ACR Recommendations Analyses and Requests:

-Clarification of Expanded Grid Size
-Clarification of lack of Downwind Rails Depicted to the North as they are to the South for N70 Analysis
-Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

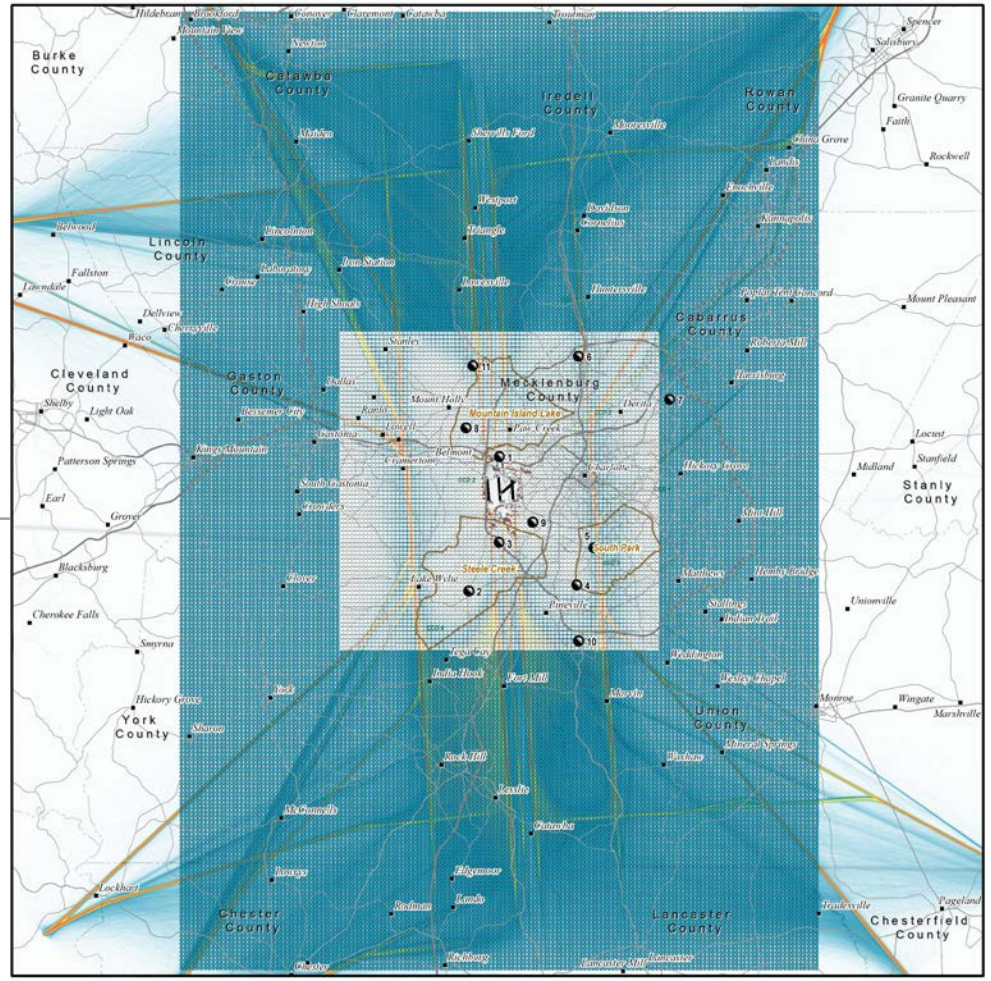
For ACR Review, Understanding, and Discussion

January 15, 2020

ACR Clarification: Expanded Grid Size

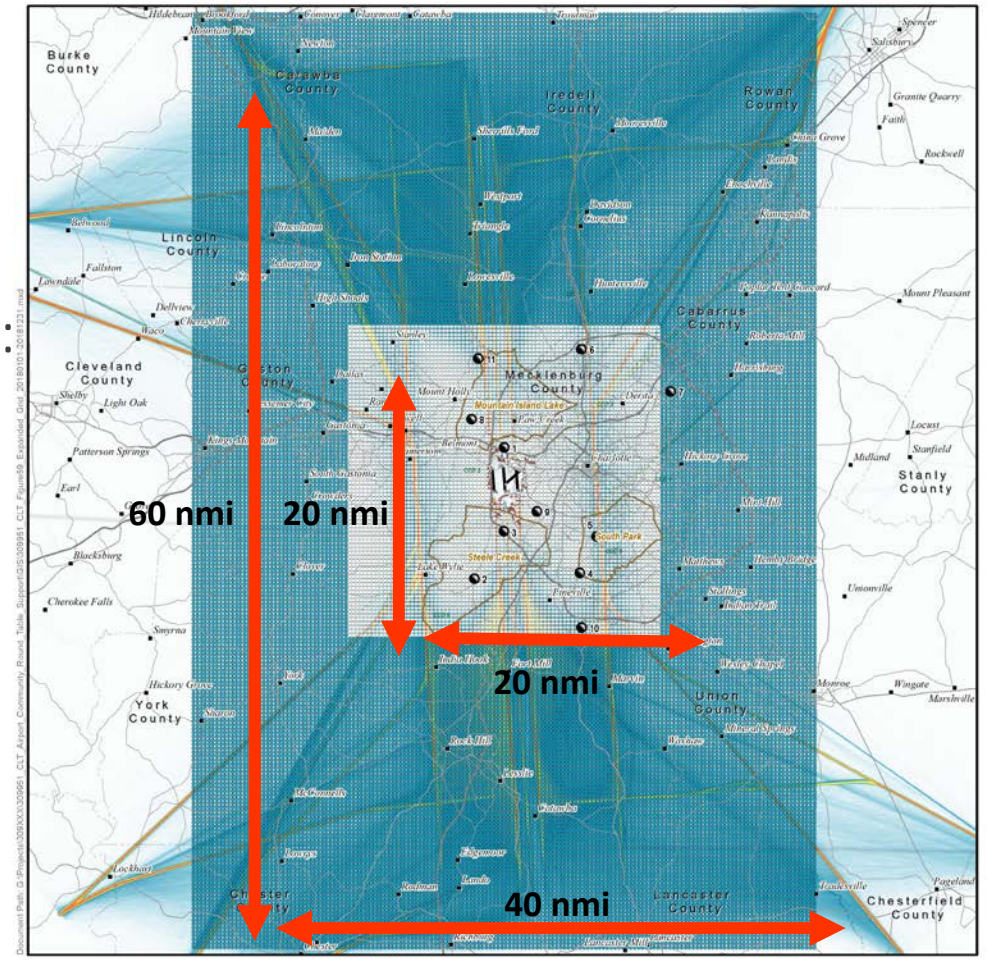
Request of the ACR at the

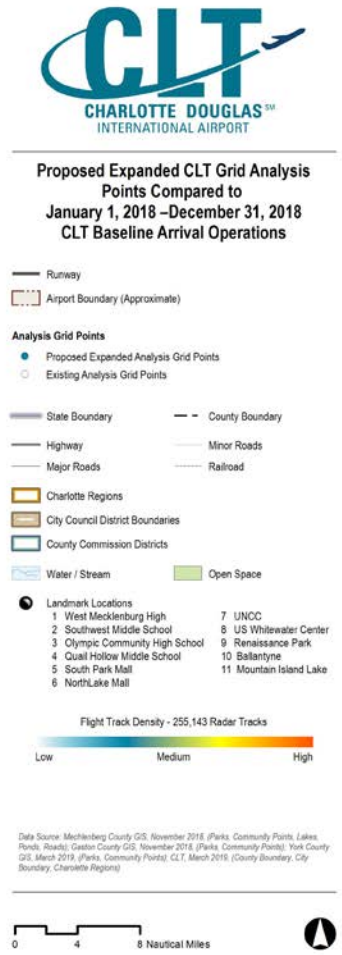
December 2019 ACR meeting



ACR Clarification: Expanded Grid Size

- ACR requested the specific dimensions of the expanded grid compared to original analysis grid:
  - Original grid was a square 20 nautical miles (nmi) wide (east-west) by 20 nmi long (north-south) centered on CLT airport
    - 20 by 20 nmi
  - Expanded grid is a rectangle 40 nmi wide (east-west) by 60 nmi long (north-south) centered on CLT airport
    - 40 by 60 nmi





ACR Clarification:
Lack of Downwind Rails Depicted to the North as they are to the South for N70 Analysis

