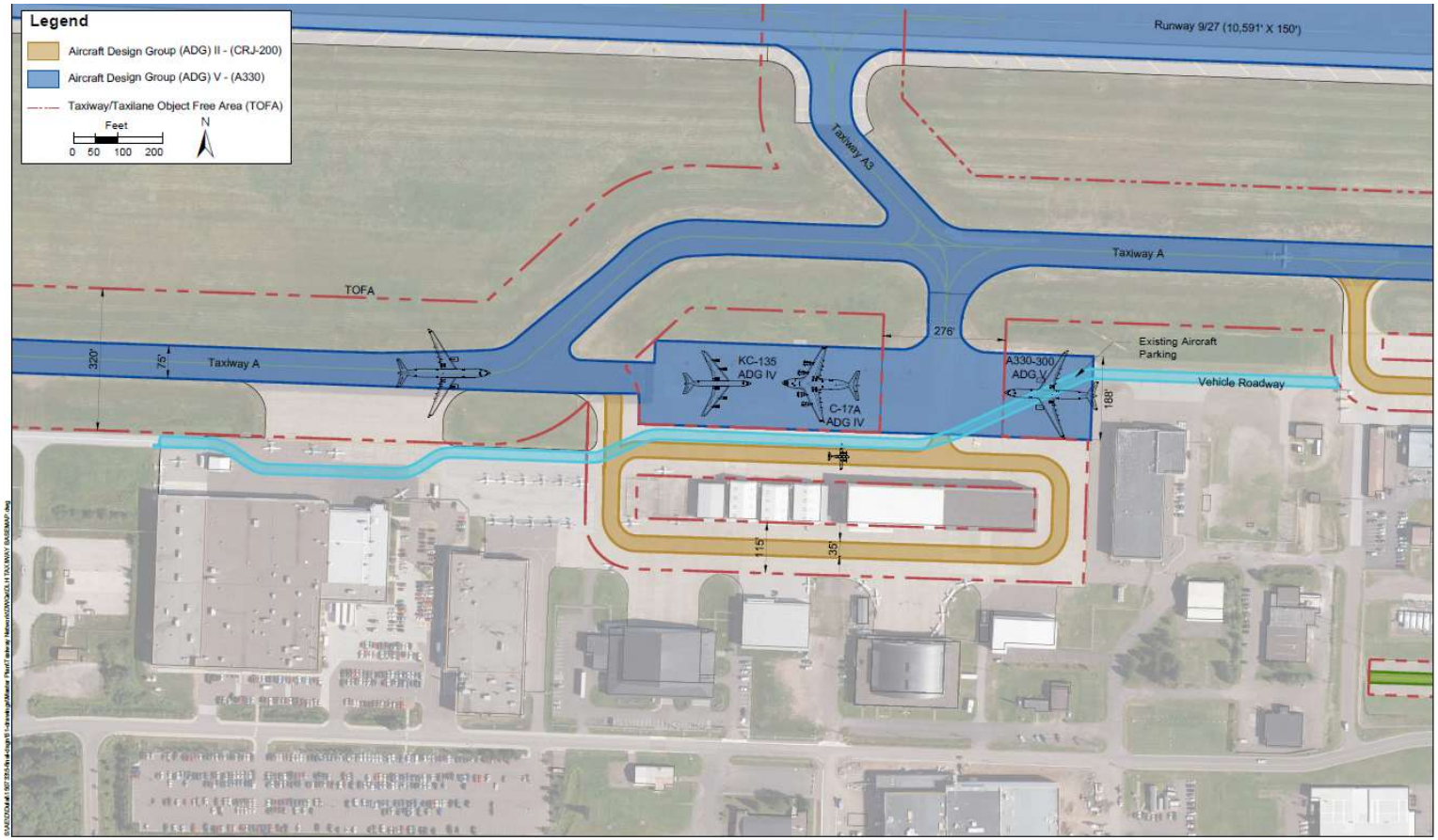
Taxiway Network – Aircraft Design Group



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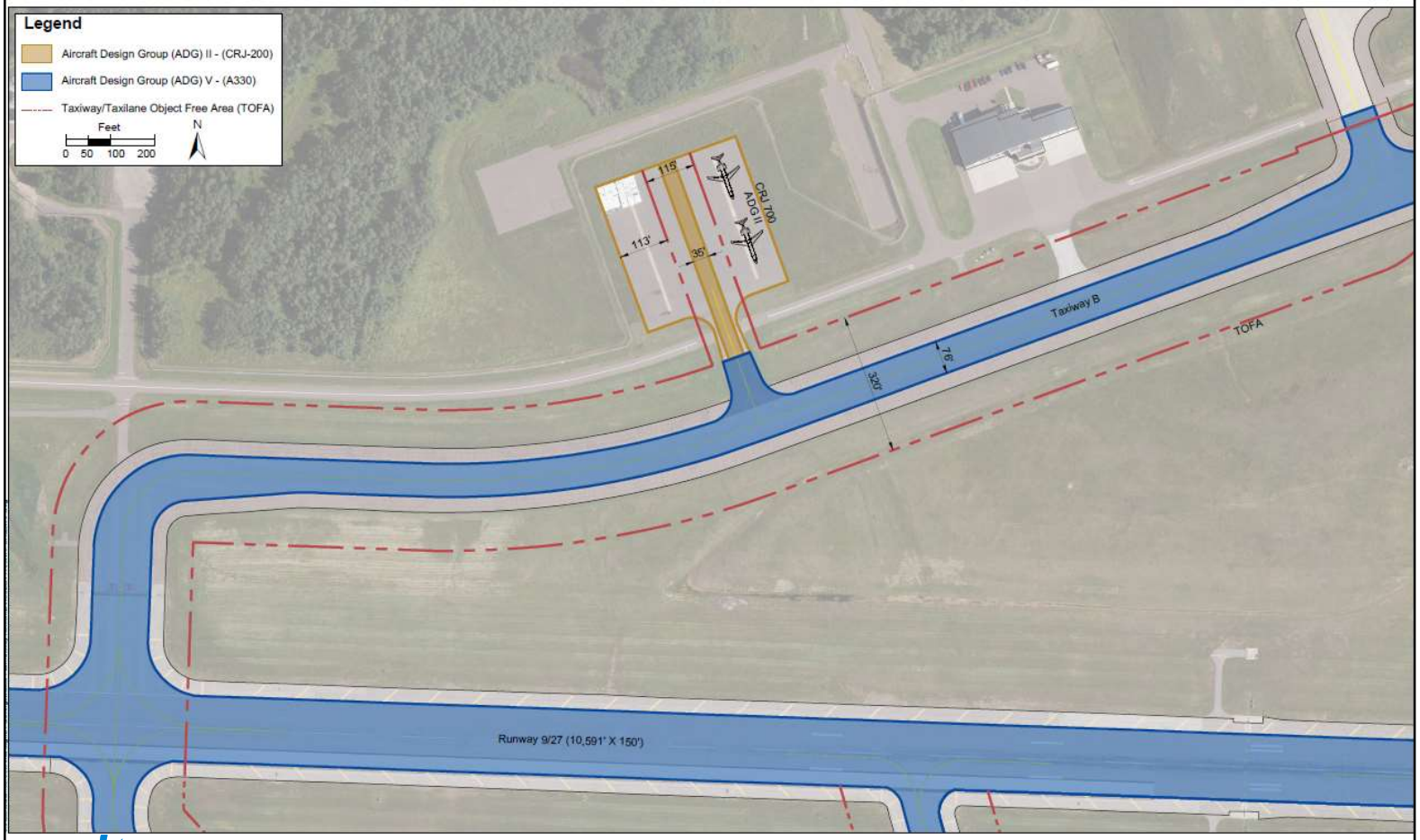
Taxiway Network – Aircraft Design Group



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Taxiway Design

- Good design practices keep taxiway intersections simple.
- Complex layouts increase the possibility of pilot error.
- Three-node concept – A pilot has no more than 3 choices at an intersection – ideally, left, right and straight ahead.
- Intersection angles – Design turns to be 90 degrees wherever possible.

