FAR PART 150 NOISE COMPATIBILITY STUDY

MILWAUKEE COUNTY'S

GENERAL

MITCHELL

INTERNATIONAL AIRPORT

D. EXISTING & FUTURE BASELINE NOISE CONDITIONS

Existing and Future Baseline Noise Conditions

Introduction

Noise measurements were conducted between June 4, 2003 and July 2, 2003 at various locations within the Milwaukee area. Measurement data were collected at a total of eleven (11) portable noise monitoring locations. These portable measurements were used to supplement the measurement data from the airport's seven (7) permanent noise monitoring locations. Data from January 1, 2002 through December 31, 2002 were obtained from the permanent noise system.

The portable measurements consisted of: (1) single event noise levels from individual aircraft flyovers, (2) cumulative 24-hour continuous measurements, and (3) ambient non-aircraft noise sources. The survey used specialized equipment that recorded and displayed the complete time history of sound at the respective sites. The methodology used in the noise measurement program and a description of measurement locations is presented in Section C, Background Information on Noise/Methodology. The results of the measurement survey and noise data from the permanent noise monitoring system are summarized in the following paragraphs. Additional data, with more detailed results for each measurement site, is presented on the General Mitchell International Airport Part 150 project web site. This section is divided into the following sub-sections:

- Noise Measurement Results – Describes the results of the noise measurement survey. The measurement results can be divided into the following subsections:
  - Continuous noise measurement data
  - Ambient levels
  - Single event aircraft noise levels (SEL)
  - DNL noise levels
  - Hourly noise levels
  - Time Above noise levels (TA)
- Noise Contour Modeling Results –Presents the noise contour modeling results.

Noise Measurement Results

Continuous One-Second Noise Data

Noise levels were continuously recorded at each of the portable noise-monitoring sites. Continuous one-second noise data continually records noise data every one second. The results can be shown for a specified period, which in this case is 25 minutes. In addition to recording the noise events from aircraft, monitors also recorded the ambient noise level of the community surrounding the site. The monitors continuously monitored all noise events. An example of this is presented in Figure D1 where 15-minutes of continuous noise data are shown for two sites. The graphic shows the measured A-weighted noise level on the left axis versus time for the sample 15-minute period. The difference between an aircraft event and the ambient noise can be easily distinguished in this plot; each peak corresponds to the noise caused by an aircraft overflight.

The top portion of the graph plots the data for site M01, a site close to the Airport to the north. The bottom portion of the site plots the same time period for site M03, a slightly more distant site north of the Airport, but along the same general flight path. Aircraft departing to the north first pass over site M01, and then about 15 seconds later pass over site M03. The time sequence of each noise event is shown in that noise events occur first at M01 and then at M03.

Ambient Noise Measurement Results

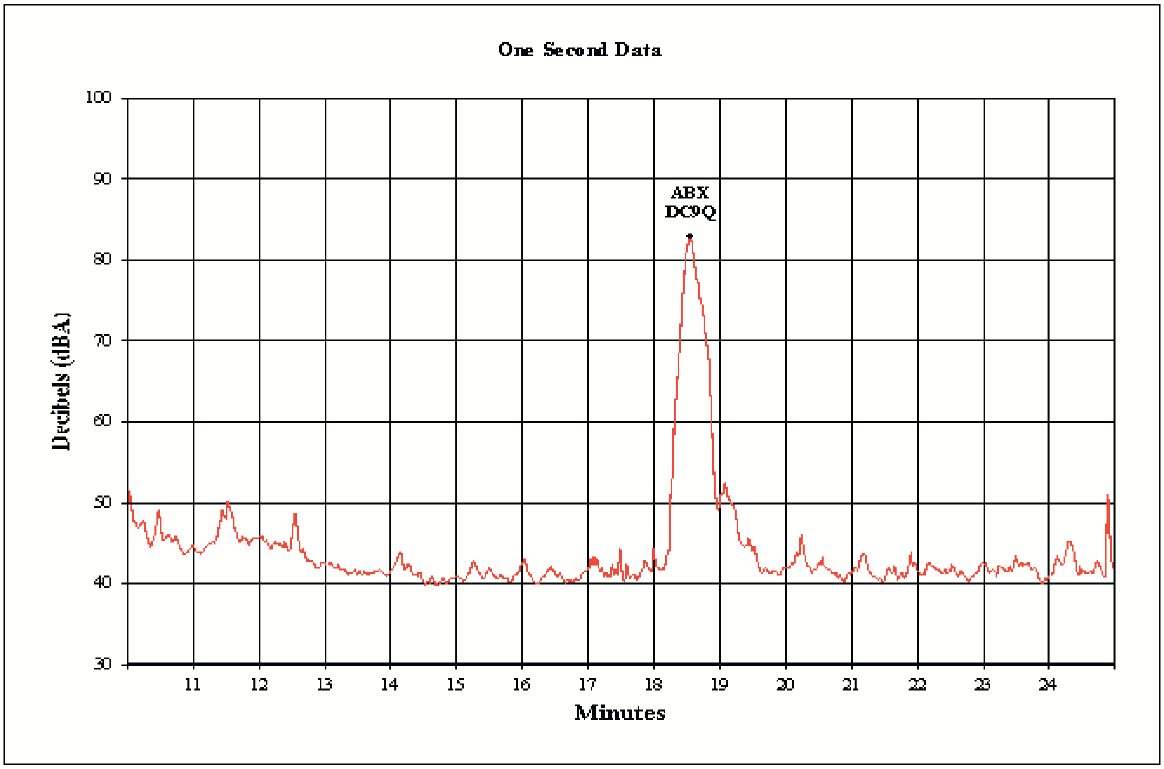
The ambient noise level was identified based on the survey data for each of the measurement sites. In this case, ambient noise refers to the background noise that would occur without influences from aircraft overflight at each site. The quantities measured were the Percent Noise Levels (Ln). Percent Noise Level is the noise level exceeded different percentages (n) of the time. These metrics are described in greater detail in the background section (Section C). The data help establish the ambient noise environment for all sources of noise and aid in assessing how intrusive aircraft noise is on the ambient environment. Other sources include noise from roadway, railroad, commercial sources, and residual background noise.

The results of the ambient noise measurement survey at each measurement site are described in the following figures and tables. Table D1 presents the statistical summary of the ambient measurements for all of the sites in tabular format. This table presents the Ln noise level for the Lmin, L90, L50, L10 and Lmax. The Lmax is presented for the peak dBA value that was measured while the Lmin is the lowest dBA value that was measured. This table illustrates the range in noise levels that exist at each site. Note that aircraft noise is included in this information and is typically the source of peak or maximum noise levels. Although aircraft noise is not technically a component of the ambient noise levels, it is the loudest event at most noise monitor locations; therefore, it is included in the table.

Table D1
AMBIENT MEASUREMENT RESULTS FOR ALL SITES (Aircraft events included)
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

NMS	Description	Address	Statistical Noise Levels (dBA) Max	L10	L50	L90	Min
Permanent Sites							
NMS01	Oak Creek	S Clement and Manitowoc	94	59	47	40	38
NMS02	S. Milwaukee	End of Marion St.	89	52	45	39	37
NMS03	Cudahy	Hately Av by Somers Ave	96	61	49	43	41
NMS04	Milwaukee	Vermont and Oklahoma	96	66	56	43	41
NMS05	Milwaukee	Oklahoma Av by Taylor Ave	102	69	62	48	43
NMS06	Milwaukee	23rd St and Kimberley Ave	96	60	51	46	43
NMS07	Oak Creek	20th St and Timber Ridge	99	64	55	50	46
Portable Sites							
M01	Milwaukee	4401 Lenox St.	92	54	47	44	38
M02	Milwaukee	3813 Alabama	97	52	46	42	35
M03	Milwaukee	1702 Eden	95	52	46	43	36
M04	Milwaukee	1901 Kimberly	97	57	52	50	42
M05	Milwaukee	707 W. Maplewood Ct.	92	57	52	49	40
M07	Oak Creek	410 Marquette	93	54	48	45	36
M09	Oak Creek	6775 Juniper	90	55	49	45	39
M10	Cudahy	3225 Mallory	93	54	47	44	37
M11	Cudahy	3713 Holmes	97	55	47	44	39
M12	Cudahy	3025 Holmes	98	57	49	45	38
M13	Milwaukee	6632 S. 19th St.	88	56	52	50	41

Source: *BridgeNet International*



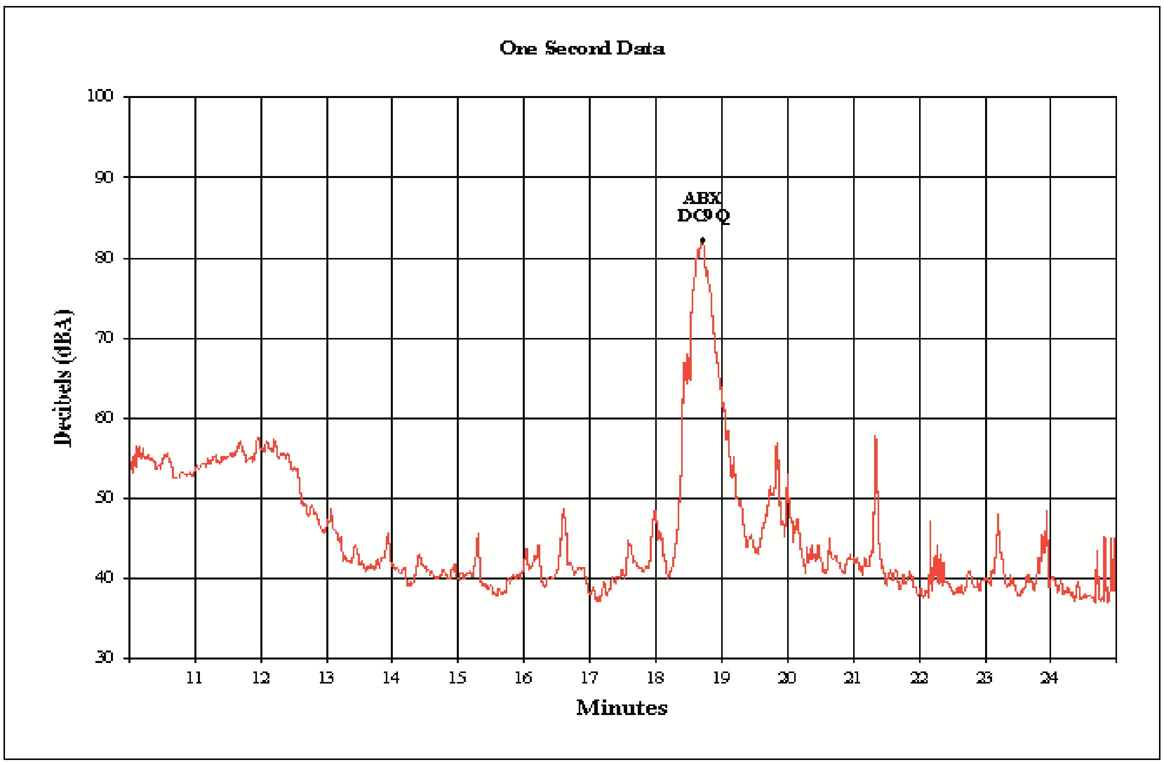


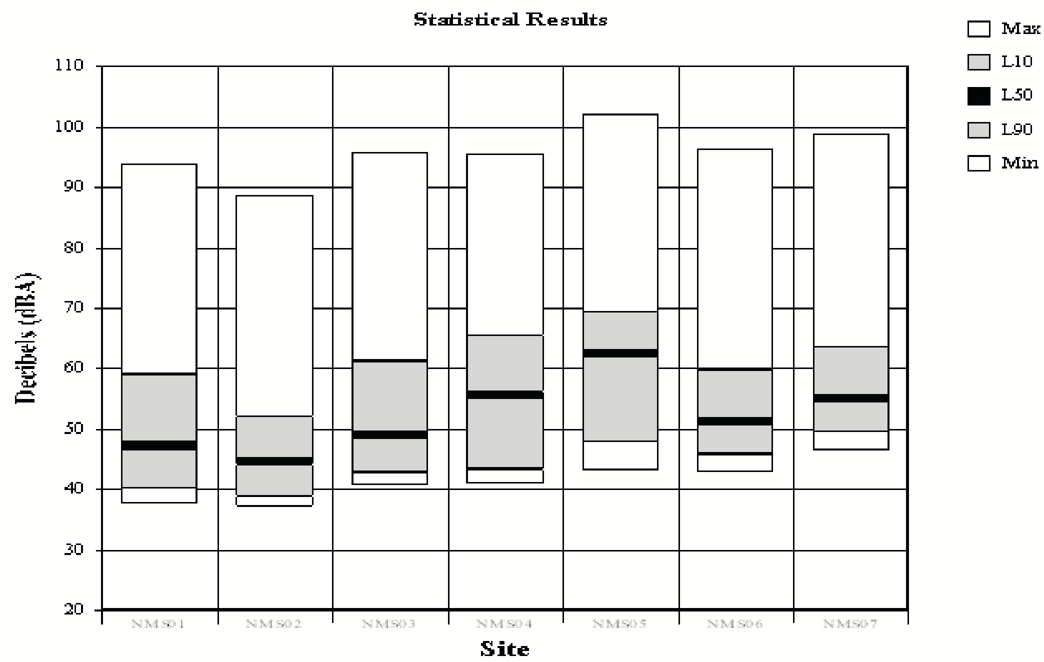
Figure D1 **Sample Time History Noise Plot of Aircraft and Ambient Noise**

The information from Table D1 is also presented graphically in Figure D2. The top portion of the figure presents data for the permanent sites. The bottom portion presents the data for the portable sites. Industry practices indicate that the L90 is a good representation of the background or ambient noise level. It represents the level that is exceeded 90 percent of the time. Therefore it is commonly referred to as the residual noise when other sources of noise are not present. This is the level above which noise events occur, such as an aircraft overflight or train pass-by. Aircraft noise would have very little if any contribution to this noise level. The L50 noise level is referred to as the median noise level. Half the time the noise is below this level; half the time it is above this level. During peak hours of aircraft activity, the L50 noise level could be influenced by the aircraft noise, but on a 24-hour basis, this level is generally reflective of ambient noise levels.

The results of the measurements showed that background L90 noise levels ranged from a low of 39 dBA to a high of 50 dBA. Most sites had background L90 noise levels in the mid 40 dBA. The majority of these sites are located in relatively quiet settings that are not exposed to community noise sources, such as highways. The sites with the higher ambient noise levels were typically exposed to roadway noise. These levels are typical of urban residential environments.

Ambient noise levels vary by day and time of day. To illustrate this range in noise, ambient noise data from one of the sites is summarized in Figure D3. The data for all other sites is presented on the General Mitchell International Airport website, www.mitchellairport.com. The top portion of this figure illustrates the day-to-day measurement results. The bottom portion of the figure shows each hour of measurement for one typical day. The results show that day-to-day ambient noise levels are approximately the same for each day, except occasional days that are higher. These higher ambient days are generally during bad weather conditions. As is shown, ambient noise levels do vary by time of day; noise levels are quieter at night and during late evening and early morning hours. The ambient levels increase during daytime hours. Typical daytime ambient noise levels are about 5 to 10 dBA higher than the nighttime hours.

Neighborhood: Permanent Sites



Neighborhood: Long-term Sites

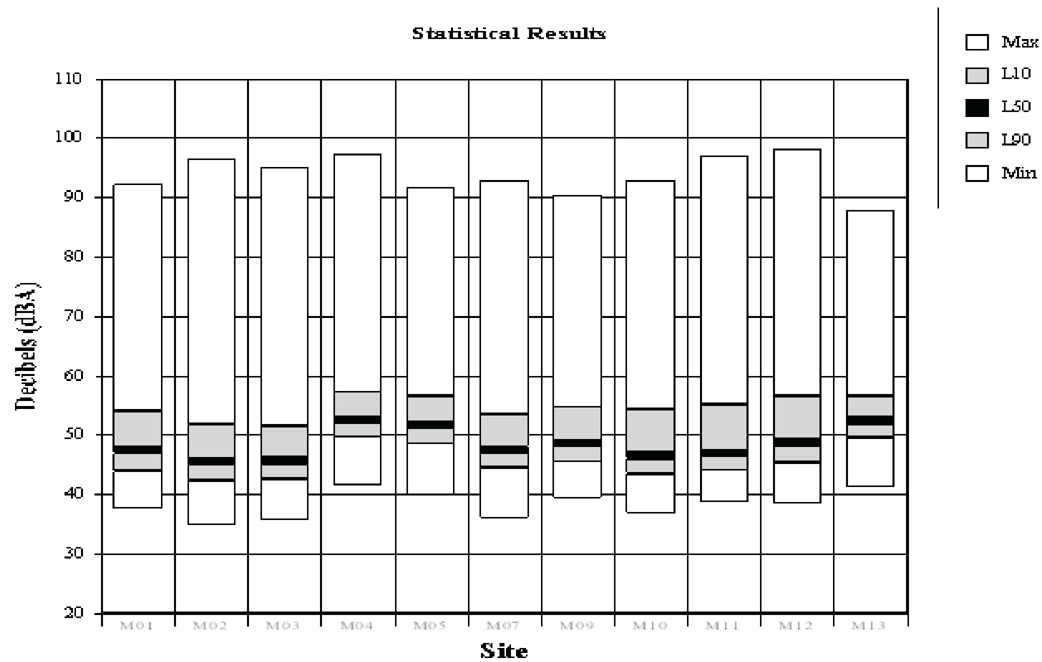
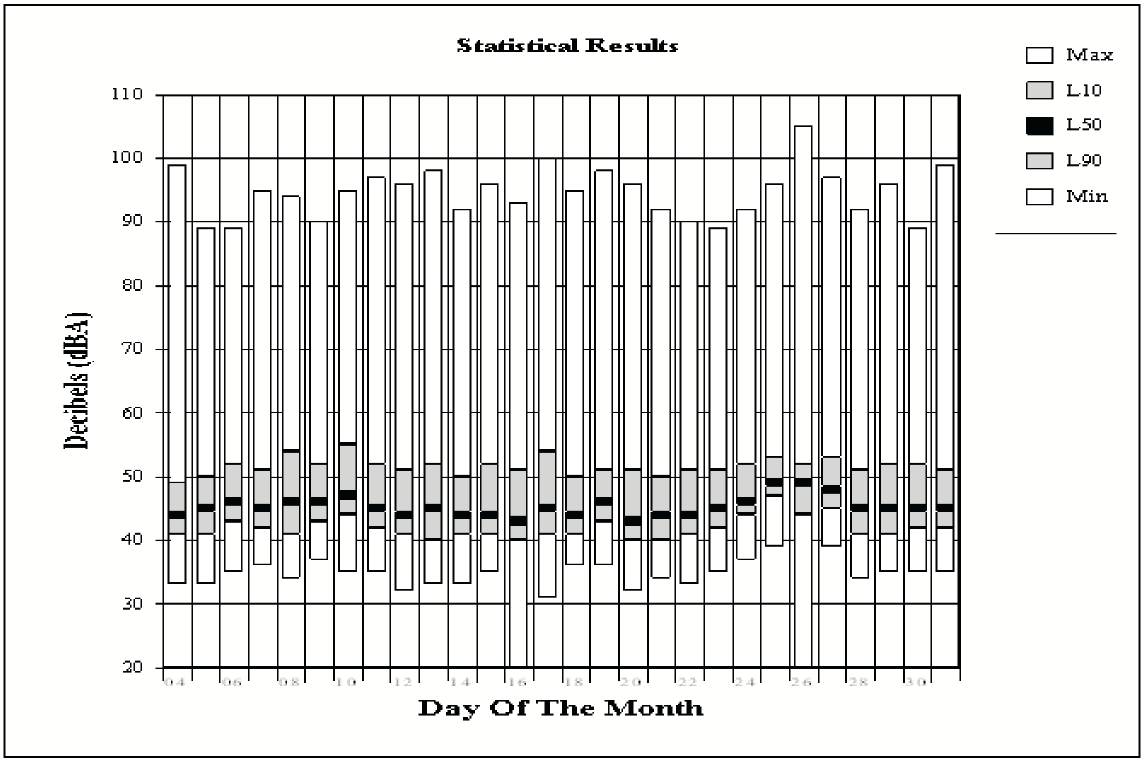


Figure D2 **Ambient Noise Measurement Results (All Sites)**



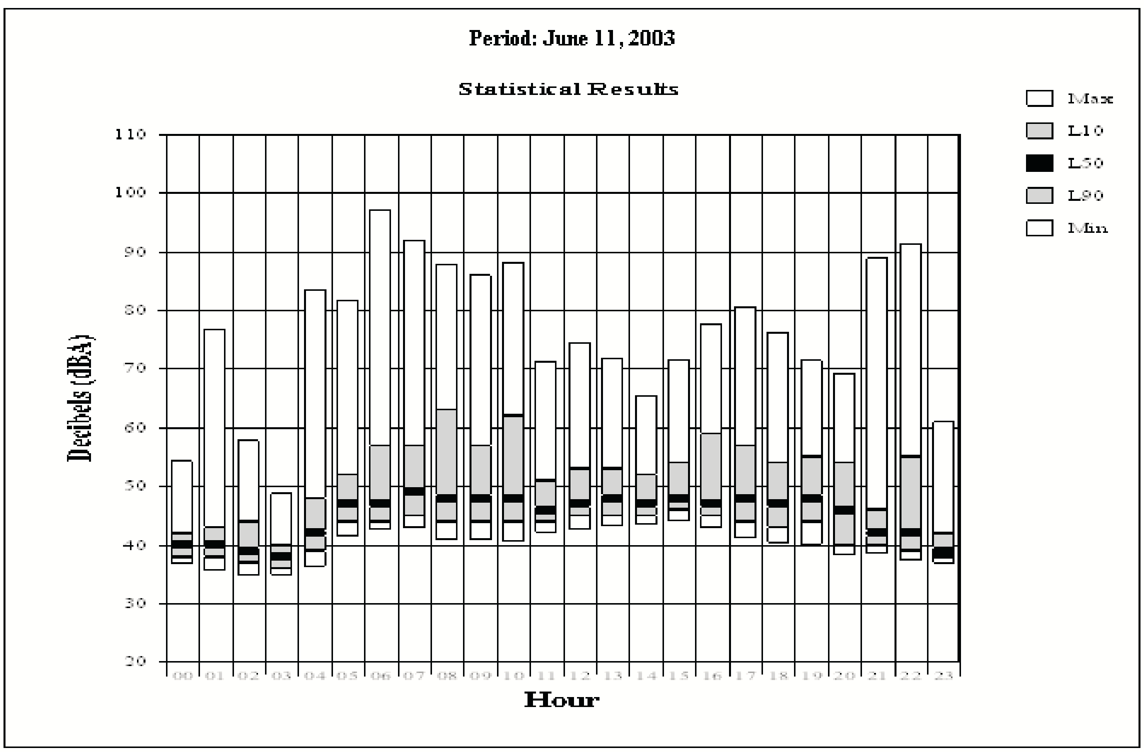


Figure D3 **Ambient Noise Measurement Results (Site - M02)**

Aircraft Single Event Noise Measurement Results

Aircraft single event noise levels were identified at each measurement site. The acoustic data included the maximum noise level (Lmax), Sound Exposure Level (SEL), and the time duration of aircraft events. The single noise events measured during the survey were correlated with flight operations information. With this correlated single event noise data, it was possible to identify the single event noise levels from the different aircraft types generating noise. The single event results are summarized in the following paragraphs. Additional single event noise data are presented in the Appendix.