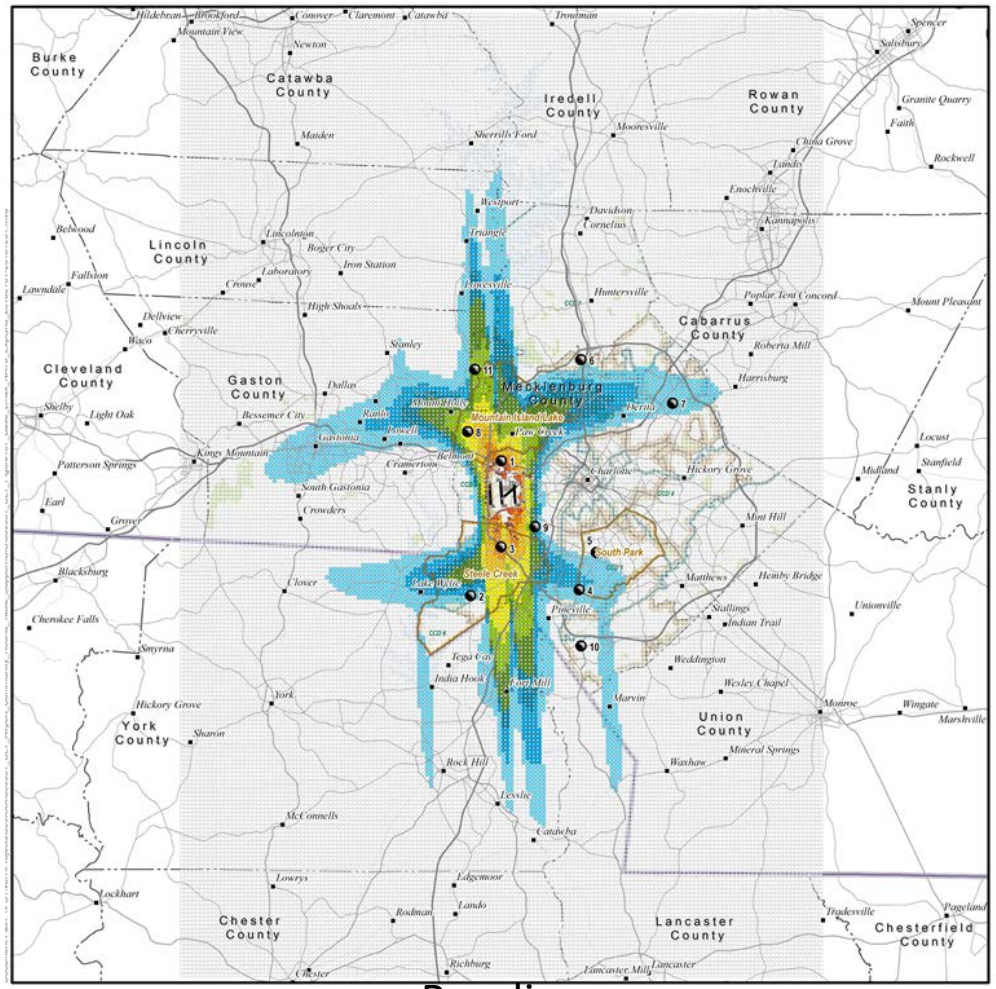
Request of the ACR at the

December 2019 ACR meeting

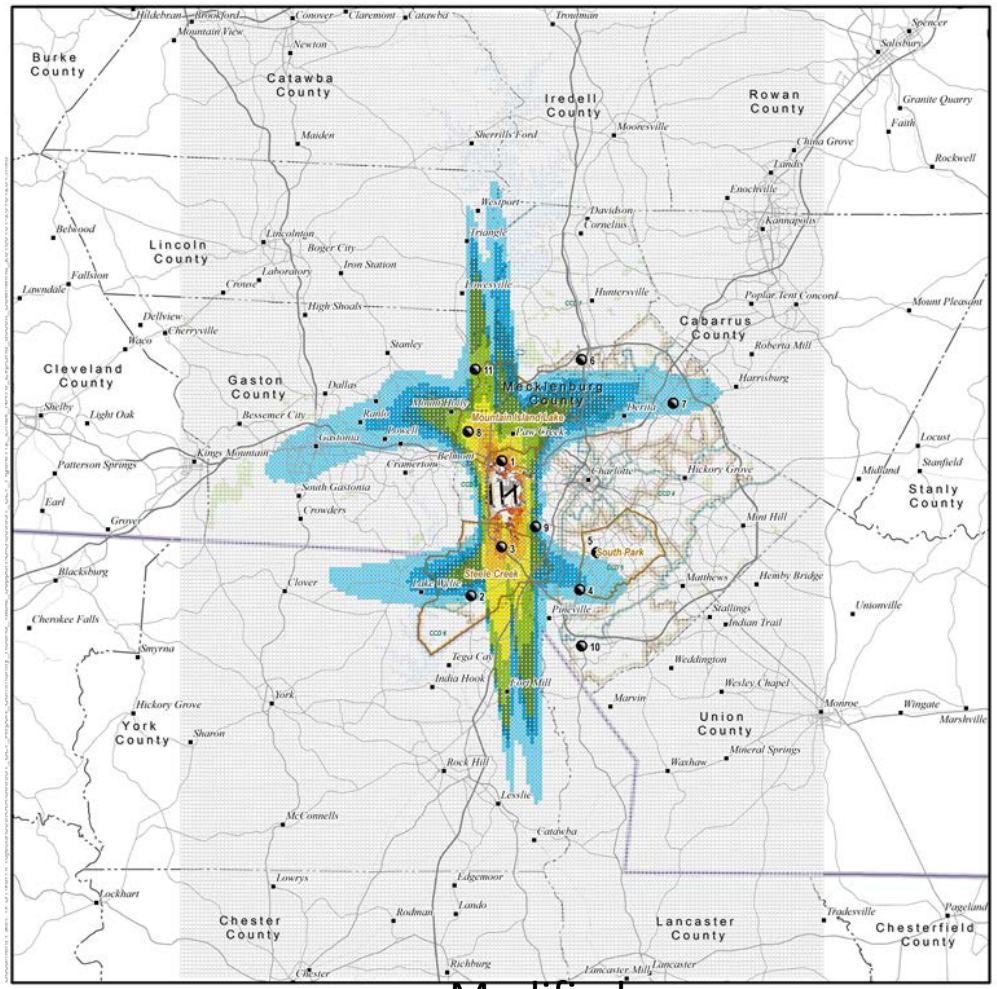
ACR Clarification:
Lack of Downwind Rails Depicted to the North as they are to the South for N70 Analysis

- HMMH presented noise and flight track analysis of increasing/maintaining arrival aircraft altitudes on the downwind of at least 6,000 feet at the December 2019 ACR meeting
- Modified calendar year 2018 aircraft arrivals so that aircraft would maintain altitudes of at least 6,000 feet on downwind based on the following:
  - North Flow:
    - 36L: 7,000 feet
    - 36C: 8,000 feet
    - 36R: 6,000 feet
  - South Flow:
    - 18L: 6,000 feet
    - 18C: 8,000 feet
    - 18R: 7,000 feet
- ACR requested clarification why number of average daily noise events above 70 dB (N70) for south flow arrivals do not seem to depict downwind rails

Number of Noise Events Above 70 dB (N70) Analysis : 2018 Operations with 6,000-foot Minimum Altitude on Downwinds Compared to Baseline