Design to Reduce Runway Incursions

- Increase situational awareness, keep taxiway systems simple.
- Avoid wide expanses of pavement.
- Limit runway crossings.
- Avoid “dual purpose” pavements
- Avoid “high energy” intersections (middle 1/3 of the runway).
- Avoid direct access to runways
- Increase visibility – Right angle intersections provide the best visibility.

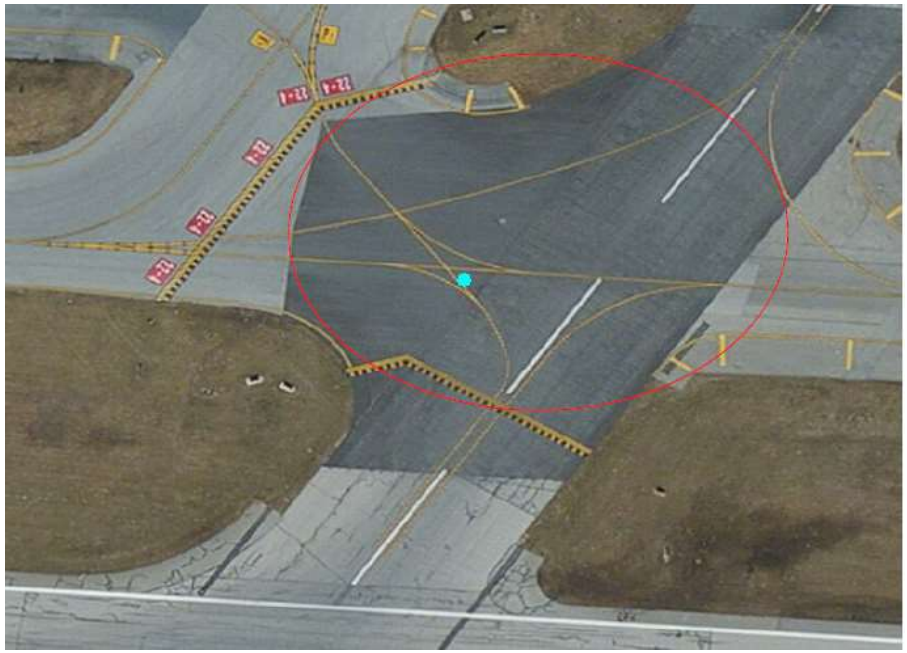
Problematic Taxiway Design - *Examples*

- <u>Wide expanse of pavement:</u> Reduces pilot's ability to see visual cues (signs, etc.)

Problematic Taxiway Design - *Examples*

- Direct access from Ramp to Runway: May create false expectation of a parallel taxiway prior to the runway.

Problematic Taxiway Design - *Examples*



- Greater than 3-node intersection: May lead to pilot confusion. Difficult to properly locate signs.

Problematic Taxiway Design - *Examples*

- <u>Intersection at other than 90 degrees.</u> Does not provide best visual perspective to a pilot.

Problematic Taxiway Design - *Examples*

- Short taxi distance from ramp to runway. Pilots must complete the same number of checklist items in a short distance. Chances of incursions increase in that head-down period

Problematic Taxiway Design - *Examples*

- Unexpected hold line location: The placement is unexpected and pilots may ignore/not expect the hold position point, increasing the chance of a runway incursion.

DLH Taxiway & Apron Standards Review

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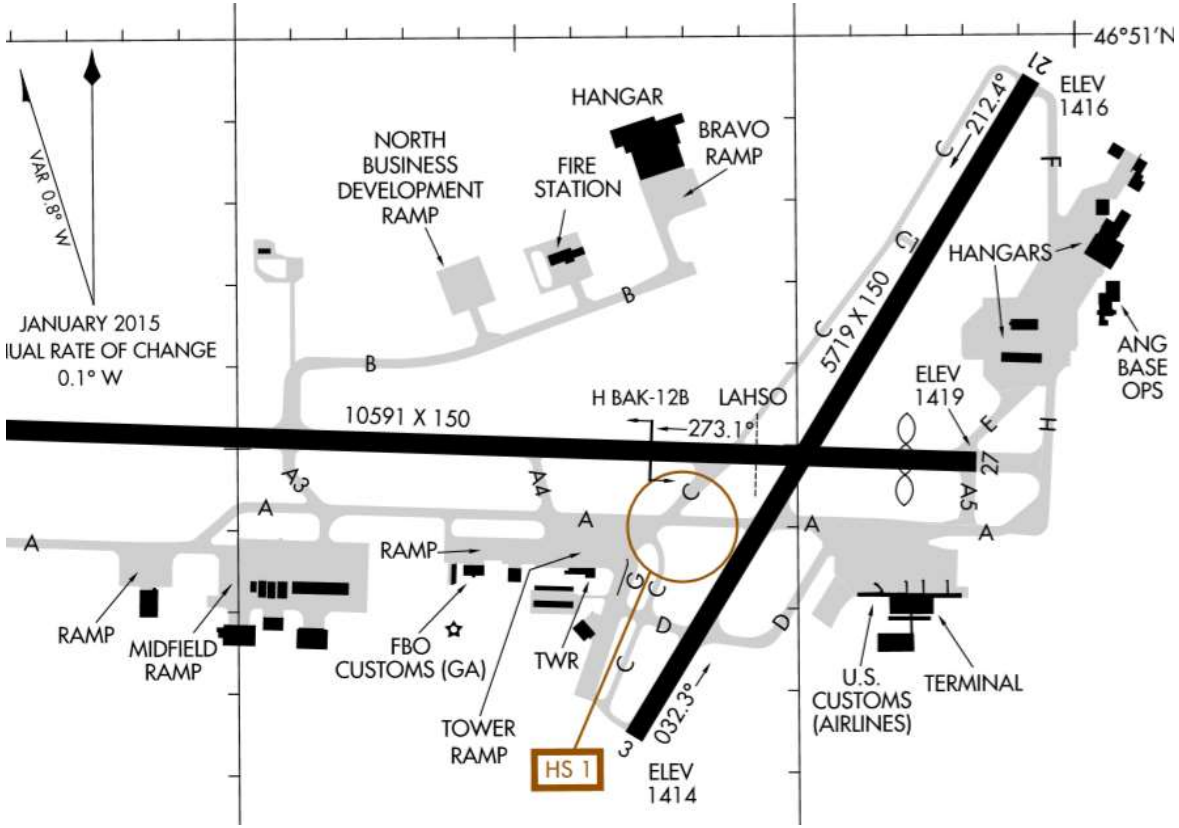
Hot Spot 1 – Complex Intersection

