DETROIT METROPOLITAN WAYNE COUNTY AIRPORT
FAR PART 150 NOISE COMPATIBILITY STUDY UPDATE

DETROIT METRO • WILLOW RUN
WAYNE COUNTY AIRPORT AUTHORITY

CHAPTER D
EXISTING & FUTURE BASELINE NOISE CONDITIONS

Existing and Future Baseline Noise Conditions

Introduction

Noise measurements were conducted between November 30, 2004 and December 30, 2004 at various locations within the Wayne County area. The purpose of the measurement program was to validate the computer model using actual noise measurement data from aircraft operating at the Airport and was **NOT** used to generate the contours. Measurement data were collected at a total of twenty-two (22) long-term noise monitoring locations and twenty (20) short-term noise monitoring locations. The measurements were conducted at the long-term locations for periods of one to three weeks; the short-term portable noise monitoring consisted of one day of monitoring spread over a number of different days.

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. Ambient noise is defined as noise generated from numerous sources for a general background noise level. Ambient noise is determined by the living conditions, i.e., urban, suburban, or rural area. Each will have varying ambient noise levels determined by such items as roadway noise, proximity to school yards, dogs barking, lawn mowers, etc. 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 the measurement locations are presented in Section C, **Background Information on Noise/Methodology**. The results of the measurement program are summarized in the following paragraphs. Additional data, with more detailed results for each measurement site, is presented on the Detroit Metropolitan Wayne County Airport Part 150 project web site. This section consists of the following sub-sections:

- <u>Noise Measurement Results</u> – Describes the results of the actual noise measurements. The measurement results are described by:
  - Continuous noise measurements
  - Ambient or background sound levels
  - Single event sound levels for aircraft
  - Day-Night Average Level (DNL) noise levels
  - Hourly noise levels
  - Time Above noise levels (TA)

- Noise Contour Modeling Results –Presents the results of the computer modeling process that creates aircraft noise exposure contour maps.

Noise Measurement Results

Continuous Noise Measurements

Sound levels were continuously recorded at each of the portable noise-monitoring sites set up for this study. Continuous one-second noise data continually notes the actual sound level every one second. In addition to recording the noise events from aircraft, monitors also registered the ambient, or background noise level of the site, since the monitors were continuously monitoring all sounds. An example of continuous noise measurements is presented in **Figure D1**; 15-minutes of continuous sound data are shown for two sites. The graphic shows the measured A-weighted noise level on the Y/vertical axis versus time for the sample 15 minute period on the X/horizontal axis. The aircraft events and the ambient noise can be easily distinguished in this plot; each of the peaks was caused by an aircraft over-flight, and the valleys typically reflect ambient or background sound.

The top portion of the graph plots the data for Site S04, a site close to the Airport to the south. The bottom portion of this plot shows the same time period for Site S01, a more distant site south of the Airport, along the same general flight path. Aircraft departing to the south first pass over Site S04, and then about fifteen seconds later pass over Site S01. The time sequence of each of the noise events is shown in that noise events occur first at S04 and then at S01.

Ambient or Background Sound Levels

The ambient sound level at each site was identified based on the survey data. In this case, ambient level refers to the background sound level that would occur without influences from aircraft over-flight at each site. Ambient sound level is measured using the Percent Noise Levels (Ln). Percent Noise Level is the noise level exceeded different percentages (n) of the time (i.e., L90 represents the sound level exceeded 90% of the time). These metrics are described in greater detail in the background section (Section C). Such data helps identify the ambient noise environment and aids in assessing how intrusive aircraft noise is at a particular location. The sources of background sound include noise from cars on roadways, railroads, and commercial sources.

The results of the ambient noise measurement survey at each measurement site are described in the following figures and tables. **Table D1** presents a 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 (quietest) dBA value that was

Table D1
AMBIENT MEASUREMENT RESULTS FOR LONG-TERM SITES, NORTH AND SOUTH (Aircraft events included)
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

NMS	Description	Address	Statistical Noise Levels (dBA)				
			Max	L10	L50	L90	Min
Long-Term Sites (North)							
N1	Wayne	2988 Hubbard Street	86	53	48	45	40
N2	Wayne	4851 Harrison Street	82	52	45	42	37
N3	Romulus	6547 Gloria Street	84	58	49	45	39
N4	Westland	30131 Julius Blvd	89	57	47	43	37
N5	Inkster	29536 Thomas Circle	88	57	46	43	38
N6	Inkster	1072 Eastwood Street	96	55	45	42	35
N7	Dearborn Heights	337 Rosemary Street	82	52	43	41	35
N8	Dearborn	1315 N. Silvery Lane	77	52	44	40	33
N9	Dearborn	24407 Rockford Street	80	52	43	39	32
N10	Dearborn	22262 Long Blvd	77	50	42	38	27
N11	Inkster	27019 Penn Street	88	53	46	41	36
N12	Dearborn Heights	24096 Lehigh Street	79	53	47	44	37
Long-Term Sites (South)							
S1	New Boston	39933 Wear Road	81	52	44	39	30
S2	Belleville	39791 Judd Road	92	58	46	41	36
S3	New Boston	31740 King Road	84	54	46	43	37
S4	New Boston	37610 Harvest Lane	92	59	48	45	39
S5	Romulus	37541 Barth Street	88	58	49	45	38
S6	Romulus	15248 Colbert	88	59	51	47	37
S7	Belleville	17007 Renton Road	82	59	53	51	43
S8	New Boston	33675 Sibley Road	86	60	52	48	37
S9	New Boston	21950 Dickenson Road	85	53	45	41	33
S10	Brownstown	32304 Stefano Court	84	52	48	46	39

Source: BridgeNet International

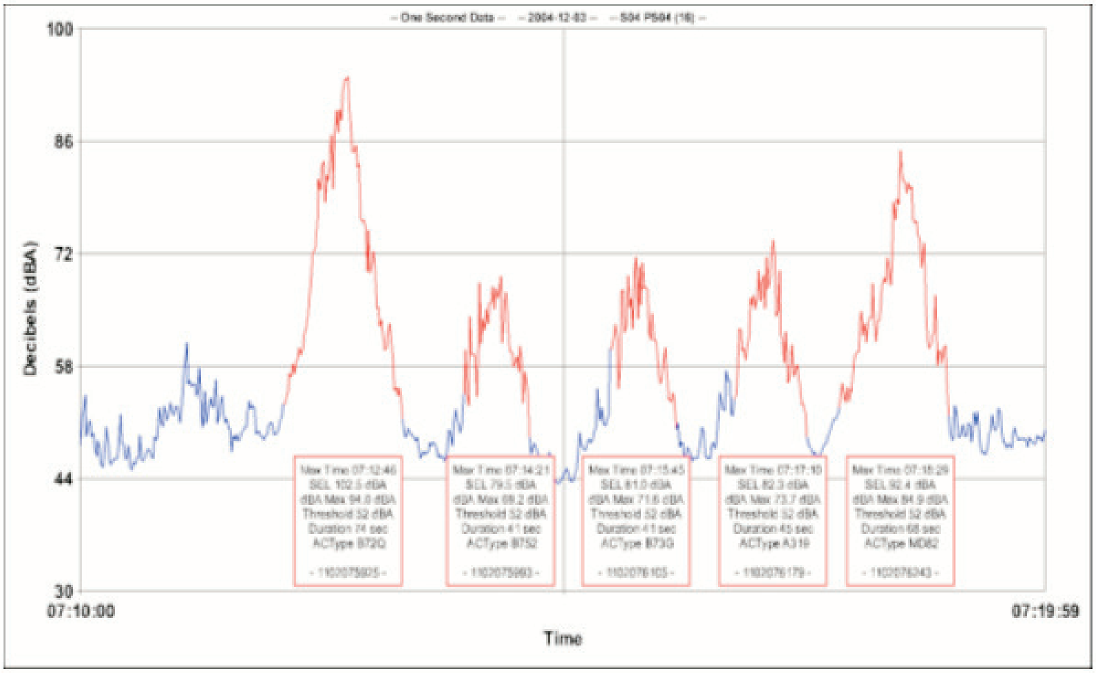
measured. This table illustrates the range in noise levels that exists at each site. Note that aircraft noise is included in this information and is typically the source of the peak, or maximum, noise levels. Although Lmax is not technically a component of the ambient noise levels, it is included in the table because at most noise monitor locations aircraft noise is the loudest event.

Figure D-1

Sample Time History Noise Plot of Aircraft and Ambient Noise

Period: Dec 03, 2004 7:10:00 to Dec 03, 2004 7:29:59

Site: PS04 - 37610 Harvest Lane



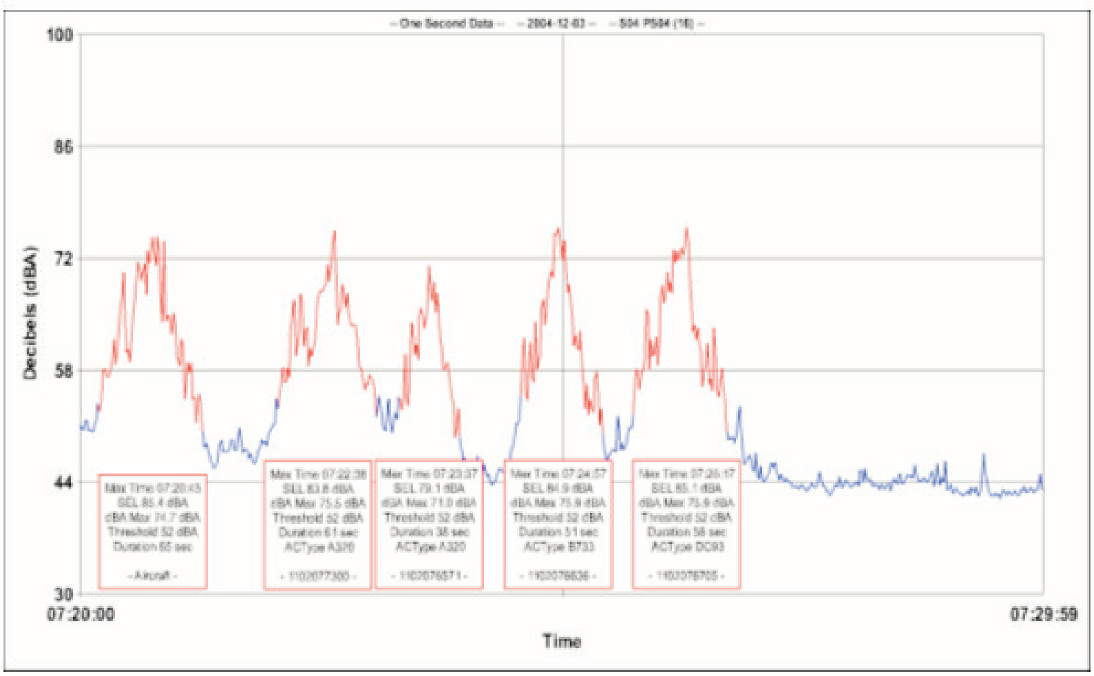


Figure D1 **Sample Time History Noise Plot of Aircraft and Ambient Noise**

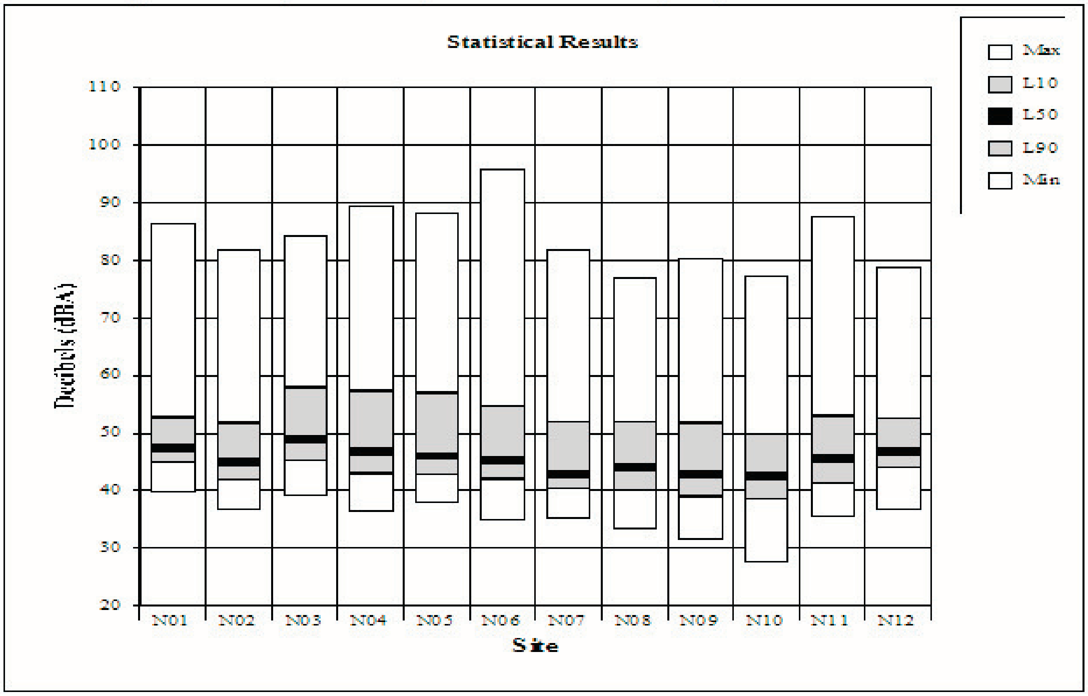
This same information is illustrated in **Figure D2**. The top portion of the figure presents data for the long-term permanent sites. The bottom portion presents the data for the short-term sites. Industry practices indicate that the L90 generally represents the ambient or background sound level. It represents the level of noise that is exceeded 90 percent of the time. Therefore it is commonly referred to as the residual sound when other sources of noise are not present and is the level above which noise events occur, such as an aircraft over-flight or train pass-by. 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 all of the measurements conducted for this study 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 40s 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 (Site S04) is summarized in **Figure D3**. The data for all other sites is presented on the Part 150 Noise Study Website, http://www.airportnetwork.com/dtw. The top portion of **Figure D3** presents 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 occurred generally during bad weather conditions. As is shown, ambient noise levels do vary by time of day, where background 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.

Figure D-2
Site Specific Ambient Noise Measurement Results (Aircraft Events Included)

North Long-Term Sites (December 15, 2004 to December 30, 2004)



South Long-Term Sites (November 30, 2004 to December 15, 2004)

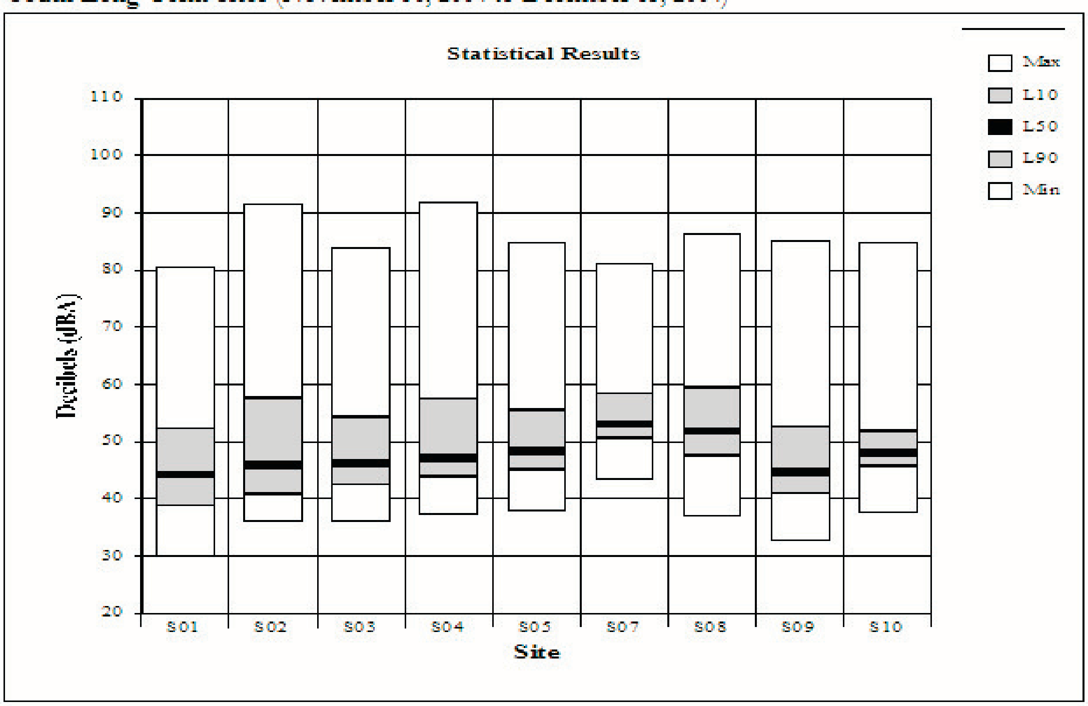
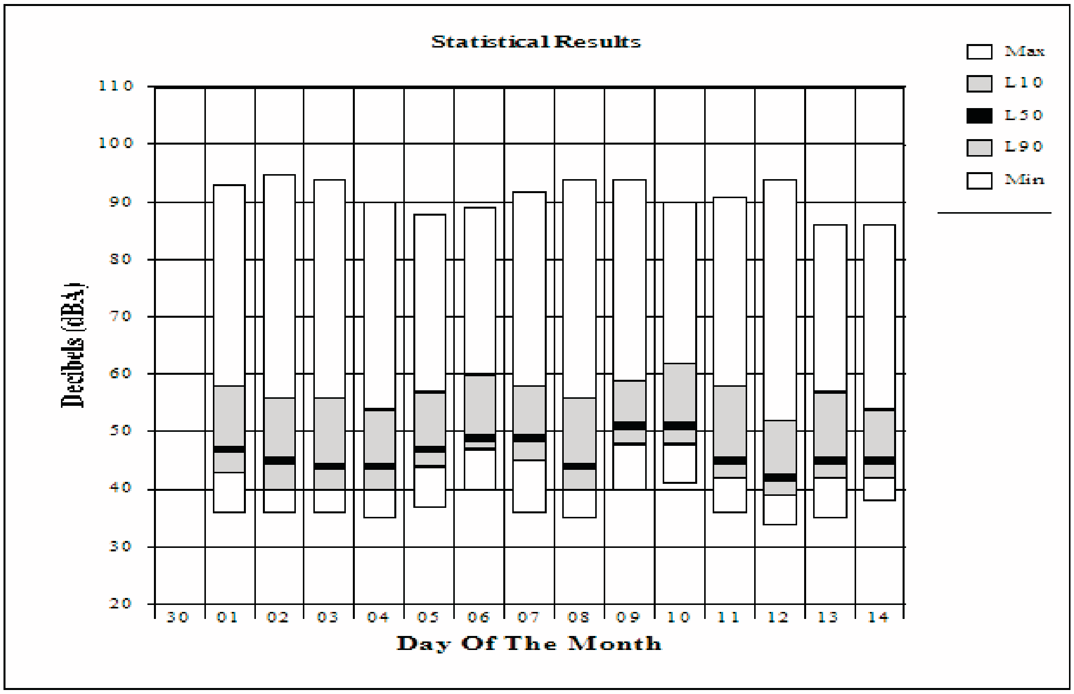


Figure D2 **Site Specific Ambient Noise Measurement Results (Aircraft Events Included)**

Figure D3
Site Specific Ambient Noise Measurement Results (Aircraft events included)
Site: PS04 - 37610 Harvest Lane

Period: November 30, 2004 to December 14, 2004



Period: December 7, 2004

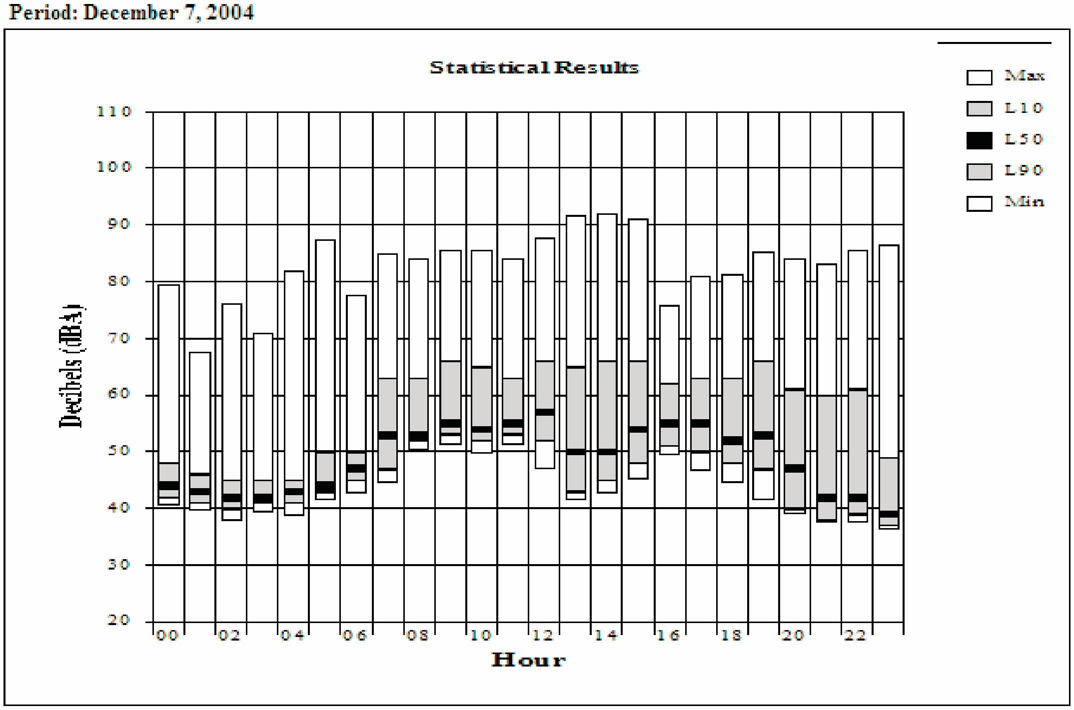


Figure D3 **Site Specific Ambient Noise Measurement Results (Aircraft Events Included)**

Single Event Sound Levels From Aircraft

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 events measured during the survey were correlated with flight operations information. Using single event noise data, it was possible to separately identify the single event sound levels from the different aircraft types operating at Detroit Metro Airport. The single event levels are summarized in the following paragraphs. Additional single event sound level data are presented in the web site (http://www.airportnetwork.com/dtw).