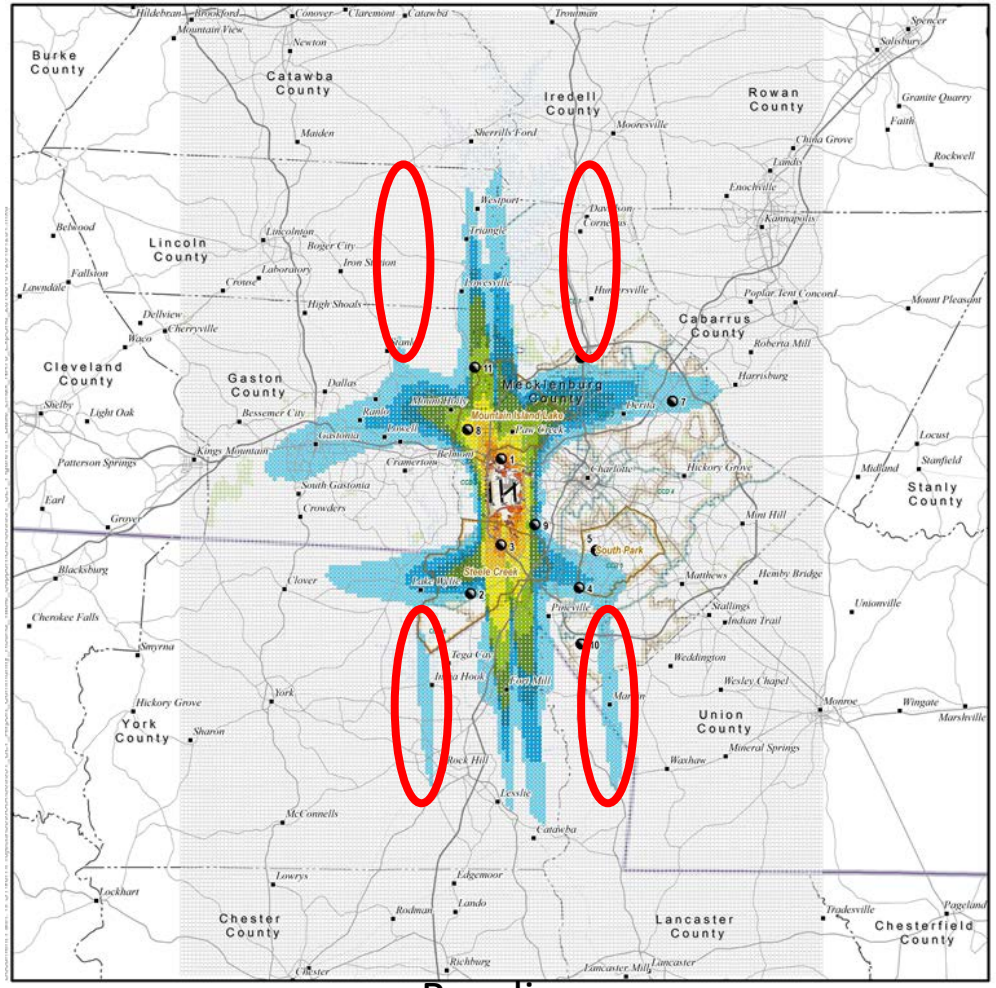


Baseline

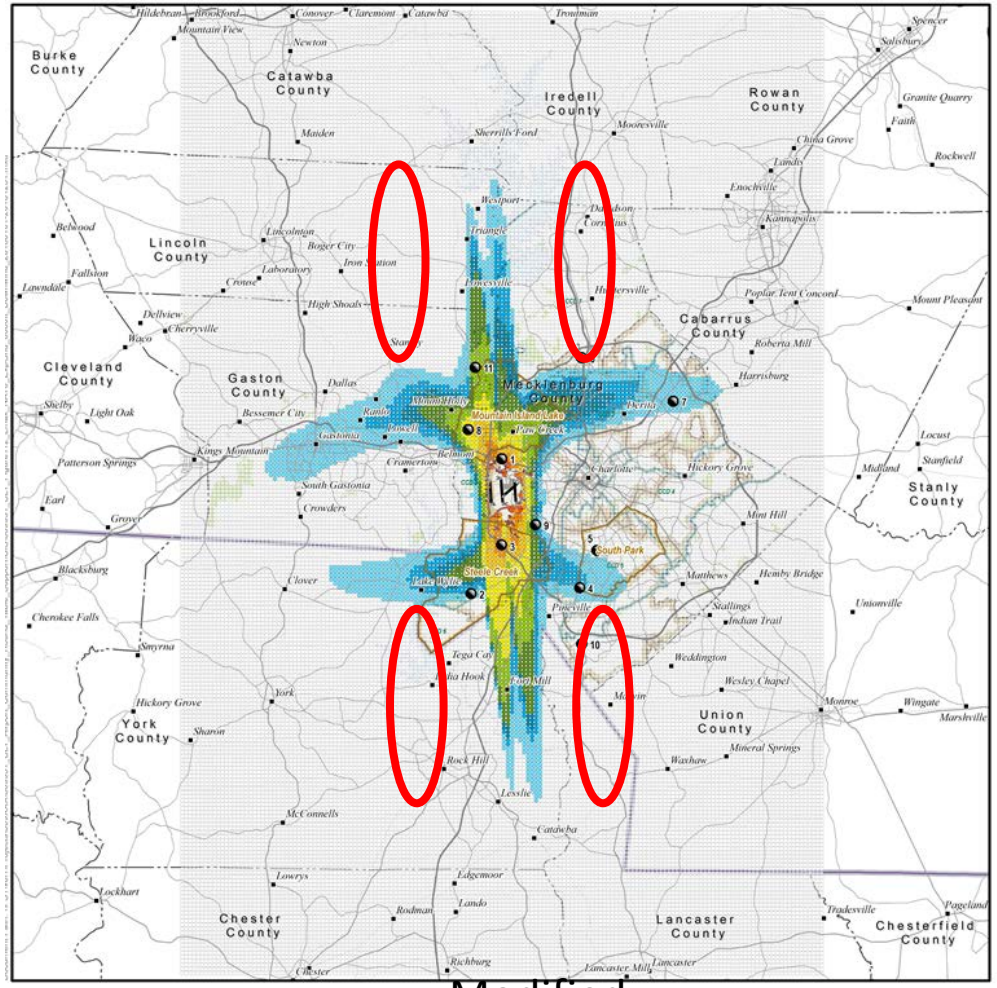


Modified

Number of Noise Events Above 70 dB (N70) Analysis : 2018 Operations with 6,000-foot Minimum Altitude on Downwinds Compared to Baseline



Baseline

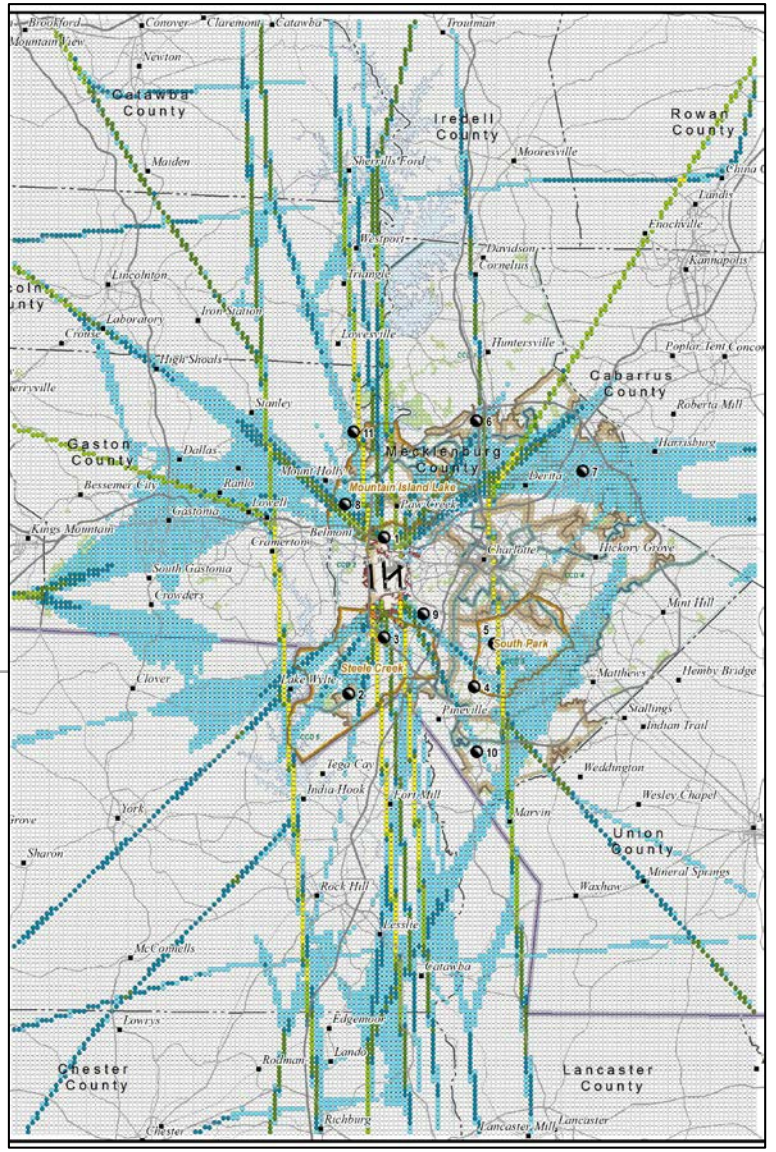


Modified

ACR Clarification:
Lack of Downwind Rails Depicted to the North as they are to the South for N70 analysis