Hot Spot: History or potential risk of collision or runway incursion



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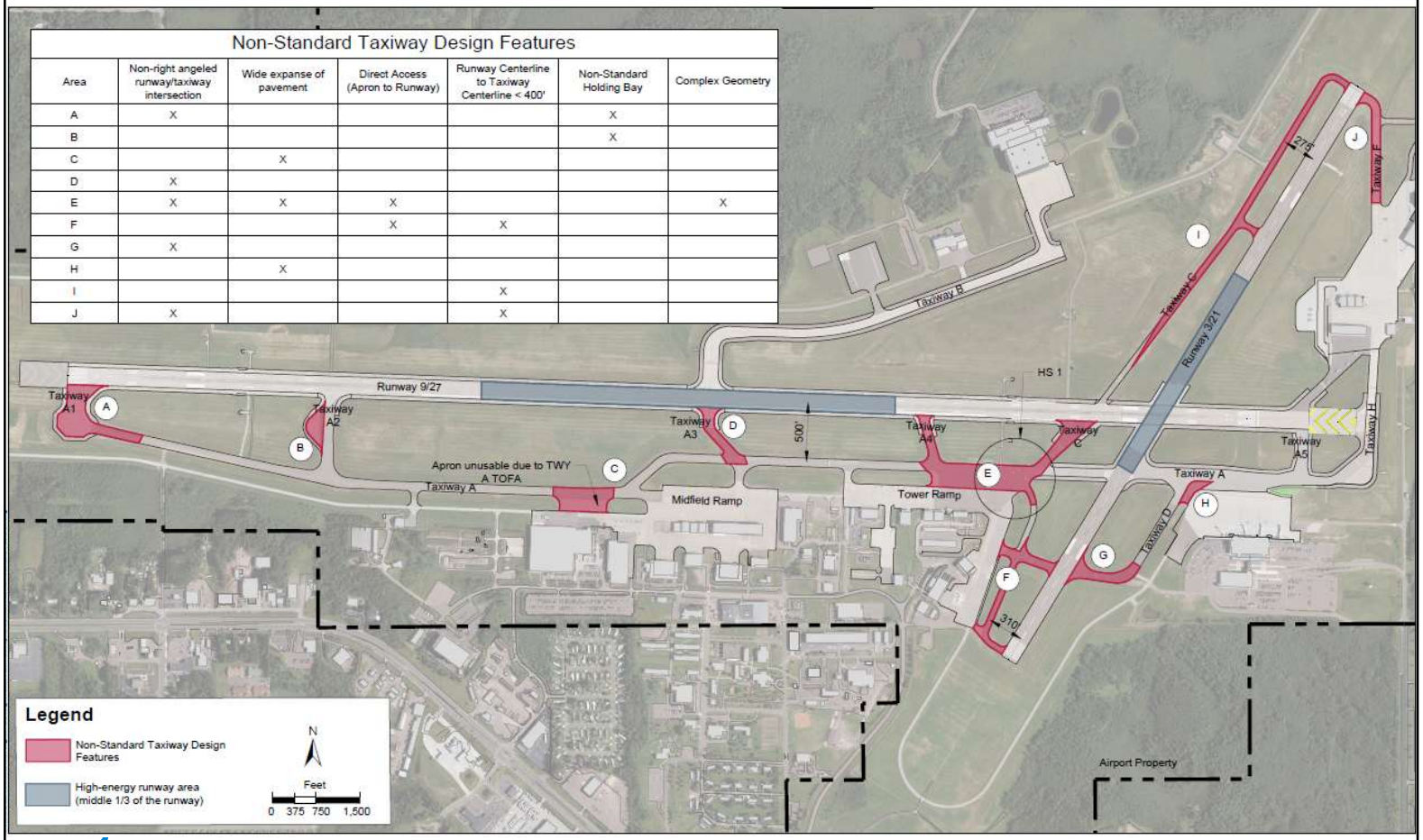
DLH - Design Standards Review



Non-Standard Taxiway Design Features

Area	Non-right angeled runway/taxiway intersection	Wide expanse of pavement	Direct Access (Apron to Runway)	Runway Centerline to Taxiway Centerline < 400'	Non-Standard Holding Bay	Complex Geometry
A	X				X	
B					X	
C		X				
D	X					
E	X	X	X			X
F			X	X		
G	X					
H		X				
I				X		
J	X			X		

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Next Steps

- Documentation of problems to solve
- Alternatives development
- TAC Meeting #2

Questions and Discussion

Thank You!

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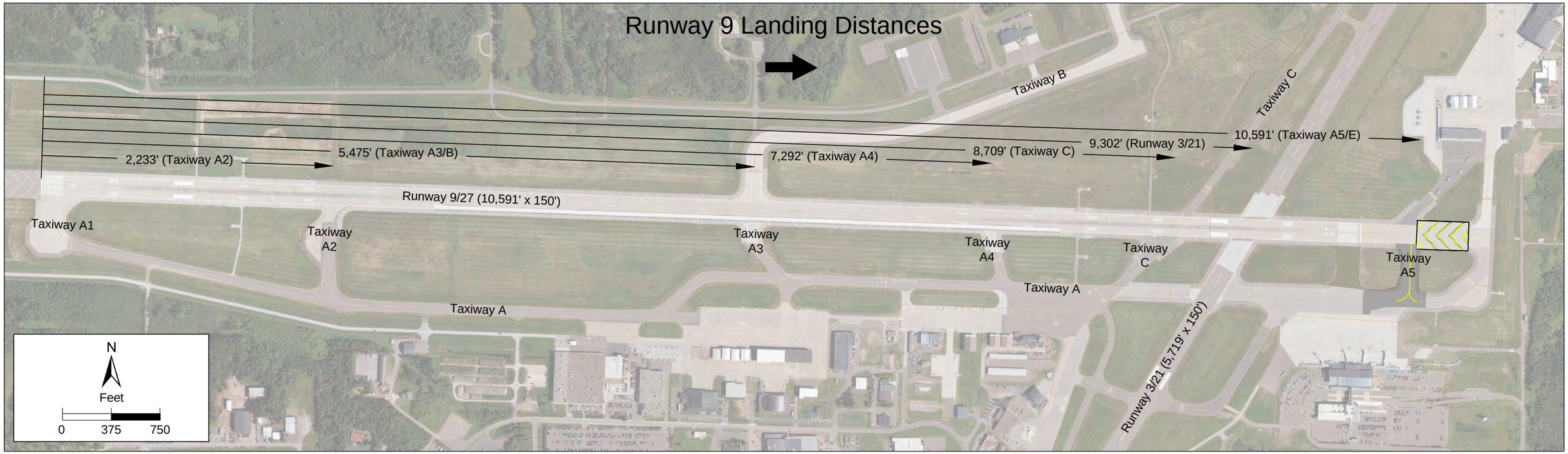
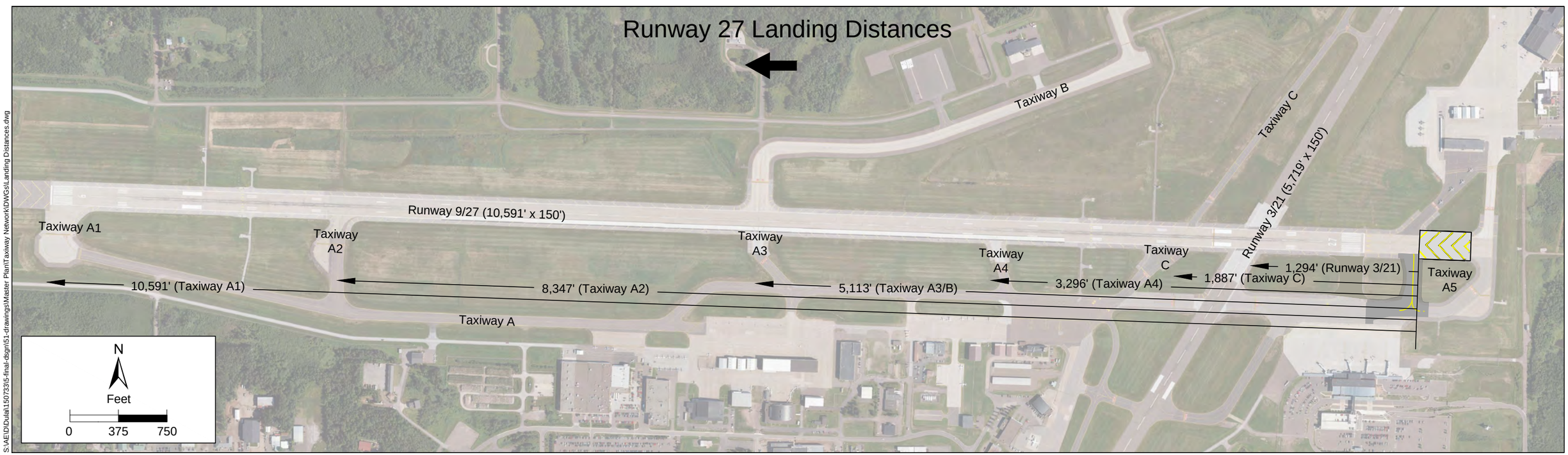
Airport Master Plan - Taxiway Network TAC