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 (Site S08). The table presents the SEL noise value plotted as a histogram. The Y/vertical axis presents the number of events in each hour. The X/horizontal axis shows the hour of the day. The SEL values are plotted vertically for each event in each hour. Data for each long-term site and each measurement day is presented on the web site.

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 Site N04 and at Site N06. The histogram shows the number of measured aircraft events on the vertical column and the measured SEL on the horizontal column. Site N04 is representative of a location closer to the Airport, while Site N06 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 to the operational information, the single event levels 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 N04 is presented in **Figure D6** for departure noise levels and **Figure D7** for arrival levels. 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 higher noise level and a wider range in noise per the different aircraft types. For arrivals, the relative difference in noise among the different aircraft types is less.

Figure D4
One Day of Measured Aircraft Noise Events
Period: December 9, 2004
Site: S08 - 33675 Sibley Road

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.

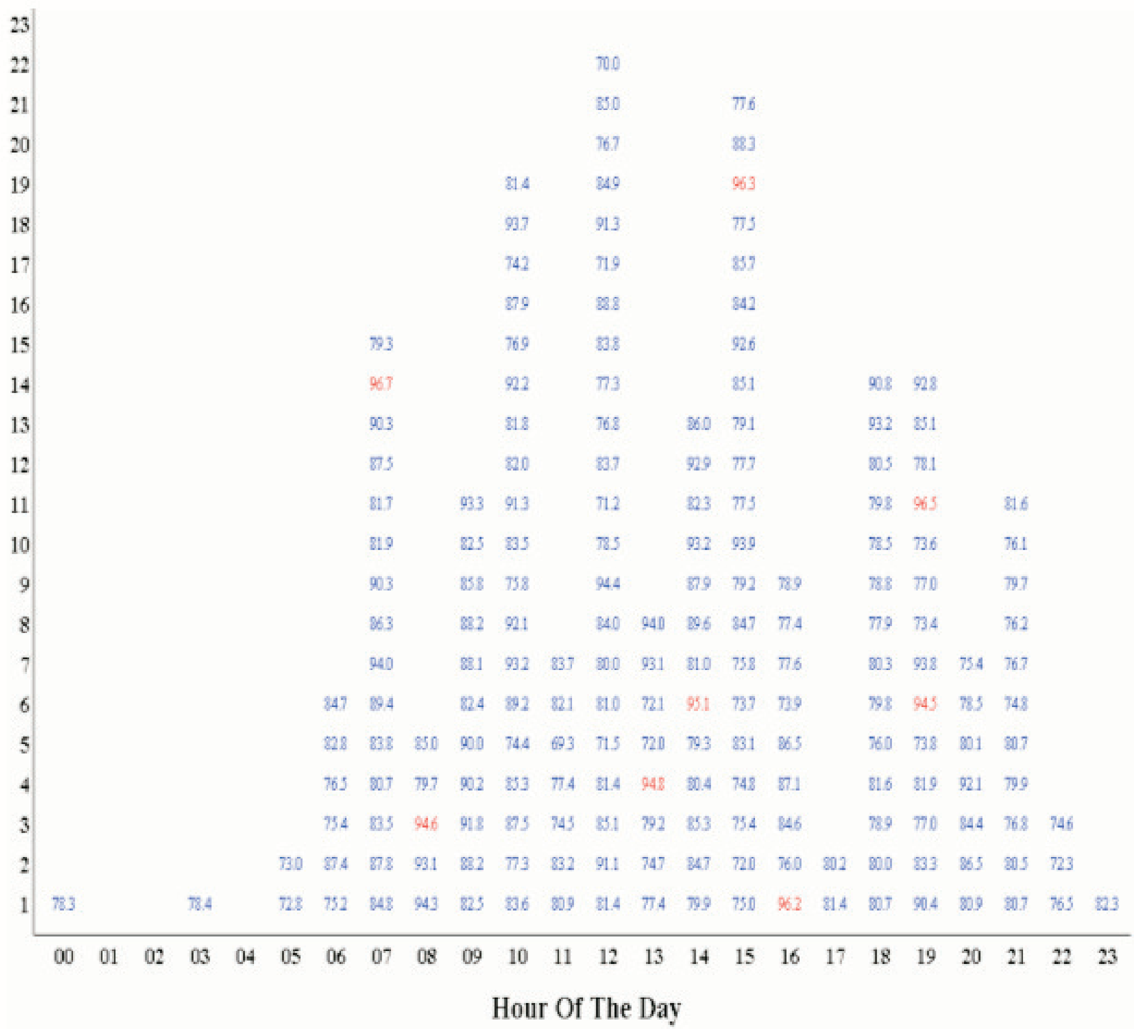
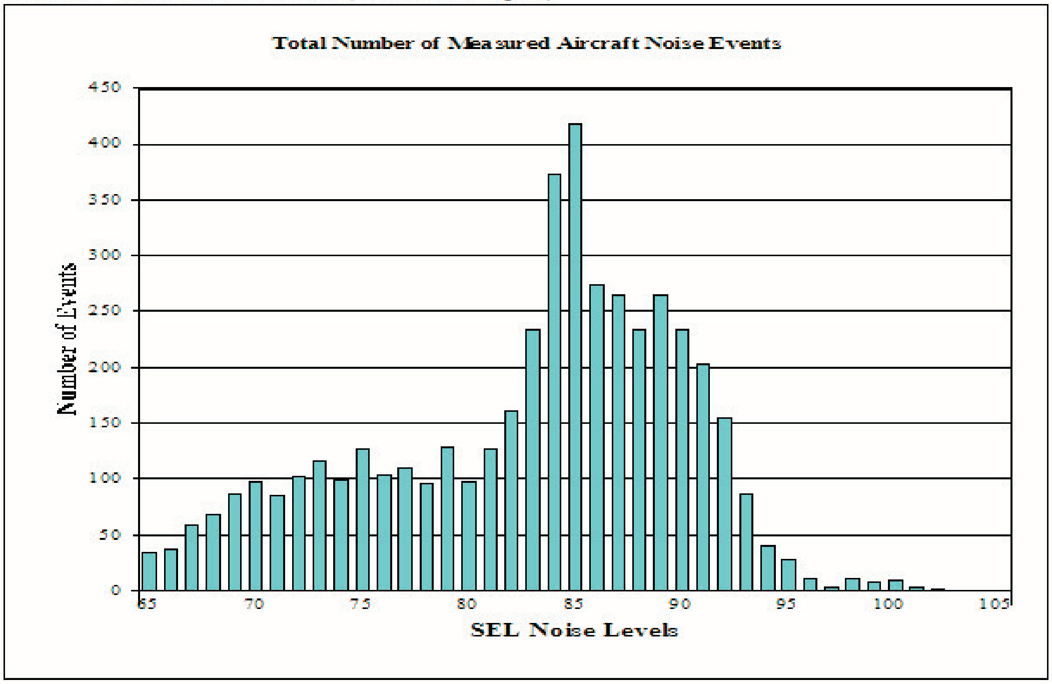


Figure D4 **One Day of Measured Aircraft Noise Events**

Figure D5
Range of Noise and Number of Events Histrograms
Period: November 30, 2004 to December 14, 2004

Site: S04 - 37610 Harvest Lane (closer to the airport)



Site: S01 - 39933 Wear Road (more distant from the airport)

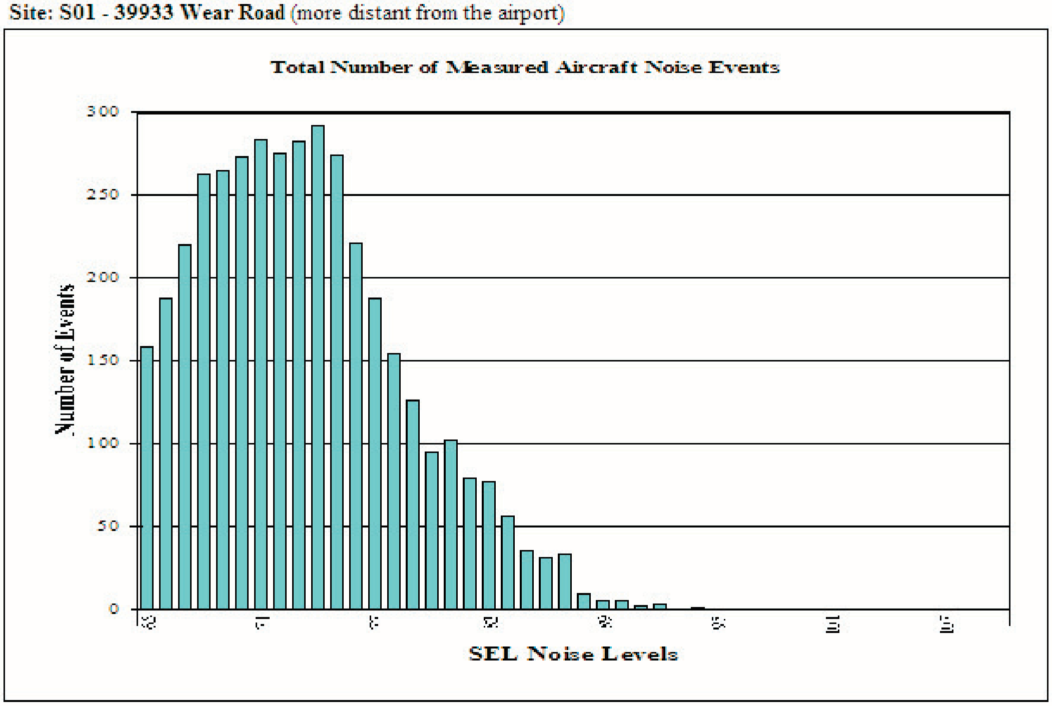


Figure D5 **Range of Noise and Number of Events Histograms**

Figure D6
Single Event Noise Level by Aircraft Report
Detroit Metropolitan (Wayne County) Airport
Period: December 2004
Site: N05 - PN05 - 29536 Thomas Circle
Operations: D   Runways: 4L;4R   Tracks: ALL

Aircraft	Event Count	Energy Average SEL
A330	2	82.1
B72Q	4	99.4
B73B	23	82.1
B744	11	97.0
B752	78	80.6
BA46	15	78.2
CRJ2	31	71.3
DC10	2	88.1
DC9Q	87	89.1
EA32	71	82.1
MD80	11	91.2
Other Aircraft	4	84.2

Graph of Energy Average SEL

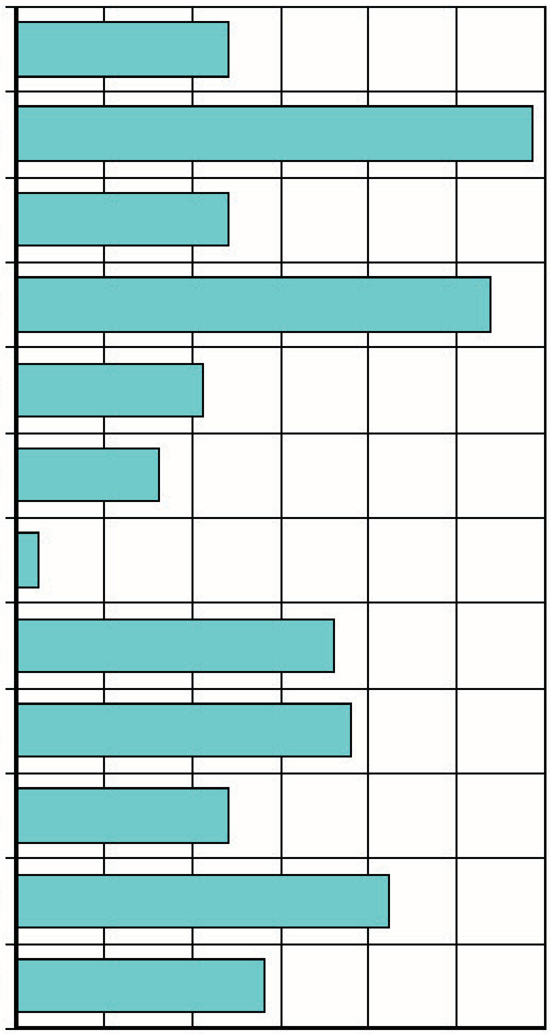


Figure D6 **Single Event Noise Level by Aircraft Report**

Figure D7
Single Event Noise Level by Aircraft Report
Detroit Metropolitan (Wayne County) Airport
Period: December 2004
Site: N05 - PN05 - 29536 Thomas Circle
Operations: A   Runways: 22R;22L   Tracks: ALL

Aircraft	Event Count	Energy Average SEL
A330	41	86.1
B72Q	17	89.2
B73B	158	84.2
B73Q	1	83.8
B744	21	88.8
B752	223	85.2
BA46	159	81.1
CRJ2	551	80.3
CRJ7	4	80.0
DC10	15	88.4
DC8Q	7	89.2
DC9Q	601	86.2
EA32	426	83.5
MD11	8	89.8
MD80	133	85.0
SF34	375	82.8
Other Aircraft	41	82.0

Graph of Energy Average SEL

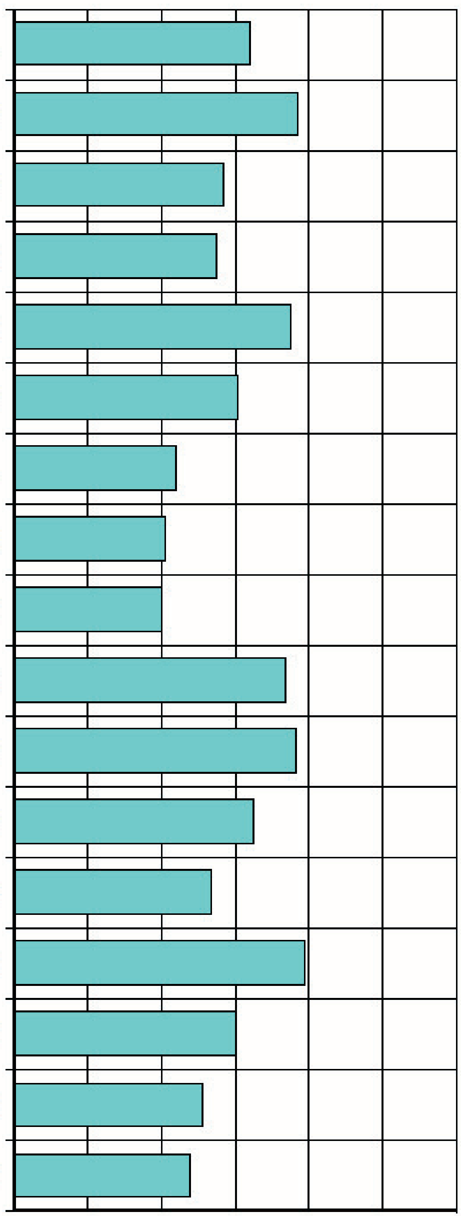


Figure D7 **Single Event Noise Level by Aircraft Report**

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 N04 and N01, respectively. The figure includes 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. Data for other sites are presented on the Detroit Metropolitan Wayne County Airport Part 150 project web site, which can be found at (www.airportnetwork.com/dtw).

Day-Night Average Sound Level (DNL) Noise Levels

Aircraft-related DNL levels were identified for each of the long-term noise monitoring sites. **Table D2** presents the results of the DNL noise measurements at the 22 long-term noise-monitoring locations. This table lists the average DNL due to aircraft events for the period monitored at each site (November 30, 2004 to December 30, 2004).

It is important to note that the DNL is defined as an average annual sound level. As actual measurements were not conducted over a year, estimates of DNL can be generated from long-term measurement data to enable comparison to the computer generated noise exposure contour maps discussed in a later section. Therefore, the actual measurements noted as DNL reflect either a daily or short-term period approximation of the average annual noise levels.

Figure D10 shows the same results of the DNL noise measurements at the 22 long-term sites in graphical format. The top portion of the graph shows the average DNL noise level measured at each noise monitoring location for the duration of the measurement survey. The bottom portion of the table shows the range of daily DNL-type values, along with the average DNL for the entire measurement period. The results show the wide range in noise levels 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 day DNL-type data were an average of 3 to 7 dBA higher than the average day.

Figure D11 graphically presents the DNL noise level due to aircraft events for each day the noise level was monitored at Site N04. **Figure D12** graphically presents the same data at Site S04. This figure presents 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 presenting this information for the other sites are presented on the Detroit Metropolitan Wayne County Airport Part 150 project web site (http://www.airportnetwork.com/dtw).