The number of aircraft noise events measured daily at a site is presented graphically in Figure D4. This figure presents one day of events for one measurement site. The table presents the SEL noise value plotted as a histogram. The vertical axis presents the number of events in each hour. The horizontal axis reports the hour of the day. The SEL values are plotted vertically for each event in each hour.

The single event data were analyzed in terms of noise level per aircraft type and in terms of the total range in noise events. An example of the range in noise data is presented for two sites in Figure D5. This figure presents a histogram of all the aircraft events that were measured at Sites M01 and NMS05. The histogram shows number of measured aircraft events on the vertical column and the measured SEL noise level on the horizontal column. Site M01 is representative of a location close to the Airport while site NMS05 is representative of a location more distant from the Airport. These results show the wide range in aircraft events that occur at each site, as well as the number of noise events.

Once correlated with the operational information, the single event data were analyzed in terms of noise level per aircraft type. An example of the single event noise level by aircraft type is presented in Figures D6 and D7. The data for site NMS06 is presented in Figure D6 for departure information and Figure D7 for arrival information. These figures show the type of aircraft, the number of measured noise events correlated to that aircraft type, and the average noise level measured for that aircraft type. The longer bar graph illustrates those aircraft with the loudest events. The louder events were generally older generation commercial aircraft. These data also illustrate the difference in noise events generated by departures versus arrivals. These data show that departure noise generates a higher noise level and a wider range in noise per the different aircraft types. For arrivals, there is less relative difference in noise among the different aircraft types.

This table presents one day of events for one measurement site. The table presents the SEL noise value plotted as a histogram. The vertical axis presents the number of events in each hour. The horizontal axis is the hour of the day. The SEL values are plotted vertically for each event in each hour. The data shows that the noise events generally occur during peak times of the day. This peak period varies from day to day and is not always the same hours. Numbers in Red are higher noise level events when the SEL exceeds 94.5 dBA.

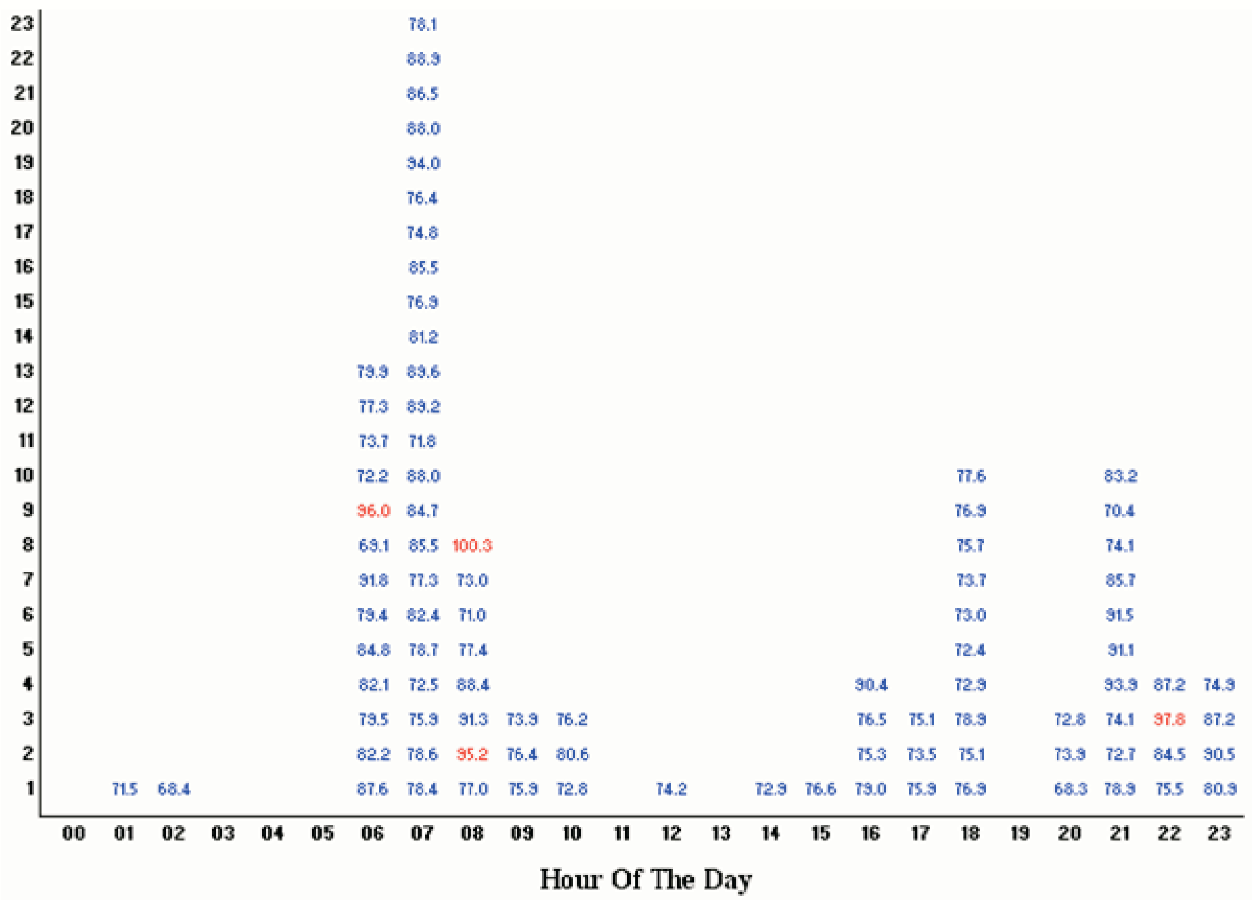


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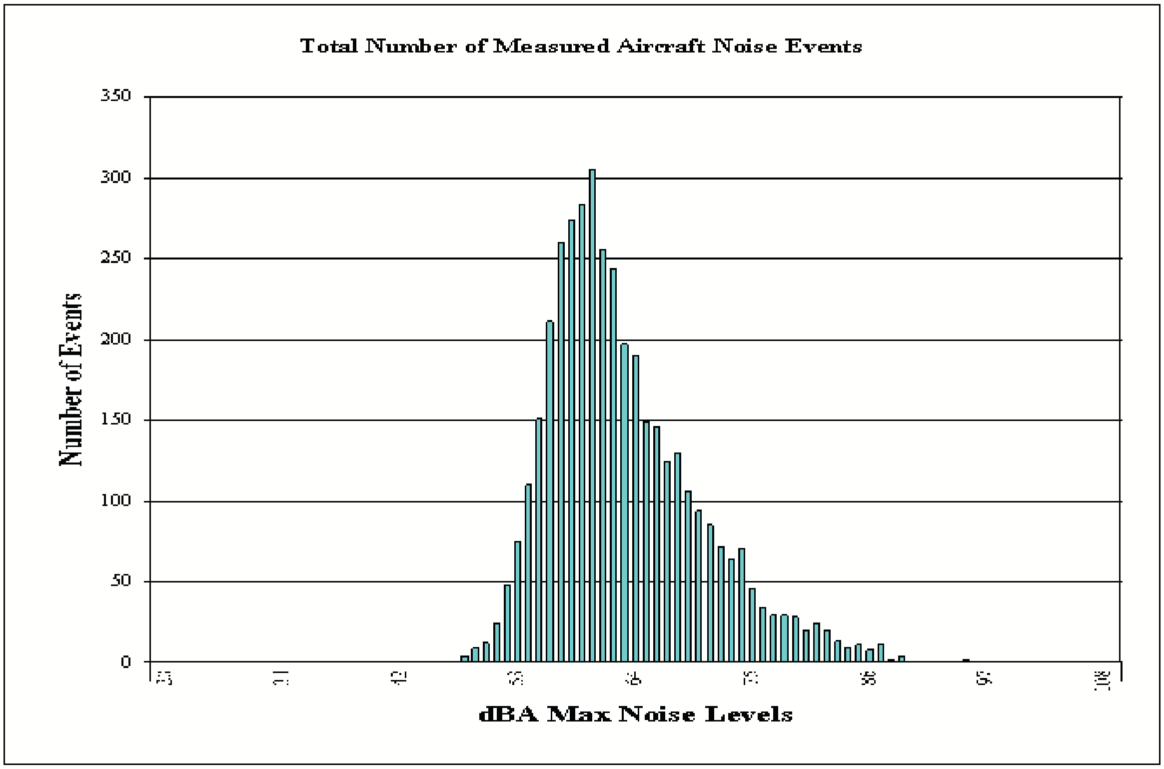
Figure D4 **SEL Noise Graphic for One Site**



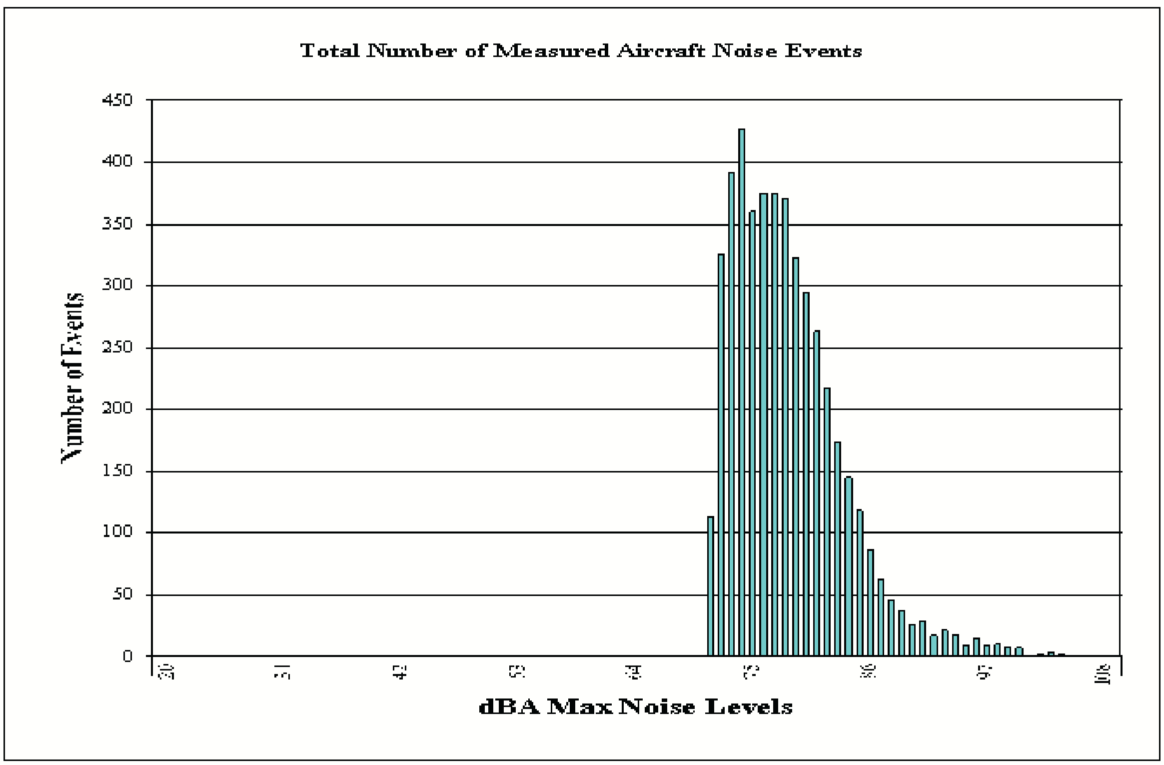


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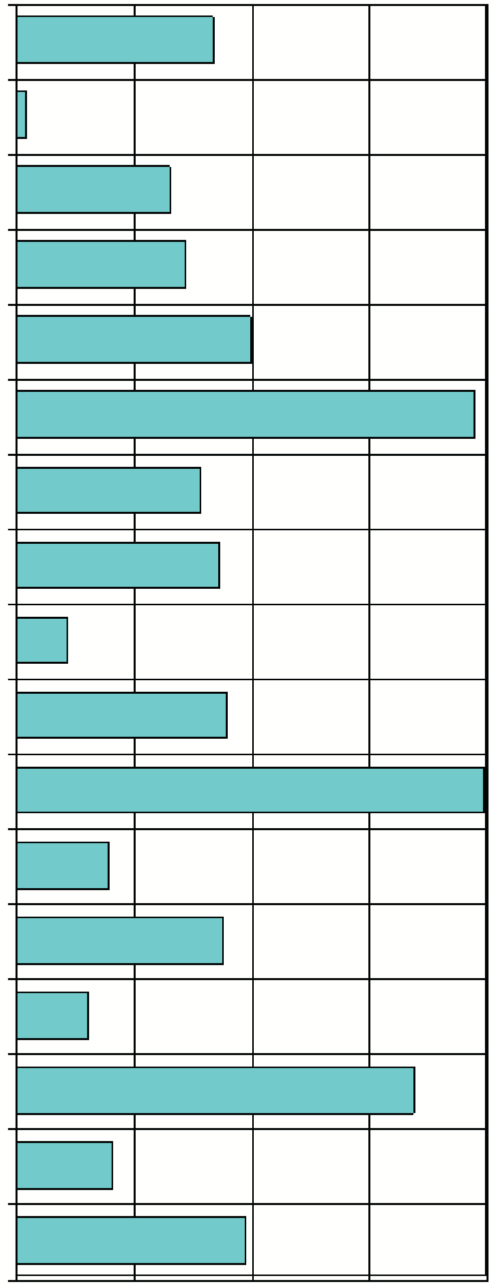
Figure D5 **Sample Time History Noise Plot of SEL Noise Levels for Two Sites**

Aircraft	FAR 36 Stage	Event Count	Energy Average SEL
A306		3	88.4
B190		61	80.5
B717		52	86.6
B72Q		2	87.2
B73B		20	90.0
B73Q		4	99.5
B752		27	87.9
BA46		16	88.7
CARJ		49	82.2
CJET		80	89.0
DC9Q		113	99.9
E145		147	84.0
EA32		17	88.8
J328		120	83.1
MD80		76	96.9
SF34		3	84.1
Other Aircraft		117	89.8

Graph of Energy Average SEL



Note: Energy Average is average of all events on a noise energy basis.
FAR36 Stage is for general categories and does not account for hushkitted aircraft.

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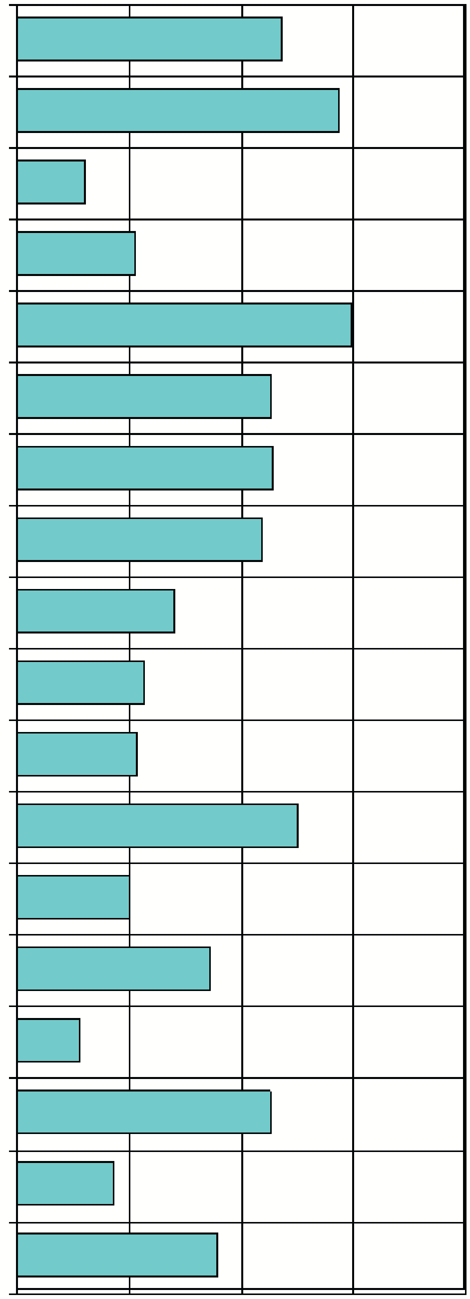
Figure D6 **SEL Noise Graphic, Departure Operations (NMS06)**

Aircraft	FAR 36 Stage	Event Count	Energy Average SEL
A306		9	91.9
A310		4	94.4
B190		293	83.1
B717		111	85.3
B72Q		7	94.9
B73B		49	91.4
B73Q		18	91.5
B752		25	91.0
BA46		38	87.1
CARJ		117	85.7
CJET		150	85.4
DC9Q		222	92.5
E145		275	85.1
EA32		37	88.6
J328		262	82.8
MD80		191	91.3
SF34		59	84.3
Other Aircraft		261	89.0

Graph of Energy Average SEL



Note: Energy Average is average of all events on a noise energy basis.
FAR36 Stage is for general categories and does not account for hushkitted aircraft.

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Figure D7 **SEL Noise Graphic, Arrival Operations (NMS06)**

To better illustrate which aircraft generate the highest noise events, the 25 loudest single event noise levels at each measurement site were identified. These events were correlated with an aircraft type and plotted. The results are shown in Figures D8 and D9 for sites M02 and NMS01, respectively. The figures include the date and time of the event, the aircraft type, the operation, and the associated noise levels. For most of the measurement locations, the loudest identified aircraft were typically older generation commercial aircraft, such as DC9s and MD80s. Data for other sites are presented on the General Mitchell International Airport Part 150 project web site.

DNL Noise Measurement Results

Aircraft-related DNL levels were identified for each of the permanent noise monitoring locations and the portable monitoring locations. Table D2 presents the results of the DNL noise measurements at the seven sites from the Airport's noise monitoring system and from the 11 portable noise-monitoring locations. This table lists the average DNL due to aircraft events for the period monitored at each site (June 4, 2003 to July 1, 2003).

Figure D10 shows the same results of the DNL noise measurements at the seven permanent locations and the 11 portable noise-monitoring locations in a graphical format. The top portion of the graph shows the average DNL noise level measured at each noise monitoring location. The bottom portion of the table shows the range of daily DNL values, along with the overall DNL for the entire measurement period. The results show the wide range in noise level that is experienced at each location. The number of operations and the pattern of the operations vary with the weather, which affects which runway is used. Peak DNL days were an average of 3 to 7 dBA higher than the average day.

Figure D11 graphically presents the DNL noise level due to the aircraft events for each day the noise level was monitored at Site NMS03 (Cudahy). Figure D12 graphically presents the same data at Site M02 (Milwaukee). This figure shows the day-to-day change in noise levels. The bottom portion of the graphic represents the range of measured SEL noise levels during the measurement period. Additional figures illustrating this information for the other sites are presented on the General Mitchell International Airport Part 150 project web site.

