St. Paul Downtown Airport (STP)
Annual Aircraft Noise Study
July 11-17, 2019

Metropolitan Airports Commission
Community Relations Office
6040 28th Avenue South
Minneapolis, MN 55450

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1.0 Introduction

The purpose of the St. Paul Downtown Airport (STP) Annual Aircraft Noise Study (Study) is to evaluate STP aircraft operations and associated noise events occurring in neighborhoods that surround the airport. This report evaluates data collected during the Study period beginning July 11, 2019 at 12:00 a.m. and ending on July 17, 2019 at 11:59 p.m. The dates for this study period and the data collection locations were determined by the St. Paul Downtown Airport Advisory Council (DAAC) members during the group's meeting held on April 23, 2019.

Data collected for this Study includes STP aircraft operations details (e.g.; aircraft types, runways used, time of operation, etc.), sound data related to STP aircraft operations and community activity, aircraft noise complaints submitted during the Study period, and weather conditions during the Study period.

Section 2 of this Study shares the details of the sound data collection. Section 3 summarizes the findings of the analyses, and compares data in 2019 with results of previous Study periods. A glossary of terms is provided in Section 4.

2.0 Sound Data Collection

The data collection and analysis conducted for this Study were performed by Metropolitan Airports Commission (MAC) Community Relations Office staff. An initial sound calibration was performed on system deployment, and system checks were made throughout the study period to ensure the system was operating and within tolerances. Details about the instrumentation and data collection sites are provided below.

2.1 Instrumentation

Each noise data collection site consists of laboratory-quality sound monitoring instrumentation manufactured by Larson Davis Incorporated (LD) and PCB Piezotronics. The main components of each site consisted of a Type-1 noise analyzer (LD 831), a preamplifier (LD PRM831), and a microphone (LD 377B02). These instruments are certified by an independent accredited laboratory and traceable to National Institute of Standards and Technology (NIST).

2.2 Analysis Parameters

Sound data analyzers were positioned at six different monitoring locations. Each site operated continuously utilizing slow response with A-weighting (dBA), as federally-prescribed by standards for collecting aircraft noise in the Federal Aviation Administration's (FAA) 14 CFR Part 150. Events were recorded when the analyzer detected a sound level over 65 dBA for four seconds or longer. These parameters are consistent with those used for each of the STP Annual Noise Studies conducted since 2007.

Recorded events were correlated with flight track data collected by MAC's Noise and Operations Monitoring System (MACNOMS). Parameters used to correlate noise events and radar flight tracks include distance, altitude and time.

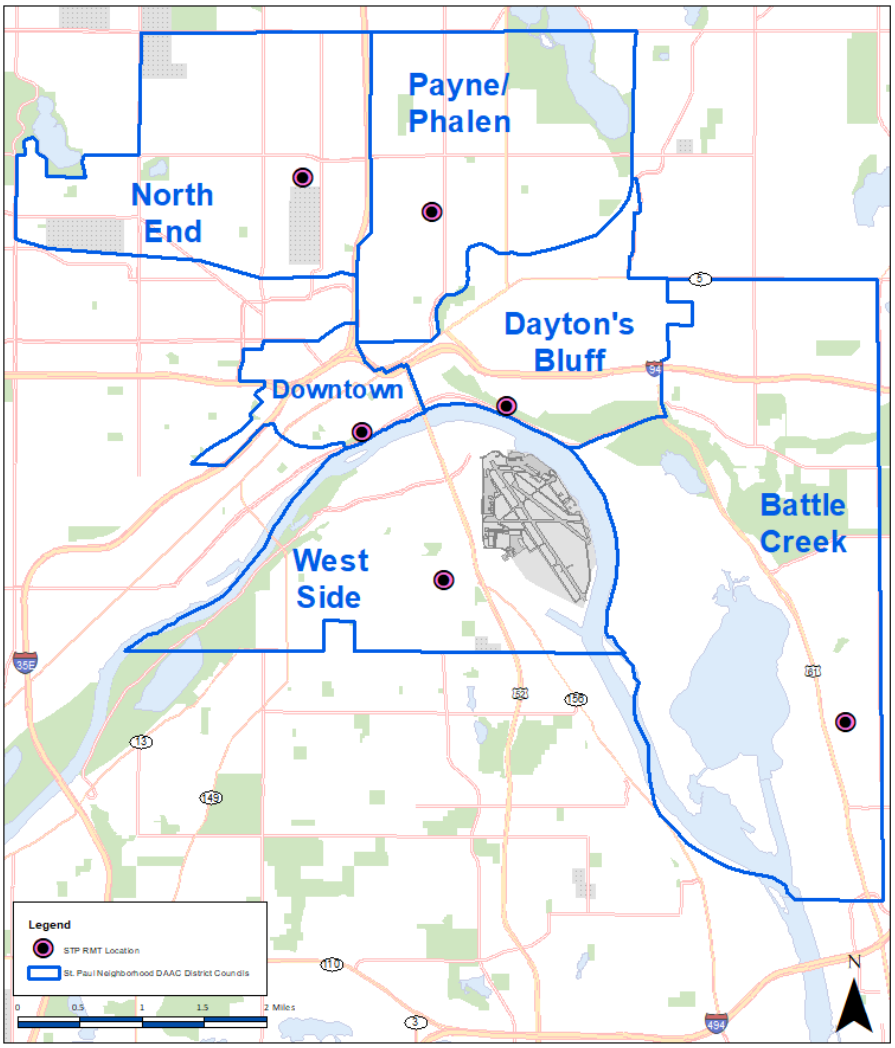
It important to note that aircraft activity occurs throughout the twin cities area airspace as flights travel to and from a variety of airports. The purpose of this Study is evaluate sounds of aircraft activity associated with STP only. Sources of sounds that were unable to be correlated with STP aircraft operations, including non-STP aircraft operations, are reflected in this report as community events.

2.3 Sound Data Collection Locations

Sound data collection equipment was set up to record events simultaneously from six different locations. One data collection site was located in each of the St. Paul community districts adjacent to STP. Representatives from each of these districts make up the community membership on the DAAC. **Figure 1** depicts a map of the district council areas and locations for all six data collection sites used during the 2019 study period.

All six of the data collection sites were placed in the same location that were used for data collection during the previous study period in 2018.

Figure 1: Noise Data Collection Locations
7/11/2019-7/17/2019



Photos of each noise data collection site are provided in **Figure 2**. All sites were inspected before the data collection was initiated. Each site was found to be acceptable and able to meet the project objectives expressed by the DAAC.

Figure 2: Noise Data Collection Location Photos
7/11/2019-7/17/2019

Site 1
Mt. Hope Drive & Prescott Street

Site 4
Indian Mounds Park

Site 2
Union Depot

Site 5
Skyway Drive & Henry Park

Site 3
Jenks Avenue & Jessie Street

Site 6
Abell Street & Jessamine Avenue

2.4 Weather Data Collection

Weather conditions (e.g.; temperature, precipitation, wind, etc.) affect the way sound is heard and recorded. It also impacts runway use decisions and performance of aircraft. For these reasons, weather data are documented during the study period, and summarized by date in **Figure 3**.