- Downwind arrival rails were modeled for both the baseline and 6,000 foot downwind alternative for both north and south flow arrival aircraft
- Downwind arrival rails do not appear for south flow arrival aircraft (north of the airport) in the same manner as north flow (south of the airport) due to differences in arrival runway use
  - 2018 North Flow: 60.3%
    - 05: 0.1%
    - 36L: 31.2%
    - 36C: 6.1%
    - 36R: 22.9%
  - 2018 South Flow: 39.7%
    - 23: 1.8%
    - 18L: 13.0%
    - 18C: 4.2%
    - 18R: 20.6%
- Due to increased utilization of north flow, aircraft on the east and west downwinds south of the airport trigger more N70 events than aircraft on the east and west downwinds north of the airport under south flow

ACR Slate Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

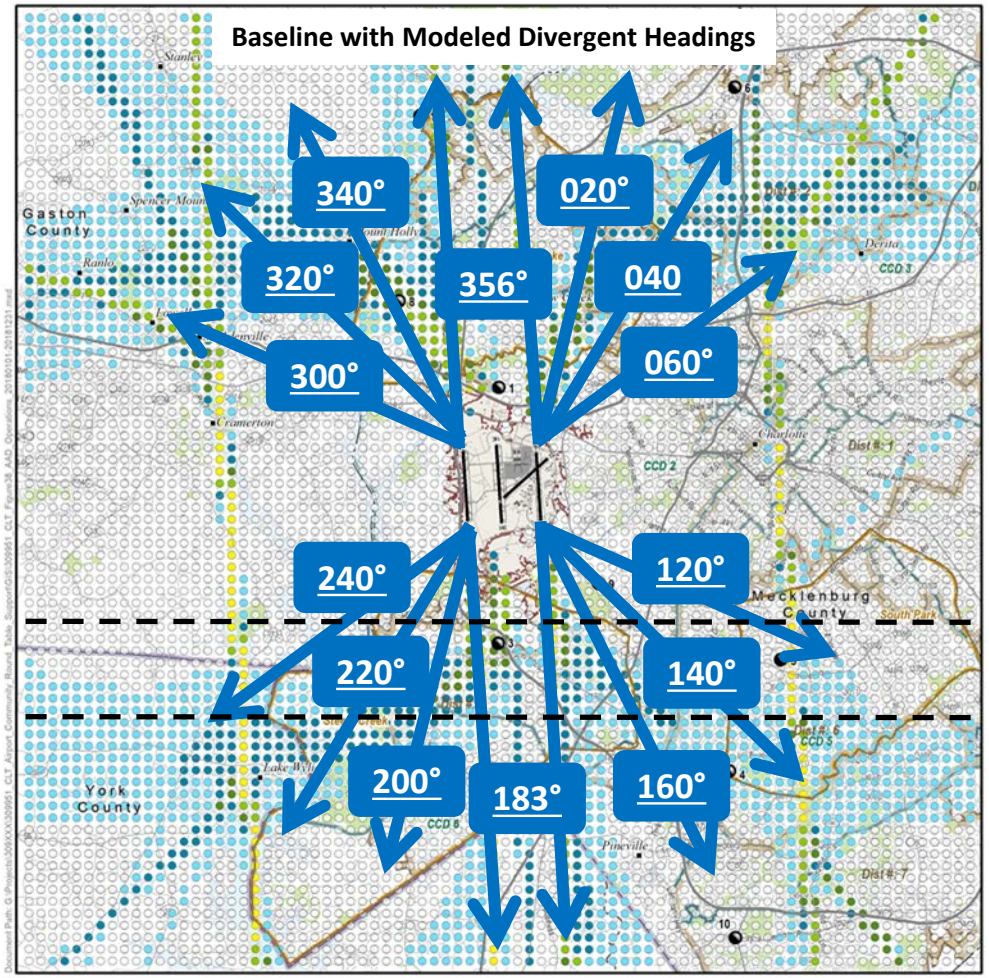


Request of the ACR at the

December 2019 ACR meeting

ACR Slate Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

- Modified calendar year 2018 operations collectively such that:
  - Aircraft would maintain altitudes of at least 6,000 feet on downwind as was presented at the December 2019 ACR meeting
  - Departure aircraft would utilize multiple divergent departure headings
  - Departure aircraft would turn prior to two-miles with elimination of the two-mile departure restriction
  - It is assumed the turn to a divergent departure heading would occur at the end of the runway under both north and south flows