Table D2

DNL NOISE MEASUREMENT RESULTS FOR LONG TERM SITES, NORTH and SOUTH

Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Measurement Period November 30, 2004 through December 30, 2004

NMS	Description	Address	Aircraft DNL Noise Level
Long-Term Sites (North)			
N1	Wayne	2988 Hubbard Street	55
N2	Wayne	4851 Harrison Street	56
N3	Romulus	6547 Gloria Street	60
N4	Westland	30131 Julius Blvd	63
N5	Inkster	29536 Thomas Circle	62
N6	Inkster	1072 Eastwood Street	59
N7	Dearborn Heights	337 Rosemary Street	56
N8	Dearborn	1315 N. Silvery Lane	54
N9	Dearborn	24407 Rockford Street	54
N10	Dearborn	22262 Long Blvd	52
N11	Inkster	27019 Penn Street	55
N12	Dearborn Heights	24096 Lehigh Street	55
Long-Term Sites (South)			
S1	New Boston	39933 Wear Road	56
S2	Belleville	39791 Judd Road	61
S3	New Boston	31740 King Road	59
S4	New Boston	37610 Harvest Lane	65
S5	Romulus	37541 Barth Street	61
S6	Romulus	15248 Colbert	61
S7	Belleville	17007 Renton Road	56
S8	New Boston	33675 Sibley Road	62
S9	New Boston	21950 Dickenson Road	58
S10	Brownstown	32304 Stefano Court	48

Source: BridgeNet International

Figure D8
Twenty five Loudest SEL Noise Events
Period: November 30, 2004 to December 14, 2004
Site: S06 - 15248 Colbert

Aircraft	Airline	Event Time	Aircraft	Ops	Rwy	Lmax	SEL	Graph Of SEL
	NORTHWEST	Dec 04, 09:31	DC95	D	21R	91.4	100.9	
	NORTHWEST	Dec 04, 10:40	DC95	D	21R	90.4	100.1	
	NORTHWEST	Dec 04, 13:40	DC94	D	21R	92.3	99.6	
	NORTHWEST	Dec 04, 10:47	DC95	D	21R	90.8	99.4	
	NORTHWEST	Dec 13, 10:03	DC95	D	21R	88.0	98.3	
	NORTHWEST	Dec 08, 07:17	DC93	D	21L	87.8	97.8	
	NORTHWEST	Dec 12, 13:50	DC93	D	21R	89.6	97.8	
	NORTHWEST	Dec 08, 21:20	DC95	D	21R	88.9	97.6	
	NORTHWEST	Dec 12, 19:57	DC93	D	21R	87.5	97.5	
	NORTHWEST	Dec 12, 17:51	DC95	D	21R	88.3	97.1	
	NORTHWEST	Dec 08, 10:36	DC94	D	21R	82.3	96.8	
	NORTHWEST	Dec 12, 17:47	DC95	D	21R	86.7	96.6	
	NORTHWEST	Dec 04, 14:19	DC95	D	21R	86.5	96.5	
	NORTHWEST	Dec 04, 13:49	DC93	D	21R	88.6	96.3	
	NORTHWEST	Dec 04, 09:07	DC93	D	21R	86.6	96.1	
	NORTHWEST	Dec 12, 14:37	DC95	D	21R	87.3	96.1	
	NORTHWEST	Dec 04, 12:32	DC94	D	21R	85.7	96.1	
	NORTHWEST	Dec 08, 15:24	DC94	D	21R	85.6	96.0	
	NORTHWEST	Dec 04, 15:29	DC93	D	21R	88.2	95.9	
	NORTHWEST	Dec 12, 17:46	DC93	D	21R	88.1	95.9	
	NORTHWEST	Dec 04, 10:27	DC93	D	21R	85.4	95.7	
	NORTHWEST	Dec 04, 14:25	DC93	D	21L	86.4	95.7	
	NORTHWEST	Dec 03, 17:21	DC93	D	21R	86.6	95.7	
	NORTHWEST	Dec 09, 09:43	DC95	D	21R	85.9	95.5	
	NORTHWEST	Dec 12, 21:21	DC95	D	21R	87.1	95.5	

Figure D8 **Twenty Five Loudest SEL Noise Events**

Figure D9
Loudest Aircraft Noise Events Site Report
Period: December 15, 2004 to December 30, 2004
Site: N04 - 30131 Julius Blvd.

Aircraft	Airline	Event Time	Aircraft	Stage	Ops	Rwy	Lmax	SEL	Graph Of SEL
	CA	Dec 26, 11:07	B722	3	D	4R	94.2	103.9	
	CA	Dec 17, 09:36	B72Q	3	D	4R	92.4	101.8	
	CA	Dec 19, 07:51	B72Q	3	D	4R	92.2	101.1	
	U	Dec 19, 14:01	B744	3	D	4R	92.6	99.9	
	CA	Dec 23, 13:37	B72Q	3	D	4R	89.9	99.8	
	NORTHWEST	Dec 22, 14:10	DC93	3	D	4R	85.6	99.4	
	NORTHWEST	Dec 22, 14:17	B744	3	D	4R	89.6	99.1	
	NORTHWEST	Dec 19, 13:33	B744	3	D	4R	90.8	98.4	
	NORTHWEST	Dec 19, 14:24	B744	3	D	4R	91.1	98.3	
	NORTHWEST	Dec 26, 14:05	B744	3	D	4R	90.5	98.2	
	NORTHWEST	Dec 26, 15:20	B744	3	D	4R	90.8	97.9	
	NORTHWEST	Dec 22, 13:43	B744	3	D	4R	89.3	97.9	
	SPIRIT	Dec 22, 19:34	MD83	3	D	4R	86.3	95.7	
	NORTHWEST	Dec 22, 19:41	DC95	3	D	4R	82.0	95.2	
	NORTHWEST	Dec 23, 14:49	B744	3	D	4R	86.1	95.2	
	NORTHWEST	Dec 19, 15:07	B744	3	D	4R	86.3	95.1	
	GA	Dec 18, 09:37	LJ24	2	A	22R	84.6	94.8	
	KITTY HAWK	Dec 21, 07:04	B72Q	3	A	22R	88.2	94.7	
	NORTHWEST	Dec 26, 14:12	DC93	3	D	4R	79.6	94.6	
	SPIRIT	Dec 17, 09:41	MD83	3	D	4R	85.4	94.6	
	SPIRIT	Dec 22, 21:54	MD83	3	D	4R	86.8	94.6	
	NORTHWEST	Dec 18, 07:48	DC95	3	A	22R	86.2	94.4	
	SPIRIT	Dec 26, 20:46	MD83	3	D	4R	84.4	94.3	
	FEDERAL EXPRESS	Dec 22, 10:06	B72Q	3	A	22R	87.0	94.1	
	NORTHWEST	Dec 26, 13:26	B744	3	D	4R	85.0	94.1	

Figure D9 **Loudest Aircraft Noise Events Site Report**

Figure D-10
Aircraft DNL
Period: November 30, 2004 to December 30, 2004
Neighborhood: All Long-term Sites

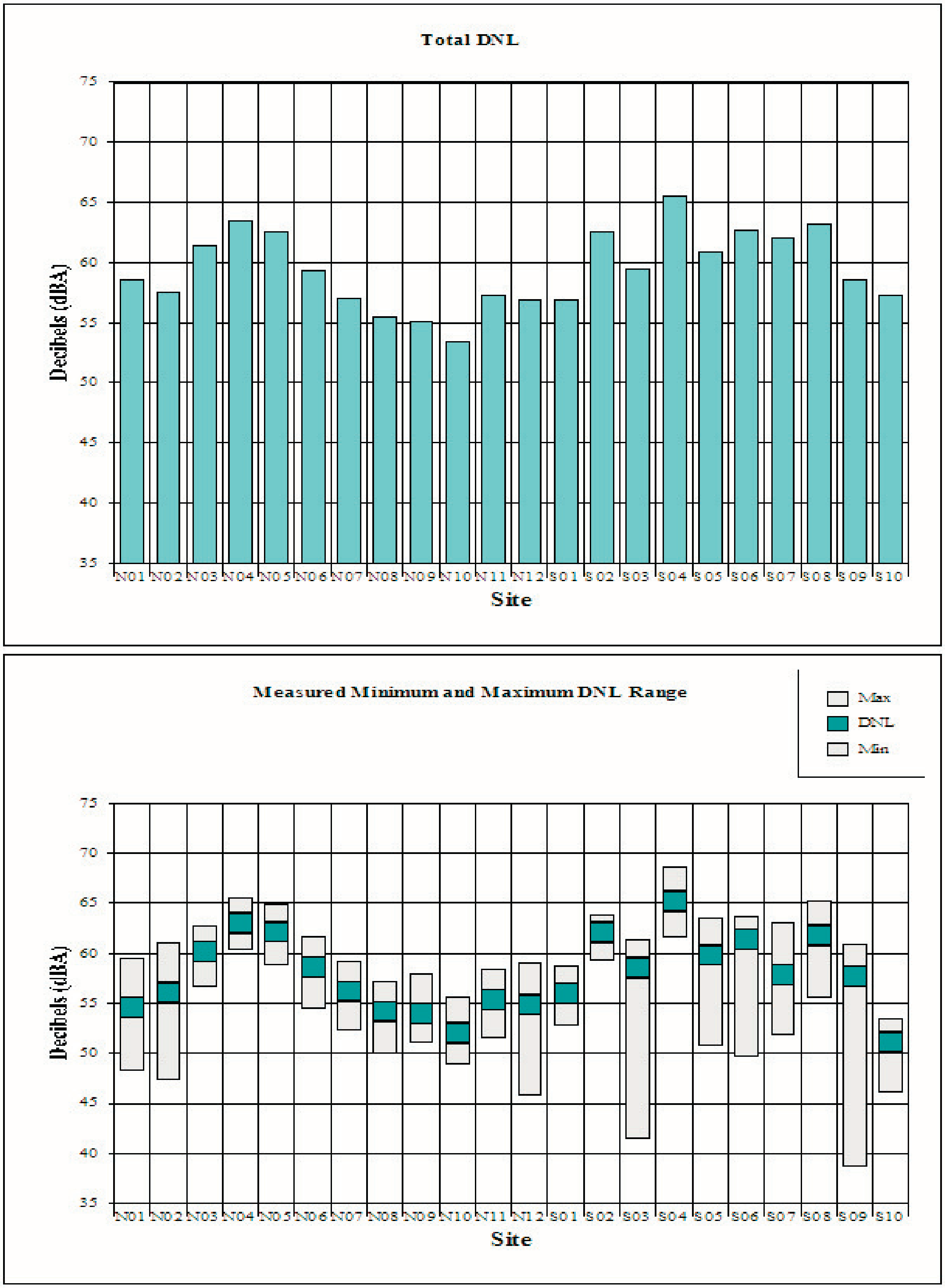
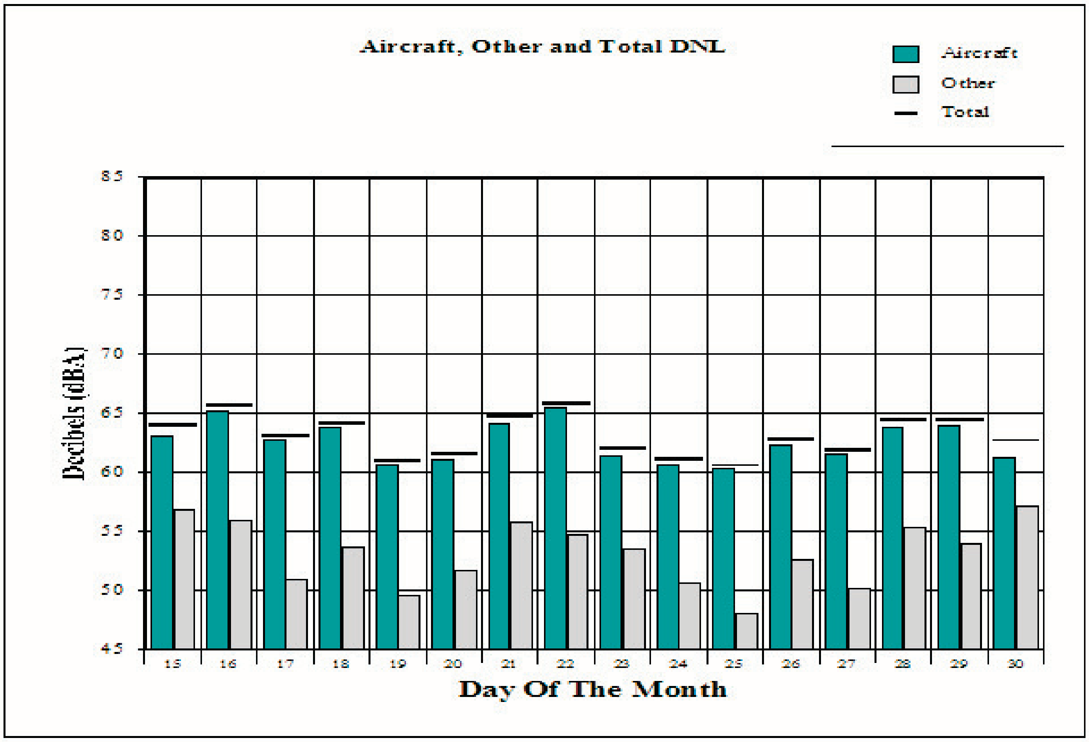


Figure D10 **Aircraft DNL**

Figure D-11
DNL Contribution and SEL Distribution Results
Period: December 15, 2004 to December 30, 2004
Site: N04 - 30131 Julius Blvd.



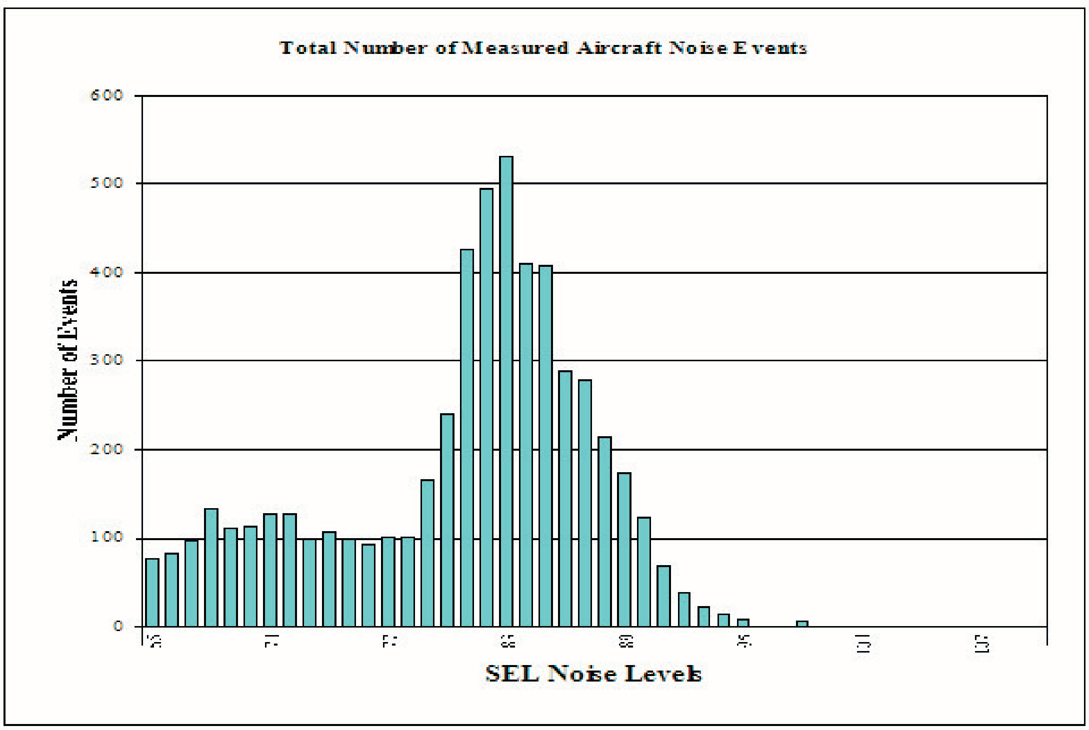
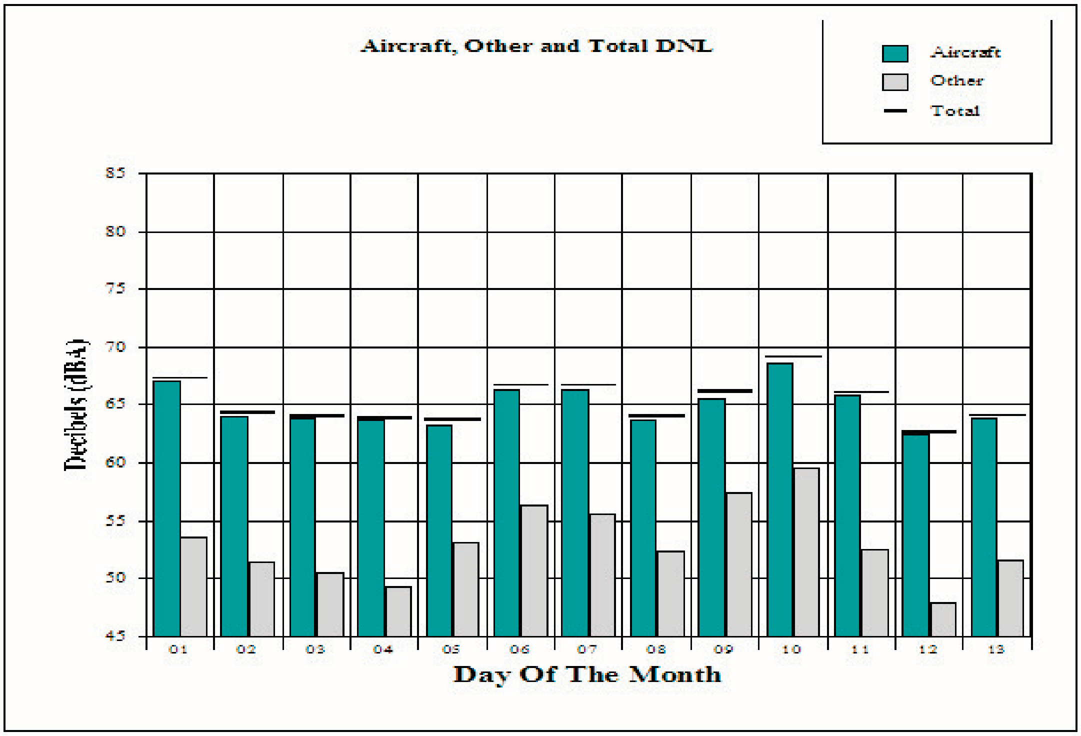


Figure D11 **DNL Contribution and SEL Distribution Results**

Figure D-12
DNL Contribution and SEL Distribution Results
Period: December 1, 2004 to December 13, 2004
Site: S04 - PS04 - 37610 Harvest Lane



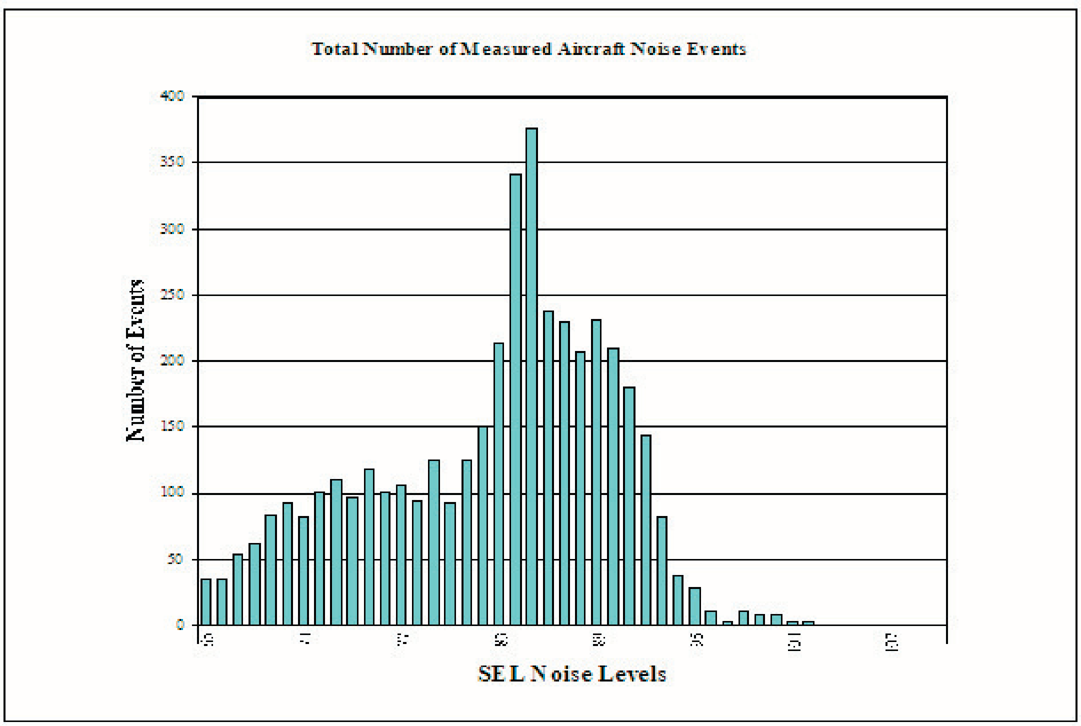


Figure D12 **DNL Contribution and SEL Distribution Results**

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 aircraft noise exposure contour maps.