Table D2

DNL NOISE MEASUREMENT RESULTS FOR ALL SITES

General Mitchell International Airport FAR Part 150 Noise Compatibility Study

NMS	Description	Address	Aircraft DNL Noise Level
Permanent Sites (Part 150 Measurement Period: Jan 1, 2002 to Dec 31, 2002)			
NMS01	Oak Creek	S Clement and Manitowoc	63
NMS02	S. Milwaukee	End of Marion St.	60
NMS03	Cudahy	Hately Av by Somers Ave	65
NMS04	Milwaukee	Vermont and Oklahoma	61
NMS05	Milwaukee	Oklahoma Av by Taylor Ave	64
NMS06	Milwaukee	23rd St and Kimberley Ave	63
NMS07	Oak Creek	20th St and Timber Ridge	62
Portable Sites (Part 150 Measurement Period: June 4, 2003 to July 1, 2003)			
M01	Milwaukee	4401 Lenox St.	62
M02	Milwaukee	3813 Alabama	64
M03	Milwaukee	1702 Eden	63
M04	Milwaukee	1901 Kimberly	64
M05	Milwaukee	707 W. Maplewood Ct.	58
M07	Oak Creek	410 Marquette	63
M09	Oak Creek	6775 Juniper	62
M10	Cudahy	3225 Mallory	62
M11	Cudahy	3713 Holmes	65
M12	Cudahy	3025 Holmes	65
M13	Milwaukee	6632 S. 19th St.	55

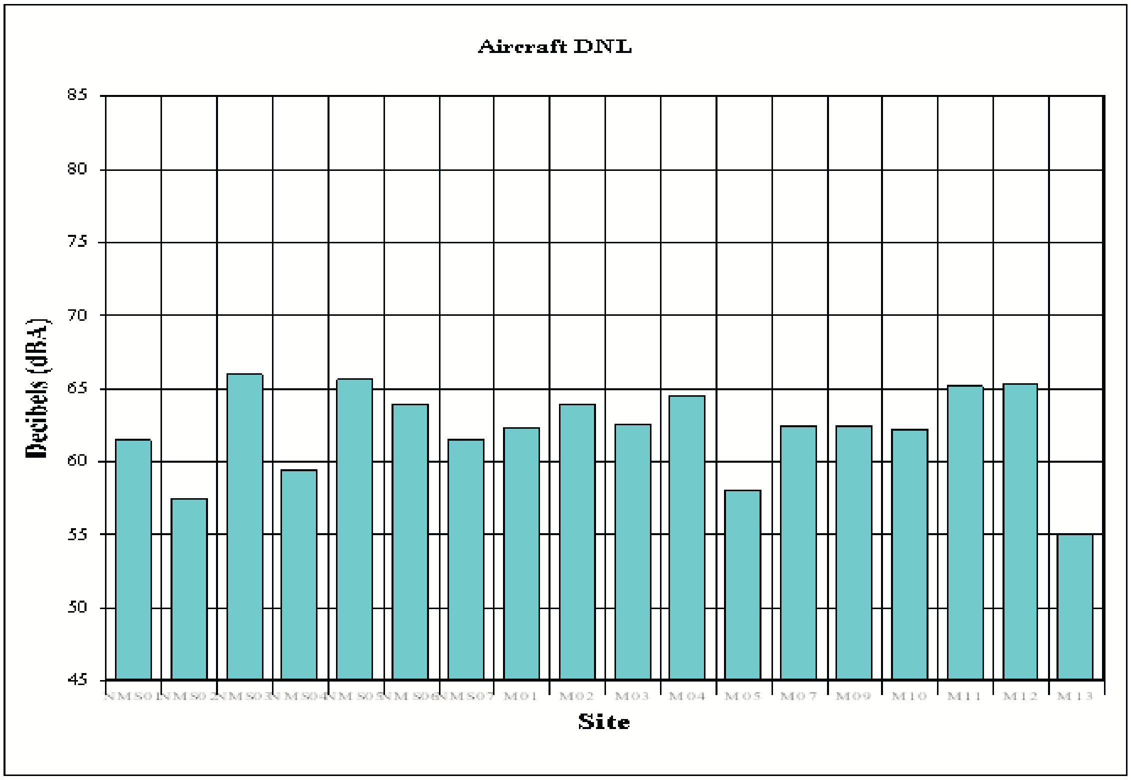
Source: *BridgeNet International*

Aircraft	Airline	Event Time	Aircraft	Ops	Rwy	Lmax	SEL	Graph Of SEL
	United States Postal Service	Jun 04, 06:13	B722	D	1L	99.3	105.7	
	Midwest Express Airlines	Jun 12, 17:54	DC93	D	1L	94.7	102.7	
	Midwest Express Airlines	Jun 26, 09:06	MD88	D	1L	94.1	102.4	
	Midwest Express Airlines	Jun 18, 17:14	DC93	D	1L	95.4	102.3	
	Midwest Express Airlines	Jun 13, 07:44	DC93	D	1L	95.8	101.9	
	Midwest Express Airlines	Jun 12, 08:57	MD88	D	1L	93.9	101.1	
	Polar Air Cargo	Jun 08, 21:55	B743	D	1L	93.7	100.6	
	U	Jun 18, 17:44	U	D	1L	93.1	100.6	
	Midwest Express Airlines	Jun 14, 16:07	DC93	D	1L	92.4	100.5	
	Airborne Express	Jun 12, 22:31	DC9Q	D	1L	93.9	100.3	
	Midwest Express Airlines	Jun 12, 07:48	U	D	1L	94.0	100.2	
	Midwest Express Airlines	Jun 28, 08:56	MD88	D	1L	91.5	100.1	
	Midwest Express Airlines	Jun 08, 22:04	DC93	D	1L	91.5	100.1	
	Midwest Express Airlines	Jun 12, 22:13	MD82	D	1L	92.8	99.8	
	United States Postal Service	Jun 25, 23:27	B722	A	19R	95.6	99.8	
	Midwest Express Airlines	Jun 08, 22:08	MD82	D	1L	91.2	99.7	
	Midwest Express Airlines	Jun 12, 21:56	DC93	D	1L	92.0	99.2	
	Midwest Express Airlines	Jun 18, 17:30	MD82	D	1L	90.3	98.7	
	Midwest Express Airlines	Jun 12, 22:45	DC93	D	1L	91.5	98.7	
	Airborne Express	Jul 01, 22:19	U	D	1L	91.3	98.6	
	Midwest Express Airlines	Jun 04, 22:06	DC93	D	1L	90.7	98.4	
	Northwest	Jun 28, 06:13	DC95	D	1L	91.2	98.3	
	Northwest	Jun 18, 17:22	DC93	D	1L	90.6	98.3	
	Midwest Express Airlines	Jun 03, 21:52	DC93	D	1L	90.0	97.9	
	Airborne Express	Jun 04, 22:18	DC9Q	D	1L	91.3	97.8	

Figure D8 **25 Loudest SEL Events Site (M02)**

Aircraft	Airline	Event Time	Aircraft	Ops	Rwy	Lmax	SEL	Graph Of SEL
	United States Postal Service	Jun 04, 23:58	B722	D	19R	92.0	100.5	
	Northwest	Jun 09, 06:08	DC95	D	19R	90.2	99.8	
	Midwest Express Airlines	Jun 05, 07:51	DC93	D	19R	91.2	98.7	
	Delta Air Lines	Jun 09, 07:48	MD80	D	19R	90.3	98.5	
	Midwest Express Airlines	Jun 26, 08:01	DC93	D	19R	91.0	98.4	
	Midwest Express Airlines	Jun 26, 08:04	DC93	D	19R	89.7	98.2	
	Midwest Express Airlines	Jun 24, 09:06	MD88	D	19R	88.1	97.9	
	Midwest Express Airlines	Jun 05, 07:33	DC93	D	19R	89.7	97.8	
	Midwest Express Airlines	Jun 21, 07:43	DC93	D	19R	87.4	96.9	
	Midwest Express Airlines	Jul 02, 08:06	U	D	19R	88.0	96.8	
	Delta Air Lines	Jun 09, 06:22	B73Q	D	19R	87.6	96.7	
	U	Jul 02, 07:48	U	D	19R	86.7	96.3	
	Midwest Express Airlines	Jun 09, 07:34	DC93	D	19R	86.5	96.3	
	Midwest Express Airlines	Jun 05, 08:54	MD81	D	19R	86.8	96.3	
	Delta Air Lines	Jun 05, 07:47	MD80	D	19R	87.6	96.2	
	Midwest Express Airlines	Jun 09, 07:41	MD81	D	19R	86.2	96.1	
	United States Postal Service	Jun 24, 06:44	B722	D	19R	86.6	95.9	
	Delta Air Lines	Jun 25, 16:30	B73Q	D	19R	87.0	95.8	
	Delta Air Lines	Jun 08, 07:48	MD80	D	19R	86.6	95.7	
	Midwest Express Airlines	Jun 18, 07:37	DC93	D	19R	87.0	95.5	
	Midwest Express Airlines	Jun 09, 09:00	MD81	D	19R	86.0	95.5	
	Delta Air Lines	Jun 22, 18:09	MD80	D	19R	85.8	95.4	
	Midwest Express Airlines	Jun 09, 08:02	DC93	D	19R	85.6	95.4	
	Midwest Express Airlines	Jun 13, 20:17	MD81	D	19R	85.1	95.4	
	Midwest Express Airlines	Jun 05, 08:00	DC93	D	19R	86.3	95.3	

Figure D9 **25 Loudest SEL Events Site (NMS01)**



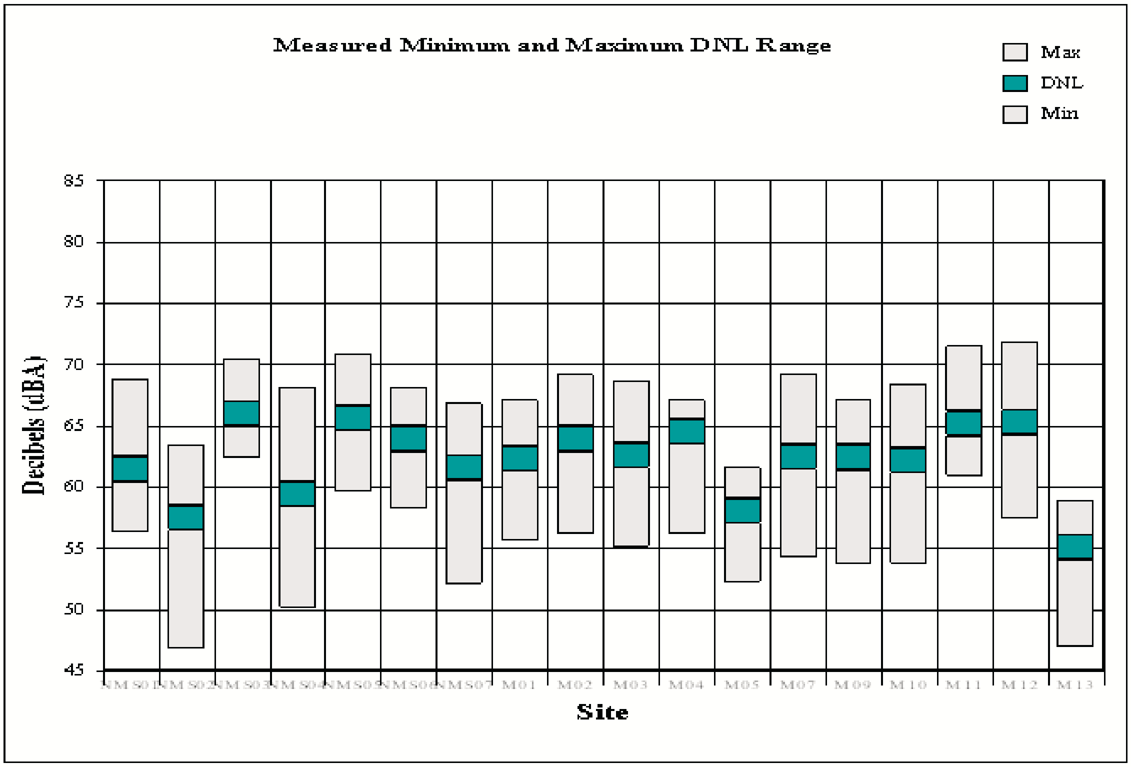


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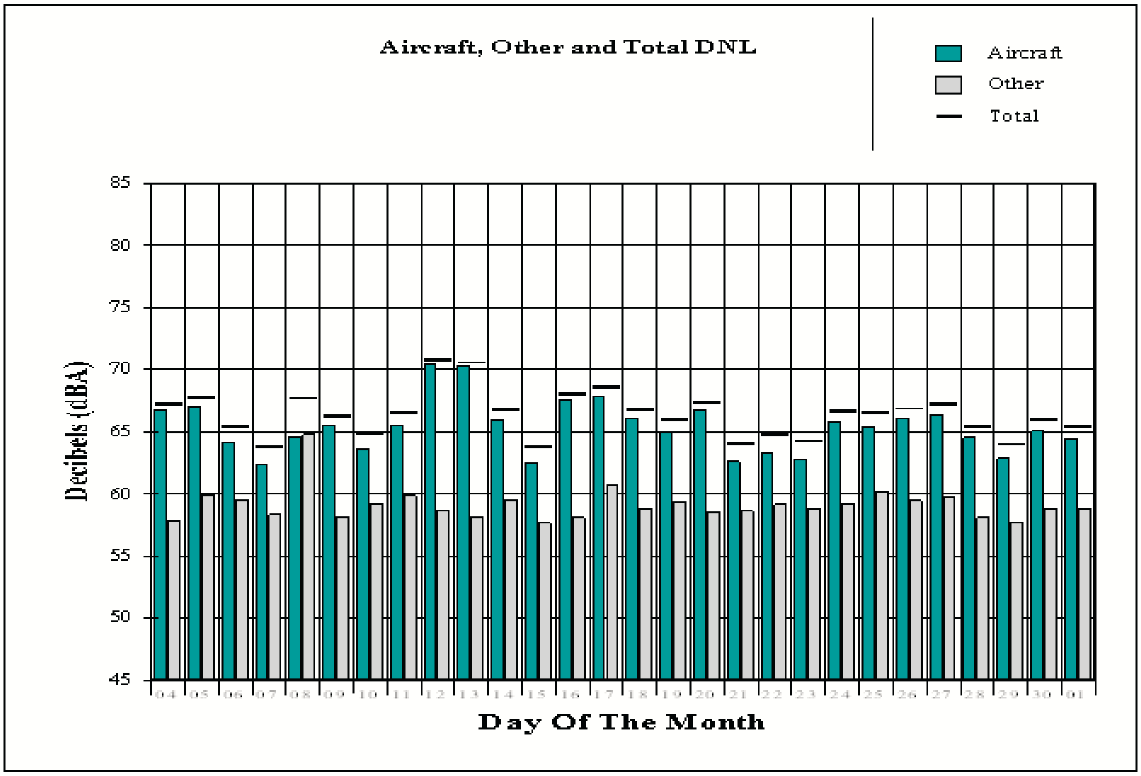
Figure D10 **Measured Aircraft DNL (All Sites)**



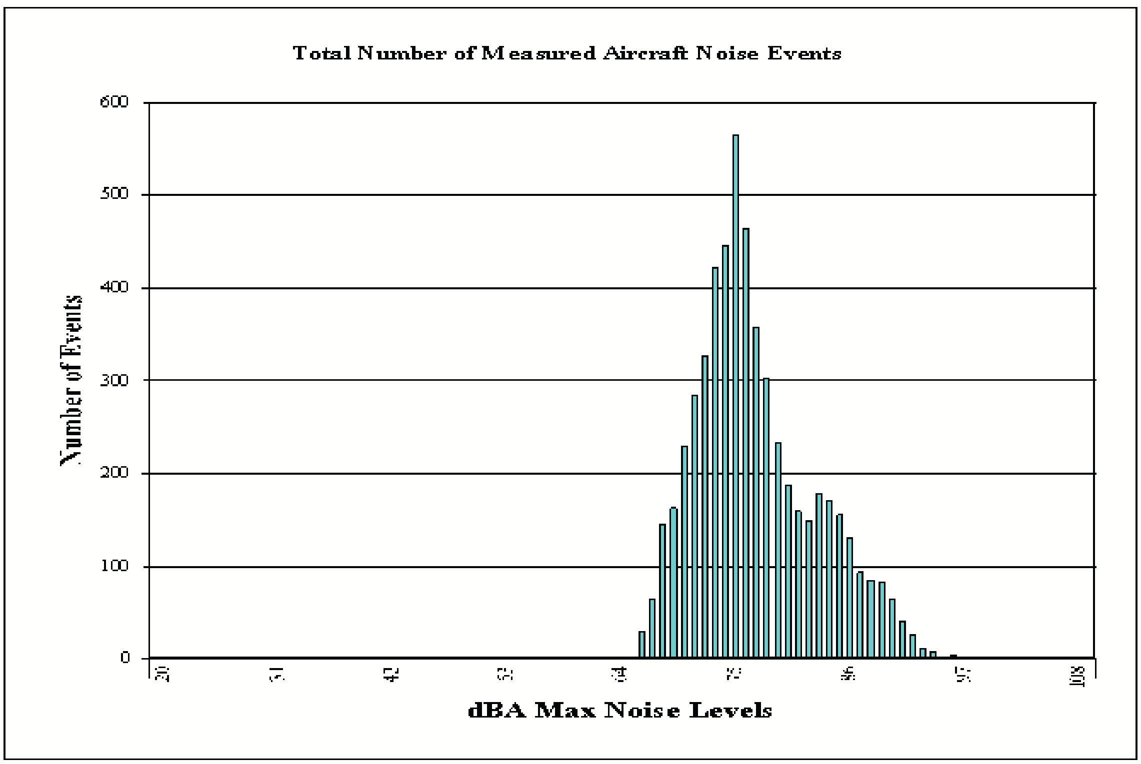
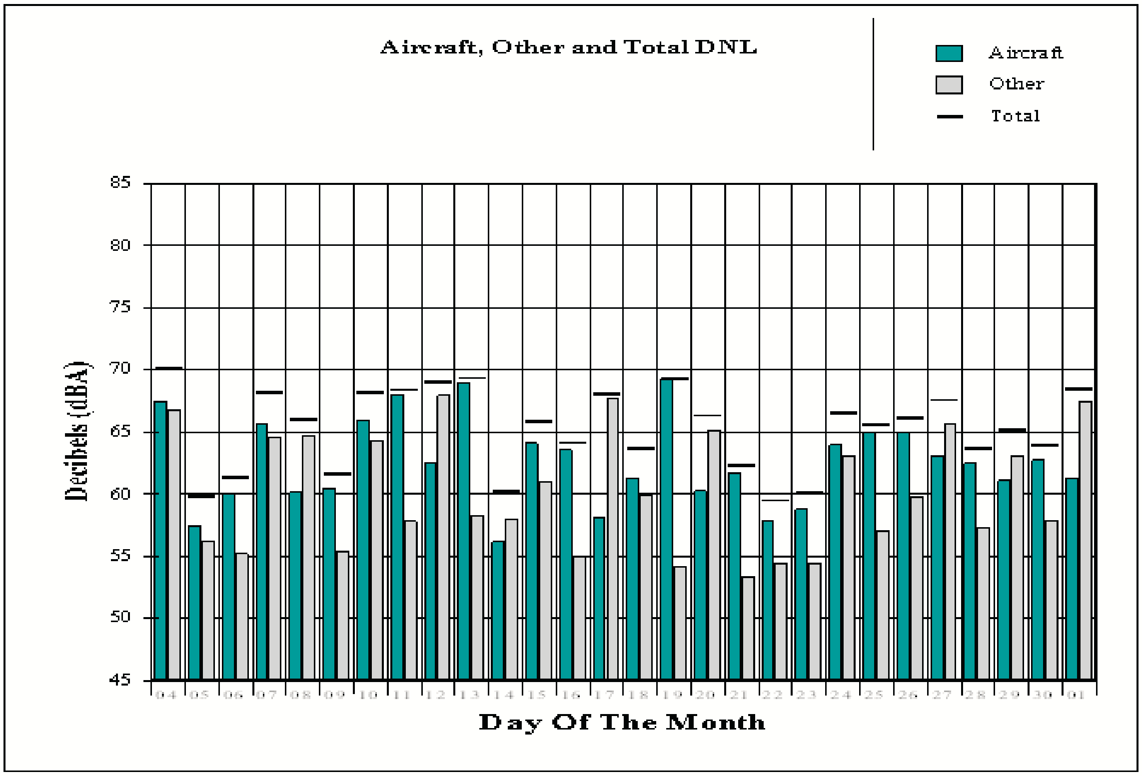


Figure D11 **Measured Aircraft Noise Levels (NMS03)**



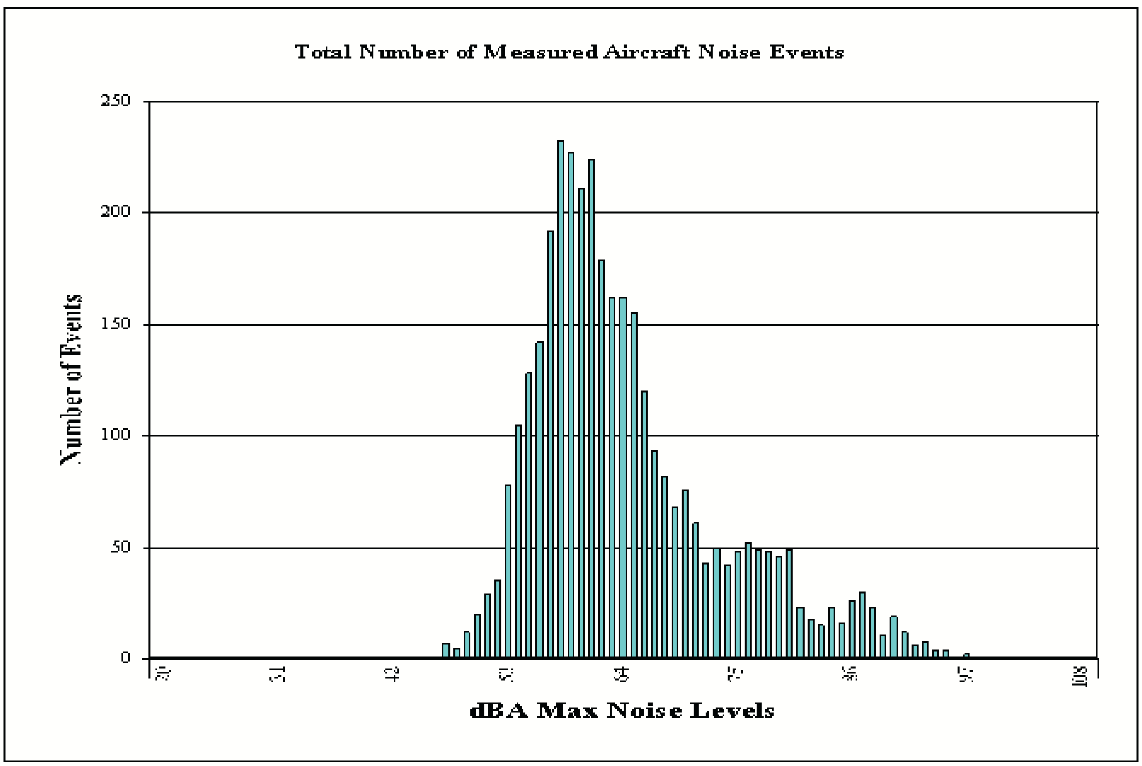


Figure D12 **Measured Aircraft Noise Levels (M02)**

The measured DNL noise level from the permanent noise monitoring sites reflects the annual DNL noise level for the base period of the study (January 1, 2002 through December 31, 2002). The measured DNL noise level for the portable noise monitoring locations is for the time period of the portable measurements and do not necessarily reflect annual noise level conditions. As described in the Methodology section, the primary purpose of the measurements was not to measure DNL, but to measure the single event noise levels that can be used to validate the INM modeling.

Hourly LEQ Noise Measurement Results

LEQ is the equivalent sound pressure level, i.e. a steady sound level that over a specified period of time would create the same energy the fluctuating sound level actually occurring. Hourly noise level data were determined for each of the portable measurement locations. Hourly values include the Aircraft LEQ, non aircraft LEQ, and total LEQ. In addition, Time Above noise levels in terms of minutes per hour was also determined. This includes the Time Above 85 dBA, 75 dBA and 65 dBA.

An example of the hourly LEQ noise data for site NMS01 is presented in Table D3. This table shows that the hourly noise level varies throughout the day. Also note that there are some louder nighttime hours. These are a result of the night cargo operations.

Time Above Noise Measurement Results

Time Above is the time in minutes per day that the noise levels were greater than a specific sound level. The Time Above (TA) levels that were determined from the noise measurement survey are: TA 65 dBA, which is designed to reflect when aircraft are clearly audible; TA 75 dBA, which is designed to reflect when aircraft would start to cause speech interference, and TA 85 dBA, which is designed to reflect when aircraft are sufficiently loud so that speech is clearly interfered with.