Figure 1

Duluth International Airport
Duluth, Minnesota

Runway 9/27 Landing Distances Available
Date: 11/2019; Project: DULAI 150733





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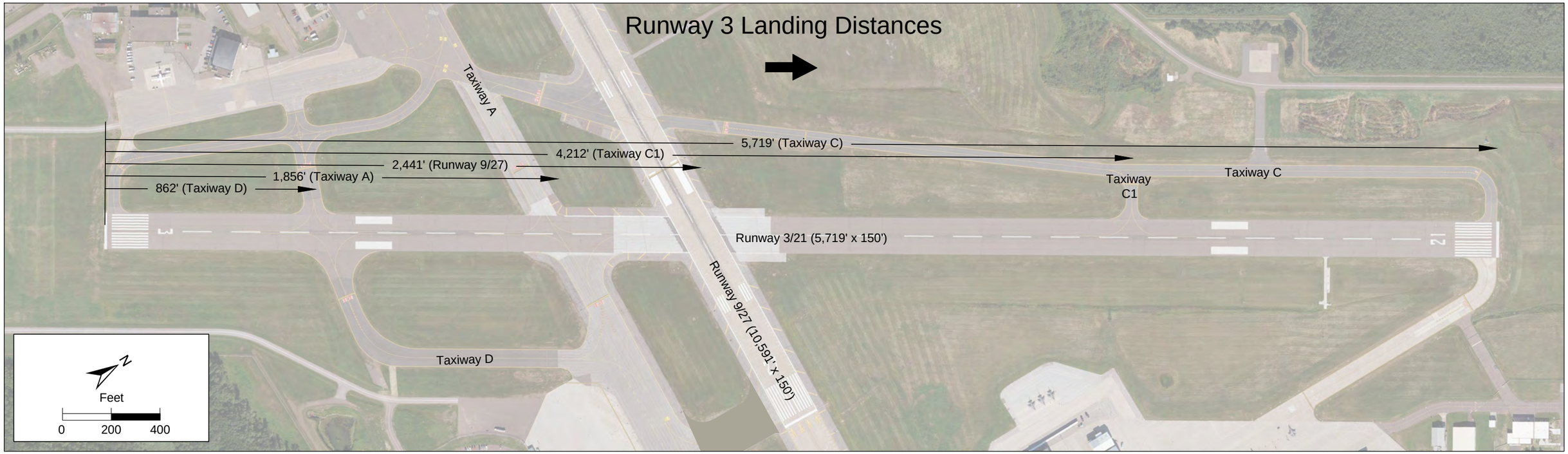
Runway 27 Landing Distances

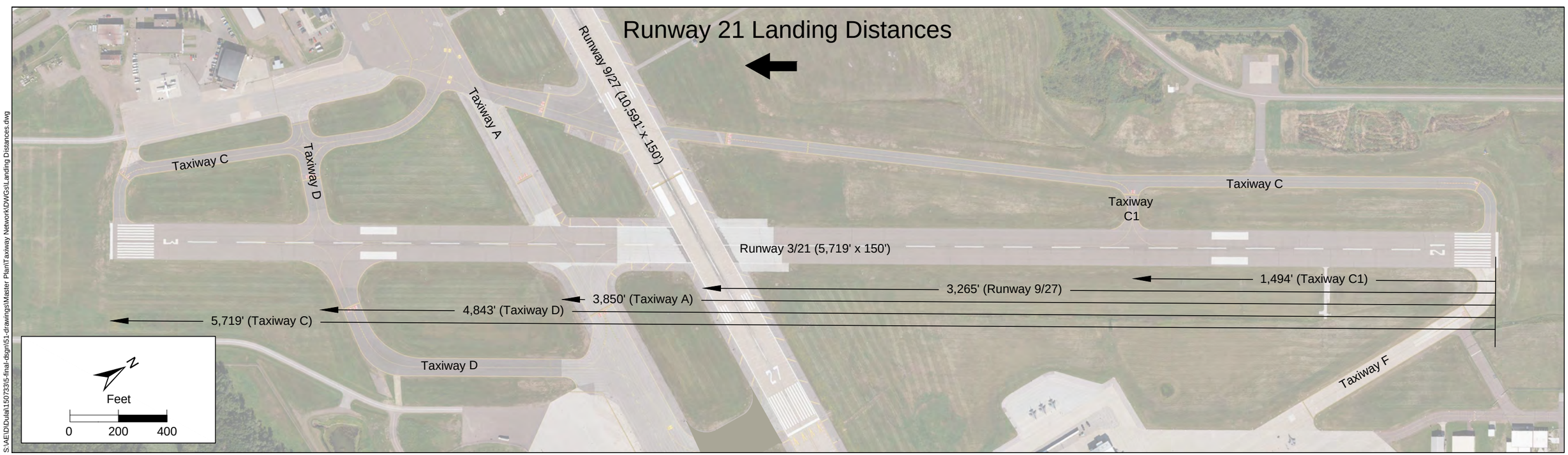
Airport Master Plan - Taxiway Network TAC

Figure 2

Duluth International Airport
Duluth, Minnesota

Runway 3/21 Landing Distances Available
Date: 11/2019; Project: DULAI 150733





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Airport Master Plan

Figure 3

Duluth International Airport
Duluth, Minnesota

Vehicle Access
Date: 11/2019; DULAI 150733

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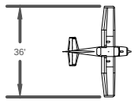
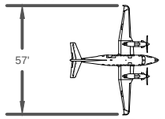
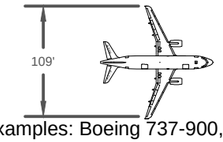
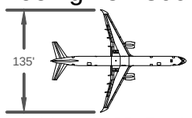
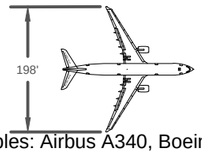
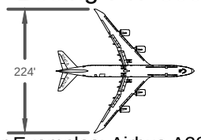
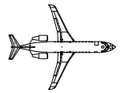
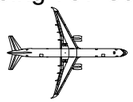
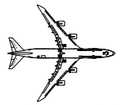
Airplane Design Group (ADG) - based on Tail Height and Wingspan

ADG	Example Aircraft	Photo
ADG I Tail Height: <20' Wingspan: <49'	Cessna 172  Other Examples: Cessna 310, Cirrus SR22, F-16 Falcon, Piper Cub	
ADG II Tail Height: 20' - <30' Wingspan: 49' - <79'	King Air 350  Other Examples: Cessna 208, CRJ-200, ERJ-145, Gulfstream G400	
ADG III Tail Height: 30' - <45' Wingspan: 79' - <118'	Airbus A319  Other Examples: Boeing 737-900, MD-88, CRJ-900, Gulfstream G650	
ADG IV Tail Height: 45' - <60' Wingspan: 118' - <171'	Boeing 757-300  Other Examples: Airbus A300, Boeing 767-400ER, MD-11, C-130	
ADG V Tail Height: 60' - <66' Wingspan: 171' - <214'	Airbus A330-300  Other Examples: Airbus A340, Boeing 777-200, Boeing 787-900	
ADG VI Tail Height: 66' - <80' Wingspan: 214' - <262'	Boeing 747-800  Other Examples: Airbus A380-800, Antonov AN-124	

Taxiway Design Group (TDG) - based on Main Gear Width (MGW) and Wheelbase

TDG	Example Aircraft	Photo
TDG 1A	Cessna 172  Other Examples: Cessna 208, Cirrus SR22, F-16 Falcon, Piper Cub	
TDG 1B	CRJ-200  Other Examples: Cessna Citation III	
TDG 2	King Air 350  Other Examples: CRJ-900	
TDG 3	KC-135  Other Examples: Airbus A319, Boeing 737-900	
TDG 4	Boeing 757-300  Other Examples: MD88	
TDG 5	Boeing 747-800  Other Examples: Antonov AN-124, C-5, c-17	
TDG 6	Boeing 777-300ER  Other Examples: Airbus A340-600, Boeing 787-10, MD-11	
TDG 7	Airbus A380-800 	