Figure 3: Weather Observations
7/11/2019-7/17/2019

Jul-2019	Temperature (°F)			Dew Point (°F)			Humidity (%)		Sea Level Pressure (Inches)		Wind Speed (miles per hour)		Precip. (Inches)
	high	avg	low	high	avg	low	high	low	high	low	high	low	Total
Thursday, July 11	81	74.3	65	63	57.8	51	87	36	29.2	29.1	15	3	0.22
Friday, July 12	86	77.5	69	73	65	60	82	53	29	28.9	30	3	0
Saturday, July 13	85	78.1	70	65	62.2	59	73	43	29.2	29	10	0	0
Sunday, July 14	91	81.6	72	71	68	64	87	48	29.2	29	12	5	0
Monday, July 15	91	77.3	71	74	69.9	66	93	55	29.1	28.9	24	0	0.01
Tuesday, July 16	85	77.7	71	73	67.9	63	87	63	29	28.9	15	0	1.75
Wednesday, July 17	85	77.8	70	72	69.5	66	91	53	29	28.9	17	0	0.01

Source: https://www.wunderground.com/history/monthly/us/mn/saint-paul/KMSP/date/2019-7

3.0 Summary of Findings

The following information summarizes the findings of the 2019 STP Annual Aircraft Noise Study.

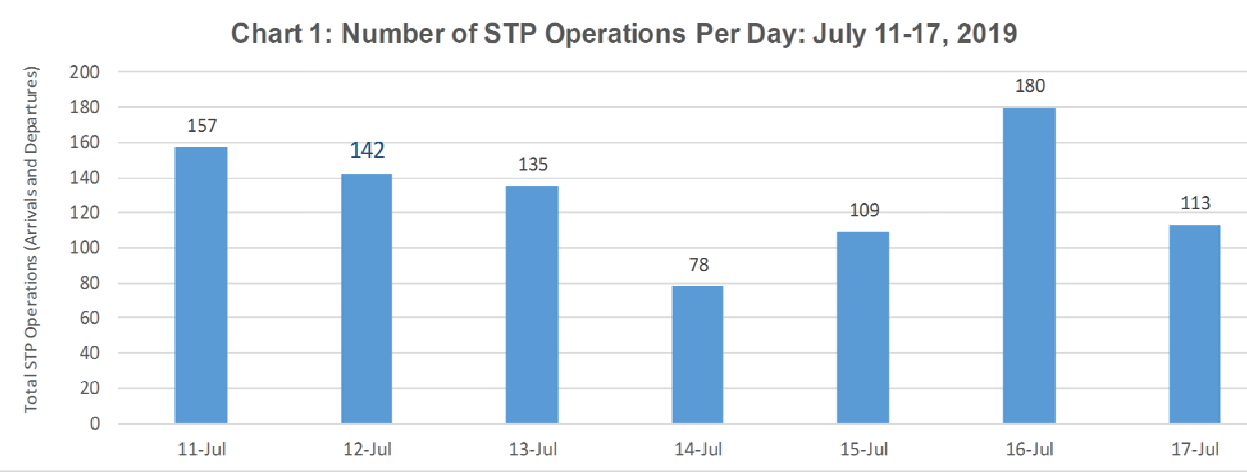
3.1 Aircraft Operations

STP flight activity was observed during the study period and flight tracking data were used to report runway use patterns. There were 914 total operations at STP during the study period. This level is 32% greater than what occurred during the previous study period in May 2018. During nighttime hours of 10 p.m.—7 a.m., there were 79 STP operations. This is nearly double the number of nighttime operations reported in the 2018 study period.

The primary runway used at STP for arrivals and departures is Runway 14/32. Runway 14 was used for 57% of the arrivals and 51% of the departures during the Study period. Runway 32 was used for 36% of arrivals and 42% of departures. The highest count of STP aircraft operations occurred on Wednesday, July 16, 2019 with 180 total operations. Eighty-seven operations were arrivals and 93 were departures.

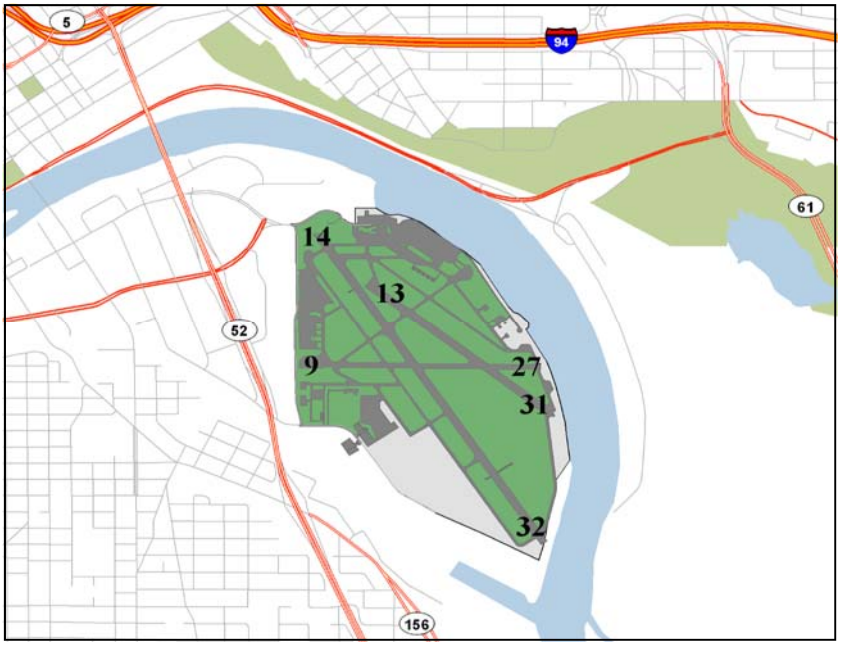
Chart 1 below displays the aircraft operations count during each day of the 2019 study period.

Figure 4 shows the detailed count of operations for each STP runway during the 2019 Study period.



Source: MACNOMS

Figure 4: Runway Use
7/11/2019-7/17/2019

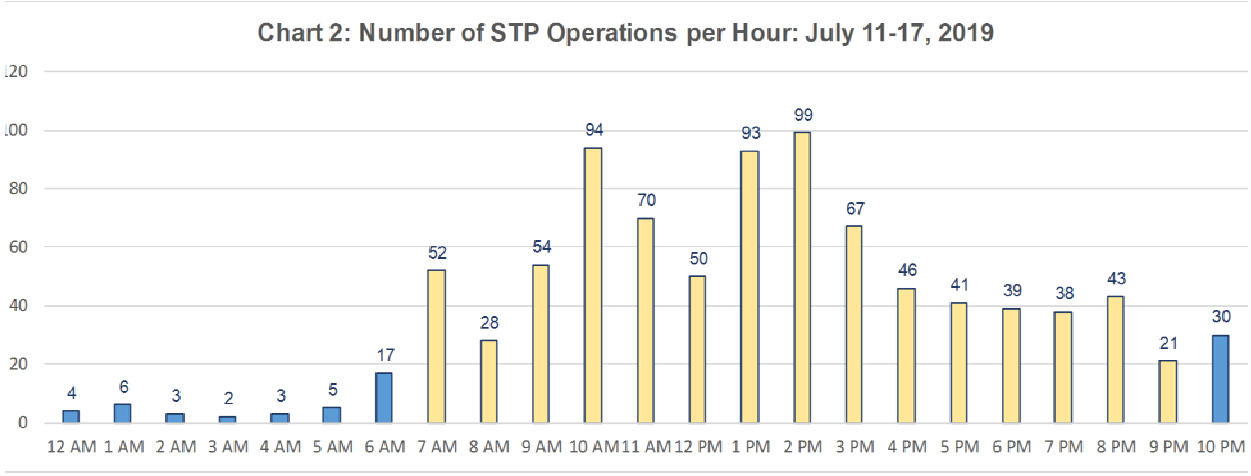


Operations (24 Hour Days)		
Arrivals		
Runway	Count	Percent
9	4	0.9%
13	2	0.4%
14	264	57.4%
27	11	2.4%
31	10	2.2%
32	167	36.3%
Unknown	2	0.4%
Total	460	100.0%
Departures		
9	4	0.9%
13	8	1.8%
14	233	51.3%
27	10	2.2%
31	7	1.5%
32	192	42.3%
Unknown	0	0.4%
Total Departures	454	100.0%
Total Operations	**914**	

Nighttime Operations (10 p.m. - 7 a.m.)		
Nighttime Arrivals		
Runway	Count	Percent
9	0	0.0%
13	0	0.0%
14	18	47.4%
27	1	2.6%
31	0	0.0%
32	19	50.0%
Unknown	0	5.0%
Total Arrivals	38	100%
Nighttime Departures		
9	1	2.4%
13	0	0.0%
14	19	46.3%
27	1	2.4%
31	0	0.0%
32	20	48.8%
Unknown	0	0.0%
Total Departures	41	100.0%
Total Nighttime Operations	**79**	

Source: MACNOMS

The hours that accommodated the highest volume of aircraft operating at STP during the Study period were 10 a.m., 1 p.m., and 2 p.m. The hourly operation details are shown below in **Chart 2**, with daytime hours shown in yellow and nighttime hours shown in blue.