Hourly Noise Levels

Hourly noise level data were recorded for each of the measurement locations. Hourly values include the aircraft LEQ, non-aircraft LEQ, and total LEQ.

An example of the hourly LEQ noise data, including aircraft and non-aircraft events, for Site PS08 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; however, typically the nighttime operations are less except for some cargo operations on the east side of the Airport.

Table D-3

Hourly Noise Level Site Report

Period: December 3, 2004 to December 15, 2004

Site: S09 - 21950 Dickenson Road

Metric: Aircraft LEQ

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	
Dec 3	--	--	--	--	--	--	--	--	--	--	--	--	56	62	59	63	58	61	56	63	41	62	49	55	61
Dec 4	0	46	36	45	0	34	57	66	63	57	60	58	62	61	60	63	60	62	61	63	51	62	50	0	61
Dec 5	0	39	40	34	0	52	57	63	53	40	62	27	38	27	43	30	28	37	39	33	46	35	33	0	56
Dec 6	0	25	41	29	0	25	15	0	0	0	31	27	30	27	29	23	18	28	35	39	33	27	22	23	38
Dec 7	24	21	23	21	14	0	43	45	33	0	0	42	60	60	59	62	62	50	48	45	44	58	55	54	57
Dec 8	50	0	27	40	0	48	57	63	56	59	58	57	63	63	61	63	58	64	54	64	55	62	55	52	61
Dec 9	32	0	0	41	38	47	52	62	57	59	62	48	60	60	61	62	53	33	56	60	54	35	47	36	58
Dec 10	32	44	34	0	26	33	29	41	43	40	43	35	47	43	45	47	42	50	47	50	49	53	50	51	52
Dec 11	44	46	38	30	0	37	30	49	48	54	49	41	45	48	47	51	47	62	58	50	44	44	41	50	53
Dec 12	22	0	0	0	39	45	50	62	61	61	59	61	56	57	59	63	62	60	61	66	57	65	48	51	60
Dec 13	39	34	38	37	38	32	56	65	59	65	65	63	63	47	44	45	40	49	34	45	44	46	44	48	59
Dec 14	37	38	40	41	34	37	39	51	31	39	0	29	38	43	39	30	31	40	46	62	53	61	55	55	56
Dec 15	0	41	0	39	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46
Energy Average	41	41	36	39	33	45	53	61	57	58	59	56	59	58	57	60	57	58	56	60	51	59	51	51	58

Table D3 **Hourly Noise Level Site Report**

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 one minute per day for all sites. 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 duration is short. Generally, the noise is only above 85 dBA when an aircraft is directly overhead or in close proximity. The duration of events that have a maximum noise level greater than 85 dBA is typically less than 10 seconds. The data shows that the majority of the noise from aircraft operations is below 85 dBA.

In terms of the Time Above 75 dBA level, the results show that the Time Above 75 dBA noise levels occur less than 21 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 over-flight is generally above 75 dBA for a period of 10 to 30 seconds.

The results in terms of Time Above 65 dBA occur between 14 and 85 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 are on average above 65 dBA for 50 seconds. Many events from older and louder hush kit aircraft can last longer.

Table D4
TIME ABOVE MEASUREMENT RESULTS
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

			Time Above Noise Level (Minutes per Day)		
NMS	**Description**	**Address**	**TA-65**	**TA-75**	**TA-85**
Long-Term Portable Sites – North Sites					
N1	Wayne	2988 Hubbard Street	14.2	0.9	0.0
N2	Wayne	4851 Harrison Street	14.7	1.5	0.0
N3	Romulus	6547 Gloria Street	52.2	2.9	0.0
N4	Westland	30131 Julius Blvd	79.8	11.2	0.2
N5	Inkster	29536 Thomas Circle	72.6	7.8	0.1
N6	Inkster	1072 Eastwood Street	38.5	1.1	0.0
N7	Dearborn Heights	337 Rosemary Street	24.4	0.4	0.0
N8	Dearborn	1315 N. Silvery Lane	11.9	0.2	0.0
N9	Dearborn	24407 Rockford Street	13.8	0.2	0.0
N10	Dearborn	22262 Long Blvd	7.5	0.1	0.0
N11	Inkster	27019 Penn Street	17.8	1.1	0.0
N12	Dearborn Heights	24096 Lehigh Street	16.8	1.0	0.0
Long-Term Portable Sites – South Sites					
S1	New Boston	39933 Wear Road	14.3	0.3	0.0
S2	Belleville	39791 Judd Road	68.1	6.0	0.2
S3	New Boston	31740 King Road	34.9	4.6	0.0
S4	New Boston	37610 Harvest Lane	85.2	20.7	0.6
S5	Romulus	37541 Barth Street	48.3	6.9	0.3
S6	Romulus	15248 Colbert	74.5	7.8	0.3
S7	Belleville	17007 Renton Road	40.3	1.5	0.0
S8	New Boston	33675 Sibley Road	74.7	7.5	0.1
S9	New Boston	21950 Dickenson Road	30.4	3.6	0.0
S10	Brownstown	32304 Stefano Court	5.0	0.1	0.0

Source: BridgeNet International

Existing Baseline Noise Modeling Inputs

Existing Aircraft Operations

The existing noise environment for Detroit Metropolitan Wayne County Airport was evaluated based upon the level of aircraft operations in 2004, and the associated airport operational characteristics. A Part 150 Noise Compatibility Study requires that the baseline or existing noise exposure contour maps reflect annual conditions using a recent continuous 12-month period. The development of the Baseline conditions used data from a variety of sources. The sources of data for this study are listed below:

- Aircraft Tower Counts
- Aircraft Situational Display Information (ASDi) Data
- Airline Activity Reports
- Field Observations and Noise Monitoring Results from Noise Measurement Survey
- Discussions with Airport Staff

As noted earlier, aircraft noise exposure maps are generated using the FAA's Integrated Noise Model (INM). The INM computer model requires a variety of operational data to evaluate the noise environment around an airport. These data include 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 FAA's Air Traffic Control (ATC) tower activity data, called tower counts. The tower count data showed that, for 2004, there were a total of approximately 522,641 operations, or an average of

1,432 operations per day (an operation is one takeoff or one landing). The tower count information also provided a breakdown as to ATC category of operations reflecting broad categories of aircraft operators (i.e., air carrier, air taxi, military, etc). **Table D5** summarizes the tower count data for 2004. Air taxi operations are essentially non-scheduled passenger operations generally using general aviation type aircraft.

Table D5
AIRPORT TOWER COUNT FOR BASELINE PERIOD
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Category	Annual Operations	Average Daily Operations
Air Carrier	331,629	909
Air Taxi	175,694	481
General Aviation	15,168	42
Military	150	<1
TOTAL	**522,641**	**1,432**

Calendar Year 2004
Source: BridgeNet International

Aircraft Fleet Mix Categories

The breakdown of aircraft operator categories identified in ATC tower counts is useful for air traffic purposes, but does not provide sufficient detail necessary for the noise analysis. As a result, the breakdowns by aircraft fleet mix categories of aircraft operations are presented within this section with further refinements of these categories in the subsequent section **Detailed Aircraft Fleet Mix**. Aircraft fleet mix categories are defined relative to type of aircraft (i.e., jet or propeller), as well as size and noise characteristic. These categories were determined from the different sources with the primary source being the landing reports that each airline submits to the Airport Authority. **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 general aviation propeller operations are actually unscheduled commuter propeller flights. Similarly, some air taxi operations are small single engine piston aircraft that may be categorized as general aviation piston, or vise 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 - 2004 BASELINE PERIOD
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Operations Category	Daily Operations	Annual Operations	Percent Operations
Air Carrier Wide Body	41	14,881	3%
Air Carrier Narrow Body Louder	427	155,882	30%
Air Carrier Narrow Body Quieter	388	141,485	27%
Regional Jets	366	133,582	25%
Commuter Prop	152	55,606	11%
General Aviation Jet	38	13,980	3%
GA/Air Taxi/Cargo Prop	20	7,225	1%
TOTAL	**1,432**	**522,641**	**100%**

Source: BridgeNet International

Detailed Aircraft Fleet Mix

The specific mix of aircraft that operate at the Airport is one of the most important airport noise exposure factors. Fleet mix data were determined from all of the data described previously, with the primary source being the FAA's actual radar data. A full year of Aircraft Situational Display Information (ASDi) radar data for 2004 was collected and used to determine the existing fleet mix. This data was supplemented with Landing Activity Reports submitted by Northwest Airlines. 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 aircraft fleet mix data reported in the previously identified sources does not identify the specific engine type used on the aircraft, which is required for noise modeling with the INM. Therefore, it was necessary to assign an INM aircraft type. For instance, airline X may operate B-737-700 aircraft types. B-737-700 aircraft can be equipped with one of three different engines; each has a different noise profile. The INM aircraft type assigned for each of the aircraft operating at Detroit Metropolitan Wayne County Airport was based upon the INM type that most closely matched the type of aircraft (and aircraft/engine combination) that each airline operates at the Airport. Some aircraft with smaller numbers of operations were grouped into the aircraft type that was most representative of the aircraft operated by that airline.

Table D7
Aircraft Fleet Mix Assumptions (2004)
Detroit Metropolitan (Wayne County) Airport

INM Type	Category	Daily Operations	Annual Operations
74720B	Widebody	0.18	67
747400	Widebody	10.04	3,663
767300	Widebody	0.54	198
777200	Widebody	1.52	554
A30062	Widebody	0.74	271
A310	Widebody	0.96	351
A330	Widebody	11.90	4,343
A340	Widebody	2.52	919
DC1030	Widebody	8.66	3,161
DC870	Widebody	2.27	828
DC8QN	Widebody	1.26	462
MD11PW	Widebody	0.18	65
727EM1	Narrowbody Louder	0.34	124
727EM2	Narrowbody Louder	6.47	2,360
737N17	Narrowbody Louder	0.43	157
DC95HW	Narrowbody Louder	345.74	126,195
MD83	Narrowbody Louder	74.10	27,047
7373B2	Narrowbody Quieter	36.62	13,368
737400	Narrowbody Quieter	0.14	51
737500	Narrowbody Quieter	10.84	3,958
737700	Narrowbody Quieter	11.95	4,362
737800	Narrowbody Quieter	10.41	3,799
737900	Narrowbody Quieter	0.20	73
757300	Narrowbody Quieter	0.98	357
757PW	Narrowbody Quieter	73.26	26,741
757RR	Narrowbody Quieter	18.60	6,789
A319	Narrowbody Quieter	110.33	40,272
A320	Narrowbody Quieter	110.21	40,228
A32123	Narrowbody Quieter	1.12	408
F10065	Narrowbody Quieter	2.96	1,080
BAE300	Regional Jet	54.20	19,781
EMB145	Regional Jet	37.91	13,839
EMB14L	Regional Jet	270.51	98,734
F10062	Regional Jet	3.36	1,227
BEC190	Commuter Prop	1.45	530
BEC9F	Commuter Prop	0.61	224
DHC6	Commuter Prop	0.54	198
DHC8	Commuter Prop	6.03	2,203
SF340	Commuter Prop	143.70	52,451
CIT3	General Aviation Jet	2.40	878
CL600	General Aviation Jet	3.51	1,282
CNA55B	General Aviation Jet	5.10	1,863
CNA750	General Aviation Jet	4.88	1,781
FAL20	General Aviation Jet	1.51	552
GIIB	General Aviation Jet	1.01	367
GIV	General Aviation Jet	7.89	2,878
IA1125	General Aviation Jet	0.90	330
LEAR25	General Aviation Jet	1.29	471
LEAR35	General Aviation Jet	5.37	1,961
SABR80	General Aviation Jet	4.43	1,618
BEC58P	GA/Air Taxi Prop	1.52	556
CNA441	GA/Air Taxi Prop	7.27	2,652
GASEPV	GA/Air Taxi Prop	11.00	4,017
Total		**1,432**	**522,642**

Table D7 **Aircraft Fleet Mix Assumptions (2004)**

Note that the same INM types are shown more than once in the table; this is to identify the separate categories of operations (i.e., scheduled cargo vs. general aviation).

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 hush kit aircraft versus manufactured Stage 3.

Time of Day

In the DNL metric, any operation that occurs after 10 p.m. and before 7 a.m. is considered more intrusive and its noise level is penalized by adding 10 dBA. The nighttime operations assumptions were determined from the FAA's radar data. The overall percentage of nighttime operations at Detroit Metropolitan Wayne County Airport was 8% as summarized in **Table D8;** of the 1,432 average daily operations, 8% or 115 operations occurs between 10 p.m. and 7 a.m. The specific percentages of daytime versus nighttime of the INM categories were presented in the previous table (**Table D7**). **Table D8** presents a summary of nighttime operations.

Table D8
SUMMARY HOURS OF OPERATIONS BY CATEGORY, YEAR 2003
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Category	**Percentage Nighttime Operations**		
	Arrivals	Departures	Average
Air Carrier Wide Body	24%	26%	25%
Air Carrier Narrow Body Louder	9%	7%	8%
Air Carrier narrow Body Quieter	13%	5%	9%
Regional Jets	4%	7%	5%
Commuter Prop	1%	6%	3%
General Aviation Jet	13%	12%	13%
General Aviation Prop	43%	46%	45%
TOTAL	**7%**	**9%**	**8%**

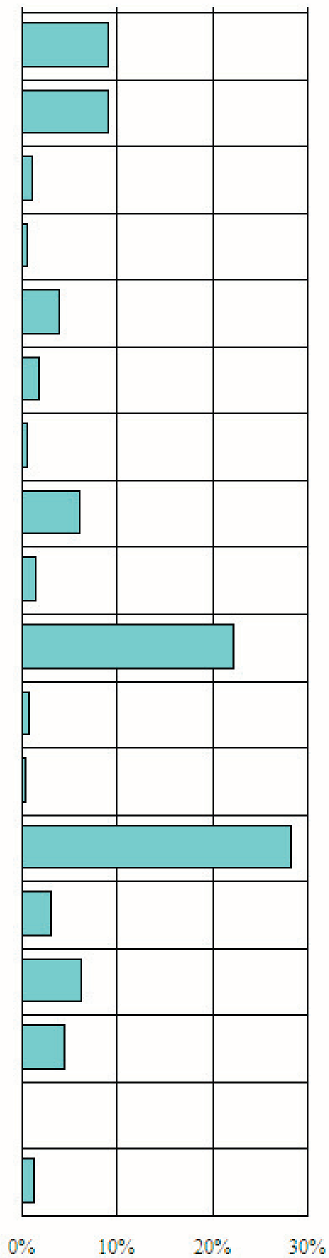
Source: BridgeNet International

Figure D13

COMMERCIAL JET OPERATIONS BY AIRCRAFT TYPE

Period: January 1, 2004 to December 31, 2004

Jet Aircraft	Built *FAR 36 Stage*	Operations Average Per Day	Percentage Of Total *Percent of Total*
A319	3	110.8	9%
A320	3	110.1	9%
A330	3	12.0	1%
B72Q	2	7.0	1%
B733/4/5	3	48.1	4%
B737/8/9	3	22.7	2%
B744	3	7.6	1%
B752	3	74	6%
B753	3	17	1%
CRJ1/2/7	3	270	22%
DC10	3	9	1%
DC8Q	2	3	0%
DC9Q	2	345	28%
E145/35	3	38	3%
MD80	3	75	6%
RJ85	3	54	4%
Other Aircraft (Built Stage 2)	2	0	0%
Other Aircraft (Built Stage 3)	3	14.5	1%



Numbers are rounded to nearest 0.0 value

Figure D13 **Commercial Jet Operations by Aircraft Type**

Figure D14
COMMERCIAL JET OPERATIONS BY AIRLINE (2004)
Period: January 1, 2004 to December 31, 2004

Airline		Operations Average Per Day	*Percent of Total*
American	AAL	30	2%
Mesa Airlines	ASH	15	1%
America West Airlines	AWE	11	1%
United Express	BLR	5	0%
Continental Express	BTA	14	1%
[illegible]	CHQ	5	0%
Continental Airlines	COA	13	1%
Delta Connection Comair	COM	20	2%
Delta Air Lines	DAL	19	2%
American Eagle	EGF	8	1%
Federal Express	FDX	7	1%
nwa Airlink	FLG	222	18%
USA 3000 Airlines	GWY	4	0%
independence air	IDE	5	0%
American Connection	LOF	6	0%
Mesaba Airlines	MES	54	4%
Spirit	NKS	41	3%
Northwest	NWA	651	53%
Southwest Airlines	SWA	30	2%
United	UAL	20	2%
USAir	USA	5	0%
Other Airlines	Other	35	3%

Percent of Total: 0% 10% 20% 30% 40%

Numbers are rounded to nearest 0.0 value

Airlines with 4 or more operations per day

Figure D14 **Commercial Jet Operations by Airline (2004)**

Runway Use

An additional important consideration in developing the noise exposure contours is the percentage of time each runway is used. The speed and direction of the wind dictate the direction in which the runways are operated (north versus south). In general, aircraft operate into the wind – landing into the wind and departing into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the new wind direction.

The existing runway use percentages presented in **Table D9** are based upon a full year of FAA actual radar data (Aircraft Situational Display for Industry [ASDi] radar data) and six months of FAA terminal radar. ASDi radar data is long-range data that updates every one minute. Terminal radar covers a shorter distance, typically 50 miles, and updates every 5 seconds. The table presents the percentage that each runway was used for departures and arrivals separately 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.

The data show that the Airport is in south flow (departing to the south and arriving from the north/to the south) about 68% of the time, north flow (departing and arriving to the north) about 30% of the time, and the crosswinds about 2% of the time. The majority of the time, the outboard runways (of the four parallel runways, the outboards are the outer east and west runway) are used for arrivals, while the inboard runways are used for departures. **Figure A3** in the *Inventory* chapter presents a diagram of the runway configuration.