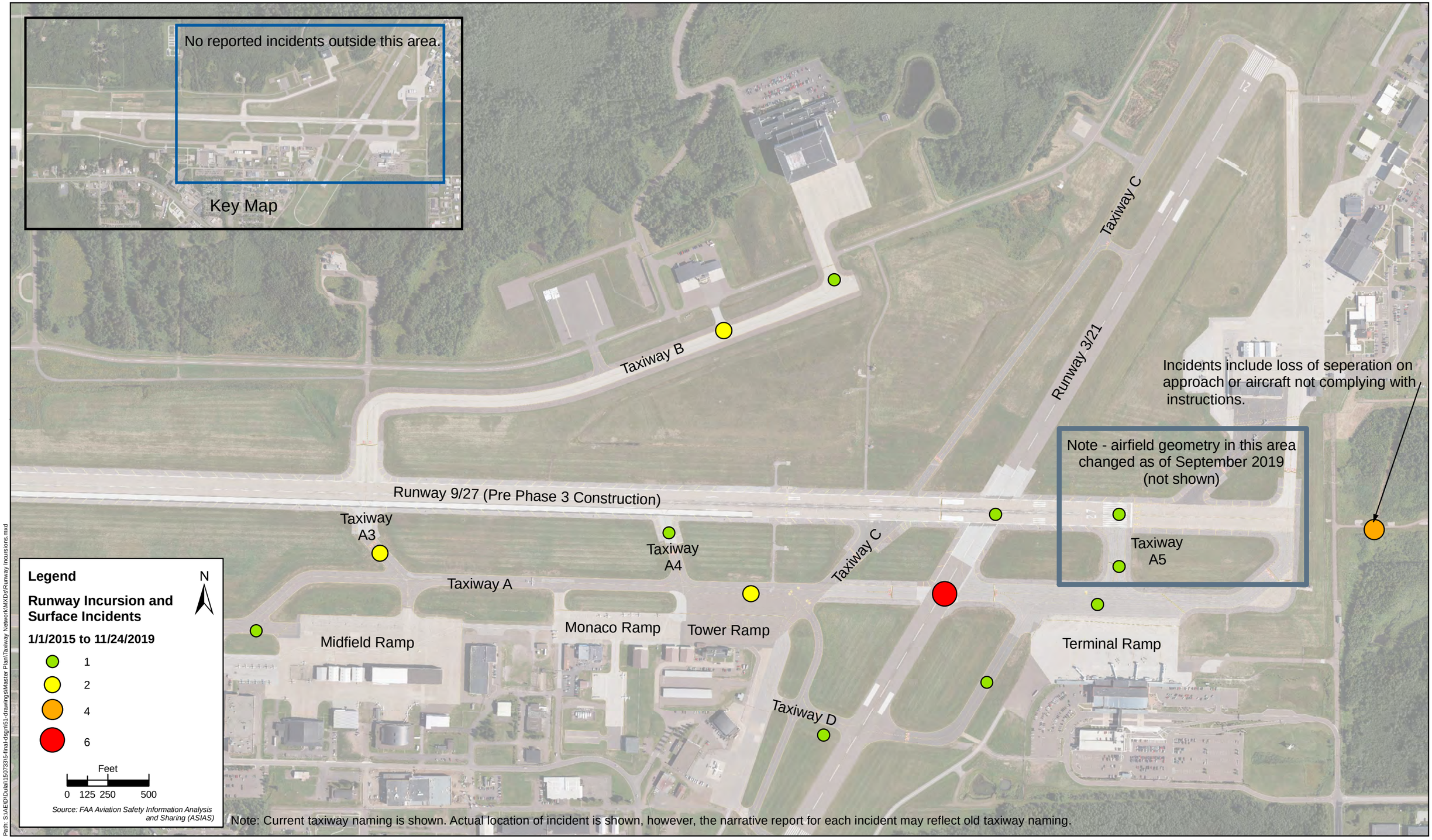


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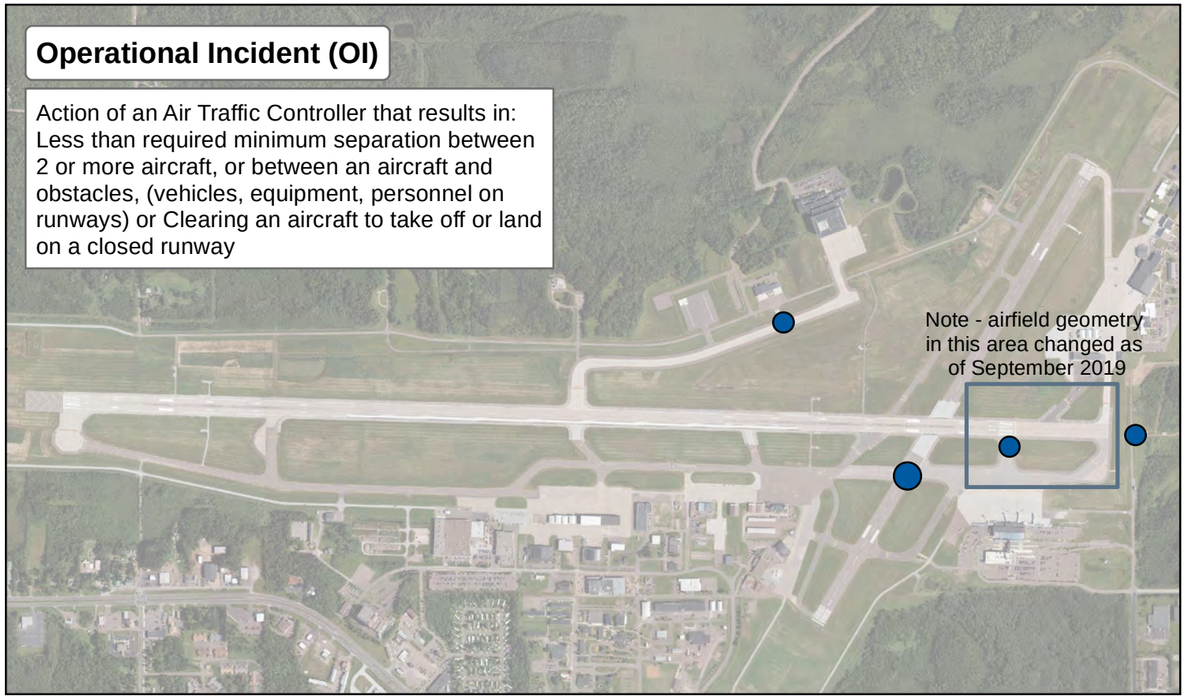
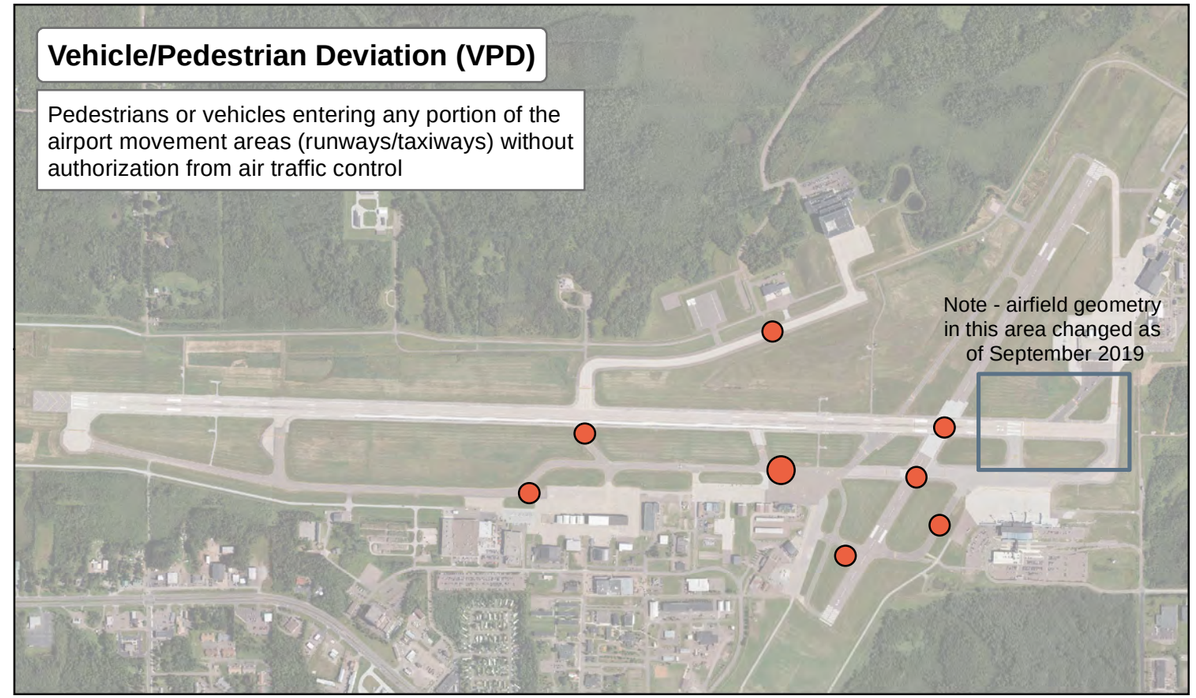
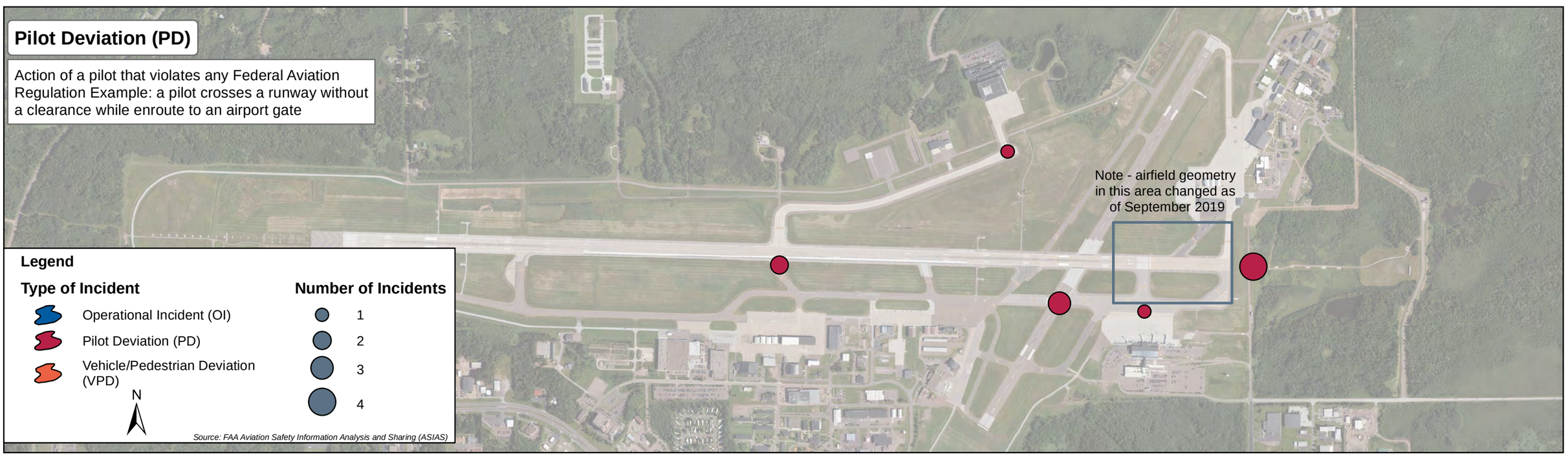
Figure 6