The Time Above 65 dBA is not to imply that noise levels below 65 dBA would not be audible or be annoying to all individuals, but it is reflective of when an aircraft would be clearly audible in the typical daytime environments. The results of the Time Above measurements are summarized in Table D4. These results show the amount of time that the noise levels were greater than the specified noise levels.

The results show that the Time Above 85 dBA noise levels occur less than three minutes per day, except for one site. Time Above 85 dBA represents the high interruption level. The results show that the high noise levels do not occur often and when they do occur, the event is of short duration. Generally the noise is only above 85 dBA when an aircraft is directly overhead or in close proximity to the site. The events that have a maximum noise level greater than 85 dBA typically last less than 10 seconds. The data shows that the majority of the noise from aircraft operations is below 85 dBA.

DATE	Hour Of The Day																								DNL
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Jun 4	50	48	50	45	57	54	59	59	56	55	55	54	57	55	58	59	61	57	57	57	57	57	56	65	64
Jun 5	58	56	48	44	59	56	60	69	66	58	57	58	55	58	60	58	58	57	58	60	56	60	58	53	64
Jun 6	59	50	52	49	54	59	59	65	62	56	57	58	60	63	60	64	62	60	60	55	62	56	57	50	64
Jun 7	49	46	59	46	58	54	55	67	62	62	62	66	60	67	65	56	72	54	55	55	56	54	59	56	65
Jun 8	48	54	72	62	62	61	57	62	62	61	57	64	74	63	64	58	58	55	54	56	54	56	57	54	70
Jun 9	52	47	50	54	50	53	67	69	65	63	58	57	56	55	57	58	60	57	57	56	53	56	58	49	66
Jun 10	63	48	60	45	51	55	60	61	61	62	60	61	62	62	58	64	65	61	56	55	53	58	58	54	65
Jun 11	48	51	53	49	52	57	56	60	58	57	59	61	61	62	62	60	61	60	59	65	59	59	60	55	63
Jun 12	51	46	55	41	52	55	58	57	58	58	54	57	54	70	57	57	57	56	57	55	54	57	56	56	62
Jun 13	51	51	51	42	52	56	55	55	59	58	55	61	55	56	61	60	60	61	61	57	62	55	60	55	62
Jun 14	51	49	49	46	50	58	59	58	55	54	61	56	55	57	55	59	58	57	58	62	56	56	54	52	61
Jun 15	51	48	46	58	54	45	51	55	54	62	57	57	63	58	60	60	57	57	60	56	57	56	53	52	61
Jun 16	50	45	44	58	54	53	58	64	55	56	56	54	56	56	56	58	55	57	56	55	53	53	54	58	62
Jun 17	51	51	51	41	60	54	54	57	55	55	54	58	60	55	55	58	57	55	60	53	55	57	64	54	63
Jun 18	59	47	58	42	52	58	60	66	65	58	55	53	54	55	59	61	55	58	55	57	56	57	58	57	64
Jun 19	59	52	49	43	53	57	55	57	56	54	69	60	58	58	57	57	61	57	61	55	54	56	55	57	63
Jun 20	57	48	53	55	53	61	59	57	55	55	56	55	58	54	56	56	58	56	57	62	55	55	54	55	63
Jun 21	53	47	47	58	52	53	57	67	62	54	54	56	56	61	55	55	61	57	60	56	59	54	51	52	62
Jun 22	50	47	47	45	48	54	61	61	57	61	62	64	61	65	64	60	69	61	62	61	55	53	55	52	63
Jun 23	50	43	45	42	50	53	60	65	63	54	58	54	55	54	54	55	55	60	63	60	55	56	56	60	62
Jun 24	49	47	56	43	48	53	63	64	65	67	57	60	54	55	55	56	56	59	59	59	53	56	56	52	63
Jun 25	58	51	50	50	55	59	61	62	65	56	55	54	58	53	53	56	64	59	56	58	54	56	57	58	64
Jun 26	61	43	45	42	47	50	59	66	67	55	55	56	55	57	57	58	60	57	57	58	54	59	61	62	64
Jun 27	59	56	58	48	55	58	60	61	67	61	55	56	56	56	57	57	62	60	66	58	68	65	53	52	65
Jun 28	52	49	48	45	54	58	56	55	59	66	63	62	55	57	61	54	56	53	56	57	58	54	54	55	62
Jun 29	49	52	57	46	52	49	51	62	63	62	60	58	56	55	55	61	56	55	66	58	55	55	52	59	62
Jun 30	51	46	50	43	58	52	62	65	62	56	55	55	55	55	56	55	56	55	55	59	55	53	52	56	63
Jul 1	49	61	50	44	62	55	61	68	67	62	57	55	54	56	53	55	61	65	56	54	54	54	54	55	65
Energy Average	56	52	59	52	56	56	60	64	63	60	60	59	62	61	59	59	63	59	60	58	58	57	57	57	64

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Table D3 **Hourly LEQ Noise Data for Site NMS01**

In terms of the Time Above 75 dBA level, the results show that the Time Above 75 dBA noise levels occur less than 19 minutes per day. Time Above 75 dBA roughly represents when some degree of activity interference may occur, such as speech communication. For those aircraft events that generate noise levels greater than 75 dBA, the noise from the aircraft overflight generally exceeds 75 dBA for a period of 10 to 30 seconds.

Results show that the Time Above 65 dBA occurs between 13 and 64 minutes per day. The majority of measurable noise events from aircraft operations generated noise levels greater than 65 dBA. The noise events from aircraft noise generally exceed 65 dBA for about 50 seconds per event. Many events from older and louder Hush Kit aircraft can last longer.

Table D4
TIME ABOVE MEASUREMENT RESULTS
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

			Time Above Noise Level *(Minutes per Day)*		
NMS	**Description**	**Address**	TA-65	TA-75	TA-85
Portable Sites					
M01	Milwaukee	4401 Lenox St.	28.7	6.3	0.5
M02	Milwaukee	3813 Alabama	16.3	3.6	0.8
M03	Milwaukee	1702 Eden	13.3	3.2	0.5
M04	Milwaukee	1901 Kimberly	47.1	15.1	2.6
M05	Milwaukee	707 W. Maplewood Ct.	27.3	3.8	0.2
M07	Oak Creek	410 Marquette	32.5	5.0	0.4
M09	Oak Creek	6775 Juniper	29.8	5.1	0.3
M10	Cudahy	3225 Mallory	44.9	9.8	1.5
M11	Cudahy	3713 Holmes	63.7	18.6	2.8
M12	Cudahy	3025 Holmes	63.9	13.9	3.1
M13	Milwaukee	6632 S. 19th St.	19.7	3.6	0.1

***Source**: BridgeNet International*

Existing Baseline Noise Modeling Inputs

Existing Aircraft Operations

The existing noise environment for General Mitchell International Airport was analyzed based upon 2004 operational conditions. A Part 150 Noise Compatibility Study requires that the baseline noise exposure contours reflect annual conditions using the most recent 12-month period. The development of the Baseline conditions use data from a variety of sources. The sources of data for this study are listed below:

- Aircraft Tower Counts
- Flight Operations and Radar data from the Airports Noise and Flight Track Monitoring System
- Aircraft Situational Display (ASD) Data
- Field observations and noise monitoring results from noise measurement survey
- Discussions with airport staff

The INM noise model requires a variety of operational data to model the noise environment around an airport. These data includes the following information, which are discussed in detail in the following paragraphs:

- Total Aircraft Activity Levels
- Aircraft Fleet Mix Categories
- Detailed Fleet Mix
- Time of Day
- Runway Use
- Departure and Arrival Procedures
- Flight Paths
- Flight Path Utilization

Total Aircraft Activity Levels

The total aircraft operational levels were derived directly from the Air Traffic Control (ATC) tower counts. The tower count data showed that for the 2004 base period, there were a total of approximately 214,467 operations, or an average of 587 operations per day (an operation is one takeoff or one landing). The tower count information also contains a breakdown by ATC category of operations. The total operations and the breakdown for the baseline period are presented in Table D5.

Table D5
AIRPORT TOWER COUNT FOR BASELINE PERIOD
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Category	Annual Operations	Average Daily Operations
Air Carrier	66,189	181
Air Taxi	107,193	294
General Aviation	36,274	99
Military	4,811	13
TOTAL	**214,467**	**588**

Source: *BridgeNet International, Year 2004*

Aircraft Fleet Mix Categories

The categorical breakdown used by ATC is useful for air traffic purposes, but does not provide sufficient detail necessary for the noise analysis or the details that are often of interest to the general public. As a result, the breakdown by aircraft fleet mix categories is presented within this section. The categories are defined relative to type of user, (i.e., passenger or cargo) and type of aircraft (i.e., jet or propeller). The breakdown by these categories was determined from the different sources of operational data that were described above with the primary source being the landing reports. Table D6 presents operations for the different categories of aircraft.

It is not possible to definitively categorize all of the operations into unique groups. For example, some corporate jet operations are actually unscheduled cargo flights. Similarly some air taxi operations are small single-engine piston aircraft that may be categorized as general aviation piston, or vice versa. But these generally define the categories of operations that occur at the Airport and will be used within this study.

Table D6
OPERATIONS BY AIRCRAFT CATEGORY FOR 2004 BASELINE PERIOD
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Category	**Annual Operations**
Passenger Air Carrier and Air Cargo	
Wide Body Jets	1,712
Narrow Body Jets	64,477
Regional Jets	65,206
Commuter Prop	41,041
General Aviation and Small Air Taxi	
Corporate Jets	14,582
Single & Multi-Engine Prop	22,645
Military	
Tankers	4,628
Transports	183
Total Operations	214,467

Source*: BridgeNet International, Calendar year 2004. Numbers have been rounded*

Detailed Aircraft Fleet Mix

The mix of aircraft that operate at the Airport is one of the most important factors in terms of the airport noise environment. Fleet mix data were determined from all of the data described previously with the primary source being the radar data from the airport's noise monitoring system. A full year of radar data for 2004 was used to determine this fleet mix. The fleet mix assumptions are presented in Table D7. This table presents the average daily operations for each type of aircraft used in the INM noise model as well as a description of these aircraft.

The INM aircraft type assigned for each of the aircraft operating at General Mitchell International Airport was based upon the INM type that most closely matched the type of aircraft that each airline operated at the Airport. Some aircraft with smaller numbers of operations were grouped into the aircraft type that was most representative of those aircraft. In order to identify the separate categories of operations, the same INM types are shown more than once in the table.

Table D7

DETAILED AIRLINE FLEET MIX (2004)

General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Period: January 1, 2004 to December 31, 2004

Aircraft Category	INM Type	Daily Arrivals Day	Daily Arrivals Night	Daily Departures Day	Daily Departures Night	Daily Operations	Annual Operations
Air Carrier Wide Body	74720B	0.03	0.01	0.03	0.01	0.08	29
Air Carrier Wide Body	A30062	0.91	1.06	0.83	1.14	3.94	1,438
Air Carrier Wide Body	A310	0.22	0.06	0.18	0.11	0.57	208
Air Carrier Wide Body	DC1030	0.04	0.01	0.05		0.10	36
Air Carrier Narrow Body	717200	27.33	2.74	26.77	3.30	60.14	21,951
Air Carrier Narrow Body	727EM1	0.13	0.21	0.07	0.27	0.68	248
Air Carrier Narrow Body	727EM2	0.63	0.86	0.29	1.20	2.98	1,088
Air Carrier Narrow Body	7373B2	1.39	1.11	2.32	0.18	5.00	1,825
Air Carrier Narrow Body	737400	0.06	0.01	0.06	0.01	0.14	51
Air Carrier Narrow Body	737800	2.52	0.11	2.52	0.12	5.27	1,924
Air Carrier Narrow Body	737N17	4.66	0.03	3.97	0.72	9.38	3,424
Air Carrier Narrow Body	757PW	3.24	1.07	3.31	1.00	8.62	3,146
Air Carrier Narrow Body	757RR	1.17	0.06	0.93	0.30	2.46	898
Air Carrier Narrow Body	A319	5.22	1.70	4.96	1.96	13.84	5,052
Air Carrier Narrow Body	A320	3.21	0.51	3.34	0.37	7.43	2,712
Air Carrier Narrow Body	A32123	0.33	0.14	0.33	0.14	0.94	343
Air Carrier Narrow Body	DC870	0.08	1.29	0.64	0.73	2.74	1,000
Air Carrier Narrow Body	DC95HW	9.76	0.96	9.35	1.38	21.45	7,829
Air Carrier Narrow Body	MD83	15.09	2.69	15.80	1.98	35.56	12,979
Regional Jets	BAE146	2.46		2.44	0.02	4.92	1,796
Regional Jets	BAE300	2.00	0.01	2.00		4.01	1,464
Regional Jets	EMB145	22.92	0.87	21.32	2.46	47.57	17,363
Regional Jets	EMB14L	19.63	3.71	17.77	5.57	46.68	17,038
Regional Jets	F10065	0.01		0.01		0.02	7
Regional Jets	J328	34.04	3.69	33.49	4.23	75.45	27,539
Commuter Prop	BEC190	34.98	4.14	34.83	4.29	78.24	28,558
Commuter Prop	DHC6	5.38	1.53	5.34	1.57	13.82	5,044
Commuter Prop	DHC8	1.33	0.25	0.76	0.82	3.16	1,153
Commuter Prop	EMB120	0.05	0.70	0.49	0.26	1.50	547
Commuter Prop	SF340	6.75	1.11	6.47	1.39	15.72	5,738
General Aviation Jet	CIT3	2.87	0.23	2.62	0.48	6.20	2,263
General Aviation Jet	CL600	0.87	0.05	0.87	0.05	1.84	672
General Aviation Jet	CNA55B	6.12	0.30	5.79	0.63	12.84	4,687
General Aviation Jet	CNA750	0.95	0.07	0.93	0.09	2.04	745
General Aviation Jet	FAL20	0.34	0.05	0.38	0.01	0.78	285
General Aviation Jet	GIIB	0.37	0.03	0.38	0.02	0.80	292
General Aviation Jet	GIV	1.62	0.13	1.49	0.26	3.50	1,278
General Aviation Jet	IA1125	0.40	0.01	0.39	0.03	0.83	303
General Aviation Jet	LEAR25	0.16	0.01	0.16	0.01	0.34	124
General Aviation Jet	LEAR35	1.52	0.13	1.52	0.13	3.30	1,204
General Aviation Jet	SABR80	3.47	0.27	2.81	0.93	7.48	2,730
General Aviation Prop	BEC58P	4.09	1.17	2.54	2.72	10.52	3,840
General Aviation Prop	CNA441	6.58	1.22	3.31	4.49	15.60	5,694
General Aviation Prop	GASEPF	1.34	0.06	1.35	0.06	2.81	1,026
General Aviation Prop	GASEPV	6.05	0.88	6.14	0.79	13.86	5,059
General Aviation Prop AT	BEC9F	0.36	0.04	0.33	0.08	0.81	296
General Aviation Prop AT	CNA208	6.96	2.26	2.52	6.70	18.44	6,731
Military	KC135R	2.30	0.17	2.30	0.17	4.94	1,803
Military	C130	3.75	0.12	3.75	0.12	7.74	2,825
Military	F16GE	0.25		0.25		0.50	183
	Total	**255.94**	**37.84**	**240.50**	**53.30**	**587.58**	**214,467**

The mix of jet aircraft is illustrated in Figures D13 and D14. Figure D13 presents the average daily operations of commercial/cargo jet aircraft. Figure D14 shows the number of these jet aircraft operations by each airline. These figures also show the percentage of jet aircraft that are the louder, hush kit aircraft versus the quieter, manufactured Stage 3.

Time of Day

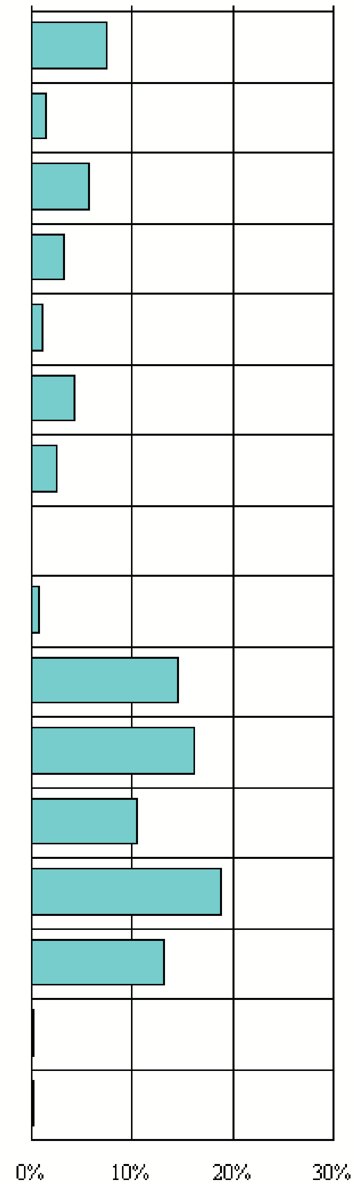
In the DNL metric, any operations that occur after 10 p.m. and before 7 a.m. are considered more intrusive and their noise levels are penalized by adding 10 dBA. The nighttime operations assumptions were determined from the Airport's flight-track monitoring system during the base period. The overall percentage of nighttime operations at General Mitchell International Airport was determined to be 13.9 percent as summarized in Table D8 for each category of aircraft. The time of day assumptions used in the model were specific to each aircraft operation. The specific percentages were presented in the previous Table (Table D7). Table D8 presents a summary of nighttime operations by INM aircraft type and by departures and arrivals.

Table D8
SUMMARY HOURS OF OPERATIONS BY CATEGORY, YEAR 2004
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Category	**Percentage Nighttime Operations**		
	Arrivals	Departures	Average
Air Carrier Wide Body	48.7%	53.6%	51.2%
Air Carrier Narrow Body	15.3%	15.5%	15.4%
Regional Jets	9.3%	13.7%	11.5%
Commuter Prop	13.7%	14.8%	14.3%
General Aviation Corporate Jet	6.4%	13.2%	9.8%
General Aviation Prop	18.2%	47.8%	33.0%
Military	4.4%	4.4%	4.4%
TOTAL	**11.6%**	**16.4%**	**13.9%**

Source: *BridgeNet International*

Jet Aircraft	Built *FAR 36 Stage*	Operations Average Per Day	Percentage Of Total *Percent of Total*
B717-200	3	26.0	7%
B727 Hush Kit	2	5.0	1%
B737 New Series	3	20.0	6%
B757 All Series	3	11.0	3%
A300/A310	3	4.0	1%
A320/A319/A321	3	15.0	4%
BAe146	3	9.0	3%
DC10 All Series	3	0.0	0%
DC8-70	3	2.7	1%
DC9 Hush Kit	2	51.0	15%
EMB-145	3	57.0	16%
CL Regional Jet	3	37.0	11%
J328	3	66.0	19%
MD80 All Series	3	46.0	13%
Other Aircraft (Built Stage 2)	2	0.7	0%
Other Aircraft (Built Stage 3)	3	0.5	0%



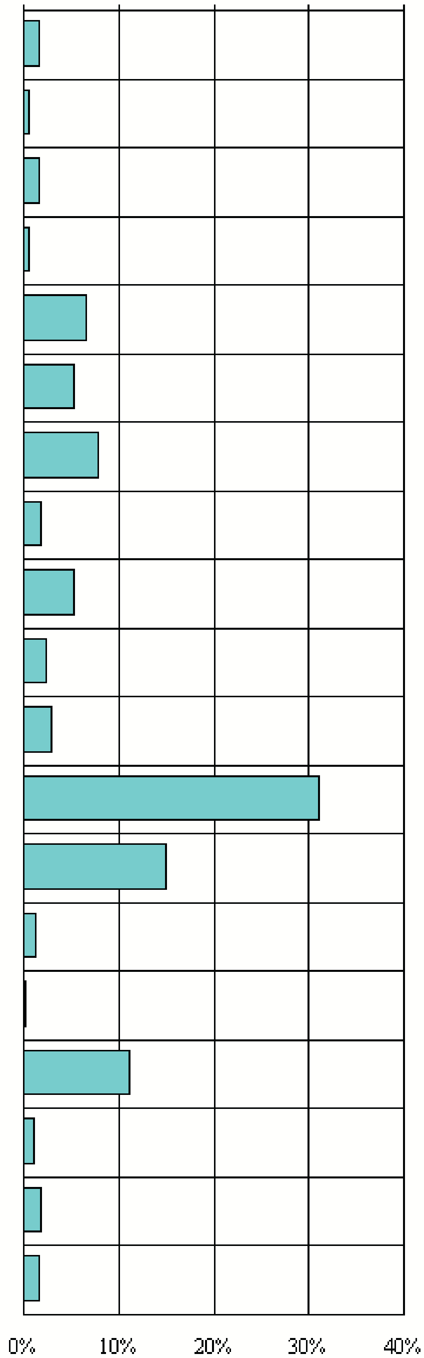
Numbers are rounded to nearest 0.0 value

Source: BridgeNet International

Figure D13 **Average Daily Jet Operations by Aircraft Type (2004)**

Airline		Operations Average Per Day	*Percent of Total*
Air Canada	ACA	4.0	2%
Airborne Express	ABX	1.4	1%
America West Airlines	AWE	4.0	2%
American	AAL	1.6	1%
American Eagle	EGF	16.4	7%
ATA	AMT	13.4	5%
Continental Express	BTA	19.5	8%
Delta Connection Comair	COM	4.8	2%
Delta Air Lines	DAL	13.5	5%
Federal Express	FDX	6.1	2%
United Express	ASH	7.5	3%
Midwest Express Airlines	MEP	77.6	31%
Northwest	NWA	37.7	15%
United States Postal Service	RYN	3.1	1%
United	UAL	0.6	0%
United Express	AWI	27.7	11%
UPS	UPS	2.6	1%
USAir	USA	4.8	2%
Other Airlines		4.3	2%

Percent of Total



Numbers are rounded to nearest 0.0 value

Source: BridgeNet International

Figure D14 **Number of Jet Operations by Airline (2004)**

Runway Use

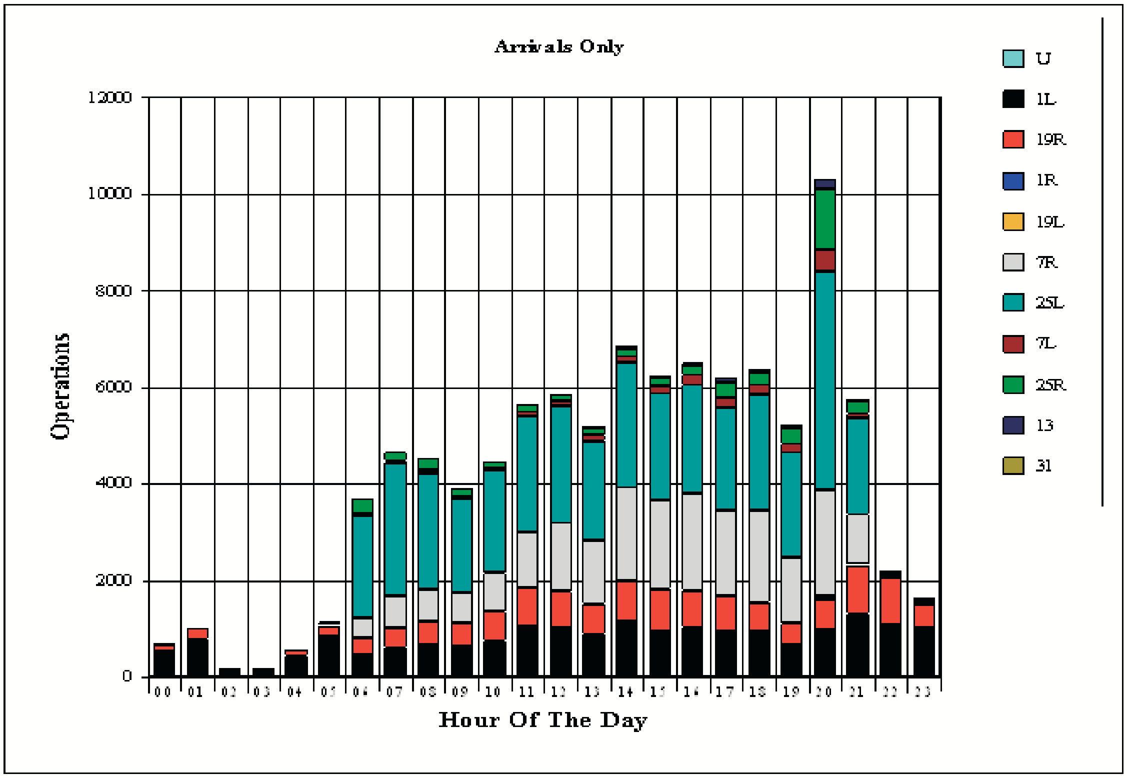
An additional consideration in developing the noise exposure contours is the percentage of time each runway is used. The speed and direction of the wind dictate which runway direction aircraft use. From a safety and stability standpoint, it is desirable, and usually necessary, to arrive and depart an aircraft into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the new wind direction. Runway use was modeled for the year 2004; this is the first year of full radar data after the runway construction was completed.

