Minneapolis-St. Paul International Airport
Noise Oversight Committee (NOC)

NOC Committee Members

Jeffrey Hart – Co-Chair (Delta Air Lines)
Dianne Miller – Co-Chair, City of Eagan Representative (City of Eagan)
Ryan Barette – Minnesota Business Aviation Association Representative
Paul Borgstrom – Chief Pilot Representative (Delta Air Lines)
Pam Dmytrenko – City of Richfield Representative (City of Richfield)
Chris Finlayson – At-Large Airport User Representative (Endeavor Air, Inc.)
Brian Hoffman – At-Large Community Representative (City of St. Louis Park)
Christine Koppen – Cargo Carrier Representative (United Parcel Service)
Todd Lawrence – Charter/Scheduled Operator Representative (Sun Country Airlines)
Patrick Martin – City of Bloomington Representative (Bloomington City Council)
Jay Miller – City of Mendota Heights Representative (Mendota Heights City Council)
Linea Palmisano – City of Minneapolis Representative (City of Minneapolis)

MEETING AGENDA

July 17, 2019 at 1:30 PM

MAC General Office Building, Lindbergh Conference Room

6040 28th Avenue South

Minneapolis, MN 55450

(Dianne Miller, City of Eagan, will be the acting Chairperson for the meeting)

***Note:** 1:00 to 1:30 PM – Committee Agenda Review Session

(NOC members, alternates, and at-large contacts only in the Coleman Conference Room)

1.	1:30	Nomination and Election of Co-Chairs
2.	1:40	Review and Approval of May 15, 2019 Meeting Minutes
3.	1:45	Review of Monthly Operations Reports: May and June 2019
4.	2:00	Public Comment Period
5.	2:20	Converging Runway Operations
6.	2:30	Runway 17 Departure Operations Report
7.	2:55	Eagan Mobile Noise Monitoring Report
8.	3:05	MSP Airport Long-Term Plan and Stakeholder Engagement
9.		Announcements
10.		Adjourn

Public Comment Notice: A public comment period of no more than 20 minutes will be added to each agenda. Members of the public wishing to address the NOC during this period are allotted 3 minutes to speak. Please complete and submit a speaker card prior to the start of the meeting or have arrangements made with your NOC representative prior to the meeting date.

ITEM 1

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **NOMINATION AND ELECTION OF CO-CHAIRS**

DATE: July 3, 2019

Per the Minneapolis-St. Paul International Airport (MSP) Noise Oversight Committee (NOC) Bylaws Article 2, Part 6, the "primary representatives and alternate representatives of Designated Communities and, Users and At-Large Communities shall be appointed to serve for two (2) years." Pursuant to this bylaw provision and in consideration of the present appointment cycle, NOC appointments were required as of June 26, 2019, as the preceding appointment cycle began on June 26, 2017. All Designated Communities, At-Large Communities, and Users have made their appointments.

Within the Users group, Paul Borgstrom replaced Gordy Goss as the Chief Pilot representative earlier in 2019; Christine Koppen replaced Angie Moos as the primary Cargo Carrier representative. All other representatives were re-appointed by their respective authorities.

Within the Community group, Linea Palmisano replaced Andrew Johnson as the City of Minneapolis representative; Marty Doll replaced Skip Nienhaus earlier in 2019 as the Burnsville representative; Heather Rand replaced Janice Gundlach as the Inver Grove Height representative. All other representatives were re-appointed by their respective cities. The updated NOC roster is available in the packet.

The process for the selection of Co-Chairs is found in the NOC Bylaws in Article V, given below:

> *"The airport user and community segments of the Committee shall each select a Co-Chairperson who will serve at the pleasure of the appointing group. Each Co-Chairperson will serve for a two-(2) year term or until his/her representation on the Committee terminates, or until replaced by the appointing group, whichever occurs first.*
>
> *The powers and duties of the Co-Chairpersons are as follows:*
>
> 1. *To review agendas.*
> 2. *To preside over meetings - the presiding Chairperson will alternate every other meeting.*
> 3. *By the mutual consent of the Co-Chairpersons, special meetings may be called, or upon request of a majority of the Committee, four (4) users and four (4) community representatives.*
> 4. *To sign as Co-Chairpersons of this Committee, all instruments in writing that may require such signature, unless the membership shall otherwise direct, and to perform*

such other duties and tasks as these Bylaws or as the membership shall from time to time prescribe.

5. *Each segment of the Committee, by a majority vote, shall elect their respective Co-Chairperson."*

At the July 17, 2019 NOC meeting a nomination process and vote will be conducted for airport user selection and community selection of their respective NOC Co-Chairs.

COMMITTEE ACTION REQUESTED

CONDUCT USER AND COMMUNITY CO-CHAIR NOMINATIONS AND ELECTIONS TO ESTABLISH THE RESPECTIVE CO-CHAIRS TO SERVE FOR TWO YEARS FROM JUNE 26, 2019 THROUGH JUNE 25, 2021.

MSP Noise Oversight Committee

Membership Roster
26 June 2019

Airport User Chair: TBD
Community Chair: TBD

User Representation	Representative	Alternate	Alternate
SCHEDULED AIRLINE (Term: 6.26.19 - 6.25.21)	Jeffrey Hart Delta Air Lines Department 118 D5550 4300 Glumack Dr St Paul MN 55111 jeffrey.hart@delta.com	Hank Moody Delta Air Lines Department 877 1030 Delta Boulevard Atlanta GA 30320 404.715.2114 hank.moody@delta.com	
CARGO CARRIER (Term: 6.26.19 - 6.25.21)	Christine Koppen United Parcel Service 2645 Cargo Rd Minneapolis MN 55450 612.243.4703 ckoppen@ups.com	Angie Moos United Parcel Service 2645 Cargo Rd Minneapolis MN 55450 612.243.4703 amoos@ups.com	
CHARTER/SCHEDULED OPERATOR (Term: 6.26.19 - 6.25.21)	Todd Lawrence Sun Country Airlines Chief Pilot 2005 Cargo Rd Minneapolis MN 55450 651.681.3984 todd.lawrence@suncountry.com	Jonathan Malin First Officer 2005 Cargo Road Minneapolis, MN 55450 651.681.3984 jonathan.malin@suncountry.com	
CHIEF PILOT (Term: 6.26.19 - 6.25.21)	Paul Borgstorm Chief Pilot - Minneapolis Delta Air Lines Dept MSP 062 7500 Airline Dr St Paul MN 55111 612.266.8770 paul.g.borgstrom@delta.com	John Klinger Chief Pilot - Minneapolis Delta Air Lines Dept MSP 062 7500 Airline Dr St Paul MN 55111 612.266.8770 john.r.klinger@delta.com	
MBAA (Term: 6.26.19 - 6.25.21)	Ryan Barette 1651 Mayapple Pass Chanhassen, MN 55331 952.250.2164 barette.ryan@gmail.com	Tim Cossalter 5222 Green Farms Road Edina, MN 55436 651.269.1221 timcossalter@outlook.com	
AT-LARGE REPRESENTATIVE (Term: 6.26.19 - 6.25.21)	Chris Finlayson Endeavor Air Inc 4300 Glumack Drive Room C-1410B St. Paul, MN 55111 612-412-8575 christopher.finlayson@endeavorair.com	Charles Stene Endeavor Air Inc 4300 Glumack Drive Room C-1410B St. Paul, MN 55111 952.657.7291 charles.stene@endeavorair.com	Sarah Amato Endeavor Air Inc 4300 Glumack Drive Room C-1410B St. Paul, MN 55111 952.657.7291 sarah.amato@endeavorair.com

Community Representation	Representative	Alternate	Alternate
CITY OF BLOOMINGTON (Term: 6.26.19 - 6.25.21)	Patrick Martin City Council Member City of Bloomington 1800 W Old Shakopee Rd Bloomington MN 55431 952.454.6657 pmartin@BloomingtonMN.gov	Dwayne Lowman City Council Member City of Bloomington 1800 W Old Shakopee Rd Bloomington MN 55431 952.479.0226 dlowman@BloomingtonMN.gov	Lynn Moore Environmental Health Manager City of Bloomington 1800 W Old Shakopee Rd Bloomington MN 55431 952.563.8970 lmoore@BloomingtonMN.gov
CITY OF EAGAN (Term: 6.26.19 - 6.25.21)	Dianne Miller Assistant City Administrator City of Eagan 3830 Pilot Knob Rd Eagan MN 55122 651.675.5014 dmiller@CityofEagan.com	Cyndee Fields City Council Member City of Eagan 3830 Pilot Knob Rd Eagan MN 55122 H: 651.686.0351 cfields@CityofEagan.com	
CITY OF MENDOTA HEIGHTS (Term: 6.26.19 - 6.25.21)	Jay Miller City Council Member City of Mendota Heights 1101 Victoria Curve Mendota Heights MN 55118 H: 651.994.0482 jaym@Mendota-Heights.com	Liz Petschel (first alternate) lizpetschel@gmail.com David Sloan (second alternate) Davidssloan@msn.com	Cheryl Jacobson Assistant City Administrator 1101 Victoria Curve Mendota Heights MN 55118 651.255.1359 cherylj@Mendota-Heights.com
CITY OF MINNEAPOLIS (Term: 6.26.19 - 6.25.21)	Linea Palmisano City Council Member, Ward 13 City of Minneapolis 350 South 5th St, Room 307 Minneapolis MN 55415 W: 612.673.2213 andrew.johnson@MinneapolisMN.gov	Loren Olson Government Relations Representative City of Minneapolis 350 South 5th St, Room 307 Minneapolis MN 55415 W: 612.673.2447 C: 612.759.9037 loren.olson@MinneapolisMN.gov	
CITY OF RICHFIELD (Term: 6.26.19 - 6.25.21)	Pam Dmytrenko Assistant City Manager City of Richfield 6700 Portland Ave Richfield MN 55423 W: 612.861.9708 pdmytrenko@richfieldmn.gov	Ben Whalen City Council Member City of Richfield 6700 Portland Ave Richfield MN 55423 C: 612.361.1563 bwhalen@richfieldmn.gov	

At-Large Representative	Primary Representative	Alternate Representative
(Term: 6.26.19 - 6.25.21)	TBD	

At-Large City Contacts	Representative	Alternate
APPLE VALLEY (Term: 6.26.19 - 6.25.21)	John Bergman City Council Member City of Apple Valley 14691 Guthrie Ave Apple Valley MN 55124 H: 952.891.2508 jkbergman@frontiernet.net	
BURNSVILLE (Term: 6.26.19 - 6.25.21)	Marty Doll Communications Director City of Burnsville 100 Civic Center Pkwy Burnsville MN 55337 W: marty.doll@burnsvillemn.gov	
EDINA (Term: 6.26.19 - 6.25.21)	Mary Brindle City Council Member City of Edina 6901 Paiute Dr Edina MN 55439 H: 952.941.7749 C: 612.270.9887 mbrindle@comcast.net mbrindle@EdinaMN.gov	
INVER GROVE HEIGHTS (Term: 6.26.19 - 6.25.21)	Heather Rand Community Development Director City of Inver Grove Heights 8510 Barbara Ave Inver Grove Heights MN 55077 W: 651.450.2546 hrand@invergroveheights.org	
ST LOUIS PARK (Term: 6.26.19 - 6.25.21)	Brian Hoffman Director of Inspections City of St Louis Park 5005 Minnetonka Blvd St Louis Park MN 55416-2290 W: 952.924.2584 bhoffman@StLouisPark.org	
ST PAUL (Term: 6.26.17 - 6.25.19)	TBD	
SUNFISH LAKE (Term: 6.26.19 - 6.25.21)	Daniel O'Leary, Mayor 10 Windy Hill Rd Sunfish Lake MN 55077 W: 651.222.2731 C: 651.238.0904 olearytriallaw@yahoo.com	

MAC STAFF	Brad Juffer NOC Technical Advisor 6040 28th Ave S Minneapolis MN 55450 W: 612.467.0741 brad.juffer@mspmac.org	Amie Kolesar NOC Secretary 6040 28th Ave S Minneapolis MN 55450 W: 612.794.9140 amie.kolesar@mspmac.org

ITEM 2

MSP NOISE OVERSIGHT COMMITTEE
DRAFT MEETING MINUTES
Wednesday, 15th of May 2019 at 1:30 PM

MAC General Office
Lindbergh Conference Room

Call to Order

A regularly-scheduled meeting of the MSP Noise Oversight Committee, having been duly called, was held Wednesday, 15th of May 2019, in the Lindbergh Conference Room at the MAC General Office building. Chair Hart called the meeting to order at 1:30 PM. The following were in attendance:

Representatives: J. Hart; D. Miller; R. Barette; P. Dmytrenko; C. Finlayson; B. Hoffman; L. Moore; D. Sloan; A. Moos; L. Olson

Staff: D. Nelson; B. Juffer; A. Kolesar; J. Lewis; N. Pesky; D. Anderson; N. Ralston; B. Ryks; P. Hogan; R. Fuhrman;

Others: R. Sekonski - FAA; L. Grotz – City of Edina; G. Albjerg – HNTB; B. Whalen – City of Richfield; S. Fortier – FAA; R. MacPherson – FAA; C. Chaves – City of Minneapolis; H. Rand – City of Inver Grove Heights; T. Postiglione – FAA; S. Heegaard – City of St. Paul; M. Doll – City of Burnsville; M. Brindle – City of Edina; M. Sands – FAA; D. Langer – FAA; R. Owen – City of St. Paul

1) Review and Approval of January 16, 2019 and March 20, 2019 Meeting Minutes

Chair Hart, Delta, asked for approval of the January and March 2019 NOC minutes. The motion was moved by **Co-chair Miller, Eagan,** and seconded by **Representative Hoffman, Saint Louis Park**. The motion passed unanimously and the minutes were approved.

Dana Nelson, Director – Stakeholder Engagement, announced that Brad Juffer was promoted to Manager of Community Relations and will serve as the Technical Advisor for the NOC.

2) Review of Monthly Operations Reports: March and April, 2019

Brad Juffer, Technical Advisor, reviewed and presented the March and April 2019 operations report for MSP airport.

March 2019

- 35,3121 total operations
- 2,877 nighttime operations

April 2019

- 32,968 total operations
- 2,665 nighttime operations

- North/South/Mixed flows 46/30/16
- RJ/Narrow/Wide split 39/58/3
- 13,111 complaints
- 251 complaint locations
- 408 hours of aircraft sound events
- R17 procedure 99.3%
- Crossing procedure day: 30%
- Crossing procedure night: 48%
- EMH Procedure: 95.9%
- RUS: 56%

- North/South/Mixed flows 37/48/8
- RJ/Narrow/Wide split 39/58/3
- 15,473 complaints
- 303 complaint locations
- 478 hours of aircraft sound events
- R17 procedure 99.7%
- Crossing procedure day: 26%
- Crossing procedure night: 40%
- EMH Procedure: 89.3%
- RUS 53%

Representative Olson, Minneapolis, asked to clarify Mixed Flow A as a north flow over the city of Minneapolis and using R17 for departures. **Juffer** affirmed and elaborated on the runway distribution of R30L and R30R and R17 in that configuration.

3) Public Comment Period

C. Chaves, Minneapolis, stated her presence at the meeting was to understand what the NOC does and to understand the long-term plan for the airport and the noise. **Chair Hart, Delta,** thanked Chavez for the comments and asked her to stay after the meeting to discuss her concerns.

4) Converging Runway Operations (CRO)

Brad Juffer, Technical Advisor, introduced Rebecca MacPherson, FAA Regional Administrator for the Great Lakes Region.

Rebecca MacPherson, FAA, announced that she will attend all future NOC meetings to provide a consistent national and local FAA perspective. The FAA is changing its methods on addressing noise and ensuring the regional administrators will attend all noise related roundtable discussions.

MacPherson stated that when the airport expanded in 2005, CRO wasn't considered a problem so assumptions made regarding noise concerns have sometimes proven to be incorrect. While a lot of work and research went into the best made assumptions, intervening events prove to occur. **MacPherson** stated that the FAA made the determination and moving forward, unmitigated converging runway operations will be avoided because it presents a true safety hazard. The FAA deems this such a serious safety consideration that they have changed their policy regarding CRO. Mitigations have been put in place, at MSP the FAA decided to create an ADW south of R35. If an aircraft is in the ADW window, departures will be halted from R30L and R30R. This will create some loss of efficiency, pre-CRO the landing rate was about 75-90 aircraft per hour and a departure rate of about 60/hour. With the new implementation the landing rate is about 74-84 aircraft/hour and the departure rate has not been calculated. **MacPherson** stated that the preference of the FAA is to not use the CRO configuration and related mitigations because it can be complicated. As a result, the FAA produced a new order stating that R35 will be used "on demand", meaning when capacity peaks, R35 will be used to accommodate traffic levels. An environmental review of some kind will occur in the future and when the FAA has more details, they will inform the MAC and the NOC as well provide community outreach.

MacPherson answered questions from representatives regarding runway use, other airports that have experienced CRO, and transparency with residents. **Co-chair Miller, Eagan,** requested MacPherson write a brief summary of her review and associated information to then be shared with the community.

5) MSP Airport Long-Term Plan and Stakeholder Engagement

Dana Nelson, Director – Stakeholder Engagement, provided an update on the MSP Airport Long-Term Plan and associated Stakeholder Engagement Program.

A project website on the www.mspairport.com site has more information about the planning process. The website includes:

- Project Overview
- Community and Stakeholder Engagement
- Progress and Schedule
- Documents and Links
- Frequently Asked Questions
- Contact Us
- Newsletter Sign-up

The first Stakeholder Advisory Panel meeting is scheduled for Monday, June 10.

6) Runway 17 Departure Operations Report Scope

Brad Juffer, Technical Advisor, provided background on the R17 Departure Evaluation as it was added to the 2019 NOC Workplan. The objective is to work collaboratively with stakeholders south of the airport to identify concerns related to R17 departures and highlight trends and changes. Juffer presented the scope, as developed by MAC staff in collaboration with residents and the Eagan ARC. The scope intends to compare pre-CRO R17 data to post-CRO data as well as assumptions form the Environmental Assessment and actual operations data. **Juffer** provided the NOC with timeline expectations and answered questions regarding data compilation and comparison as well as fleet mix and altitude.

7) Website Redesign

Brad Juffer, Technical Advisor, presented the intent to redesign the www.metroairports.org website and the www.macnoise.com website and combine them. He asked for representative input on the websites as well as from the communities. The goal is to make the sites as useful as possible.

8) Spring Listening Session

Brad Juffer, Technical Advisor, reviewed the Spring Listening Session in Mendota Heights, MN. Seven residents attended as well as MAC Staff, NOC Members, and FAA Staff. The conversation focused on R12L and R12R departures. City of Mendota Heights live streamed and recorded the meeting. The recording may be found on the city website.

9) Announcements

Summer Listening Session will be in the City of Edina. Specifics will be announced at the July NOC meeting.

10) Adjourn

A motion to adjourn was requested by **Chair Hart, Delta,** moved by **Co-Chair Miller, Eagan,** and seconded by **Representative Olson, Minneapolis**. The meeting adjourned at 2:40 pm.

The next meeting of the NOC is scheduled for **Wednesday, 17 July, 2019 at 1:30 PM**

Respectfully Submitted,

Amie Kolesar, Recording Secretary

ITEM 3

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **REVIEW OF MSP MONTHLY OPERATIONS REPORTS: MAY AND JUNE 2019**

DATE: July 3, 2019

Each month, the MAC reports information on MSP aircraft operations, aircraft noise complaints, sound levels associated with MSP aircraft operations, and compliance with established noise abatement procedures on its interactive reporting website: https://www.macenvironment.org/reports/.

At the July NOC meeting, MAC staff will provide a summary of this information for May and June 2019. To view these summary reports prior to the meeting, visit the "Archive" section at the link above.

ITEM 4

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **PUBLIC COMMENT PERIOD**

DATE: July 3, 2019

Members of the public are welcome to attend NOC meetings. During each meeting, a public comment period of no more than 20 minutes is added to each agenda. Individuals choosing to speak during the public comment period may do so by submitting a speaker card prior to the meeting start time or by contacting their NOC representative prior to the meeting date. Speaker cards will be made available at the sign-in table before each meeting. Submit completed speaker cards to the NOC Secretary or to any NOC member before the meeting begins.

Below are some rules of decorum for speaking at NOC meetings.

- Each speaker will have one opportunity to speak and is allotted three (3) minutes. The public comment period is limited to 20 minutes.

- When called upon to speak, speak clearly into the microphone, state your name and address. If you are affiliated with any organization, please state your affiliation.

- Commenters shall address their comments to the NOC and not to the audience.

- Use of profanity, personal attacks, or threats of violence will not be tolerated.

ITEM 5

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **CONVERGING RUNWAY OPERATIONS**

DATE: July 3, 2019

At the May 15, 2019 NOC meeting, FAA Great Lakes Regional Administrator Rebecca MacPherson provided an update on Converging Runway Operations (CRO) at MSP.

MacPherson indicated that existing CRO mitigation impacts capacity during high demand times, but there are not many instances during the day where that demand exists. Because there is not consistent high demand throughout the day, the FAA's preference is to not use a CRO configuration and instead rely on the parallel runways for arrival and departure when it is not necessary.

MacPherson updated the NOC that the FAA released an updated order in May that specifies that Runway 35 will only be used for departure during high demands at the airport as agreed upon by the FAA tower, FAA TRACON and FAA Center. This procedure was tested in a pilot session last summer.

MacPherson stated that the result of only employing CRO configurations when necessary has increased noise on communities south of the airport. She recognized the FAA needs to have a conversation with the community about that impact.

Finally MacPherson committed that because the order is final, the FAA is at a point where it would be appropriate for the agency to do an environmental evaluation and the appropriate community outreach with a chance that the outreach will more than what is required by NEPA due to the community concern.

As requested by NOC co-chair Dianne Miller, a written summation of the CRO briefing and details of the pilot from 2018 was provided by the FAA. A copy of that written summary is included in the agenda packet.

As a follow up to this briefing, the NOC has requested that MAC staff include the attached letter in the July 17, 2019 packet for consideration by the Committee. This action is intended to ensure that the FAA considers the full resolution passed unanimously by the NOC in September 2016.

COMMITTEE ACTION

APPROVE AND SEND THE ATTACHED LETTER TO THE FAA GREAT LAKES REGIONAL ADMINISTRATOR TO COMMUNICATE THE FULL REQUEST OF RESOLUTION #02-2016.

Converging Runway Operations
At Minneapolis St. Paul International Airport
July 1, 2019

Background

On January 27, 2006, a near midair collision occurred at the Las Vegas-McCarran International Airport when a landing Airbus executed a "go around", as directed by the Federal Aviation Administration (FAA) Air Traffic Control (ATC), to avoid a conflict with another aircraft that was crossing the runway in front of it. The go around took the Airbus directly into the flight path of a Boeing 757 that had just taken off from a crossing runway. While the two aircraft did not collide, the subsequent investigation by the National Traffic Safety Administration (NTSB) revealed that the near collision due to converging runway operations (CRO) was not an isolated incident. The NTSB conducted a broader investigation of existing ATC procedures, and in July 2013, the NTSB made a safety recommendation to the FAA urging a change to existing procedures and standards covering these types of events in ATC's rulebook (FAA Order 7110.65), which it determined were inadequate..

In January and July 2014, the FAA issued changes to the ATC rulebook establishing new separation standards and procedures where airport geometry presents the possibility of CRO, to ensure that a landing aircraft executing a last minute go-around does not conflict with a departing aircraft climbing away from a non-intersecting, but converging runway. As part of the new CRO mitigation requirements, the FAA identified a limited number of tools that could assist in developing local procedures to meet the new requirements.

In December 2015, the NTSB accepted the FAA's actions and closed the safety recommendation as acceptable.

CRO at Minneapolis St. Paul International Airport

Minneapolis St. Paul International Airport (MSP) has a runway geometry that creates a risk of collision due to CRO under certain conditions: i.e., when the prevailing winds are from a northerly direction, favoring takeoffs and landings on runway 30 Right (30R) and/or runway 30 Left (30L), and landings on runway 35. (Generally, aircraft depart into the wind because it allows pilots to achieve a higher altitude in less time and with less speed, and aircraft land into the wind since it allows for a shorter stopping distance and a reduced speed upon landing.)

Absent mitigation, this configuration presents a risk of a mid-air collision due to CRO. Prior to the ATC rulebook changes, aircraft departing runway 30R and/or runway 30L could conflict with an airplane needing to go around from an aborted approach while trying to land on runway 35. The FAA implements CRO procedures at MSP only when runway 35 is used for arrivals and the prevailing winds are from the North.

One of the new mitigation tools specified by the changes to the ATC rulebook when there is a risk of a CRO-related collision is use of the Arrival/Departure Window (ADW). This tool uses radar to show an aircraft's position relative to a software generated "window" or box displayed

on the air traffic control screen at the extended final centerline of a runway. At MSP, Air Traffic tower controllers use the ADW displayed for runway 35 to determine when a departing aircraft can start its takeoff roll from runway 30L and/or runway 30R. An aircraft cannot start its takeoff roll on runway 30L and/or 30R when an aircraft is inside the runway 35 ADW. A takeoff roll can begin after the aircraft landing on runway 35 has exited the ADW.

While the CRO process has worked well from a safety perspective, it has adversely effected efficiency of the MSP runways 30L, 30R and 35 configuration at the higher traffic levels. Prior to FAA implementation of CRO mitigations, runway 30R and runway 35 configuration was the most efficient for MSP when the winds were from the North. Under those conditions, the FAA was able to achieve landing rates of 75-90 aircraft per hour. Since implementation of CRO requirements in 2014, the efficiency of the runway landings using the runways 30L, 30R and 35 configuration at MSP has decreased to 75-84 aircraft per hour. This is because of the increased spacing between aircraft required to meet the constraints of the ADW. This increased separation has also led to ATC distributing additional arrival traffic that would have landed on runway 35 prior to the CRO mitigations to runway 30L and runway 30R.

The FAA has worked with the MAC to identify possible mitigations that would improve the landing efficiency rates while ensuring the safety of the airspace around MSP. We believe we have achieved optimal utilization given the existing state of technology. In January 2019, the FAA completed a 180-day testing period of a new standardized process to support demand-based CRO. Under the new process, MSP air traffic will only use runway 35 for arrivals (and implement the CRO mitigations) when demand at the airport justifies the use of the runway. Currently there are three, well-defined arrival/departure "banks" at MSP when traffic demand is at its highest points (Monday through Friday at 7AM, 4PM and 6PM), when such a need has been demonstrated.

The results of the 180-day test have been incorporated into Standard Operating Procedure (SOP) in all three of the MSP District ATC facilities (ATCT, TRACON and ARTCC) that control air traffic into and out of the MSP airport. Because the criteria for implementing CRO is demand-based, the times that CRO may be implemented under the SOP can shift as arrival/departure banks shift. Likewise, new periods of CRO may be implemented as demand requires. Many internal processes and controls are in place to ensure that the new CRO mitigation process supports safety, real demand, and arrival and departure efficiency.

The FAA is in the process of evaluating the appropriate level of environmental review to assess and disclose potential adverse impacts of changes in runway use because of the implementation of CRO procedures at MSP. The agency hopes to provide the MSP Noise Oversight Committee (NOC) with an update at the September 2019 NOC meeting.

Noise Oversight Committee (NOC)
Minneapolis/St. Paul International Airport (MSP)
6040 28th Avenue South Minneapolis, MN 55450-2799
Phone: (612) 725-6455

July 10, 2019

Rebecca MacPherson
FAA Great Lakes Region Regional Administrator
Federal Aviation Administration
Great Lakes Region
O'Hare Lake Office Center
2300 East Devon Avenue
Des Plaines, IL 60018

RE: Non-intersecting Converging Runway Operations (CRO) impacts at Minneapolis-St. Paul International Airport

Dear Ms. MacPherson:

Thank you for the briefing you provided to the MSP Noise Oversight Committee (NOC) on May 15, 2019 regarding non-intersecting converging runway operations (CRO) at the Minneapolis-St. Paul International Airport (MSP). The NOC has been updated numerous times about CRO from local Federal Aviation Administration (FAA) officials since new rules were enacted at MSP in July 2015. The members appreciate the efforts that the FAA has taken to keep airport users and neighboring communities informed about CRO. The partnership the NOC has fostered with the FAA is both appreciated and necessary for the members to adequately serve in our roles and we look forward to continuing our work with you and the Great Lakes Regional Office.

Converging runway operations have had an impact on the operating characteristics of MSP. The solutions identified and enacted by the FAA to maintain compliance with the new standards to ensure the highest degree of safety while minimizing capacity and environmental impacts have resulted in changes to runway use and hourly arrival rates that affect neighboring communities and airport users. The NOC recognized these trends and in 2016 unanimously passed NOC Resolution 02-2016. Subsequently, the Metropolitan Airports Commission (MAC) board unanimously approved Resolution 02-2016 and forwarded it to the FAA Great Lakes Regional Administrator.

NOC Resolution 02-2016 formally requests the following from the FAA:

> An environmental review be conducted by the FAA to thoroughly assess the existing and future impacts to noise and airport capacity from non-intersecting converging runway operations at MSP. This evaluation should include the following:
>
> - Runway use comparisons prior to and following the implementation of the new Converging Runway standards;
> - 20-year forecast runway use under the new Converging Runway standards;

Noise Oversight Committee (NOC)
Minneapolis/St. Paul International Airport (MSP)
6040 28th Avenue South Minneapolis, MN 55450-2799
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- Noise evaluation comparing Day-Night Average Sound Level (DNL) noise contours of the environment prior to and following the implementation of the new Converging Runway standards;
- An examination of airport capacity impacts, including throughput, efficiency, airborne and ground traffic flow effects, and increased variances in operations performance and reliability resulting from the implementation of the new Converging Runway standards as compared to pre-Converging Runway Operations; and
- A plan to present this study and its findings to the NOC and communities.

The FAA responded to the MAC in December 2016, in part, with the following:

> Please be assured that the FAA is fully committed to conducting an appropriate level of environmental review in accordance with the requirements of the National Environmental Policy Act and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures.

The Committee remains committed to knowing the full magnitude of the changes borne from CRO at MSP. Each element requested in Resolution 02-2016 is necessary to ensure adequate understanding of the current and future operational conditions so that we may communicate effectively with our communities and airport users. We reaffirm our desire that FAA complete all elements identified in Resolution 02-2016 and seek clarification that the FAA is considering these elements as part of their environmental review. Further, we look forward to receiving more information on the expected timeline for the FAA's evaluation to be conducted.

Sincerely,

Jeff Hart
NOC Airport User Co-Chair

Dianne Miller
NOC Community Co-Chair

cc: MSP Planning, Development & Environment Committee
Brian Ryks, MAC CEO/Executive Director

Attachments: NOC Resolution 02-2016
Mr. Barry Cooper response letter dated December 23, 2016

METROPOLITAN AIRPORTS COMMISSION

Minneapolis-Saint Paul International Airport
6040 - 28th Avenue South • Minneapolis, MN 55450-2799
Phone (612) 726-8100

October 18, 2016

Mr. Barry Cooper
FAA Great Lakes Region Regional Administrator
Federal Aviation Administration
Great Lakes Region
O'Hare Lake Office Center
2300 East Devon Avenue
Des Plaines, IL 60018

RE: Non-Intersecting Converging Runway Operations (CRO) Impacts at Minneapolis-St. Paul International Airport

Dear Mr. Cooper,

On July 24, 2015, the FAA announced the temporary suspension of aircraft arrivals on Runway 35 while aircraft were departing simultaneously to the northwest and west off Runway 30L at Minneapolis-St. Paul International Airport (MSP). The suspension was triggered by new safety standards for non-intersecting Converging Runway Operations (CRO). Subsequently, on August 28, 2015, arrival options resumed on Runway 35 with the use of an Arrival Departure Window (ADW) for Runway 30L departures. On January 21, 2016, the FAA announced its determination that the new CRO requirements for Runway 35 applied to Runway 30R departure operations as well. The FAA's Runway 35/Runway 30R CRO ruling created a scenario in which departure operations from both parallel runways are dependent on Runway 35 arrival operations. Air Traffic Control (ATC) at MSP has developed an ADW for Runway 30R departure operations.

However, MSP ATC is currently in the process of developing a more efficient long-term operational solution to CRO at MSP. The goal of this effort is to "maintain compliance with FAA Order 7110.65 ensuring the highest degree of safety, while minimizing capacity and environmental impacts." In short, getting as close to the previous operational state as is possible.

Based on the runway use trends that have manifested at MSP as a result of the FAA's CRO mitigation activities, several elected officials, communities and/or residents have raised concerns with aircraft operation levels over their communities including Minneapolis,

Minnetonka, St. Louis Park, Burnsville, Eagan, Mendota Heights, Sunfish Lake, and Richfield. As such, the MSP Noise Oversight Committee (NOC) has been in a leadership role facilitating the dialogue between the communities, FAA and the MAC on the CRO noise issue. As part of this ongoing dialogue, communities and the airlines have united in a call for FAA environmental review of the CRO related changes referencing the provisions of FAA Order 1050.1F and evaluation of the associated capacity impacts.

At its September 21, 2016 meeting, the NOC unanimously adopted a resolution recommending that the MAC support and communicate a request to the FAA that it conduct an environmental review to thoroughly assess the existing and future impacts to noise and airport capacity from its CRO mitigation actions at MSP. This request includes a call for existing and forecast runway use and noise contour analyses, as well as evaluation of specific components that determine airport capacity.

On October 17, 2016, the MAC Board of Commissioners took unanimous action supporting NOC Resolution # 02-2016. Please accept this letter as the MAC's endorsement of the attached NOC Resolution and the request to the FAA contained therein.

Sincerely,

Dan Boivin
MAC Chairman

cc: MSP NOC
Mr. Brian D. Ryks, MAC CEO/Executive Director

Attachment

MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT (MSP)

NOISE OVERSIGHT COMMITTEE (NOC)

RESOLUTION # 02-2016

REQUESTING FAA ENVIRONMENTAL REVIEW AND DOCUMENTATION OF EXISTING AND FUTURE IMPACTS TO NOISE AND AIRPORT CAPACITY FROM NON-INTERSECTING CONVERGING RUNWAY OPERATIONS AT MINNEAPOLIS-ST. PAUL INTERNATIONAL AIRPORT (MSP)

WHEREAS, the NOC is the primary advisory body to the full Metropolitan Airports Commission (MAC) on topics related to aircraft noise at MSP; and,

WHEREAS, NOC members have been officially selected to represent their respective city(s) and airport user group constituencies and vote accordingly; and,

WHEREAS, the NOC is a balanced forum for the discussion and evaluation of noise impacts around MSP including the identification, study, and analysis of noise issues; and,

WHEREAS, the FAA amended Order 7110.65 (Air Traffic Control) in January 2014 to address a National Transportation Safety Board (NTSB) recommendation to establish separation standards for non-intersecting converging runway operations; and,

WHEREAS, the FAA currently defines non-intersecting converging runway operations when the extended centerline of two runways intersect within one nautical mile of the two runway departure ends, posing a potential risk if a landing aircraft on one runway discontinues it's approach and goes around concurrent with a simultaneous departure from the other runway, and neither aircraft diverges from its initial flight path; and,

WHEREAS, on July 24, 2015, the FAA determined that the Runways 30L and 35 Converging Runway mitigation in place at MSP, as documented in a Safety Risk Management Document, were not sufficient to meet the standards of the Converging Runway requirement, therefore a temporary suspension was put in place for arrivals to MSP Runway 35; and,

WHEREAS, on August 28, 2015, the FAA began allowing arrivals to Runway 35 using an approved separation technique to comply with the new Converging Runway requirements, which uses an Arrival-Departure Window (ADW) off the approach end of Runway 35 to effectively alternate Runway 30L departures with Runway 35 arrivals; and,

WHEREAS, on September 21, 2016 the MAC delayed the MSP Long Term Comprehensive Plan, at the request of elected officials and the surrounding communities, to ensure the plan's noise

analysis adequately considers the runway use now and into the future with the new Converging Runway standards and related runway use patterns; and,

WHEREAS, the local FAA Air Traffic Control Tower Manager provided updates to the NOC on this topic at the September 16 and November 18, 2015 meetings during an evaluation period for the mitigation techniques to determine the impacts they have on runway use and airport arrival rates; and,

WHEREAS, the NOC was informed at its January 2016 meeting that, in addition to Runway 30L, the FAA determined that the new Converging Runway standards apply to MSP Runway 30R, requiring implementation of a second ADW off the approach end of Runway 35 beginning February 29, 2016; and,

WHEREAS, since the new Converging Runway standards and related runway use patterns were put in place, changes have been observed in runway use and flight track data as reviewed and reported to the public by the NOC; and,

WHEREAS, communities surrounding MSP have been expressing concern with a change in overflight frequency, patterns and related noise impacts; and,

WHEREAS, communities and residents surrounding MSP are requesting information on the details surrounding the current ATC operational state and existing and future noise and capacity impacts; and

WHEREAS, FAA Order 1050.1F instructs that "formal and informal runway use programs that may significantly increase noise over sensitive areas" are FAA "actions normally requiring an Environmental Assessment,"

NOW THEREFORE BE IT RESOLVED, by the Noise Oversight Committee of the Minneapolis-St. Paul International Airport that the NOC recommends the MAC support and communicate the following request to the FAA:

An environmental review be conducted by the FAA to thoroughly assess the existing and future impacts to noise and airport capacity from non-intersecting converging runway operations at MSP. This evaluation should include the following:

- Runway use comparisons prior to and following the implementation of the new Converging Runway standards;
- 20-year forecast runway use under the new Converging Runway standards;
- Noise evaluation comparing Day-Night Average Sound Level (DNL) noise contours of the environment prior to and following the implementation of the new Converging Runway standards;
- An examination of airport capacity impacts, including throughput, efficiency, airborne and ground traffic flow effects, and increased variances in operational performance and reliability resulting from the implementation of the new Converging Runway standards as compared to pre Converging Runway Operations; and
- A plan to present the study and its findings to the NOC and communities.

Adopted by the Minneapolis-St. Paul International Airport Noise Oversight Committee on this day, the 21st of September 2016.

Representative	Vote
Bergman – Community At-Large	Aye
Erazo – Sun Country Airlines	Aye
Fitzhenry – City of Richfield	Aye
Goss – Chief Pilot	Aye
Hart – Delta Air Lines	Aye
Miller – City of Eagan	Aye
Moos – United Parcel Service	Aye
Nelson – Minnesota Business Aviation Association	Aye
Lowman – City of Bloomington	Aye
Petschel – City of Mendota Heights	Aye
Quincy – City of Minneapolis	Aye
Vick – Airport User At-Large	Aye

Resolution adopted by a unanimous vote of 12 to 0.