Table D9
PERCENTAGE RUNWAY UTILIZATION
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Name	Flow	Location	Arrival Daytime	Arrival Nighttime	Departure Daytime	Departure Nighttime
4L	North	West Outboard	14%	13%	0%	0%
4R	North	West Inboard	3%	4%	15%	15%
3L	North	East Inboard	1%	1%	15%	15%
3R	North	East Outboard	12%	11%	1%	1%
22R	South	West Outboard	32%	36%	1%	1%
22L	South	West Inboard	9%	11%	31%	32%
21R	South	East Inboard	4%	4%	34%	33%
21L	South	East Outboard	23%	18%	1%	1%
9L	East	North Runway	<1%	<1%	<1%	<1%
27R	West	North Runway	<1%	<1%	<1%	<1%
9R	East	South Runway	<1%	<1%	<1%	<1%
27L	West	South Runway	<1%	<1%	<1%	<1%

Source: BridgeNet International

Figure D15
OPERATIONS PER EACH HOUR OF THE DAY PER RUNWAY

Based Upon Six Months of Radar Data

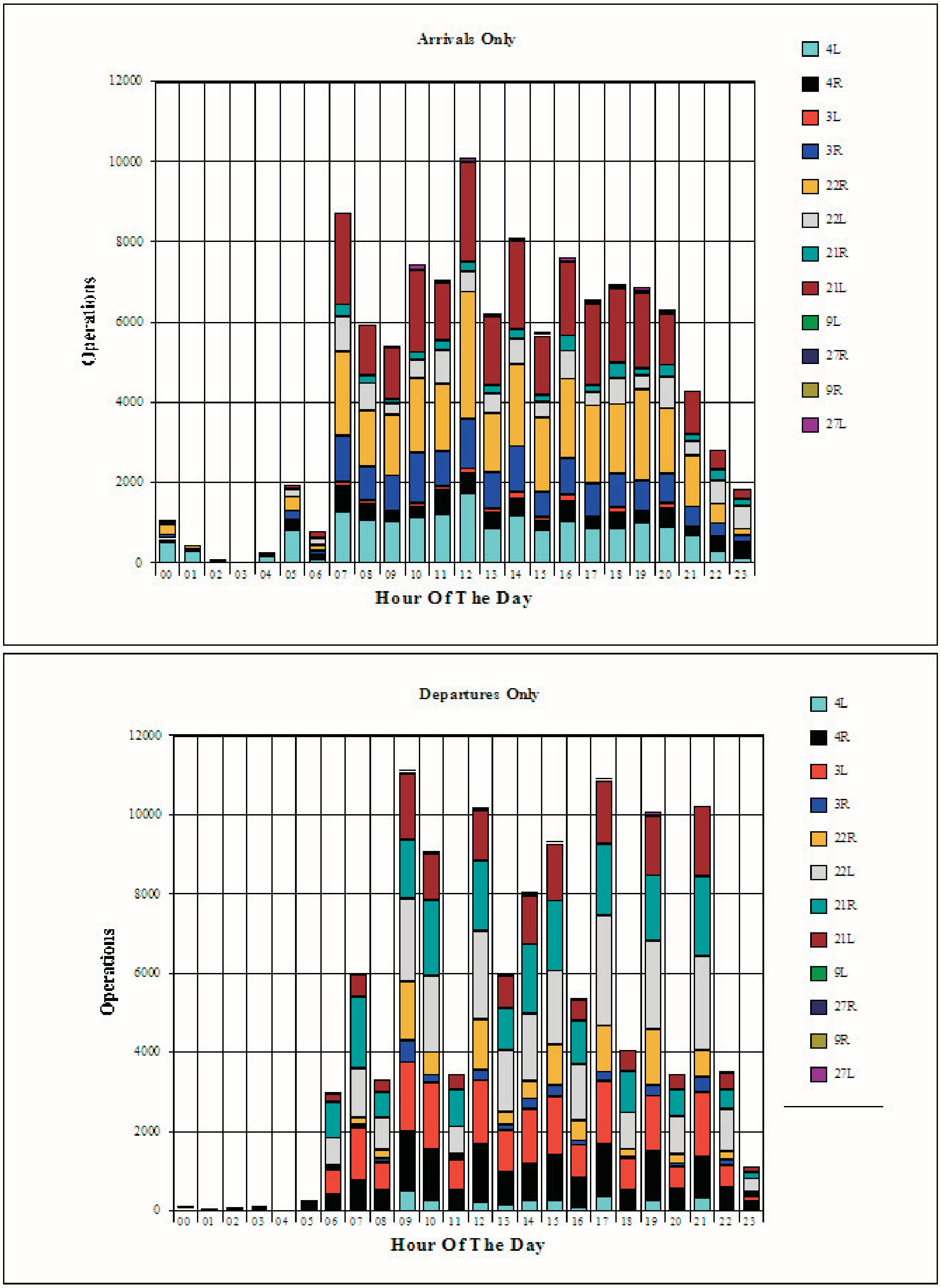


Figure D15 **Operations Per Each Hour of the Day Per Runway**

The runway use information, obtained from the previously identified sources, enables the identification of each runway used by each operation. Therefore, runway use can be aircraft type specific. Different aircraft have different runway uses based upon aircraft size, performance, and location relative to the passenger terminal gates.

The more detailed breakdown of runway use by category of aircraft is presented in **Table D10**. The table includes the percentage of operations by aircraft category using each of the runways. Note that wide-body aircraft use the longest runway (4L/22R) most often, while cargo and general aviation aircraft used the east runways (3L&R/21R&L) because of their proximity to the passenger terminal gates.

Table D10
RUNWAY UTILIZATION BY CATEGORY OF AIRCRAFT
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study

Aircraft Class	4L	4R	3L	3R	22R	22L	21R	21L	9L	27R	9R	27L
ARRIVALS												
Wide Body	19%	5%	1%	4%	42%	14%	1%	10%	<1%	<1%	<1%	<1%
Loud Narrow Body	13%	3%	1%	12%	29%	12%	5%	21%	<1%	<1%	<1%	<1%
Quiet Narrow Body	13%	3%	1%	12%	32%	12%	3%	20%	<1%	<1%	<1%	<1%
Regional Jet	13%	2%	1%	13%	27%	11%	4%	25%	<1%	<1%	<1%	<1%
Propeller	6%	2%	3%	18%	12%	8%	8%	39%	<1%	<1%	<1%	<1%
Business Jet	14%	1%	1%	13%	34%	8%	2%	23%	<1%	<1%	<1%	<1%
DEPARTURES												
Wide Body	0%	22%	5%	2%	1%	46%	17%	3%	<1%	<1%	<1%	<1%
Loud Narrow Body	0%	13%	15%	1%	1%	31%	34%	1%	<1%	<1%	<1%	<1%
Quiet Narrow Body	0%	14%	14%	1%	1%	34%	31%	1%	<1%	<1%	<1%	<1%
Regional Jet	0%	11%	17%	1%	1%	26%	39%	1%	<1%	<1%	<1%	<1%
Propeller	0%	13%	15%	1%	1%	31%	34%	1%	<1%	<1%	<1%	<1%
Business Jet	0%	5%	23%	1%	1%	17%	44%	5%	<1%	<1%	<1%	<1%

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 weight of the flight. Generally, heavier aircraft climb at a slower rate; 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 fly shorter distances only have Stage Length 1 available (flying up to 500 nautical miles). The different stage lengths used in the INM model are listed below:

Stage Length 1	0 to 499 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 location of North American airports that are points of service for commercial and cargo jet operations to/from Detroit Metropolitan Wayne County Airport. The larger the dot, the greater the number of operations associated with that airport. Note that the graphic shows that many of the aircraft flights are to nearby hub airports for the major airlines. Thus, the majority of the stage lengths for Detroit Metropolitan Wayne County Airport are less than 1,500 nautical miles (Stage Length 3 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 flight distance stage length is used to assign the departure climb profile using the flight distance data as was 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 Detroit Metropolitan Wayne County Airport, as obtained from radar data. This data was obtained from the six months of terminal radar data from Passur. Passur is a third-party source for flight track radar data. The radar data can be used to show the rate of climb for different aircraft.[1]

An example of the departure climb profiles for the DC9 and the A319 aircraft are presented in **Figure D17**. The red lines are actual Passur 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 bolder 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 actual Passur 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 that most 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.

1 Passur data was necessary as the FAA's ASDi radar data is not at a sufficient detail close-in to the Airport to enable its use in improving the accuracy of the INM.

Figure D16

Flight Destinations for DTW Jet Aircraft Operations

Detroit Metropolitan Wayne County Airport

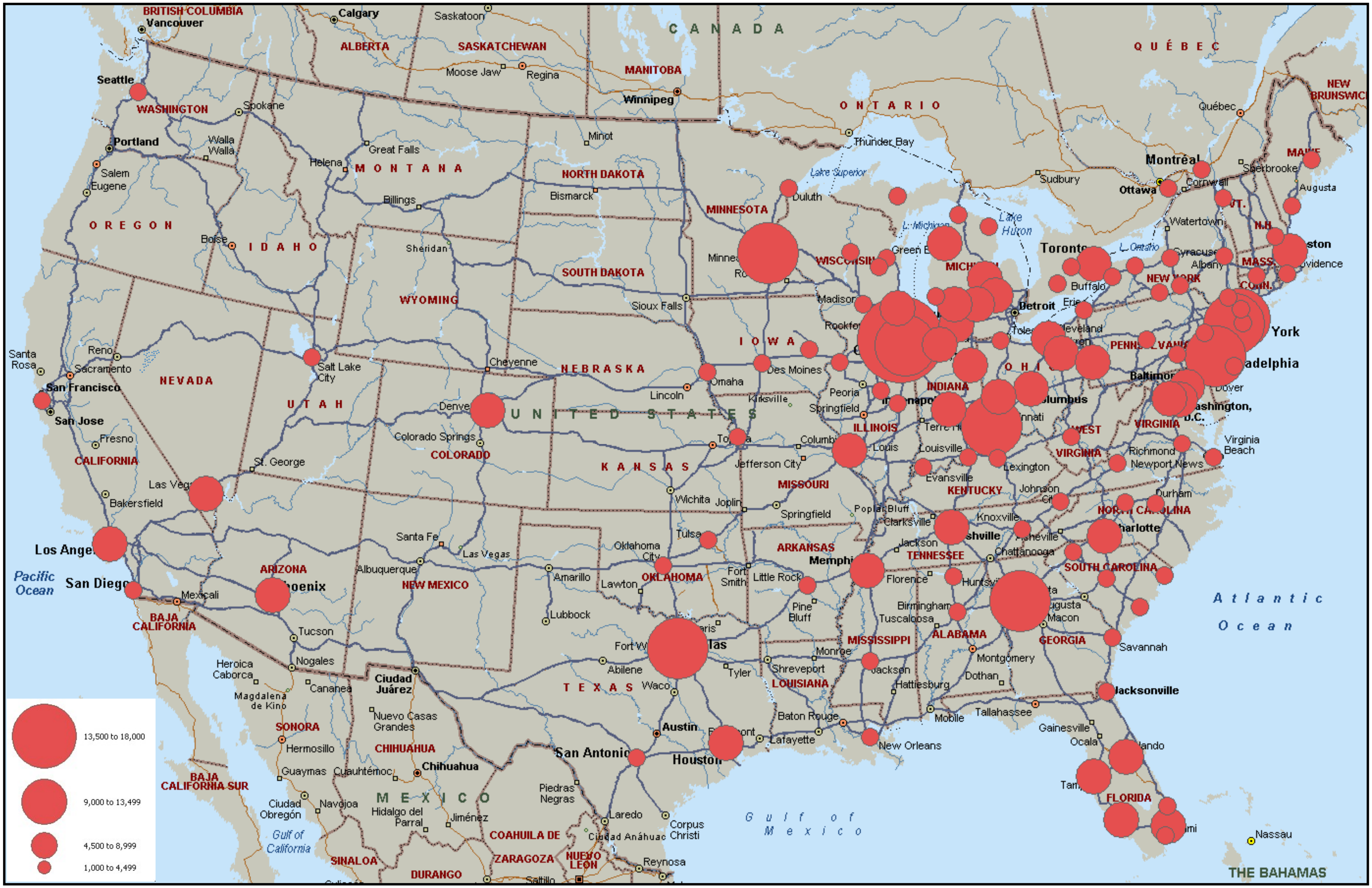
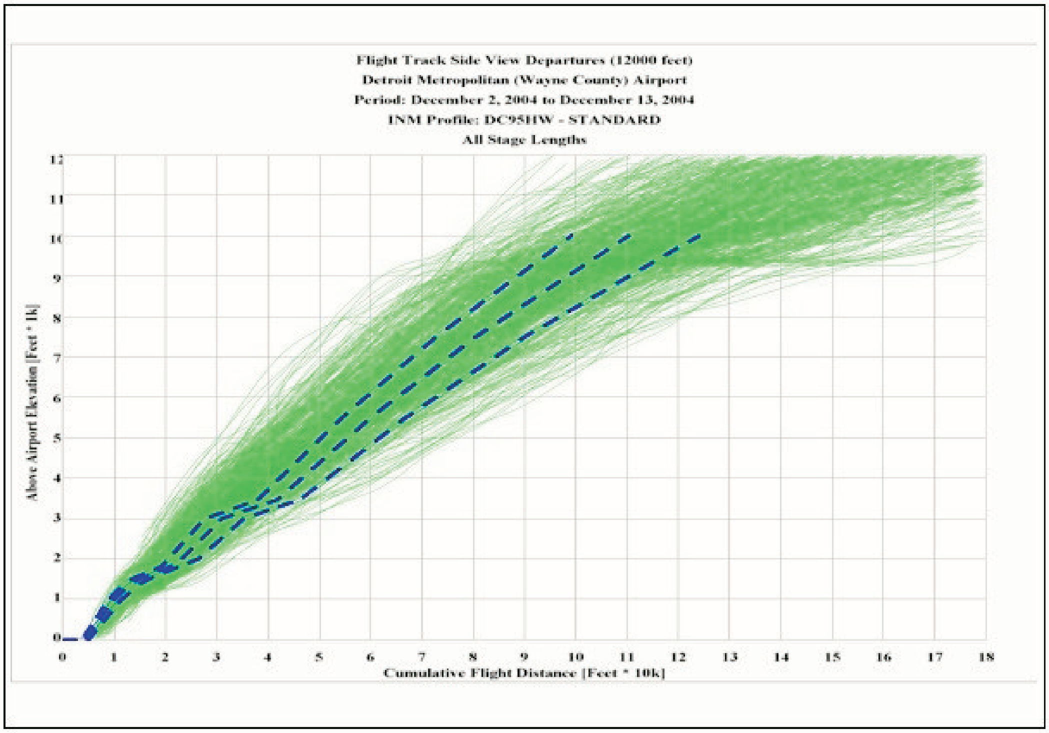


Figure D17
Departure Profiles for DC9Q and A320 Aircraft



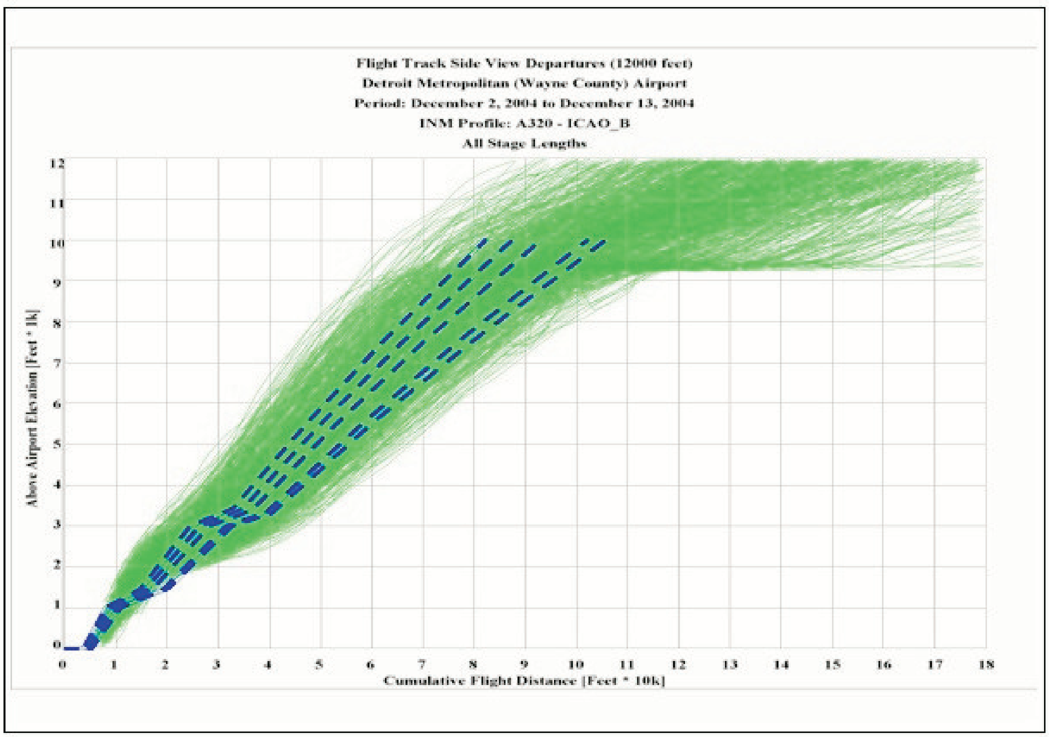


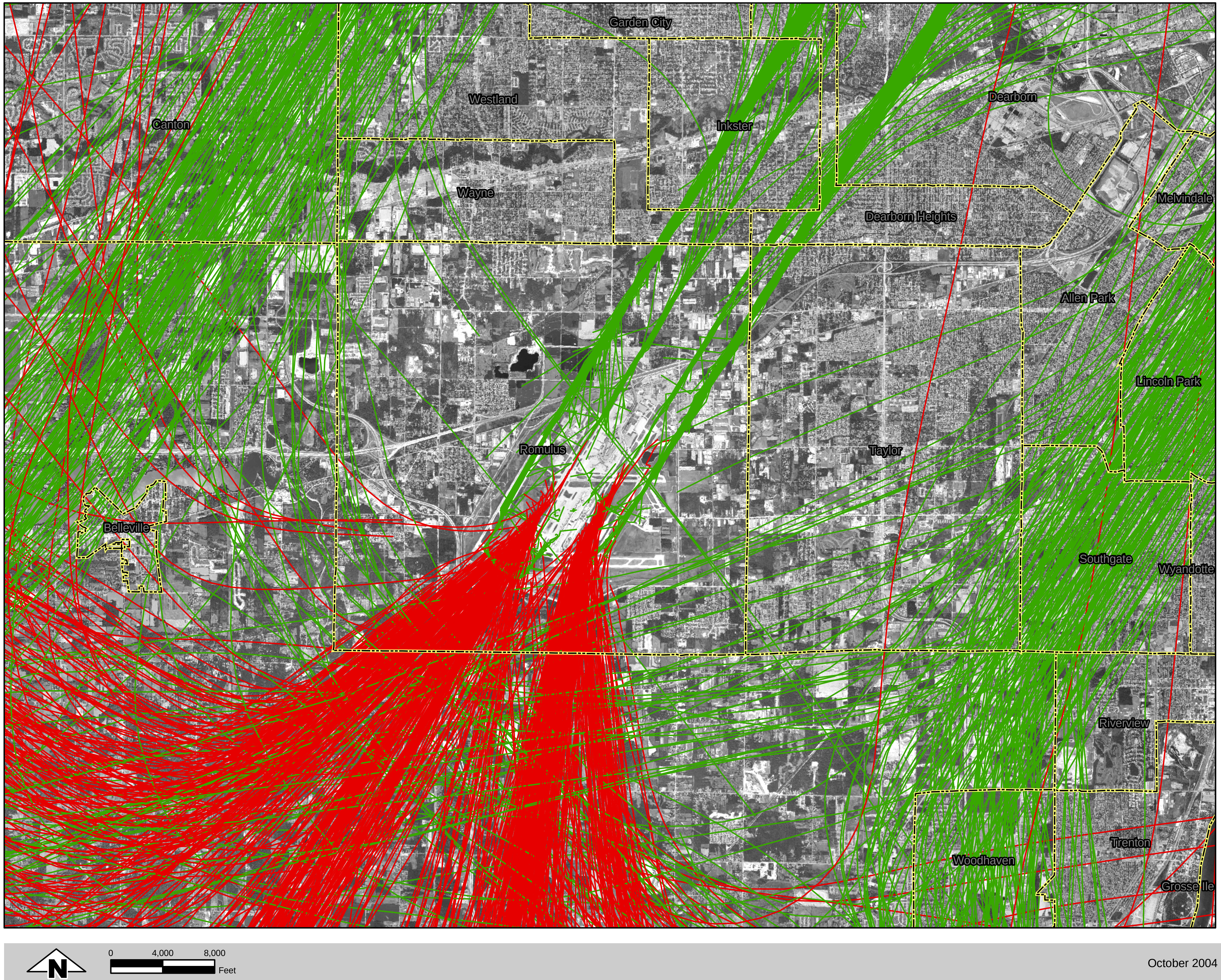
Figure D17 **Departure Profiles for DC9Q Family and A320 Aircraft**

Flight Paths/Tracks and Flight Path Use

The Federal Aviation Administration (FAA) has established paths (sometimes called tracks) for aircraft arriving and departing from Detroit Metropolitan Wayne County 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 path is based upon third-party Passur radar data, field observations, and discussions with Airport Authority noise-abatement personnel. Six months of actual FAA ASDi terminal area radar data were used in the development of the INM flight paths used in this Study. The flight paths used in the INM noise model are derived from all of the actual flight paths flown throughout the base period study year, 2004. Six months of third-party radar data were used; the six months were spread throughout the year to allow for weather and seasonal changes that affect runway usage.