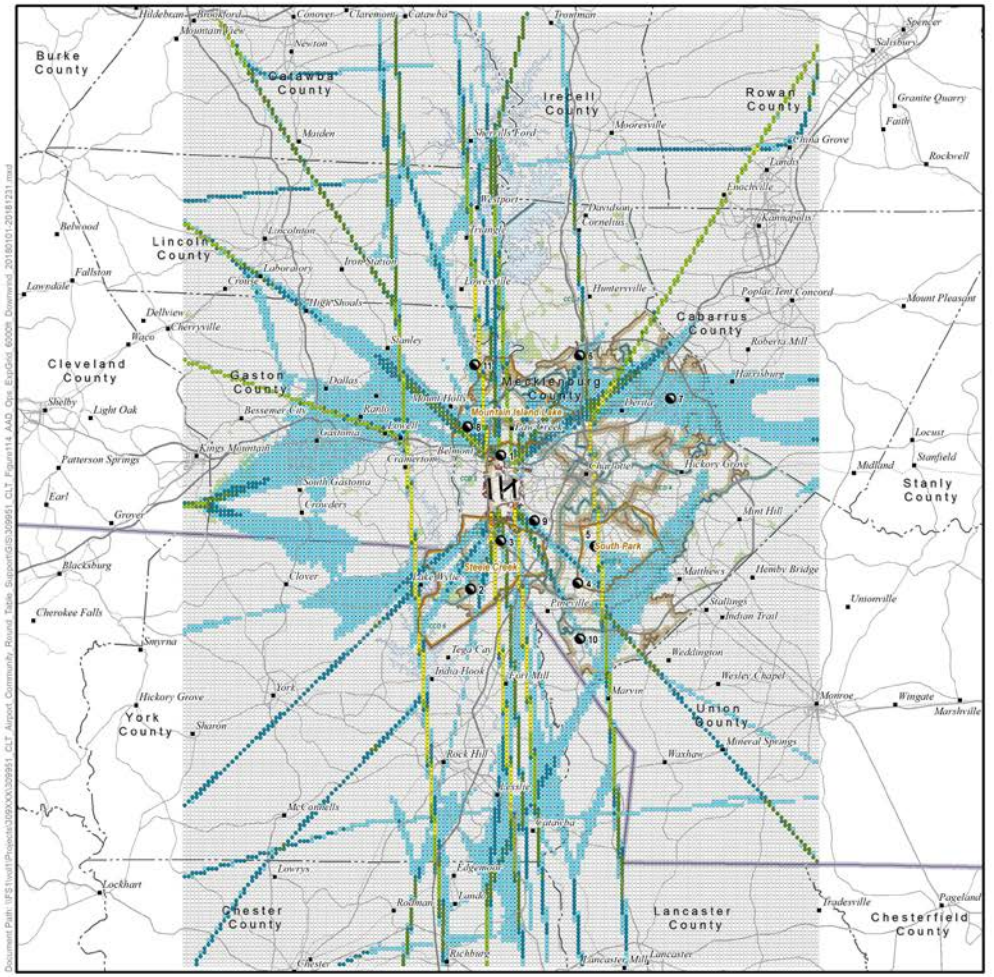


ACR Slate Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

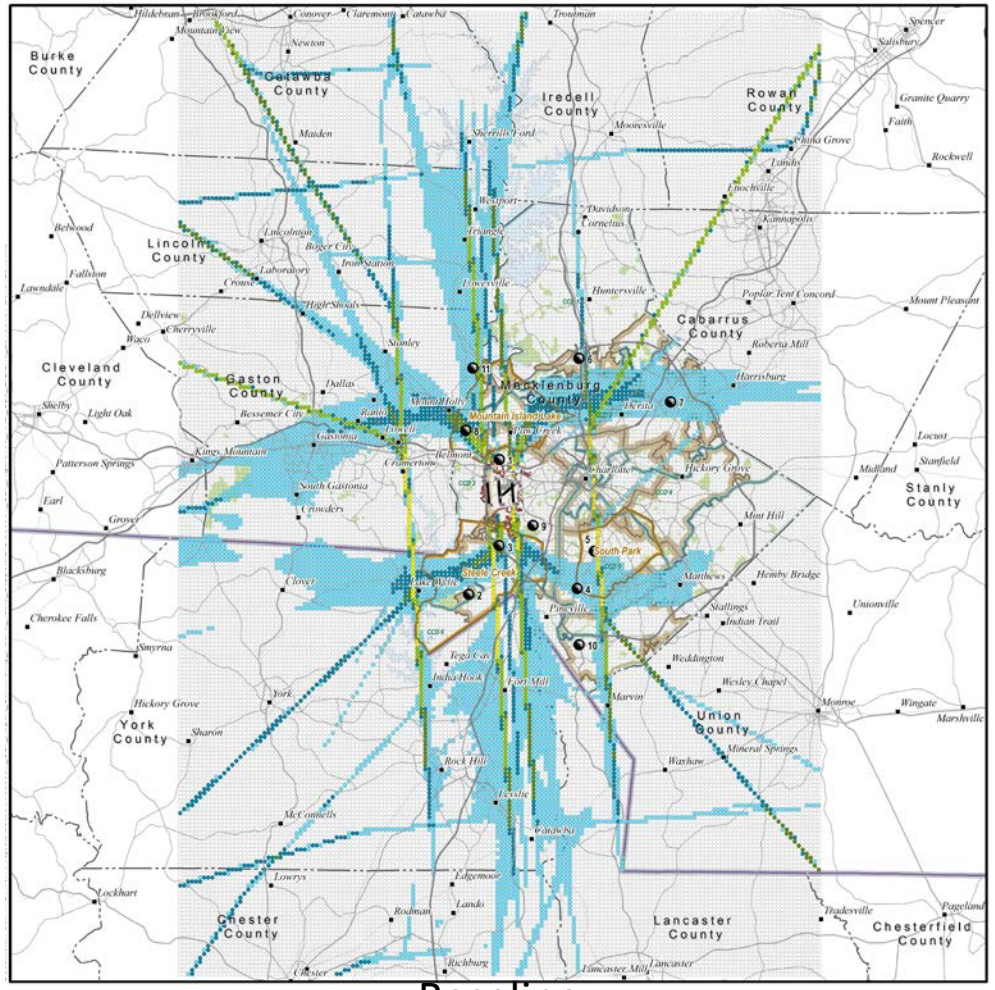
- Compared the modified collective results with the 2018 baseline results at each of the grid points (including population estimates at each grid point) in terms of:
  - Number of annual-average overflights
  - Number of average daily noise events above 70 dB (N70)
- Collective results are presented on the expanded grid and utilize updated 2017 ACS population data

Annual Average Day Aircraft Overflights Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

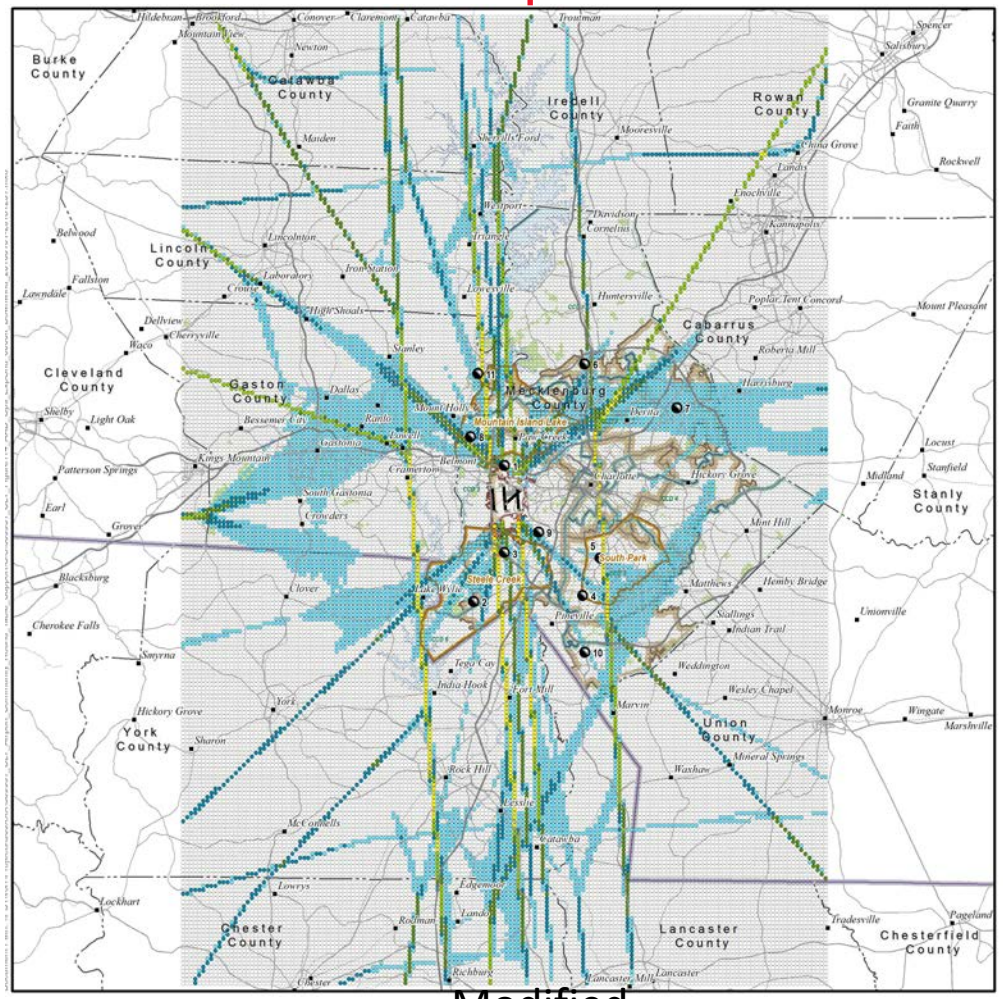
Overflight Interval (Operations)	Count of Grid Points	Count of Population
Less than 5	30,432	1,570,321
6-15	5,168	442,629
16-30	1,152	64,809
31-60	756	42,492
61-120	483	32,071
121-240	305	31,138
241-360	5	101
Greater than 360	0	0
Total	38,301	2,183,561



Annual Average Day Aircraft Overflights Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Compared to Baseline