Amie Kolesar, NOC Secretary

U.S. Department
of Transportation
**Federal Aviation
Administration**

Great Lakes Region
2300 East Devon Avenue
Des Plaines, IL 60018

DEC 2 3 2016

Dan Boivin
MAC Chairman
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN 55450

Dear Mr. Boivin:

The Federal Aviation Administration (FAA) is in receipt of your letter dated October 18, 2016 regarding non-intersecting Converging Runway Operations (CRO) at Minneapolis-St. Paul International Airport (MSP), and the potential impacts of CRO.

The FAA is committed to minimizing the environmental impacts associated with CRO to the greatest extent possible while maintaining safety. As you know, MSP Air Traffic Control (ATC) is currently in the process of developing a long-term strategy to address CRO at MSP. To devise the optimal long-term strategy, ATC is utilizing a variety of operational configurations and procedures to determine what options will best meet required safety goals while also minimizing efficiency constraints and environmental impacts. To accomplish this, ATC is operating under an environmental Categorical Exclusion (CATEX) that allows for the testing of procedures for 180 days. That test period commenced on November 7, 2016 and it expires on May 6, 2017.

Once the FAA has gathered the necessary data from the testing period, a long-term strategy will be recommended based on the results of FAA's operational and environmental analyses. At that time, the FAA will determine the appropriate level of environmental review and documentation that will be needed to fully assess the impacts of the recommended long-term strategy.

The FAA appreciates the perspective of both the MSP Noise Oversight Committee (NOC) and the Metropolitan Airports Commission (MAC) Board of Commissioners. Our agency has worked closely with the NOC and the MAC on many issues in the past, and we value the relationship FAA has with both organizations. Please be assured that the FAA is fully committed to conducting an appropriate level of environmental review regarding CRO, in accordance with the requirements of the National Environmental Policy Act and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures.

The FAA will keep the MAC and NOC informed as further information becomes available. Should you have questions prior to the completion of the test period, please do not hesitate to contact me at 847-294-7294 or Kristi Regotti, Environmental Specialist, at 817-222-5763.

Sincerely,

Barry D. Cooper
Regional Administrator
Great Lakes Region

ITEM 6

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **RUNWAY 17 DEPARTURE OPERATIONS REPORT**

DATE: July 3, 2019

The 2019 MSP Noise Oversight Committee Work Plan directs MAC staff to conduct an analysis of MSP Runway 17 departure activity over cities to the south of the airport. The direction was based on feedback provided from members of the public who attended the August 2018 Listening Session in Eagan and the 2018 Fall Listening Session.

Collectively, a group of residents from Eagan, Apple Valley, Savage, the Eagan Airport Relations Commission and MAC Staff designed the objective and scope of the analysis to ensure the components would effectively incorporate observations and related noise concerns from the residents of these communities.

Airport data from 2005 through 2018 was used to examine changes in the use of Runway 17. The Report focused primarily on 2014 and 2018 to compare the use of the runway before Converging Runway Operation (CRO) mitigations were implemented to after. Specifically, the following topics were researched:

- Pre-CRO day vs. Post-CRO day
- Flight Frequency
- Departure Headings
- AEDT Noise Model Data
- Land Use
- Runway 17 Environmental Assessment Assumptions
- Runway 17 Altitudes

The completed Runway 17 Departure Operations is attached, and the report will be presented and discussed at the July NOC meeting.

RUNWAY 17 DEPARTURE OPERATIONS REPORT

July 2019

Community Relations Office

Metropolitan Airports Commission
6040 28th Avenue South, Minneapolis, MN 55450
metroairports.org

RUNWAY 17 DEPARTURE OPERATIONS REPORT

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Executive Summary

During MSP Noise Oversight Committee (NOC) Listening Sessions in 2018, residents shared concerns about the use of Runway 17 for aircraft departing Minneapolis-St. Paul International Airport (MSP). In response, the NOC included an item in the 2019 Work Plan to study the use of Runway 17 in a manner that investigated the concerns raised by the residents. MAC staff worked in partnership with the residents, the Eagan Airport Relations Commission and the NOC to develop a scope and objective for the study. In addition to creating the scope, these groups worked together to establish the following statement of purpose for the study: *Working collaboratively with neighbors and communities south of the airport, the MAC will identify concerns related to Runway 17 Departures and compile a report that will identify operational necessities of Runway 17, highlight trends in the use of the runway and identify changes experienced after FAA implemented new rules to address Converging Runway Operations*.

Prior to construction of Runway 17-35, a significant amount of environmental study took place through the Federal Environmental Impact Statement (FEIS) for the MSP Dual Track Airport Planning Process and subsequent Runway 17 Departure Procedure Environmental Assessment (EA) completed in 2003. The studies projected that 37.1% of daytime departures and 34.6% of nighttime departures in 2005 would use Runway 17 after the runway's opening, for a total runway use of 36.7%. Which means the runway was projected to be used for most departing flights, superseding Runways 12L and 12R combined by over 10 percentage points. Runway 17 was constructed to be used to the south as a departure-only runway. After opening in 2005, actual use of this runway for departures remained below 25% every year until new rules regarding Converging Runway Operations (CRO) were implemented.

Acting on a safety recommendation from the National Transportation Safety Board (NTSB), in 2014 the FAA established separation standards for converging runway operations (CRO) on non-intersecting runways at airports nationwide. In 2015, the FAA determined the CRO mitigations it had developed for MSP were insufficient to meet these new standards. New air traffic tactics were required to adhere to the new CRO separation standards. While CRO does not directly impact Runway 17 departures, an indirect result is decreased use of a North Flow configuration at MSP (favoring departures off Runways 30L, 30R and 35) due to complexities introduced by CRO. This decreased use of North Flow inversely increased the use of South Flow (favoring departures off Runways 12L, 12R and 17), thus increasing departures from Runway 17, over Bloomington and parts of Eagan.

In 2016, 2017 and 2018—the three full years since CRO standards were implemented—the use of Runway 17 for departures increased to 33.3%, 31.0% and 33.7%, respectively. While there were increases in the percentage use of the runway compared to recent years, actual operational counts and percentages remain below those forecast in the 2003 EA. The EA forecasted 574,984 daily operations at MSP with 36.7% of all departures on Runway 17, resulting in 105,510 departures on that runway. In 2018, MSP had 406,913 total operations and 68,565, or 33.7%, departed from Runway 17.

This study investigates a number of operational trends identified by the community as points of concern. For comparison purposes, aircraft activity in 2014 was used to evaluate trends prior to the CRO standards, and 2018 was used to evaluate operational variations after CRO standards were implemented.

While the use of Runway 17 has increased post-CRO, the study finds that specific operational characteristics of the runway have not changed significantly. The frequency of flights during short periods of time (15-minute intervals) has not increased. The Runway 17 flight path (or heading) distribution has varied little after 2015. The study determines that there is a larger volume of air traffic on each heading; however, aircraft are not using new headings compared to the headings used before the new CRO standards. The study also finds the altitudes of aircraft departing Runway 17 decreased in 2018 compared to 2014. This variation is not a result of CRO, but rather a change in weather conditions, particularly warmer temperatures in 2018 with less headwind to help aircraft climb.

When evaluating the combination of runways used, the study finds that the FAA has increased the use of a mixed configuration at MSP. This configuration occurs when aircraft are arriving on Runways 30L and 30R and departing from Runway 17 and, to a lesser extent, Runways 30L and 30R. Although this configuration adds to the number of Runway 17 departures, it has a net benefit to residents living in central Eagan because it reduces the number of departures flying eastbound over the middle of the city. Instead, aircraft are instructed to fly straight out from the runway to remain separated from arrivals to Runways 30L and 30R using adjacent airspace. The land use in areas straight-out from the runway are more compatible with aircraft noise than areas of central Eagan.

Finally, the study further compares operations, aircraft types and headings in 2018 with what was projected in the 2003 EA. More total operations and louder aircraft in the EA produced a much larger noise exposure area than what is actually experienced today. The EA acknowledged that variances in runway and flight track use will occur due to weather, safety and aircraft interactions. The MAC's current practice is to evaluate operational changes on an annual basis through the MSP Annual Noise Contour Report. This report includes actual annual noise contours, which are used to determine residential noise mitigation eligibility. Even with the increase in Runway 17 departures experienced in 2016, 2017, and 2018, the actual annual noise contours from these years do not extend south of the Minnesota River, nor do they extend beyond the MAC's previous residential noise mitigation program area in the area of Runway 17 departure activity.

1. Introduction

The Metropolitan Airports Commission (MAC) is a public corporation governed by a board of commissioners that reports to the Governor of Minnesota and the Minnesota State Legislature. The MAC is charged with managing a system of seven airports within the Minneapolis-St. Paul metropolitan area, including Minneapolis-St. Paul International Airport (MSP). In addition to the MAC, other air transportation entities play critical roles in the successful operation of an airport. The Federal Aviation Administration (FAA) regulates all aircraft activity. At MSP, the FAA's Air Traffic Control (ATC) is solely responsible for directing aircraft on the ground and in the air. ATC's highest priority is the safe and efficient movement of air traffic. Air transportation companies, such as airlines, provide transportation services for people and products. **Figure 1 - Air Transportation Entities** below outlines the primary air transportation units responsible for the successful operation of MSP.

Figure 1 - Air Transportation Entities

The MAC has designated the Noise Oversight Committee (NOC) as its primary advisory body regarding aircraft noise issues associated with flight operations at MSP. Based on feedback provided from members of the public who attended quarterly Listening Sessions in 2018, the NOC directed MAC staff to conduct an analysis of MSP Runway 17 departure activity over cities to the south of the airport. A graphic of the MSP runway layout is provided in **Appendix B**. Residents of communities south of MSP, the Eagan Airport Relations Commission, and MAC staff collaboratively designed the objective and scope of this analysis to ensure the components would effectively incorporate observations and noise concerns from residents of these communities. The study objective is provided below, and the final scope developed in conjunction with the residents is provided in **Appendix A.**

Objective: Working collaboratively with neighbors and communities south of the airport, the MAC will identify concerns related to Runway 17 Departures and compile a report that will identify operational necessities of Runway 17, highlight trends in the use of the runway and identify changes experienced post-CRO.

2. Background

In 1989, the Minnesota Legislature enacted the Metropolitan Airport Planning Act. This act provided the basis of determining whether the long-term air transportation needs of the Twin Cities metropolitan area and the State could best be met by enhancing capacity at MSP, or by developing a replacement air carrier airport elsewhere within the metropolitan area. In what came to be known as the "Dual Track Airport Planning Process," the legislation directed the MAC, in conjunction with the public and with cooperating federal, State, and local agencies, to complete a series of studies and documents which would evaluate long-range aviation alternatives to fulfill the aviation needs in the Twin Cities area for a 30-year period.

The *Dual Track Airport Planning Process Report to the Legislature: Summary* was submitted to the Minnesota Legislature on March 18, 1996. In April of 1996, legislation was passed that stopped further study of a new airport and directed MAC to implement the Long-term Comprehensive Plan (LTCP) for MSP.

The MSP LTCP included construction of a new runway on the west side of the airport. The FAA's Final Record of Decision on the Federal Environmental Impact Statement (FEIS) for *Minneapolis-St. Paul International Airport Dual-Track Airport Planning Process New Runway 17/35 and Airport Layout Plan Approval* was completed in September of 1998. Runway 17-35 construction was completed in October 2005. This runway provided an opportunity to route aircraft over an unpopulated area – the Minnesota River Valley.

During construction of the runway, an Environmental Assessment (EA) was conducted to fulfill federal requirements for the environmental review of potential aircraft departure procedures designed for Runway 17 and to establish a noise abatement departure procedure for westbound departure operations to be routed such that they avoid close-in residential areas southwest of the runway. This document projected that 37.1% of daytime departures and 34.6% of nighttime departures in 2005 would use Runway 17 after the runway's opening. The combined final use percentage for Runway 17 projected by the EA was 36.7%, which totals 105,510 annual operations. This percentage is the highest for departure operations, superseding Runways 12L and 12R combined by over 10 percentage points. Runway 17 was projected to be used the highest amount because it was constructed to be used to the south as a departure-only runway. That is, when aircraft are departing Runway 17, aircraft are not simultaneously arriving on the runway, as they are on Runways 12L and 12R. This allows successive aircraft departures from the runway without waiting to sequence arriving aircraft between departures. The same is true for the runway used in the opposite direction. When Runway 35 is being used, it becomes an arrival-only runway, without departures to the north over Minneapolis.

In practice, the runway has never been used to the 36.7% that was predicted in the EA. In all years prior to 2015, the highest percent usage occurred in 2007 when just under 58,000 departures used Runway 17. This total represents just under 26% of all departures that year. **Figure 2 - Runway 17 Departures by Year** displays the total departures from MSP, the total departures from Runway 17 and the percent use by year, beginning in 2005 when the runway was operational.

As shown in **Appendix C**, Runway 17 is used during two primary airport configurations: (1) South Flow – where aircraft are departing from Runways 12L, 12R and 17 and arriving on Runways 12L and 12R; and (2) Mixed Flow A – where aircraft are departing from Runway 17 along with a smaller number of departures on Runways 30L and 30R, with aircraft arriving to Runways 30L and 30R.

The MSP Runway Use System (RUS) prioritizes arrival and departure runways to promote flight activity over less-populated residential areas as much as possible. During a South Flow, the Priority 1 departure runways (12L and 12R) are used for aircraft taking off. The Priority 2 departure runway (17) is also being used, typically to a greater extent than the first priority runways since Runway 17 does not have simultaneous arrival operations. In a South Flow, however, the lowest priority arrival runways (12L and 12R) are used for all aircraft arriving to MSP.

The RUS is maximized in Mixed Flow A, where the Priority 1 arrival runways (30L and 30R) are used for arrivals, while the Priority 2 departure runway (17) is used for the majority of departures. The last priority departure runways (30L and 30R) are used to a lesser extent for aircraft taking off. An additional benefit in this configuration is the aircraft departing from Runway 17 do not turn left over residential areas of Eagan because they need to stay separated from the inbound aircraft arriving to Runways 30L and 30R. Thus, the departures are flying over more compatible land uses for a longer period of time.

In 2014 the FAA, acting on a safety recommendation from the National Transportation Safety Board (NTSB), amended Order 7110.65 (Air Traffic Control) to establish separation standards for non-intersecting converging runway operations (CRO) at airports nationwide. The FAA defines non-intersecting converging runway operations when the extended centerline of two runways intersect within one nautical mile of the two runway departure ends, posing a potential risk if a landing aircraft on one runway discontinues its approach and goes around concurrent with a simultaneous departure from the other runway, and neither aircraft diverges from its initial flight path. The FAA's first priority is the safe movement of air traffic.

On July 24, 2015, the FAA determined that the Runways 30L and 35 Converging Runway mitigations in place at MSP, as documented in a Safety Risk Management Document, were not sufficient to meet the standards of the Converging Runway requirement. A temporary suspension was put in place for arrivals to MSP Runway 35. On August 28, 2015, the FAA began allowing arrivals to Runway 35 using an approved separation technique to comply with the new Converging Runway requirements, which uses an Arrival-Departure Window (ADW) off the approach end of Runway 35 to effectively alternate Runway 30L departures with Runway 35 arrivals.

In January 2016, in addition to Runway 30L, the FAA determined that the new Converging Runway standards apply to MSP Runway 30R, and implementation of a second ADW off the approach end of Runway 35 was required.

While CRO does not directly impact Runway 17 departures, an indirect result of CRO is decreased use of a North Flow configuration at MSP, due to complexities introduced by CRO. This decreased use of North Flow inversely increased the use of South Flow, thus increasing departures from Runway 17. In 2016, 2017 and 2018—the three full years since CRO standards were implemented—the use of Runway 17 for departures increased to 33.3%, 31.0% and 33.7% respectively.

While the Runway 17 departure levels in all three of these years were still below the use projected during the planning process, the communities below departure flights paths for Runway 17 noticed an increase and began to seek information from the MAC and the NOC.

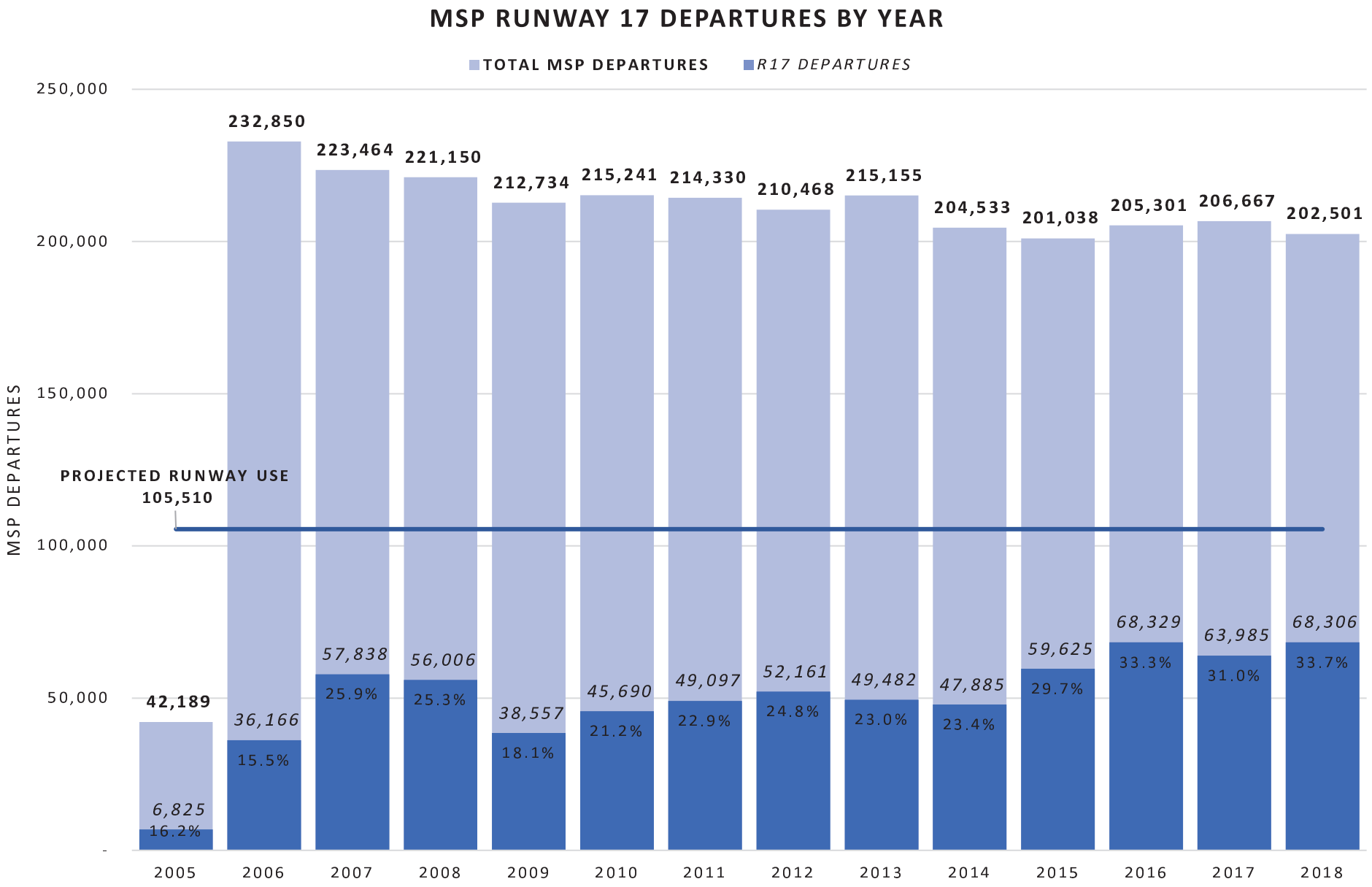


Figure 2 - Runway 17 Departures by Year

3. Pre-CRO day vs. Post-CRO day

The Converging Runway Operation (CRO) requirements put in place at MSP have changed runway use decisions. Additionally, MSP has experienced other runway use changes since July 2015 that are not the direct result of CRO requirements. Weather, special events and airfield maintenance all impact the operational flow of air traffic daily. Airline schedules and changing fleet characteristics affect runway use monthly and annually. It is important to note that these inherent operational impacts occur independent of CRO.

The overall use of Runway 17 post-CRO is a fundamental concern raised by residents. The study scope includes an assessment into how a typical day in a South Flow has changed. Specifically, the community wanted the study to (1) investigate daily peak hour trends; (2) investigate current and historic departure peaks; and (3) build a typical day for Runway 17 departure operations in a South Flow pre-CRO and compare it to a day post-CRO. The following paragraphs describe this assessment.

In 2014, there were 93 days where Runway 17 was used for at least half the hours in the day while the airport was in a South Flow. In 2018, that level rose to 134 days. To further examine this, **Figure 3 - Average Annual Day** shows the average number of Runway 17 departures during each hour when the airport was in a South Flow during 2014 compared to 2018. As shown, Runway 17 was used very little between 23:00 and 5:00. In 2014, the average daily total for departures between these hours was 0.9. The average daily total rose slightly to 1.1 in 2018.

Throughout the remainder of the day, peaks and valleys are prevalent, which are driven by airline scheduling trends. The first peak of the day in both years occurred in the 7:00 hour followed by the first valley in the 8:00 hour. After 8:00, differences occur between the two years.

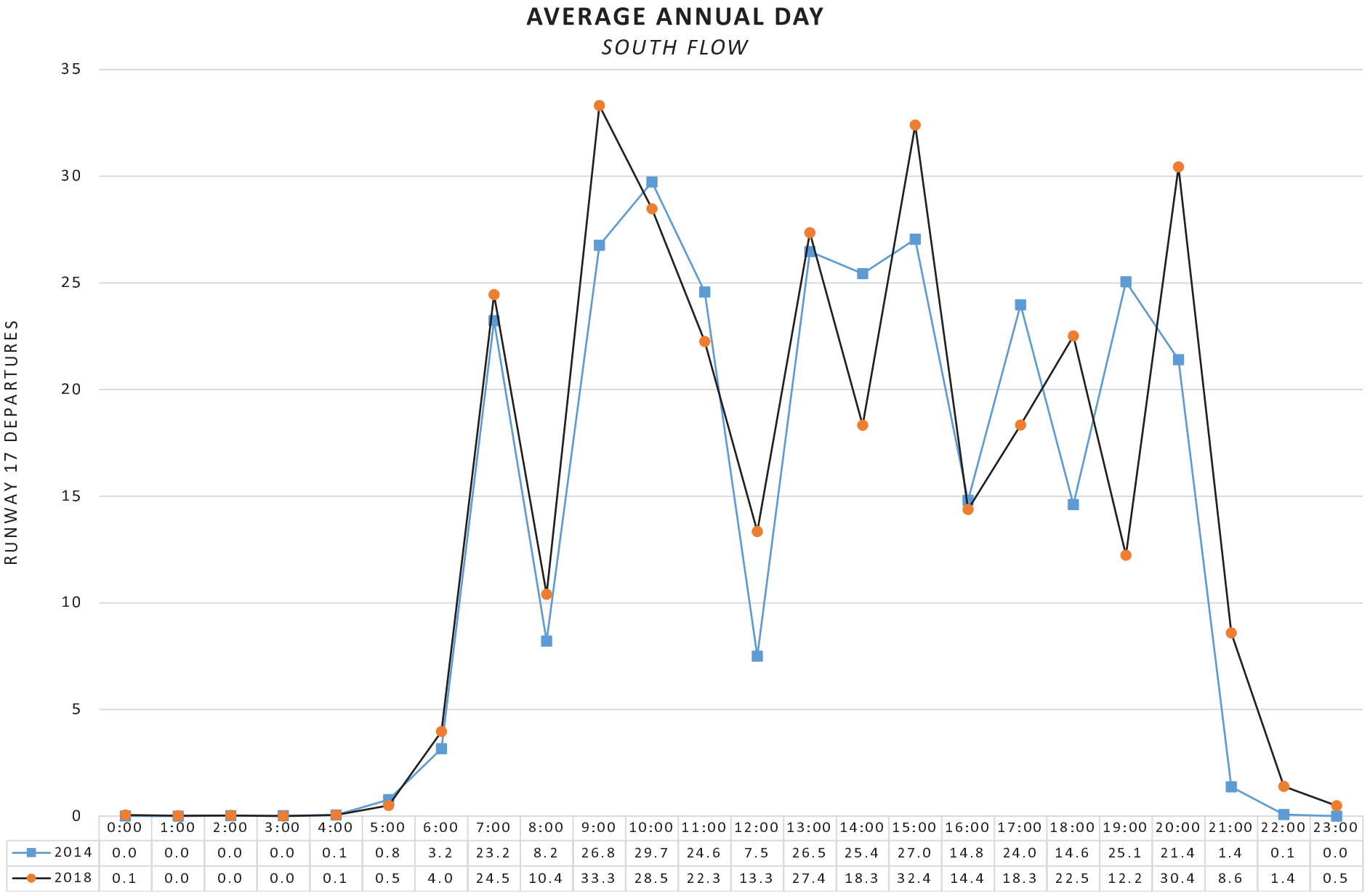
In 2018, higher peaks are generally surrounded by valleys, indicating a rush of departure activity in a more condensed period of time, surrounded by respite periods. In 2014, the peaks are not as high and the activity is often spread over two to three hours. For example, during the 9:00-11:00 period, the average in 2014 stays high for all three hours, averaging 81 departures during the three hours. During 2018, the three hours had 84 average annual departures, however they were more condensed into the 9:00 hour. This trend is also visible in the 13:00-15:00 period when 2014 had 79 average departures, evenly spread in those three hours and 2018 had 78 average departures, primarily occurring in the 13:00 and 15:00 hours with a slight respite period in the middle.

Depictions of average days are informative, but averages can be misleading. **Figure 4 - Peak Hour Departure Operations** depicts the highest number of Runway 17 departures that occurred on any given hour during 2014 and 2018. In general, the peaks and valleys are like the averages. The 0:00 – 2:00 hours were all higher than expected with Super Bowl traffic departing MSP on Monday, February 5, 2018.

As noted earlier, CRO impacted the use of runways at MSP. The community requesting this study is specifically interested in the total days spend in a South Flow. It is common that community concern increases as the consecutive days spent in one flow increases. **Figure 5 - MSP South Flow Days** compares both of those metrics from 2014 to 2018.

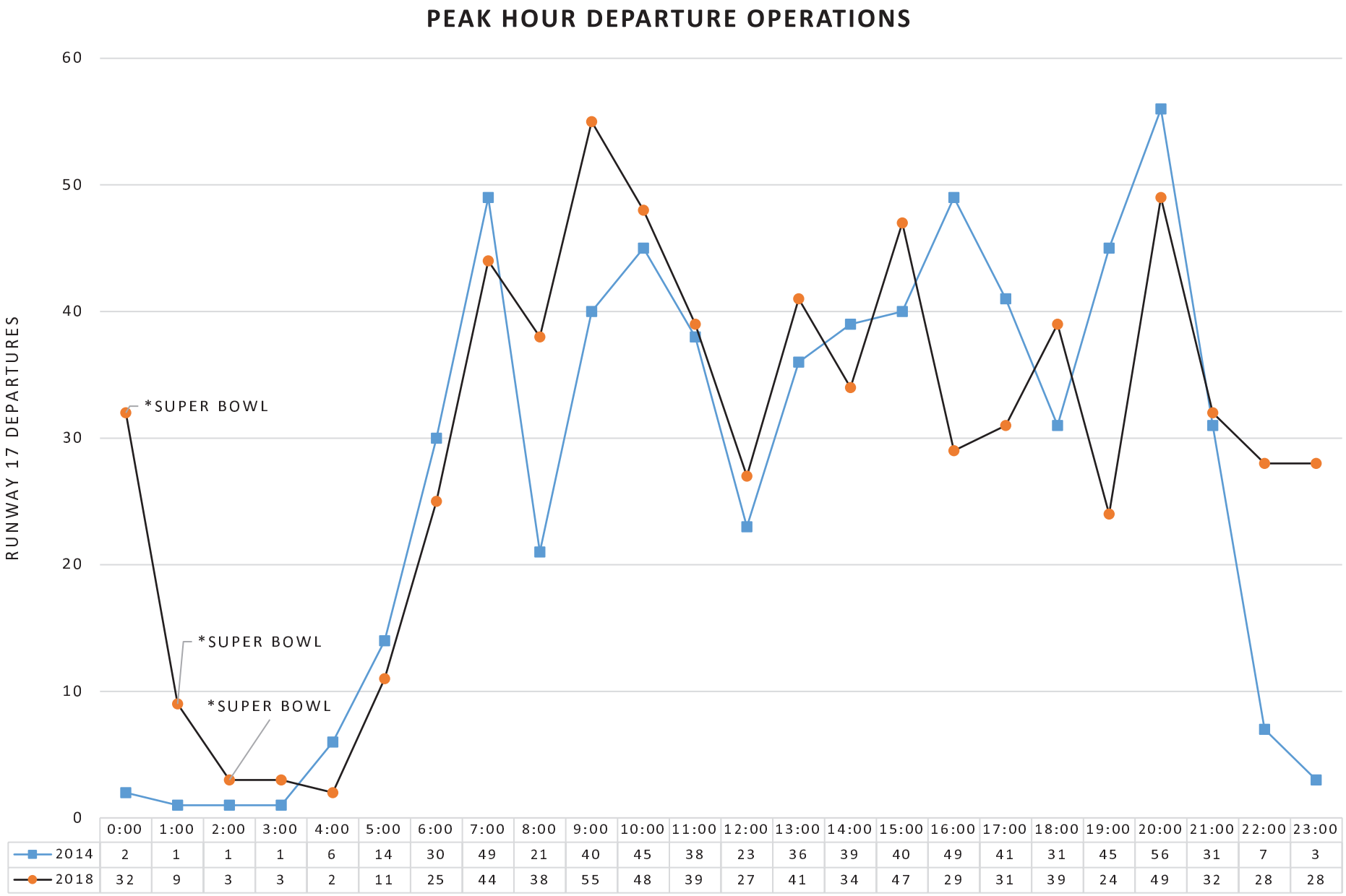
The data in Figure 3 shows the number of days in which 12 or more hours were spent in South Flow; the data in Figure 5 shows the number of days in which six or more hours were spent in South Flow. In 2014 there were 147 days with at least six hours of South Flow activity. In 2018, that jumped to 180. June and September of 2018 both had more than 20 days during the month with at least six hours of South Flow. In addition to more days with South Flow operations, there were higher successive days in 2018. March, June and September all had a period of more than 10 days in a row with at least six hours of South Flow operations. The highest such month in 2014 was June with seven consecutive days. In short, during 2018 the airport was configured in a South Flow more often and stayed there longer as compared to 2014.

It is also important to know how the individual runways are used in airport configurations when Runway 17 is active. **Figure 6 - Departure Runway Distribution** lays out the distribution in 2014 and 2018 in South Flow and Mixed Flow A. These percentages do not reflect the annual percent use of departures. They are only including the time the airport was configured in a South Flow or a Mixed Flow A, respectively. When MSP was configured in a South Flow in 2014, 59% of all departures used Runway 17. That percentage increased to 63% in 2018. More traffic was shifted away from the parallel runways. The MSP Runway Use System (RUS) prioritizes Runways 12L and 12R above Runway 17 for departures. This change decreased the use of the highest priority runways. In the Mixed Flow A configuration, 42% of all departures used Runway 17 in 2014. That use increased to 47% in 2018. The use of Runway 30R for departures also increased between 2014 and 2018 while the use of Runway 30L dropped from 24% to 14%. This change improved the use of the Runway Use System as Runway 17 departures are prioritized above departures from Runways 30L and 30R.



	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2014	0.0	0.0	0.0	0.0	0.1	0.8	3.2	23.2	8.2	26.8	29.7	24.6	7.5	26.5	25.4	27.0	14.8	24.0	14.6	25.1	21.4	1.4	0.1	0.0
2018	0.1	0.0	0.0	0.0	0.1	0.5	4.0	24.5	10.4	33.3	28.5	22.3	13.3	27.4	18.3	32.4	14.4	18.3	22.5	12.2	30.4	8.6	1.4	0.5

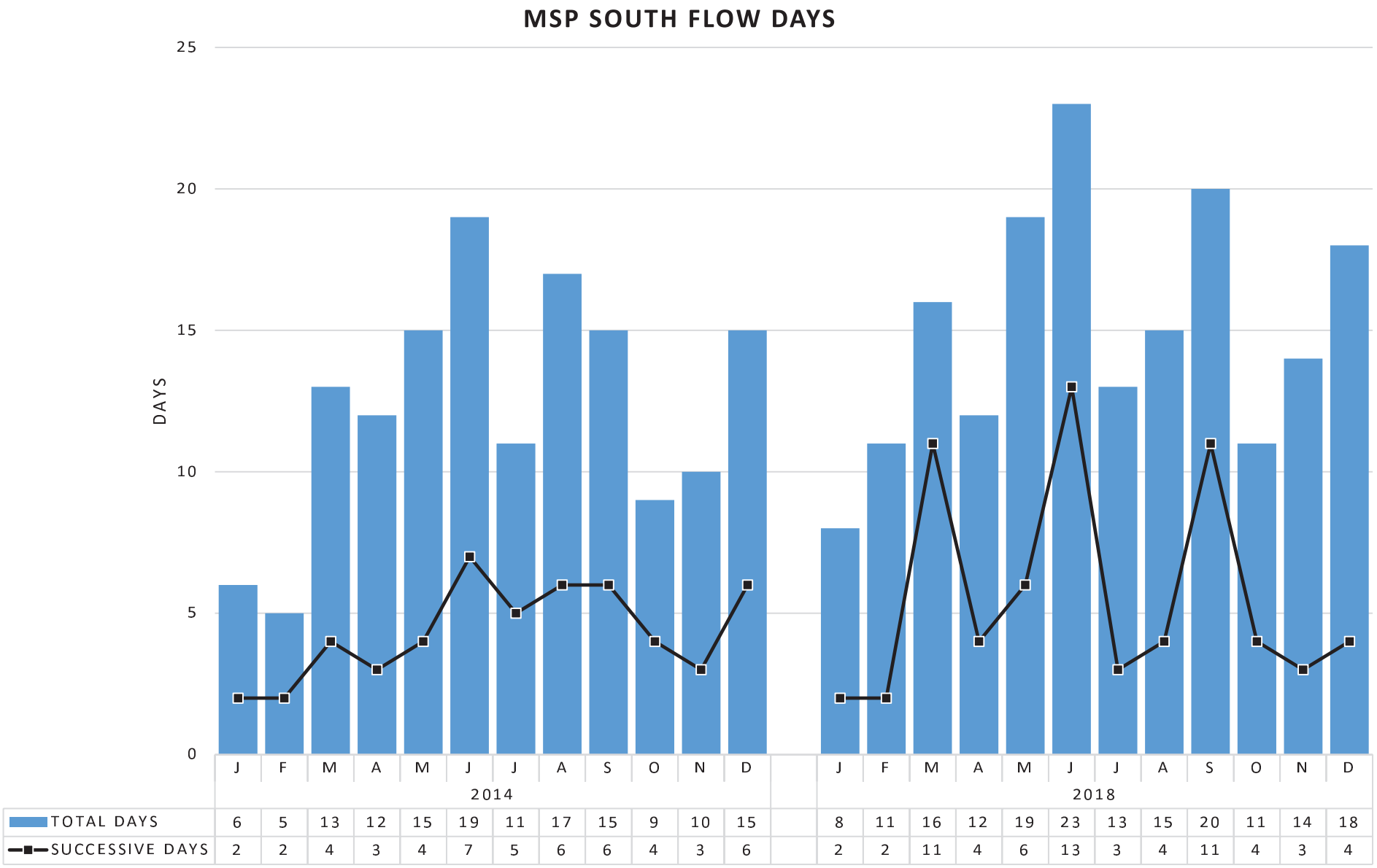
Figure 3 - Average Annual Day



	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2014	2	1	1	1	6	14	30	49	21	40	45	38	23	36	39	40	49	41	31	45	56	31	7	3
2018	32	9	3	3	2	11	25	44	38	55	48	39	27	41	34	47	29	31	39	24	49	32	28	28

Figure 4 - Peak Hour Departure Operations

12



	J	F	M	A	M	J	J	A	S	O	N	D		J	F	M	A	M	J	J	A	S	O	N	D
	2014													2018											
TOTAL DAYS	6	5	13	12	15	19	11	17	15	9	10	15		8	11	16	12	19	23	13	15	20	11	14	18
SUCCESSIVE DAYS	2	2	4	3	4	7	5	6	6	4	3	6		2	2	11	4	6	13	3	4	11	4	3	4

**Days were counted when South Flow was used at least 6 hours or more*

Figure 5 - MSP South Flow Days

13

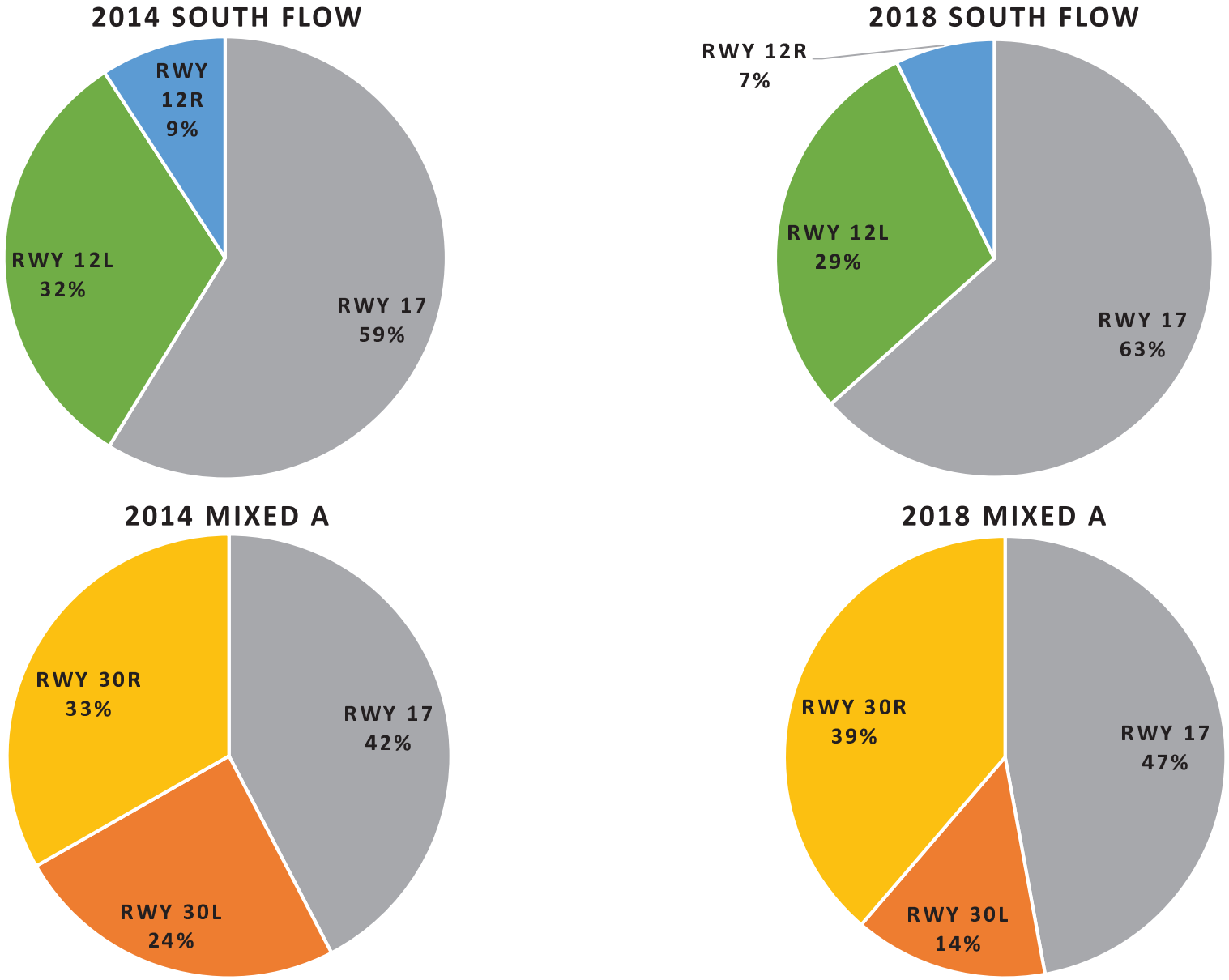


Figure 6 - Departure Runway Distribution

14

4. Flight Frequency

The use of Runway 17 has increased from 2014 to 2018, as described in Section 2. The number of days in the year and hours in the day when Runway 17 was chosen for departing aircraft increased during that time. One common experience communicated by residents was that the frequency of flights in short periods of time has changed.