DLH Incursion Data by Type (2015-2019)
Date: 11/2019; Project: DULAI 150733







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Airport Master Plan

Duluth International Airport
Duluth, Minnesota

Figure 7

Taxiway Network Design Aircraft
Date: 10/2019; Project: DULAI 150733

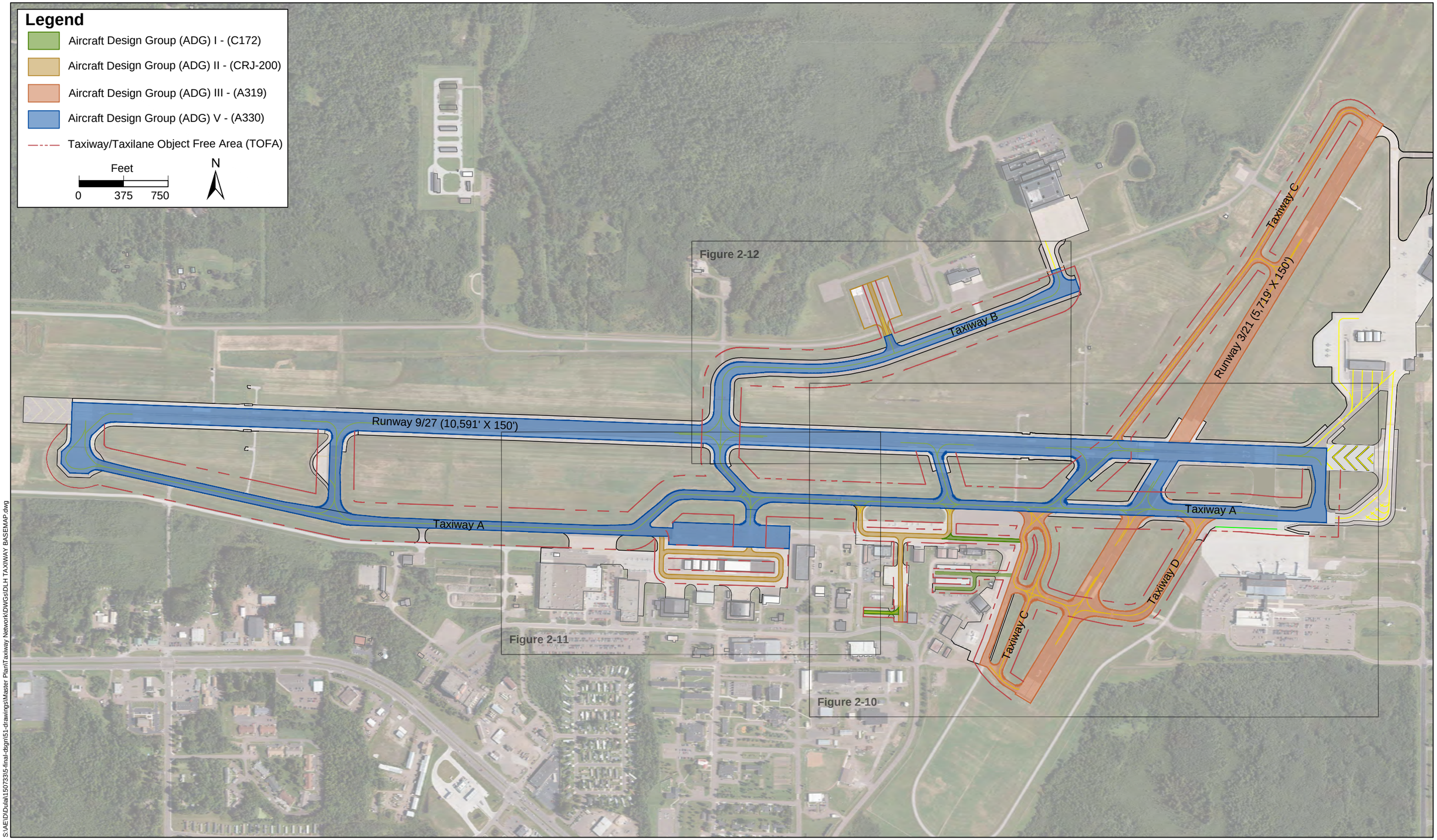

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Figure 8

Southwest Development Area Design Aircraft

Date: 10/2019; Project: DULAI 150733