Example actual flight tracks for different operational conditions are presented in the following figures. Jet flight tracks for south flow conditions (which occur about 68% of the time) are presented in **Figure D18**; arrival tracks are shown in green; while departure tracks are shown in red. Similarly, jet flight tracks for north flow conditions (arrivals from the south, departures to the north, which occur about 30% of the time) are shown in **Figure D19**. Examples of a west flow (arrivals from the west, departures to the east) arrival day (which occurs about 2% of the time) are presented in **Figure D20**.

Figure D18 **South Flow Jet Flight Tracks**



Legend

Jets South Flow

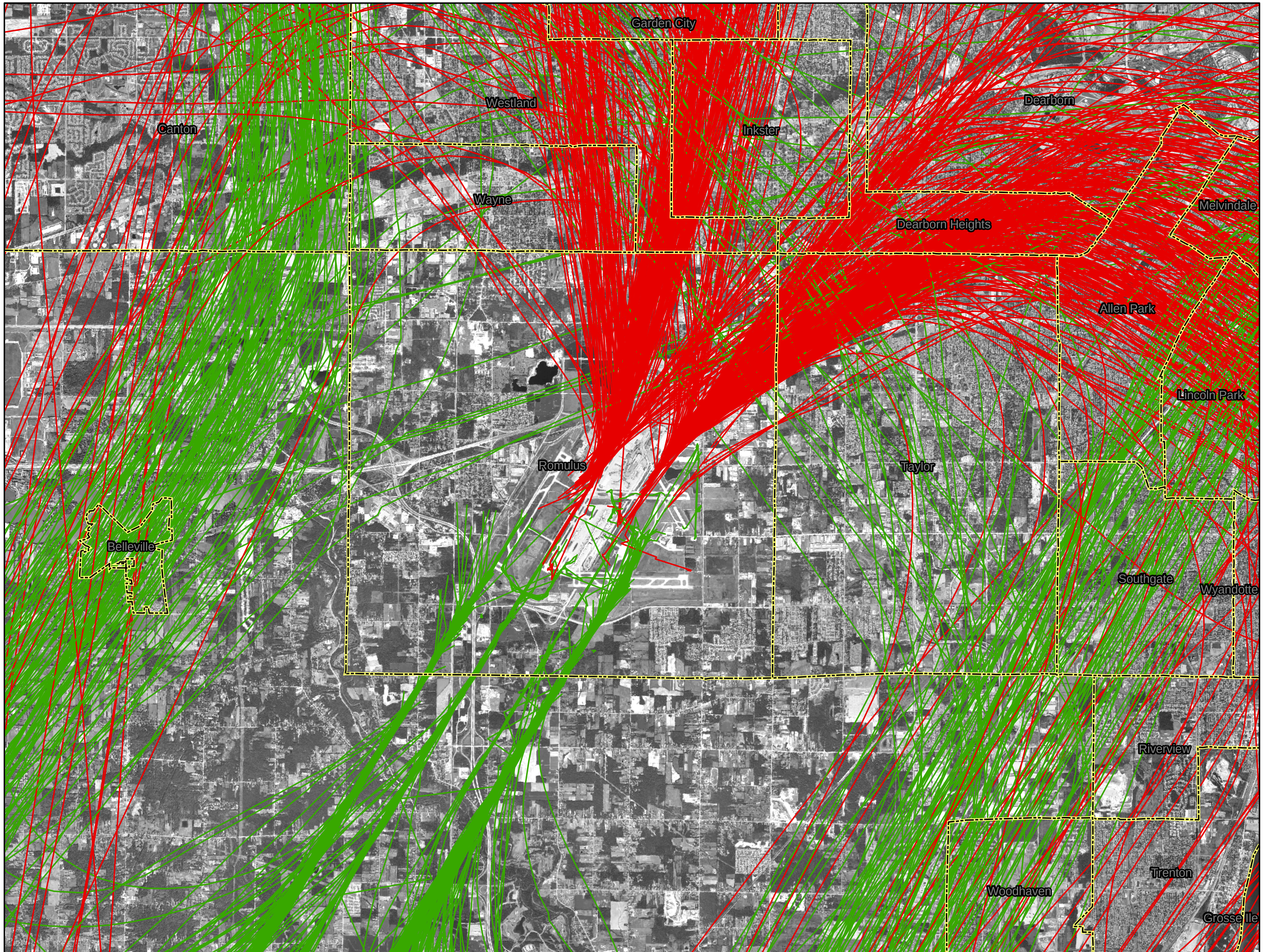
- Arrivals
- Departures

October 2004

Source: Michigan Department of Natural Resources, SEMCOG, Detroit Metropolitan Wayne County Airport files.

DETROIT METROPOLITAN WAYNE COUNTY AIRPORT

Figure D19 **North Flow Jet Flight Tracks**



Legend

Jets North Flow

- Arrivals
- Departures

N

0 4,000 8,000 Feet

October 2004

Source: Michigan Department of Natural Resources, SEMCOG, Detroit Metropolitan Wayne County Airport files.

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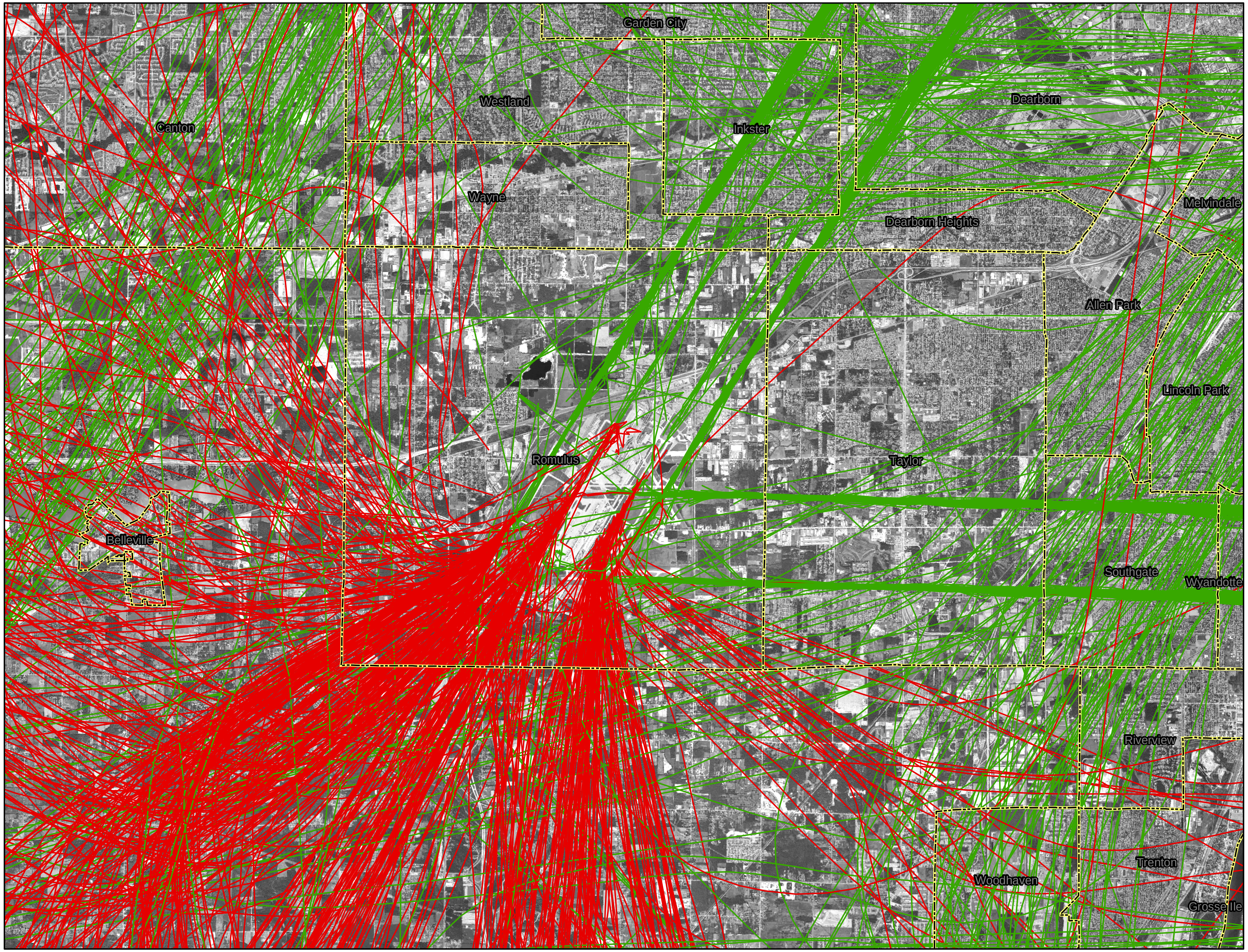
Figure D20 **West Flow Jet Flight Tracks**



Legend

Jets West Flow

- Arrivals
- Departures

October 2004

Source: Michigan Department of Natural Resources, SEMCOG, Detroit Metropolitan Wayne County Airport files.

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In the development of the existing noise contours, the INM noise model requires aggregating the flight paths into a set of generalized flight tracks of aircraft operating at the Airport. In the INM noise model, a flight track 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 tracks from the actual radar flight data. The program first assigned each aircraft operation to an air traffic control procedure. The software then calculated the average path of all the aircraft that flew those procedures. The program also determined 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 48 departure flight paths and 32 arrival flight paths at the Airport. The flight paths modeled in the study were those within approximately 15 miles of the noise contour study area.

To illustrate the different jet departure tracks for each runway quadrant, INM flight tracks overlaid on actual tracks have been prepared in graphic format. **Figure D21** presents sample jet departures for jets departing on Runway 4R. This is the primary departure runway for aircraft departing northward on the west runway complex. These actual tracks are presented in red. The modeled INM tracks are overlaid in blue, with the solid track showing the center path and the dashed tracks representing the dispersed tracks. The percentage of time each track is used is also shown on the figure. This same data is presented in **Figure D22** for departures on Runway 3L. This is the primary runway for departures northward on the east runway complex.

Figures D23 and **D24** present the same analysis for south flow jet departures. **Figure D23** presents the data for departures on Runway 22L (primary departure runway for the west runway complex), while **Figure D24** presents the data for departures on Runway 21R (primary departure runway for the east runway complex).

As can be seen from this flight track data, the Airport is divided into an east side and west side. This means that aircraft departing to eastern destinations primarily depart on the east runways; aircraft departing to western destinations primarily depart on the west runways. This approach enables the FAA to minimize the crossing of flights that operate from the east runway complex, departing to western locations, and vice versa.

Figure D21
ACTUAL AND INM JET DEPARTURE FLIGHT TRACKS (RUNWAY 4R)
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study

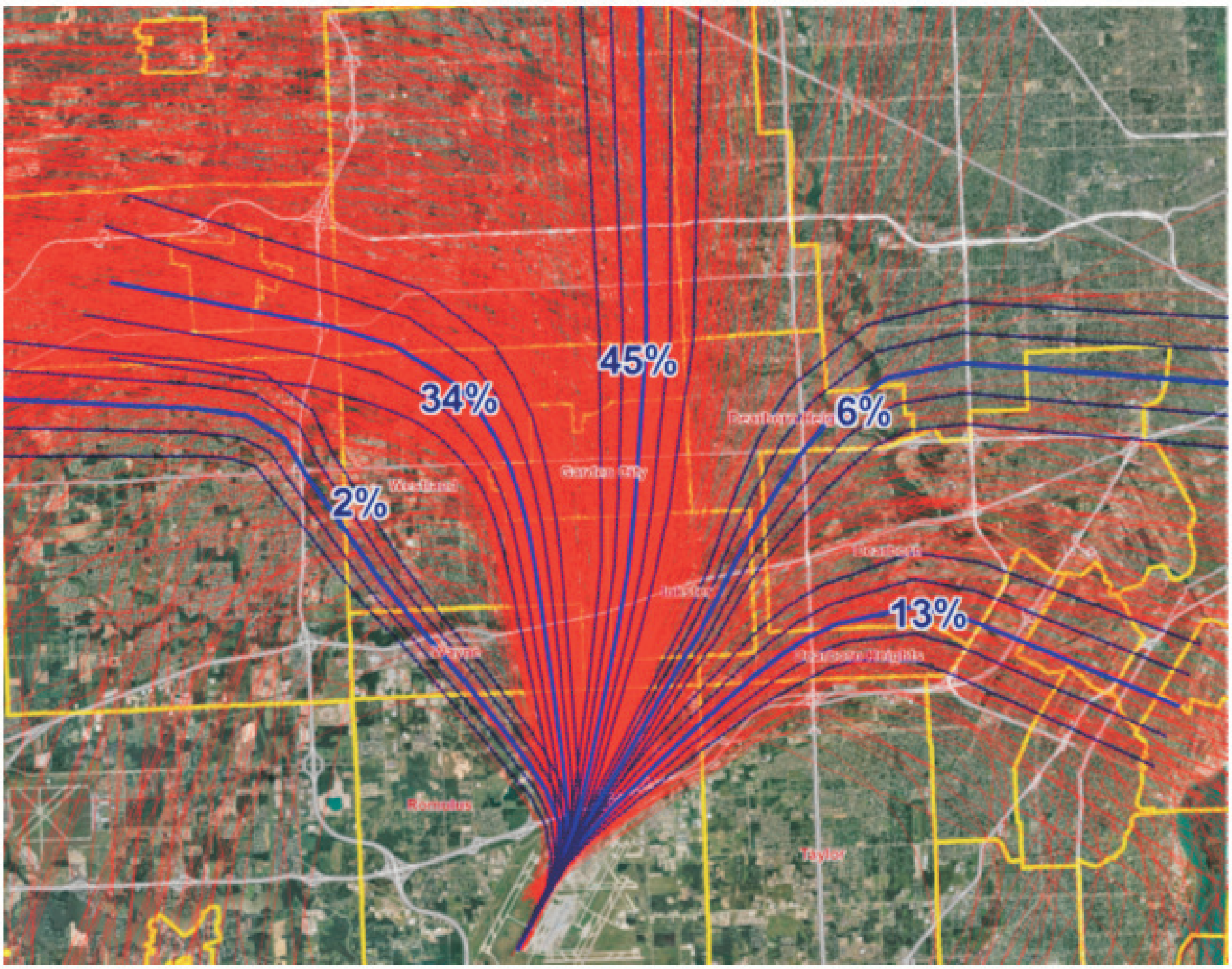


Figure D21 **Actual and INM Jet Departure Flight Tracks on Runway 4R**

Figure D22
ACTUAL AND INM JET DEPARTURE FLIGHT TRACKS (RUNWAY 3L)
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study

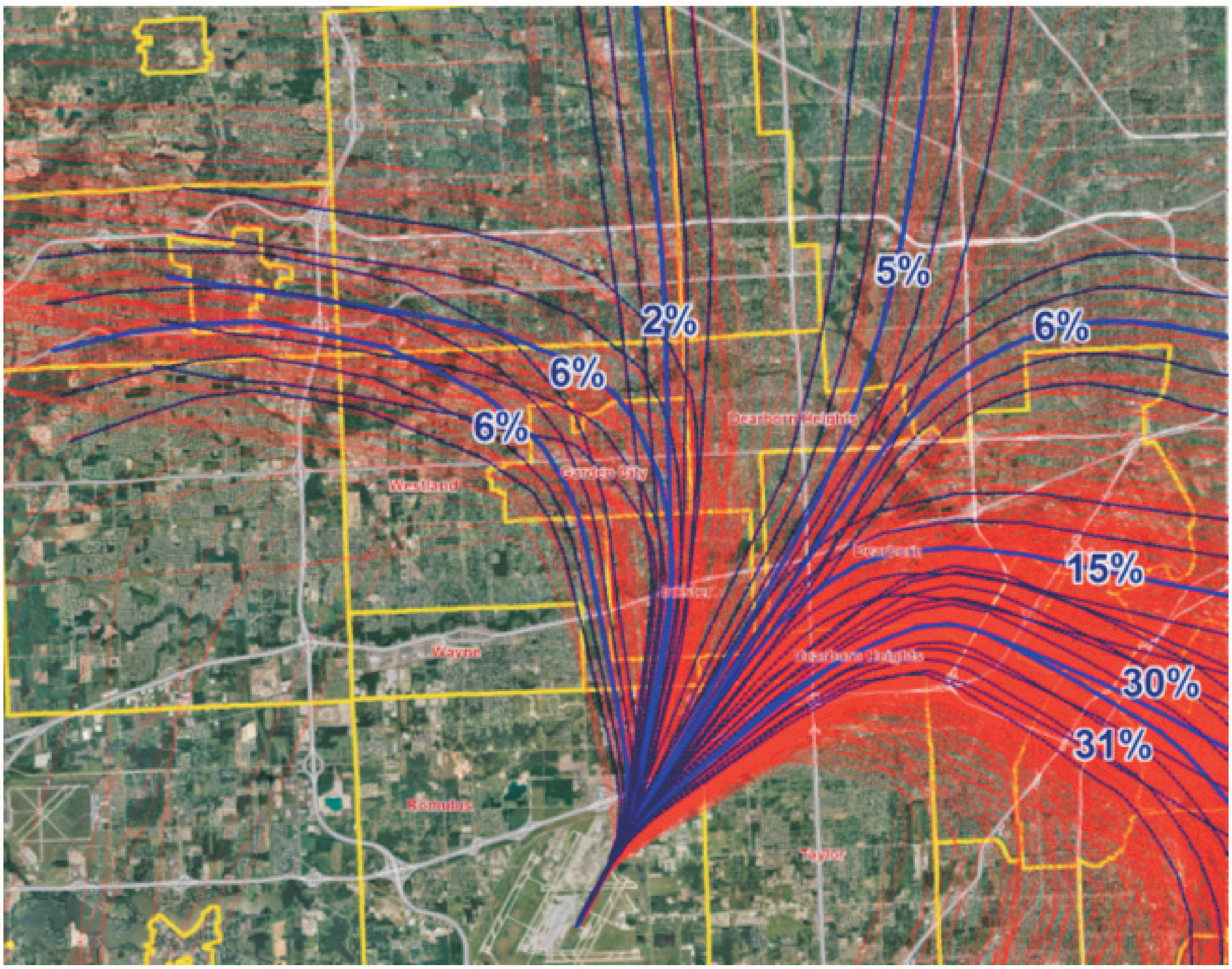


Figure D22 **Actual and INM Jet Departure Flight Tracks on Runway 3L**

Figure D23
ACTUAL AND INM JET DEPARTURE FLIGHT TRACKS (RUNWAY 22L)
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study