The following analysis contains data for all of 2014 and 2018. The MAC stores runway-use data provided by the FAA Aviation System Performance Metrics (ASPM) data, categorized in 15-minute segments. This data was used to effectively assess change in frequency of flights in short periods of time. Periods of South Flow, when Runways 12L, 12R and 17 are being used for departures, were isolated from periods when Mixed Flow A was active. In Mixed Flow A, Runway 30L, 30R and 17 are utilized for departure. Overall, instances of South Flow were higher in 2018 than in 2014. To investigate whether the flight frequency within the 15-minute segments has changed, this analysis counts the number of Runway 17 departures during all 15-minute segments in 2014 and compares them to 2018. **Figure 7 - Runway 17 15-Minute South Flow Departure Usage** displays the percent of time Runway 17 departures occurred at various levels of frequency (i.e. the number of Runway 17 departures per 15-minutes was 0, 1-2, 3-4, 5-6, etc.).

It is important to note that although Runway 17 may be included in the FAA's ASPM data, indicating the runway is available for departure, it may not necessarily be used. Overnight hours are the most frequent occurrence of this situation. Often Runway 17 is available for use with no actual departures from the runway. For example, the Runway Use System prioritizes a departure on Runway 12L or 12R before a departure on Runway 17; therefore, Runways 12L and 12R will be considered before a departure on Runway 17. **Figure 7 - Runway 17 15-Minute South Flow Departure Usage** visually displays this as well, showing the highest percentages of 15-minute segments where Runway 17 was available for use, did not have any departures on that runway. While there are many instances when Runway 17 is available, 38% of the time in 2018 it was not used during any given 15-minute block. Figure 7 shows that these situations dropped between 2014 and 2018.

Figure 7 also shows that the decrease of 15-minute blocks when the runway is available but not used was offset by increases in the blocks when 3-4 departures occurred, 5-6 departures occurred, and 7-8 departures occurred. These groups increased between 0.6% and 2.6%. The number of times when nine or more departures operated from Runway 17 in a 15-minute block during 2018 was equal to or below what was observed in 2014. The occurrences of 15-minute blocks when MSP was configured in South Flow and Runway 17 had at least one departure increased from 2014 to 2018; however, the average number of aircraft departing within any given 15-minutes period dropped from 2014 to 2018. In these situations, the average departures per 15-minutes was 5.96 in 2014 falling to 5.74 in 2018. In short, flights were not departing more frequently in short (15-minute) periods of time in 2018; there were simply more 15-minute segments spent in South Flow with Runway 17 departures.

Figure 8 - Runway 17 15-Minute Mixed Flow Departure Usage isolates the same information for the Mixed Flow A configuration. Occurrences of Mixed Flow A available for use are much lower than South Flow. Between 2014 and 2018, the occurrences of Mixed Flow A increased. Much of that increase occurred during the 00:00 – 05:00 hours. The RUS stipulates that Mixed Flow A would be prioritized above North

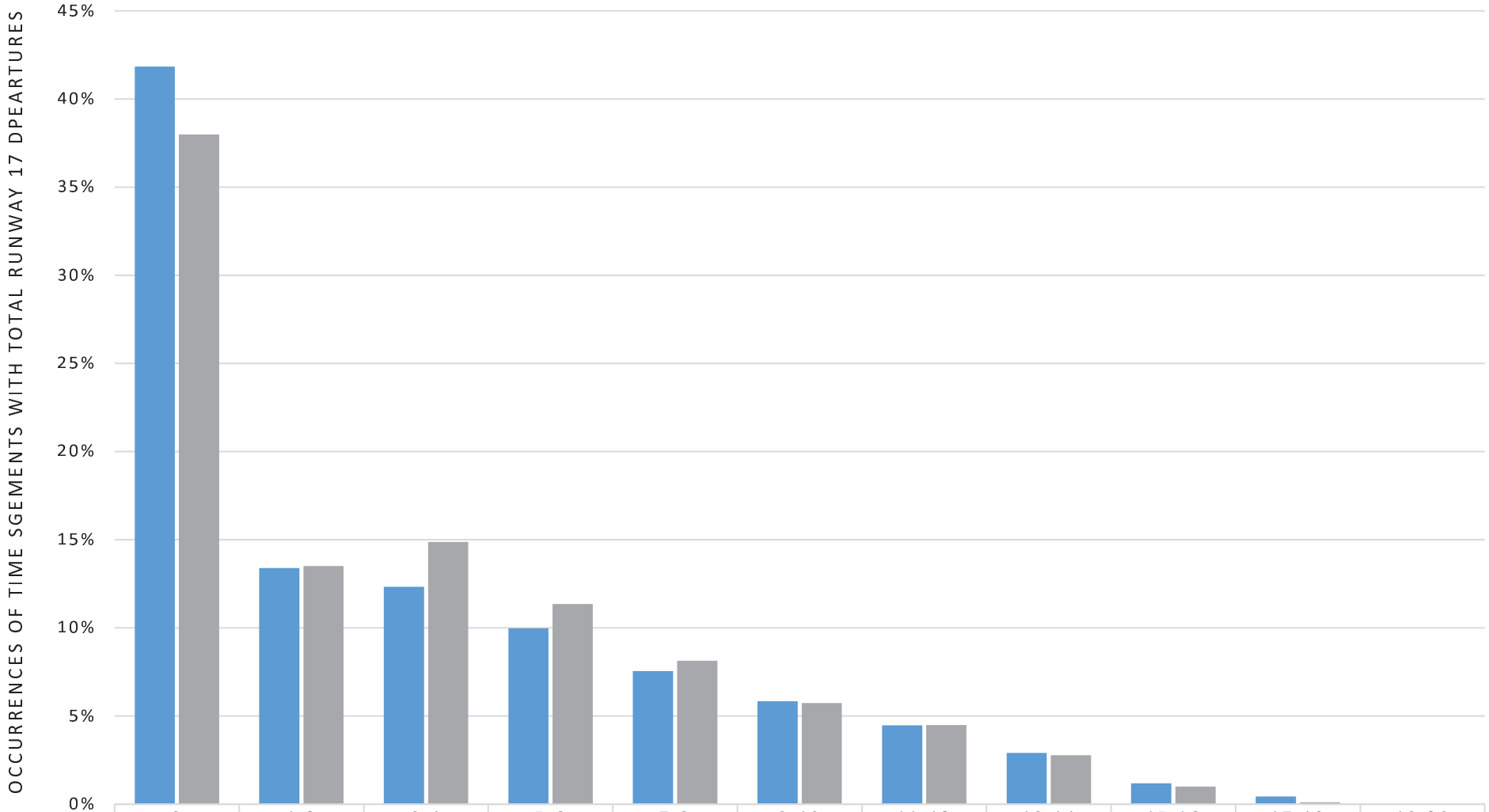
Flow as arrivals would use the Priority 1 runways and departures would use the Priority 2 runway. In 2018, the number of 15-minute segments the runway was available for use but not actually used increased nearly four times from 2014. From a percentage basis, 23.6% of the time that Runway 17 was available it was not used in 2014. That increased to 39% in 2018. The distribution of frequency in Mixed Flow A decreased between 2014 and 2018 in the 1-2, 3-4, 5-6 and 11-12 groups. There was an increase in the 7-8, and 13-14 group.

There were no occurrences of more than 16 departures in a 15-minute segment in 2014 or 2018. This is likely due to flight path constraints placed on departing aircraft from Runway 17 in this configuration. The Runway 17 departure airspace is reduced to allow adequate space for the aircraft arriving to Runways 30L and 30R; therefore, fewer heading options exist off Runway 17. The average departures per 15-minutes in Mixed Flow A was 3.67 in 2014, increasing to 4.34 in 2018.

RUNWAY 17 15-MINUTE DEPARTURE USE

SOUTH FLOW

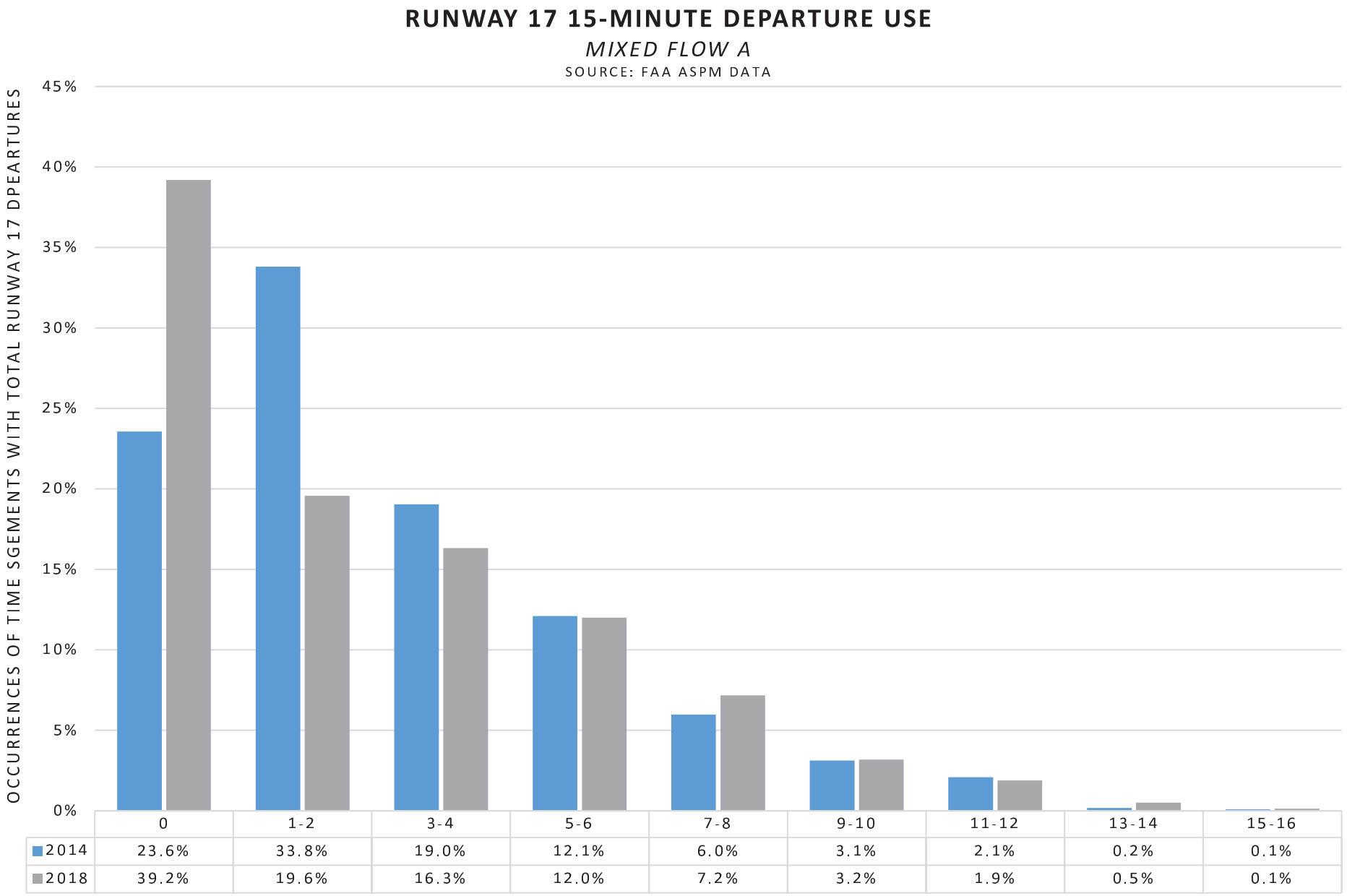
SOURCE: FAA ASPM DATA



	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20
2014	41.8%	13.4%	12.3%	10.0%	7.5%	5.8%	4.5%	2.9%	1.2%	0.4%	0.1%
2018	38.0%	13.5%	14.9%	11.4%	8.1%	5.7%	4.5%	2.8%	1.0%	0.1%	0.0%

Figure 7 - Runway 17 15-Minute South Flow Departure Usage

17



	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16
2014	23.6%	33.8%	19.0%	12.1%	6.0%	3.1%	2.1%	0.2%	0.1%
2018	39.2%	19.6%	16.3%	12.0%	7.2%	3.2%	1.9%	0.5%	0.1%

Figure 8 - Runway 17 15-Minute Mixed Flow Departure Usage

18

5. Runway 17 Departure Headings

In both primary runway-use configurations when Runway 17 is used, the runway serves aircraft departing to destinations that are generally west, southwest, south, and southeast of MSP. This covers a broad range of geographic locales. To accommodate that traffic, FAA Air Traffic Control (ATC) assigns a broad range of headings from 095° to 285°. While there is a range available to ATC, the FAA uses primary headings for departure. These headings are chosen after considering numerous criteria including the aircraft's destination, routing, aircraft type, weather conditions, other air traffic and airport configuration. Since using primary headings improves consistency, repeatability and safety. The residents who helped create the scope for this study expressed that while departures are fanned, the use of primary headings leads to periods with multiple overflights in specific areas of the community.

For the purpose of modeling aircraft noise, the Aviation Environmental Design Tool (AEDT) uses model tracks; however, the actual flight paths would be distributed along these tracks. Aircraft were assigned a modeled track and then dispersed off the base track using a standard distribution method within the model. The industry and the MAC continue to use this method during the development of aircraft noise exposure contours. **Figure 9 - Runway 17 Modeled Departure Tracks** below shows the location of the different tracks for Runway 17 departures. These tracks were developed using actual flight data and continue to be evaluated on an annual basis. Actual flights can be assigned to a modeled track using a best fit approach. These same tracks in **Figure 9** are categorized by general headings in **Figure 10 - Runway 17 Departure Modeled Tracks by Heading**.

The result of this process is encapsulated in **Figure 11 - Runway 17 Departure Heading Use**. The figure shows variation in departure heading usage and also shows that the departure headings used today are the same headings that have been issued since the opening of Runway 17 in 2005. Focusing on 2014 and 2018 annual heading usages does not show any new headings as a result of CRO. The most common tracks flown by aircraft departing Runway 17 are the tracks categorized by a 210° heading. This use has been above 25% of all Runway 17 departures every year, increasing to 35% in 2014 before falling back down to 33% in 2018. This flight track is directed over the Minnesota River Valley and dramatically reduces instances of aircraft overflight impacts immediately south of the Minnesota River Valley in Northeast Burnsville.

The second most common tracks used in 2018 are labeled as 140°. The use of these tracks has slowly increased over time, peaking at 22% in 2014 before ending 2018 with 21% of all Runway 17 departures.

The early years of Runway 17 use had pronounced variability in some of the headings utilized. The tracks labeled as 120° were used less than 15% in late 2005 and less than 10% in 2006. This use quickly jumped in 2007 to 19%, increasing to its peak use in 2012 at 23%. Since 2012, the use of the 120° tracks has fallen down to 17% in 2018. Conversely, the 185° heading tracks were used for 17% of all departures in 2006 before dropping under 5% until 2015. This heading has increased every year since 2014 and finished 2018 at 9% of all Runway 17 departures.

Figure 11 represents all aircraft types in all weather conditions in all airport configurations. The use of these tracks changes considerably when specific variables are considered. Data and density maps for

carrier jet departures under different variables are presented in **Appendix D**. In the Mixed Flow A configuration, arrivals to Runways 30L and 30R need to be separated from Runway 17 departures. To accomplish this, aircraft that would typically be assigned a heading east of 170° are assigned runway heading, 170°, and their east bound turn is delayed until after the departing traffic is separated from the arrival traffic. In this configuration, Runway 17 departures flew the tracks categorized at 170° or higher 97% of the time. This has the effect of reducing the number of aircraft overflights in residential areas of central Eagan.

The aircraft destination and associated routing are important determinants to the heading assigned to a departure. Destination is determined by the aircraft operator. At MSP, airlines determine the schedule of aircraft operations, and the frequency of flights to their chosen destinations. How quickly the airlines change the schedule would be contingent on their responsiveness to market demand. **Figure 12 - Top 5 Destinations by Heading** displays the top five destinations that airlines fly to after departing from Runway 17, based on the heading flown after departure.

Because airline scheduling decisions vary throughout the day, headings that favor certain regions of the country may be more prevalent during certain hours of the day. **Figure 13 - 2014 Heading-Use by Time** and **Figure 14 - 2018 Heading-Use by Time** provide the utilization of headings by hours of the day in 2014 and 2018. These charts only determine how heading-use fluctuates during the day; it does not account for total volume of departures during these hours.

In 2018, the 210° heading saw peak usage in the 11:00, 14:00 and 19:00 hours. This is a slight change from 2014 when the peaks occurred at 9:00, 11:00, 14:00 and 18:00. The 170° heading saw its biggest use in the overnight hours. Runway 17 is not used frequently during these hours, but when it is used, it is typically used in Mixed Flow A. The use was a reduction from 2014 when the 170° was used for 46% of all departures between 22:00 and 06:00.

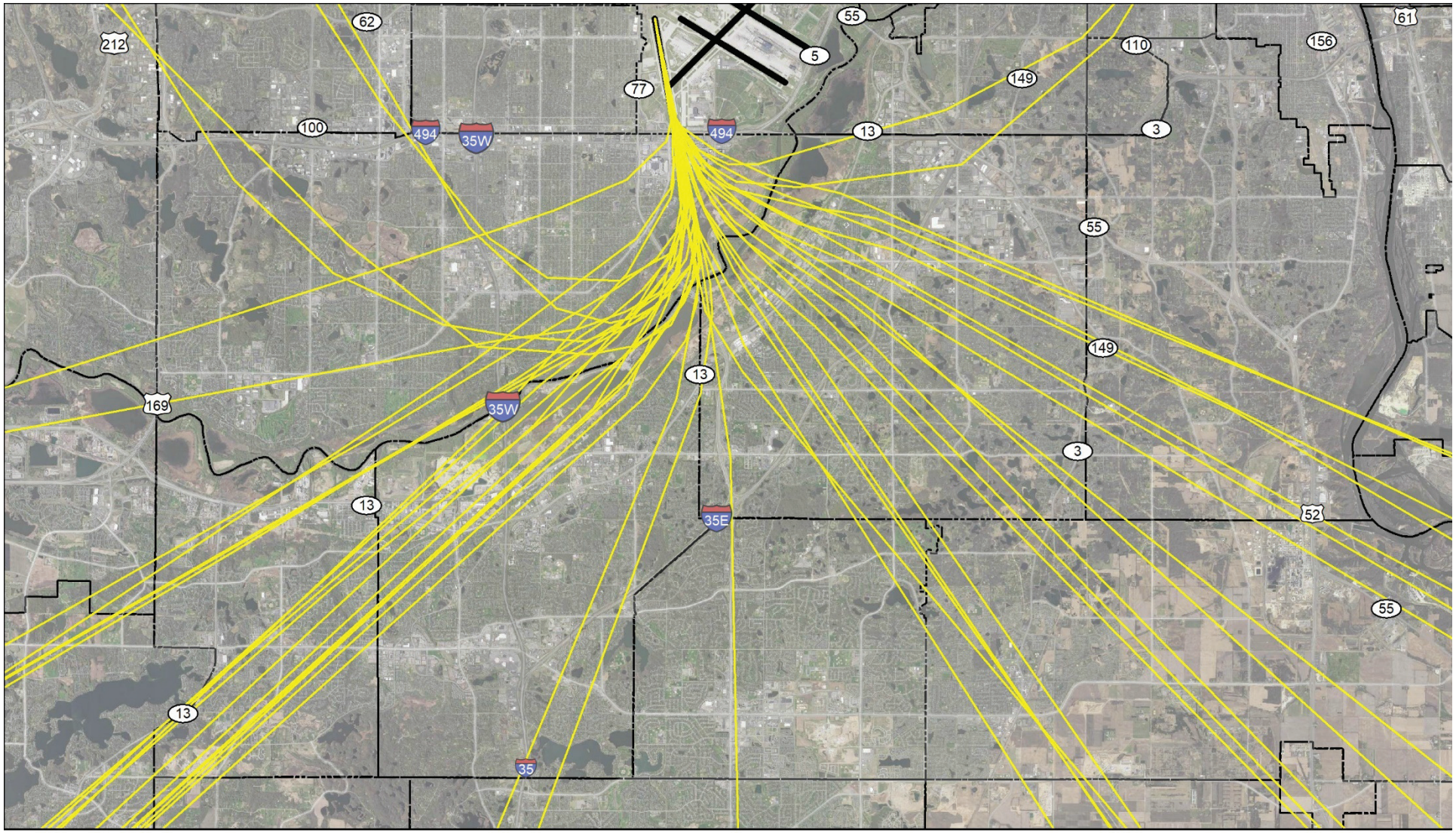


Figure 9 - Runway 17 Modeled Departure Tracks

21

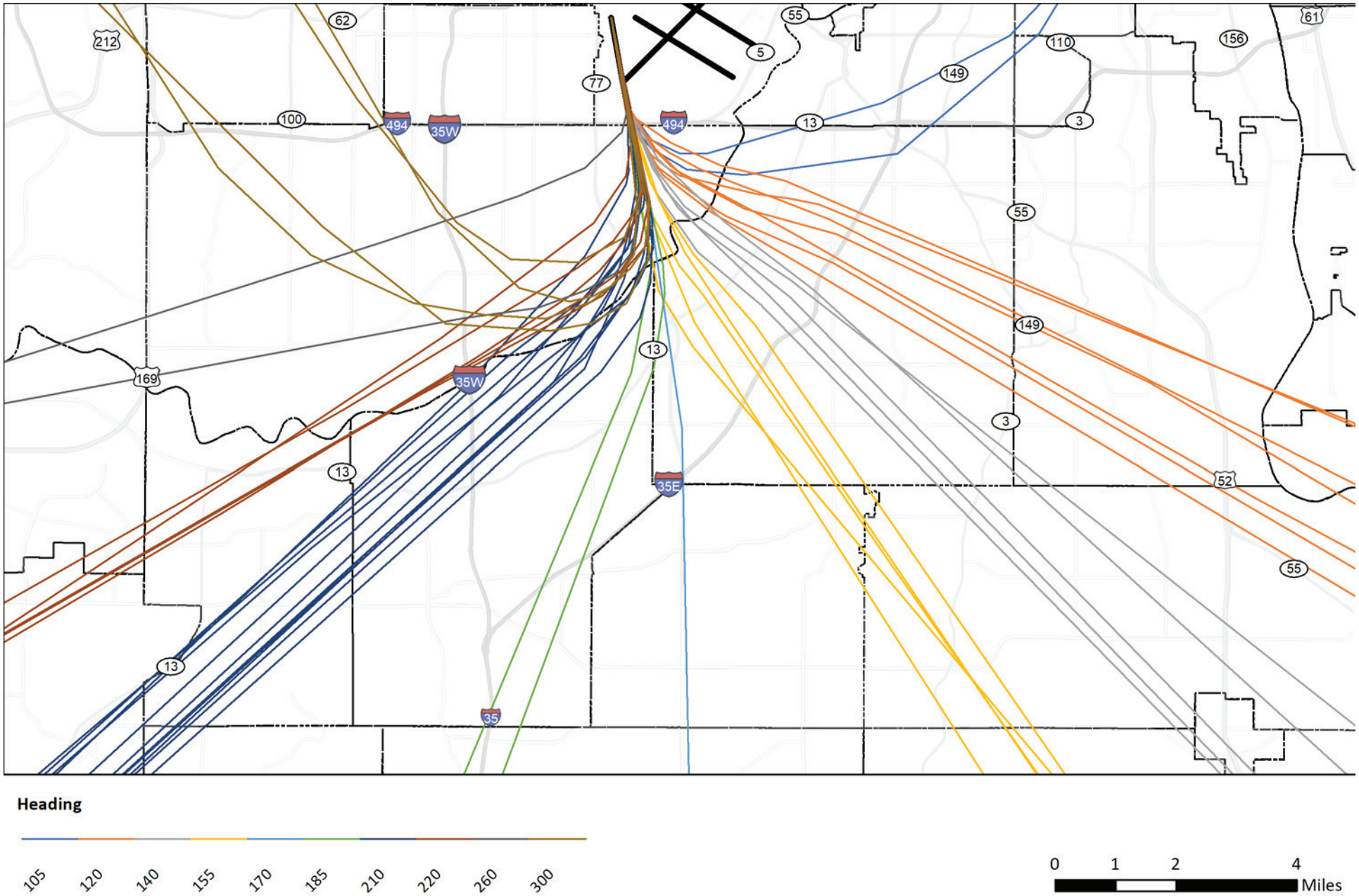


Figure 10 - Runway 17 Departure Modeled Tracks by Heading

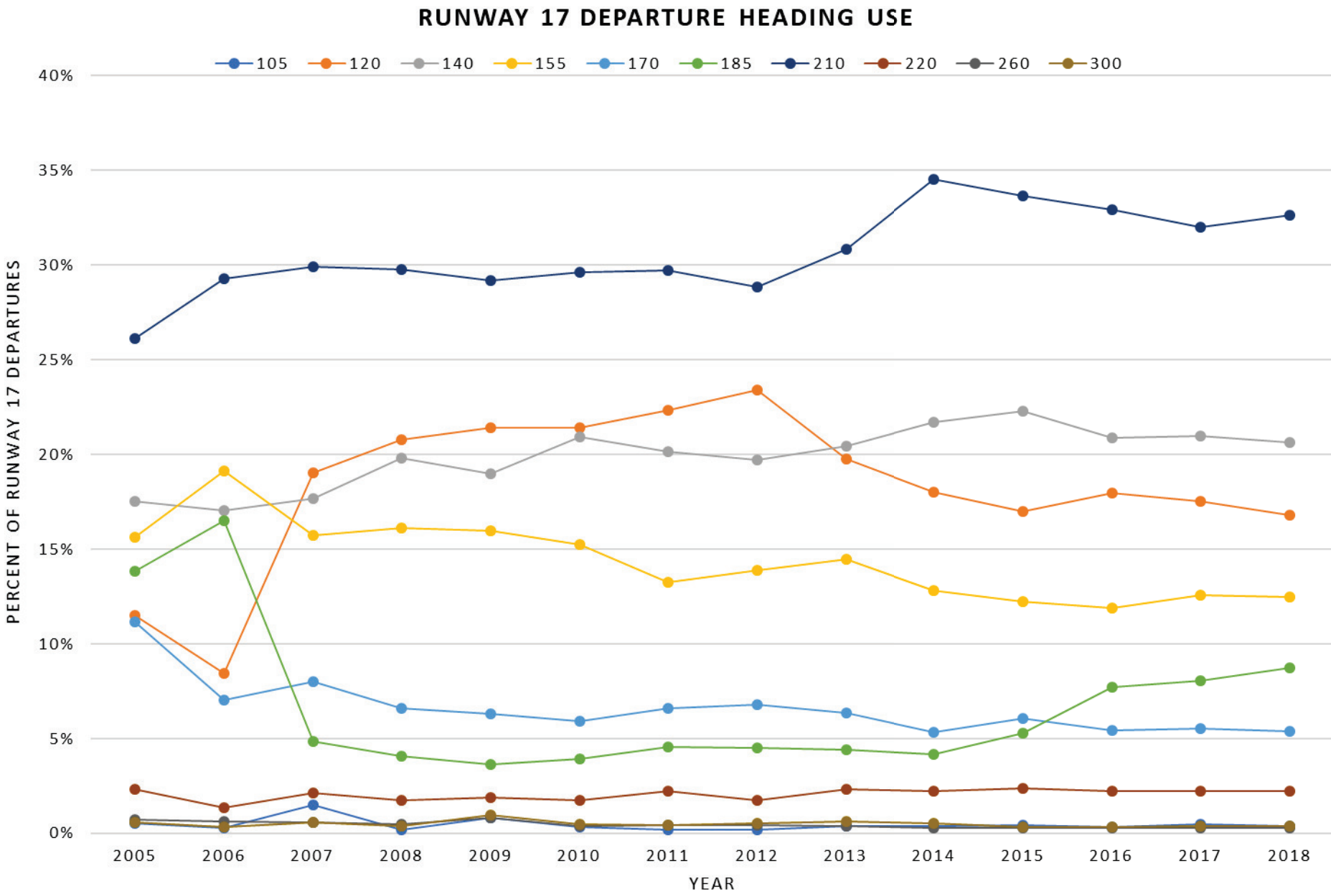


Figure 11 - Runway 17 Departure Heading Use

2018 Destination Rank

Heading	1	2	3	4	5
120°	New York - LaGuardia	Washington - Reagan	Detroit	New York - JFK	Philadelphia
140°	Chicago – O'Hare	Atlanta	Chicago - Midway	New York - Newark	Orlando
155°	Chicago – O'Hare	Chicago - Midway	St. Louis	Atlanta	Memphis
170°	Chicago – O'Hare	Chicago - Midway	Atlanta	St. Louis	New York - Newark
185°	Chicago – O'Hare	Chicago - Midway	Atlanta	Dallas - Ft. Worth	Denver
210°	Denver	Phoenix	Dallas - Ft. Worth	Houston - Intercontinental	Las Vegas

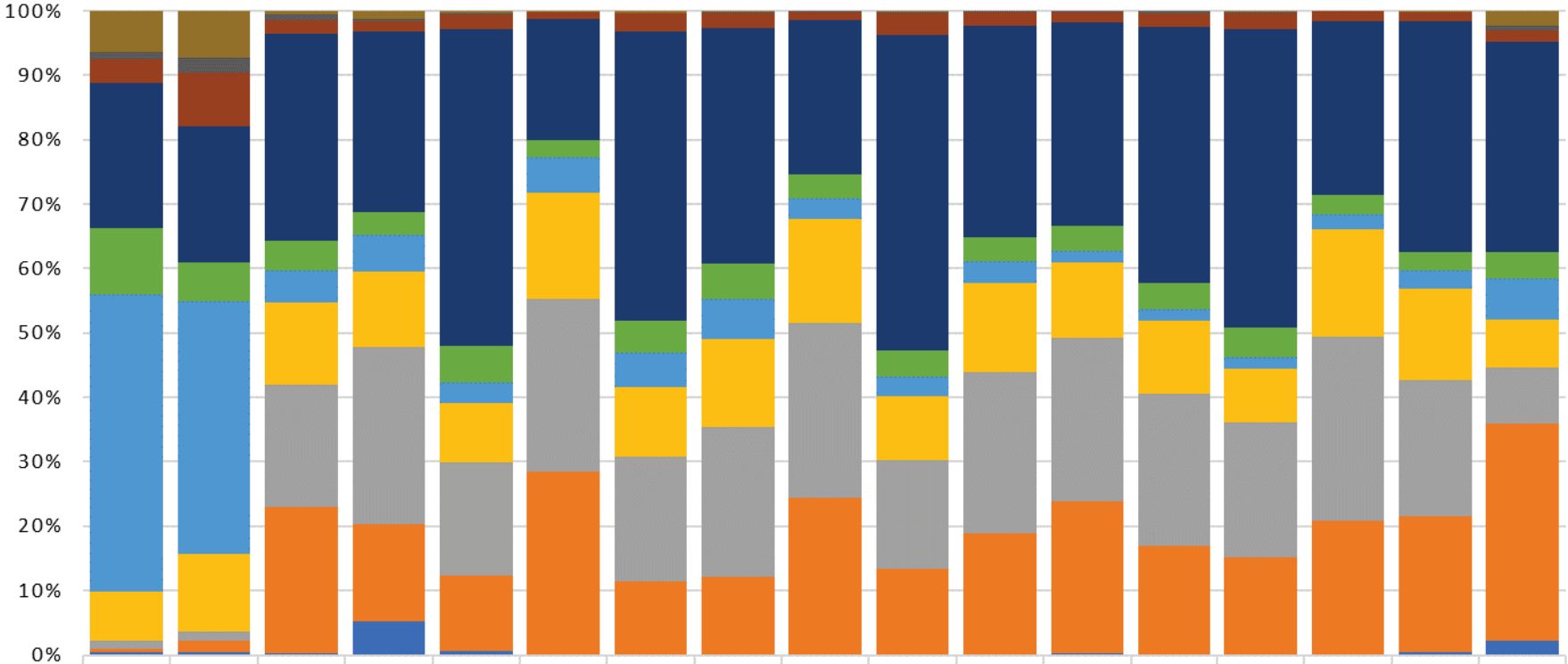
2014 Destination Rank

Heading	1	2	3	4	5
120°	Milwaukee	Detroit	Philadelphia	Madison	New York - LaGuardia
140°	Chicago – O'Hare	Chicago - Midway	Atlanta	New York - Newark	Indianapolis
155°	Chicago – O'Hare	Chicago - Midway	St. Louis	Atlanta	Memphis
170°	Chicago – O'Hare	Atlanta	Chicago - Midway	Charlotte	St. Louis
185°	Denver	Chicago – O'Hare	Dallas - Ft. Worth	Phoenix	Houston - Intercontinental
210°	Denver	Dallas - Ft. Worth	Phoenix	Houston - Intercontinental	Los Angeles

Figure 12 - Top 5 Destinations by Heading

RUNWAY 17 DEPARTURE HEADING USE BY TIME PERIOD

2014



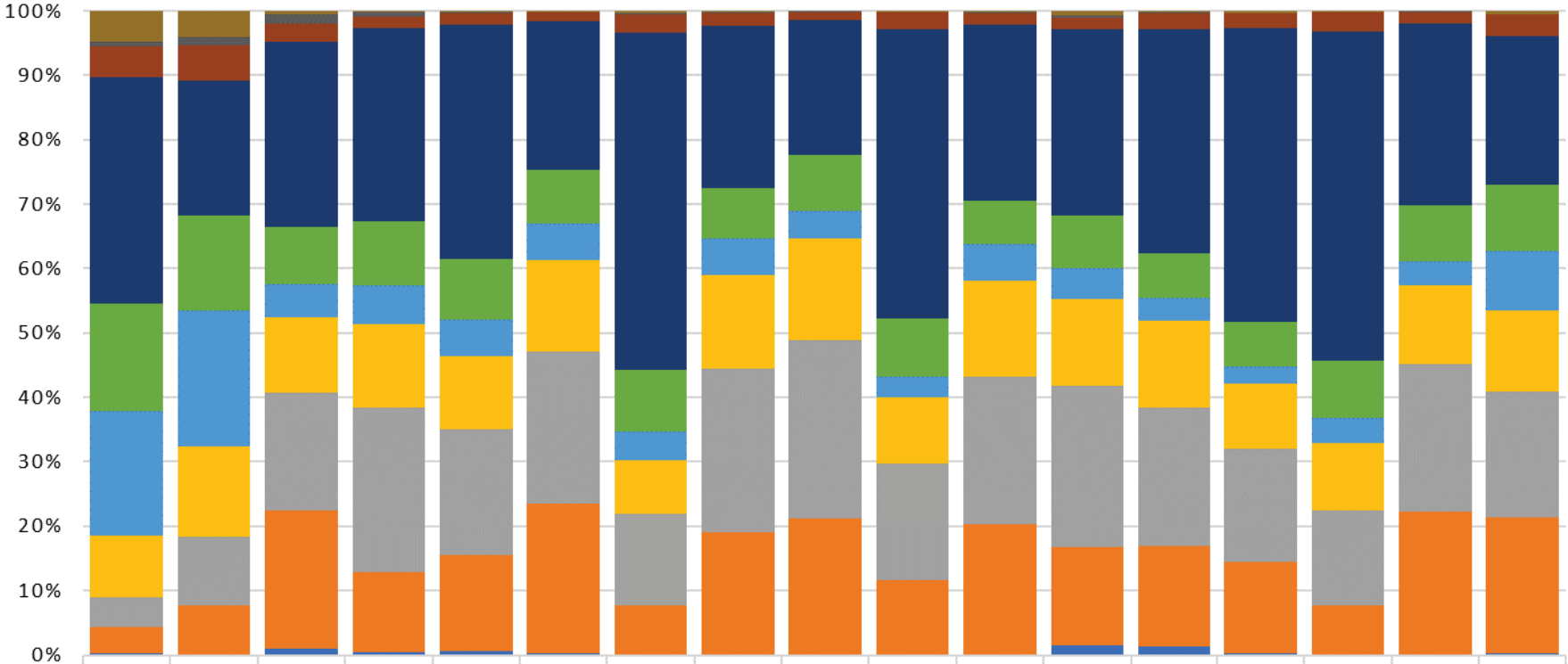
	22:00 - 5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00
300	6%	7%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
260	1%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
220	4%	8%	2%	1%	2%	1%	3%	2%	1%	3%	2%	2%	2%	3%	2%	1%	2%
210	23%	21%	32%	28%	49%	19%	45%	37%	24%	49%	33%	32%	40%	46%	27%	36%	33%
185	10%	6%	5%	4%	6%	3%	5%	5%	4%	4%	4%	4%	4%	5%	3%	3%	4%
170	46%	39%	5%	6%	3%	6%	5%	6%	3%	3%	3%	2%	2%	2%	2%	3%	6%
155	8%	12%	13%	12%	9%	17%	11%	14%	16%	10%	14%	12%	11%	8%	17%	14%	7%
140	1%	1%	19%	28%	17%	27%	19%	23%	27%	17%	25%	25%	24%	21%	28%	21%	9%
120	1%	2%	23%	15%	12%	28%	11%	12%	24%	13%	19%	24%	17%	15%	21%	21%	34%
105	0%	0%	0%	5%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%

Figure 13 - 2014 Heading-Use by Time

25

RUNWAY 17 DEPARTURE HEADING USE BY TIME PERIOD

2018



	22:00 - 5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00
300	5%	4%	1%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
260	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
220	5%	5%	3%	2%	2%	1%	3%	2%	1%	3%	2%	2%	2%	2%	3%	2%	3%
210	35%	21%	29%	30%	36%	23%	52%	25%	21%	45%	27%	29%	35%	46%	51%	28%	23%
185	17%	15%	9%	10%	9%	8%	10%	8%	9%	9%	7%	8%	7%	7%	9%	9%	10%
170	19%	21%	5%	6%	6%	6%	4%	6%	4%	3%	6%	5%	4%	3%	4%	4%	9%
155	9%	14%	12%	13%	11%	14%	8%	15%	16%	10%	15%	14%	13%	10%	10%	12%	13%
140	5%	11%	18%	25%	19%	24%	14%	25%	28%	18%	23%	25%	22%	18%	15%	23%	19%
120	4%	8%	21%	13%	15%	23%	8%	19%	21%	11%	20%	15%	16%	14%	8%	22%	21%
105	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%

Figure 14 - 2018 Heading-Use by Time

26

6. AEDT Noise Model Data

The Federal Aviation Administration Office of Environment and Energy (FAA-AEE) recognizes that the environmental consequences stemming from the operation of commercial aviation – primarily noise, emissions, and fuel consumption – are highly interdependent and occur simultaneously throughout all phases of flight. The Aviation Environmental Design Tool (AEDT) is a software system that is designed to model aviation related operations in space and time to compute noise, emissions, and fuel consumption. AEDT evaluates noise and emissions impacts from aircraft operations using data inputs such as runway-use, flight tracks, aircraft fleet mix, aircraft performance and thrust settings, topography information, and atmospheric conditions to generate noise contours depicting an annualized average day of aircraft noise impacts. Quantifying aircraft-specific noise characteristics in AEDT is accomplished by employing a comprehensive aircraft noise database developed under the auspices of Federal Aviation Regulation (FAR) Part 36. As part of the airworthiness certification process, aircraft manufacturers are required to subject aircraft to a battery of noise tests that document takeoff, sideline, and approach noise levels.

