St. Paul Downtown Airport (STP)
Annual Aircraft Noise Study
October 6–12, 2016
St. Paul Downtown Airport (STP)
Annual Aircraft Noise Study 2016

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1.0 Project Description

The 2016 St. Paul Downtown Airport (STP) Annual Aircraft Noise Study (study) reports the results of the aircraft noise data collected during October 6-12, 2016 that is associated with STP runway operations and complaints received during the data collection period.

Aircraft noise events were documented from six separate noise monitoring locations beginning at 12:00 a.m. on Thursday, October 6 and continuing through 11:59 p.m. on Wednesday, October 12.

The airspace throughout the twin cities metropolitan area accommodates aircraft operating to and from numerous airports and heliports; however, aircraft noise events recorded at the noise data collection locations during the 2016 study period were excluded from this study if the aircraft did not arrive or depart at STP. In other words, this study reports aircraft noise events only for aircraft operating at STP. This monitoring project was conducted by the Metropolitan Airports Commission (MAC) Noise Program Office.

1.1 Instrumentation

Each site consists of laboratory-quality noise monitoring instrumentation manufactured by Larson Davis Incorporated (LD) and PCB. 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 used are certified and traceable to National Institute of Standards and Technology (NIST) and within specifications.

1.2 Analysis Parameters

The analyzer at each site monitored noise levels continuously utilizing slow response with A-weighting, as directed by 14 CFR Part 150. The analyzer detected an event when the sound pressure level (SPL) reached a threshold of 65 dB and recorded events when the SPL remained at or above 63 dB for four seconds or longer. Recorded events were then correlated with flight track data obtained from the MAC’s Noise and Operations Monitoring System (MACNOMS)\(^1\) to determine whether the noise source was associated with a specific aircraft operation associated with STP or a community event. Parameters used to correlate noise events and radar flight tracks included range, altitude and time.

Weather conditions affect sound measurement and propagation, therefore weather data were documented during each day of the study. A summary of these weather data may be found in Table 1 near the end of this report.

1.3 Noise Monitoring Sites

Six monitoring sites were used simultaneously to record noise events. One noise monitoring site was selected for each of the St. Paul community districts represented on the St. Paul Downtown Airport Advisory Council (DAAC). Map 1 depicts the locations for all six noise data collection sites used during the 2016 study period; these were the same locations as were used for data collection during the 2015 study period.

\(^1\)FAA Opsnet data counts may be different from MACNOMS data counts
Photos of each site are provided in Figure 1. All sites were inspected before the data collection commenced and each site was found to be acceptable for this monitoring project. Noise levels and weather data were recorded in accordance with normal monitoring practices. During the study period, site inspections were conducted daily except on the weekend days. None of the sites experienced damage or data loss during the monitoring project.

1.4 DNL Noise Metric

The Day-Night Average Sound Level (DNL) metric is utilized by the Federal Aviation Administration (FAA) to assess aircraft noise impact. The DNL is a cumulative measure of noise exposure during a 24-hour day with a 10 dB penalty added to noise events occurring between the hours of 10:00 p.m. and 7:00 a.m. Aircraft DNL reflects only aircraft events, while community DNL reflects everything except aircraft events.

Aircraft noise is generally considered by the FAA to be significant when levels reach an annual DNL (cumulative measure of 365 days) of 65 dB or greater. An annual aircraft DNL at or above 65 dB is considered by the FAA to be incompatible with residential areas and other noise sensitive land uses. DNL noise contours are not part of this an-
Figure 1: Noise Data Collection Site Location Photos
10/6/2016 - 10/12/2016

Site 1
Prescott Street & Mt. Hope Drive

Site 2
Kellogg Park

Site 3
Jenks Avenue & Bradley Street

Site 4
Indian Mounds Park

Site 5
Skyway Drive & Henry Park

Site 6
Abell Street & Jessamine Avenue
Annual noise study; however, noise contours are generated with the software developed by the FAA and calculated using historical aircraft operations data as a normal process within the STP Long Term Comprehensive Planning (LTCP) Update. Preparation of the 2035 STP LTCP Update will begin in 2017.

2.0 Summary of Results

STP flight activity was greater during the 2016 study period than during the 2015 study period. Figure 2 details the number of STP aircraft arrivals and departures between October 6-12, and shows a break out of activity that occurred during the nighttime hours of 10 p.m.-7 a.m. There were a total of 341 arrivals and 335 departures at STP during the 2016 study period, which represents approximately a 11 percent increase in arrivals and 6 percent increase in departures compared to the 2015 study period. During the nighttime hours, there were 30 arrivals and 34 departures during the 2016 study period, which represents a 50 percent increase in arrivals and 100 percent increase in departures over the 2015 study period.