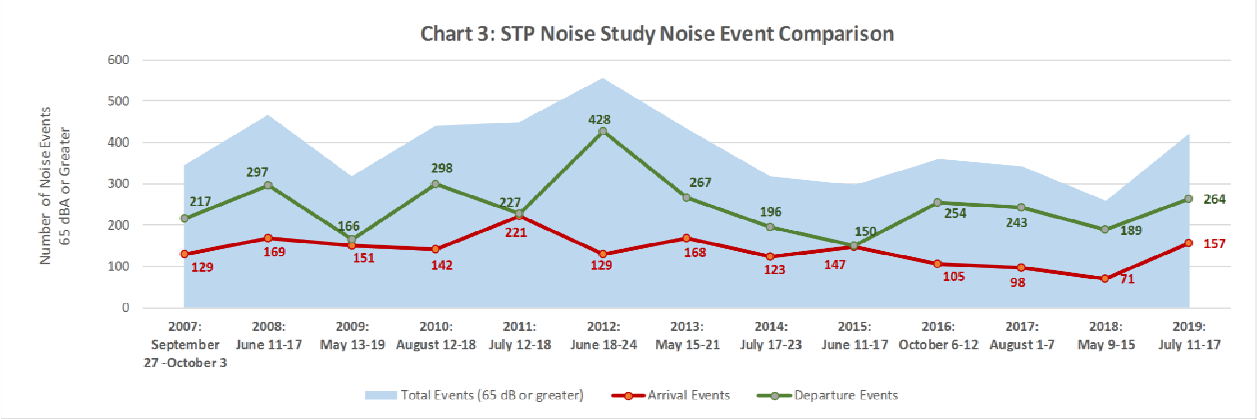


Source: MACNOMS

Figure 5 shows two maps with flight tracks associated with the STP during the Study. On each map, green tracks represent departing aircraft and red tracks represent arriving aircraft. One map shows the STP flights occurring during daytime hours (7 a.m.– 10 p.m.), and the other map shows the STP flights occurring during nighttime hours (10 p.m.-7 a.m.).

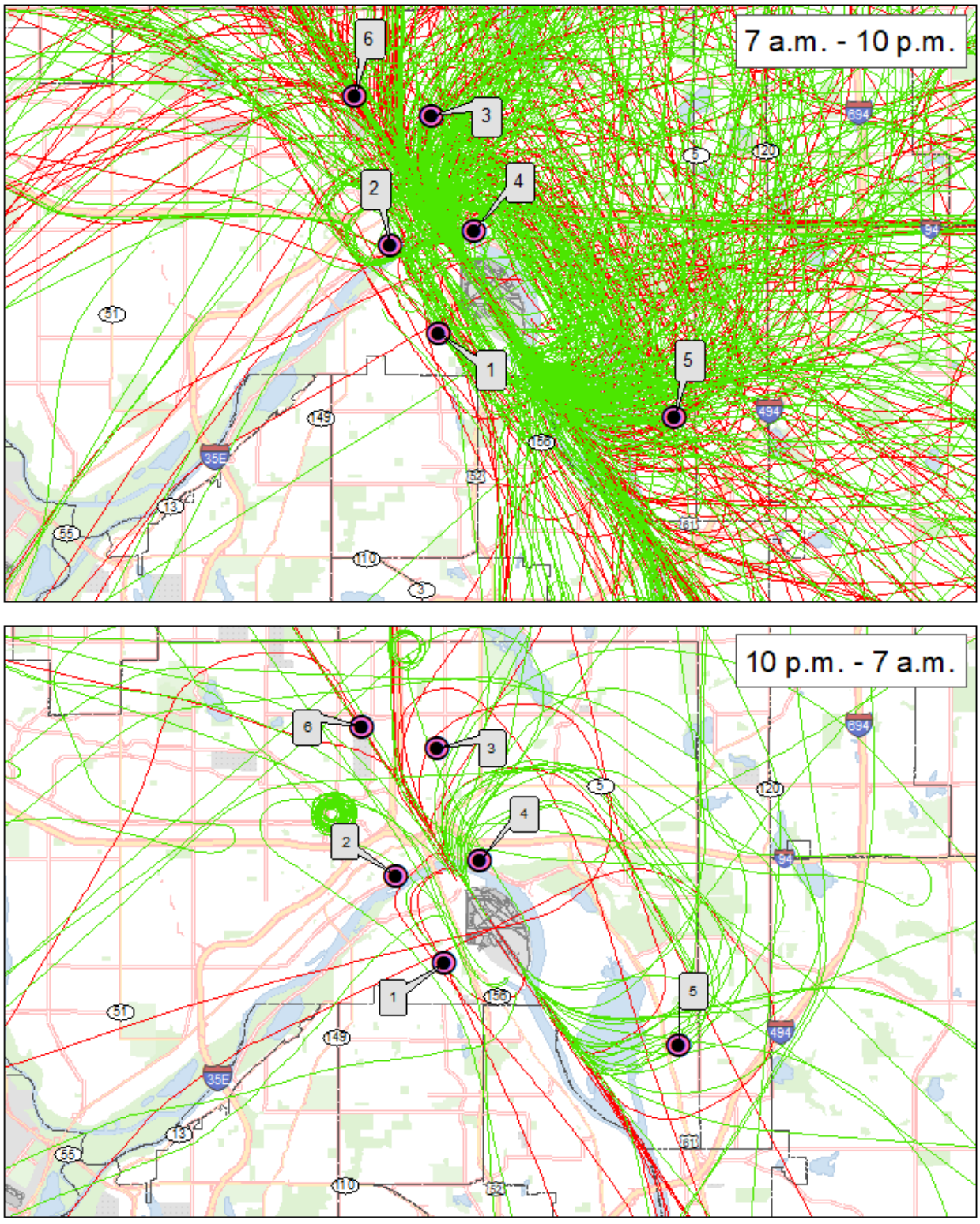
3.2 Noise Events

During the 2019 study period there were a total of 421 aircraft noise events recorded above 65 dBA: 157 arrival noise events, and 264 departure noise events. This level is 62% greater than the number of aircraft noise events recorded during the 2018 study period. **Chart 3** below provides a comparison of events recorded in the 2019 Noise Study compared with studies conducted since 2007. Seasonal trends show a greater number of events during summer months that coincide with greater levels of flight activity that also typically occur during summer.



Source: MACNOMS

Figure 5: STP Daytime (7 a.m.-10 p.m.) and Nighttime (10 p.m.—7 a.m.) Flight Activity 7/11/2019-7/17/2019



Source: MACNOMS

Figure 6 details the number of aircraft noise events that exceeded 65 dBA, 80 dBA, 90 dBA, and 100 dBA. The highest number of arrival noise events was recorded at Site 6 with a total of 83. The highest number of departure noise events was recorded at Site 4, with a total of 109. These sites also recorded the highest number of arrival and departure noise events respectively during the 2018 study period.