AEDT is the federally prescribed model required to develop the annual Day-Night Average Sound Level (DNL) contour, which is the basis for the MSP Annual Noise Contour Report and related noise mitigation program. While the focus on traditional AEDT modeling efforts is typically DNL contour, the software has the capability to produce alternate noise metrics.

The MAC maintains a system of 39 Remote Monitoring Towers (RMT). These RMTs are permanently installed and operate 24-hours per day in neighborhoods near MSP, to capture sounds from aircraft as they approach the airport or depart from the airport. Each RMT site consists of laboratory-quality noise monitoring equipment that includes a noise analyzer, a preamplifier and a measurement microphone. This equipment undergoes annual calibration and certification by an independent accredited laboratory.

The analyzer in each RMT monitors noise levels continuously, utilizing slow response with A-weighting as directed by the Federal Aviation Regulations (14 CFR Part 150). The analyzer is set to detect an event when the sound pressure level (SPL) reaches 65 dBA and records an event when the SPL remains at or above 63 dBA for at least eight seconds. These measured noise events are downloaded daily and correlated with flight tracks to determine whether the noise source was an aircraft event or a community event.

The MAC system of 39 RMTs is one of the most extensive aircraft noise monitoring systems in the world. The data collected provides important information about sound levels and aircraft activity in the areas where the monitors exist. To augment the permanent system, AEDT can be used to determine the modeled events at specific points around MSP that are not covered by an RMT.

MAC's Noise and Operations Monitoring System (MACNOMS) data for aircraft operations including aircraft type, aircraft track, aircraft altitude and operation time were input into the AEDT software for modeling. AEDT allows for multiple noise metrics to be used. In this evaluation, the number of noise events above 65 dBA (also referred to as "count above 65") was used to coincide with the MAC RMTs. Using a dense grid system, the model output displays how many times aircraft caused the sound pressure to rise above 65 dBA at various points throughout the community. To make the results applicable to this analysis, actual aircraft departures from Runway 17 over the course of the entire year in 2014 and in 2018 were modeled.

The MACNOMS total operations number is marginally lower than the operations number reported in the FAA's Operations Network (OPSNET). Additionally, MACNOMS does not contain necessary attributes for every aircraft that operated at MSP. Operations by unknown aircraft types were discarded as it would not be possible to model aircraft noise from an unknown type. In 2014 and 2018, there were .1% and .2% of operations with incomplete attributes respectively. To rectify the disparity between the MACNOMS data and FAA reported operations, the total data count was adjusted upwards by 1.2% for 2018 and 2.4% for 2014 to reflect the total reported by the FAA. After this adjustment was applied, the total departures modeled from Runway 17 in 2018 was 68,577 while the total number of departures modeled for 2014 was 48,273.

The results of the AEDT models are displayed in **Figure 15 - 2014 Runway 17 Departure Events Above 65 dB** and **Figure 16 - 2018 Runway 17 Departure Events Above 65 dB**. Given the more than 20,000 departure increase of aircraft using Runway 17 between 2014 and 2018, it is not surprising that the modeled events also increased in specific areas. Areas of eastern Bloomington and northwestern Eagan saw modeled events increase by more than 10,000 events. The modeled locations in eastern Richfield, eastern Bloomington, northeastern Burnsville, and western and central Eagan near I-35E and Pilot Knob had increased between 5,000 and 10,000 events.

Modeled sites in southern Savage, southwestern Burnsville, southeastern Apple Valley, far southeastern Eagan, northern Eagan, central and southern Inver Grove Heights all returned fewer modeled events in 2018 than in 2014.

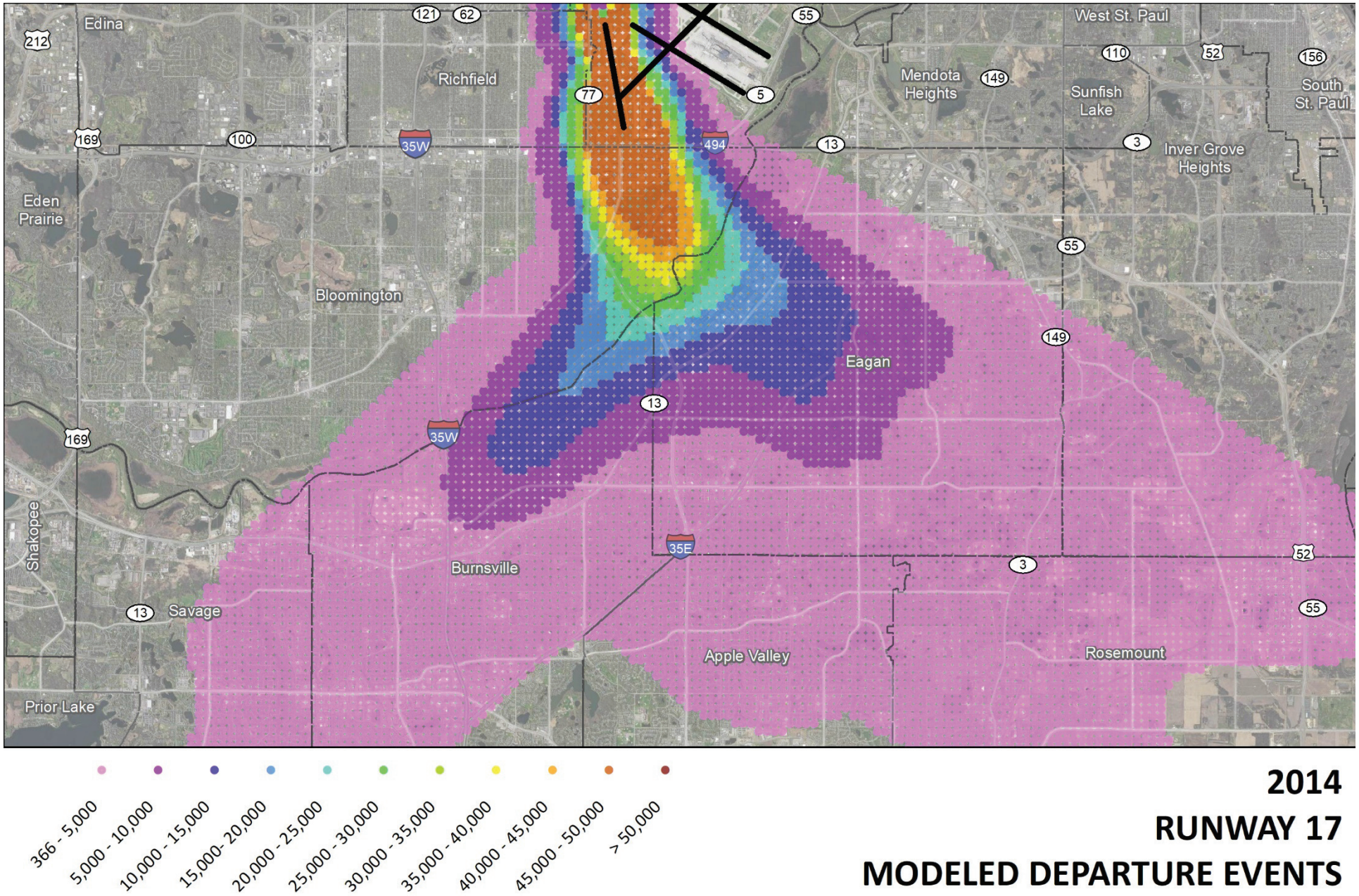


Figure 15 - 2014 Runway 17 Departure Events Above 65 dB

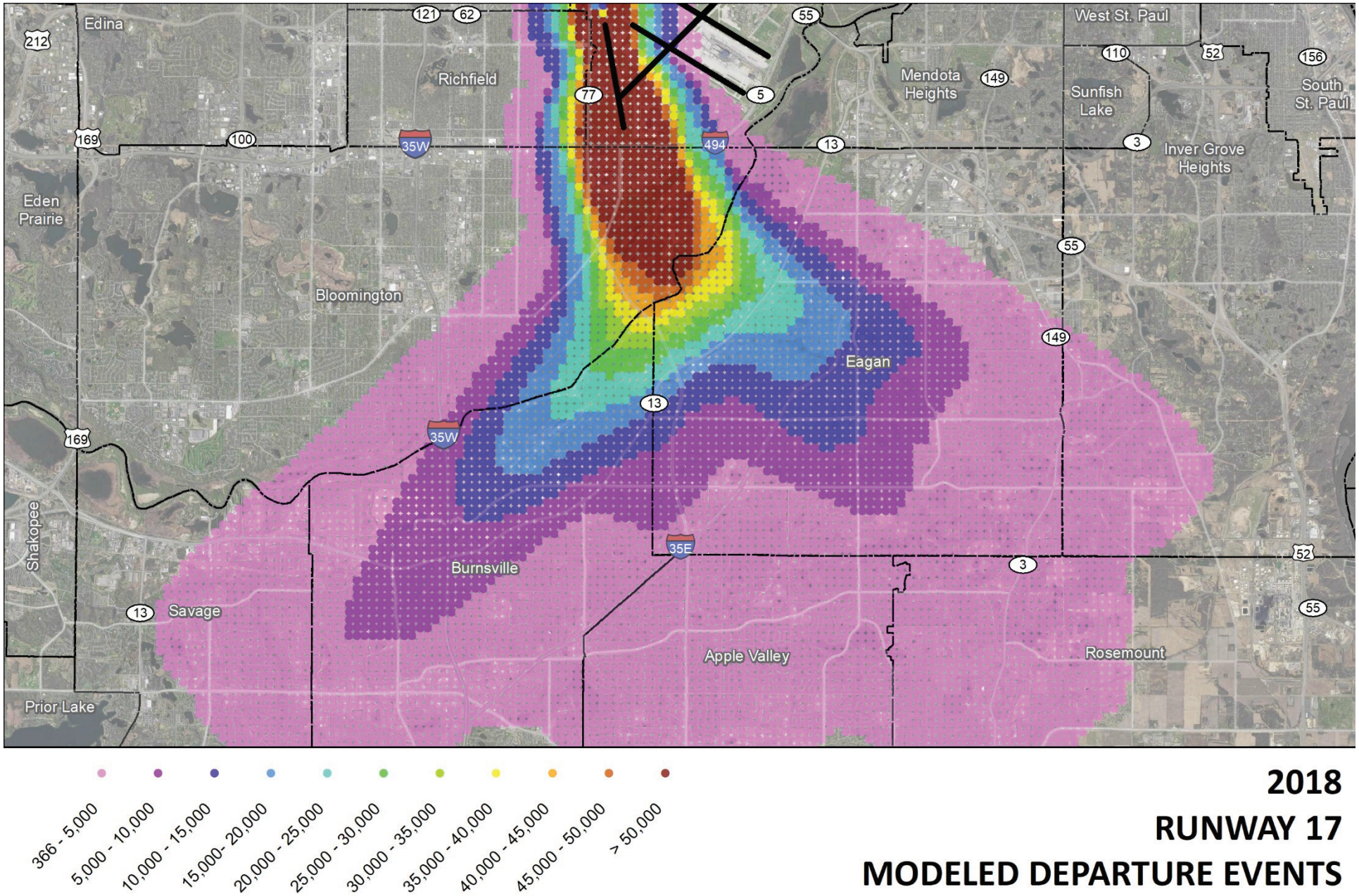


Figure 16 - 2018 Runway 17 Departure Events Above 65 dB

30

7. Land Use

One of the elements in the study scope was to investigate land use for areas that underlie typical Runway 17 departure paths to better understand which areas are compatible with aircraft operations at specific noise levels.

FAA regulations Part 150 – Airport Noise Compatibility Planning delineates compatible land uses from non-compatible land uses. Part 150 does that through the following two definitions:

> *"Compatible land use* means the use of land that is identified under this part as normally compatible with the outdoor noise environment (or an adequately attenuated noise level reduction for any indoor activities involved) at the location because the yearly day-night average sound level is at or below that identified for that or similar use under appendix A (Table 1) of this part.
>
> *Noncompatible land use* means the use of land that is identified under this part as normally not compatible with the outdoor noise environment (or an adequately attenuated noise reduction level for the indoor activities involved at the location) because the yearly day-night average sound level is above that identified for that or similar use under appendix A (Table 1) of this part."

The referenced Table 1 for Part 150, included for reference in this document in **Appendix E**, lists the land uses and associated Noise Level Reduction (NLR) recommended by the FAA for land uses within certain DNL levels. The Day-Night Average Sound Level (DNL) is the total accumulation of all sound energy spread uniformly over a 24-hour period. The DNL calculation applies a 10-decibel penalty on aircraft operations between 10:00 P.M. and 7:00 A.M. Examples of land uses above 65 dB DNL that would be considered noncompatible by this part include residential, mobile home parks, transient lodging, schools, outdoor music shells and amphitheaters. Hospitals, nursing homes and churches within the 65 dB DNL are considered generally compatible but the outdoor to indoor NLR of 25 dB should be achieved through incorporations of noise attenuation into the design and construction of the structure.

MetroGIS updates parcel data on a quarterly basis. The data is available via the Minnesota Geospatial Commons website. Parcel and associated land use data are supplied from the county where the parcel resides. Parcel data from April 2019 was acquired from the seven-county Minneapolis-St. Paul metro area and labeled as compatible or noncompatible using the criteria from FAR Part 150.

Figure 17 - Minneapolis-St. Paul Metropolitan Parcel Data provides a regional view of the land uses surrounding MSP. **Figure 18 - Parcel Data south of MSP** gives a closer view of the area South of MSP that are typically overflown by MSP Runway 17 Departures. **Figure 19 - Parcel Data with 2018 Runway 17 Departure Density** lays the 2018 Runway 17 Departure density data over the land use area to illustrate the land uses south of the airport that see the highest density of departures from Runway 17. The land use north and west of the airport are less compatible with aircraft overflights. The commercial area south of the airport and the Minnesota River to the south and west of MSP allows for more overflights with compatible land use. Additionally, areas southeast of MSP in Mendota Heights and Eagan have been zoned

to be more compatible with aircraft overflights. Because of these known land uses, numerous noise abatement procedures have been established to leverage these conditions. The Runway Use System prioritized runways that direct aircraft towards these areas. The 215° Departure Heading was designed to keep aircraft over the river. The Eagan-Mendota Heights Corridor procedure was also designed to contain aircraft over commercial and industrial land uses.

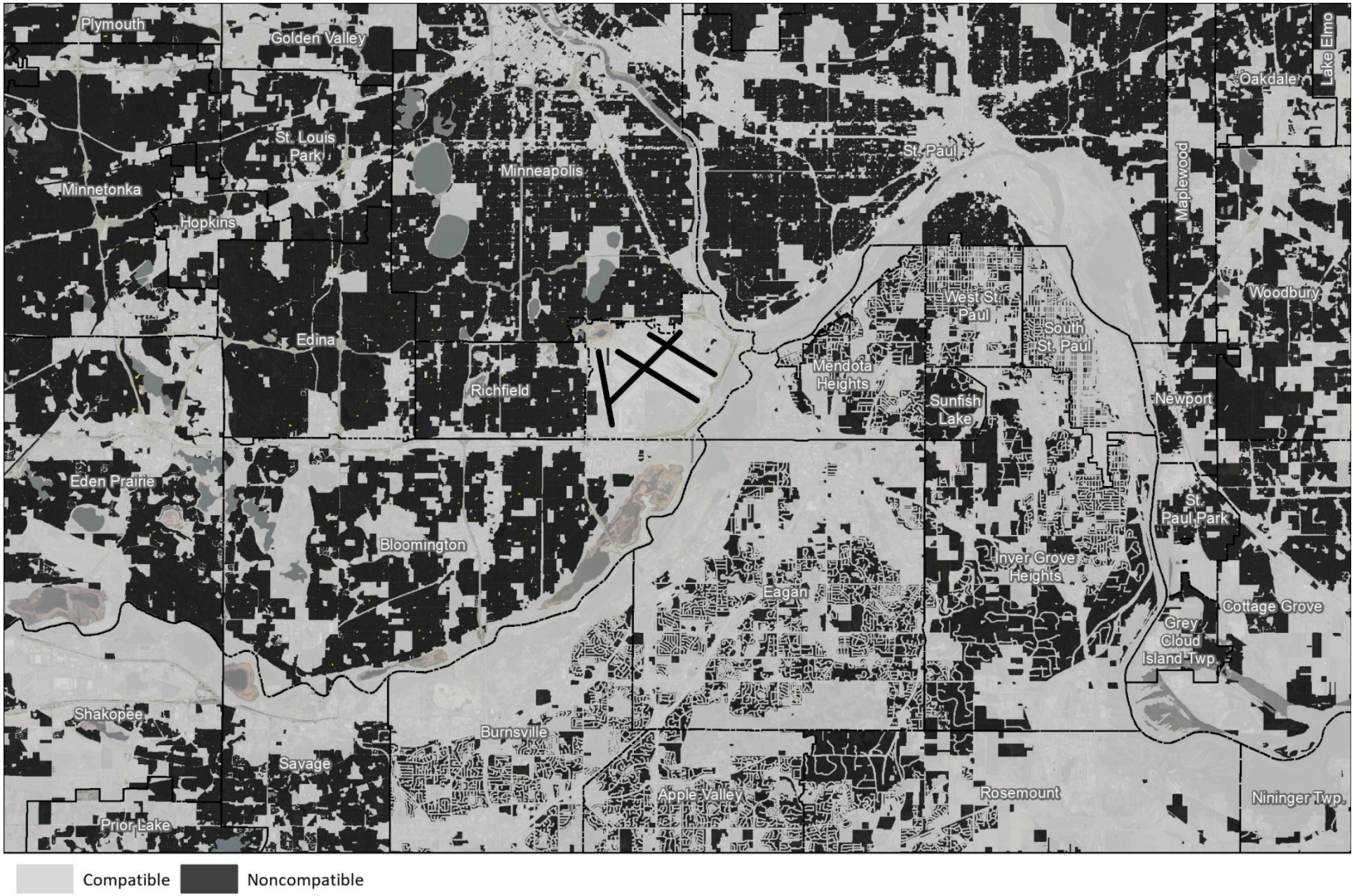


Figure 17 - Minneapolis-St. Paul Metropolitan Parcel Data

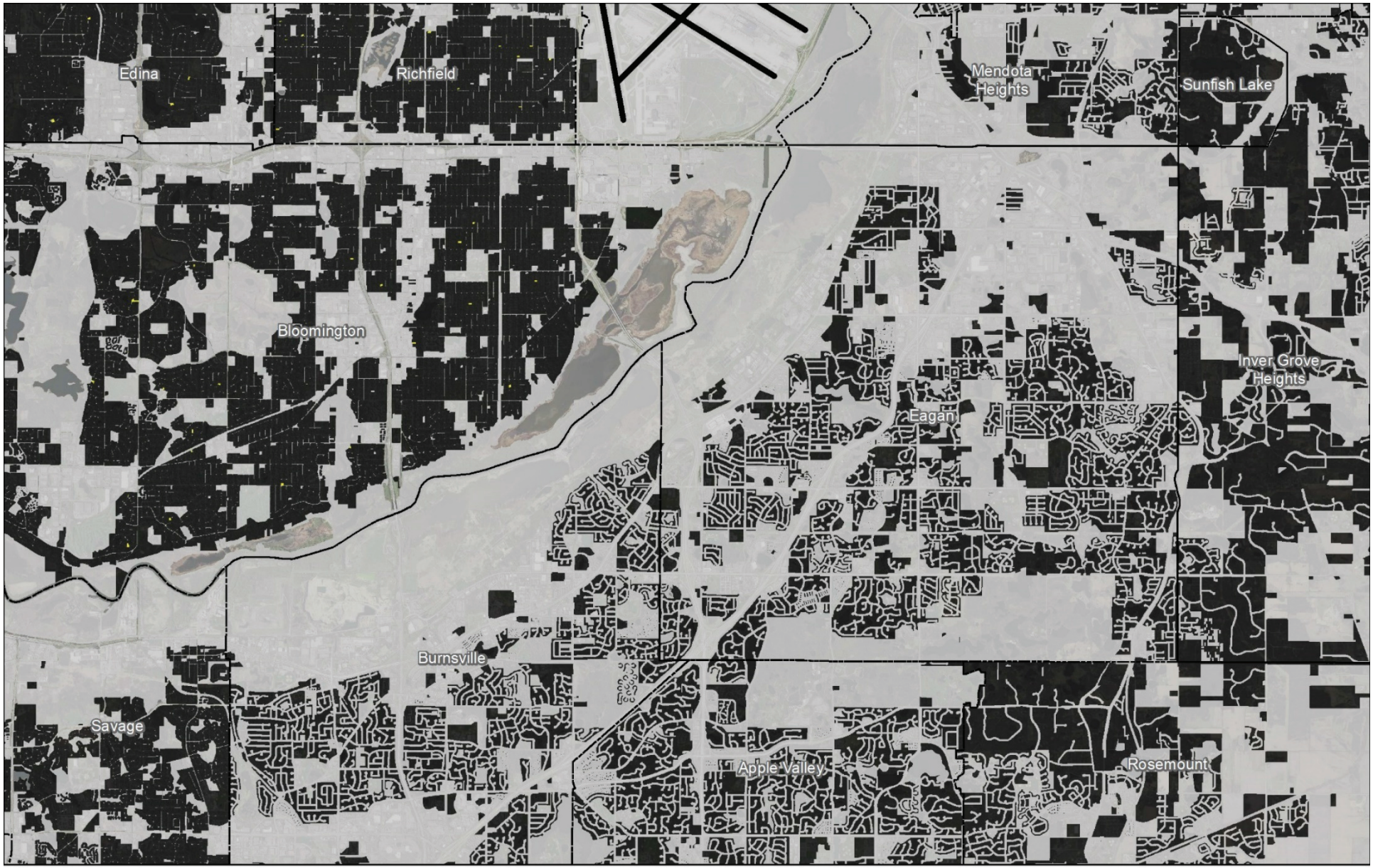


Figure 18 - Parcel Data south of MSP

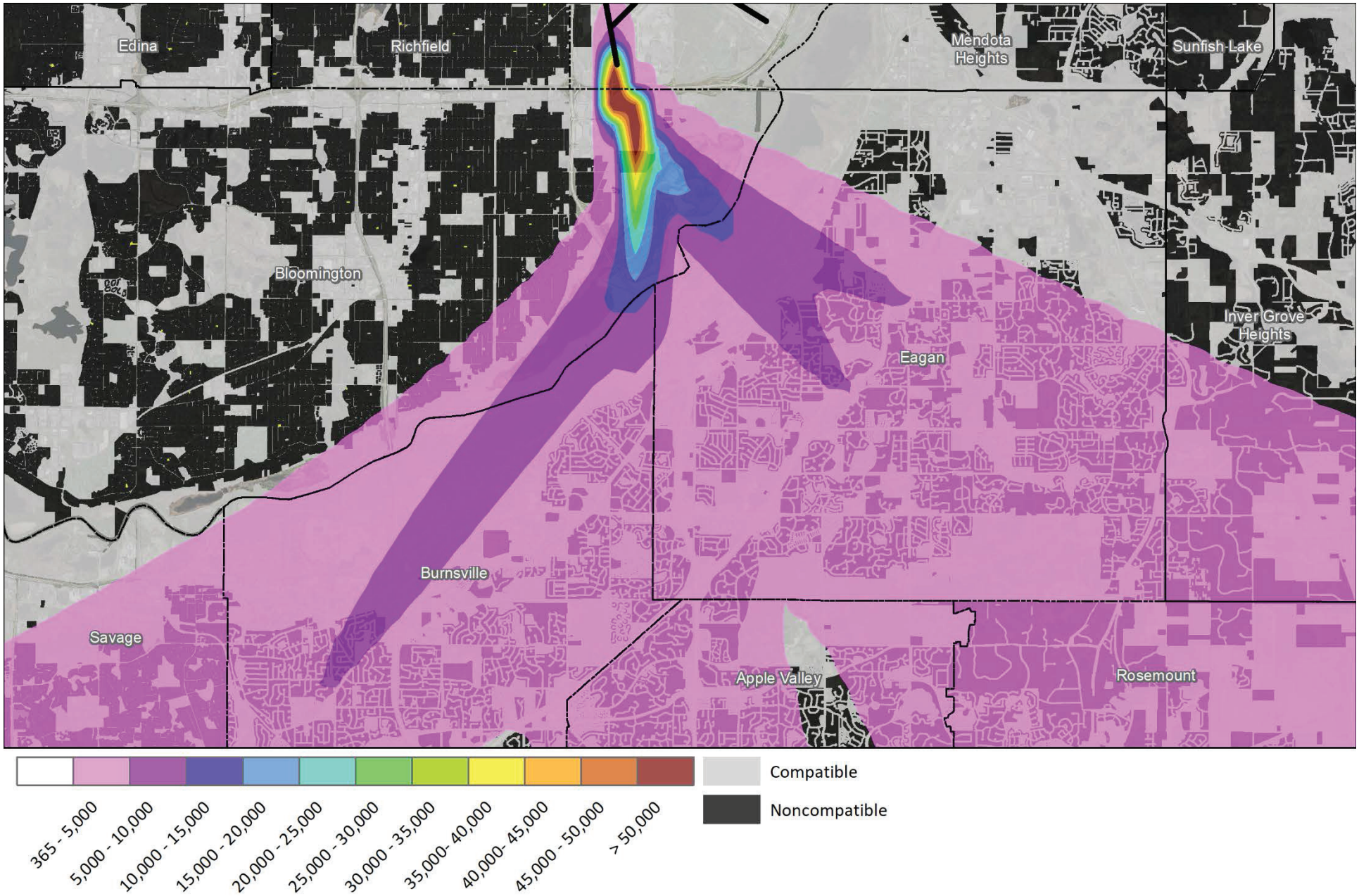


Figure 19 - Parcel Data with 2018 Runway 17 Departure Density

8. Runway 17 Departure Procedure Environmental Assessment

As discussed in Section 2, the construction of Runway 17 was the culmination of decades of planning by the MAC and extensive public involvement. This planning effort was done at the direction of the Minnesota Legislature to determine the long-term suitability of the airport's location. During the Dual-Track planning process, the Minnesota Legislature passed legislation that kept MSP in its current location rather than relocate it. Planning for MSP's future in its current location, the MAC began implementation of the 2010 Plan to ensure the facility provided an efficient and safe airport to meet forecasted air travel demands. One of the most visible components of the 2010 Plan was the construction of Runway 17-35. The Record of Decision on the Environmental Impact Statement that evaluated the 2010 Plan included consideration of future noise abatement procedures off of Runway 17. The *Environmental Assessment for the Implementation of a Departure Procedure off of Runway 17* (EA) was conducted and completed in 2003 as Runway 17-35 was being constructed.

The EA contains the following text in Section 3.2:

> The Proposed Action is to direct aircraft that have initial departure headings east of runway heading (headings ranging from 95° to 170°) to initiate their turns as soon as possible when departing Runway 17. This recommendation was made due to the fact that there is no one flight path considered "better" than another when departing to the southeast over the existing residentially developed areas. This is consistent with the FEIS documentation for Runway 17.
>
> When conducting the same evaluation for departure headings west of runway centerline (headings from 170° to 285°) two main considerations arose: (1) Heavily residential developed areas exist west of runway heading almost immediately off the runway end and (2) the Minnesota River Valley south of the airport offers an area where departure operations could overfly at higher altitudes in an effort to reduce residential overflight impacts close-in to the airport.
>
> A delayed turn point off runway heading (170°) for westbound jet departures offers a solution that not only reduces the number of residents within the 65 and 60 DNL contours, but is also feasible for implementation according to the FAA's airspace management and safety criteria.
>
> As a result of evaluations and comprehensive input as part of the 2000 MSP Part 150 Update process, the recommended Runway 17 departure tracks include departure turns, when able, for departures east of 170° to 95° and a 2.5 Nautical Mile (from the start of takeoff) Turn Point, as determined by Distance Measuring Equipment (DME), at which time jet departure operations would turn from runway heading (170°) to westbound departure headings between 171° and 285°.

This EA was completed prior to the opening of Runway 17-35. Assumptions were made to effectively conduct an evaluation of the airport operations prior to opening of the runway. Table 8-1 below shows the average daily operations that were projected in the 2003 EA. At the time, the airport was projected

to have a total of 1,5735.3 operations each day in 2005. Of those, 261.8 average daily operations were projected to be in Hushkit Stage 3 Jets, with 29.3 occurring at night. Hushkit Stage 3 Jets are older, louder aircraft such as the DC9 and B727 that have been "hushkitted" to meet the Stage 3 noise standard.

Table 8-1 – EA Average Daily Operations

Aircraft Type	Day	Night	Total
Manufactured to be Stage 3	924.7	137.6	1062.3
Hushkit Stage 3	232.5	29.3	261.8
Propeller	205.1	46.1	251.2
Total	**1362.3**	**213.0**	**1575.3**

Source: Environmental Assessment for the Implementation of a Departure Procedure off of Runway 17 Table A-1

Other assumptions in the 2003 EA were based on the number of flights operating on each runway. Table 8-2 below shows the projected runway use after Runway 17/35 opened in 2005.

Table 8-2 – Revised RUS Forecast 2005 Average Annual Runway Use

Runway	Arrival			Departure		
	Day	Night	Total	Day	Night	Total
4	0.1%	3.8%	0.5%	0.2%	0.4%	0.2%
22	0.5%	2.5%	0.7%	0.1%	0.8%	0.3%
12L	21.7%	17.8%	21.2%	9.5%	12.5%	9.9%
12R	14.6%	12.0%	14.3%	15.9%	18.6%	16.2%
30L	21.1%	24.2%	21.5%	14.8%	13.2%	14.5%
30R	25.5%	26.0%	25.5%	22.4%	19.9%	22.1%
17	0.1%	0.1%	0.1%	37.1%	34.6%	36.7%
35	16.6%	13.7%	16.2%	0.1%	0.1%	0.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Environmental Assessment for the Implementation of a Departure Procedure off of Runway 17 Table A-6

Tables 8-3 and 8-4 below details the average daily operations and runway use in 2018.

Table 8-3 – 2018 Average Daily Operations

Aircraft Type	2018 Day	2018 Night	2018 Total
Manufactured to be Stage 3	953.3	117.4	1070.8
Hushkit Stage 3	0.3	0.5	0.8
Propeller	38.3	2.3	40.5
Helicopter	0.1	0.0	0.1
Military	1.9	0.0	2.0
Total	**994.5**	**120.3**	**1,114.8**

Source: MACNOMS

Table 8-4 – 2018 Annual Runway Use

Runway	Arrival			Departure		
	Day	Night	Total	Day	Night	Total
4	0.0%	0.3%	0.1%	0.5%	1.0%	0.5%
22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
12L	22.2%	14.2%	21.3%	14.2%	18.6%	14.7%
12R	25.6%	27.5%	25.8%	4.1%	24.9%	6.2%
30L	24.8%	34.7%	25.9%	23.2%	25.0%	23.4%
30R	21.9%	16.6%	21.3%	21.6%	18.5%	21.3%
17	0.0%	0.6%	0.1%	36.3%	11.7%	33.8%
35	5.4%	6.1%	5.5%	0.0%	0.2%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: MACNOMS

The following tables provide the change from the 2003 EA assumptions to actual conditions in 2018. As shown in Table 8-5, the EA forecasted far more operations in 2005 than occurred in 2018. From an average day standpoint, there were 461.1 fewer operations in 2018 than were forecast for 2005. This equates to an annual reduction of over 168,000 operations. Additionally, there were far fewer propeller and Hushkit Stage 3 operations in 2018 than were forecasted in the EA. There were 261.8 Hushkit operations forecast and 2018 had less than one per day. Additionally, 251.2 propeller operations were expected in 2005, however MSP experienced only 41 per day in 2018.

Table 8-5 – EA vs. 2018 Average Daily Operations

Aircraft Type	Average Daily Operations						
	Day		Night		Total		Difference between EA and 2018
	2018	EA	2018	EA	2018	EA	
Manufactured to be Stage 3	953.3	924.7	117.4	137.6	1070.8	1062.3	8.5
Hushkit Stage 3	0.3	232.5	0.5	29.3	0.8	261.8	-261
Propeller	38.3	205.1	2.3	46.1	40.5	251.2	-210.7
Helicopter	0.1	0.0	0.0	0.0	0.1	0.0	0.1
Military	1.9	0.0	0.0	0.0	2.0	0.0	2.0
Total	**994.5**	**1362.3**	**120.3**	**213.0**	**1,114.8**	**1575.3**	**-461.1**

Runway-use also varied in 2018 from what was forecast for 2005, detailed in Table 8-6 and 8-7 below. The biggest differences in arrivals occurred on Runways 12R and 35. Runway 12R arrivals were forecast to be 14% in 2005 and were closer to 26% in 2018. Arrivals to Runway 35 were expected at 16% but were actually below 6%. For departures, the south parallel, Runway 12R-30L, saw the biggest differences. Runway 12R was expected to handle 16% of the departures but only took 6% in 2018. Runway 30L departures were expected to be just above 14% but actually were over 23% in 2018.

Table 8-6 – EA vs. 2018 Runway Use Percentages

Runway	Arrival			Departure		
	2018	EA	Change	2018	EA	Change
4	0.1%	0.5%	-0.4%	0.5%	0.2%	0.3%
22	0.0%	0.7%	-0.7%	0.0%	0.3%	-0.3%
12L	21.3%	21.2%	0.1%	14.7%	9.9%	4.8%
12R	25.8%	14.3%	11.5%	6.2%	16.2%	-10.0%
30L	25.9%	21.5%	4.4%	23.4%	14.5%	8.9%
30R	21.3%	25.5%	-4.2%	21.3%	22.1%	-0.8%
17	0.1%	0.1%	0.0%	33.8%	36.7%	-2.9%
35	5.5%	16.2%	-10.7%	0.0%	0.1%	-0.1%
Total	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**0.0%**

The change in percentage use of the runway does not fully capture the magnitude of the operational change. In 2003 when the EA was published, it was expected that there would be 574,985 operations at MSP when the runway opened in 2005. In 2018, there were only 406,913. Using the runway use percentages in Tables 8-2 and 8-5 in combination with the daily operations number from Tables 8-1 and 8-4 allows for the comparison of the actual change in operations from what was forecast in the EA to what occurred in 2018 in Table 8-9.