Charts 1 and 2 show a daily and hourly summary of STP operations during the study period. The highest use of STP occurred on October 9, 2016 with a total of 116 arrivals and departures. The hours that netted the highest volume of aircraft operating at STP during the study period were 2-4 p.m. with a combined total of 191 operations during those hours.

During the 2016 study period there were a total of 359 aircraft noise events recorded above 65 dB. Figure 3 details the number of aircraft noise events that exceeded 65 dB, 80 dB, 90 dB, and 100 dB.

The number of aircraft arrival events exceeding 65 dB during the study period in 2016 ranged from four at Site 2 and 64 at Site 6. Aircraft departure noise events exceeding 65 dB during the 2016 study period ranged from 13 events at Site 1 to 129 at Site 4. Figure 4 provides a list of the top ten aircraft noise events at each site, and Figure 5 shows the flight tracks associated with the STP during the study period.

Figures 6-8 summarize aircraft and community noise data collected during the study period. Based on the aircraft activity and associated noise, the data collected during the 2016 noise study period show daily average aircraft noise levels from operations associated with STP do not meet the FAA’s 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.

Chart 3 provides a comparison of events recorded in the 2016 Noise Study compared with studies conducted since 2007.

There were no aircraft noise complaints associated with STP flight operations during the 2016 study period.
Figure 2: Runway Use
10/6/2016 - 10/12/2016

<table>
<thead>
<tr>
<th>Arrivals</th>
<th>Nighttime Operations (10 p.m. - 7:00 a.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway</td>
<td>Count</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
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<td>14</td>
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<td>27</td>
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<td>32</td>
<td>164</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>Total Arrivals</td>
<td>341</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Departures</th>
<th>Nighttime Departures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway</td>
<td>Count</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>145</td>
</tr>
<tr>
<td>27</td>
<td>8</td>
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<tr>
<td>31</td>
<td>12</td>
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<tr>
<td>32</td>
<td>160</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
</tr>
<tr>
<td>Total Departures</td>
<td>335</td>
</tr>
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</table>

Total Operations: 676
Total Nighttime Operations: 64

Note: Sum of runway use % may not equal 100% due to rounding.
Figure 3: Aircraft Noise Events  
10/6/2016 - 10/12/2016

**Arrival-Related Events**

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>&gt;=65dB LA_{max}</th>
<th>&gt;=80dB LA_{max}</th>
<th>&gt;=90dB LA_{max}</th>
<th>&gt;=100dB LA_{max}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prescott Street and Mt. Hope Drive</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>2</td>
<td>Kellogg Park</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Jenks Avenue and Bradley Street</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Indian Mounds Park</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Skyway Drive and Henry Park</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Abell Street and Jessamine Avenue</td>
<td>64</td>
<td>5</td>
<td>0</td>
<td>0</td>
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<td></td>
<td><strong>Total Arrival Noise Events</strong></td>
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<td><strong>0</strong></td>
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**Departure-Related Events**

<table>
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<th>Site</th>
<th>Location</th>
<th>&gt;=65dB LA_{max}</th>
<th>&gt;=80dB LA_{max}</th>
<th>&gt;=90dB LA_{max}</th>
<th>&gt;=100dB LA_{max}</th>
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</thead>
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<td>1</td>
<td>Prescott Street and Mt. Hope Drive</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Kellogg Park</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Jenks Avenue and Bradley Street</td>
<td>38</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Indian Mounds Park</td>
<td>129</td>
<td>6</td>
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<td>0</td>
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<tr>
<td>5</td>
<td>Skyway Drive and Henry Park</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>6</td>
<td>Abell Street and Jessamine Avenue</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total Departure Noise Events</strong></td>
<td><strong>254</strong></td>
<td><strong>10</strong></td>
<td><strong>1</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>
Note: The sum of operations per day may not equal runway use totals due to operations that extend from one day to next.

Note: The sum of operations per hour may not equal runway use totals due to operations that extend across multiple hours or into the next day.
### Figure 4: Top 10 Loudest Aircraft Noise Events
10/6/2016 - 10/12/2016