Figure 6: Aircraft Noise Events
7/11/2019-7/17/2019

Arrival-Related Events

Site	Location	>=65dBA LA_{max}	>=80dBA LA_{max}	>=90dBA LA_{max}	>=100dBA LA_{max}
1	Mt. Hope Drive and	9	1	0	0
2	Union Depot	10	0	0	0
3	Jenks Avenue and Jessie Street	14	0	0	0
4	Indian Mounds Park	26	1	0	0
5	Skyway Drive and Henry Park	15	0	0	0
6	Abell Street and	83	2	0	0
Total Arrival Noise Events		**157**	**4**	**0**	**0**

Departure-Related Events

Site	Location	>=65dBA LA_{max}	>=80dBA LA_{max}	>=90dBA LA_{max}	>=100dBA LA_{max}
1	Mt. Hope Drive and Prescott Street	11	0	0	0
2	Union Depot	25	0	0	0
3	Jenks Avenue and Jessie Street	57	4	0	0
4	Indian Mounds Park	109	3	0	0
5	Skyway Drive and Henry Park	40	2	0	0
6	Abell Street and Jessamine Avenue	22	3	0	0
Total Departure Noise Events		**264**	**20**	**0**	**0**

Source: MACNOMS

Figure 7 provides a list of the top ten loudest aircraft sound events recorded at each site. It is important to note that some aircraft type details were unavailable during the Study; these operations are noted with “UKN.”

Figures 8-10 summarize aircraft and community noise data collected during the study period. The Day-Night Average Noise Level (DNL) calculations for Aircraft DNL in **Figure 8** reflect aircraft noise DNL and community DNL. The community DNL in **Figure 8** reflects all non-STP aircraft noises recorded during the study period. (*See Section 4.0 Glossary for details about DNL*)

The background noise levels for each site (i.e. the amount of noise that occurred 90% of the time) are charted in **Figure 9**, and **Figure 10** contains the hourly distribution of all aircraft and community sounds recorded at each site during the study period.

Based on data collected during the 2019 noise study period, daily average aircraft noise levels from operations associated with STP do not meet the Federal Aviation Administration’s (FAA) criteria of significance for noise-sensitive land uses. However, it is important to note that single events may at times be considered significant by individuals based on the intrusiveness of events and varying individual tolerance levels.

DNL noise contours are not part of this annual noise study; however, noise contours are generated with software developed by the FAA and calculated using historical aircraft operations data as a normal process within the STP Long Term Comprehensive Plan (LTCP) Update. Preparation of the next STP LTCP Update is anticipated to begin in 2020.

3.3 Aircraft Noise Complaints

There were three aircraft noise complaints from two households reported for STP during the 2019 Study. One of the complaints pertained to a medical helicopter that operated during nighttime hours at a nearby hospital, not STP. The other two complaints were related to flights at STP during daytime hours. **Figure 11** shows the locations and complaint time detail for all three complaints.

Figure 7: Top 10 Loudest Aircraft Noise Events
7/11/2019-7/17/2019

Site 1 - Mt. Hope Drive & Prescott Street

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/13/2019 10:26		HELO	A	14	81.5	30
7/13/2019 11:14		UKN	A	14	74.8	8
7/11/2019 21:44		UKN	A	14	74.1	22
7/13/2019 11:19		UKN	D	14	73.8	10
7/16/2019 21:57		UKN	A	14	73.4	21
7/12/2019 13:21		UKN	D	27	72.8	11
7/11/2019 20:25		UKN	D	32	72.7	38
7/17/2019 18:29		UKN	D	14	72.6	22
7/12/2019 13:17		UKN	D	27	71.9	12
7/14/2019 17:23		UKN	A	14	71.1	9

Site 2 - Union Depot

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/11/2019 20:25		UKN	D	32	79.4	29
7/13/2019 10:27		HELO	A	14	78.6	25
7/16/2019 21:57		UKN	A	14	77.8	35
7/15/2019 13:44		UKN	D	27	75.1	16
7/13/2019 13:13	N27493	B25	D	14	74.8	20
7/13/2019 0:41	N119SP	HELO	D	27	74.2	14
7/16/2019 20:28	N119SP	HELO	D	14	74	28
7/13/2019 16:02		UKN	D	14	73.4	18
7/16/2019 20:31	N119SP	HELO	D	14	72.8	18
7/17/2019 20:45		UKN	D	27	72.3	20

Site 3 - Jenks Avenue & Jessie Street

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/13/2019 13:01	N27493	B25	D	14	84.4	20
7/12/2019 12:08	N387LS	BE40	D	32	81.8	18
7/11/2019 10:45	N473K	FA7X	D	32	81.2	22
7/14/2019 11:34		UKN	D	14	80	18
7/12/2019 16:47	N200VW	PA31	D	32	78.3	14
7/15/2019 10:50		UKN	A	14	78.3	23
7/16/2019 8:14	N351JL	CL35	D	32	77.7	18
7/11/2019 13:09	N135FT	GALX	D	32	75.9	13
7/11/2019 14:10	EJA799	CL35	D	32	75.1	15
7/12/2019 15:40	N598DR	BE40	D	32	75	13

Figure 7: Top 10 Loudest Aircraft Noise Events — Cont'd
7/11/2019-7/17/2019

Site 4 - Indian Mounds Park

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/11/2019 14:15	N478DR	BE40	D	32	88.4	20
7/11/2019 21:58		UKN	A	14	85.3	25
7/16/2019 7:13	N351CG	C56X	D	32	82.2	17
7/11/2019 12:37	N26LJ	BE58	D	32	82.2	28
7/11/2019 16:43	N14MN	BE36	A	14	79.5	16
7/12/2019 15:30	N337VG	C337	D	32	79.2	27
7/17/2019 16:58	N986AC	PC12	A	14	78.1	10
7/12/2019 9:52		UKN	A	14	77.3	9
7/11/2019 10:54		UKN	D	32	77.3	19
7/12/2019 13:40	N83M	GLF5	D	32	77.2	17