Table 8-7 – Runway Use Total Annual Operations

Forecast EA Runway Use	Runway	Arrival			Departure		
		Day	Night	Total	Day	Night	Total
	4	249	1,477	1,437	497	155	575
	22	1,243	972	2,012	249	311	862
	12L	53,950	6,919	60,948	23,619	4,859	28,462
	12R	36,298	4,665	41,111	39,531	7,230	46,574
	30L	52,459	9,407	61,811	36,796	5,131	41,686
	30R	63,398	10,107	73,311	55,691	7,736	63,536
	17	249	39	287	92,238	13,450	105,510
	35	41,271	5,326	46,574	249	39	287
	Total	**248,620**	**38,873**	**287,492**	**248,620**	**38,873**	**287,492**

2018 Actual Runway Use	Runway	Arrival			Departure		
		2018 Day	2018 Night	2018 Total	2018 Day	2018 Night	2018 Total
	4	0	66	203	907	220	1,017
	22	0	0	0	0	0	0
	12L	40,292	3,118	43,336	25,772	4,084	29,908
	12R	46,463	6,038	52,492	7,441	5,467	12,614
	30L	45,011	7,618	52,695	42,107	5,489	47,609
	30R	39,748	3,644	43,336	39,203	4,062	43,336
	17	0	132	203	65,883	2,569	68,768
	35	9,801	1,339	11,190	0	44	0
	Total	**181,496**	**21,955**	**203,457**	**181,496**	**21,955**	**203,457**

Difference	Runway	Arrival			Departure		
		Day	Night	Total	Day	Night	Total
	4	-249	-1,411	-1,234	410	64	442
	22	-1,243	-972	-2,012	-249	-311	-862
	12L	-13,658	-3,802	-17,612	2,154	-775	1,446
	12R	10,165	1,373	11,380	-32,089	-1,764	-33,959
	30L	-7,448	-1,789	-9,116	5,311	358	5,922
	30R	-23,650	-6,462	-29,974	-16,488	-3,674	-20,200
	17	-249	93	-84	-26,355	-10,881	-36,741
	35	-31,470	-3,986	-35,384	-249	5	-287
	Total	**-67,124**	**-16,918**	**-84,036**	**-67,124**	**-16,918**	**-84,036**

For purposes of modeling noise exposure and noise contour development, specific departure tracks must be developed and modeled. Although the headings assigned by the FAA are in 5-degree

increments from 095-degrees to 285-dgrees, the noise modeling in the EA only allowed backbone flight tracks representing specific headings to be evaluated.

Comparisons of a grouping of headings during 2018 and what was evaluated in the 2003 EA is shown below in Table 8-10. Some headings were grouped for comparison purposes. The headings of 105° or less were expected for 10% of all Runway 17 departure tracks but were flown by less than 1% of tracks in 2018. Headings 120° and 140° in 2018, saw an increase of 32% from the anticipated tracks in the EA. Headings between 170° and 200° were 34% below the assumptions in 2018. A similar amount of increase was seen in the 210° tracks. Usage on tracks in 2018 over 220° were 22% below what was forecast in the EA.

Table 8-8 – Flight Track Use Percentages

Track Heading	2018	EA	Change
<105°	0.4%	10.1%	-9.7%
120°	16.8%	0.0%	16.8%
140°	20.7%	5.1%	15.6%
155°-160°	12.5%	12.0%	0.5%
170°	5.4%	17.3%	-11.9%
185°-200°	8.8%	30.8%	-22.0%
210°	32.7%	0.0%	32.7%
>220°	2.9%	24.7%	-21.8%

The assumptions from the 2003 EA were made with sound judgement based on current operations at MSP. The assumptions in the previous tables were to be representative of conditions in 2005 when Runway 17-35 opened. The EA notes that the runway and flight track use results derived in the analysis are not absolutes. Variances will occur due to weather and safety, aircraft interactions. In the 15 years that have passed since the EA was completed numerous changes have occurred, not the least of which include the opening of Runway 17-35 and the actual use of the pavement for departures and how the departures interact with surrounding air traffic. On an annual basis, the MAC develops noise contour maps to assess the noise exposure from actual operations occurring the previous year. This allows variations in aircraft operations, fleet mix, runway use and flight track use to be consistently evaluated and considered for residential noise mitigation eligibility. Even with the increase in Runway 17 departures experienced in 2018 and the variation in flight track use presented above, the 2018 60 DNL noise contour does not extend south of the Minnesota River, nor does it extend beyond the MAC's residential noise mitigation program area.

9. Runway 17 Departure Altitude

Departure procedures are an important part of any discussion related to aircraft overflights. Because sound pressure travels as a wave, the distance away from a sound source is important. For aircraft overflights, that is a combination of lateral distance—i.e. distance along the ground—as well as altitude or distance above the ground. The Inverse-Square Law can be used a general rule of thumb in this instance. This axiom states that sound pressure will decrease by 50% as the distance away from a sound source doubles. Due to the logarithmic scale for sound, that equates to a six-decibel reduction for every doubling of distance. Because sound waves are impacted by atmospheric and physical environment conditions, measured values may not fully conform to this rule. To reduce the sound of aircraft, the flight track could be moved away from the receiver or the aircraft could be higher. Unfortunately, the laws of physics do not always allow for aircraft to be higher.

To conduct a reasonable comparison between aircraft departures before 2015 and departures after 2015 the study identified average departure altitudes at multiple measurement points along a track. Concentric rings centered on the start of takeoff roll from Runway 17 every mile between two miles and ten miles were used as measurement gates. **Figure 20 - Runway 17 Distance Measurement Rings** illustrates the location of those rings. The altitude of 44,795 carrier jet departures from 2014 and 63,454 carrier jet departures from 2018 at each gate were recorded and analyzed.

Weather conditions were also analyzed for 2014 and 2018, because altitude is dependent on temperature and wind conditions. Departure altitudes are more impacted by temperature and wind than arrival altitudes. As temperatures rise, altitudes will be lower. Similarly, strong headwinds will increase lift for departures, resulting in higher altitudes. The average temperature at MSP in 2014 was 43.1° Fahrenheit. That temperature increased in 2018 to an average of 46.6° Fahrenheit. Wind roses are presented in **Figure 21 - 2014 and 2018 Annual MSP Wind Rose**. During 2014, strong headwinds (over 10 mph out of a direction between 080° and 260°) occurred 20% of the time. During 2018, this was 18% of the time. Based solely on the warmer temperatures and weaker headwinds, it would be expected that average departure altitudes from Runway 17 would be lower in 2018 than 2014.

Figure 22 - Average RJ Departure Altitude and **Figure 23 - Average Narrowbody Departure Altitude** display the result of the comparison. Based on wind and temperature, the expectation that altitudes would be lower is realized. The small gap between the two years also is more pronounced as the aircraft continued away from MSP. For Regional Jets, the degree of altitude variation ranges from 41 feet to 199 feet, increasing as the aircraft travel further from the runway. The change also is noticeably pronounced in the narrowbody class of jet more than in the regional jet class. The difference in altitude from 2014 to 2018 is only 34 feet at two miles increasing to 462 feet at ten miles. Average altitudes for the top three most used aircraft types departing from Runway 17 in 2018 (Canadair Regional Jet 900, Boeing 737-800 and Canadair Regional Jet 200) are displayed in **Appendix F**.

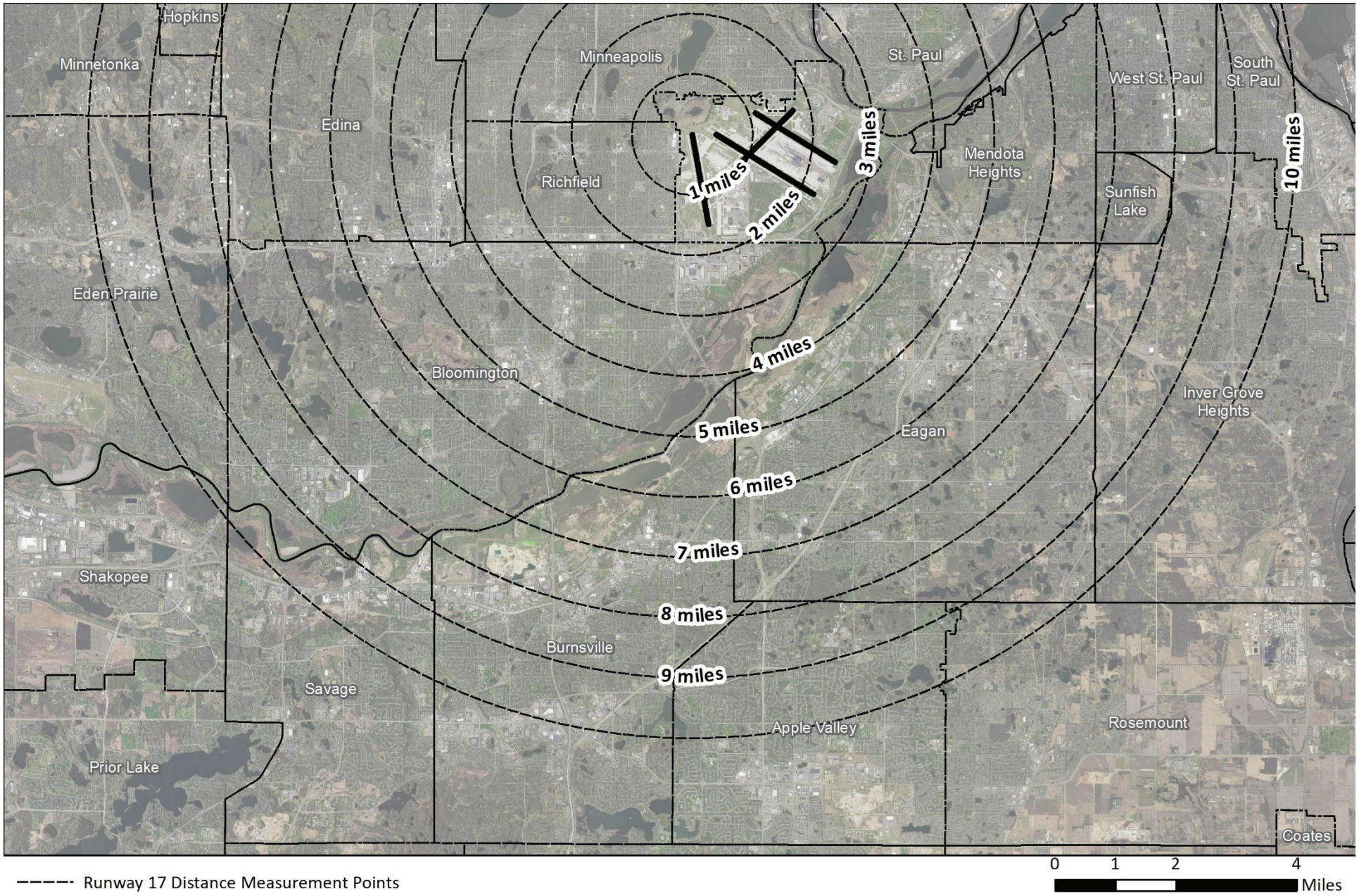
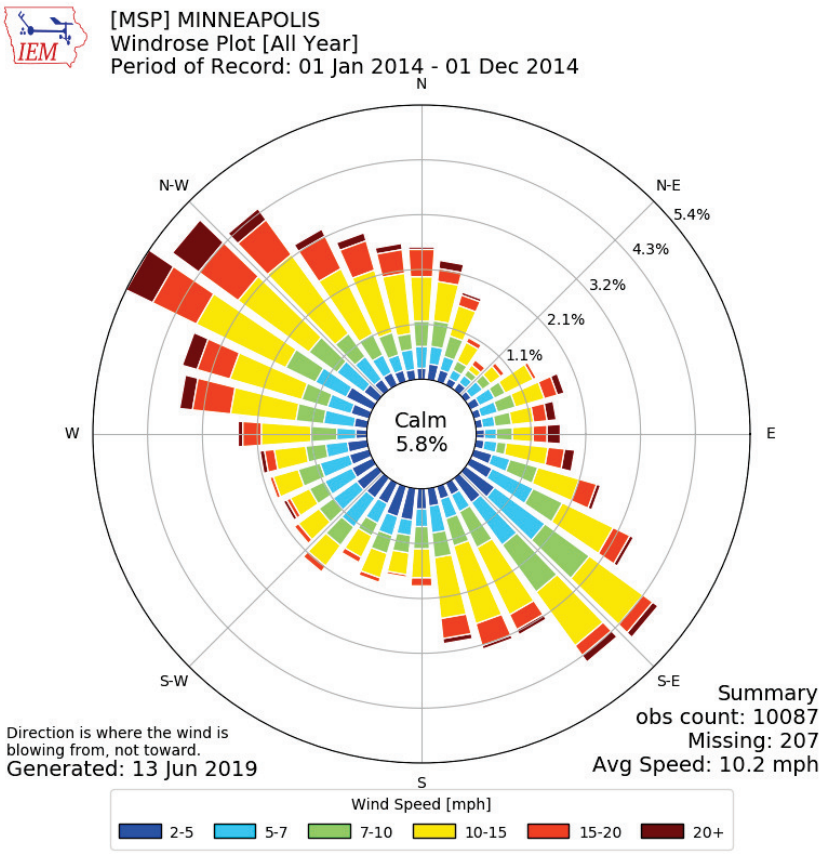


Figure 20 - Runway 17 Distance Measurement Rings



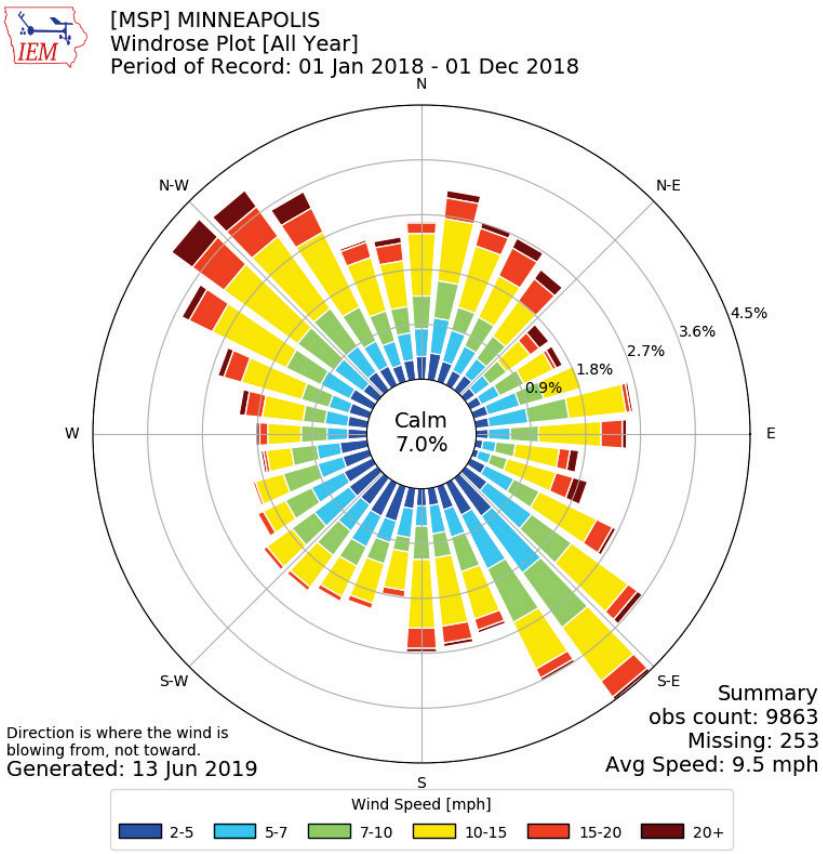


Figure 21 - 2014 and 2018 Annual MSP Wind Rose

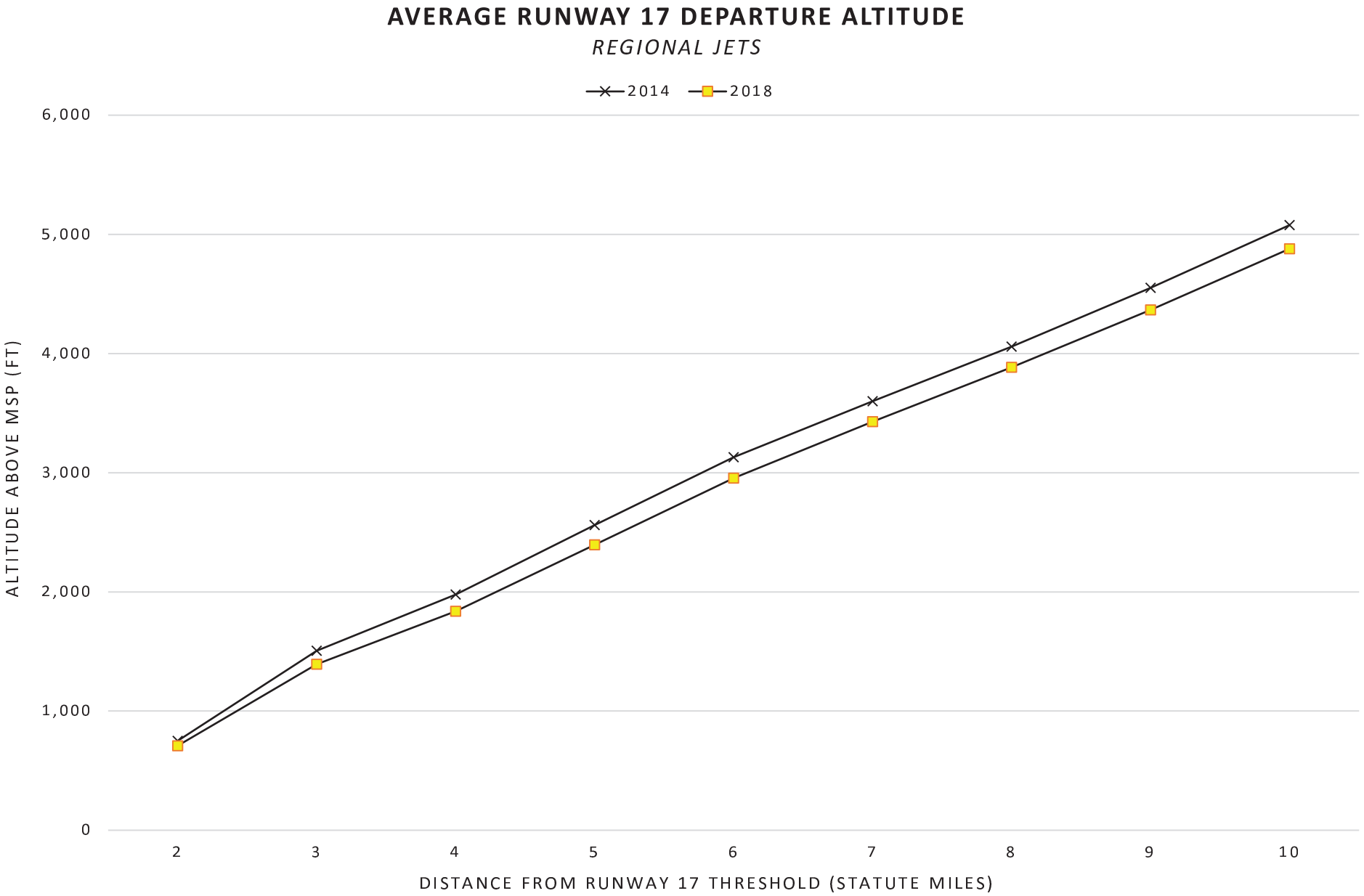


Figure 22 - Average RJ Departure Altitude

45

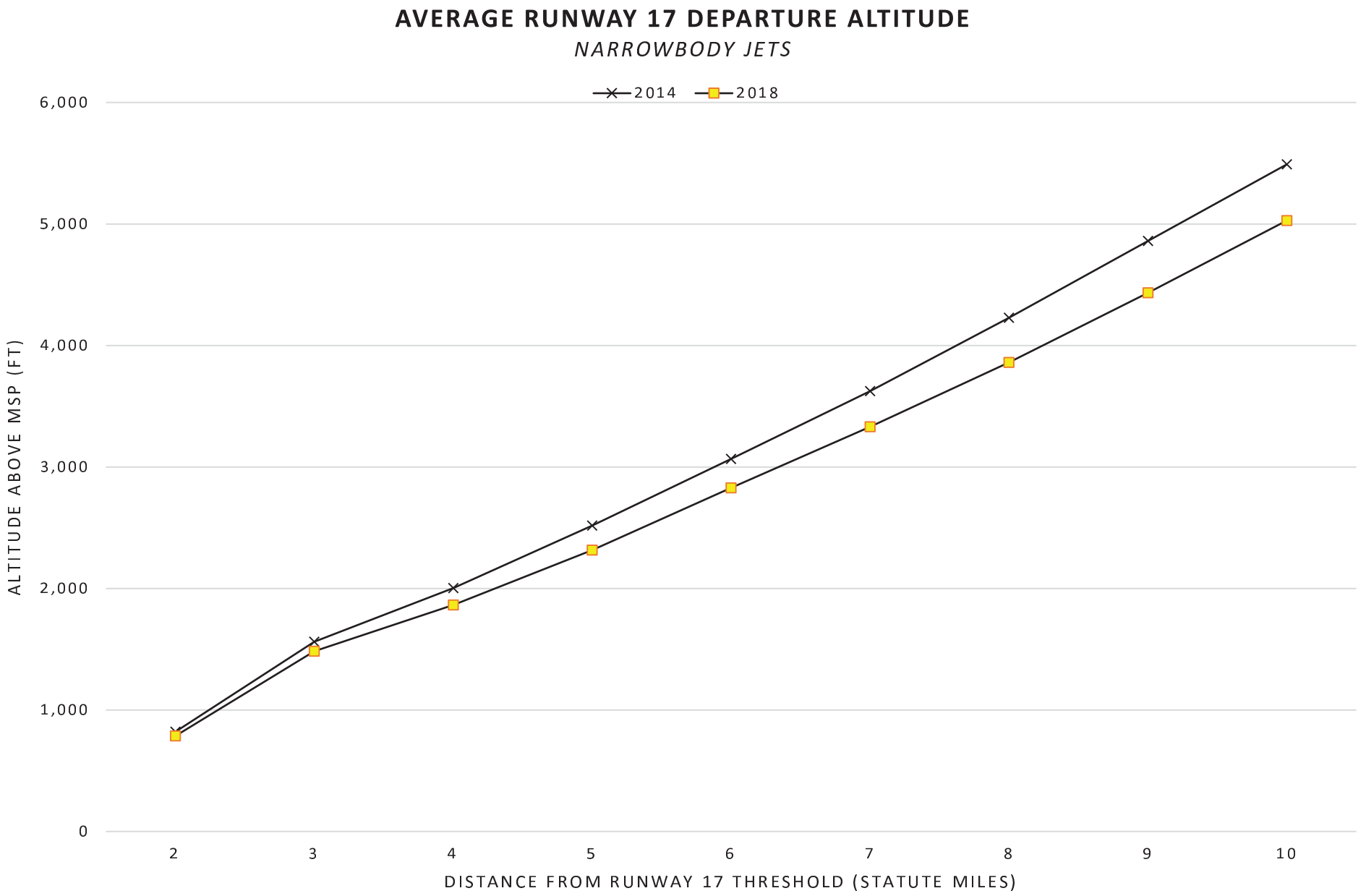


Figure 23 - Average Narrowbody Departure Altitude

APPENDIX

APPENDIX A

Runway 17 Departure Study Scope

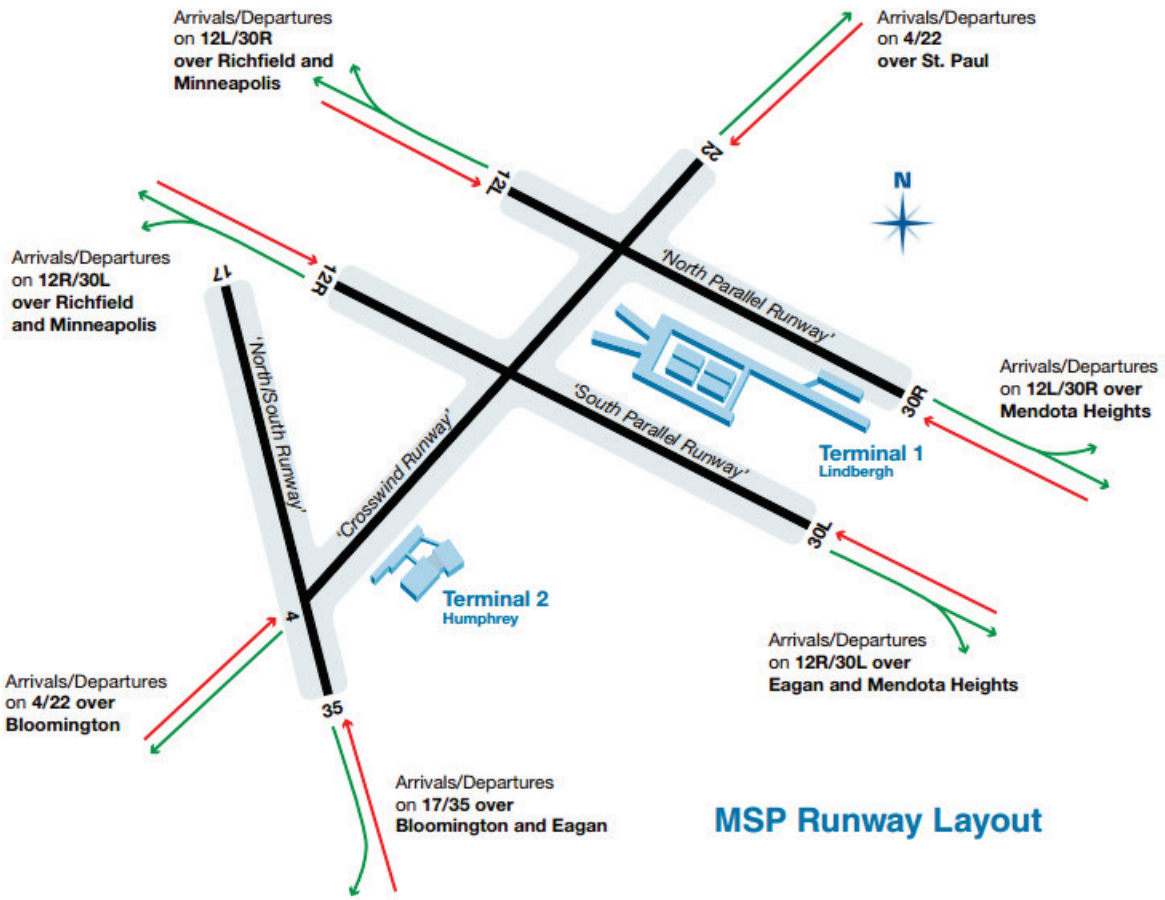
Objective: Working collaboratively with neighbors and communities south of the airport, the MAC will identify concerns related to Runway 17 Departures and compile a report that will identify operational necessities of Runway 17, highlight trends in the use of the runway and identify changes experienced post-CRO.

Report Outline

1. Executive Summary
2. Pre-CRO day vs. Post-CRO day
    a. How has a typical South Flow day changed?
        i. Daily peak hour trends
        ii. Past departure peaks and current departure peaks
        iii. Build a typical day for Runway 17 departures pre-CRO and compare it to a day post-CRO
    b. Successive Days in a South Flow
    c. Examine departure runway distribution during South Flow
3. Flight frequency
    a. Analyze 15 minutes segments and produce metrics highlighting the frequency of flights departing Runway 17. Compare pre-CRO to post-CRO
4. Headings
    a. Very few primary headings used
        i. Compare IFR vs VFR
        ii. Evaluate 105° and 170° departure headings
    b. Headings in Mixed Flow A vs. South Flow
    c. Provide data on aircraft destination by heading
    d. Highlight the use of headings by time of day
5. Noise Model Data
    a. Develop Count Above 65 dB density graphics for Runway 17 departures pre-CRO and post-CRO
6. Land Use
    a. Provide an overhead graphic of land use for areas that underlie typical Runway 17 departure paths. Categorize land uses as compatible or non-compatible
7. Runway 17 EA
    a. Compare and contrast assumptions made in the Runway 17 Departure Headings EA to 2018
8. Runway 17 Departure Altitude

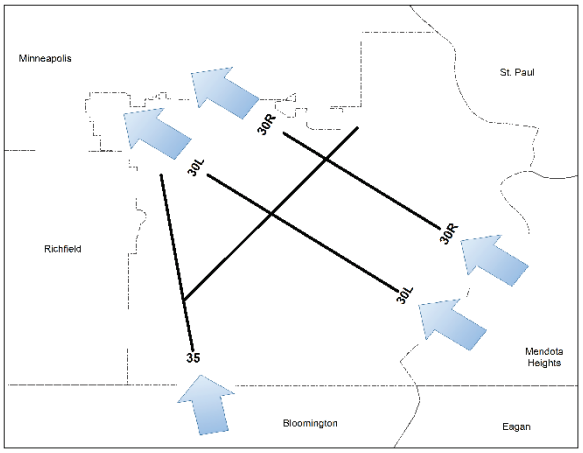
APPENDIX B

Runway Diagram

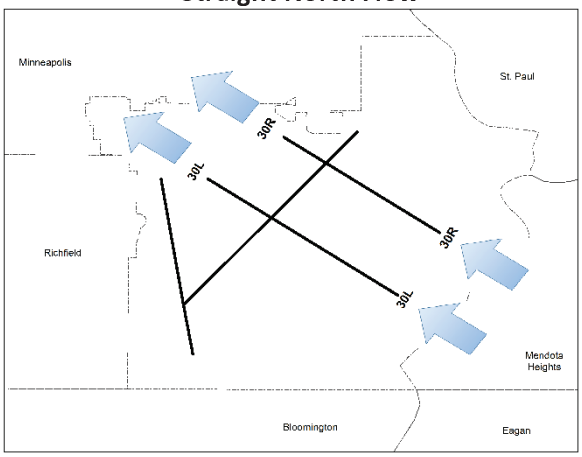


APPENDIX C
Airport Configurations

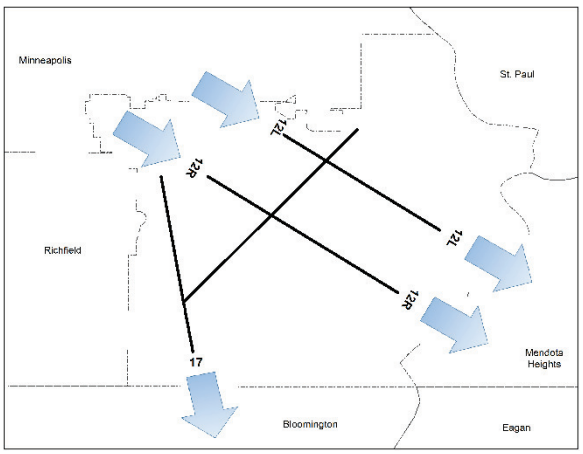
North Flow



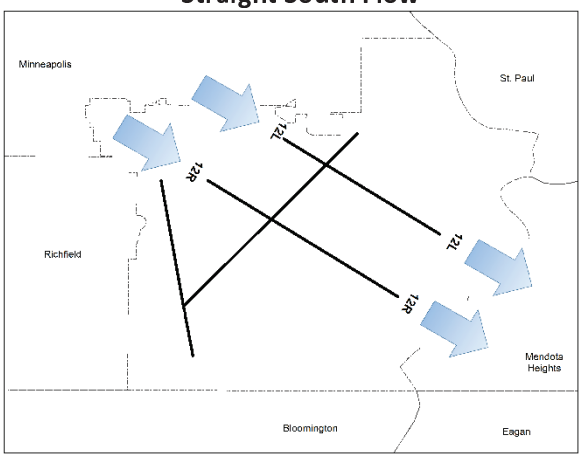
Straight North Flow



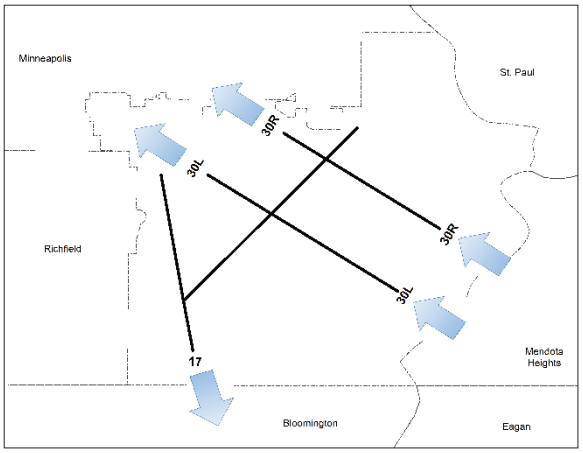
South Flow



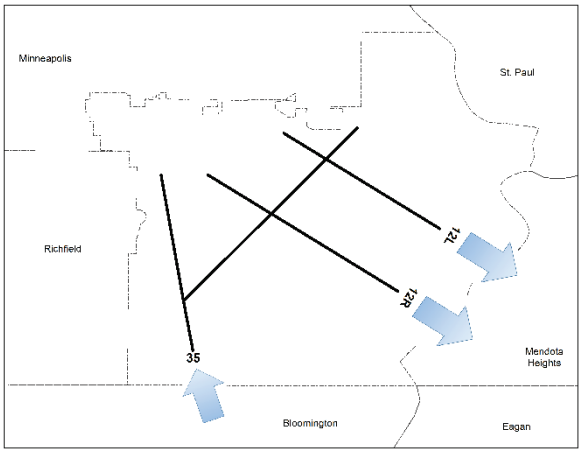
Straight South Flow



Mixed Flow A

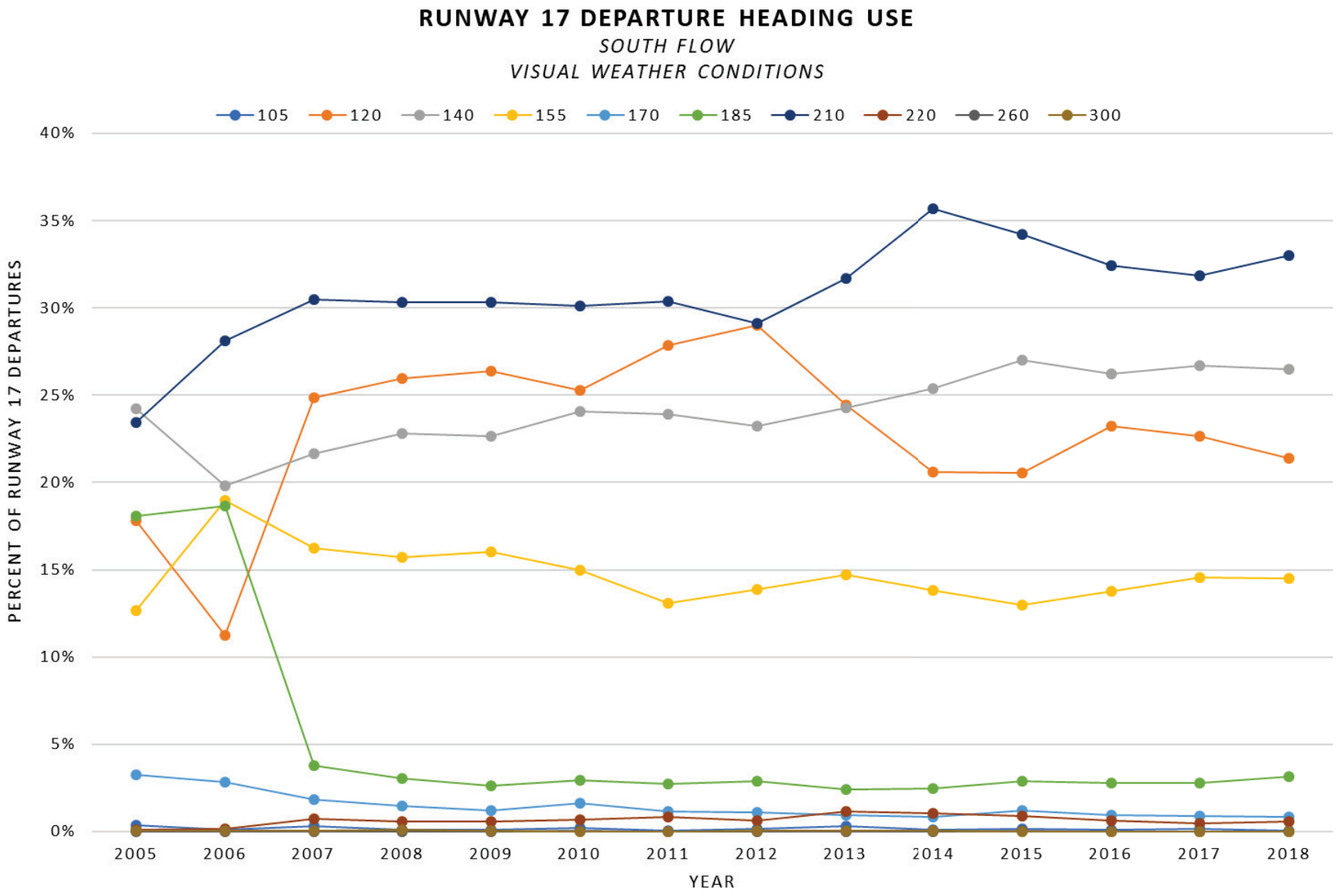


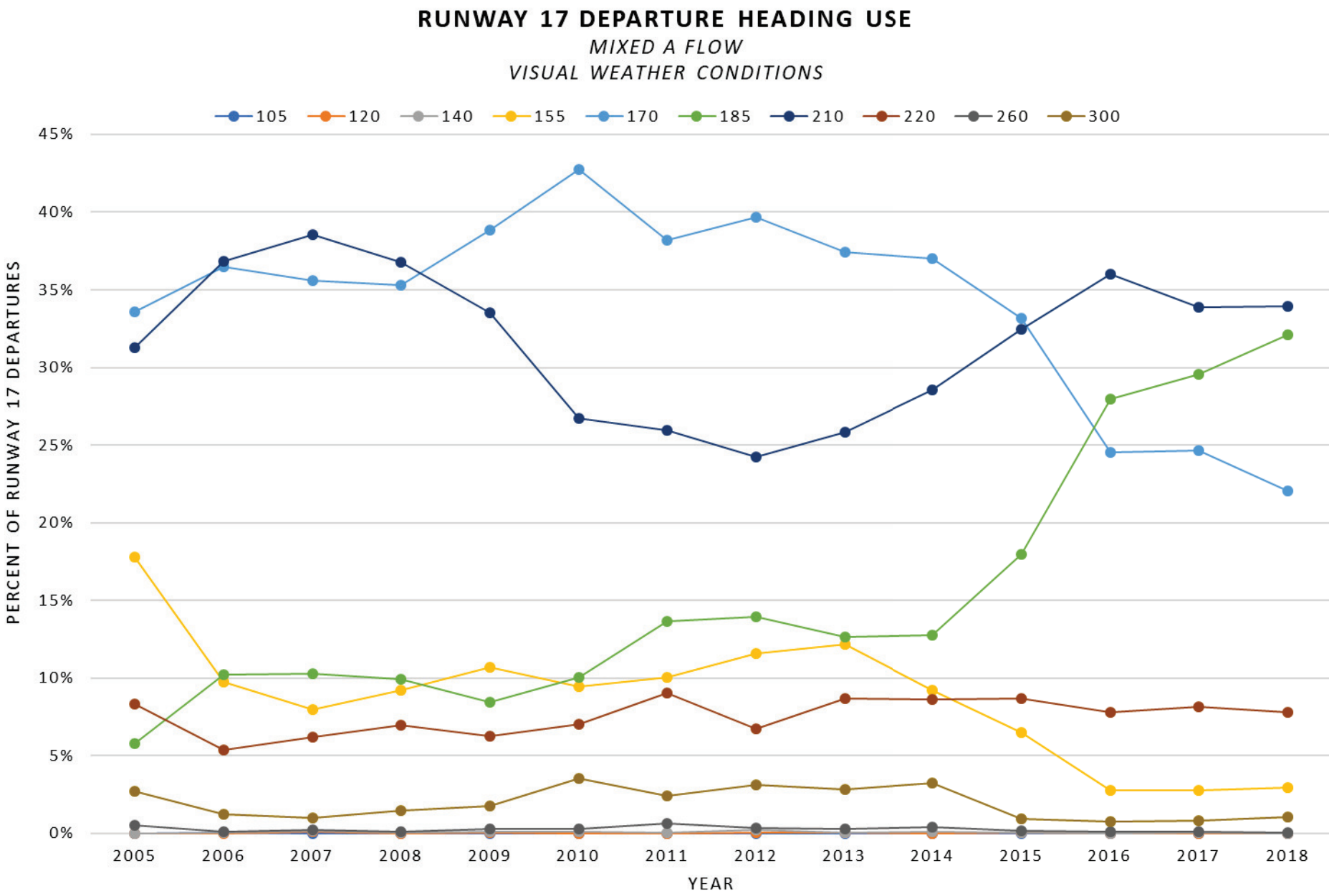
Mixed Flow B



Appendix D

Runway 17 Departure Heading Usage



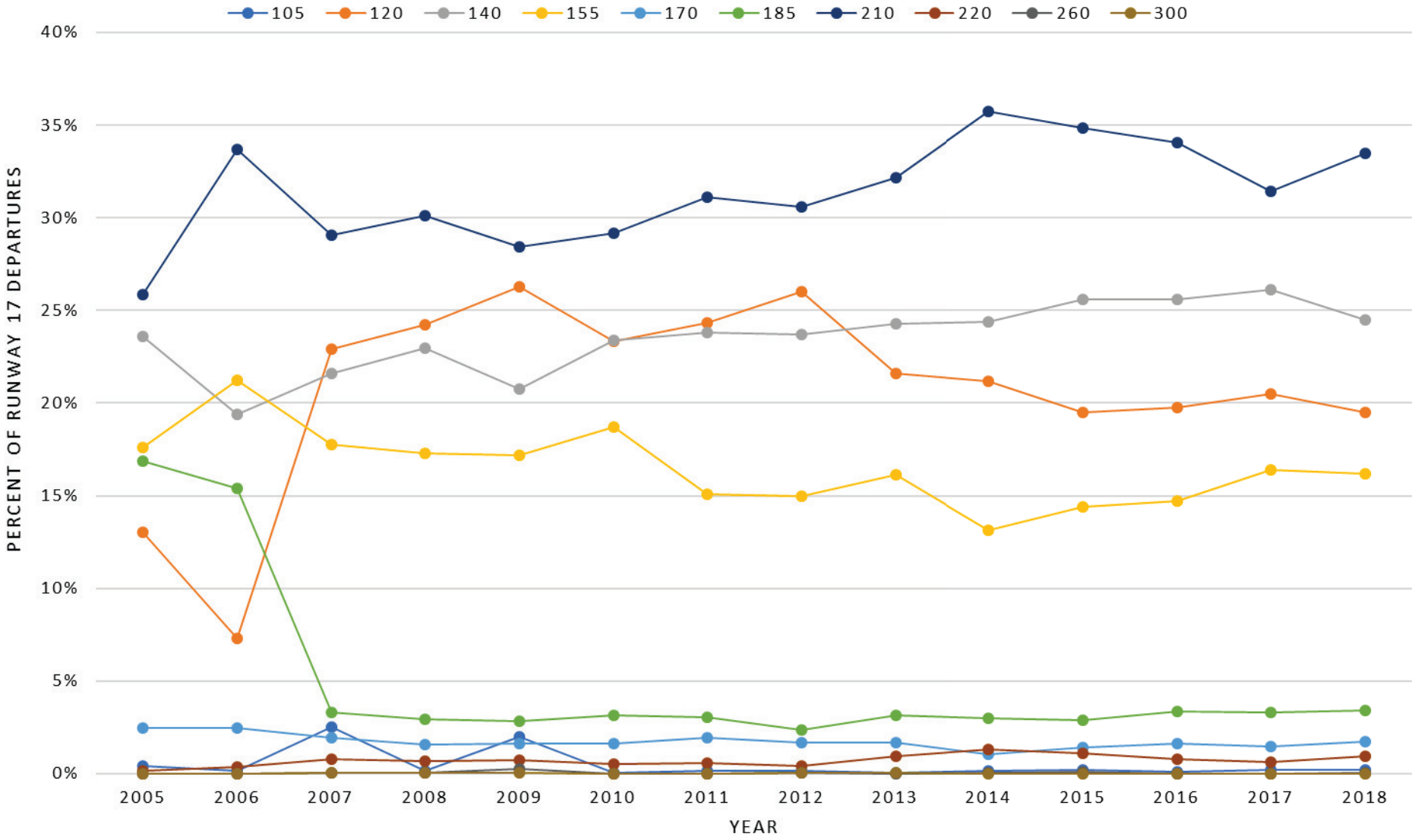

RUNWAY 17 DEPARTURE HEADING USE
MIXED A FLOW
VISUAL WEATHER CONDITIONS
105
120
140
155
170
185
210
220
260
300
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
PERCENT OF RUNWAY 17 DEPARTURES
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
YEAR