#### Site 1 - Prescott Street & Mt. Hope Drive

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Flight Number</th>
<th>Aircraft Type</th>
<th>Arr/Dep</th>
<th>Runway</th>
<th>LA&lt;sub&gt;max&lt;/sub&gt; (dB)</th>
<th>Duration (seconds)</th>
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<td>Unknown</td>
<td>D</td>
<td>27</td>
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<td>13</td>
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<tr>
<td>10/11/2016 19:50</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>74.8</td>
<td>25</td>
</tr>
<tr>
<td>10/12/2016 14:18</td>
<td>N76AZ</td>
<td>C208</td>
<td>A</td>
<td>32</td>
<td>74.1</td>
<td>7</td>
</tr>
<tr>
<td>10/11/2016 11:59</td>
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<td>Unknown</td>
<td>A</td>
<td>14</td>
<td>74.0</td>
<td>20</td>
</tr>
<tr>
<td>10/7/2016 20:50</td>
<td>N549CP</td>
<td>GLF5</td>
<td>A</td>
<td>32</td>
<td>73.9</td>
<td>10</td>
</tr>
<tr>
<td>10/7/2016 8:55</td>
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<td>Unknown</td>
<td>D</td>
<td>27</td>
<td>73.8</td>
<td>11</td>
</tr>
<tr>
<td>10/11/2016 19:53</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>73.7</td>
<td>23</td>
</tr>
<tr>
<td>10/5/2016 16:46</td>
<td>EJA873</td>
<td>H25B</td>
<td>A</td>
<td>32</td>
<td>72.9</td>
<td>12</td>
</tr>
<tr>
<td>10/5/2016 19:50</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>71.7</td>
<td>15</td>
</tr>
<tr>
<td>10/11/2016 20:02</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>70.4</td>
<td>16</td>
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#### Site 2 - Kellogg Park

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<th>Arr/Dep</th>
<th>Runway</th>
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<th>Duration (seconds)</th>
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<tbody>
<tr>
<td>10/10/2016 14:05</td>
<td>Unknown</td>
<td>HELO</td>
<td>D</td>
<td>14</td>
<td>80.0</td>
<td>23</td>
</tr>
<tr>
<td>10/5/2016 15:25</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>9</td>
<td>77.7</td>
<td>41</td>
</tr>
<tr>
<td>10/7/2016 14:11</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>31</td>
<td>75.5</td>
<td>19</td>
</tr>
<tr>
<td>10/7/2016 13:18</td>
<td>N55MN</td>
<td>BE9L</td>
<td>A</td>
<td>32</td>
<td>74.3</td>
<td>9</td>
</tr>
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<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>72.3</td>
<td>10</td>
</tr>
<tr>
<td>10/5/2016 15:22</td>
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<td>Unknown</td>
<td>D</td>
<td>9</td>
<td>72.2</td>
<td>14</td>
</tr>
<tr>
<td>10/5/2016 20:52</td>
<td>Unknown</td>
<td>Unknown</td>
<td>D</td>
<td>32</td>
<td>71.7</td>
<td>16</td>
</tr>
<tr>
<td>10/12/2016 20:08</td>
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<td>Unknown</td>
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<td>32</td>
<td>71.1</td>
<td>24</td>
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<td>HELO</td>
<td>A</td>
<td>14</td>
<td>70.9</td>
<td>19</td>
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#### Site 3 - Jenks Avenue & Bradley Street

<table>
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<tr>
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<th>Runway</th>
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<th>Duration (seconds)</th>
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<tbody>
<tr>
<td>10/12/2016 15:03</td>
<td>N650CH</td>
<td>C650</td>
<td>D</td>
<td>32</td>
<td>85.4</td>
<td>26</td>
</tr>
<tr>
<td>10/7/2016 15:57</td>
<td>CGPCZ</td>
<td>AEST</td>
<td>D</td>
<td>32</td>
<td>83.2</td>
<td>14</td>
</tr>
<tr>
<td>10/8/2016 15:47</td>
<td>N411SC</td>
<td>BE40</td>
<td>D</td>
<td>32</td>
<td>79.9</td>
<td>22</td>
</tr>
<tr>
<td>10/11/2016 19:54</td>
<td>N741VR</td>
<td>H25B</td>
<td>D</td>
<td>32</td>
<td>79.3</td>
<td>16</td>
</tr>
<tr>
<td>10/5/2016 15:01</td>
<td>N20H</td>
<td>C680</td>
<td>D</td>
<td>32</td>
<td>78.6</td>
<td>11</td>
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<td>10/12/2016 12:46</td>
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<td>D</td>
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<td>10/6/2016 17:08</td>
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<tr>
<td>10/5/2016 13:58</td>
<td>N83M</td>
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<td>13</td>
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<td>Unknown</td>
<td>A</td>
<td>13</td>
<td>74.4</td>
<td>12</td>
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### Site 4 - Indian Mounds Park