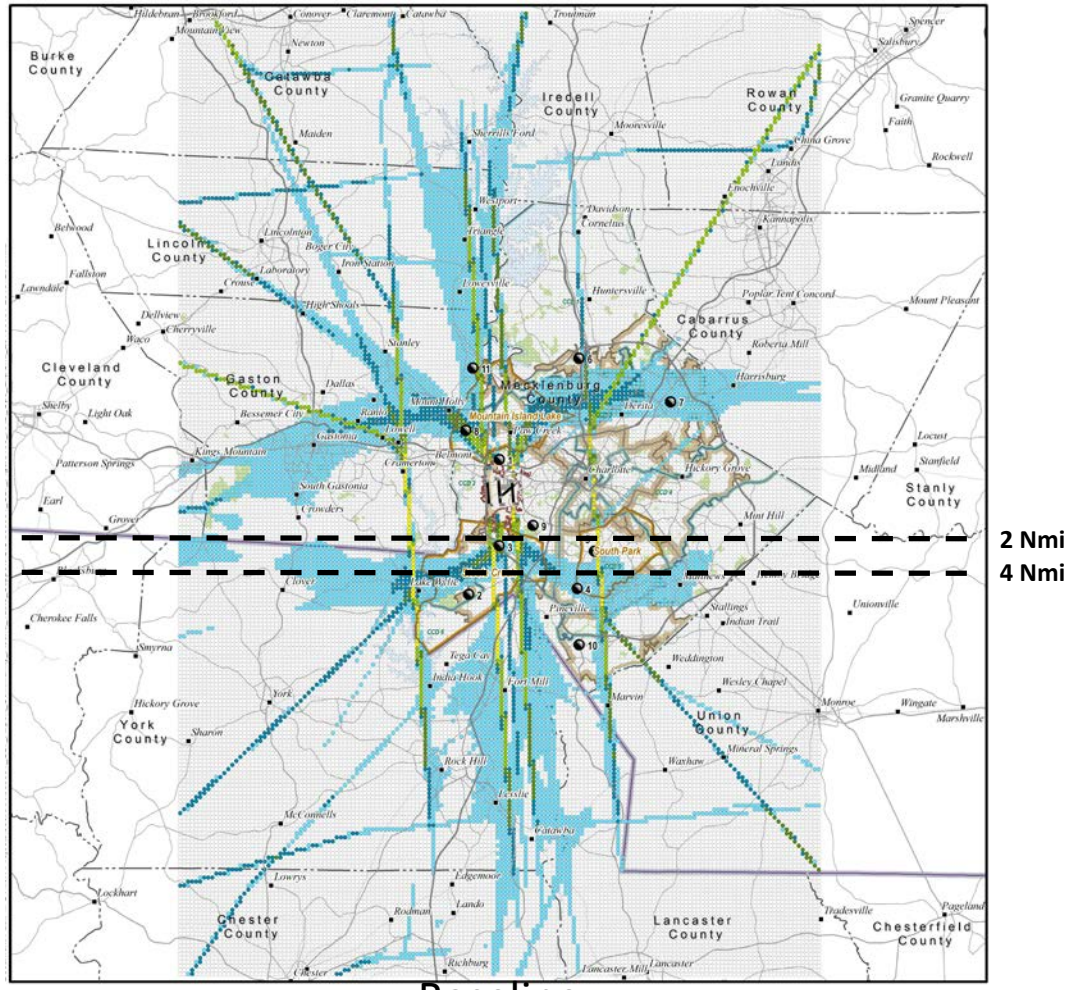


Baseline

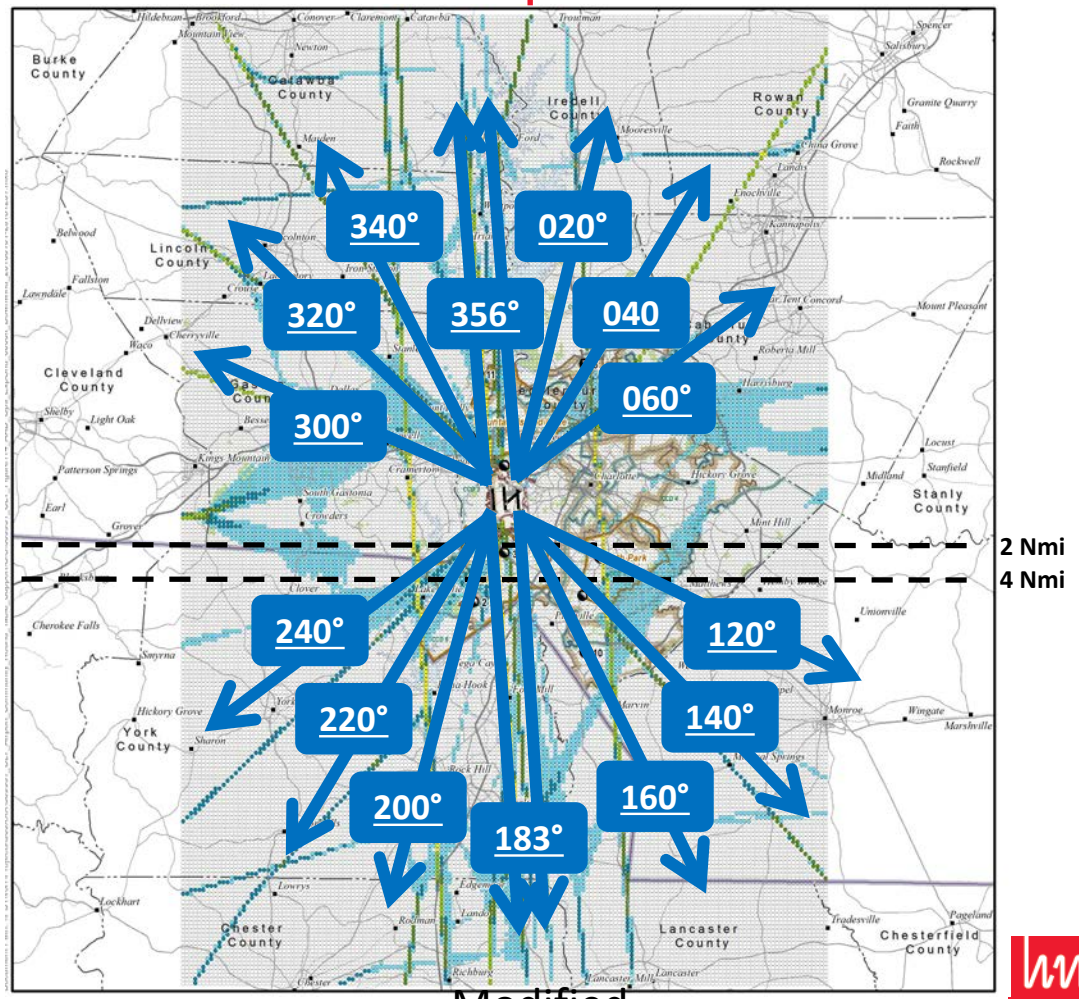


Modified

Annual Average Day Aircraft Overflights Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Compared to Baseline



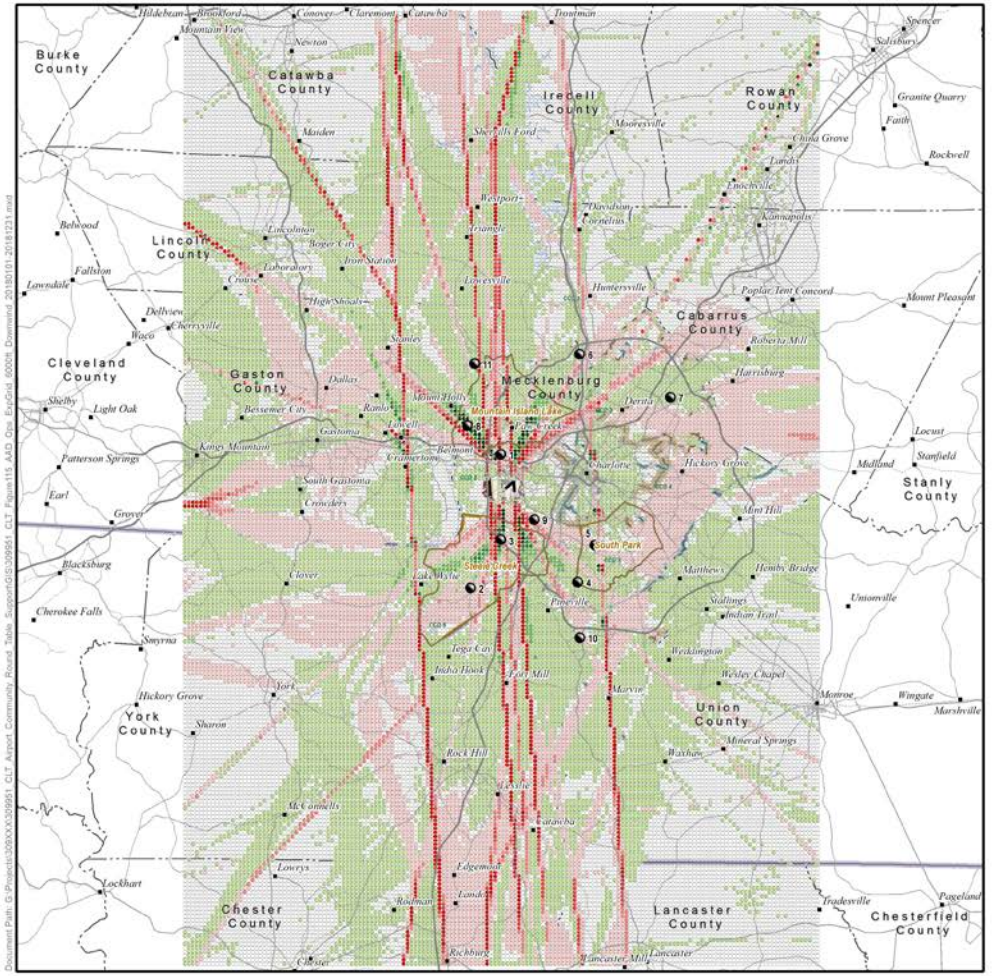
Baseline



Modified

Annual Average Day Aircraft Overflights Analysis: Difference – 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Compared to Baseline