52

RUNWAY 17 DEPARTURE HEADING USE

SOUTH FLOW

INSTRUMENT WEATHER CONDITIONS



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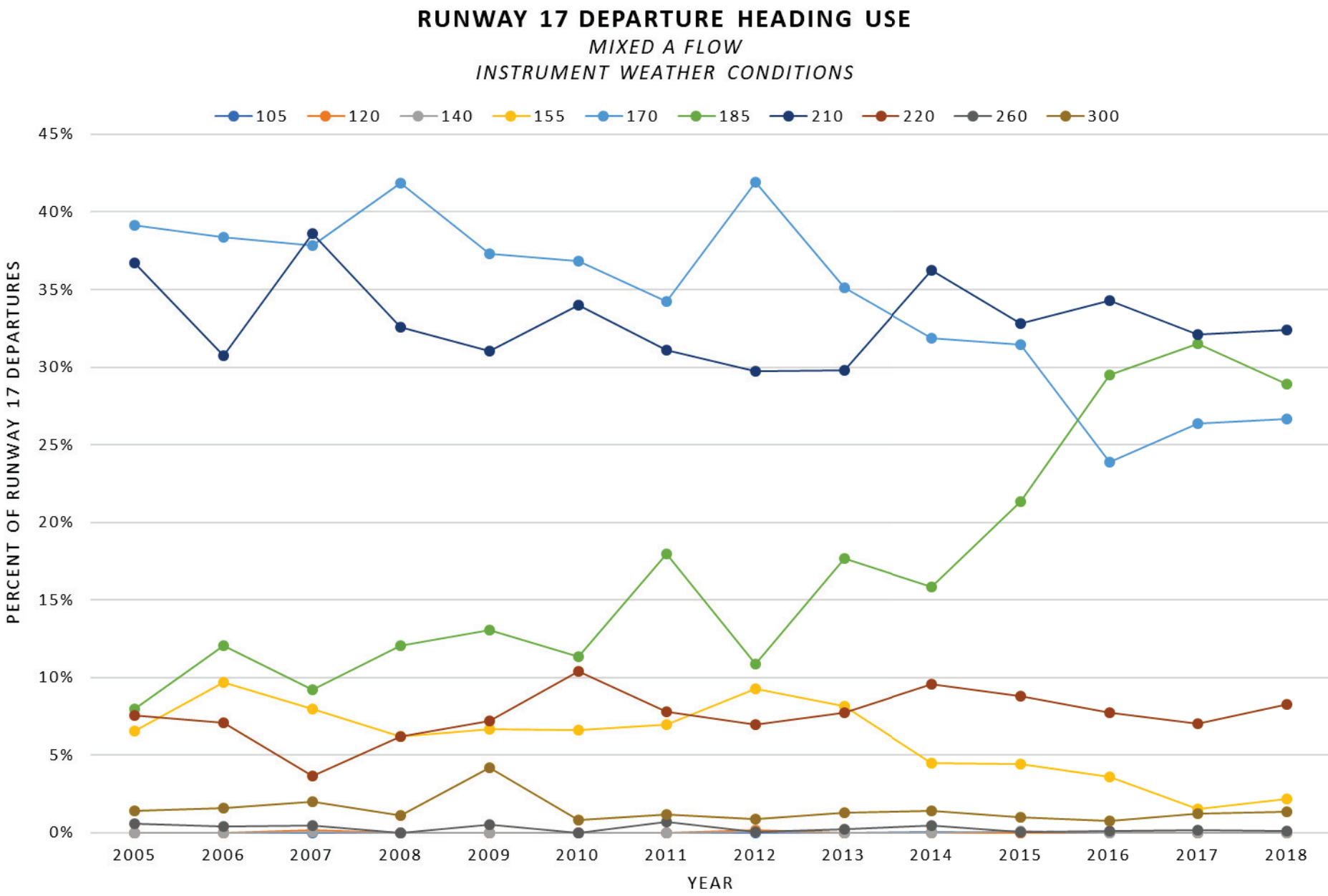
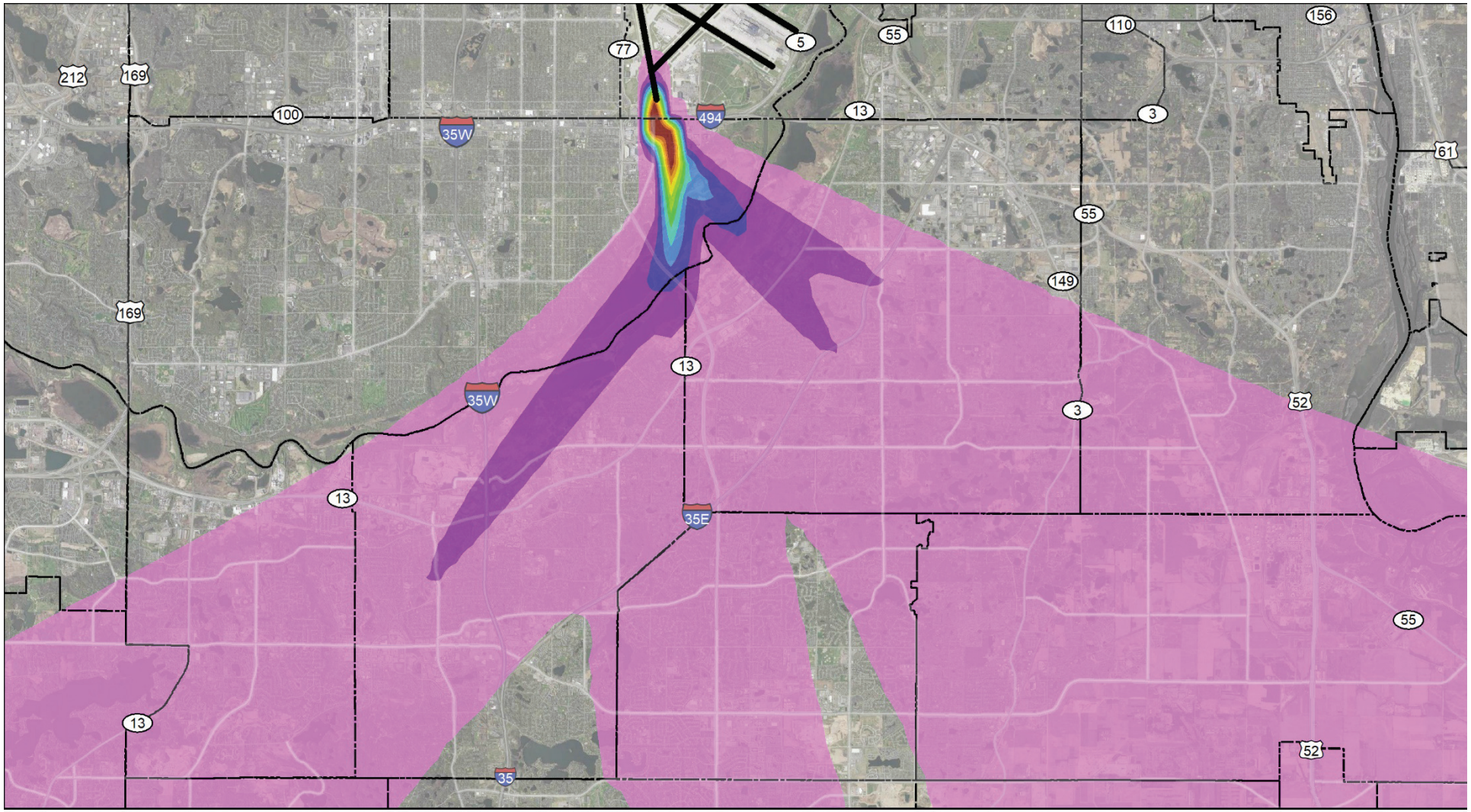
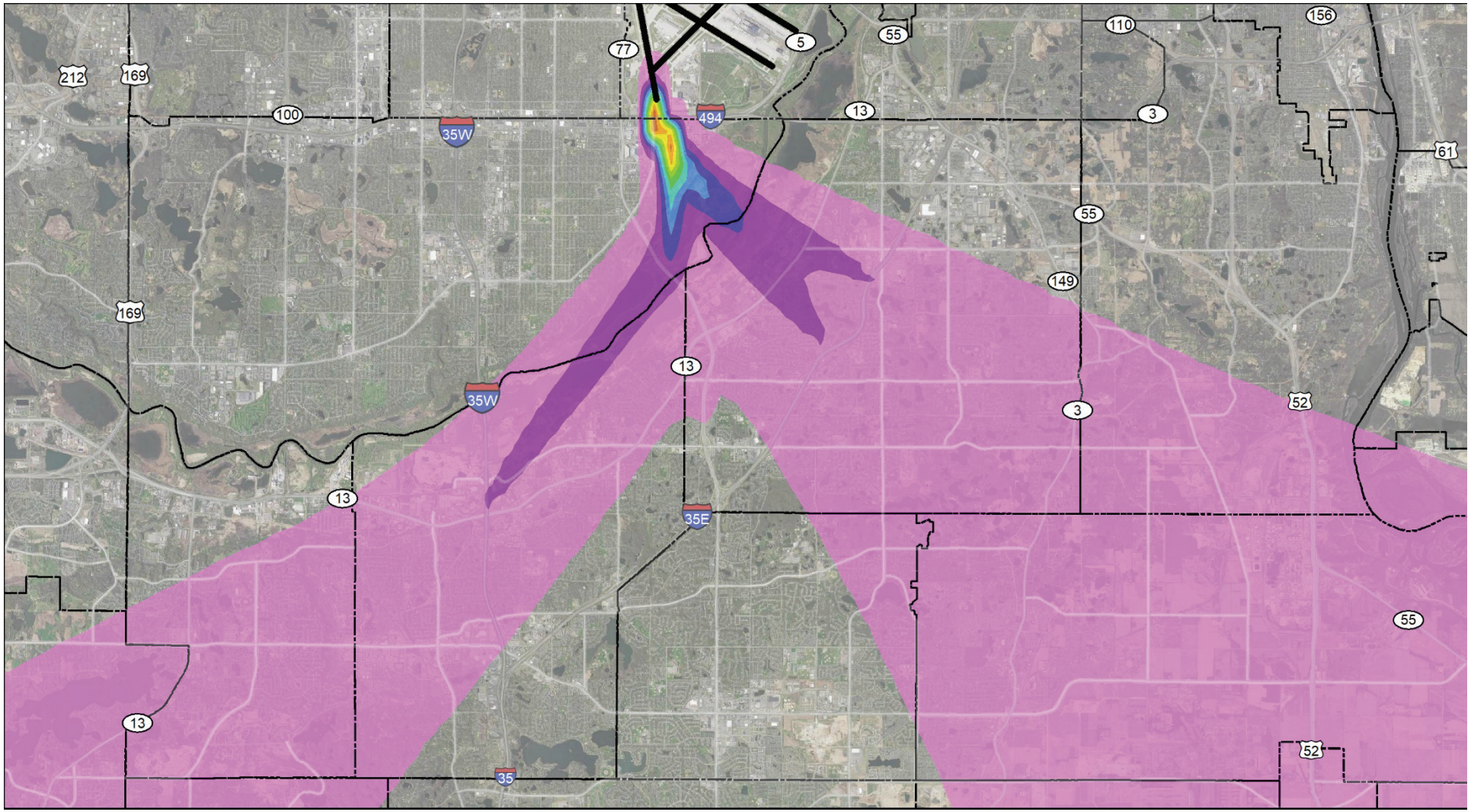

RUNWAY 17 DEPARTURE HEADING USE
MIXED A FLOW
INSTRUMENT WEATHER CONDITIONS
105
120
140
155
170
185
210
220
260
300
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
PERCENT OF RUNWAY 17 DEPARTURES
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
YEAR

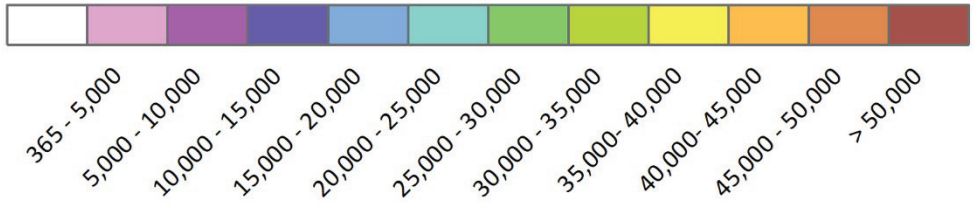


365 - 5,000
5,000 - 10,000
10,000 - 15,000
15,000 - 20,000
20,000 - 25,000
25,000 - 30,000
30,000 - 35,000
35,000- 40,000
40,000- 45,000
45,000 - 50,000
> 50,000

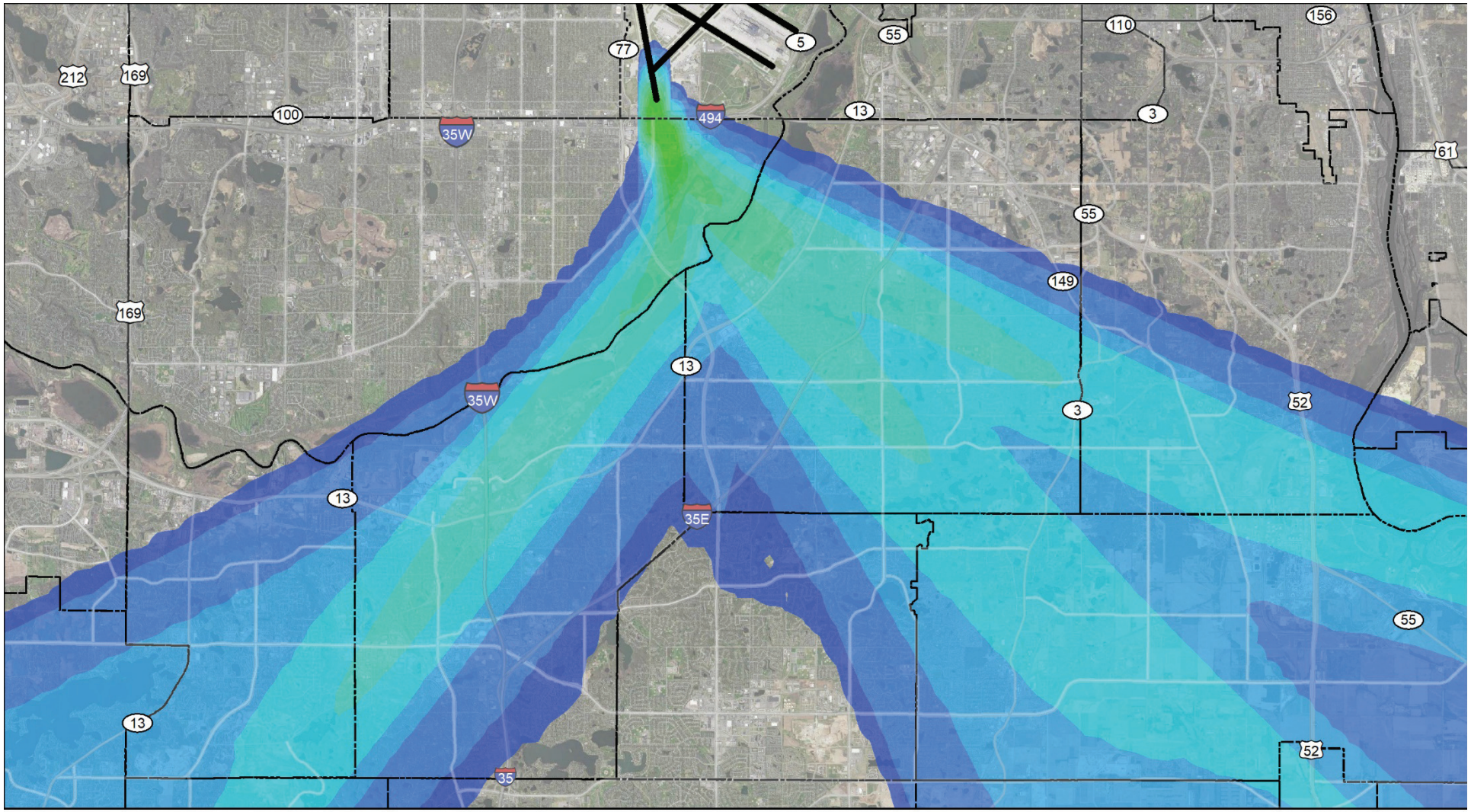
2018
ANNUAL RUNWAY 17
DEPARTURE DENSITY

55

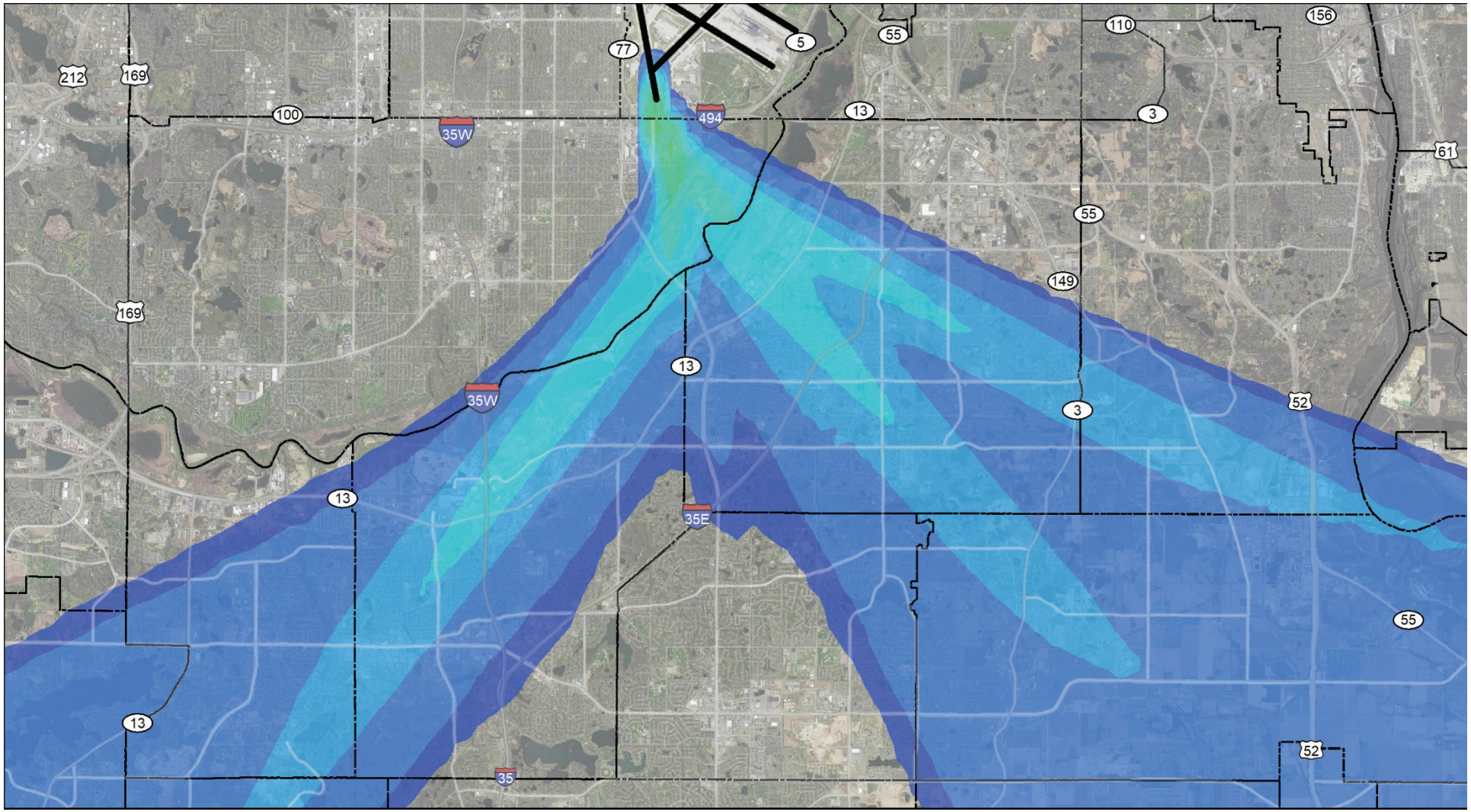




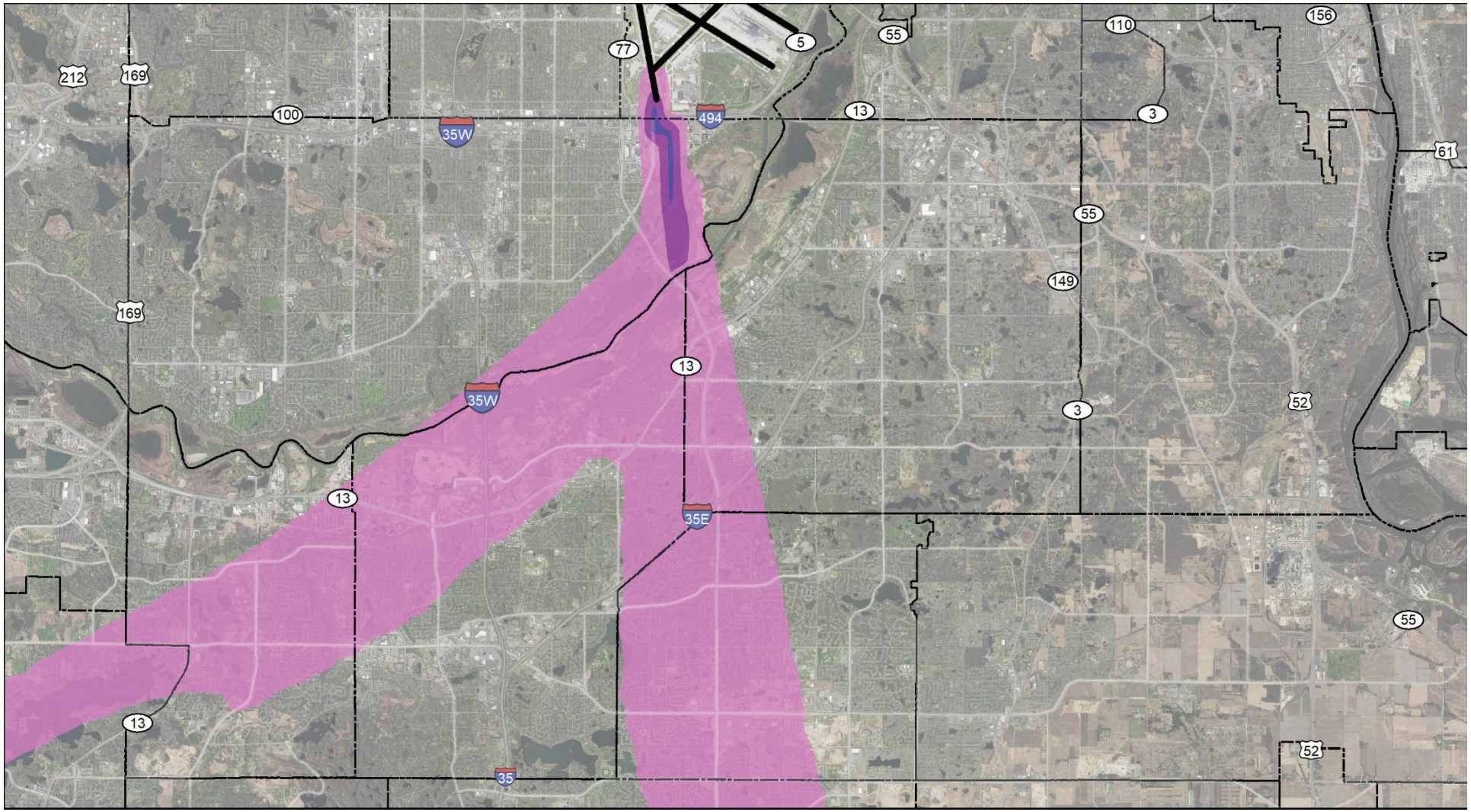
2018 ANNUAL RUNWAY 17 DEPARTURE DENSITY SOUTH FLOW



2018 ANNUAL RUNWAY 17 DEPARTURE DENSITY SOUTH FLOW VISUAL CONDITIONS

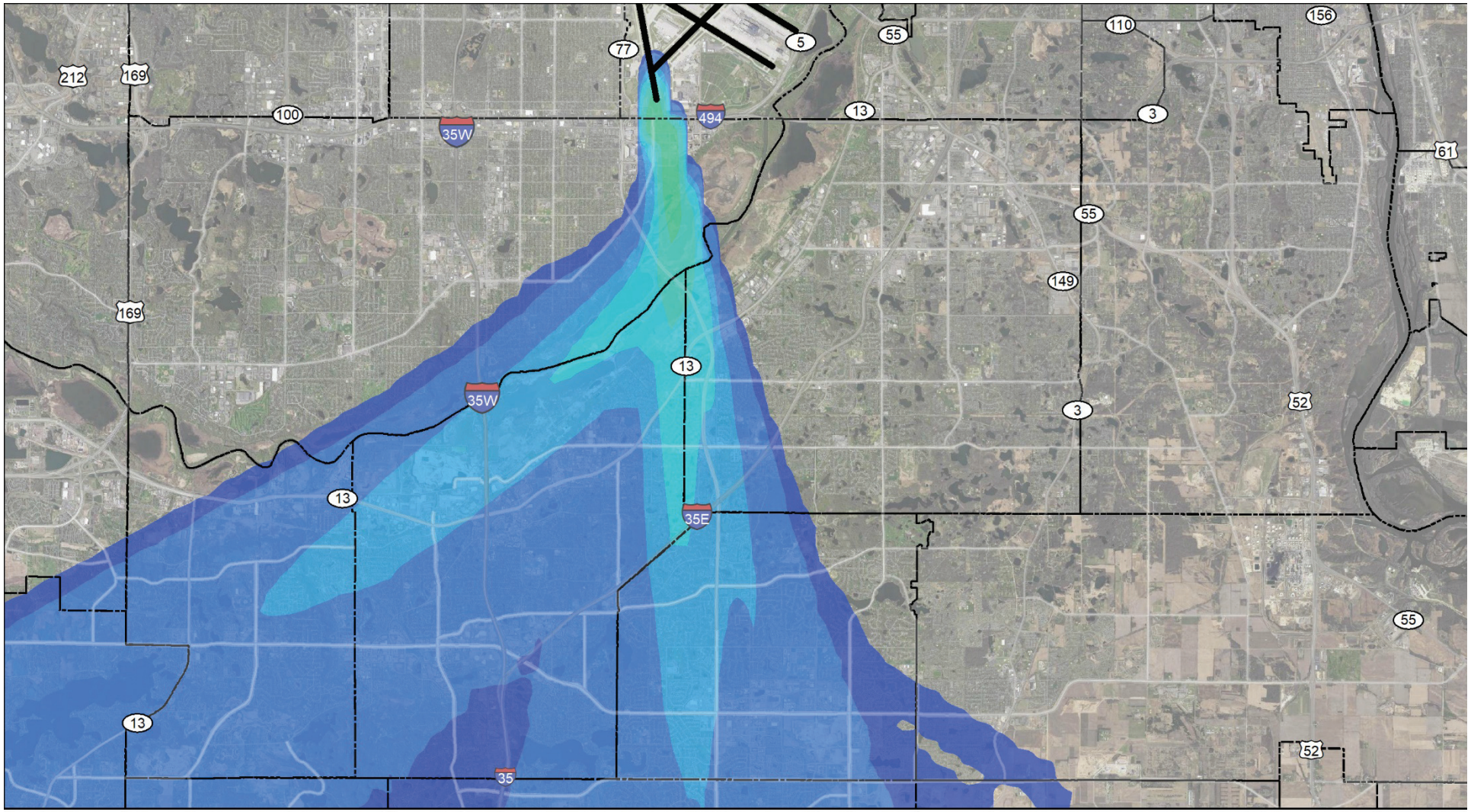


2018 ANNUAL RUNWAY 17
DEPARTURE DENSITY
SOUTH FLOW INSTRUMENT CONDITIONS

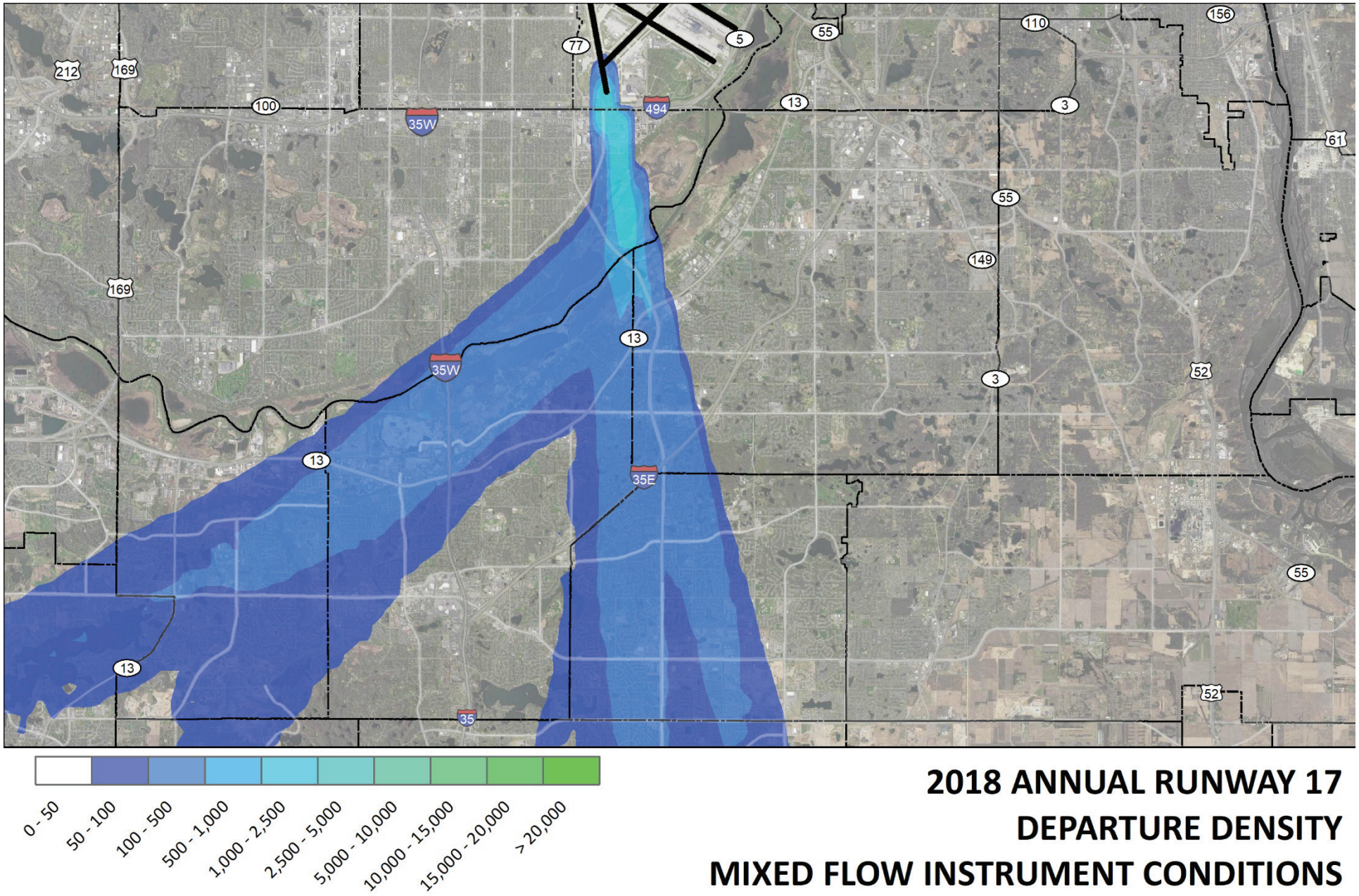


365 - 5,000
5,000 - 10,000
10,000 - 15,000
15,000 - 20,000
20,000 - 25,000
25,000 - 30,000
30,000 - 35,000
35,000- 40,000
40,000- 45,000
45,000 - 50,000
> 50,000

2018 ANNUAL RUNWAY 17 DEPARTURE DENSITY MIXED FLOW



2018 ANNUAL RUNWAY 17 DEPARTURE DENSITY MIXED FLOW VISUAL CONDITIONS



2018 ANNUAL RUNWAY 17
DEPARTURE DENSITY
MIXED FLOW INSTRUMENT CONDITIONS

61

APPENDIX E

FAR Part 150 Table 1—Land Use Compatibility* With Yearly Day-Night Average Sound Levels

Land use	Yearly day-night average sound level (L_{dn}) in decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
PUBLIC USE						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N

Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

*The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

KEY TO TABLE 1

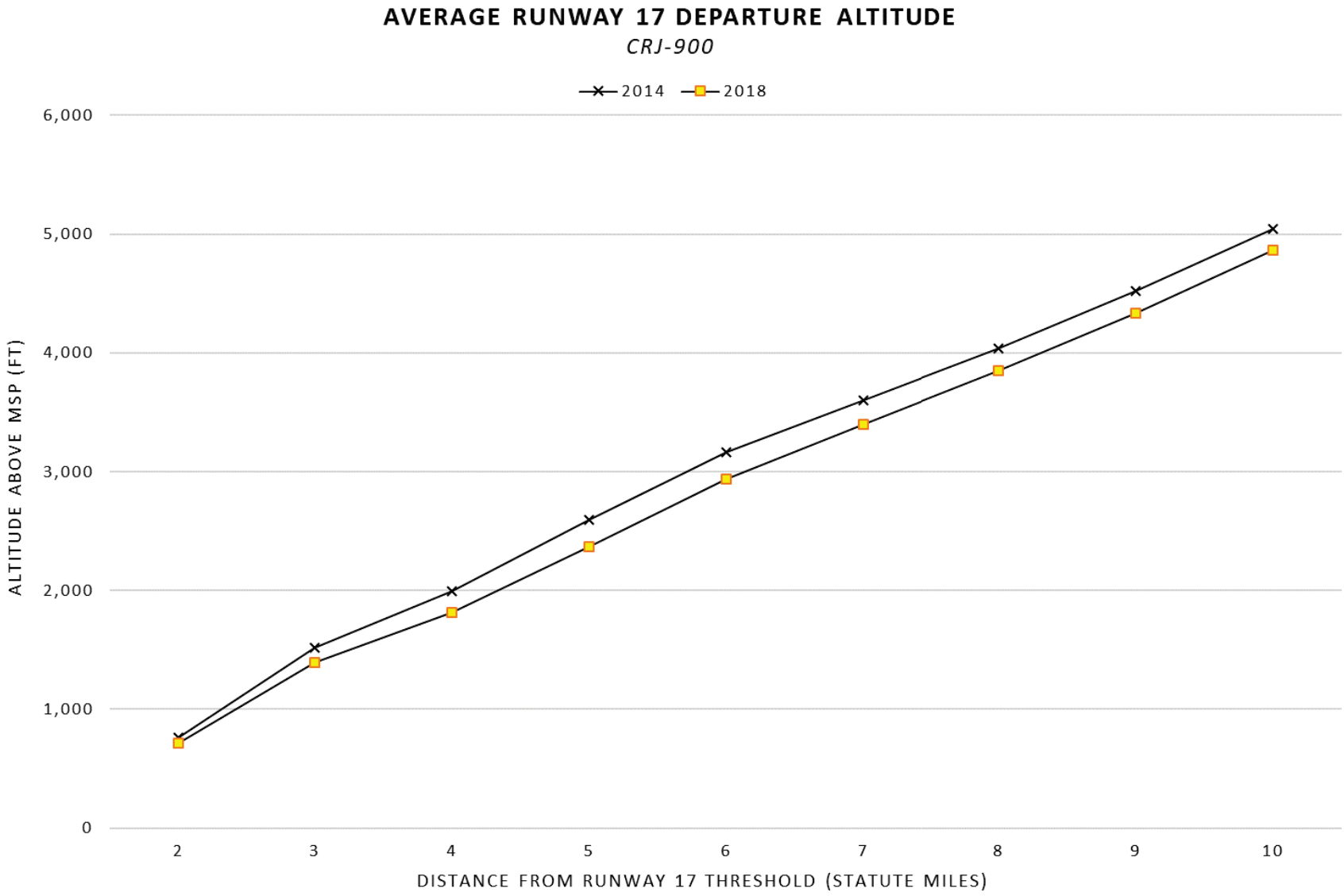
- SLUCM = Standard Land Use Coding Manual.
- Y (Yes) = Land Use and related structures compatible without restrictions.
- N (No) = Land Use and related structures are not compatible and should be prohibited.
- NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
- 25, 30, or 35 = Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

NOTES FOR TABLE 1

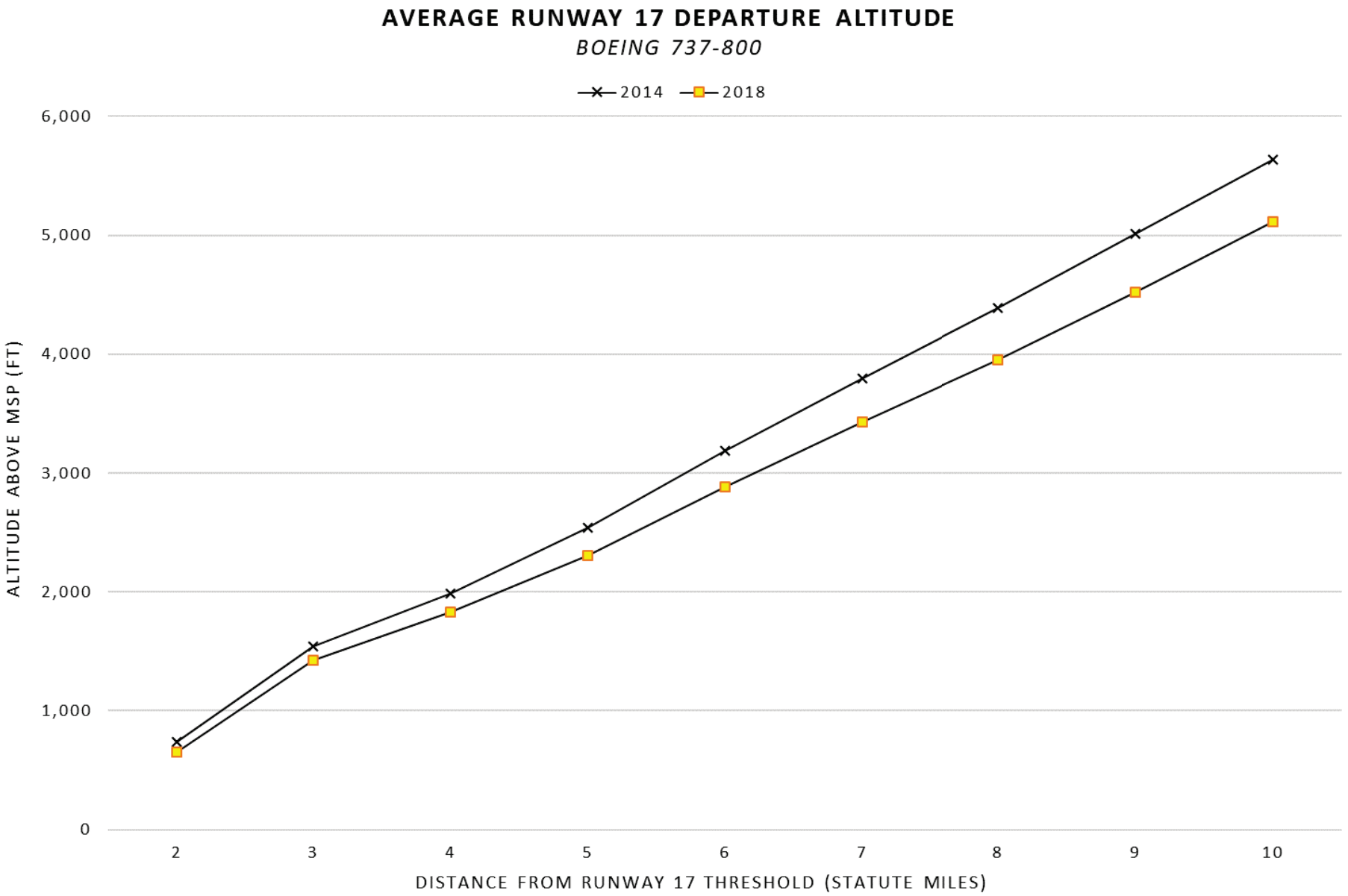
1. Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2. Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
3. Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.
5. Land use compatible provided special sound reinforcement systems are installed.
6. Residential buildings require an NLR of 25.
7. Residential buildings require an NLR of 30.
8. Residential buildings not permitted.

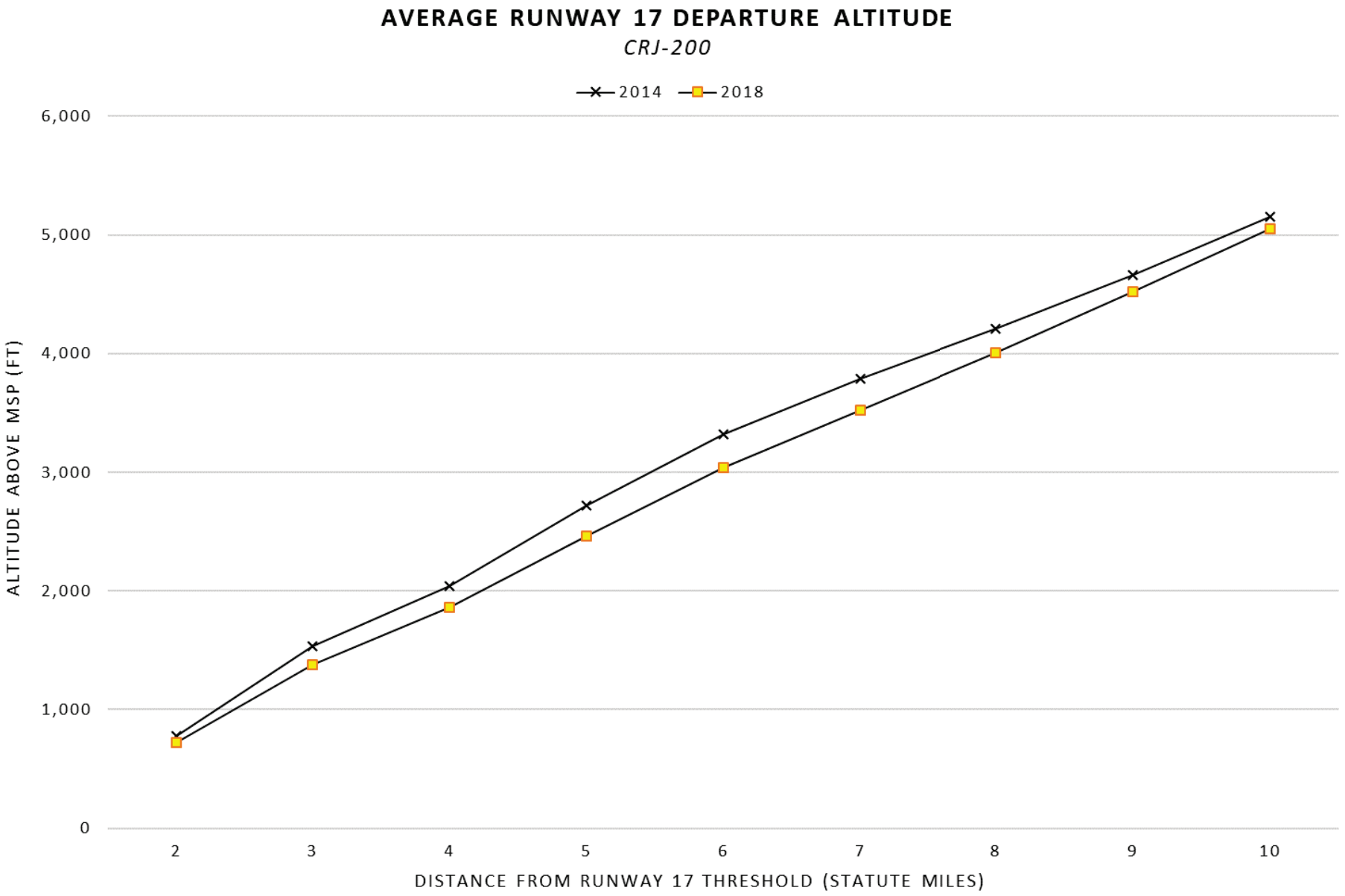
APPENDIX F

Average Runway 17 Departure Altitude



64


AVERAGE RUNWAY 17 DEPARTURE ALTITUDE
BOEING 737-800
2014
2018
6,000
5,000
4,000
3,000
2,000
1,000
0
ALTITUDE ABOVE MSP (FT)
2
3
4
5
6
7
8
9
10
DISTANCE FROM RUNWAY 17 THRESHOLD (STATUTE MILES)


AVERAGE RUNWAY 17 DEPARTURE ALTITUDE
CRJ-200
2014
2018
6,000
5,000
4,000
3,000
2,000
1,000
0
ALTITUDE ABOVE MSP (FT)
2
3
4
5
6
7
8
9
10
DISTANCE FROM RUNWAY 17 THRESHOLD (STATUTE MILES)

66

ITEM 7

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **EAGAN MOBILE NOISE MONITORING REPORT**

DATE: July 3, 2019

On September 19, 2018, responding to a mobile noise monitoring request from the City of Eagan, the members of the Minneapolis-St. Paul International Airport (MSP) Noise Oversight Committee (NOC) directed the MAC staff to conduct a noise monitoring study in the City of Eagan to evaluate the following:

1. Determine if gaps in the RMT coverage area currently exist in the City of Eagan.
2. Determine if two of the RMT locations closest to Interstate 35-E are properly located to best monitor aircraft noise given the ambient freeway noise.

The completed Eagan Mobile Noise Monitoring Report is attached, and the report will be presented and discussed at the July NOC meeting.

EAGAN MOBILE NOISE MONITORING REPORT

July 2019

Community Relations Office

Metropolitan Airports Commission
6040 28th Avenue South, Minneapolis, MN 55450
MetroAirports.org

Contents

1 INTRODUCTION

A request for mobile noise monitoring was made in 2018 by the Eagan Airport Relations Commission (ARC), and approved by the Minneapolis – St. Paul International Airport (MSP) Noise Oversight Committee (NOC), to evaluate the quality of aircraft noise events currently being collected by the Metropolitan Airports Commission (MAC) at two of its permanent sound monitoring locations in the City of Eagan.

Since 1992, the MAC has operated one of the most sophisticated and comprehensive computerized aircraft noise and flight track data collection and processing systems of its kind. The MAC Noise and Operations Monitoring System (MACNOMS) is a tool to help MAC staff analyze aircraft noise impacts around MSP and provide public access to flight tracking and detailed aircraft noise data. MAC staff can make informed decisions about aircraft noise and operations impacts and assess specific operations in a timely way. Community members can access near real-time flight operations information and can review detailed historical information at their convenience.

MACNOMS' data collection, processing and analysis and reporting tools are made up of customized software programs and instruments that provide system flexibility to conduct detailed analyses and reporting of aircraft operations and associated noise. The system does this by fusing aircraft flight tracks, aircraft operator information, noise measurements from sound monitoring stations, geographic information, and information on other variables that influence aircraft operations.

The sound data collection is conducted through an array of 39 permanently installed sound monitoring stations that operate continuously. Several MACNOMS sound monitoring sites are located within the City of Eagan; these sites are numbered as 14, 16, 24, 25, 35, 37, 38 and 39. It's important to note that the data recorded at the MACNOMS sound monitoring sites are not used in determining residential noise mitigation eligibility, nor are they used in the development of airport noise contours. These activities are strictly regulated by the Federal Aviation Administration (FAA), which requires the use of a modeling software.

The MAC's first installation of permanent sound monitors included 24 sites located primarily off the ends of the parallel runways and the crosswind runway, Runway 4/22. In 1998, the Metropolitan Sound Abatement Council (MASAC) focused on increasing the noise monitoring coverage predicated on existing runway geometry and associated operational patterns. The analysis resulted in the addition of five new monitoring towers, bringing the total to 29. The last augmentation of the noise monitoring system occurred in 2001 with the installation of ten additional locations south of the airport to measure noise levels on Runway 17/35. Citing the permanent sound monitoring stations all required a thorough and objective process. MASAC established the location of the five additional sites in 1998 using requirements that were established as part of the initial system installation, in addition to further data consideration and the utilization of increased spatial analysis capabilities. The additional ten locations were established through a Runway 17-35 Remote Noise Monitoring Tower Location Task Force. The Task Force applied requirements consistent with previous installations in addition to more robust Geographical Information System (GIS) data. These sites and the cylindrical areas of influence were sent to each respective city for the exact location and area of influence determination.

The Eagan ARC communicated concerns related to the coverage area and whether enough aircraft noise is being captured by the MACNOMS sound monitoring sites installed in Eagan. Another concern is related to the quality and accuracy of aircraft sound data collected by MACNOMS sites 25 and 37 because of their proximity to the I-35E freeway.

The concerns expressed by the ARC formulate the objectives of this study, as follows:

1. The MAC will evaluate sound data collected in Eagan and determine if gaps exist in the MACNOMS site coverage area within in the City of Eagan, and
2. determine if MACNOMS sites 25 and 37 properly capture aircraft sound levels given the ambient freeway noise being generated by 1-35E.

2 PARAMETERS & METHODOLOGY

2.1 PURPOSE

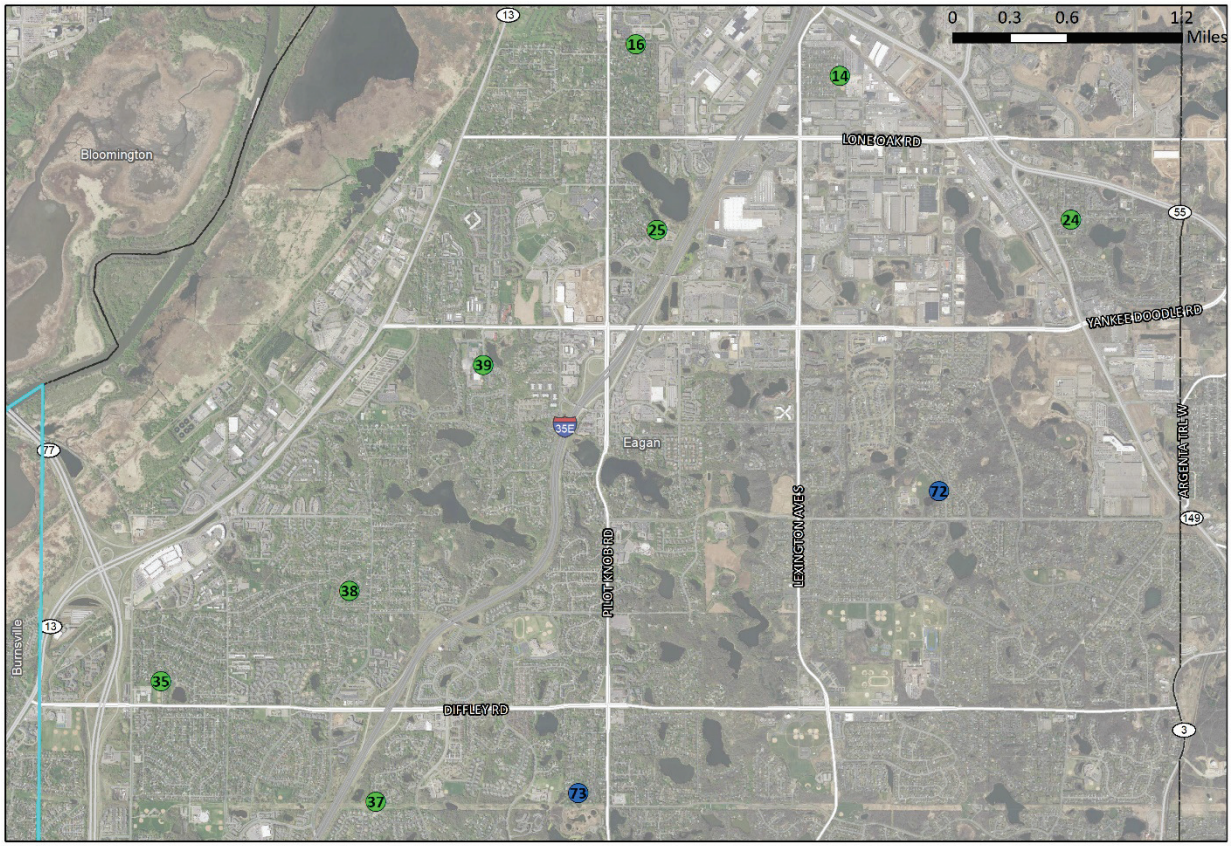
Collect quality recordings and measurements of aircraft noise events associated with MSP Airport that occur in the City of Eagan, in accordance with established Mobile Sound Monitoring Guidelines. The objectives of the study are to determine if gaps exist within the City of Eagan and to compare data collected from the mobile equipment with data being collected at the RMTs 25 and 37.

2.2 STUDY PERIOD

By mutual agreement with the Eagan ARC, the study period extended for two consecutive weeks. Mobile sound monitors were deployed on May 1st, 2019 and retrieved on May 16th, 2019. The official two-week data collection period started at 12:00 A.M. on Thursday May 2nd and concluded at 11:59:59 P.M. Wednesday May 15th.

2.3 MONITORING LOCATIONS

MAC Community Relations staff, in collaboration with the Eagan ARC, identified two locations for temporary placement of the mobile sound monitoring equipment. These sites are labeled 72 and 73 to



Permanent Sites
Mobile Sites

EAGAN SOUND MONITORING SITES

distinguish these sites from the MACNOMS sites. After consideration of various site location, the Eagan ARC approved use of Mueller Farm Park and Evergreen Park, which both met the following criteria:

- The sites were able to be secured
- The sites were located on public land, owned by the City (parks, easements, out-lots, etc.)
- The sites were located appropriate distances from known sources of community noises, such as major roadways, active construction, crowd assembly areas, railroad tracks, etc.
- The City and the MAC agreed that the sites were reasonable and adequate to obtain the necessary data to meet the project objectives

The following are the details for the mobile sound monitoring data collection sites, labeled 72 and 73:

Site #72 – Mueller Farm Park

The Mueller Farm Park site was located along east side of the park along Wescott Hills Dr, north of a walking path.

This location was chosen due to its position in a low-activity area while still on public property, and its proximity to MSP flight activity.

Site #73 – Evergreen Park

Evergreen Park abuts Thomas Lake Park to the North. The monitoring location was along Lodgepole Ct.

This location is directly east of site 37 and located in a low-activity area near while still on public property, and its proximity to MSP flight activity.

2.4 Equipment and Instrumentation

A secured weatherproof enclosure was used at each mobile monitoring site to contain the measurement and recording devices. The instrumentation is manufactured by Larson Davis and consists of a laboratory quality sound level analyzer (831A class/type 1 instrument), preamplifier (PRM831), and microphone (377B02). The preamplifier and microphone were housed within environmental protection coverings to allow sound measurements during adverse weather elements. The components used at these sites is the same equipment that is used at the permanent sound-monitoring locations.

The instruments are certified annually, and each site was calibrated at the start of the study. During the study period, inspections were performed throughout the study at both sites to verify instruments were operating and within tolerances, and to inspect for tampering and damage. A final calibration check was performed at the end of the study and found to be within tolerances.

2.5 Measurement Parameters

The sound monitoring instrumentation was configured to monitor sound continuously utilizing slow response with A-weighting, as directed by 14 CFR Part 150 and consistent with the MACNOMS data collection. Under this configuration, the analyzer uses a sound pressure level - time trigger (when the A-weighted sound pressure level exceeds 65dB for a minimum period of eight seconds) to identify and document sound events. A two-second continuation period is used to extend the sound event if the sound

below the threshold level. These parameters are consistent with the configurations employed at the permanent sites.

The measurement parameters used by the sound monitoring instrumentation only account for sound level and therefore both aircraft and community events will be documented. Additionally, aircraft do not have to fly directly over a measurement site to be recorded.

2.6 AIRCRAFT-EVENT CORRELATION

This study employed a process for correlating mobile site sound data with MSP flight track data; the same process is used for correlating MACNOMS sound data with MSP flights. The process uses both temporal (time) and spatial components to match a sound event with an aircraft overflight. The majority of sites in Eagan include a cylindrical area of influence with a radius of 2,500 meters and a ceiling of 1,830 meters. Permanent sites in Eagan also include a time window of at least one minute around an event. Mobile sites 72 and 73 used those same dimensions of the study. Sound events that could not be correlated were classified as “community” events.

3 DISCUSSION / SUMMARY OF FINDINGS

This report presents both sound measurement and aircraft operations data collected between May 2nd through May 15th, 2019. The objectives of the study are to evaluate the coverage of the MACNOMS array within the City of Eagan and determine to what degree MACNOMS sites 25 and 37 are affected by their unique proximity to I-35E.

While this study was requested by the Eagan ARC and approved by the NOC in 2018, the study was intentionally delayed until May 2019 to increase the likelihood that South Flow configurations would be prevalent at MSP. In a South flow, aircraft use Runways 12L, 12R and 17 for departures while Runways 12L and 12R are used for arrivals. This provides the most ideal configuration to conduct monitoring for the purpose of this study. Section 4.1 provides further data on specific runway use. For the 14 days of the study, a South Flow was utilized for 37.5% of the time. Additionally, 50 hours, or 16.6%, of all hours were in a Straight South Flow. In a Straight South Flow, Runways 12L and 12R are used for arrival and departure and the use of Runway 17 for departure is discontinued. The combined 54.1% provided a reasonable amount of opportunity to collect sound data for the study.

Sites 72 and 73 both proved to be conducive locations for measuring aircraft sounds because of the regularity of MSP flight activity over the area and limited levels of community noises. There were 477 sound events (383 aircraft correlated) recorded at Site 72, and 466 events (300 aircraft correlated) were recorded at Site 73. The estimated average background sound level (utilizing the statistical LA_{90} method) was 50.4 dBA for Site 72 and 45.5 dBA for Site 73. At both sites, the loudest measured sound events were identified as community-based (e.g. lawn mowers, fireworks, motorcycle, people, etc.).

Section 4.5 shows a summary of the temperature and reported wind speeds during the two-week study period. Moderate temperatures from 35° - 76° were experienced throughout the study period. Additionally, precipitation was recorded during six days of the study. A wind rose depicting all reported winds for the study period is also included in section 4.5.

3.1 DNL

The Day-Night Average Sound Level (DNL) metric is an average of noise exposure, or dose metric, of the total accumulation of all sound energy spread uniformly over a 24-hour period. The DNL calculation applies a 10-decibel penalty on aircraft operations between 10:00 P.M. and 7:00 A.M. Aircraft DNL reflects noise exposure associated with aircraft noise events only, while community DNL reflects noise exposure for all other noises.

The Federal Aviation Administration Office of Environment and Energy (FAA-AEE) recognizes that the environmental consequences stemming from the operation of commercial aviation – primarily noise, emissions, and fuel consumption – are highly interdependent and occur simultaneously throughout all phases of flight. The Aviation Environmental Design Tool (AEDT) is a software system that is designed to model aviation related operations in space and time to compute noise, emissions, and fuel consumption.

AEDT is the federally prescribed model required to develop the annual DNL contour, which is the basis for the MSP Annual Noise Contour Report and related noise mitigation program. While the focus on traditional AEDT modeling efforts is typically a DNL contour, the software has the capability to produce alternate noise metrics.

The MAC's system of 39 RMTs is one of the most extensive aircraft noise monitoring systems in the world. The data collected provides important information about sound levels and aircraft activity in the areas where the monitors exist. To augment the permanent system, AEDT can be used to determine the modeled events at specific points around MSP that are not covered by an RMT.

Aircraft noise is generally considered by the FAA to be significant when levels reach DNL 65 or greater, (average measure of 365 days). An annual aircraft DNL at or above 65 dB is considered by the FAA to be incompatible with residential areas and other noise sensitive land uses.

The measured daily aircraft DNL is shown in section 4.4 while the measured and calculated average DNL for the two-week study period is shown below.

14-Day Study Period	72 - Mueller Farm Park	73 - Evergreen Park
Measured DNL	47.5	46.6
AEDT Modeled DNL	51.2	49.5

Aircraft flying over Sites 72 and 73 are typically flying at higher altitudes than when they fly over the MACNOMS sites 25 and 37. This is because Sites 72 and 73 are located further away from MSP than Sites 25 and 37 and aircraft typically continue their climb as they travel away from the airport. The increased distance and altitude has several effects. First, it can reduce the measured DNL due to physical constraints of meeting the parameters of the event detection trigger, which causes a reduced measured DNL level. Secondly, a greater difference emerges between the measured vs. modeled DNL levels. This occurs because modeled DNL is capable of projecting all aircraft into its calculation whereas the measured DNL can only include measured and correlated aircraft sounds that do not compete with community noises.

3.2 EAGAN COVERAGE ASSESSMENT

Aircraft sound events were recorded during the study period at all eight MACNOMS sites located within the City of Eagan and the mobile equipment at the study sites 72 and 73. The study sites performed well with the MACNOMS sites in Eagan. 98.5% of all correlated events recorded at the study sites were also recorded and correlated at a permanent site in Eagan. Of the combined 683 identified aircraft events, only 10 aircraft were not recorded at the MACNOMS sites within Eagan. Site 72 had a 100% correlation while Site 73 had a 97.4% correlation. See section 4.3 for more details.

While the 10 aircraft sound events identified by the study area and not identified within the MACNOMS Eagan sites are statically small, there are several reasons why they occur. When approaching the 65dBA – 8 second threshold, other small variables like aircraft state including, power settings, the angle of attack in relation to the sound monitor, direction and positioning, and the distance between the aircraft and the sound monitor as well as tolerances of measurement instrumentation all have impact on whether an event is detectable and identifiable using the sound event parameters.

9,871 aircraft events from 4,709 aircraft were captured by the MACNOMS permanent sound monitors within Eagan. Of those aircraft operations, 4,054 or 86% of the operations triggering events at one of the permanent sites did not trigger an event at one of the mobile sites. This can be due to several factors but is largely due to the flight track of the operation and the three dimensional distance between the aircraft and the site.

The primary directive of the MACNOMS system is to measure aircraft noise to provide actual noise data at sites within the community. With a 98.5% study-to-permanent event correlation along with measured and modeled DNL below the 60 DNL contour, the study data suggests additional monitoring within the City is not required.

3.3 Evaluation of Measurement Sites Next to the I-35E

MACNOMS sites 25 and 37 are in close proximity to I-35E freeway and often record sounds of vehicles that are louder than aircraft that overfly the area. The following table contains performance measures that compare data from sites 25 and 37 to the other MACNOMS sites located within the City of Eagan and the mobile sites 72 and 73.

Site	Total Sound Events	Aircraft Events	Aircraft Event Correlation Ratio	Average Event Duration (seconds)	Primary Runway(s) and Flight Activity
14	3,065	2,570	0.84	18.3	30L ARRIVALS
16	2,974	2,370	0.80	19.8	30L ARRIVALS
24	2,925	2,382	0.81	17.5	30L ARRIVALS
25	1,646	469	0.28	56.1	12R, 17 DEPARTURES
35	598	476	0.80	16.9	35 ARRIVALS, 17 DEPARTURES
37	1,481	297	0.20	46.9	17 DEPARTURES
38	896	635	0.71	19.2	17 DEPARTURES
39	894	672	0.75	18.9	17 DEPARTURES
72	477	300	0.63	30.3	12R, 17 DEPARTURES
73	466	383	0.82	16.6	17 DEPARTURES

The table above compares data collected and correlated to aircraft activity at sound monitoring sites in the City of Eagan. It is not realistic to capture a sound event at each of the monitoring sites because of operating characteristics of aircraft, flight paths, environmental conditions, and other community sounds; however, the goal of the MAC's sound monitoring efforts is to capture as much quality sound data as possible given situational conditions. The number of sound events documented for the monitoring sites in Eagan during the study period is higher than the number of aircraft events because there are many non-aircraft sounds that fit the measurement parameters and consequently are recorded. Site 14 recorded the highest number of Total Sound Events and Aircraft Events. Site 73 recorded the lowest number of Total Sound Events, but Site 37 recorded the lowest number of Aircraft Events. These numbers by themselves are not as meaningful as the Aircraft Event Correlation Ratio.

The Aircraft Event Correlation Ratio describes the overall correlation rate between the number of measured sound events with those sound events that are correlated with aircraft activity. This metric summarizes how many sound events were associated with aircraft activity. A higher ratio means more aircraft were correlated with measured sounds than a lower ratio. The highest Correlation Ratio occurred at Site 14, and the lowest ratio occurred at Site 37.

The Average Event Duration helps to reveal how community sounds may be affecting the measures of aircraft sounds. Sites with longer community events that are occurring while aircraft are flying overhead may be preventing the site from capturing the aircraft activity sounds, particularly if the community event is louder than the aircraft event. This situation is known to occur on very windy days, or when lawn mowing takes place, or birds are singing near a monitoring site. Extended periods of vehicle traffic also contribute to sound events with extended durations. During the study period, Sites 25 and 37 recorded sound events with the highest average durations due to the unique proximity of these sites to the 1-35E freeway.

While sites 25 and 37 do record far more community events than other permanent sites, the ambient environmental sound generated by the freeway is not negatively impacting their ability to collect aircraft noise data. Given the distance of aircraft from the sites, the probability that an aircraft creates an event at sites 25 and 37 are consistent with other permanent sites in Eagan. The following tables highlights this relationship. In the first table, Runway 12R departures for June 2018 through June 2019 are evaluated at the four permanent sites and one mobile site that typically record traffic from this runway. Candidate Departures represent any flight that flew within the cylindrical area of influence (radius of 2,500 meters and a ceiling of 1,830 meters) for that site while Valid Correlated Events are the number of events at that site. In this instance Site 25 records far fewer candidate operations than other sites in Eagan. The reason, however, is not due to the freeway, but instead due to its proximity to typical Runway 12R departure tracks. The average distance between the site and the tracks of 1,615 meters is almost double the average distance at site 16, which has a much better correlation rate. Site 72 recorded a lower rate of events than any of the permanent sites.

RMT	CANDIDATE DEPARTURES	VALID CORRELATED EVENTS	RATE	AVERAGE 3D DISTANCE (meters)
14	14,693	10,815	74%	921
16	14,852	12,202	82%	815
24	13,405	7,124	53%	1,124
25	11,829	4,027	34%	1,615
72*	306	68	22%	1,157

**Mobile Sites only include data from 5/2/2019 – 5/15/2019*

The same data was analyzed for departures from Runway 17.

RMT	CANDIDATE DEPARTURES	VALID CORRELATED EVENTS	RATE	AVERAGE 3D DISTANCE (meters)
25	14,199	5,419	38%	1,597
35	30,478	7,389	24%	1,129
37	14,529	5,468	38%	1,260
38	24,561	11,199	46%	1,017
39	29,010	13,209	46%	915
72*	663	224	34%	1,225
73*	1,042	368	35%	1,103

**Mobile Sites only include data from 5/2/2019 – 5/15/2019*

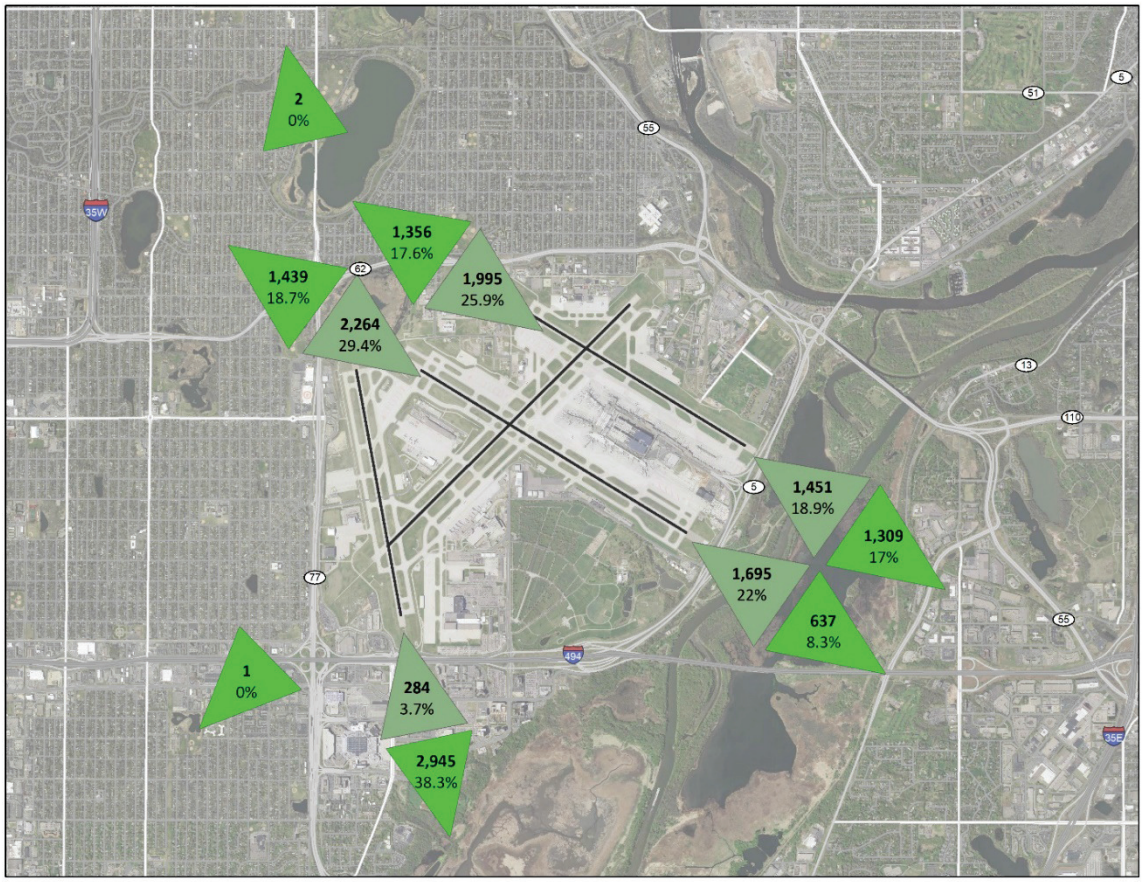
These sites show the same relationship between distance and correlation rate. Sites 25 and 37 have a lower rate than sites 38 and 39 but the distance between the tracks and the sites are further away. Sites 25 and 37 correlate at a higher rate than Site 25 despite being farther from the tracks. Sites 72 and 73 also had lower event rates than all of the permanent sites except Site 35. Because Sites 25 and 37 have correlation rates similar to other sites under Runway 17 departures, the data does not support a change to the location of the permanent monitoring sites.

The location of all sites is impacted by normal community activities. Each site within the MAC system records events with sound sources that are not aircraft related. The MAC has a robust system in place to determine whether the sound source of events is community generated or aircraft related. As discussed in Section 2.6, the MAC uses an automated system to correlate events to known MSP aircraft traffic using spatial and temporal data. Additionally, MAC staff reviews events and related attributes monthly to improve this matching process. Recently, the MAC developed a noise event classification system using a convolutional neural network which is generally referred to as machine learning to further determine the likelihood that a noise event was created by an aircraft or by a community source. Because we believe this to be the first of its kind, the MAC is seeking protection from the United States Patent and Trademark Office. These current protocols and process enhancements reduce the impact that all community events, including road noise from I-35E, have on the data produced at the permanent sites.