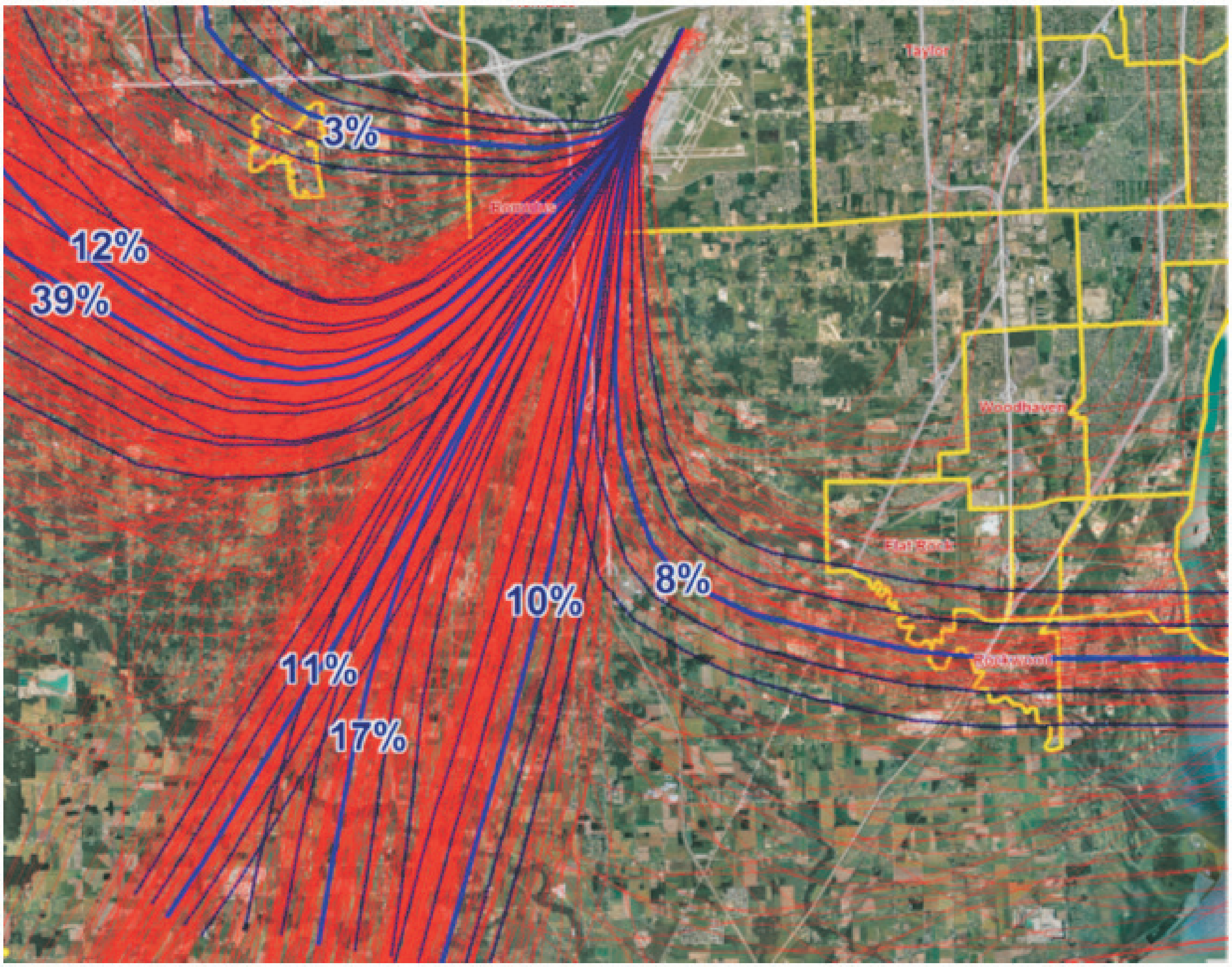


Figure D23 **Actual and INM Jet Departure Flight Tracks on Runway 22L**

Figure D24
ACTUAL AND INM JET DEPARTURE FLIGHT TRACKS (RUNWAY 21R)
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study

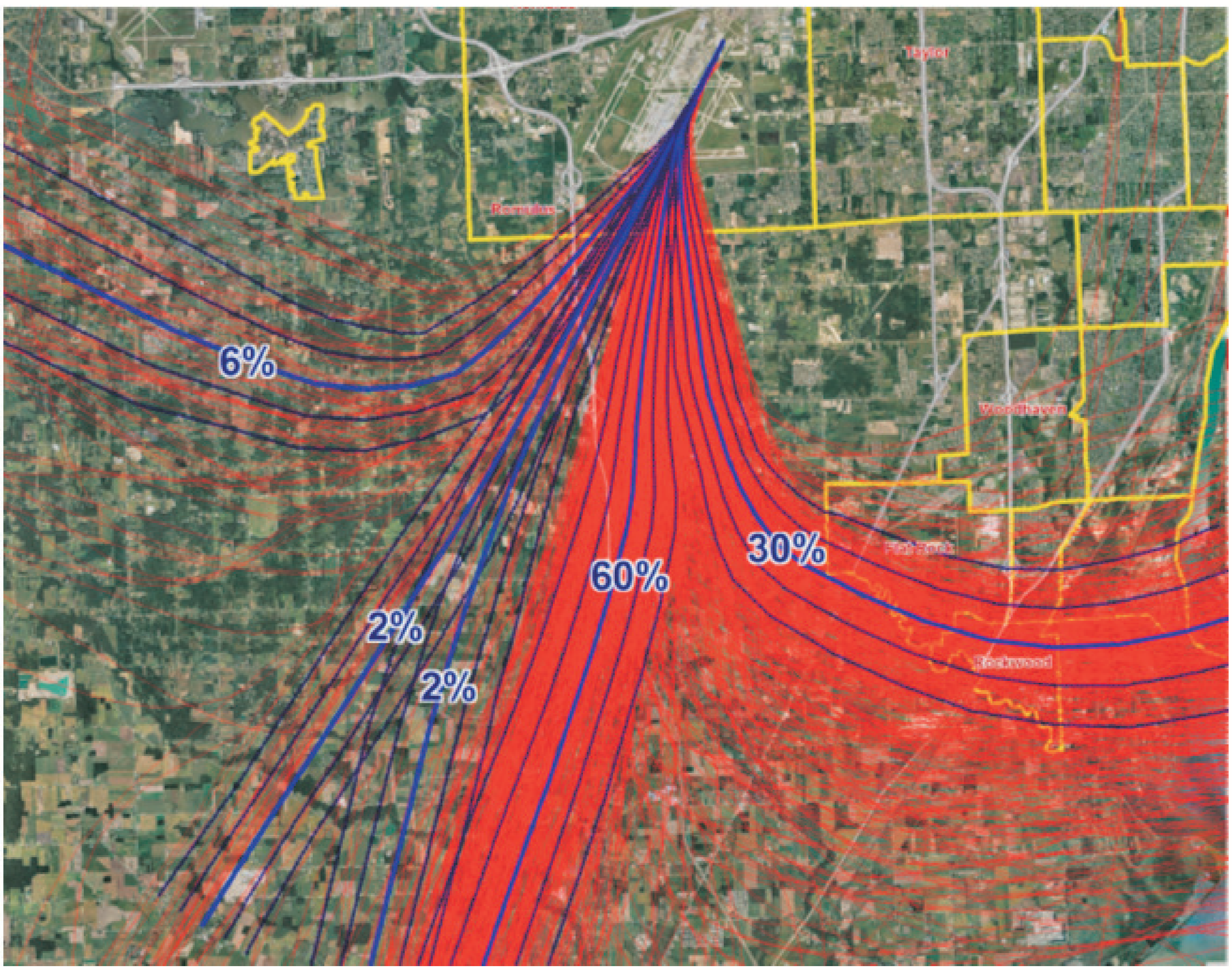


Figure D24 **Actual and INM Jet Departure Flight Tracks on Runway 21R**

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 using the DNL) and single event noise levels (noise levels from one operation).

As required by the FAA, the primary noise criterion to describe the existing noise environment is DNL.

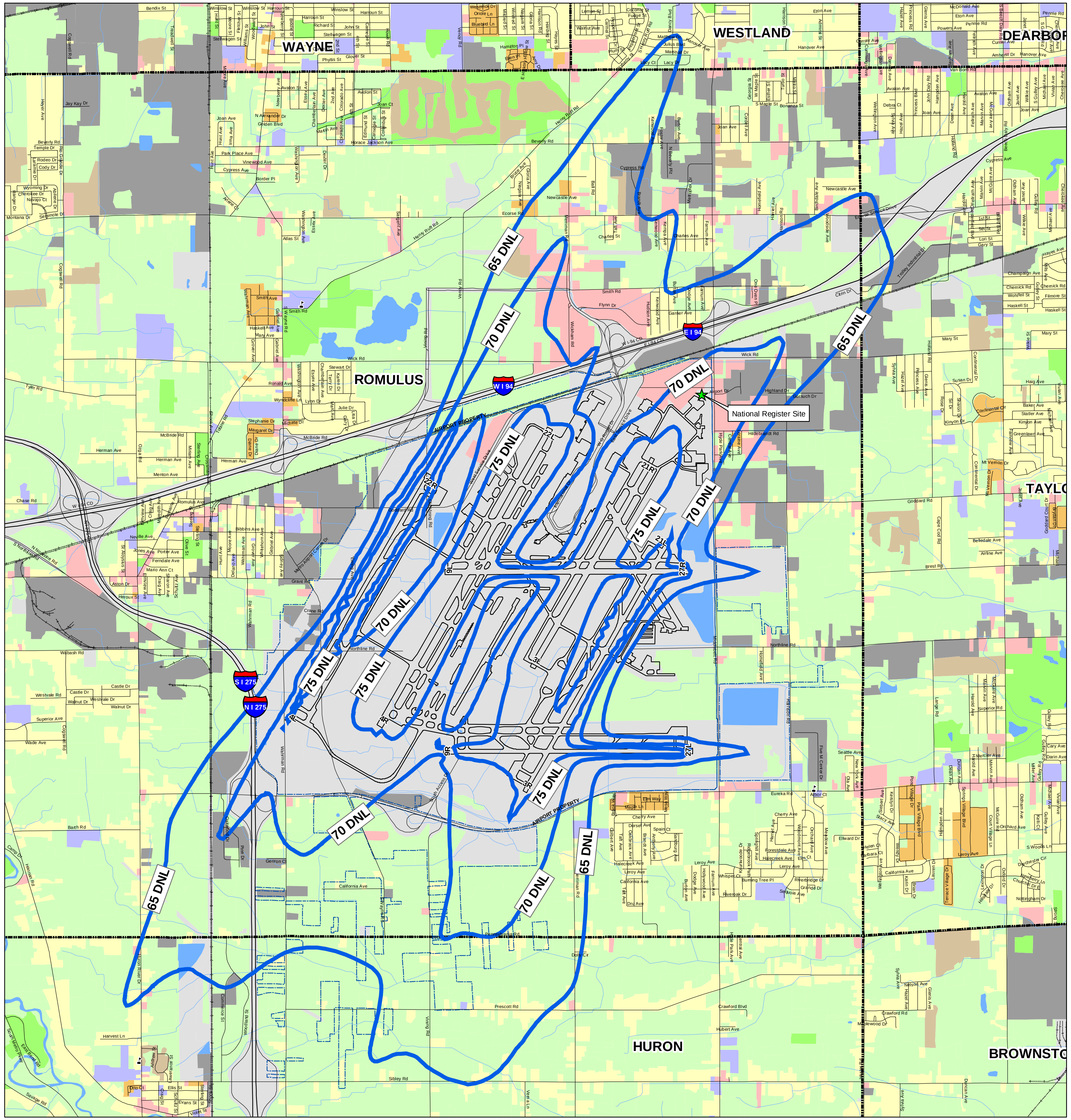
DNL Noise Contours. The existing (2004) DNL noise exposure contours for Detroit Metropolitan Wayne County Airport are presented in **Figure D25**. This figure shows the 65 DNL, 70 DNL, and 75 DNL noise exposure contours.

Single Event Noise Contours

Single event sound level contours for sample aircraft were also developed. These contours represent the single event noise levels for one (1) departure and one (1) arrival operation of a specific aircraft type. Sample single event noise exposure contours are presented in **Figures D26** and **D27** for the B747-400, DC9 (all series), A320, and CRJ700 aircraft, respectively. **Figure D26** shows noise exposure contours for south flow, arriving and departing on Runway 22L. **Figure D27** shows the SEL contours for north flow operations, arriving and departing on Runway 4R. The noise contours present the 90, 95, 100, and 105 SEL noise levels.

These data show a wide range in noise associated with the different types of aircraft. The new generation regional jets (CRJ700) are significantly quieter than the A320 aircraft, which in turn are also much quieter than the older hush kit DC9. The larger B747-400 aircraft tend to have more arrival noise than the smaller narrow-body aircraft.

Figure D25 **Existing (2004) Noise Exposure Map**



Land Use Legend

- Single-family residential
- Residential areas with 25% or more vacant land
- Multiple-family residential
- Commercial and office
- Industrial
- Institutional
- Transportation, communication, and utility
- Under development
- Cultural, outdoor recreation, and cemetery
- Woodland and wetland
- Active agriculture
- Extractive and barren
- Grassland, and shrub
- Vacant nonresidential
- Water
- City Limits Boundary
- Schools

	Existing (2004)	
65-70 DNL	Population	Housing
Huron Township	160	60
Romulus	1,060	490
Taylor	10	10
Westland	110	50
Subtotal	1,340	610
70-75 DNL		
Romulus	40	20
Subtotal	40	20
65 DNL & Greater		
Huron Township	160	60
Romulus	1,100	510
Taylor	10	10
Westland	110	50
Subtotal	1,380	630
60 DNL & Greater*		
Dearborn Heights	1,100	360
Huron Twp.	2,460	920
Inkster	4,420	1,870
Romulus	4,340	1,810
Sumpter Twp.	40	10
Taylor	3,860	1,500
Westland	2,970	1,250
Total	19,190	7,720

Source: 2000 US Census   Numbers rounded to the nearest 10 – for digits less than 5, rounded to 10.
Note: no residential uses are located in the 75 DNL and greater contours.
* includes the 65 DNL & Greater

The 65 DNL contour contains approximately 9,475 acres, 750 residential structures and 1,400 people.

The 70 DNL contour contains approximately 4,505 acres, 30 residential structures and 40 people.

The 75 DNL contour contains approximately 1,580 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 Detroit Metropolitan Wayne County 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 3-6-06

Based on 522,641 operations.