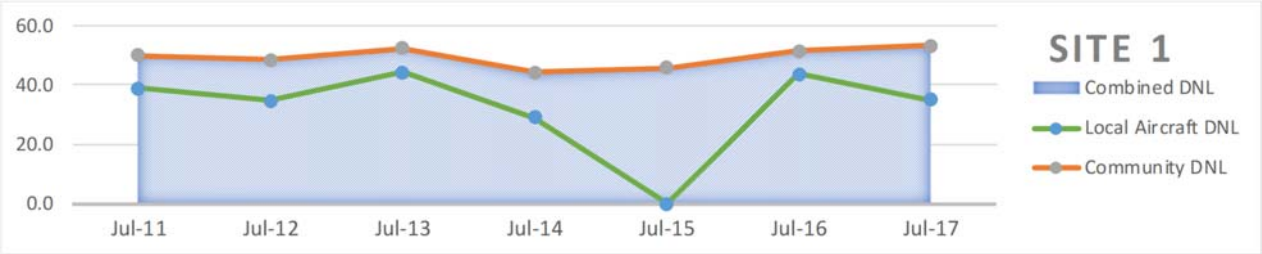
Site 5 - Skyway Drive & Henry Park

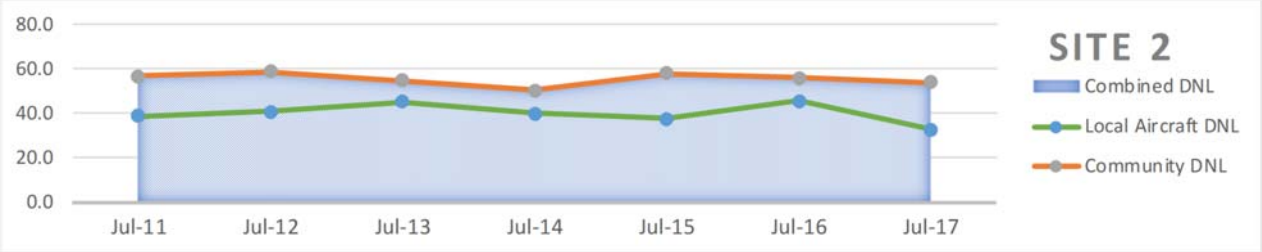
Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/13/2019 11:07	N27493	B25	D	14	88.1	24
7/17/2019 9:28	N244SA	SW3	D	14	80.9	8
7/15/2019 8:40	BLR54	FA50	D	14	79.0	15
7/13/2019 13:20	N27493	B25	D	14	78.2	17
7/13/2019 17:57	N80GA	BE55	D	14	77.6	13
7/11/2019 10:40	N287LS	BE40	A	32	77.5	16
7/12/2019 22:10		UKN	D	32	77.3	13
7/12/2019 23:00		UKN	D	32	76.3	16
7/16/2019 14:10		UKN	A	31	75.8	20
7/13/2019 13:00	N27493	B25	D	14	74.9	16

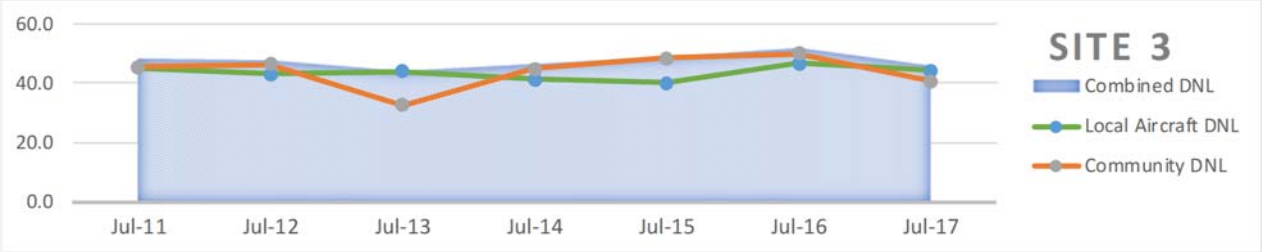
Site 6 - Abell Street & Jessamine Avenue

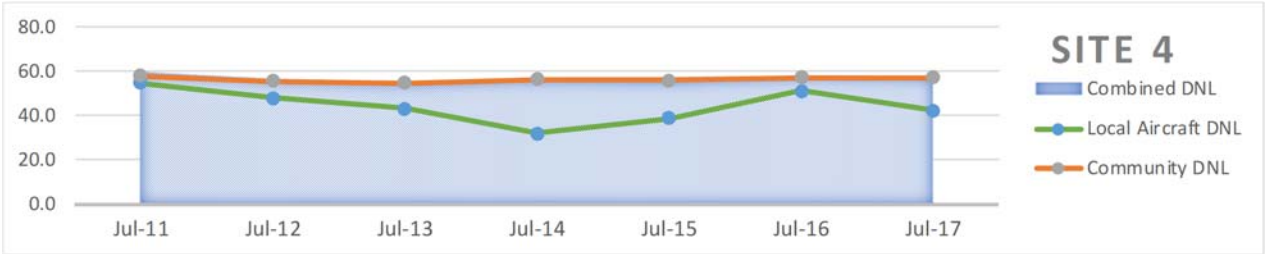
Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAmax (dBA)	Duration (seconds)
7/16/2019 21:05		UKN	D	14	83.1	18
7/15/2019 16:51		UKN	A	14	83.1	19
7/13/2019 13:02	N27493	B25	D	14	82.3	20
7/15/2019 15:00		UKN	A	14	81.2	20
7/14/2019 19:06	N954SG	FA50	D	14	80.4	14
7/14/2019 19:27		UKN	D	14	79.7	16
7/13/2019 16:32		UKN	A	14	78.8	20
7/17/2019 18:22	N690XL	C56X	A	14	78.4	11
7/12/2019 11:32		UKN	A	14	76.5	13
7/17/2019 16:48	N621DJ	CL60	A	14	76.4	12

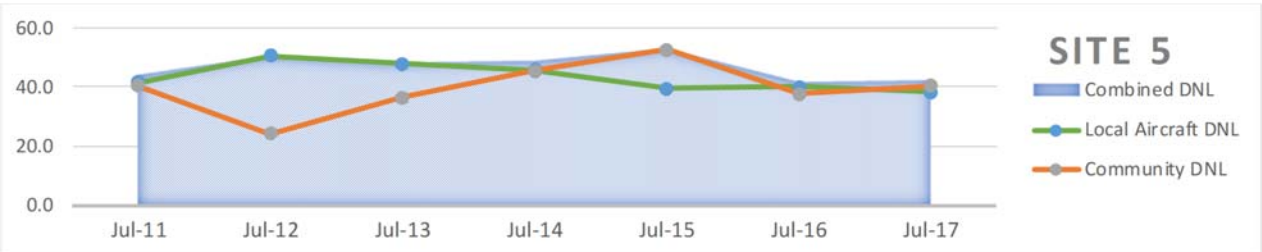
Figure 8: Aircraft and Community DNL by Site
7/11/2019-7/17/2019