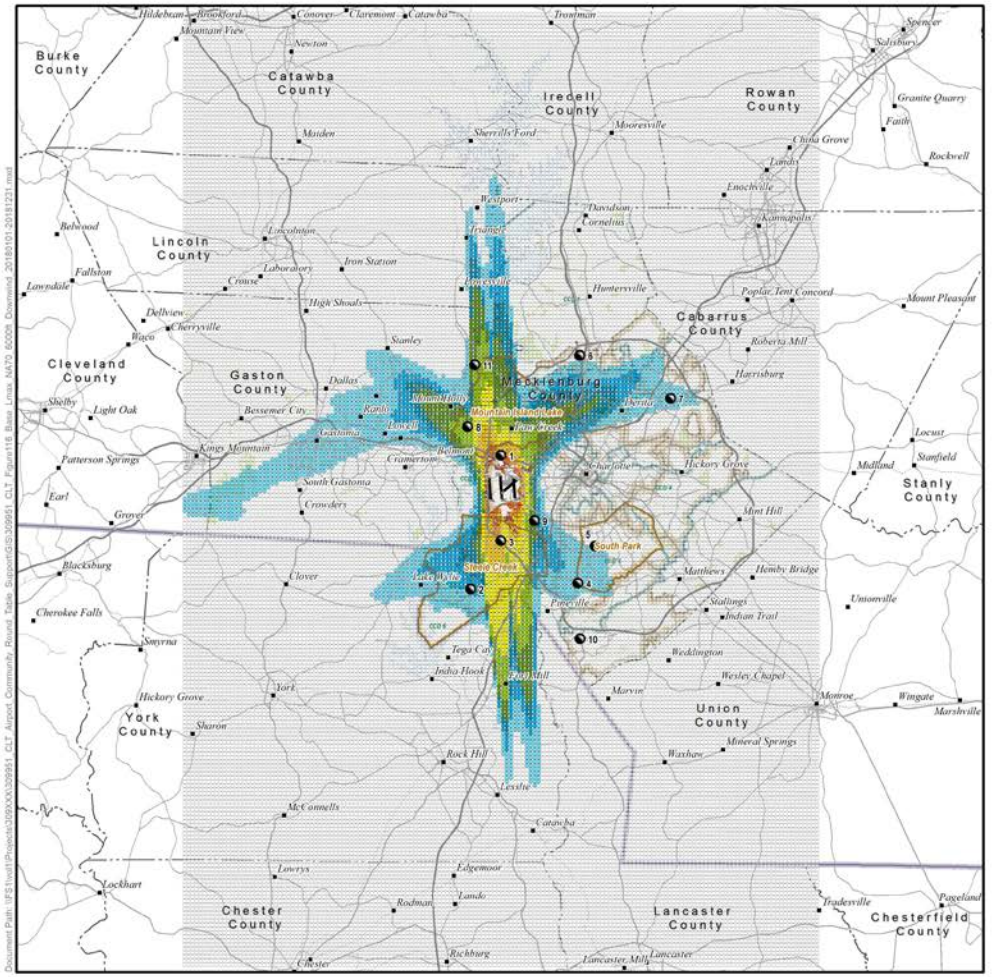
Overflight Interval (Operations)	Count of Grid Points / % Change	Count of Population / % Change
Less than -30	68 / 0.2%	6,562 / 0.3%
-30 to -20	62 / 0.2%	7,957 / 0.4%
-20 to -10	250 / 0.7%	26,442 / 1.2%
-10 to -1	6,594 / 17.2%	432,762 / 19.8%
-1 to 1	22,495 / 58.7%	1,098,337 / 50.3%
1 to 10	6,809 / 17.8%	483,442 / 22.1%
10 to 20	873 / 2.3%	63,565 / 2.9%
20 to 30	445 / 1.2%	23,446 / 1.1%
Greater Than 30	705 / 1.8%	41,048 / 1.9%
Total	38,301 / 100.0%	2,183,561 / 100.0%



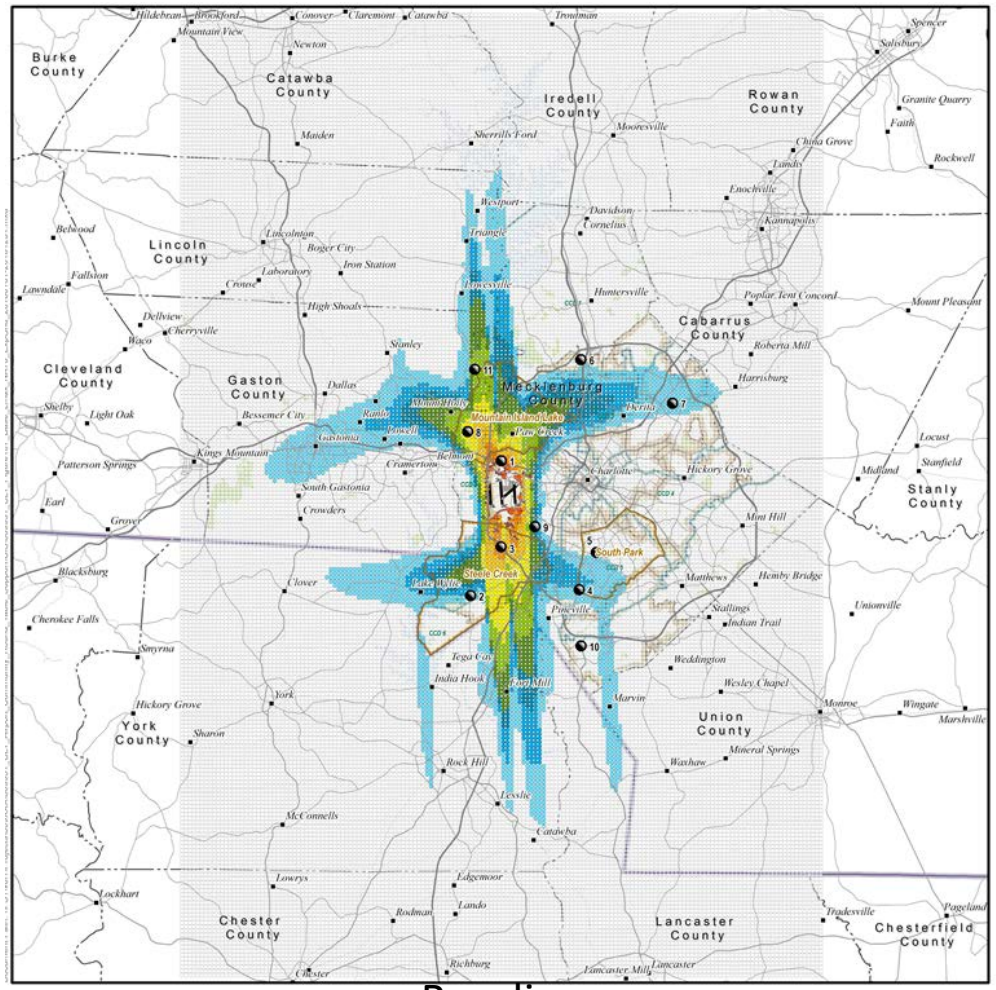
- **6,974 Grid points (18.3%) / 473,723 people (21.7%) would experience reduced numbers of overflights with collective measures**
- **8,832 Grid points (23.1%) / 611,501 people (28.0%) would experience increased numbers of overflights with collective measures**

Number of Noise Events Above 70 dB (N70) Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction

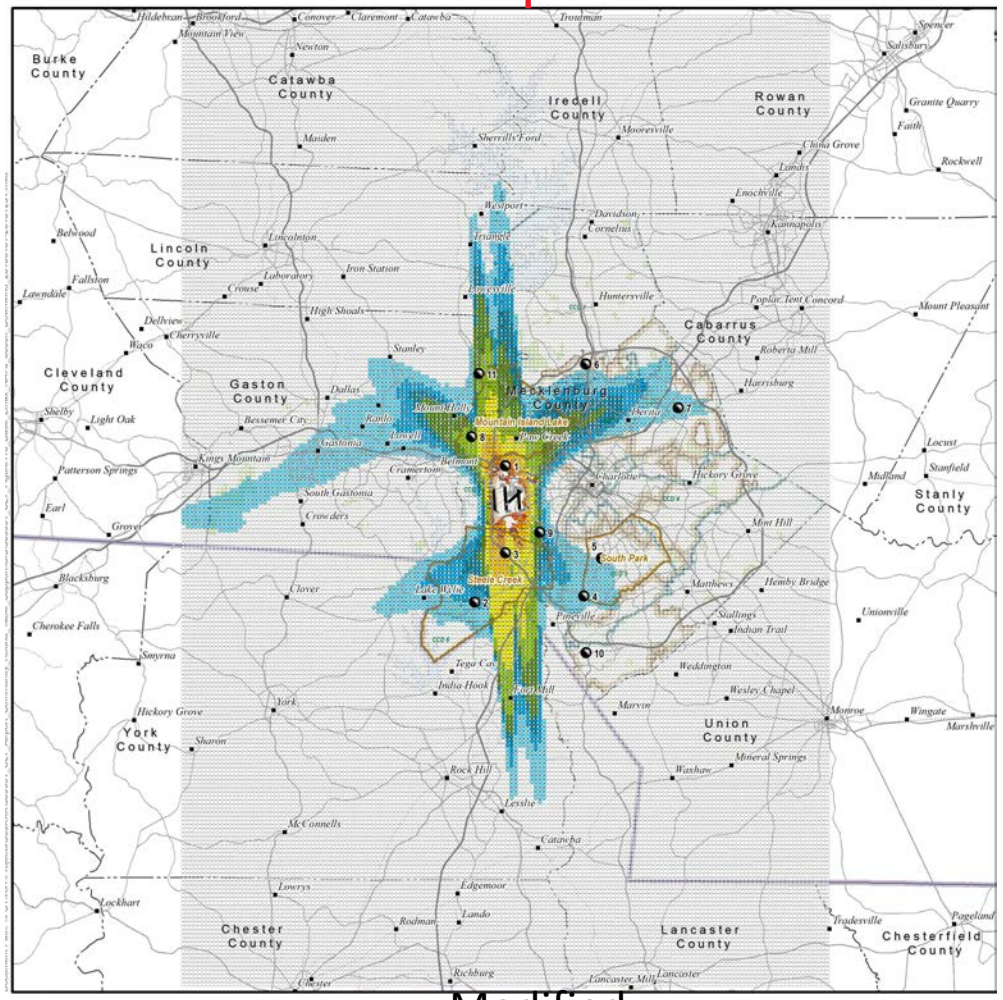
N70 Interval (Events)	Count of Grid Points	Count of Population
25 or Less	34,209	1,729,806
26-50	1,883	211,562
51-75	600	74,502
76-100	390	39,407
101-150	457	47,905
151-200	280	29,651
201-300	288	36,380
301-400	134	11,730
401-500	44	2,133
Greater than 500	16	557
Total	38,301	2,183,561



Number of Noise Events Above 70 dB (N70) Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Compared to Baseline



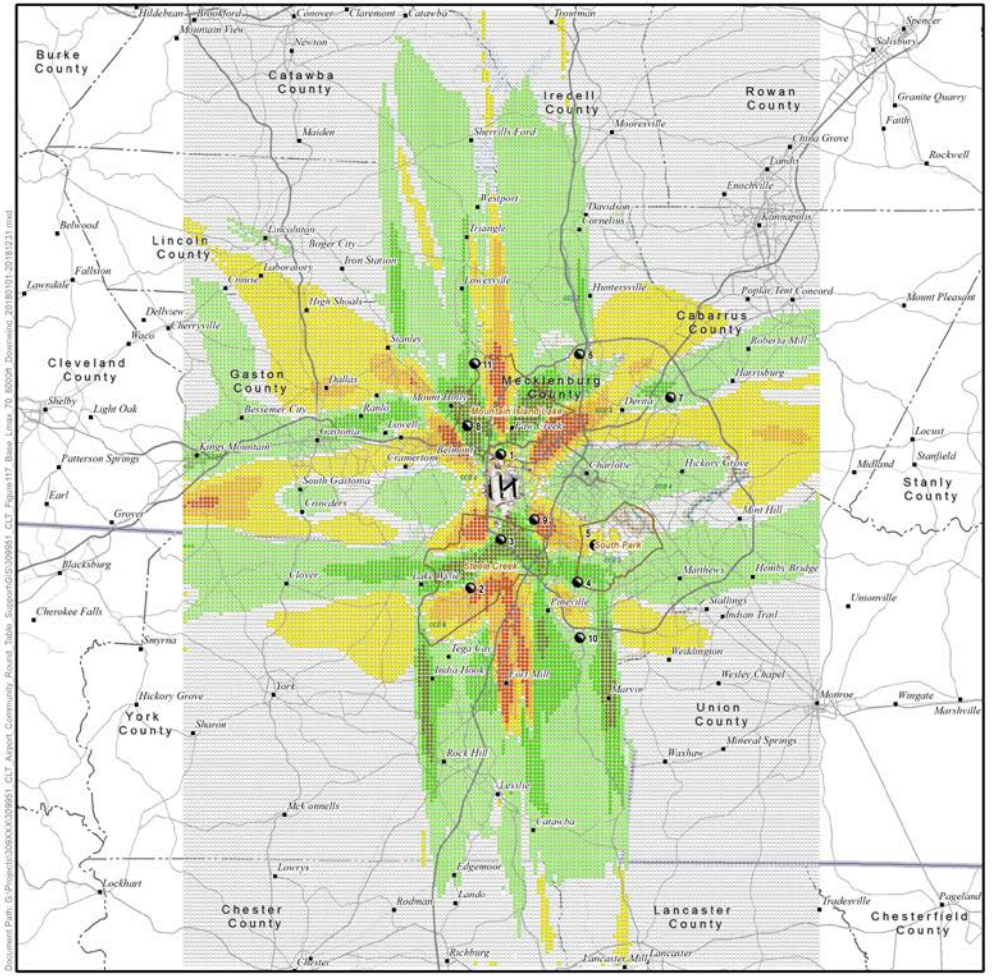
Baseline



Modified

Number of Noise Events Above 70 dB (N70) Collective Analysis: Difference – 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Compared to Baseline

N70 Difference Interval (Events)	Count of Grid Points / % Change	Count of Population / % Change
Less than -75	25 / 0.1%	2,202 / 0.1%
-75 to -25	500 / 1.3%	61,270 / 2.8%
-25 to -10	1,612 / 4.2%	159,492 / 7.3%
-10 to -1	8,940 / 23.3%	722,487/ 33.1%
-1 to 1	21,217 / 55.4%	760,617 / 34.8%
1 to 10	4,547 / 11.9%	336,472 / 15.4%
10 to 25	1,000 / 2.6%	85,677 / 3.9%
25 to 75	460 / 1.2%	55,344 / 2.5%
Greater than 75	0 / 0.0%	0 / 0.0%
Total	38,301 / 100.0%	2,183,561 / 100.0%



- **11,077 Grid points (28.9%) / 945,451 people (43.3%) would experience fewer events above 70 dB Lmax with collective measures**
- **6,007 Grid points (15.7%) / 477,493 people (21.8%) would experience more events above 70 dB Lmax with collective measures**

ACR Slate Recommendation Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Observations

- Number of average daily overflights:
  - A greater number of grid points and people experienced an increase than decrease
- Number of noise events greater than 70 dB (N70)
  - A greater number of grid points and more people experienced a decrease than an increase
- Maintaining a minimum altitude of 6,000 feet on the downwind continues to provide the greatest benefits for areas north and south of the airport between the extended runway centerlines and downwind, and disbenefit for areas north and south on runway centerline further away from the airport
- Multiple divergent departure headings without the two-mile restriction provide greatest benefits for areas north and south of the airport where aircraft turn today, and disbenefit for areas close to the airport east and west of the extended runway centerlines as well as north and south of the airport on the extended runway centerlines further from the airport

ACR Slate Recommendation Collective Analysis: 6,000-foot Minimum Altitude on Downwinds, Divergent Departure Headings, and Removing the Two-mile Restriction Observations

- Potential noise increases in the central as well as eastern and western portions of the grid, and potential noise reduction elsewhere in the grid for the community of Mountain Island Lake
- Potential noise increases in the northern portions of the grid, and potential noise reduction in the southern portion of the grid for the community of South Park
- Potential noise increases in the northern and southern portions of the grid, and noise reductions in the central portions of the grid for the community of Steele Creek
- 6,000 foot downwinds may negatively effect arrival operations throughput due to reduced flexibility to vector aircraft close to the airport and the potential, on average, to increase flight miles
- Divergent departure headings may positively effect departure operations throughput due to departure aircraft achieving divergence sooner

Discussion