<table>
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<tr>
<th>Date/Time</th>
<th>Flight Number</th>
<th>Aircraft Type</th>
<th>Arr/Dep</th>
<th>Runway</th>
<th>( L_{A_{\text{max}}} ) (dB)</th>
<th>Duration (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/7/2016 20:01</td>
<td>N115SP</td>
<td>SR22</td>
<td>D</td>
<td>32</td>
<td>84.6</td>
<td>15</td>
</tr>
<tr>
<td>10/7/2016 9:37</td>
<td>N6563K</td>
<td>BE9L</td>
<td>D</td>
<td>32</td>
<td>84.1</td>
<td>16</td>
</tr>
<tr>
<td>10/7/2016 18:09</td>
<td>N115SP</td>
<td>SR22</td>
<td>D</td>
<td>32</td>
<td>83.5</td>
<td>21</td>
</tr>
<tr>
<td>10/6/2016 22:30</td>
<td>N86MJ</td>
<td>PA46</td>
<td>D</td>
<td>32</td>
<td>82.2</td>
<td>15</td>
</tr>
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</table>

### Site 5 - Skyway Drive & Henry Park

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<thead>
<tr>
<th>Date/Time</th>
<th>Flight Number</th>
<th>Aircraft Type</th>
<th>Arr/Dep</th>
<th>Runway</th>
<th>( L_{A_{\text{max}}} ) (dB)</th>
<th>Duration (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/10/2016 7:47</td>
<td>N549CP</td>
<td>GLF5</td>
<td>D</td>
<td>14</td>
<td>79.3</td>
<td>11</td>
</tr>
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<td>10/9/2016 17:07</td>
<td>N478DR</td>
<td>BE40</td>
<td>D</td>
<td>14</td>
<td>78.6</td>
<td>19</td>
</tr>
<tr>
<td>10/9/2016 15:06</td>
<td>N370EL</td>
<td>CL30</td>
<td>D</td>
<td>14</td>
<td>77.7</td>
<td>14</td>
</tr>
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<td>10/11/2016 12:07</td>
<td>N598DR</td>
<td>BE40</td>
<td>D</td>
<td>14</td>
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### Site 6 - Abell Street & Jessamine Avenue

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Flight Number</th>
<th>Aircraft Type</th>
<th>Arr/Dep</th>
<th>Runway</th>
<th>( L_{A_{\text{max}}} ) (dB)</th>
<th>Duration (seconds)</th>
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</thead>
<tbody>
<tr>
<td>10/8/2016 13:10</td>
<td>LN100KB</td>
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<td>14</td>
<td>81.4</td>
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<td>10/9/2016 9:46</td>
<td>CGKXS</td>
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<td>14</td>
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<td>10/9/2016 11:28</td>
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<td>14</td>
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Figure 5: Flight Tracks for STP Study Period
10/6/2016 - 10/12/2016
Figure 6: Aircraft and Community DNL by Site
10/6/2016 - 10/12/2016
Figure 7: Average Background Noise Levels
10/6/2016 - 10/12/2016
Figure 8: Hourly Distribution of Noise Events
10/6/2016 - 10/12/2016
Figure 8: Hourly Distribution of Noise Events (Continued)
10/6/2016 - 10/12/2016
# Table 1: Weather Observations
*(10/6/2016 - 10/12/2016)*

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<th>Temp. (°F)</th>
<th>Dew Point (°F)</th>
<th>Humidity (%)</th>
<th>Sea Level Press. (in)</th>
<th>Visibility (mi)</th>
<th>Wind (mph)</th>
<th>Precip. (in)</th>
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Rain
3.0 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 noise at low and high frequencies and is most commonly used when evaluating environmental noise to account for human sensitivity.

**Background Noise Level**

Total hourly LA_{eq} minus aircraft noise events (Community Hourly LA_{eq}). The overall sound level of a given environment that excludes the sound source of interest.

**Decibel (dB)**

Decibel is a unit of measurement for sound.

**DNL**

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

- **Aircraft DNL** - DNL for aircraft noise events only
- **Community DNL** - DNL for community noise events only (everything but aircraft events)

**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**


**LA_{eq}**

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.

**INM (Integrated Noise Model)**

The Integrated Noise Model is a computer program developed and distributed by the FAA for the analysis of subsonic aircraft noise exposure around the nation's airports.
**LD 824 Noise Analyzer**

A noise monitoring instrument manufactured by Larson Davis that is used for the measurement of sound levels, with standard frequency weighting and standard, exponentially-weighted time averaging. A general purpose microphone (LD 2541) and preamplifier (PRM 902) operate with the noise analyzer to measure sound levels over wide temperature and humidity ranges.

$\text{LA}_{\text{max}}$

Maximum Sound Level, the maximum sound level (dB) during a particular noise event.

$\text{L}_{\text{A}90}$

The noise level exceeded 90% of the time. Values of $L_{90}$ are often used to represent the background noise, or noise that is 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 noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect).

**STP**

The aeronautical abbreviation for Holman Field, which is also known as St. Paul Downtown Airport.