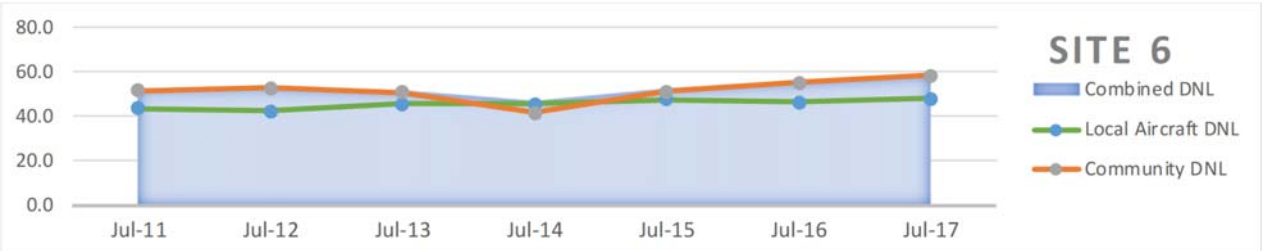


Figure 9: Average Background Sound Levels (LA_{90})
7/11/2019-7/17/2019

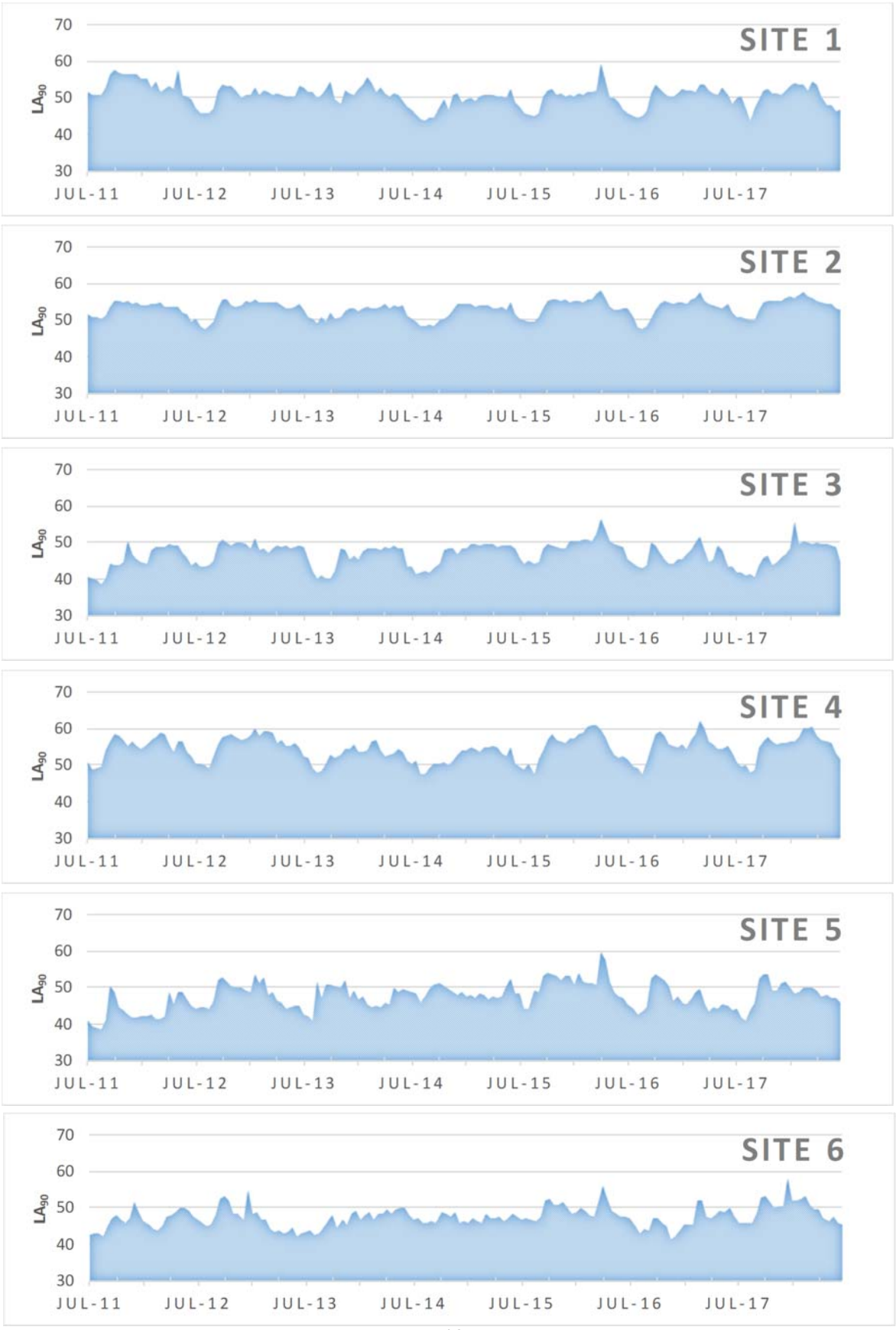
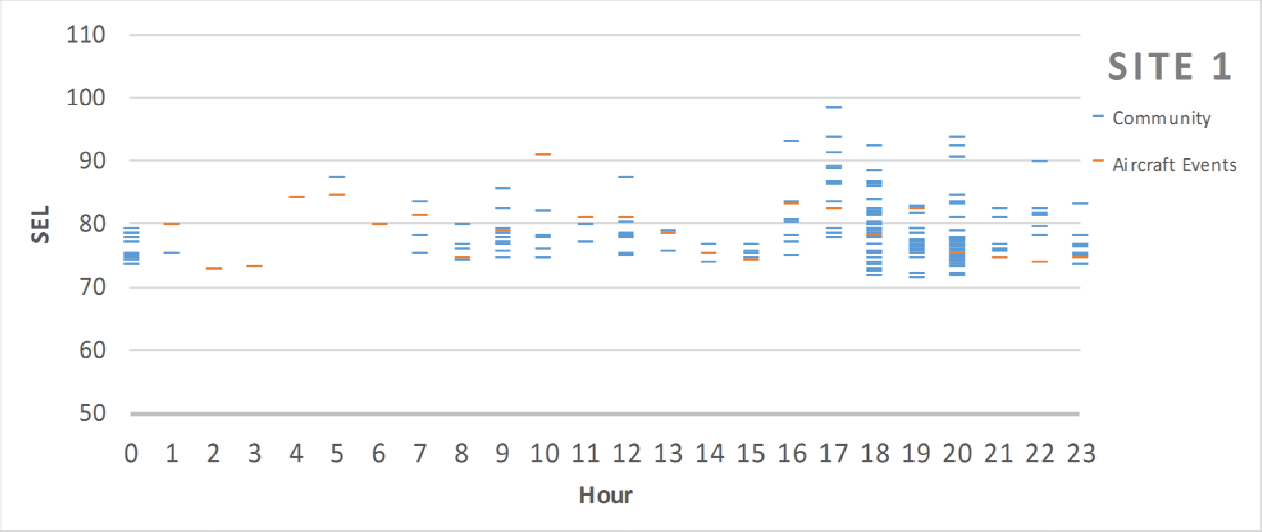
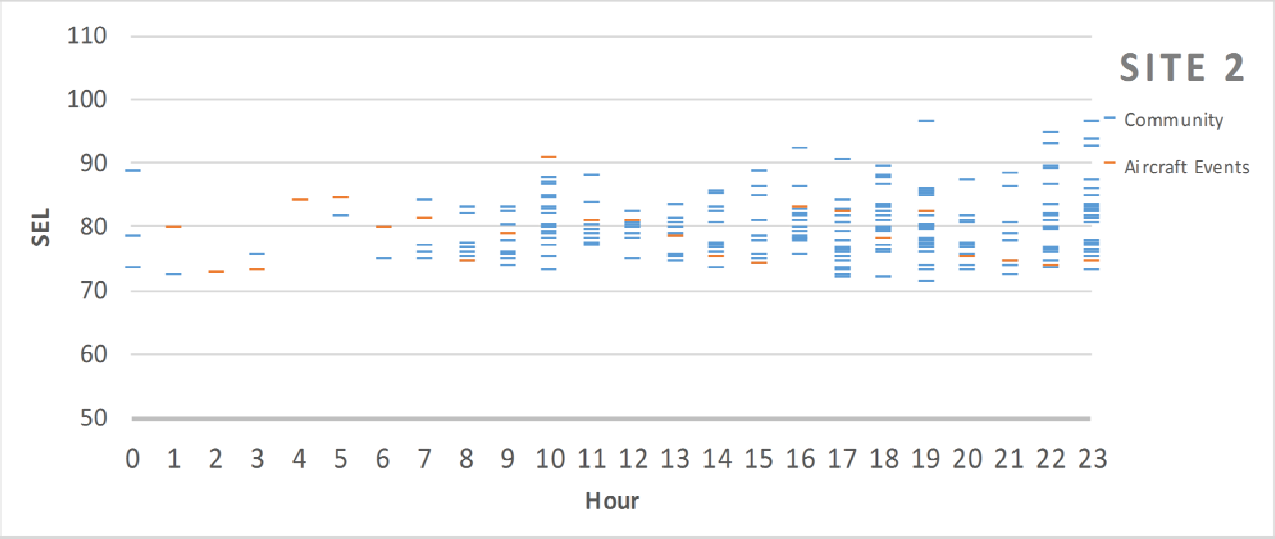