N

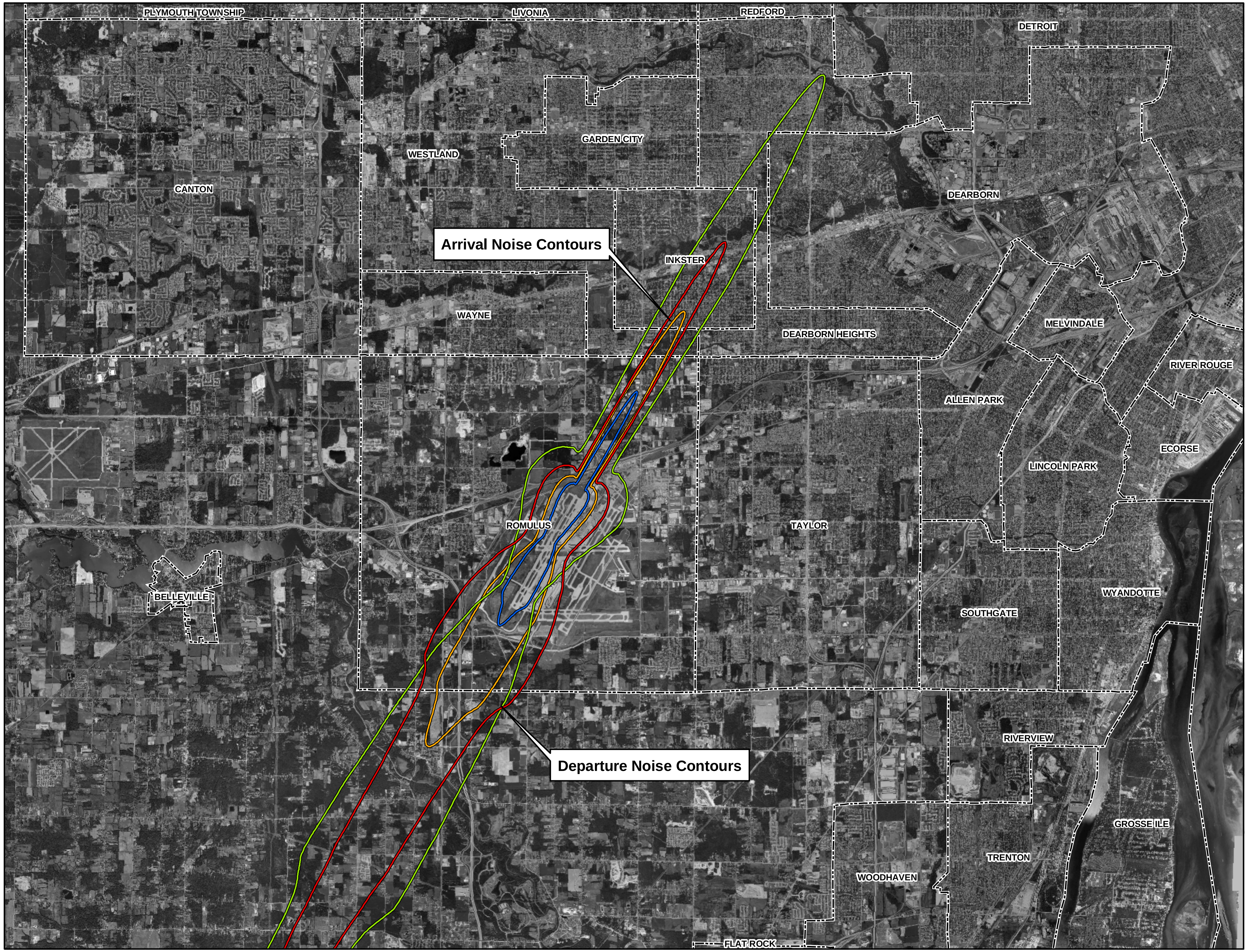
0 1,000 2,000 4,000 Feet

Source: Michigan Department of Natural Resources, SEMCOG

March 1, 2006

DETROIT
METROPOLITAN WAYNE COUNTY AIRPORT

Figure D26 **Example Single Event Noise Contours (South Flow)**



Legend

85 SEL Single Event Noise Contour

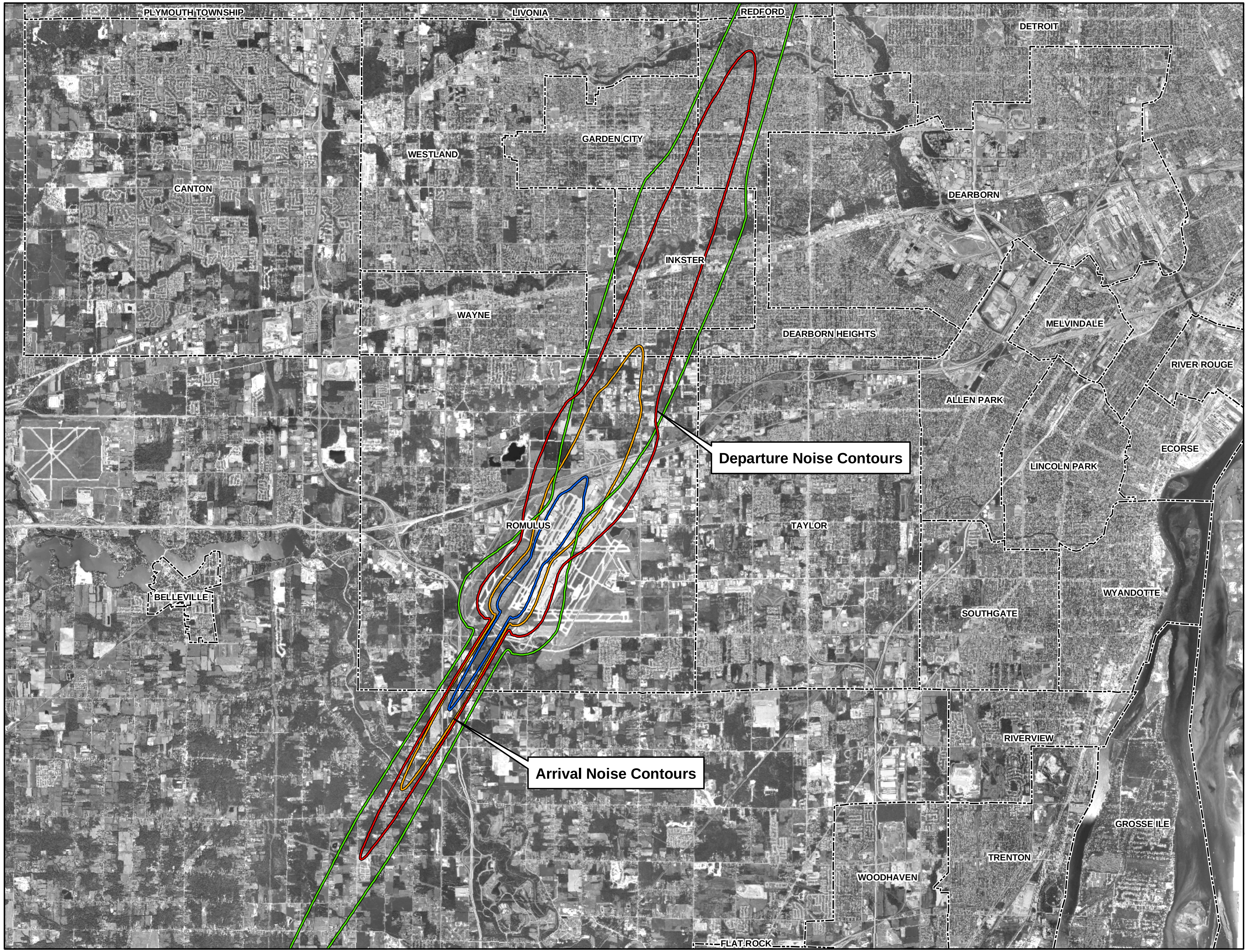
- B 747 400
- DC-9 Hush Kit
- A 320
- Regional Jet

July 2005

DETROIT METROPOLITAN WAYNE COUNTY AIRPORT

Source: Michigan Department of Natural Resources, SEMCOG, Detroit Metropolitan Wayne County Airport files.

Figure D27 **Example Single Event Noise Contours (North Flow)**



Legend

85 SEL Single Event Noise Contour

- B 747 400
- DC-9 Hush Kit
- A 320
- Regional Jet

N

July 2005

Source: Michigan Department of Natural Resources, SEMCOG, Detroit Metropolitan Wayne County Airport files.

DETROIT METROPOLITAN WAYNE COUNTY AIRPORT

Value of Additional Noise Metrics

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

Field noise measurement described previously allowed adjustment to be made to the INM model to more accurately reflect actual fleet and meteorological conditions in the Detroit metro area. Similarly, SEL contours are provided to describe the probable impact on sleep interference. Such additional measuring and metrics can aid in understanding the cost and benefits of various noise abatement alternatives. As a result, it is desired that discussion will not only be over simply the accuracy of the data, but also on the substance of the findings. The goal is to center the discussion on the relative alternatives and the desirability of those alternatives.

Future Baseline Noise Modeling Inputs

As noted in earlier sections, FAR Part 150 requires the development of existing and future aircraft noise exposure contours. FAR Part 150 requires that the future contour reflect conditions five (5) years into the future from the date the maps are submitted to the FAA. It was anticipated that the study will be finished in 2006, and thus, conditions in 2011 were evaluated.

2011 Aircraft Operations

The future noise environment for Detroit Metropolitan Wayne County Airport was analyzed based upon operational conditions in the year 2011. The aircraft operational levels come directly from the aviation forecasts presented in the *Forecasts* chapter of the Part 150 Study. The forecast data shows a total of 683,871 operations are anticipated to occur at the Airport in 2011. This equates to an average of 1,874 operations per day (an operation is either one takeoff or one landing) in that future time frame.

Aircraft Fleet Mix Categories. Categories of aircraft fleet mix were defined relative to type of aircraft (i.e., jet or propeller), size, and noise characteristics. The breakdown by these categories was determined from the aviation forecast. **Table D11** presents operations for the different categories of aircraft.

Table D11
OPERATIONS BY AIRCRAFT CATEGORY FOR FUTURE 2011 BASE CONDITIONS
Detroit Metropolitan Wayne County Airport FAR Part 150 Noise Compatibility Study Update

Operations Category	Daily Operations	Annual Operations	Percent Operations
Air Carrier Wide Body	77	28,015	4%
Air Carrier Narrow Body Louder	308	112,324	16%
Air Carrier Narrow Body Quieter	583	212,865	31%
Regional Jets	665	242,907	36%
Commuter Propeller	165	60,213	9%
General Aviation Jet	51	18,729	3%
GA/Air Taxi/Cargo Propeller	25	8,818	1%
TOTAL	**1,874**	**683,871**	**100%**

Source: BridgeNet International

Detailed Aircraft Fleet Mix. The mix of aircraft that operate at the Airport is one of the most important factors in terms of the noise environment. Fleet mix data were determined from all of the data described previously. The fleet mix assumptions are presented in **Table D12**. 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 Detroit Metropolitan Wayne County 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 for each of the aircraft types is also presented. The MD80 series aircraft are the dominant noise aircraft operating at Detroit Metropolitan Wayne County 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.

Table D12
Aircraft Fleet Mix Assumptions (2011)
Detroit Metropolitan (Wayne County) Airport

INM Type	Category	Daily Operations	Annual Operations
74720B	Widebody	0.15	54
747400	Widebody	9.91	3,617
767300	Widebody	5.23	1,909
777200	Widebody	2.00	731
A30062	Widebody	0.90	328
A310	Widebody	1.27	462
B787	Widebody	45.73	16,692
A340	Widebody	3.35	1,222
DC1030	Widebody	7.78	2,839
DC870	Widebody	0.08	31
A330	Widebody	0.07	26
MD11PW	Widebody	0.28	103
727EM1	Narrowbody Louder	0.30	108
727EM2	Narrowbody Louder	8.88	3,242
737N17	Narrowbody Louder	0.49	178
DC95HW	Narrowbody Louder	251.81	91,910
MD83	Narrowbody Louder	46.26	16,885
7373B2	Narrowbody Quieter	25.15	9,180
737400	Narrowbody Quieter	0.18	67
737500	Narrowbody Quieter	11.88	4,337
737700	Narrowbody Quieter	41.51	15,153
737800	Narrowbody Quieter	13.76	5,022
737900	Narrowbody Quieter	0.26	96
757300	Narrowbody Quieter	17.40	6,350
757PW	Narrowbody Quieter	73.22	26,724
757RR	Narrowbody Quieter	2.94	1,072
A319	Narrowbody Quieter	238.66	87,112
A320	Narrowbody Quieter	144.13	52,607
A32123	Narrowbody Quieter	10.21	3,726
F10065	Narrowbody Quieter	3.89	1,421
BAE300	Regional Jet	70.68	25,799
EMB145	Regional Jet	50.05	18,267
EMB14L	Regional Jet	428.39	156,363
F10062	Regional Jet	116.38	42,477
BEC190	Commuter Prop	1.94	708
BEC9F	Commuter Prop	0.84	307
DHC6	Commuter Prop	0.81	294
DHC8	Commuter Prop	10.39	3,792
SF340	Commuter Prop	150.99	55,111
CIT3	General Aviation Jet	3.19	1,165
CL600	General Aviation Jet	4.79	1,749
CNA55B	General Aviation Jet	6.80	2,482
CNA750	General Aviation Jet	6.42	2,343
FAL20	General Aviation Jet	2.06	751
GIIB	General Aviation Jet	1.35	493
GIV	General Aviation Jet	10.59	3,864
IA1125	General Aviation Jet	1.13	411
LEAR25	General Aviation Jet	1.83	666
LEAR35	General Aviation Jet	7.21	2,632
SABR80	General Aviation Jet	5.95	2,172
BEC58P	GA/Air Taxi Prop	5.17	1,888
CNA441	GA/Air Taxi Prop	7.79	2,844
GASEPV	GA/Air Taxi Prop	11.20	4,086
Total		**1,874**	**683,871**

Table D12 **Aircraft Fleet Mix Assumptions (2011)**

Future 2011 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.

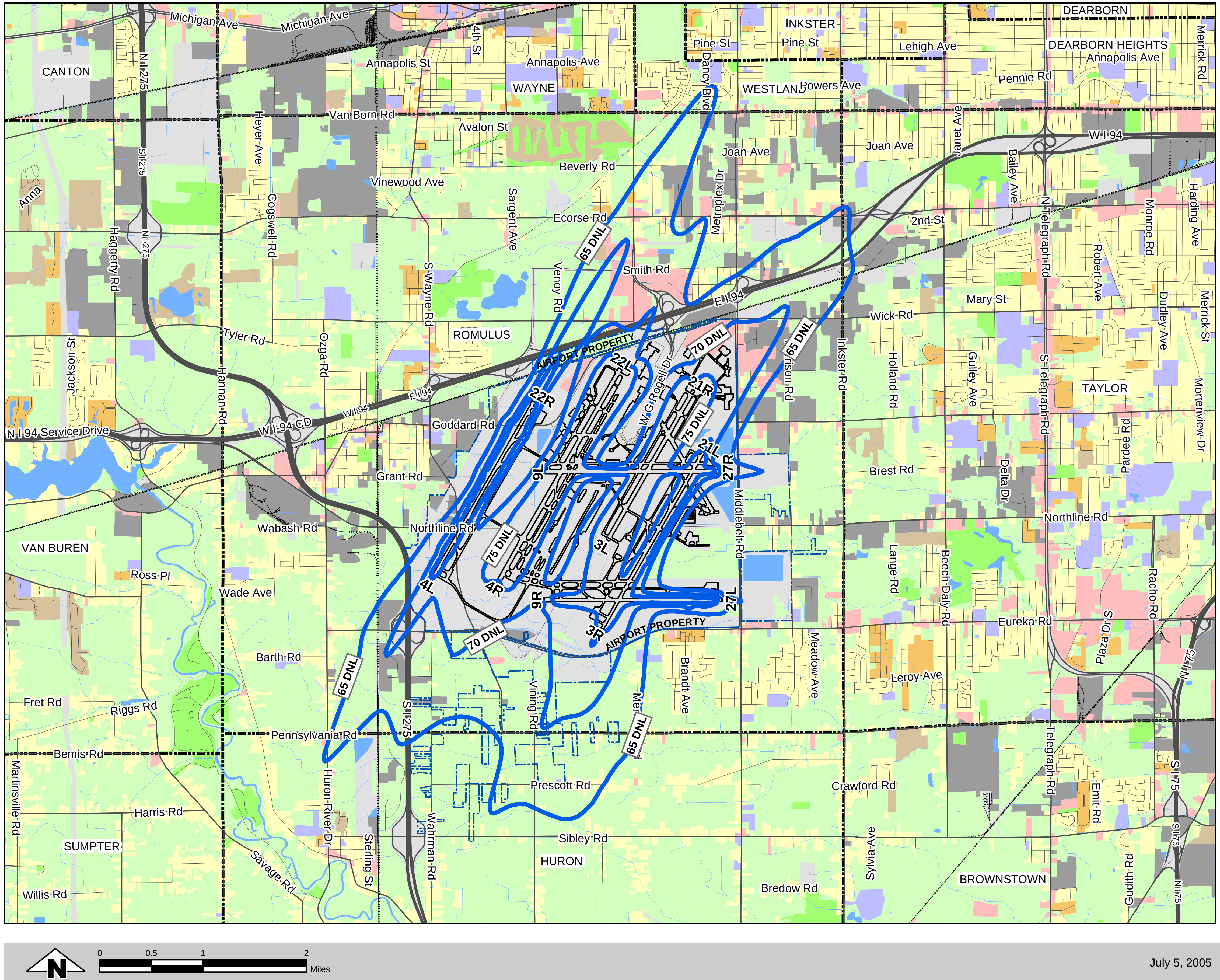
DNL Noise Contours. The future annual base period 2011 DNL noise exposure contours for Detroit Metropolitan Wayne County Airport are presented in **Figure D28**. This figure presents the 65 DNL, 70 DNL, and 75 DNL noise contours.

Single Event Noise Contours. Single event noise exposure contours for sample aircraft were developed and presented in the Existing Noise Environment section (**Figures D27** and **D28**). The same aircraft that exist today are assumed to be in operation in 2011; so, the single event analysis remains the same as with existing conditions.

2004 and 1992 Noise Contour Comparison

The following figure, **Figure D29**, shows the 65 DNL noise contour for both the 2004 existing contours and the 1992 noise contours used in the previous FAR Part 150 Study to identify sound attenuation eligibility boundaries. As can be seen, the 2004 65 DNL noise contour is approximately 35% smaller then the 1992 65 DNL noise contour; although, it does encompass and area of homes in the northwest portion of the contour that were not included in the previous program. Other than those homes, all of the homes within the 2004 65 DNL noise contour have either been offered sound attenuation or have received sound attenuation.

Figure D28 **Future (2011) Noise Contour**



Source: Michigan Department of Natural Resources, SEMCOG

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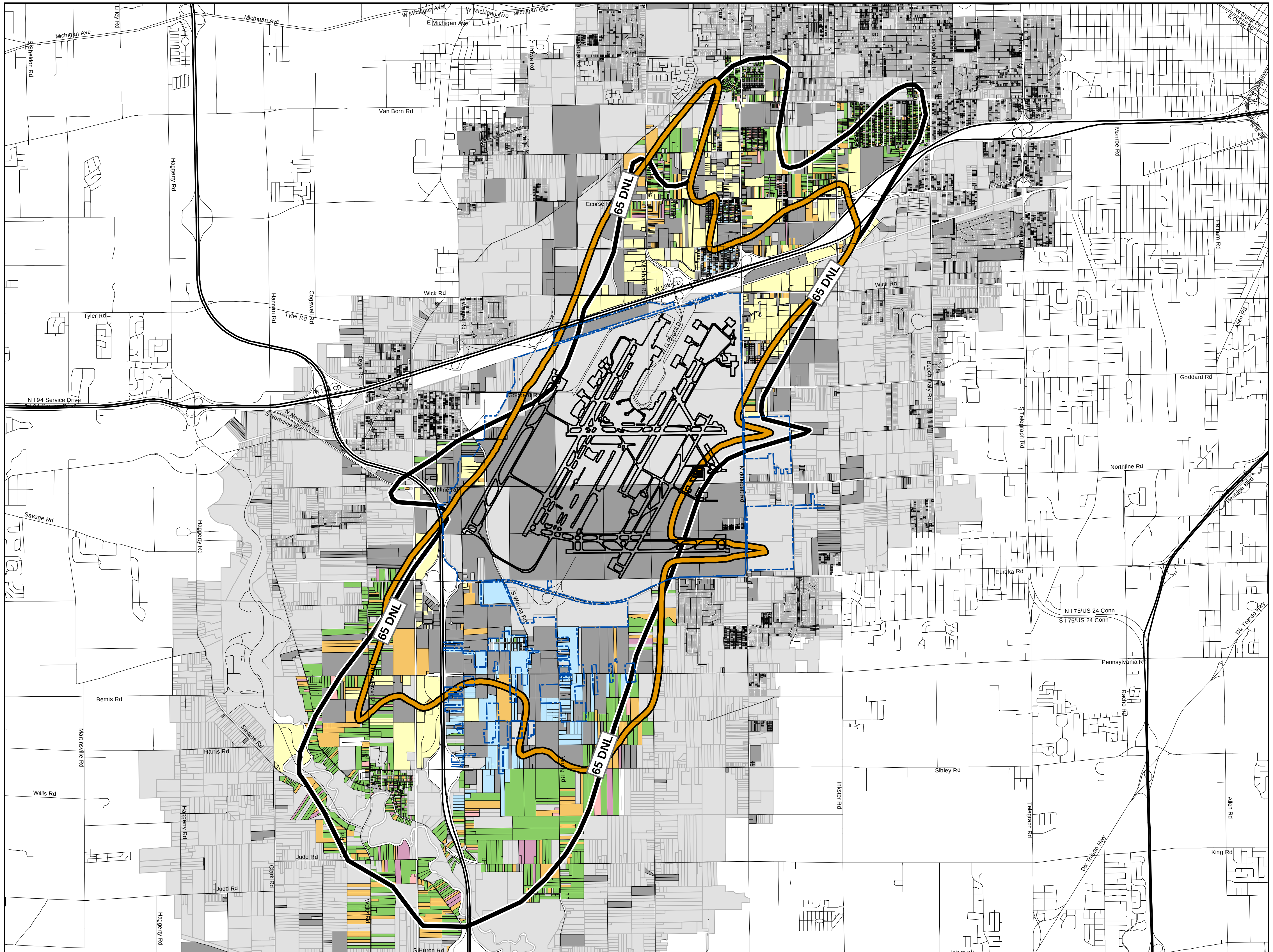
Figure D29 **Noise Contour Comparison**



Residential Sound Insulation Program Legend

- In Program
- Ineligible Applicant
- Potential Applicant
- Sound Acquisition Parcel
- Withdrawn
- Commercial
- Vacant
- TaxParcels

Noise Contour Legend

- Existing (2004) 65 DNL
- Previous (1992) 65 DNL

N

0 3,000 6,000 Feet

May 16, 2005

Source: Michigan Department of Natural Resources, SEMCOG, C&S Companies

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