The existing conditions runway use, presented in Table D9, is based upon a full year of radar data from the Airport's noise and flight track monitoring system. This table presents the percent utilization of each runway for departures and arrivals separately, and during the daytime and nighttime hours. These same data are presented graphically in Figure D15. The top portion of this figure shows the total number of departure operations per hour of the day for each runway. The same data are presented in the bottom portion of the graph for arrivals.

Table D9
PERCENTAGE RUNWAY UTILIZATION BY TIME OF DAY
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Runway	**Arrivals**		**Departures**	
	Daytime	*Nighttime*	*Daytime*	*Nighttime*
1L	12.7%	47.9%	12.4%	24.1%
1R	0.1%	0.2%	0.5%	1.2%
7L	2.1%	1.6%	0.8%	0.7%
7R	27.8%	6.9%	25.8%	10.9%
13	1.4%	0.3%	0.6%	0.2%
19L	0.3%	0.1%	0.6%	1.3%
19R	11.0%	20.0%	43.4%	47.0%
25L	40.4%	21.1%	13.9%	12.7%
25R	3.9%	1.8%	1.5%	0.3%
31	0.2%	0.2%	0.5%	1.5%
TOTAL	**100%**	**100%**	**100%**	**100%**

Source: *BridgeNet International*



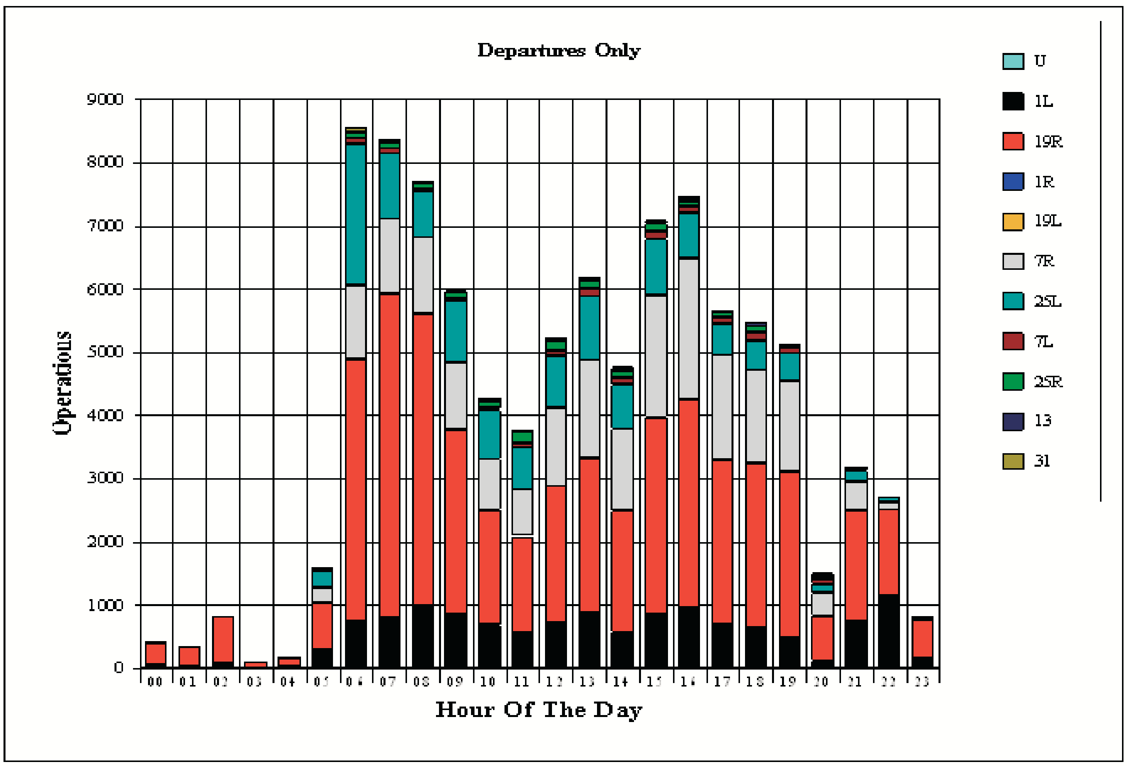


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Figure D15 **Operations per Each Hour of the Day per Runway**

The runway utilization information used in the noise model is specific to each type of aircraft. Different aircraft have different runway utilization based upon aircraft size and performance.

The more detailed breakdown of runway use by category of aircraft, presented in Tables D10 and D11, include the percentage of operations by category using each of the runways, for daytime and nighttime hours, respectively.

Table D10
DAYTIME RUNWAY UTILIZATION BY CATEGORY OF AIRCRAFT,
(7 a.m. to 10 p.m.)
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Aircraft Type	**Percentage Utilization**									
	1L	**1R**	**7R**	**13**	**19L**	**19R**	**25L**	**31**	**7L**	**25R**
Arrivals										
Air Carrier Wide Body	15%	0%	32%	0%	0%	12%	41%	0%	0%	0%
Air Carrier Narrow Body	17%	0%	25%	0%	0%	11%	47%	0%	0%	0%
Regional Jet	17%	0%	26%	0%	0%	11%	46%	0%	0%	0%
Commuter Prop	15%	0%	22%	1%	0%	11%	40%	0%	0%	0%
GA Corporate Jet	16%	0%	27%	0%	0%	12%	44%	0%	0%	0%
GA Prop/Small AT	9%	2%	13%	5%	1%	8%	19%	1%	13%	30%
Military	17%	0%	46%	0%	0%	12%	25%	0%	0%	0%
Departures										
Air Carrier Wide Body	9%	0%	23%	0%	0%	48%	21%	0%	0%	0%
Air Carrier Narrow Body	15%	0%	22%	0%	0%	51%	12%	0%	0%	0%
Regional Jet	13%	0%	25%	0%	0%	49%	12%	0%	0%	0%
Commuter Prop	12%	0%	27%	0%	0%	47%	12%	0%	1%	1%
GA Corporate Jet	12%	0%	20%	1%	0%	57%	10%	0%	0%	0%
GA Prop/Small AT	5%	0%	9%	4%	0%	35%	16%	2%	17%	11%
Military	23%	0%	41%	0%	0%	32%	5%	0%	0%	0%

***Source**: BridgeNet International*

Table D11
NIGHTTIME RUNWAY UTILIZATION BY CATEGORY OF AIRCRAFT
(10 p.m. to 7 a.m.)
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Aircraft Type	**Percentage Utilization**									
	1L	**1R**	**7R**	**13**	**19L**	**19R**	**25L**	**31**	**7L**	**25R**
Arrivals										
Air Carrier Wide Body	67%	0%	3%	0%	0%	18%	12%	0%	0%	0%
Air Carrier Narrow Body	58%	0%	4%	0%	0%	23%	15%	0%	0%	0%
Regional Jet	32%	0%	9%	0%	0%	26%	33%	0%	0%	0%
Commuter Prop	33%	0%	8%	1%	0%	17%	38%	0%	1%	3%
GA Corporate Jet	50%	8%	27%	0%	0%	25%	17%	0%	0%	0%
GA Prop/Small AT	54%	2%	3%	5%	1%	25%	4%	1%	2%	10%
Military	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Departures										
Air Carrier Wide Body	27%	0%	12%	0%	0%	51%	10%	0%	0%	0%
Air Carrier Narrow Body	25%	0%	9%	0%	0%	61%	5%	0%	0%	0%
Regional Jet	18%	0%	11%	0%	0%	65%	5%	0%	0%	0%
Commuter Prop	19%	0%	10%	0%	0%	55%	14%	0%	2%	1%
GA Corporate Jet	20%	0%	8%	0%	0%	69%	2%	0%	0%	0%
GA Prop/Small AT	7%	0%	11%	4%	0%	35%	42%	1%	1%	2%
Military	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%

***Source**: BridgeNet International*

Departure Climb Profile

The aircraft departure stage length is the distance the aircraft flies from the Airport to its first destination. The stage length of a flight can be used as a rough surrogate for the aircraft departure weight. Generally, heavier aircraft climb at a slower rate, and thus the noise levels under the flight path are likely to be louder. The rate of climb of an aircraft is called the departure climb profile. The stage length assumption is used to determine the rate of climb of each of the different aircraft operating at the airport. Small aircraft such as commuter aircraft that can only fly shorter distances only have Stage Length 1 available. The different stage lengths used in the INM model are listed below.

Stage Length 1	0 to 500 nautical miles flight distance
Stage Length 2	500 to 999 nautical miles flight distance
Stage Length 3	1000 to 1499 nautical miles flight distance
Stage Length 4	1500 to 2499 nautical miles flight distance
Stage Length 5	2500 to 3499 nautical miles flight distance
Stage Length 6	3500 to 4499 nautical miles flight distance
Stage Length 7	+4500 nautical miles flight distance

Figure D16 presents the North American airports that are points of service for commercial and cargo jet operations at General Mitchell International Airport. The larger the dot, the greater the number of operations associated with that airport. Note that the graphic shows that for the major airlines, many of the aircraft flights are to nearby hub airports. Thus, the majority of the stage lengths for General Mitchell International Airport are less than 1,000 nautical miles (Stage Length 2 or less).

The INM noise model contains different departure climb profiles for each of the aircraft contained in the model. These climb profiles define the rate of climb, speed, and engine thrust based upon the weight of the aircraft. Typically the stage length is used to assign the departure climb profile using the flight distance data, as presented in the previous figure. However, flight distance does not always correlate to the departure climb profile.

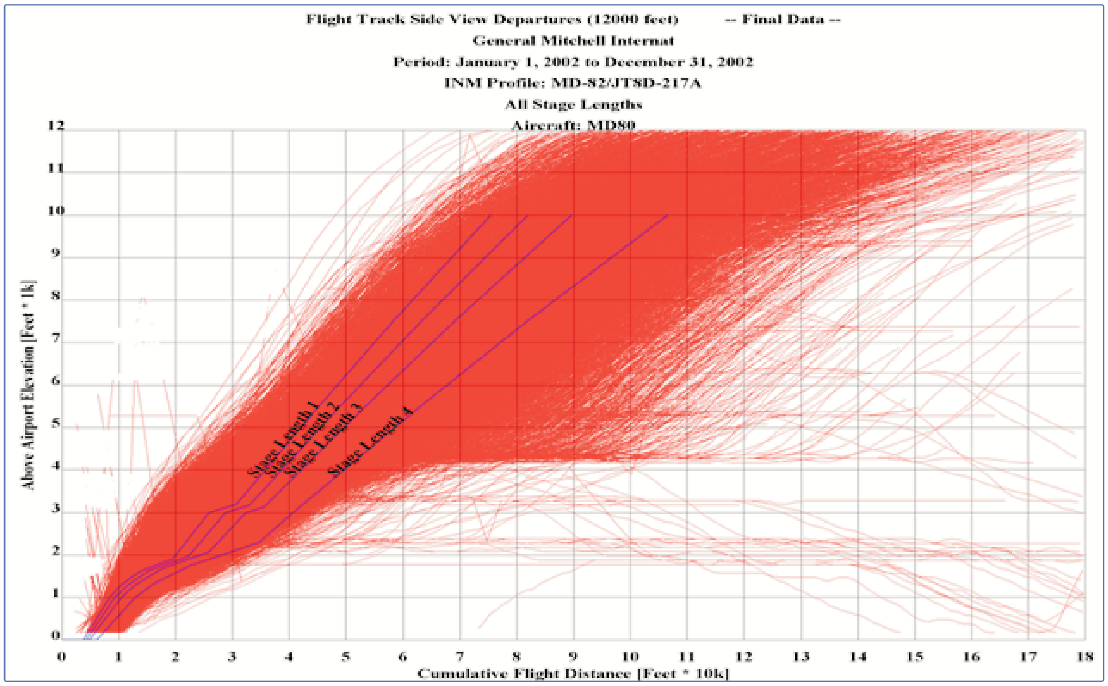
Thus for this study, the aircraft departure climb profiles were identified based upon the actual climb gradient for aircraft operating at General Mitchell International Airport. This was obtained from the FAA radar data. The radar data can be used to show the rate of climb for different aircraft. A full year's worth of radar data were used to assign the climb profile for each specific aircraft.

An example of the departure climb profiles for the MD80 and the A319 aircraft are presented in Figure D17. The red lines are actual radar data plots for those aircraft. The lines show the distance flown along the X axis versus the altitude along the Y axis. The green line shows the average climb profile for these aircraft. The blue lines illustrate the departure profiles contained in the INM noise model.

Based upon these data, the departure climb profiles that were used in the model were those that were actually flown based upon the radar data. Each aircraft is assigned the climb profile that most closely matches the climb profile that was flown. For example, the B737-300 aircraft were all modeled at the lower climb profile which more closely matched the measured departure climb gradients. This methodology resulted in low climb rates and thus higher noise levels than would have occurred using standard methodology. This also more closely matched the noise measurement data results.

Figure D16 **Flight Destinations for MKE Jet Aircraft Operations**

N



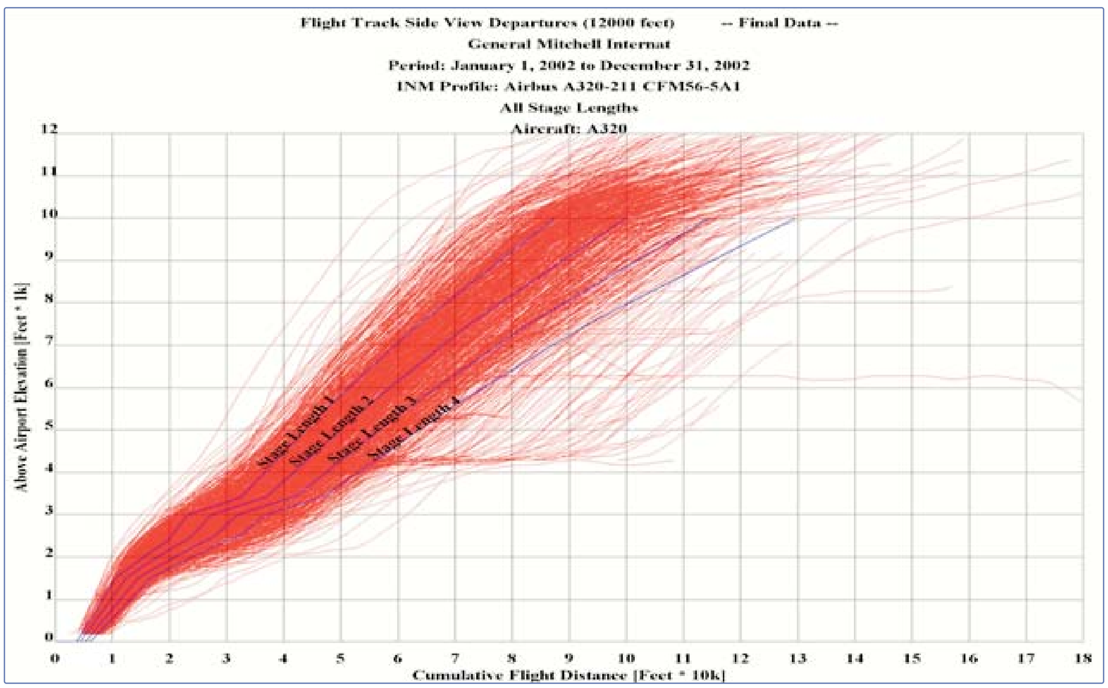


Figure D17 **A319 and MD-80 Departure Profiles**

Flight Paths and Flight Path Utilization

The Federal Aviation Administration (FAA) and the Airport have established paths for aircraft arriving and departing from General Mitchell International Airport. These paths are not precisely defined ground tracks, but represent a path along the ground over which aircraft generally fly. The identification of the location and use of the flight tracks is based upon the FAA's radar data, field observations, and discussions with noise-abatement personnel. A full year of actual radar data were used in the development of the INM flight paths. The flight paths used in the noise model are derived from all of the actual flight paths flown throughout the base period study year.

In the development of the existing noise contours it is important to aggregate the flight tracks into a set of generalized flight paths of aircraft operating at the Airport to allow the modeling of different alternative scenarios that may involve the shifting or redesign of the flight procedures.

In the INM noise model, a flight path consists of a backbone or center flight path, and the dispersion or spread of all flights that use that backbone. A computer program was used to develop the INM flight paths from the actual radar flight track data. The program first assigns each aircraft operation to an air traffic control procedure. The software then calculates the average path of all the aircraft that flew those procedures. The program also determines the dispersion of the flight tracks on that path. An example of the process used to calculate each of the flight paths was presented in the methodology section.

The modeling analysis for existing conditions included a total of 42 departure flight paths and 30 arrival flight paths at the Airport. The flight paths modeled in the study were those within the general range of the radar.

The INM flight tracks used in the modeling analysis are presented in Figures D18a, 18b and D19. Figure D18a presents the dispersed departure flight tracks that are primarily used by jet aircraft. Figure D18b presents the dispersed departure flight tracks that are primarily used by propeller aircraft. Figure D19 illustrates the dispersed arrival flight tracks. The arrival flight track figure presents tracks for both jet and propeller aircraft.

An example of an overlay of one INM flight path with actual radar data is presented in Figure D20. This figure illustrates a flight path for aircraft departing on Runway 7R and turning southbound. The tracks in red are the actual tracks flying this procedure. The solid blue line is the centerline of the flight path as determined by a computer calculation. The dashed blue lines reflect the dispersion of that flight path. The utilization of each flight path was determined based upon a full year of radar data. Each operation was assigned to one of these flight paths based upon the actual path that was flown.