Figure 10: Hourly Distribution of Noise Events (SEL)
7/11/2019-7/17/2019





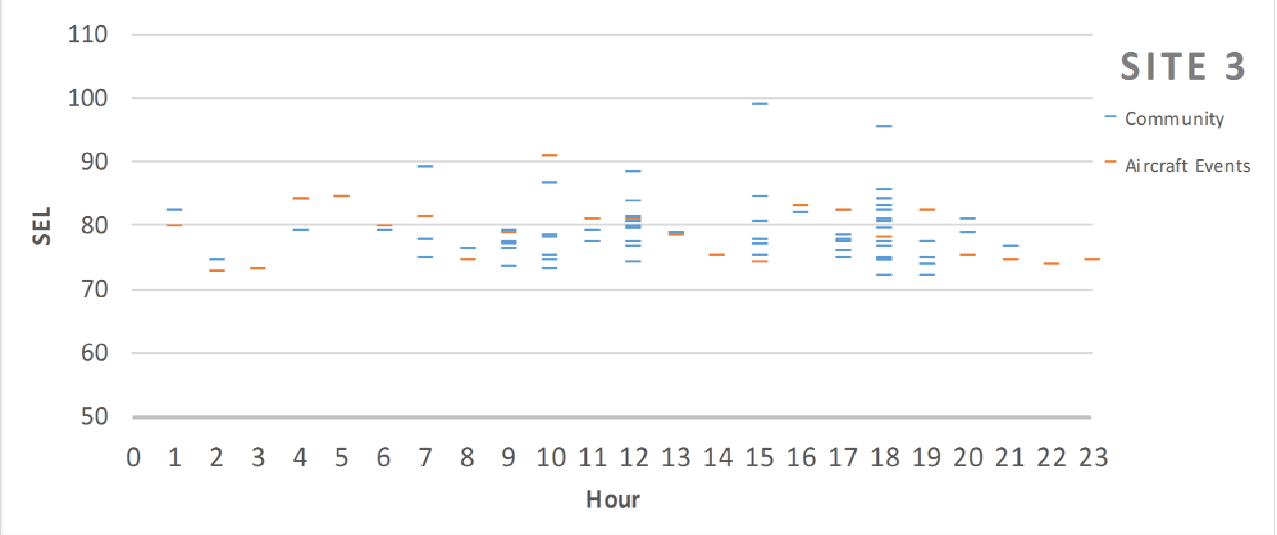
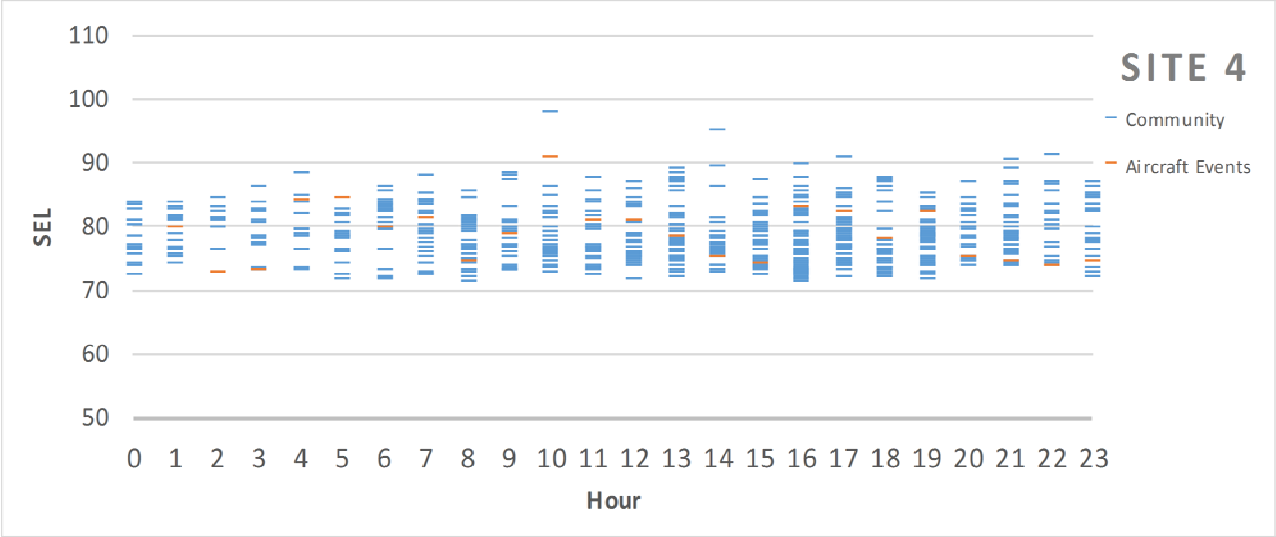
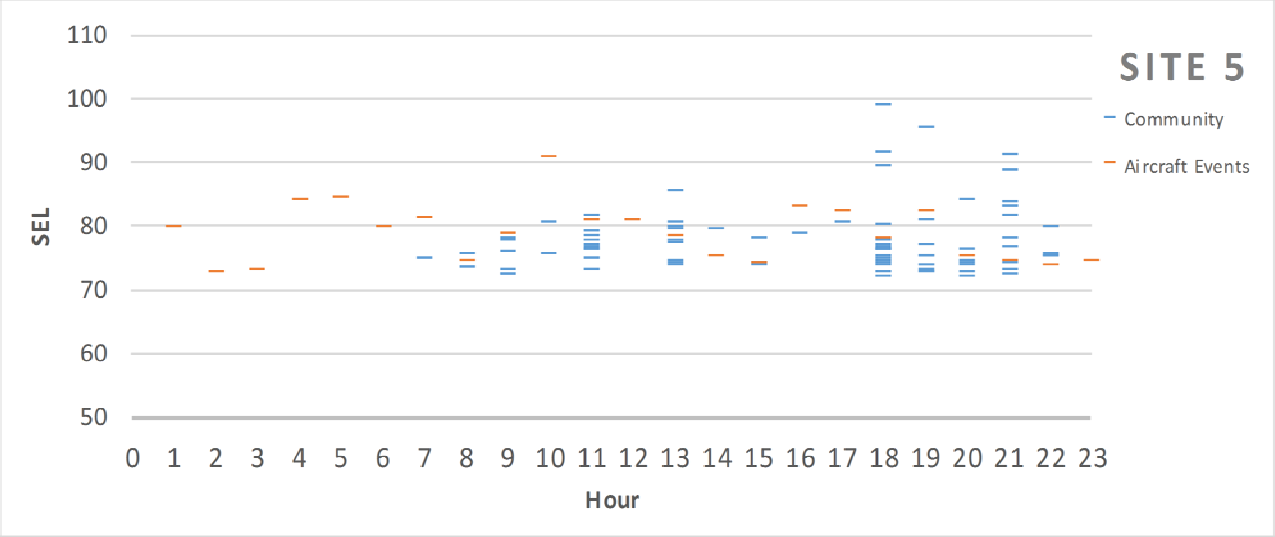


Figure 10: Hourly Distribution of Noise Events (SEL) — Cont'd
7/11/2019-7/17/2019