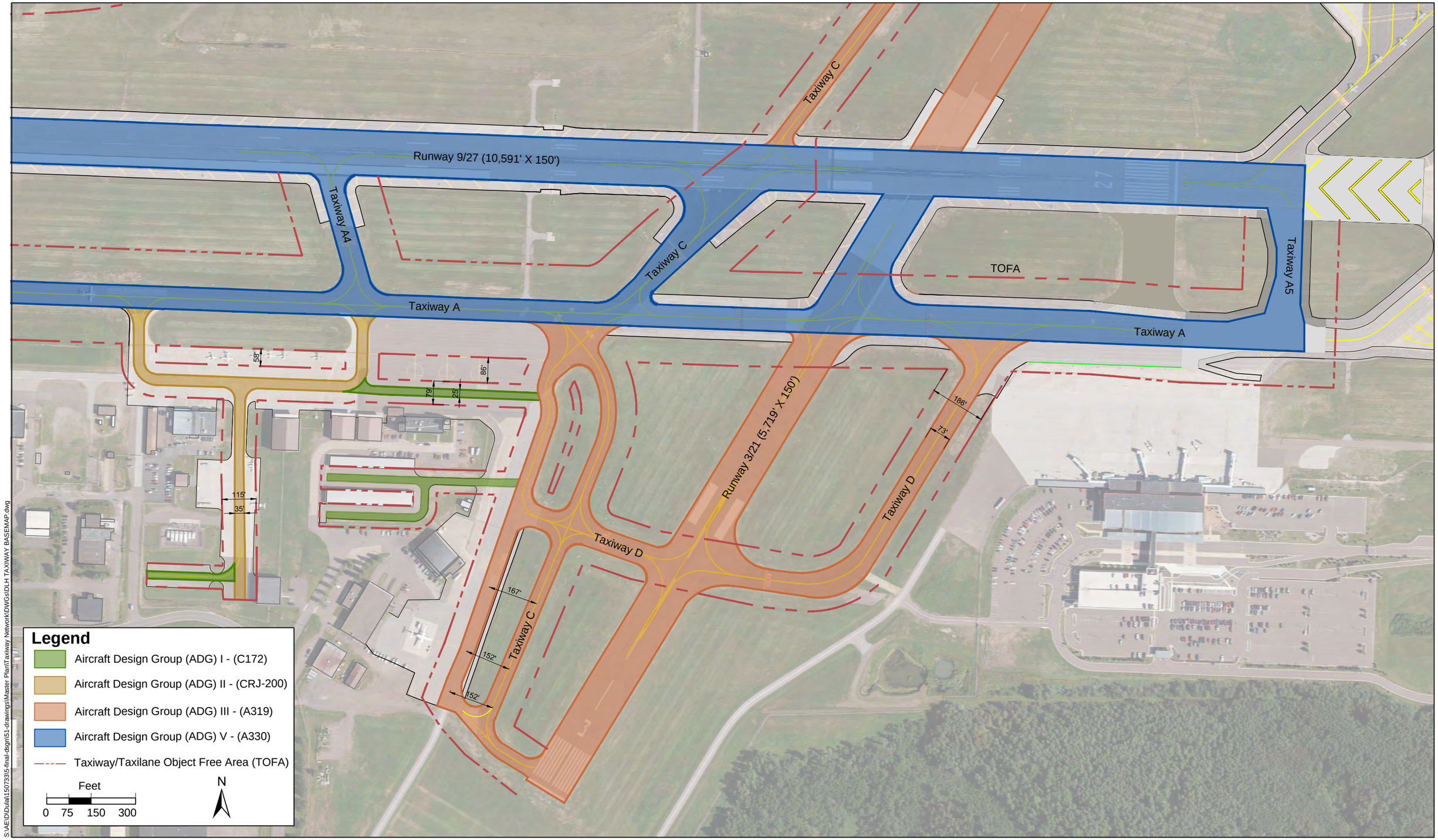

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Figure 9

Midfield Ramp Design Aircraft

Date: 10/2019; Project: DULAI 150733

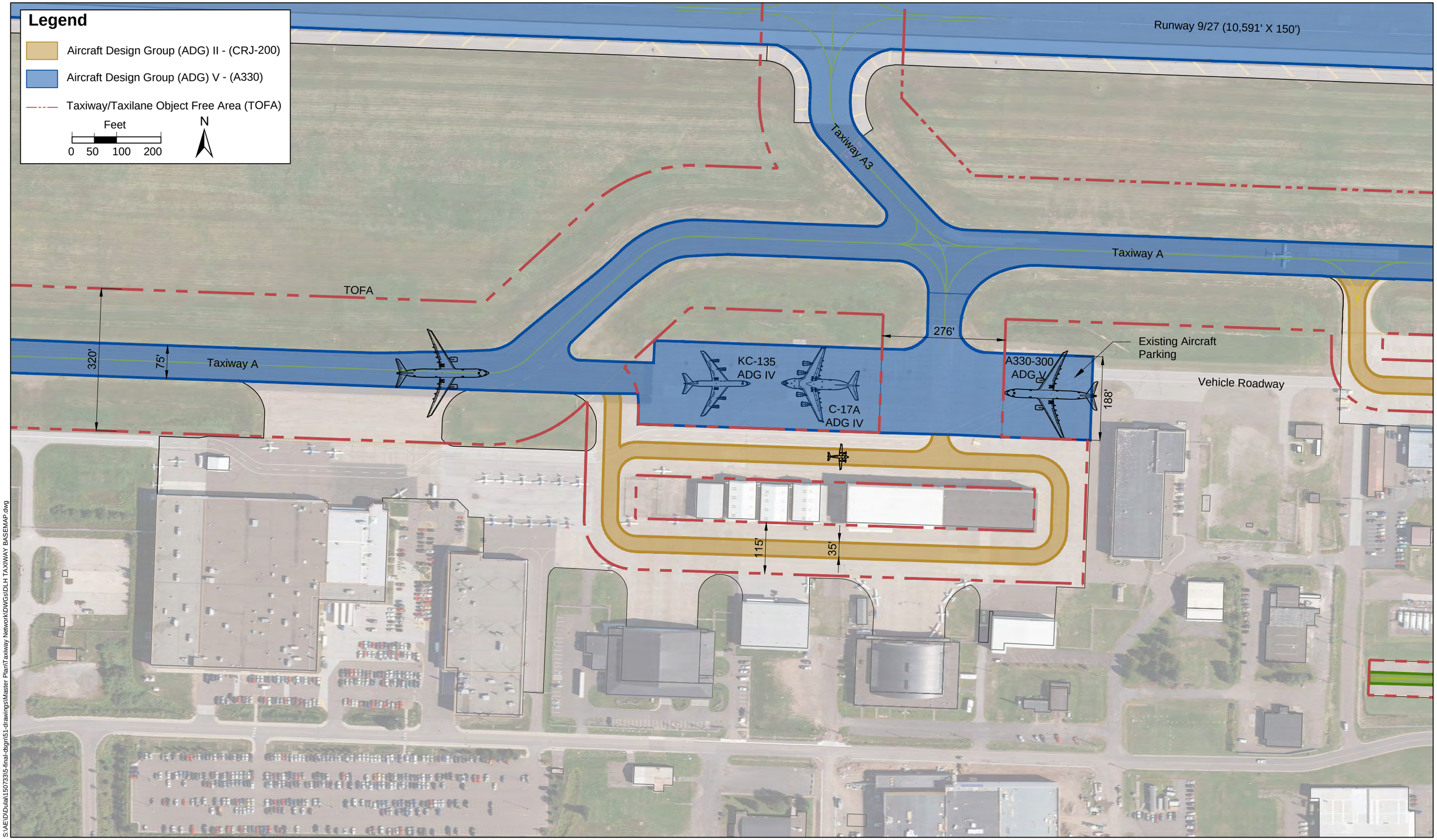

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Figure 10

North Development Area Taxiway Design Aircraft

Date: 10/2019; Project: DULAI 150733

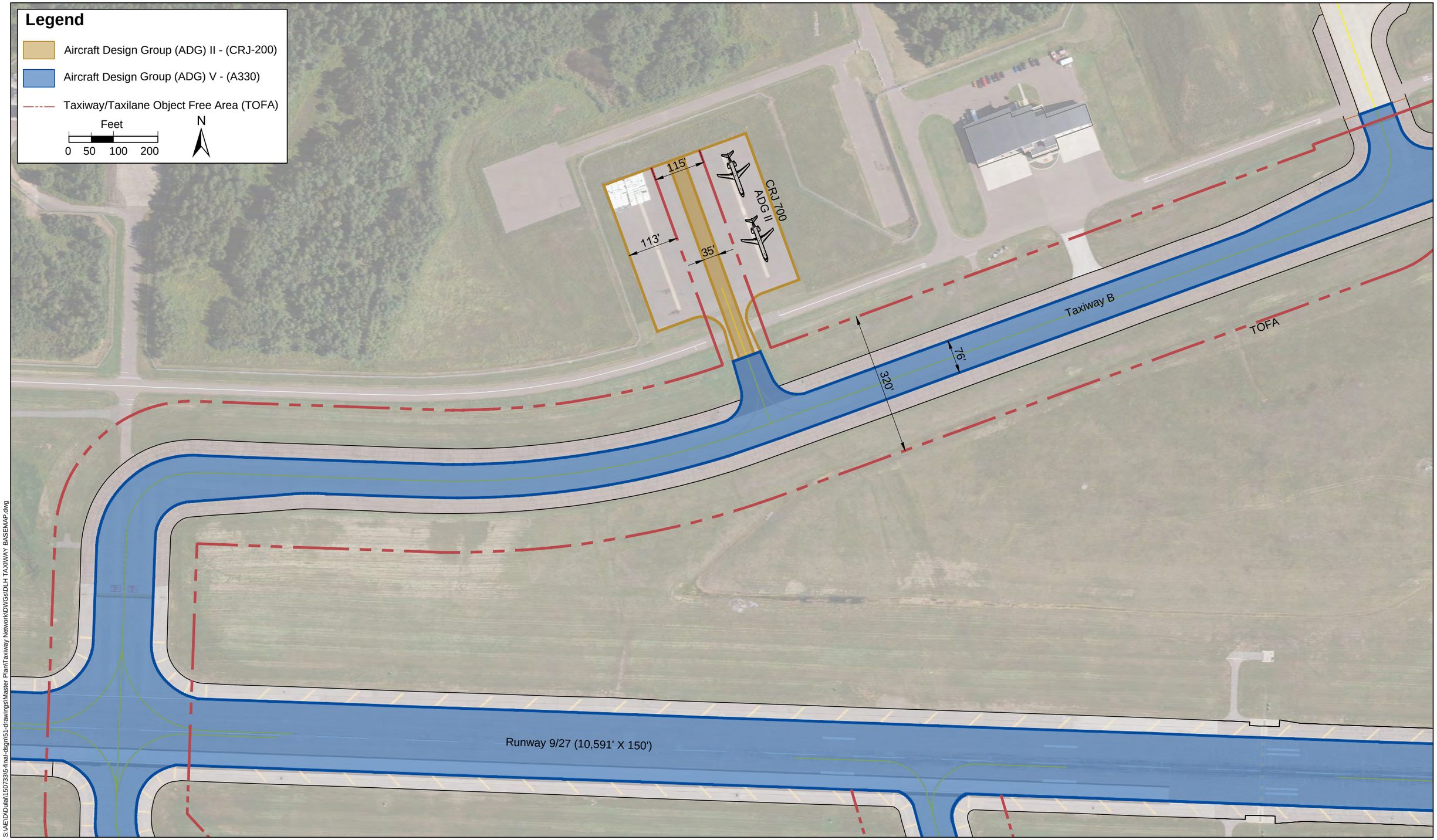

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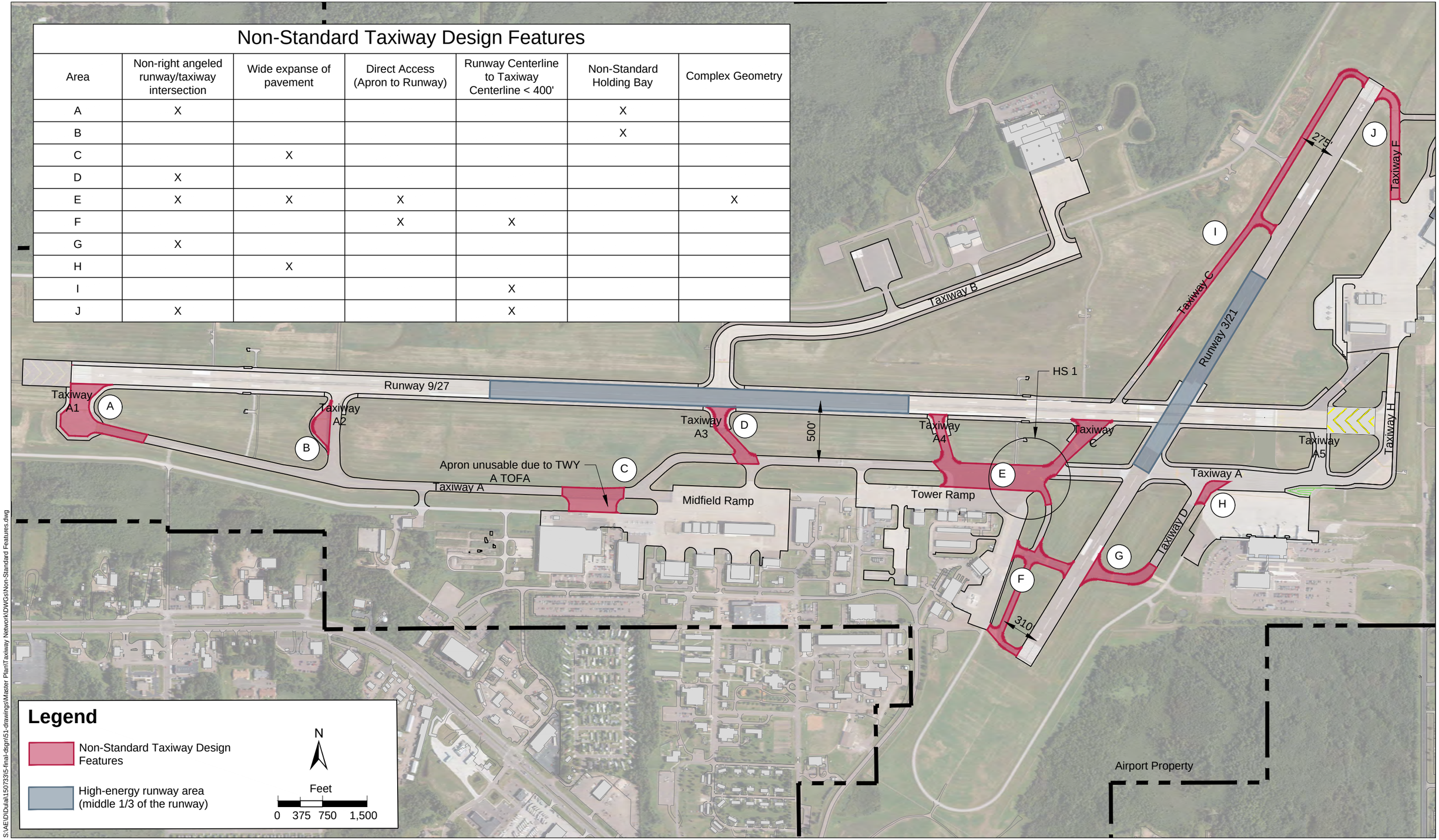
Figure 11

Non-Standard Taxiway Design Features

Date: 11/2019; Project: DULAI 150733

Non-Standard Taxiway Design Features

Area	Non-right angeled runway/taxiway intersection	Wide expanse of pavement	Direct Access (Apron to Runway)	Runway Centerline to Taxiway Centerline < 400'	Non-Standard Holding Bay	Complex Geometry
A	X				X	
B					X	
C		X				
D	X					
E	X	X	X			X
F			X	X		
G	X					
H		X				
I				X		
J	X			X		



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