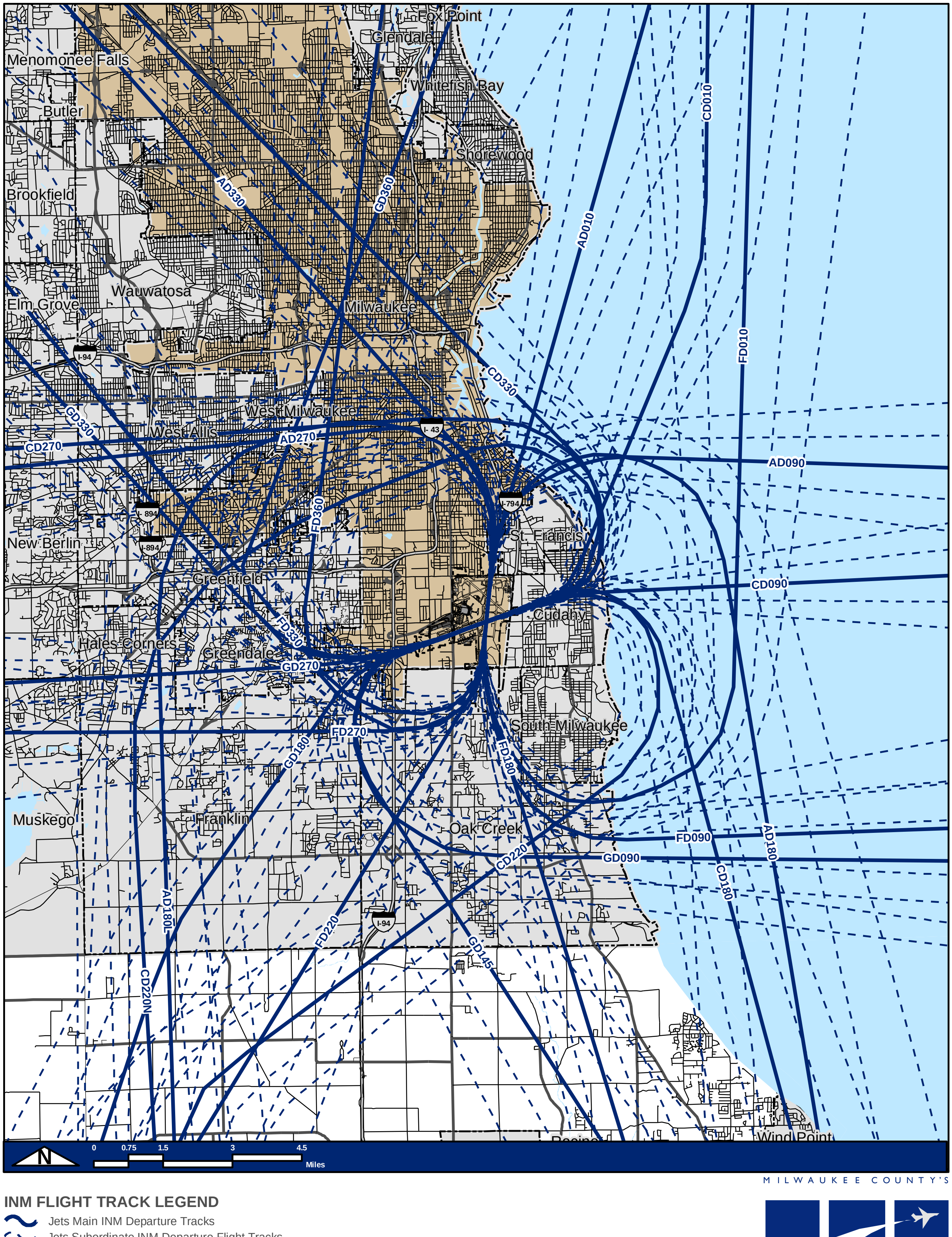
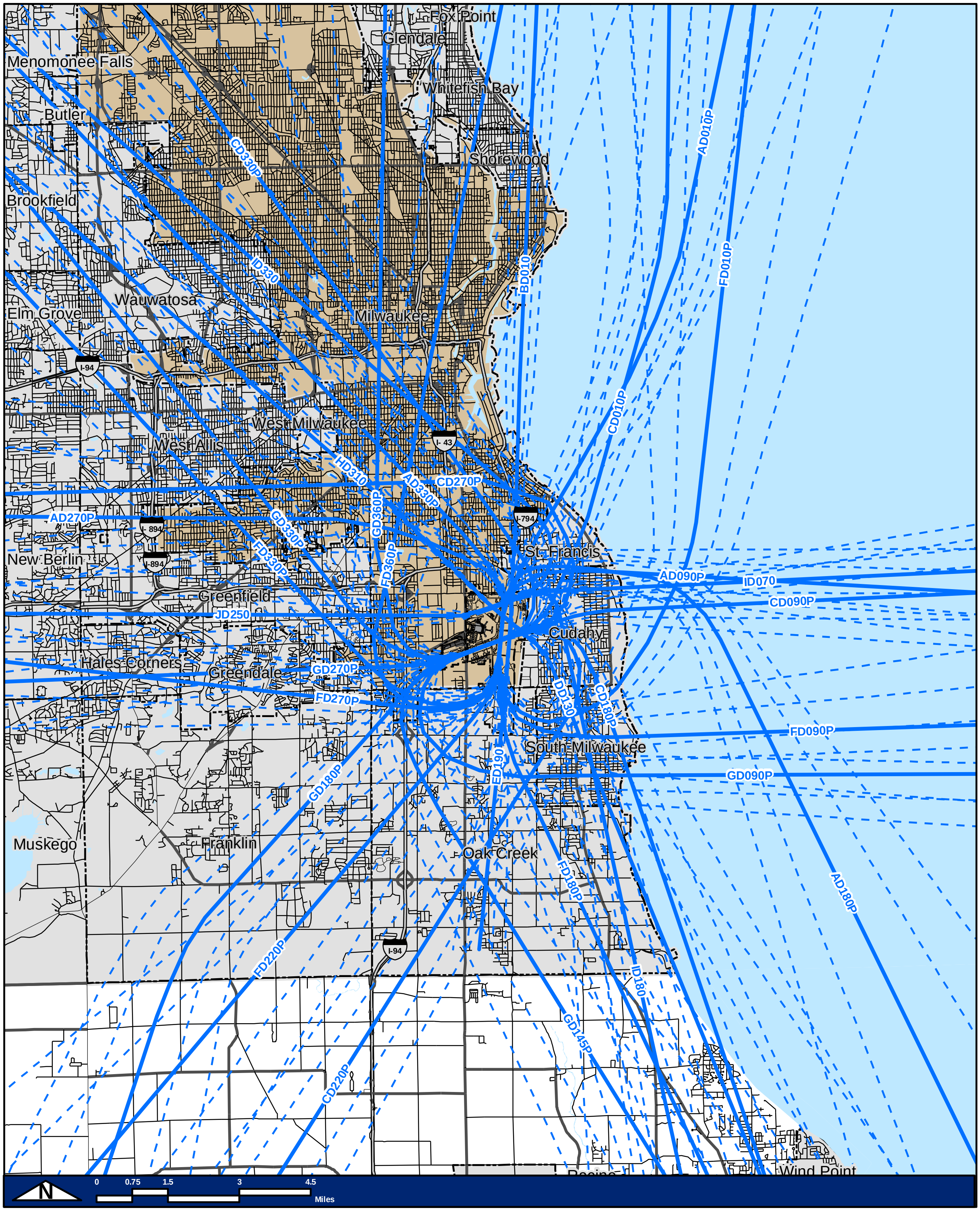


Figure D18a **INM Departure Flight Tracks (Jets)**



INM FLIGHT TRACK LEGEND

Prop Main INM Departure Tracks

Prop Subordinate INM Departure Flight Tracks

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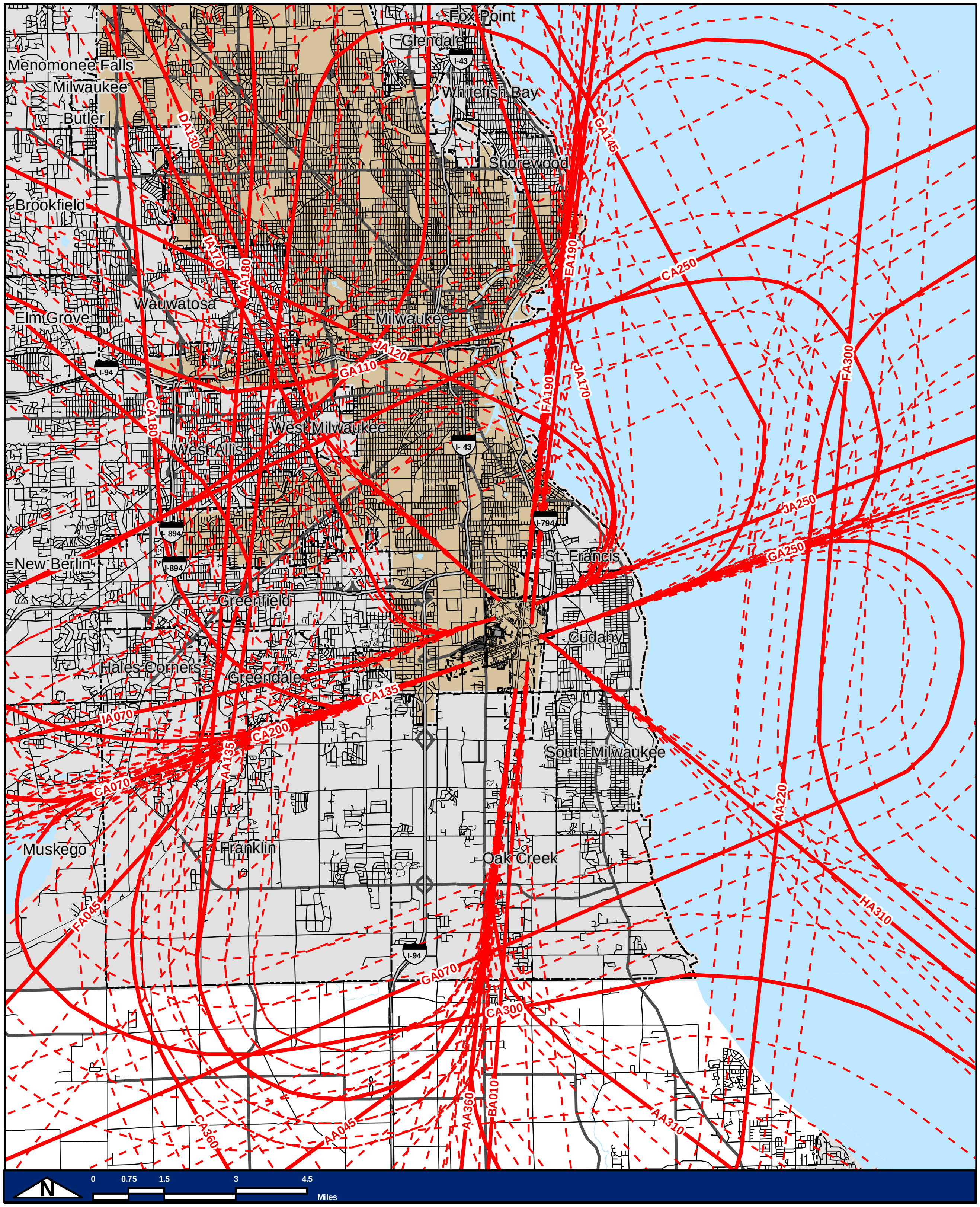
Figure D18b **INM Departure Flight Tracks (Props)**



Flight Track Legend
Main INM Arrival Tracks (All Aircraft Types)
Subordinate INM Arrival Flight Tracks (All Aircraft Types)

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Figure D19 **INM Arrival Flight Tracks**

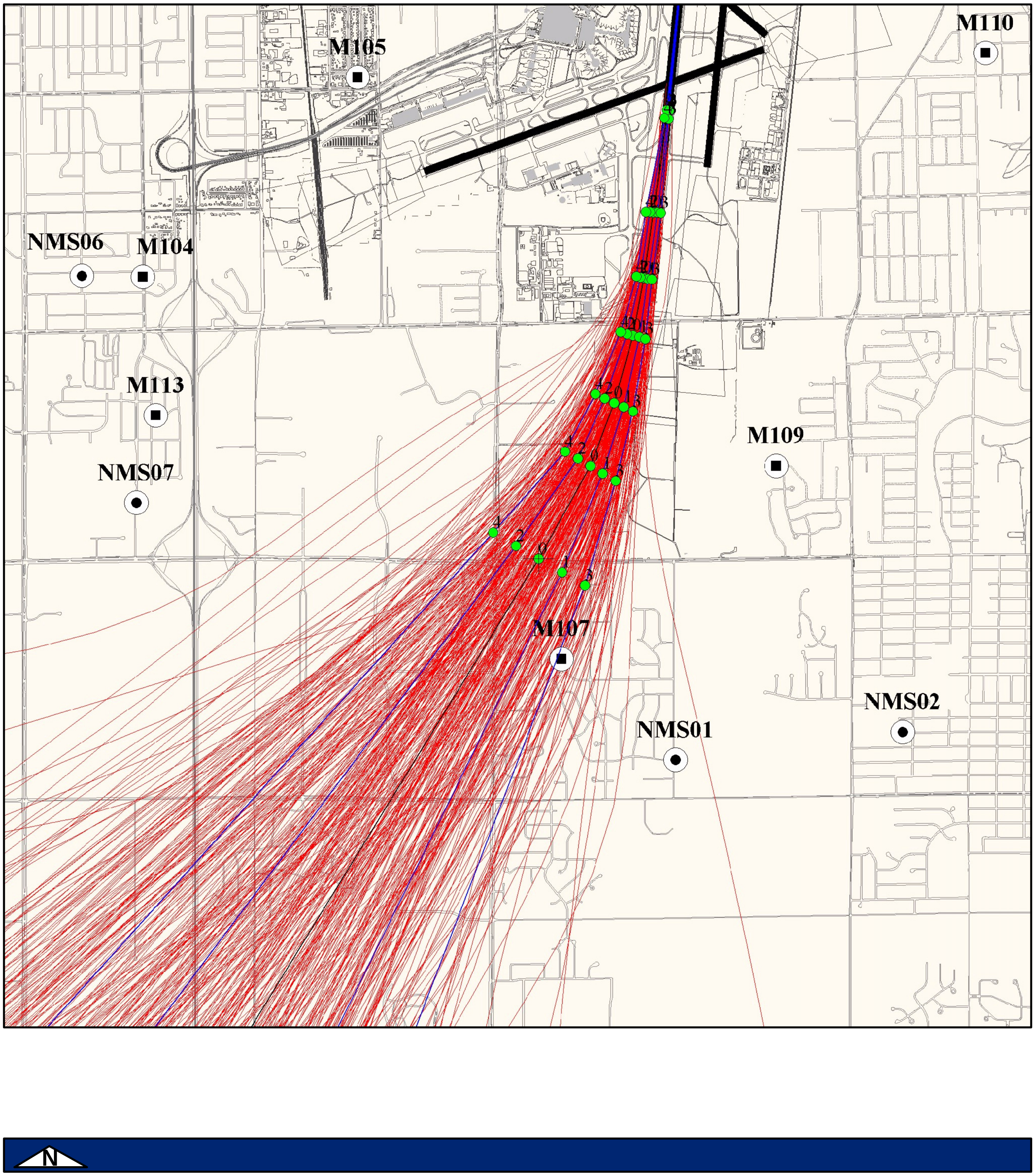


Figure D20 **Example INM Flight Path and Actual Flight Tracks**

Existing Baseline Noise Conditions

Noise exposure contours were developed using a variety of different noise metrics described in the background section of the report including both cumulative noise levels (i.e., averaged over a period of time) and single-event noise levels (noise level from one operation).

As required by the FAA, the primary noise criterion to describe the existing noise environment is DNL. Additional cumulative noise levels include the Time Above (TA) noise level. As outlined earlier, TA sums the number of minutes throughout the day that the noise levels exceed a threshold, such as 65 dBA. The single-event analysis was quantified in terms of SEL. The TA and SEL data were used to supplement the DNL analysis.

DNL Noise Contours. The existing annual base period 2004 DNL noise exposure contours for General Mitchell International Airport are presented in Figure D21. This figure presents the 65, 70, and 75 DNL noise exposure contours.

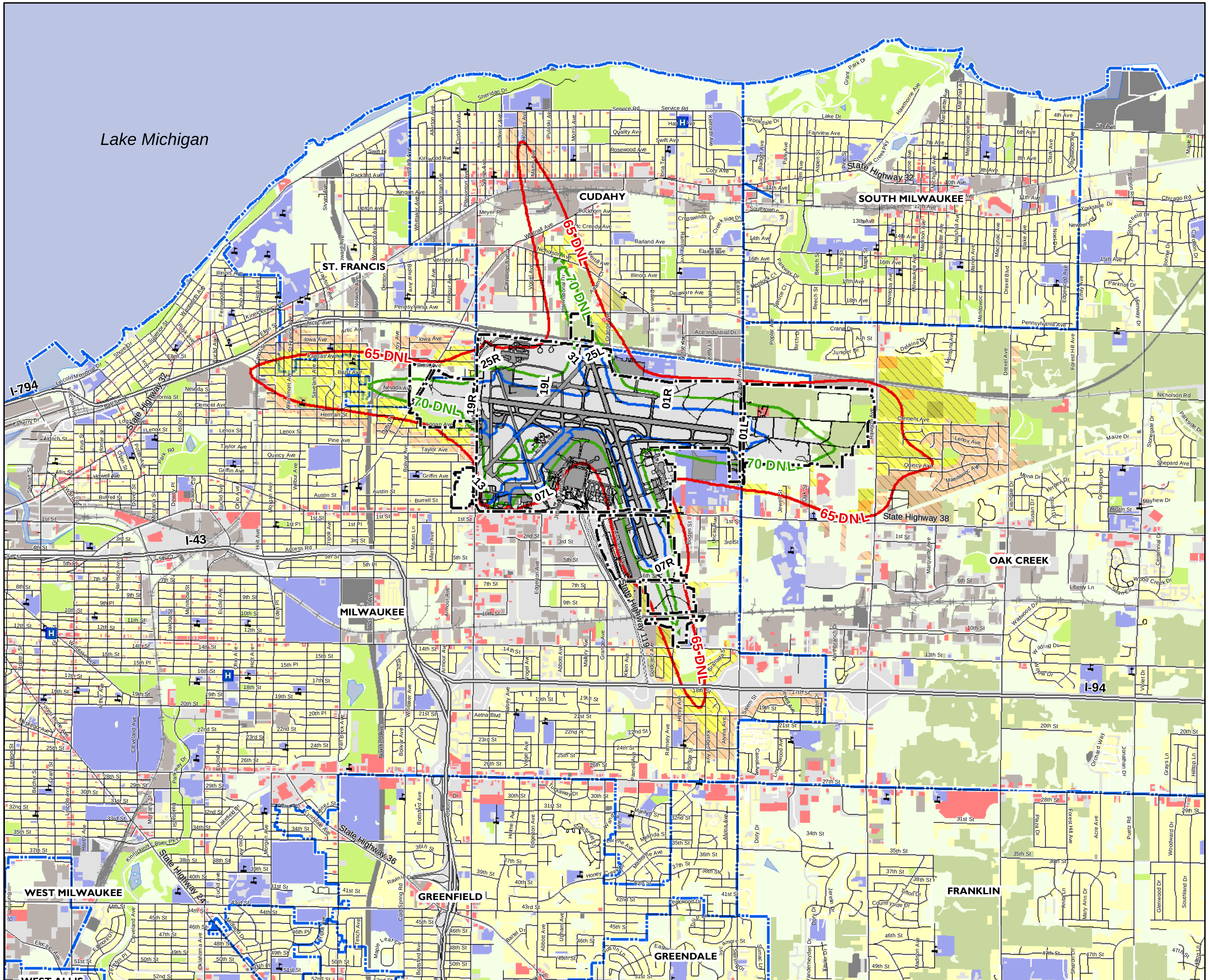
Time Above Noise Contours. The existing annual base period Time Above noise contours are presented in Figure D22. In this figure, the lines of the contours reflect the number of minutes throughout the day that the noise level exceeded 65 dBA. The results show similar shape as to the DNL noise contours.

Number of Events above (NA65) Noise Contours. The existing annual base period Number of Events above 65 dBA noise contours are presented in Figure D23. In this figure, the lines of the contours reflect the number of times throughout the day that the noise level exceeded 65 dBA.

Figure D21

Existing 2004 - Noise Exposure Map

Generalized Existing Land Use



Legend

- 65 DNL Contour (v6.2)
- 70 DNL Contour (v6.2)
- 75 DNL Contour (v6.2)
- RESIDENTIAL
- COMMERCIAL
- GOVERNMENT/INSTITUTIONAL
- INDUSTRIAL
- AGRICULTURAL
- RECREATIONAL
- OPEN LANDS
- COMMUNICATION/UTILITIES
- TRANSPORTATION
- COMMUNITY FACILITY
- MUNICIPAL BOUNDARY
- AIRPORT BOUNDARY
- hospitals
- schools
- churches

Source: Milwaukee County, 2003

- Phase 1 Program Boundaries
- Phase 2 Program Boundaries

0 2,000 4,000 8,000 Feet

North

The 65 DNL contour contains approximately 2,730 acres, 4 schools, 1,350 residential structures and 3,150 people.

The 70 DNL contour contains approximately 1,090 acres, 15 residential structures and 36 people.

The 75 DNL contour contains approximately 553 acres, no residential structures and no people.

Planning jurisdictions are shown on the map.

Noise measurement sites and flight tracks are depicted on the Noise Measurement Sites and Flight Tracks Maps.

Residential land use, as defined by FAR Part 150, is an incompatible use without proper sound attenuation within the 65 DNL or greater contour.

The Noise Exposure Maps and accompanying documentation for the Noise Exposure Map for General Mitchell Milwaukee International Airport, submitted in accordance with FAR Part 150 with the best available information, are hereby certified as true and complete to the best of my knowledge and belief.

In addition, it is hereby certified that the public was afforded the opportunity to review and comment on the document and its contents.