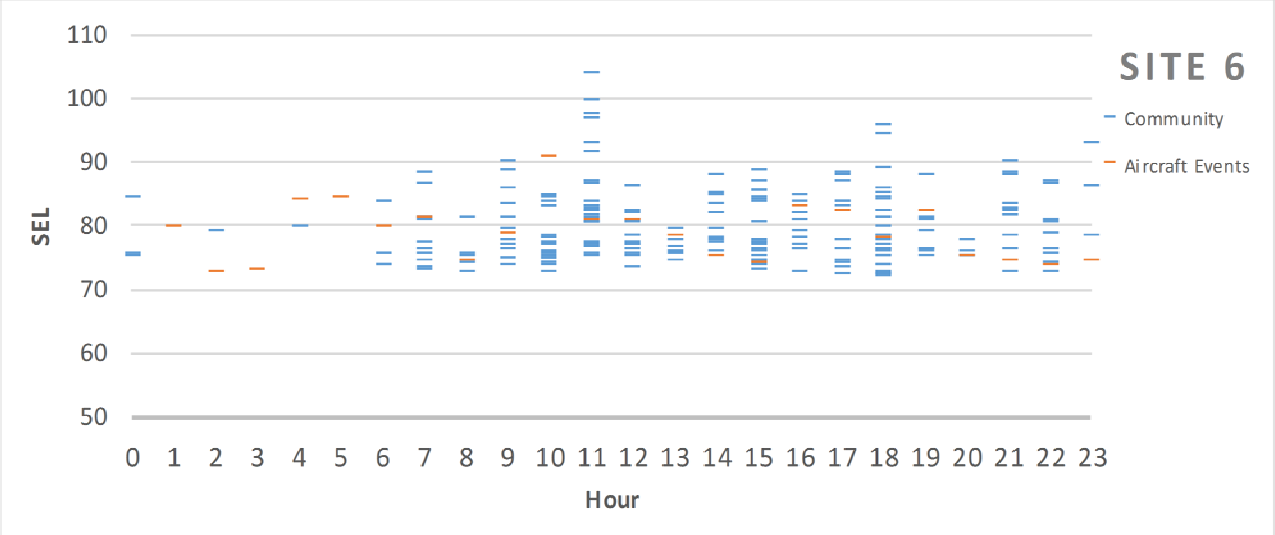
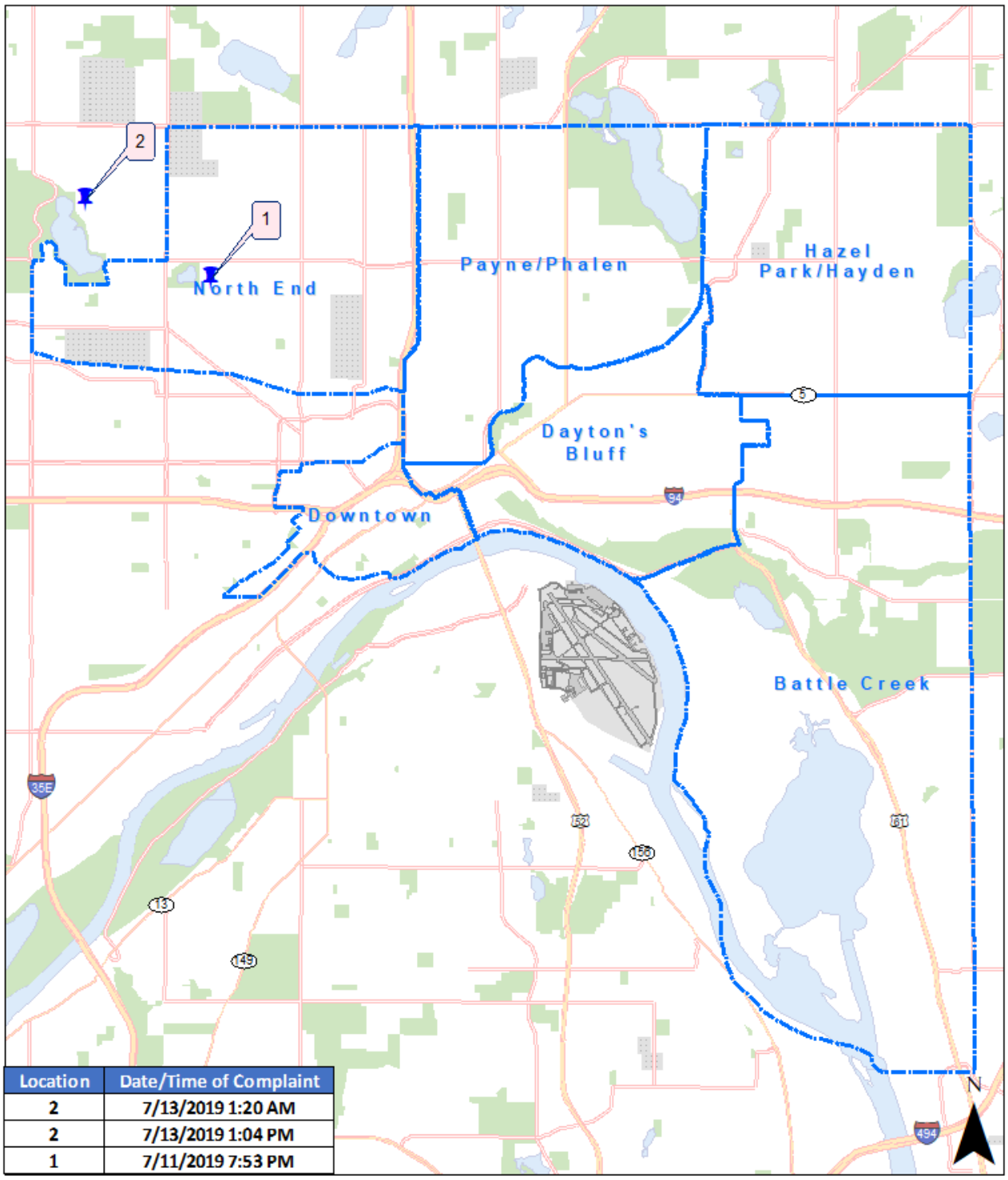


Figure 11: STP Aircraft Noise Complaint Locations during STP Study Period 7/11/2019-7/17/2019



Location	Date/Time of Complaint
2	7/13/2019 1:20 AM
2	7/13/2019 1:04 PM
1	7/11/2019 7:53 PM

Legend
2019 STP Complaint Locations
St. Paul Districts Represented on the DAAC

STP Aircraft Noise Complaint Locations
During Study Period
July 11-17, 2019

0 0.5 1 1.5 2 Miles

Source: MACNOMS

4.0 Glossary of Terms

A-weighted Sound level

The sound level obtained by the use of A-weighting. Unit: dB. Unit symbol: dBA. A-weighting significantly de-emphasizes sound at low and high frequencies and is most commonly used when evaluating environmental sound to account for human sensitivity.

Background Sound Level

Background sound level is a metric used to express a baseline sound level for any given location excluding extraneous sound events. We are using the L90 statistical method to estimate the background sound level.

Decibel (dB)

Decibel is a unit of measurement for sound and noise. dBA is used when sounds and noises are measured using an A-weighted scale (see A-weighted sound level definition above).

DNL (Day-Night Average Sound Level)

Day-night average sound level, used to describe the cumulative or total sound exposure during a period of time. DNL is an energy level averaged over a 24-hour period, with a 10 dBA penalty for sound events occurring between 10:00 p.m. and 7:00 a.m.

- **Aircraft DNL** - DNL for aircraft sound and noise events only
- **Community DNL** - DNL for community sounds and noises only (everything but STP aircraft events in this Study)

FAA (Federal Aviation Administration)

The federal agency that is responsible for the safe and efficient movement of aircraft through the National Airspace System. The FAA has broad legislative authority to create and enforce Federal Aviation Regulations.

FAR Part 150

Federal Aviation Regulations 14 CFR Part 150, Airport Noise Compatibility Planning.

LA_{eq} (Equivalent Sound Level)

Equivalent sound level, the representation of a time-varying sound as an equivalent steady-state A-weighted sound level for the period or interval of interest.

LA_{max} (Maximum Sound Level on A-weighted Scale)

Maximum sound level on an A-weighted scale. Also known as the maximum level (dBA) during a particular sound event.

LA_{90} (Sound Level Exceeded 90 Percent of the Time)

The sound level exceeded 90 percent of the time. Values of LA_{90} are often used to represent

the background sound, or levels of sound that are present most of the time.

SEL (Sound Exposure Level)

Sound Exposure Level is the total sound level someone would experience if all of the sound energy occurred in one second. This allows for the comparison of sound events that have different durations.

SPL (Sound Pressure Level)

Sound Pressure Level is a measure of the sound pressure of a given sound source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect).

STP (St. Paul Downtown Airport)

The aeronautical abbreviation for Holman Field, which is also known as St. Paul Downtown Airport is STP. The abbreviation may also be shown as KSTP, which denotes that the airport is located in the United States.