4 APPENDIX

4.1 AIRCRAFT OPERATIONS

MSP Runway Use



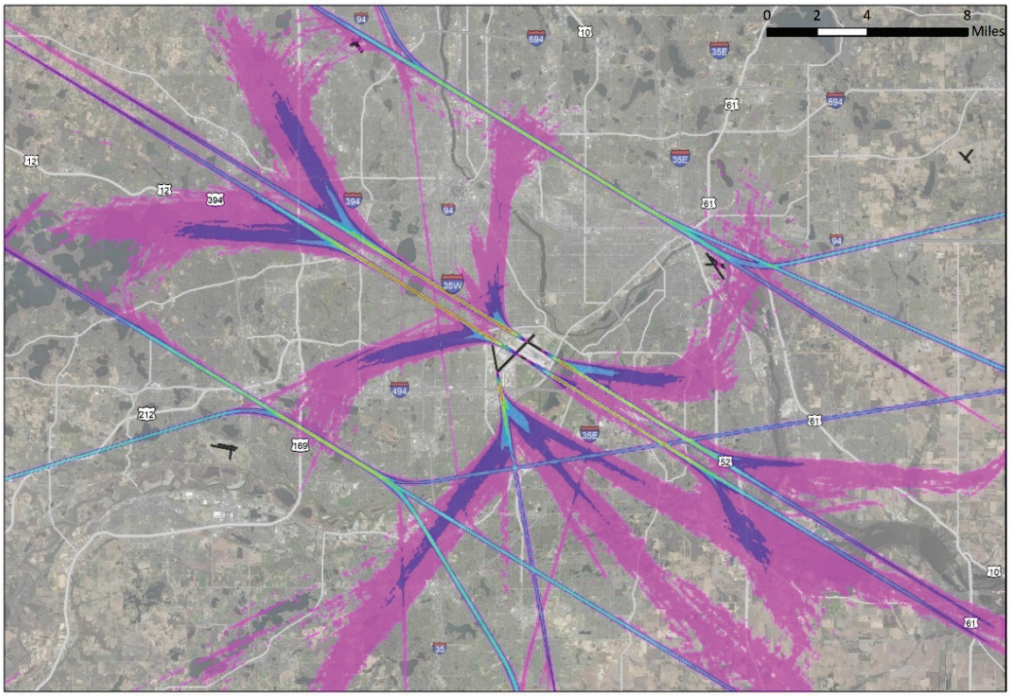
Runway	Operation	Count	Percent		Operation	Count	Percent
4	Arr	0	0.0%		Dep	0	0.0%
12L	Arr	1,995	25.9%		Dep	1,309	17.0%
12R	Arr	2,264	29.4%		Dep	637	8.3%
17	Arr	0	0.0%		Dep	2,945	38.3%
22	Arr	0	0.0%		Dep	1	0.0%
30L	Arr	1,695	22.0%		Dep	1,439	18.7%
30R	Arr	1,451	18.9%		Dep	1,356	17.6%
35	Arr	284	3.7%		Dep	2	0.0%
Total		**7,689**	**100%**	**Total**		**7,689**	**100%**

Airport Configuration (# of Hours by Day)

Day	Mixed A	Mixed B	North	Straight North	Opposite	South	Straight South	Unusual	Total
2-May	14	2	1	3				1	21
3-May	2			1	3	14	2		22
4-May	9			2	1	4	7		23
5-May			2	17	3				22
6-May			3	11	3	2	2		21
7-May			1		2	13	2		18
8-May						6	18		24
9-May			5	14	2				21
10-May	8		4	8	3				23
11-May					2	14	6		22
12-May		1				15	3		19
13-May					3	16	2		21
14-May						17	5		22
15-May	1		1	4	1	12	3		22
Total	**34**	**3**	**17**	**60**	**23**	**113**	**50**	**1**	**301**

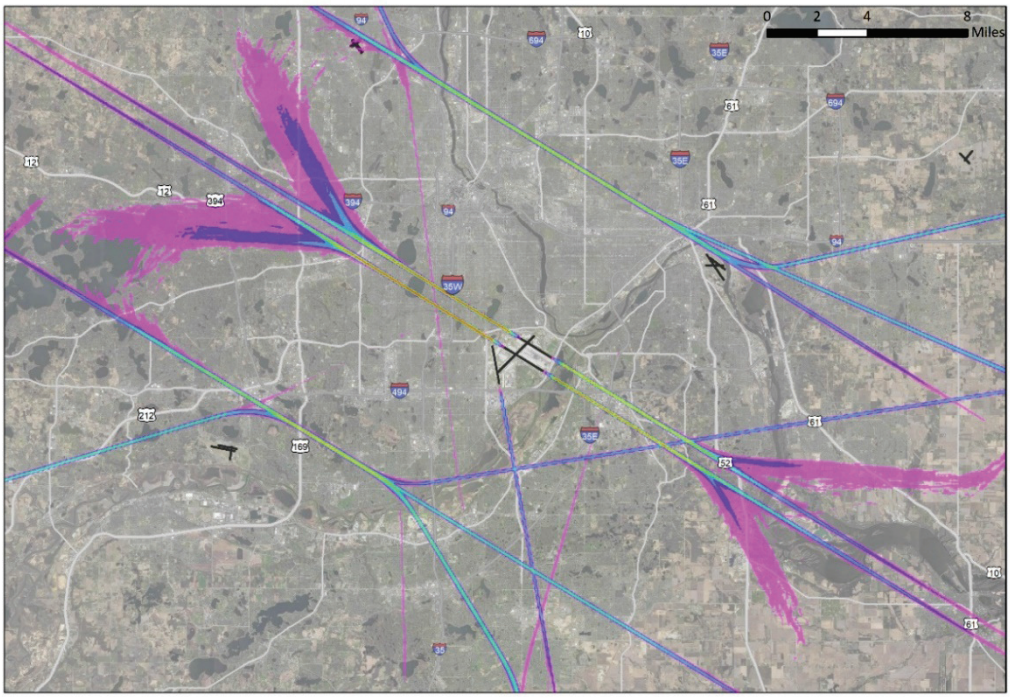
HOURS WITHOUT DATA MAY INCLUDE HOURS DURING CONFIGURATION TRANSITION OR HOURS WITHOUT OPERATIONS

Density Maps



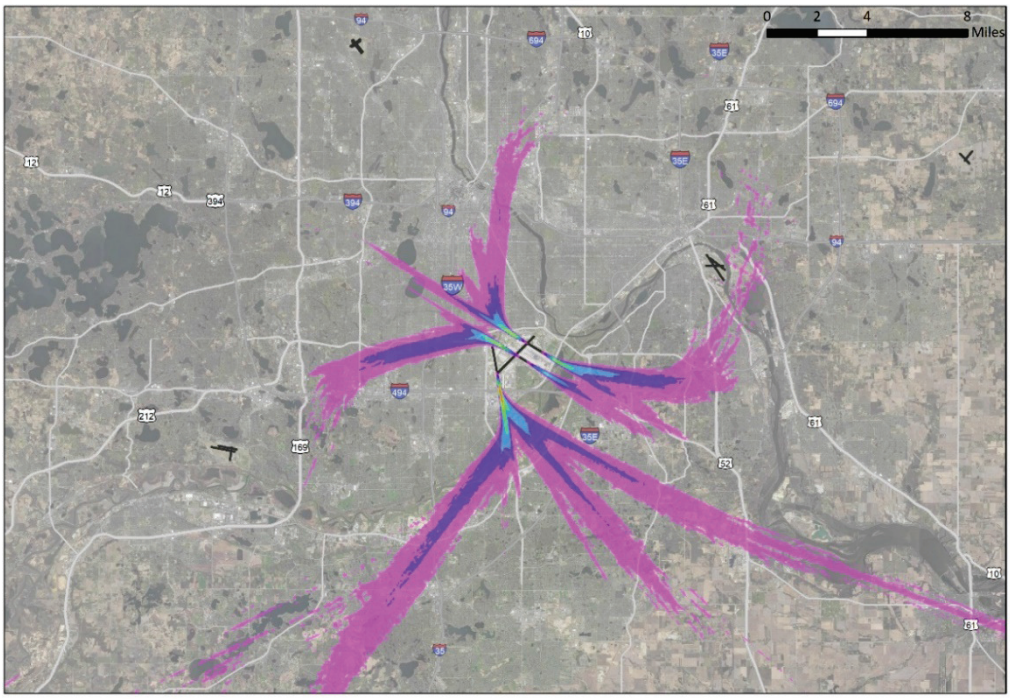
Low High

MSP DAILY OPERATION DENSITY
MAY 2 - MAY 15, 2019



Low High

MSP DAILY ARRIVAL DENSITY
MAY 2 - MAY 15, 2019



MSP DAILY DEPARTURE DENSITY
MAY 2 - MAY 15, 2019

Fleet Composition - Top 10

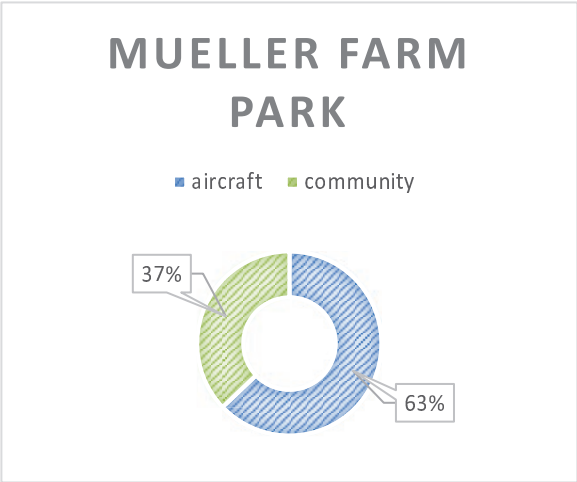
Category	Aircraft Type	Operations
Regional Jet	Canadair CRJ-900	2,098
Regional Jet	Canadair CRJ-200	2,009
Narrowbody	Boeing 737-800	1,682
Narrowbody	Airbus A320	1,419
Narrowbody	Boeing 737-900	1,137
Narrowbody	Boeing 717-200	1,108
Narrowbody	Airbus A321	1,092
Narrowbody	Airbus A319	1,056
Regional Jet	Embraer E-175	858
Narrowbody	Boeing 737-700	653

4.2 SOUND EVENTS

Summary of Measured Events

Date	72 - Mueller Park			73 - Evergreen Park		
	Aircraft	Community	(total)	Aircraft	Community	(total)
5/2/2019	1	17	18	-	1	1
5/3/2019	32	6	38	62	1	63
5/4/2019	5	6	11	20	2	22
	-	-	-	-	1	1
5/6/2019	4	5	9	8	8	16
5/7/2019	14	5	19	40	1	41
5/8/2019	34	3	37	13	6	19
5/9/2019	-	1	1	-	3	3
5/10/2019	1	4	5	-	2	2
5/11/2019	36	2	38	28	11	39
5/12/2019	45	1	46	55	1	56
5/13/2019	55	2	57	70	12	82
5/14/2019	52	17	69	43		43
5/15/2019	21	108	129	44	34	78
Grand Total	**300**	**177**	**477**	**383**	**83**	**466**
Total Aircraft Events						**683**
Total Community Events						**260**
Total Events						**943**

Measured Sound Events – Category Breakdown



Aircraft Count Above - $N_{(level)}$

Mueller Farm Park – Count Above (Aircraft)				
$N_{(n)}$	N_{65}	N_{80}	N_{90}	N_{100}
5/2/2019	1	-	-	-
5/3/2019	32	-	-	-
5/4/2019	5	-	-	-
5/5/2019	-	-	-	-
5/6/2019	4	-	-	-
5/7/2019	14	-	-	-
5/8/2019	34	1	-	-
5/9/2019	-	-	-	-
5/10/2019	1	-	-	-
5/11/2019	36	-	-	-
5/12/2019	45	-	-	-
5/13/2019	55	-	-	-
5/14/2019	52	-	-	-
5/15/2019	21	-	-	-
Total	300	1	-	-

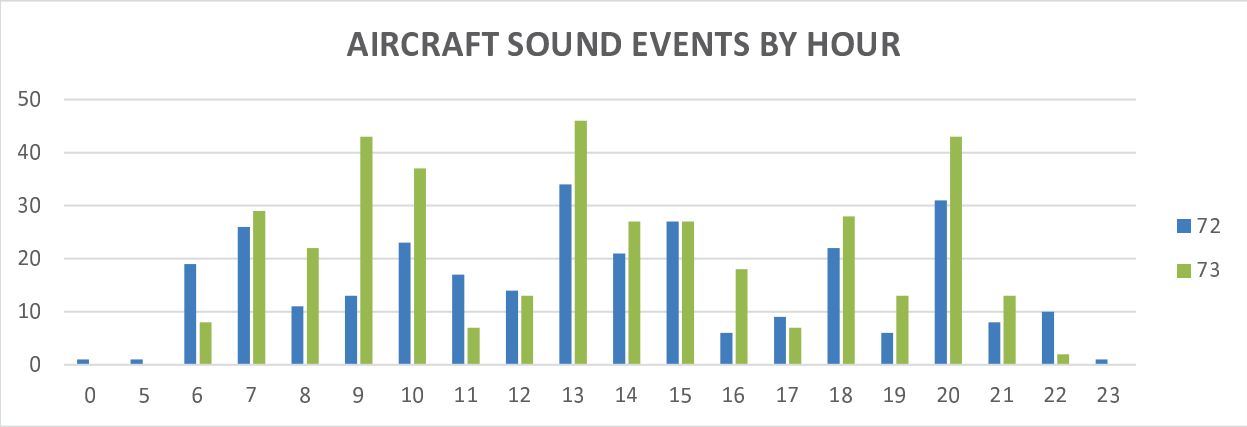
Evergreen Park – Count Above (Aircraft)				
$N_{(n)}$	N_{65}	N_{80}	N_{90}	N_{100}
5/2/2019	-	-	-	-
5/3/2019	62	-	-	-
5/4/2019	20	-	-	-
5/5/2019	-	-	-	-
5/6/2019	8	-	-	-
5/7/2019	40	-	-	-
5/8/2019	13	-	-	-
5/9/2019	-	-	-	-
5/10/2019	-	-	-	-
5/11/2019	28	-	-	-
5/12/2019	55	-	-	-
5/13/2019	70	-	-	-
5/14/2019	43	-	-	-
5/15/2019	44	-	-	-
Total	383	-	-	-

Aircraft Time Above – $TA_{(level)}$

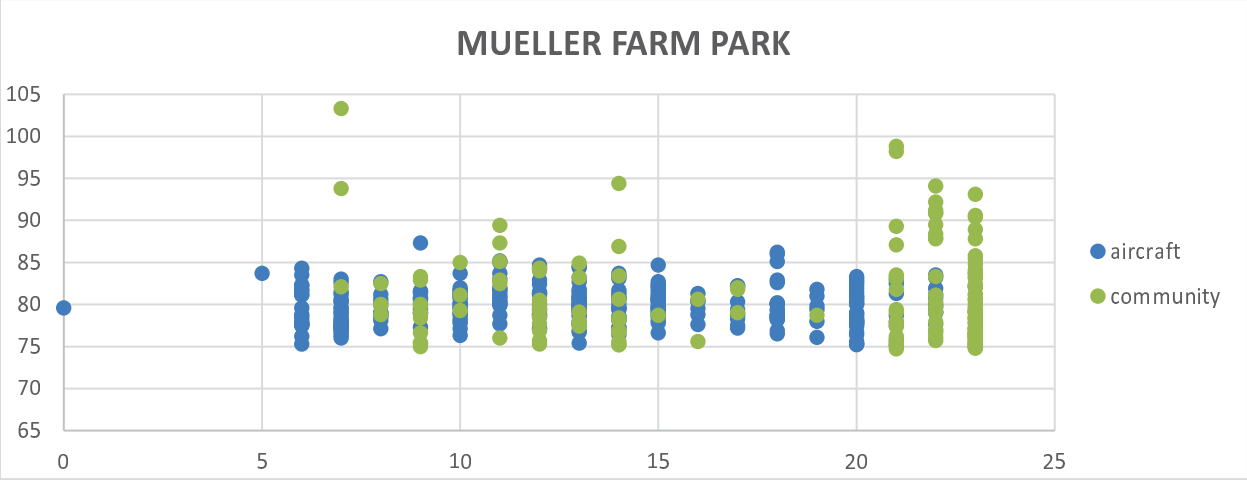
Mueller Farm Park – Time Above (Aircraft)				
$TA_{(n)}$	TA_{65}	TA_{80}	TA_{90}	TA_{100}
5/2/2019	9	-	-	-
5/3/2019	439	-	-	-
5/4/2019	63	-	-	-
5/5/2019	-	-	-	-
5/6/2019	44	-	-	-
5/7/2019	145	-	-	-
5/8/2019	452	-	-	-
5/9/2019	-	-	-	-
5/10/2019	18	-	-	-
5/11/2019	500	-	-	-
5/12/2019	593	-	-	-
5/13/2019	748	-	-	-
5/14/2019	696	-	-	-
5/15/2019	332	-	-	-
Total	4039	-	-	-

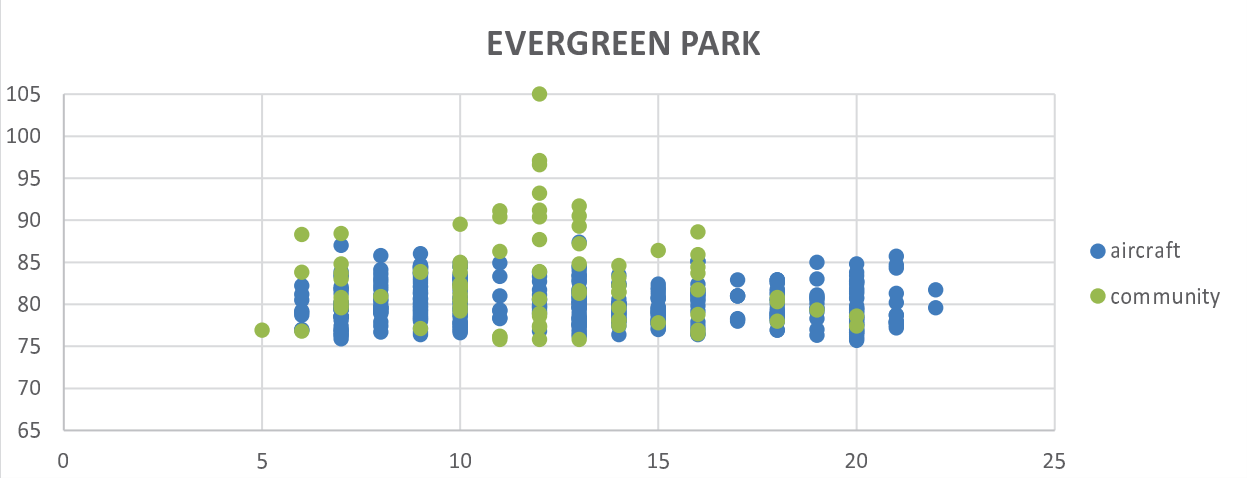
Evergreen Park – Time Above (Aircraft)				
$TA_{(n)}$	TA_{65}	TA_{80}	TA_{90}	TA_{100}
5/2/2019	-	-	-	-
5/3/2019	943	-	-	-
5/4/2019	290	-	-	-
5/5/2019	-	-	-	-
5/6/2019	93	-	-	-
5/7/2019	526	-	-	-
5/8/2019	169	-	-	-
5/9/2019	-	-	-	-
5/10/2019	-	-	-	-
5/11/2019	459	-	-	-
5/12/2019	792	-	-	-
5/13/2019	1042	-	-	-
5/14/2019	586	-	-	-
5/15/2019	612	-	-	-
Total	5512	-	-	-

Aircraft Count by Hour



LA_{sel} vs Hour





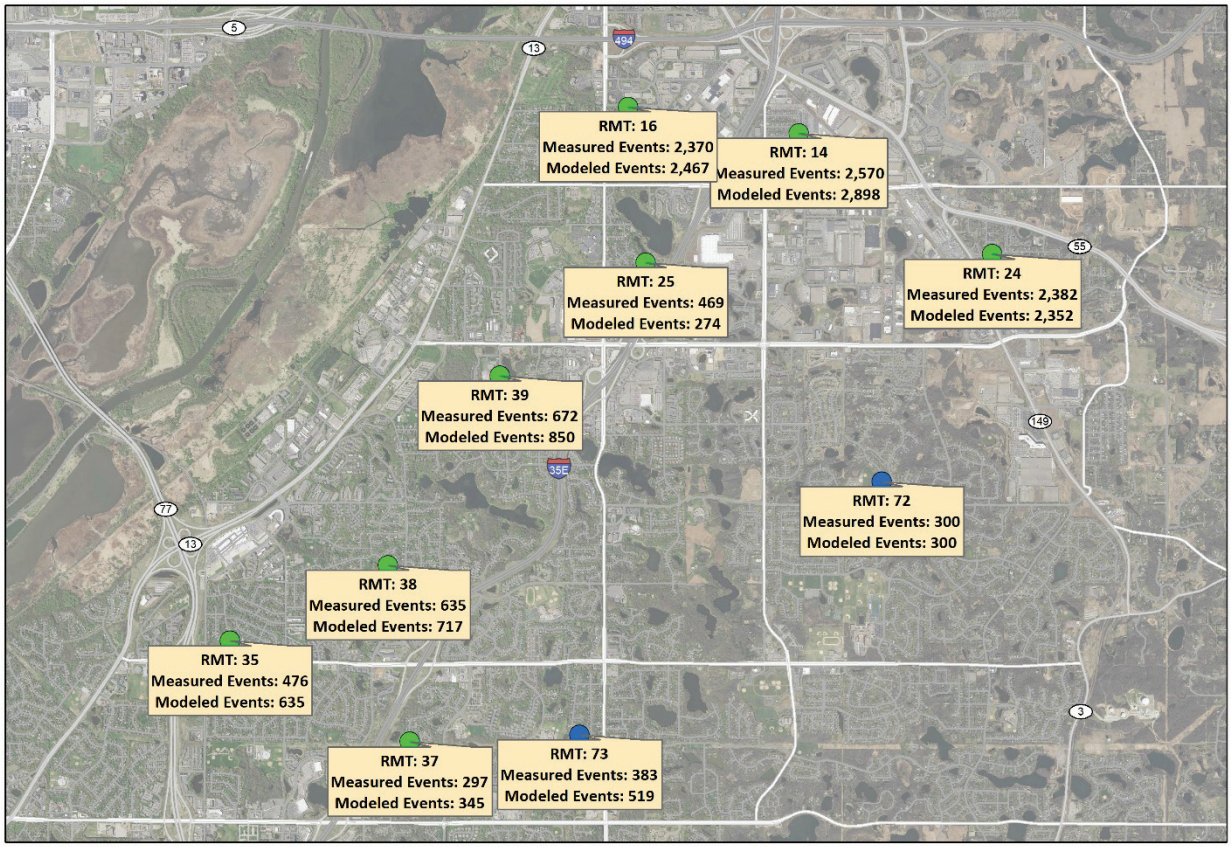
Top 10 Aircraft Events - Mueller Park

Date/Time	Flight Number	Aircraft	Operation	Runway	LA_{max} (dB)	Duration (seconds)	Distance (ft)
5/8/2019 18:21	DAL884	A321	D	12R	80.1	16	2488
5/3/2019 9:22	DAL375	A321	D	12R	78.3	18	2209
5/8/2019 18:30	DAL928	A321	D	12R	77.4	17	2769
5/14/2019 18:25	DAL1505	B739	D	12R	77.1	19	2488
5/13/2019 11:28	DAL1981	B739	D	12R	76.9	20	2580
5/8/2019 11:59	DAL1543	B753	D	12R	76.6	18	4231
5/8/2019 14:53	DAL696	A321	D	12R	76.3	14	3319
5/3/2019 15:44	DAL968	A321	D	17	76.2	15	2770
5/12/2019 13:03	DAL2376	A321	D	17	76	14	3138
5/13/2019 13:12	DAL2548	A321	D	12R	76	17	2526

Top 10 Aircraft Events - Evergreen Park

Date/Time	Flight Number	Aircraft	Operation	Runway	LA_{max} (dB)	Duration (seconds)	Distance (ft)
5/11/2019 7:50	FDX420	MD11	D	17	77.7	27	3568
5/3/2019 9:19	DAL515	B739	D	17	76.6	21	2802
5/7/2019 8:24	UPS2557	B744	D	17	76.2	24	3189
5/14/2019 21:49	UPS559	MD11	D	17	76.1	22	4194
5/12/2019 9:22	DAL550	A320	D	17	76	21	3206
5/12/2019 9:26	DAL1504	A321	D	17	76	22	3663
5/3/2019 11:37	DAL1557	A320	D	17	76	21	2908
5/13/2019 16:51	DAL307	B752	D	17	75.9	21	3868
5/3/2019 13:04	DAL2560	B739	D	17	75.8	18	3767
5/4/2019 9:07	DAL1936	A319	D	17	75.7	21	3331

Measured vs. Modeled Aircraft Sound Events



MEASURED VS. MODELED AIRCRAFT SOUND EVENTS
MAY 2 - MAY 15, 2019

Site	Modeled Events	Measured Events	(+/-)
14	2,898	2,570	(328)
16	2,467	2,370	(97)
24	2,352	2,382	30
25	274	469	195
35	635	476	(159)
37	345	297	(48)
38	717	635	(82)
39	850	672	(178)
72 - Mueller Farm Park	**300**	**300**	**-**
73 - Evergreen Park	**519**	**383**	**(136)**

4.3 UNCORRELATED AIRCRAFT EVENTS

Aircraft events at study sites not seen at permeant sites located in Eagan unknown factors (1.5% of total)

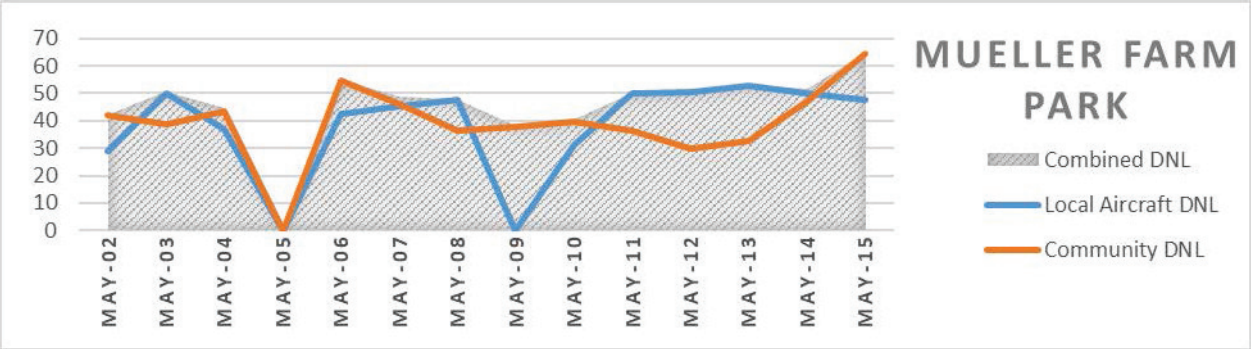
Site	Date/Time	LA_{max}	Operation	Aircraft	Runway	Factor
Evergreen Park	5/3/19 13:14:44	69.2	DEP	CRJ9	17	No Events
Evergreen Park	5/3/19 13:17:24	69.1	DEP	CRJ9	17	No Events
Evergreen Park	5/4/19 9:04:52	68.6	DEP	CRJ9	17	No Events
Evergreen Park	5/4/19 10:07:44	68.6	DEP	CRJ9	17	No Events
Evergreen Park	5/4/19 10:23:56	70.7	DEP	B712	17	No Events
Evergreen Park	5/7/19 20:50:55	69	DEP	CRJ7	17	No Events
Evergreen Park	5/11/19 20:38:40	70.1	DEP	CRJ9	17	No Events
Evergreen Park	5/12/19 16:57:19	68.9	DEP	CRJ9	17	No Events
Evergreen Park	5/13/19 19:19:19	67.8	DEP	CRJ9	17	No Events
Evergreen Park	5/13/19 20:24:41	67.3	DEP	E75L	17	No Events

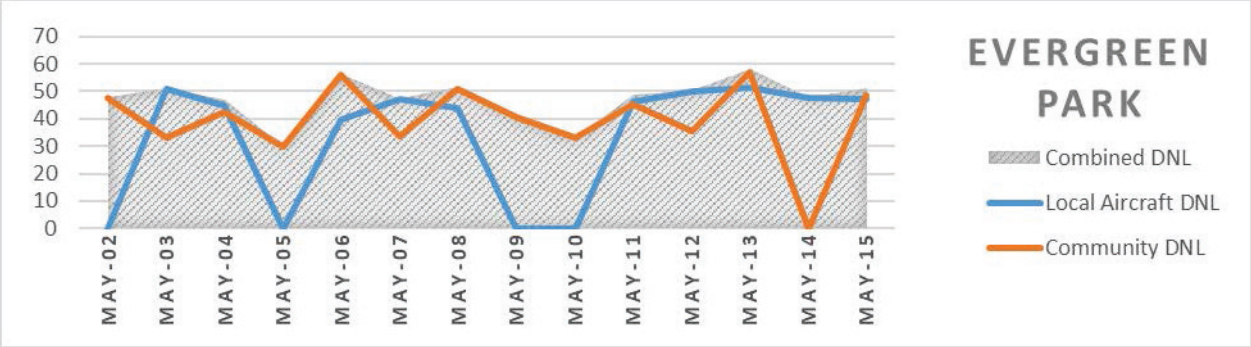
Aircraft events at study sites not seen at permanent sites located in Eagan due to known factors (1%)

Site	Date/Time	LA_{max}	Operation	Aircraft	Runway	Factor
Mueller Farm Park	5/2/19 14:46:01	70.4	ARR	C208	30L	Flight Track
Evergreen Park	5/7/19 14:26:49	70.3	DEP	B712	17	Missing Flight Track
Evergreen Park	5/13/19 10:09:49	75	DEP	A319	17	Combined Event
Evergreen Park	5/13/19 13:19:02	69.1	DEP	A319	17	Combined Event
Evergreen Park	5/13/19 14:48:16	73.2	DEP	E170	17	Combined Event
Mueller Farm Park	5/13/19 15:53:02	73.2	DEP	A321	17	Combined Event
Evergreen Park	5/15/19 13:28:13	69.1	DEP	E75L	17	Combined Event

4.4 DNL

Measured DNL by Date

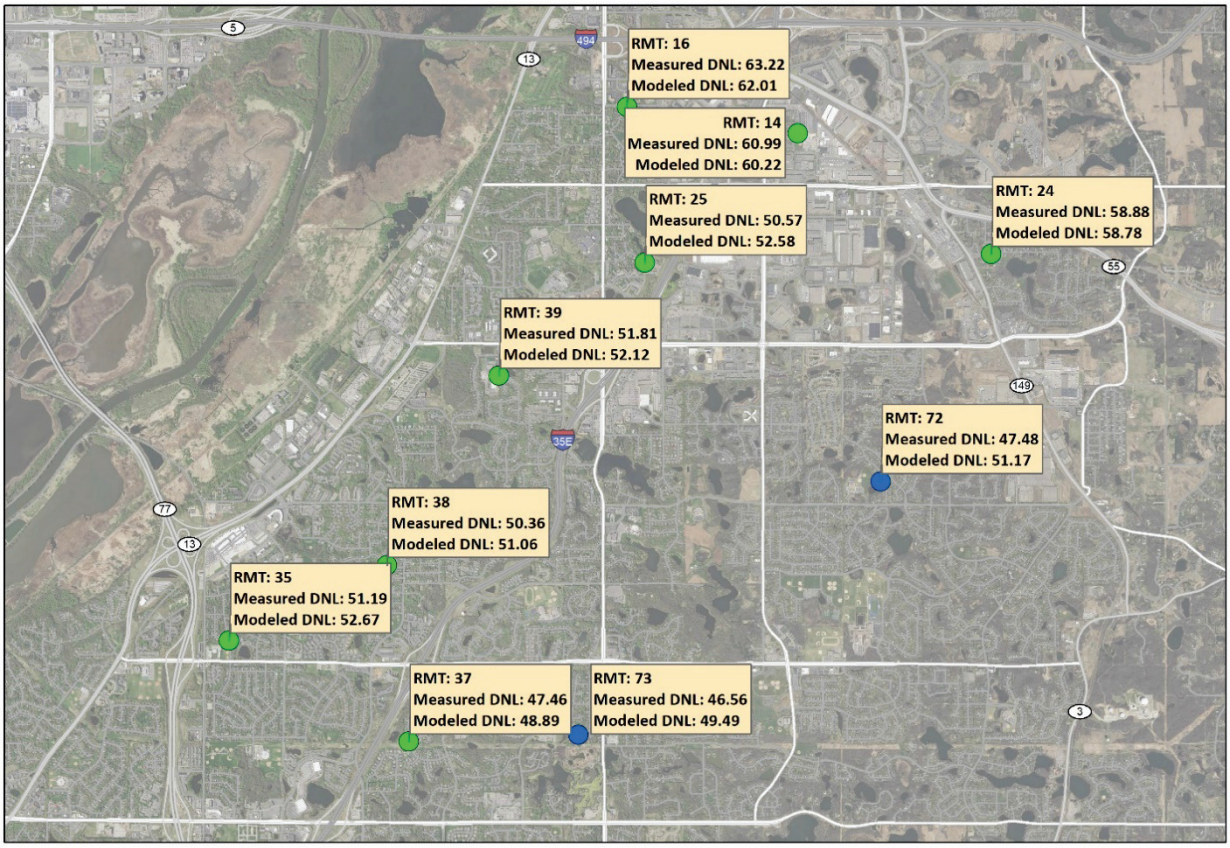




Measured DNL by Date

Date	Evergreen Park	Mueller Farm Park
5/2/2019	-	28.84
5/3/2019	51.07	50.21
5/4/2019	44.94	36.95
5/5/2019	-	-
5/6/2019	39.57	42.47
5/7/2019	47.17	45.22
5/8/2019	43.68	47.75
5/9/2019	-	-
5/10/2019	-	31.04
5/11/2019	46.46	49.85
5/12/2019	49.98	50.51
5/13/2019	51.26	52.85
5/14/2019	47.73	49.95
5/15/2019	47.33	47.87
Average	**49.49**	**46.56**

Measured vs. Modeled Aircraft DNL

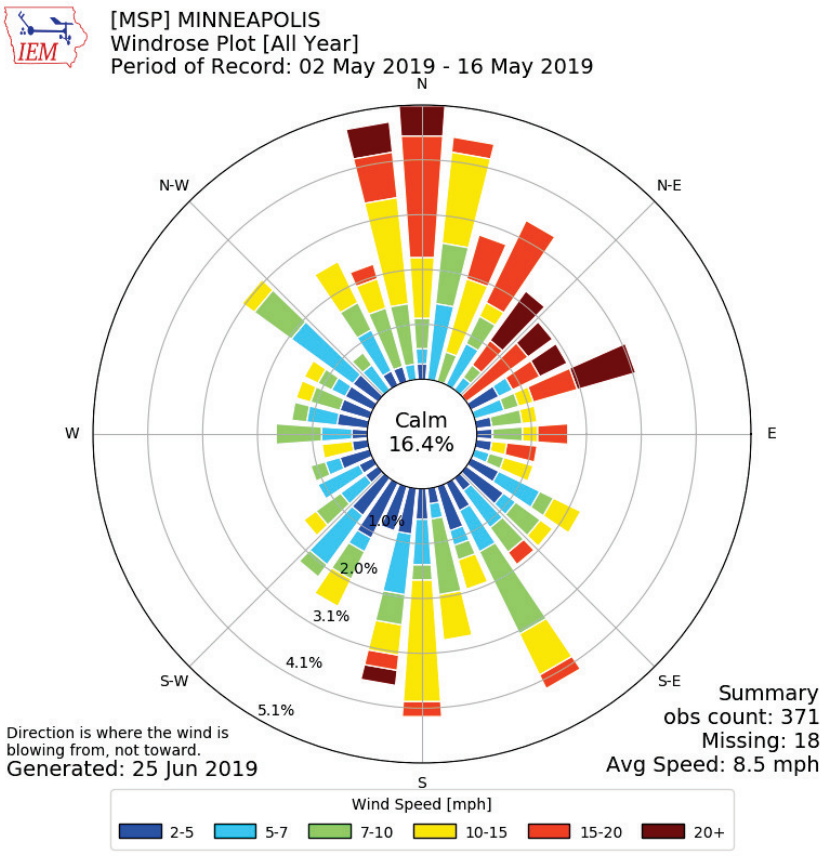


Site	Modeled ADNL	Measured ADNL	(+/-)
14	60.22	60.99	-0.77
16	62.01	63.22	-1.21
24	58.78	58.88	-0.10
25	52.58	50.57	2.01
35	52.67	51.19	1.48
37	48.89	47.47	1.42
38	51.06	50.36	0.70
39	52.12	51.81	0.31
72 - Mueller Farm Park	51.17	47.48	3.69
73 - Evergreen Park	49.49	46.56	2.93

4.5 WEATHER

Daily Observation – NOAA MSP Station

Date	Day	Low (f)	High (f)	Rain (in)	Wind (mph)
5/2/2019	1	41	57	-	13
5/3/2019	2	35	62	0.15	17
5/4/2019	3	45	71	-	16
5/5/2019	4	49	64	-	20
5/6/2019	5	47	59	-	17
5/7/2019	6	40	63	-	15
5/8/2019	7	36	55	1.45	28
5/9/2019	8	35	54	0.02	25
5/10/2019	9	38	61	-	14
5/11/2019	10	42	65	0.01	22
5/12/2019	11	43	62	-	13
5/13/2019	12	40	67	-	13
5/14/2019	13	48	73	0.04	14
5/15/2019	14	54	76	0.12	13



MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Brad Juffer, Manager, Community Relations

SUBJECT: **MSP AIRPORT LONG-TERM PLAN AND STAKEHOLDER ENGAGEMENT**

DATE: July 3, 2019

The MAC is responsible for long-term planning for each of its airports. The MSP Airport Long-Term Plan ("the Plan") is a forward-looking planning tool that studies facility and infrastructure needs based on projected 20-year passenger demand and aircraft operations.

A robust community and stakeholder engagement program – including creation of a Stakeholder Advisory Panel – will accompany various phases of the planning process, providing ample opportunities for public information, input and discussion.

An overview of engagement program updates and upcoming Stakeholder Advisory Panel activities will be shared at the July 17, 2019 NOC meeting.