Signed____________________________Date____________

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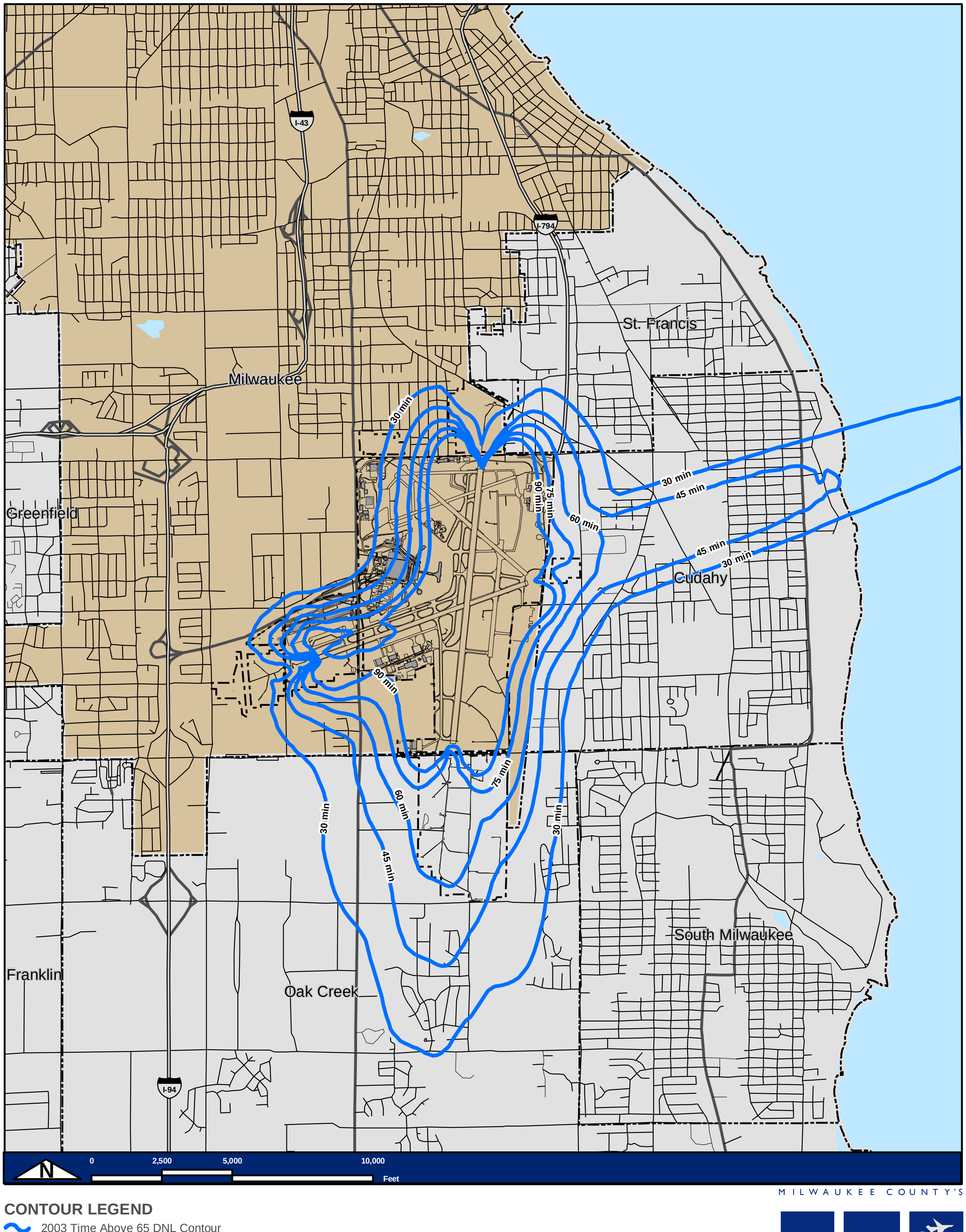

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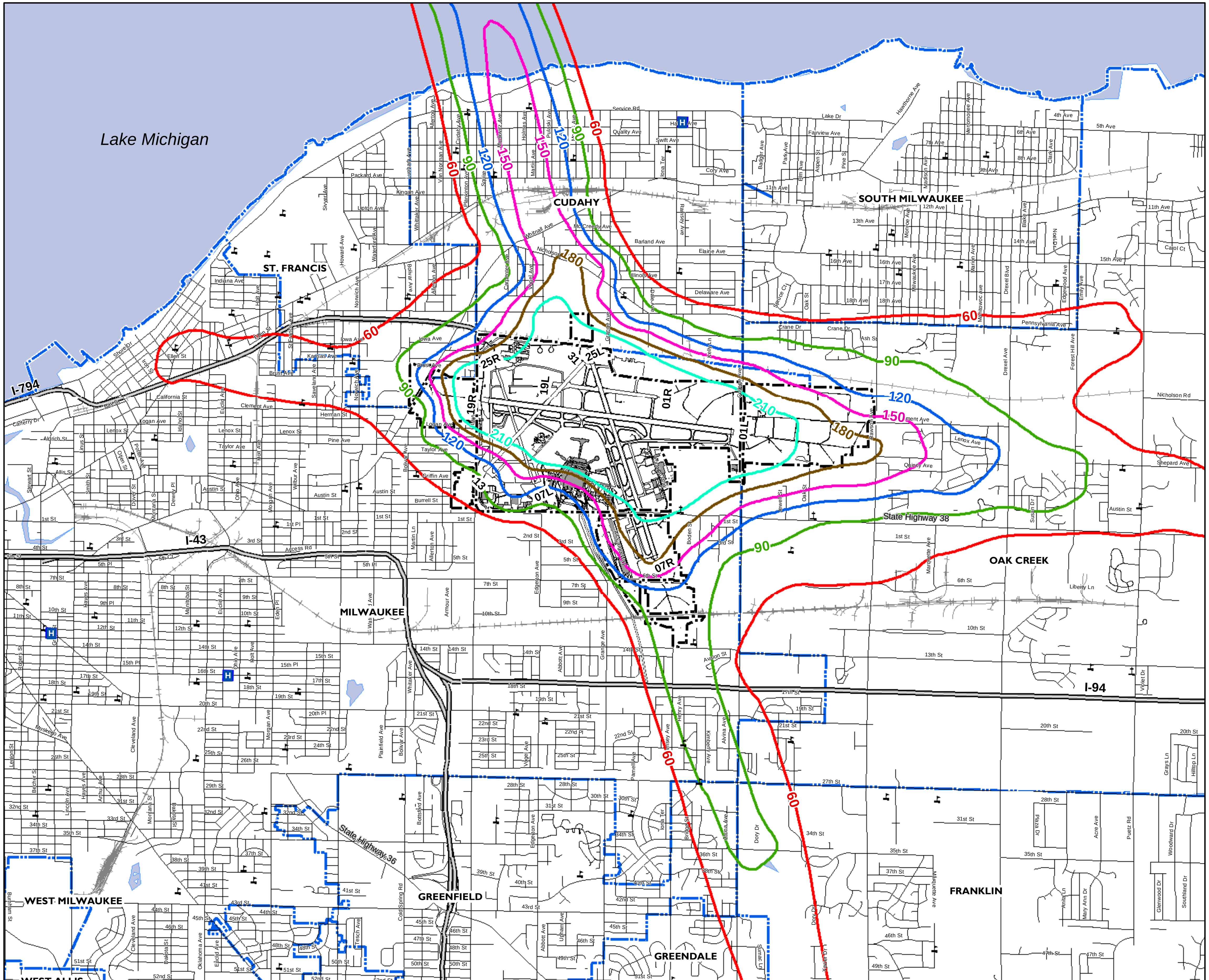
Figure D22 **Existing Daily Average Time Above 65 dBA Noise Contour**

Figure D23

Existing 2004 - Daily Average Number of Events Above 65 DNL



North

0 2,000 4,000 8,000 Feet

Legend

- 60
- 90
- 120
- 150
- 180
- 210

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Value of Additional Noise Metrics

This FAR Part 150 Study extended the standard noise analysis in two significant ways: by conducting sample noise monitoring in locations around the Airport and supplementing DNL contours with additional noise metrics including the SEL and Time Above (TA) noise metrics. Both of these tasks were initiated in response to community desire to view the noise data in as many different lights as possible. Additionally there was a very strong desire for noise information to be related to daily living activities, particularly speech and sleep.

Field noise measurement allowed adjustments to be made to the INM model to more accurately reflect actual fleet and meteorological conditions in Milwaukee. Similarly, providing SEL contours to describe the probable impact on sleep interference and providing TA data to predict the frequency of speech interference can produce a level of comfort with the study findings. The NA data can illustrate how many times in the day that noise disturbances could occur. Using additional measuring and metrics does not reduce differences of opinion on the value of various noise abatement alternatives, but it can change the nature of the debate. As a result, it is desired that discussion will not only be over simply the accuracy of the data, but on the substance of the findings. The goal is to center the discussion on the relative alternatives and the desirability of those alternatives.

Single-Event Noise Contours

Single-event noise exposure contours for sample aircraft were also developed. These contours represent the single-event noise levels for one (1) departure and one (1) arrival operation. These contours are presented in terms of the SEL noise metric. Sample single-event noise exposure contours are presented in Figures D24 through D27 for the MD80, DC9, B717-200, and EMB145 aircraft respectively. These noise exposure contours illustrate a south flow operation on Runway 19R for both a departure on a south turn and a straight in arrival. The noise contours present the 90, 95, 100 and 105 SEL noise levels.

Figure D24
Example Single Event Noise Contour
MD-80 South Flow

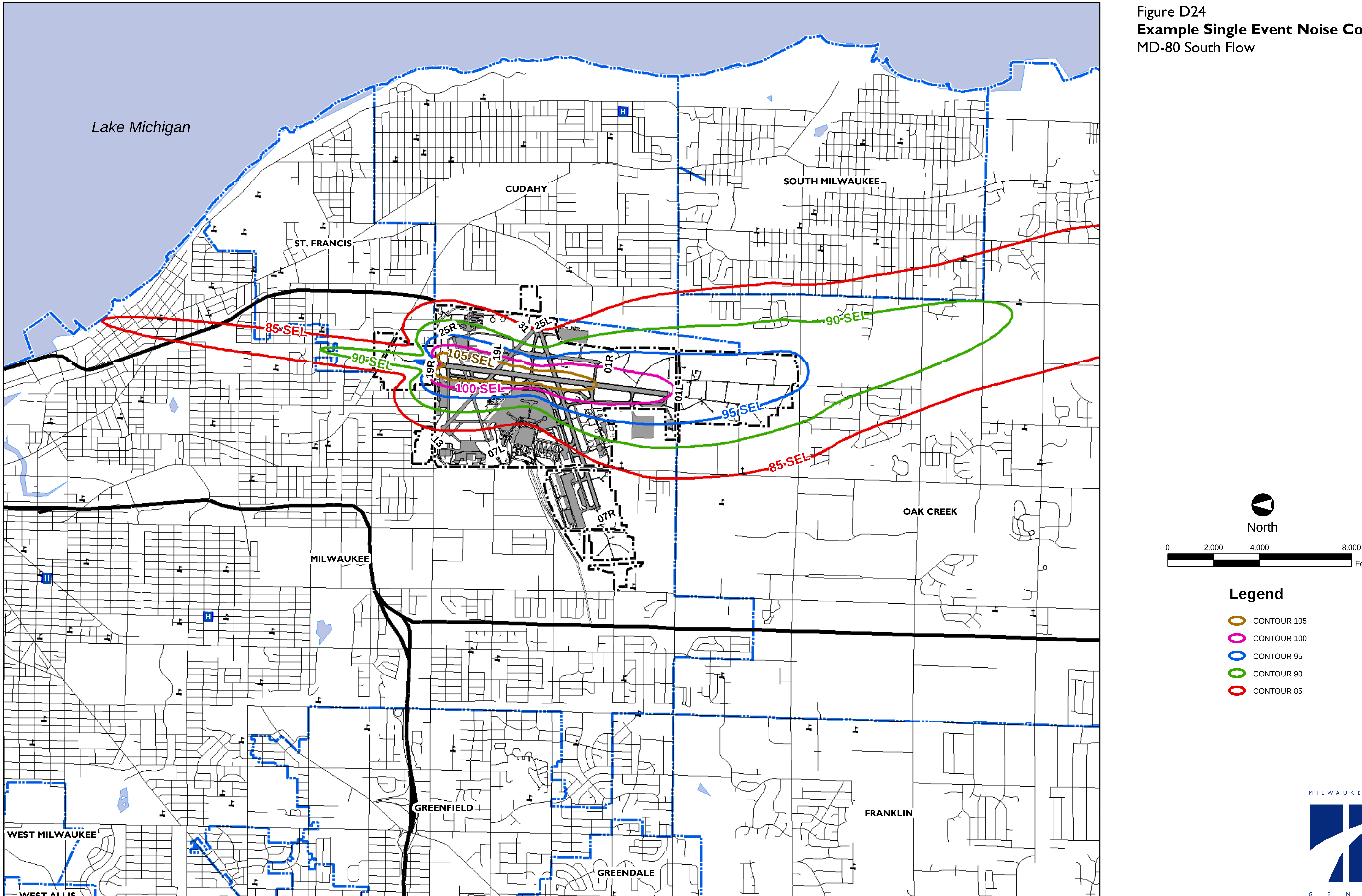

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Figure D25

Example Single Event Noise Contour

DC-9 South Flow

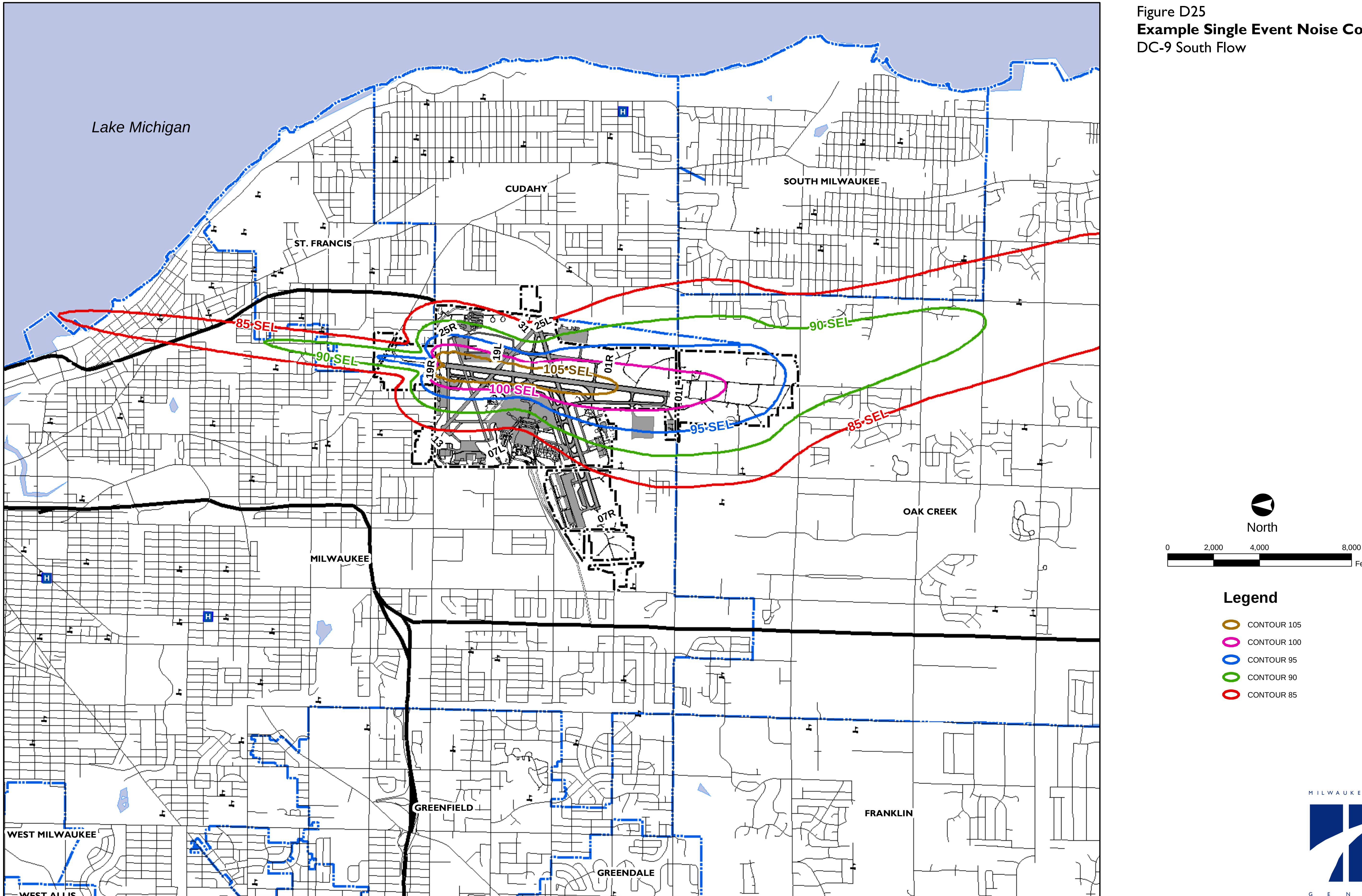

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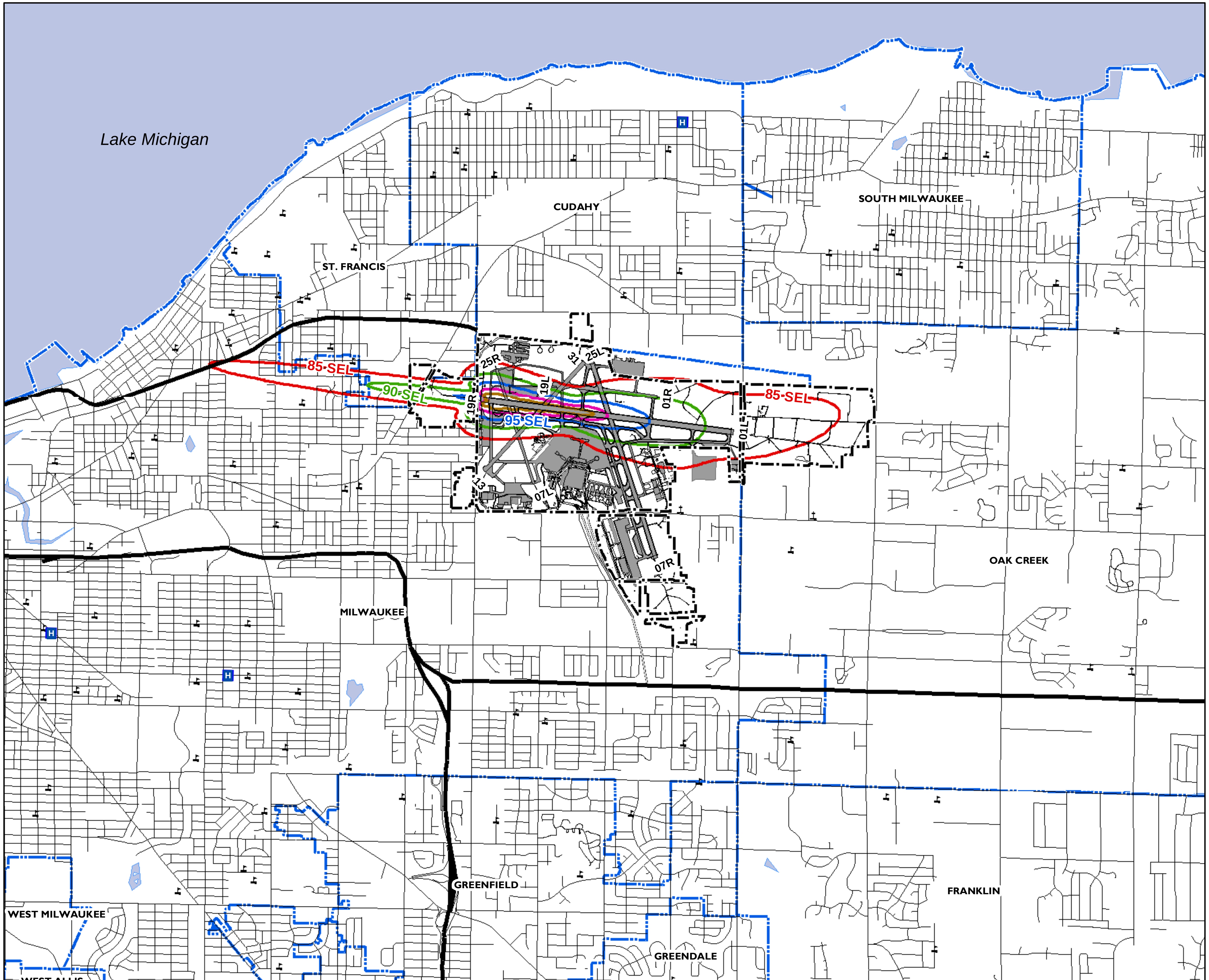
Figure D26
Example Single Event Noise Contour
B 717-200 South Flow



North

0 2,000 4,000 8,000 Feet

Legend

- CONTOUR 105
- CONTOUR 100
- CONTOUR 95
- CONTOUR 90
- CONTOUR 85

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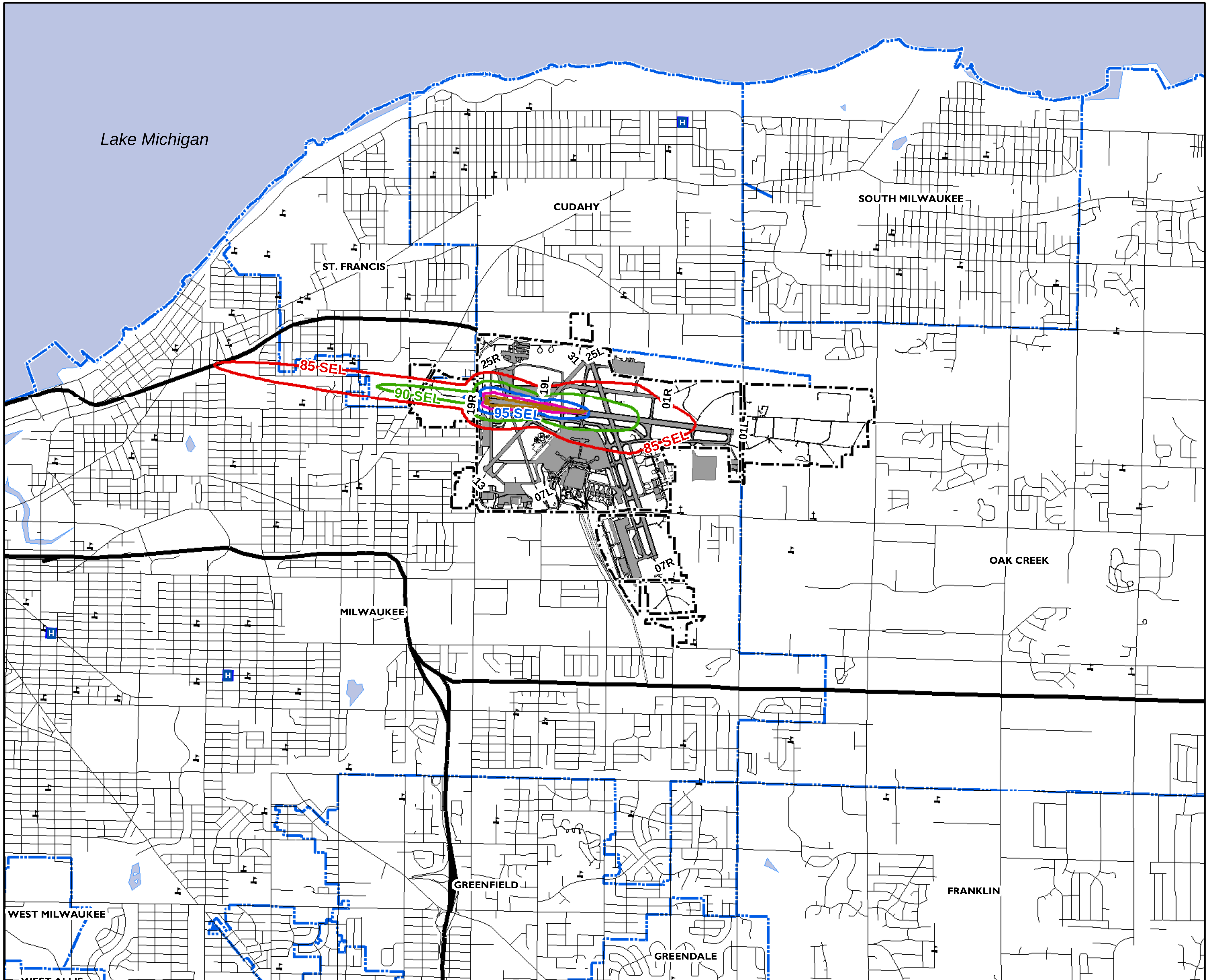
Figure D27
Example Single Event Noise Contour
EMB-145 South Flow



North

0 2,000 4,000 8,000 Feet

Legend

- CONTOUR 105
- CONTOUR 100
- CONTOUR 95
- CONTOUR 90
- CONTOUR 85

MILWAUKEE COUNTY'S GENERAL MITCHELL INTERNATIONAL AIRPORT

Future Baseline Noise Modeling Inputs

2009 Aircraft Operations

The future noise environment for General Mitchell International Airport was analyzed based upon 2009 operational conditions. The aircraft operational levels come directly from the aviation forecast presented in the Forecasts Chapter of the Part 150 Study. The forecast data shows that for the Year 2009, a total of 234,466 operations are anticipated to occur at the Airport. This equates to an average of 642 operations per day (an operation is either one takeoff or one landing).

Aircraft Fleet Mix Categories. The breakdown by aircraft type or fleet mix, categories of aircraft operations are presented in this section for the year 2009. The categories of aircraft are defined relative to type of user, (i.e., passenger or cargo) and type of aircraft (i.e., jet or propeller). The breakdown by these categories was determined from the aviation forecast. Table D12 presents operations for the different categories of aircraft.

Table D12
OPERATIONS BY AIRCRAFT CATEGORY FOR FUTURE 2009 BASE CONDITIONS
General Mitchell International Airport FAR Part 150 Noise Compatibility Study

Category	Annual Operations
Passenger Air Carrier and Air Cargo	
Wide Body Jets	1,179
Narrow Body Jets	49,803
Regional Jets	77,544
Commuter Prop	54,260
General Aviation and Small Air Taxi	
Corporate Jets	13,575
Single & Multi-Engine Prop	33,596
Military	
Tankers	1,690
Transports	2,819
Total Operations	234,466

***Source**: BridgeNet International Numbers have been rounded*

Detailed Aircraft Fleet Mix. The mix of aircraft that operate at the Airport is one of the most important factors in terms of the airport noise environment. Fleet mix data were determined from all of the data described previously. The fleet mix assumptions for 2009 are presented in Table D13. This table presents the average daily operations for each type of aircraft used in the Integrated Noise Model (INM) as well as a description of these aircraft.

The INM aircraft type assigned to each of the aircraft operating at General Mitchell International Airport was based upon aircraft in the INM database that most closely matched the aircraft each airline operated at the Airport. Some aircraft with smaller numbers of operations were grouped into the aircraft type that most closely represented those aircraft. Note that these are the same INM types shown more than once in the table. This is to identify the separate categories of operations. The percentage of operations expected in 2009 for each of the aircraft types is also presented. The MD80 series aircraft are the dominant noise aircraft operating at General Mitchell International Airport during the future year study period.

Additional Operational Assumptions

Assumptions such as runway use, time of day, flight tracks and flight track usage and departure procedures remain the same as with the existing conditions.

Aircraft Category	INM Type	Daily Arrivals Day	Daily Arrivals Night	Daily Departures Day	Daily Departures Night	Daily Operations	Annual Operations
Air Carrier Wide Body	74720B	0.01	0.01	0.01	0.01	0.05	19
Air Carrier Wide Body	A310	0.41	0.26	0.23	0.44	1.35	492
Air Carrier Wide Body	DC1030	0.30	0.01	0.31		0.62	227
Air Carrier Wide Body	A30062	0.39	0.21	0.34	0.26	1.21	440
Air Carrier Narrow Body	727EM1	0.24	0.18	0.07	0.35	0.83	304
Air Carrier Narrow Body	727EM2	1.88	1.00	1.55	1.34	5.77	2,106
Air Carrier Narrow Body	7373B2	4.05	0.07	3.90	0.21	8.23	3,006
Air Carrier Narrow Body	737400	0.39	0.01	0.40	0.01	0.80	293
Air Carrier Narrow Body	757PW	2.26	0.69	2.72	0.23	5.89	2,149
Air Carrier Narrow Body	757RR	0.24	0.05	0.12	0.17	0.58	213
Air Carrier Narrow Body	A320	2.90	0.43	2.67	0.65	6.65	2,427
Air Carrier Narrow Body	DC870	0.06	0.58	0.24	0.40	1.28	469
Air Carrier Narrow Body	F10065	0.15		0.15		0.30	109
Air Carrier Narrow Body	MD83	11.57	0.80	11.29	1.07	24.73	9,026
Air Carrier Narrow Body	737N17	0.05	0.01	0.05	0.01	0.10	38
Air Carrier Narrow Body	DC95HW	3.68	0.25	3.52	0.41	7.87	2,872
Air Carrier Narrow Body	A319	3.57	0.11	3.52	0.16	7.35	2,683
Air Carrier Narrow Body	717200	27.86	1.92	26.68	3.11	59.57	21,743
Air Carrier Narrow Body	737800	3.15	0.09	3.11	0.14	6.48	2,367
Regional Jets	BAE146	4.30	0.32	4.59	0.03	9.23	3,370
Regional Jets	BAE300	4.48	0.21	4.67	0.02	9.39	3,426
Regional Jets	EMB145	34.77	1.04	31.66	4.14	71.61	26,139
Regional Jets	EMB14L	18.38	2.39	17.35	3.42	41.54	15,162
Regional Jets	J328	36.07	4.27	36.64	3.70	80.68	29,448
Commuter Prop	DHC6	1.40	1.11	1.27	1.24	5.03	1,837
Commuter Prop	DHC8	2.09	0.19	0.75	1.53	4.56	1,666
Commuter Prop	SF340	8.33	1.18	8.21	1.30	19.02	6,941
Commuter Prop	EMB120	0.04	0.92	0.29	0.66	1.91	698
Commuter Prop	BEC190	53.51	5.56	54.00	5.06	118.13	43,117
General Aviation Jet	CIT3	2.14	0.17	2.02	0.29	4.61	1,684
General Aviation Jet	CL600	1.31	0.04	1.06	0.29	2.70	986
General Aviation Jet	FAL20	0.24	0.02	0.25	0.01	0.51	187
General Aviation Jet	GIIB	0.21	0.01	0.21	0.01	0.43	158
General Aviation Jet	GIV	1.19	0.12	1.16	0.15	2.62	957
General Aviation Jet	IA1125	0.31	0.02	0.32	0.01	0.65	237
General Aviation Jet	LEAR25	0.07		0.07	0.00	0.15	54
General Aviation Jet	LEAR35	2.07	0.18	2.02	0.23	4.49	1,641
General Aviation Jet	SABR80	3.37	0.25	3.25	0.37	7.24	2,641
General Aviation Jet	CNA55B	5.53	0.31	5.18	0.65	11.67	4,260
General Aviation Jet	CNA750	0.99	0.07	0.98	0.08	2.11	770
General Aviation Prop	BEC58P	5.80	3.48	3.79	5.49	18.56	6,774
General Aviation Prop	CNA441	2.83	2.36	2.90	2.29	10.39	3,793
General Aviation Prop	GASEPF	2.41	0.32	2.35	0.38	5.46	1,992
General Aviation Prop	GASEPV	5.19	0.25	4.53	0.91	10.87	3,969
Air Taxi	BEC9F	8.16	0.61	8.16	0.61	17.53	6,399
Air Taxi	CNA208	14.19	0.43	14.19	0.43	29.23	10,669
Military	KC135R	2.16	0.16	2.16	0.16	4.63	1,690
Military	C130	3.75	0.11	3.75	0.11	7.72	2,819
	Total	**288.42**	**32.77**	**278.65**	**42.53**	**642.37**	**234,466**

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Table D13 **Aircraft Fleet Mix Assumption for Future 2009 Conditions**

Future 2009 Baseline Noise Conditions

Future noise contours were developed using a variety of different noise metrics described in the background section of the report including both cumulative noise levels (i.e., averaged over a period of time) and single-event noise levels (noise levels generated by one operation).

As required by the FAA, the primary noise criterion to describe the existing noise environment is the cumulative measure commonly referred to as DNL. Additional cumulative noise levels include the Time Above (TA) noise level and Number of events Above (NA). TA sums the number of minutes throughout the day that the noise levels exceed a threshold, such as 65 dBA. NA reflects the number of times per day that a certain noise level is exceeded, again such as 65 dBA. The single-event analysis was quantified in terms of SEL. The TA, NA, and SEL data were used to supplement the DNL analysis.

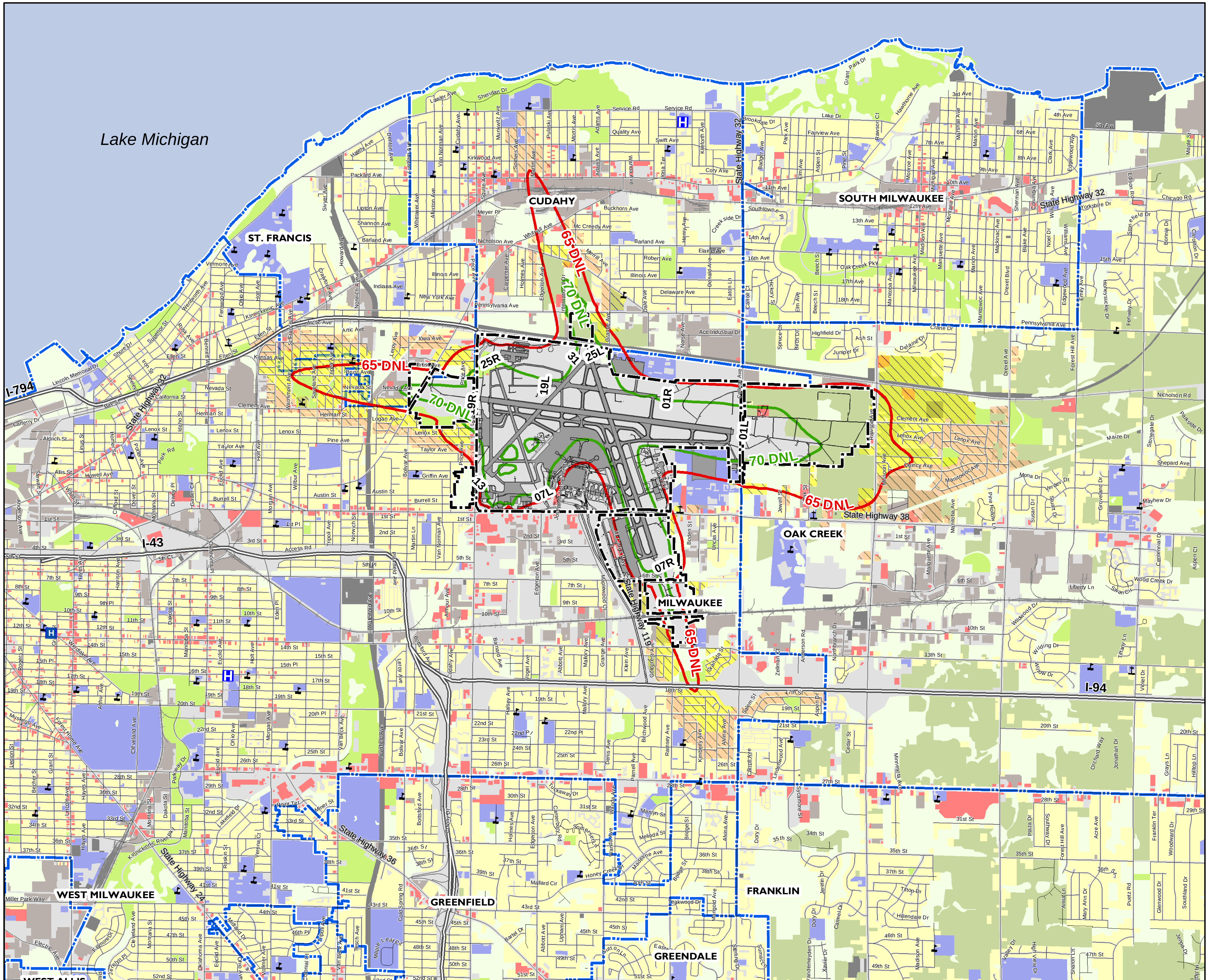
DNL Noise Contours. The future annual base period 2009 DNL noise exposure contours for General Mitchell International Airport are presented in Figure D28. This figure illustrates the 65, 70, and 75 DNL noise contours.

Time Above Noise Contours. The future 2009 annual base period Time Above noise contours are presented in Figure D29. In this figure, the lines of the contours reflect the number of minutes throughout the day that the noise level exceeded 65 dBA. This figure includes contours showing 5, 15, 30, 60, and 90 minutes per day that the noise levels exceed 65 dBA. The results show similar shape as the DNL noise contours. The time above noise contours are useful in illustrating the amount of time that communication interference can occur.

Noise Events Above Contours. The NA65 is the number of times per day that aircraft noise exceeds 65 dBA. Figure D30 presents the NA65 contours for the 2009 conditions. The figure shows the average daily number of times that the noise level exceeds 65 dBA. Contours are presented in terms of 10, 50, 100, 150 times per day.

Single-Event Noise Contours. Single-event noise exposure contours for sample aircraft were developed and presented in the Existing Noise Environment section. The same aircraft that exist today are assumed to be in operation in 2009, so the single-event analysis remains the same as with existing conditions.

Figure D28
Future 2009 Base Case-DNL Noise Contour
Generalized Existing Land Use



Legend

- 65 DNL Contour (v6.2)
- 70 DNL Contour (v6.2)
- RESIDENTIAL
- COMMERCIAL
- GOVERNMENT/INSTITUTIONAL
- INDUSTRIAL
- AGRICULTURAL
- RECREATIONAL
- OPEN LANDS
- COMMUNICATION/UTILITIES
- TRANSPORTATION
- COMMUNITY FACILITY
- MUNICIPAL BOUNDARY
- AIRPORT BOUNDARY
- hospitals
- schools
- churches

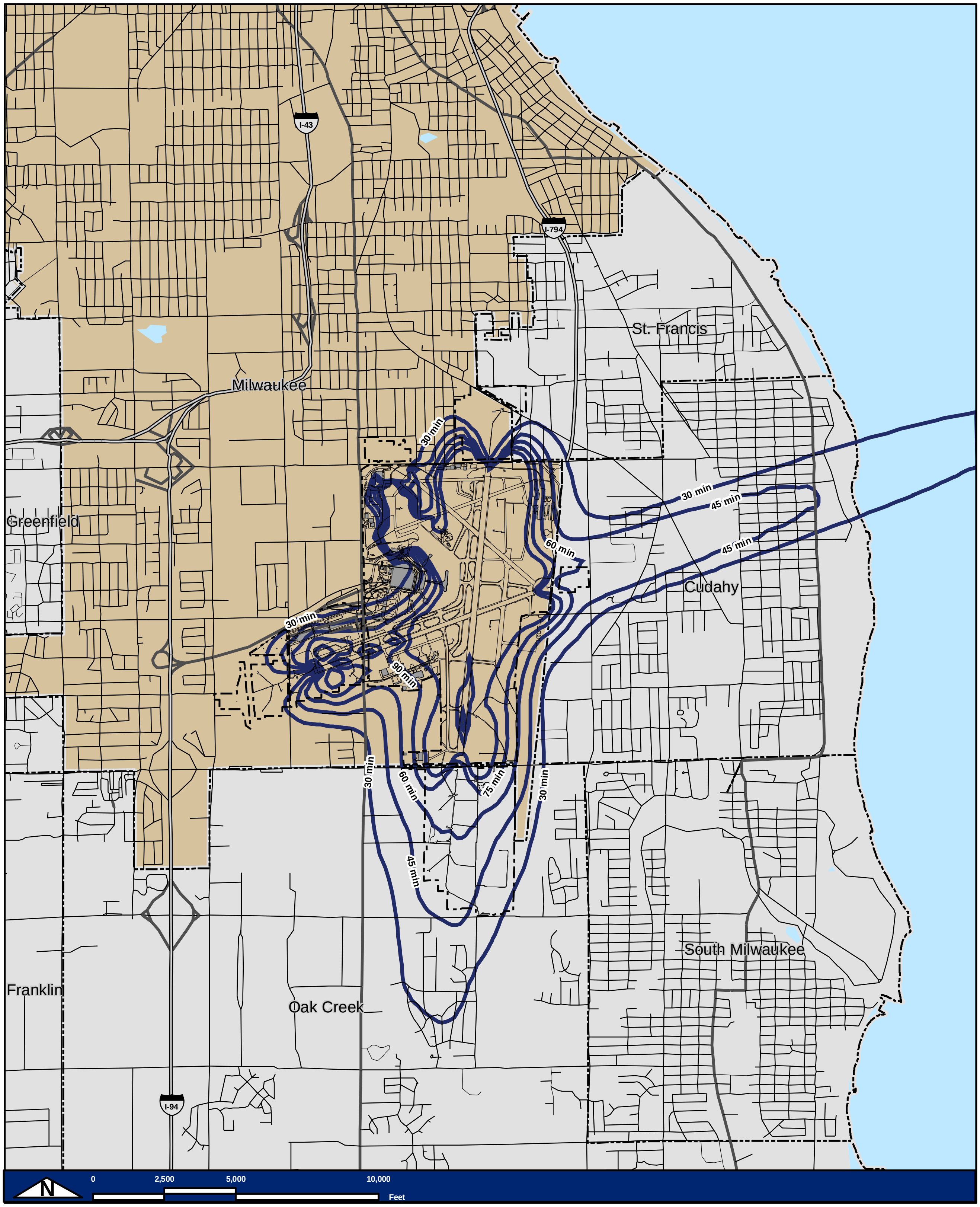
Source: Milwaukee County, 2003

- PHASE 1 PROGRAM BOUNDRIES
- PHASE 2 PROGRAM BOUNDRIES

North

0 2,000 4,000 8,000 Feet

MILWAUKEE COUNTY'S GENERAL MITCHELL INTERNATIONAL AIRPORT



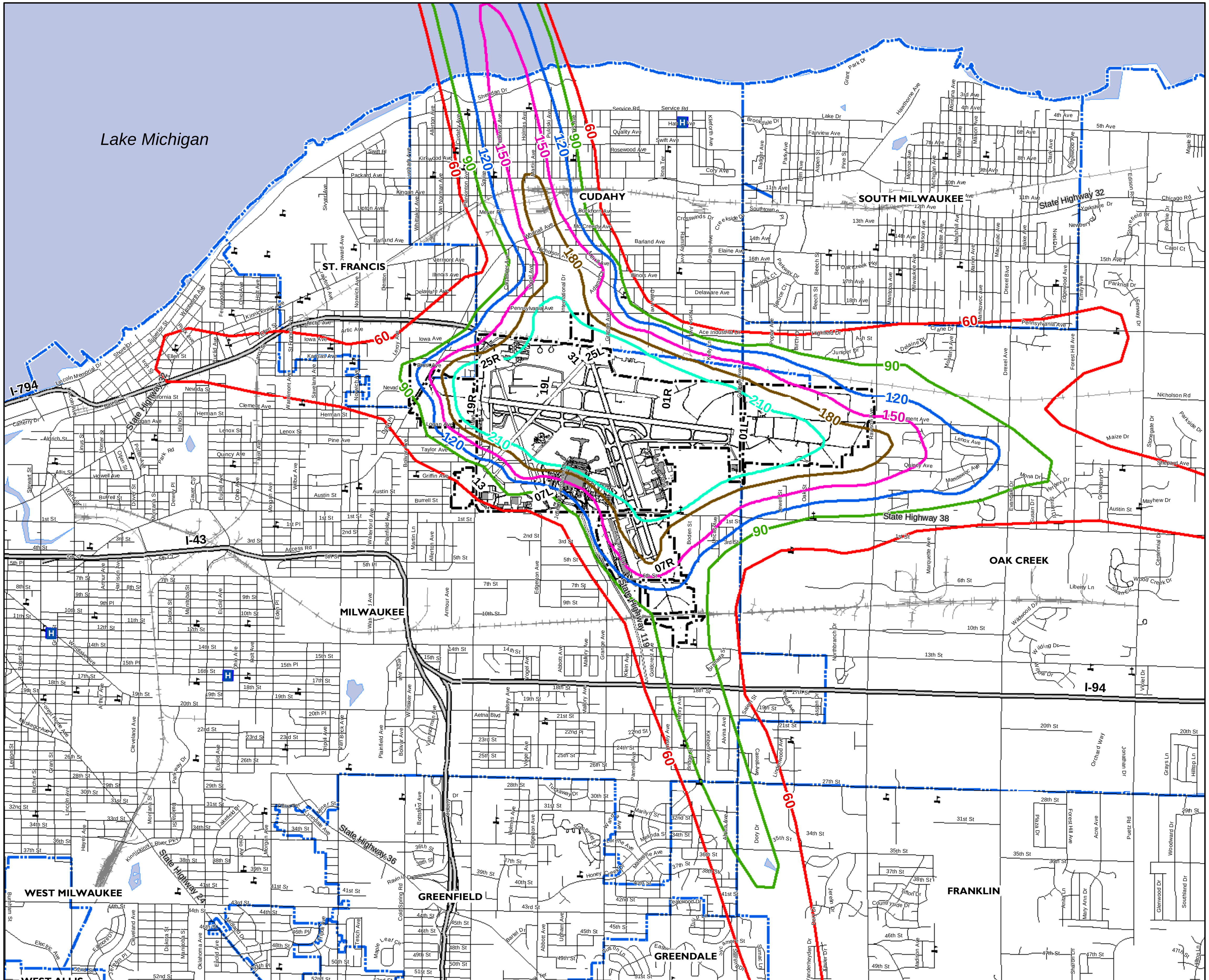
CONTOUR LEGEND

2009 Time Above 65 DNL Contour

MILWAUKEE COUNTY'S GENERAL MITCHELL INTERNATIONAL AIRPORT

Figure D29 **Base Case 2009 - Daily Average Time Above 65 dBA Contour**

Figure D30
Base Case 2009 - Daily Average Number of Events Above 65 DNL



North

0 2,000 4,000 8,000 Feet

Legend

- 60
- 90
- 120
- 150
- 180
- 210

MILWAUKEE COUNTY'S GENERAL MITCHELL INTERNATIONAL AIRPORT