APPENDIX D:

NOISE ANALYSIS

MEMORANDUM

TO:	Jason Gamache & Matt VanGoethem, MCG Explore Design
	Theresa Dutchuk, Dowl
FROM	Joshua Dunham & Erik Miller-Klein, Tenor Engineering
DATE:	June 7, 2022
PROJECT:	Alaska Cargo and Cold Storage
SUBJECT:	FAA Area Equivalent Method Acoustical Compliance Analysis

This memorandum is a summary of our Area Equivalent Method (AEM) noise analysis, as prescribed in FAA Order 1050.1F Desk Reference section 11.1.3 "FAA Aircraft Noise Screening Tools and Methodologies," for the Alaska Cargo and Cold Storage at Ted Stevens Anchorage International Airport (ANC) in Anchorage, Alaska.

Relevant FAA Criteria & Procedure

An Area Equivalent Method (AEM) analysis was performed using the AEM 2c SP2 Microsoft Excel tool available on the FAA website. The following language from FAA Order 1050.1F Desk Reference section 11.1.3 indicates when this screening tool is to be used:

> *"For use in evaluating proposed actions and alternative(s) at an airport which result in a general overall increase in daily aircraft operations or the use of larger/noisier aircraft, as long as there are no changes in ground tracks, flight profiles or runway use. If the AEM calculations indicate that the action would result in less than a 17 percent (approximately a DNL 1 dB) increase in the DNL 65 dB contour area, there would be no significant impact over noise sensitive areas and no further noise analysis would be required. If the AEM calculations indicate an increase of 17 percent or more, or if the action is such that use of the AEM is not appropriate, then the noise analysis must be performed using the Aviation Environmental Design Tool (AEDT) to determine if significant noise impacts would result."*

A user's guide for the AEM 2c SP2 Microsoft Excel tool is also available on the FAA website. It is worth noting the following language from the user's guide document:

> *"Whether an AEM-proposed screening analysis is appropriate depends upon the changes under study in the airport vicinity. AEM use is limited to changes in fleet mix and number of operations. It cannot be used to evaluate new procedures, alternative track load, or any other changes to airspace structure or utilization that would alter the location of aircraft flights, corresponding noise, and the general shape of the contour."*

AEM Analysis Methods

The AEM analysis requires per-day landing and takeoff data (LTO) during daytime operation (7 am to 10 pm*) and nighttime operation (10 pm to 7 am*), separated out by aircraft type. Annual LTO data is available that was forecasted for the year 2020 in Table D9 of the December 2015 report entitled *Ted Stevens Anchorage International Airport FAR Part 150 Noise Compatibility Study Update.* Refer to Appendix A for this data.

This annual data is divided by 365.25 days/year to obtain daily data by aircraft. This daily data is entered into the AEM 2c SP2 Microsoft Excel tool for both *Base Case* and *Alternative Case*. All data was assumed to be Daytime LTO cycles since no further information appears to be available regarding nighttime operations and the cargo operations associated with the Alaska Cargo and Cold Storage operations are predicted to align with the normal daytime and nighttime averages. The only change made to the *Alternative Case* is the addition of 18 daily LTOs for the additional aircraft type: 747-8. Refer to Appendix B to see the inputs used in the AEM 2c SP2 Microsoft Excel tool. If a more accurate daytime and nighttime accounting are needed, then a full accounting of average daytime and nighttime flights and aircraft are necessary.

*Refer to pg C39 of *Ted Stevens Anchorage International Airport FAR Part 150 Noise Compatibility Study Update.*

AEM Analysis Results

The AEM analysis indicates that the suggested action will result in a 5.2% increase in the DNL 65 dB contour area; this is well below the 17% threshold (see Appendix B, outlined in purple). Therefore, per FAA Order 1050.1F Desk Reference section 11.1.3, there will be no significant impact over noise sensitive areas, and no further noise analysis is required.

However, while the FAA screening method does not trigger the need for a further AEDT analysis, this highly simplified metric does NOT guarantee that the proposed changes will not cause noise impacts to the adjacent properties to the west and northwest of the proposed cargo operation center.

It is worth noting the following:

1. The user guide indicates that the AEM calculation *"is limited to changes in fleet mix and number of operations. It cannot be used to evaluate new procedures… or any other changes".* In this case, the additional aircraft represent a change in the number of operations, but primarily considers the flight impact and not specifically the proposed changes for ground operations and taxiing.
2. B206L and R22 Helicopters and S70 military aircraft included in the forecasted LTO data are not listed as options in the AEM 2c SP2 Microsoft Excel tool and were therefore excluded from both the *Base Case* and *Alternative Case*. It is expected that since the percentage of aircraft is relative between the two cases, this exclusion should not impact the results. These are highlighted in yellow in Appendix A.

Conclusion

Per FAA Order 1050.1F Desk Reference section 11.1.3 "FAA Aircraft Noise Screening Tools and Methodologies," a detailed analysis using AEDT is not required. If additional noise impacts are desired please contact our office to complete either a detailed AEDT or CadnaA noise model analysis of the ground operations to the nearest portions of the community above and beyond FAA requirements.

Please contact us with any questions or additional coordination.

All the best,

JOSHUA DUNHAM
ACOUSTICAL CONSULTANT

ERIK MILLER-KLEIN, PE, INCE BOARD CERTIFIED
PRINCIPAL OF ACOUSTICAL ENGINEERING

tenor Elevating acoustical design.
206.899.5450 / OFFICE
888.978.3667 / TOLL-FREE
JOSHUA.D@TENOR-ENG.COM
ERIK.MK@TENOR-ENG.COM

Appendix A: Annual LTO Data at ANC

Table D9
OPERATIONS BY AIRCRAFT CATEGORY – 2009, 2020, 2030

Typical Aircraft	Annual Operations		
	2009	2020	2030
Air Carrier Jet			
DC1010	457	593	0
MD11GE	12,549	16,260	0
737400	15,698	0	0
737700	2,188	2,835	10,216
737800	13,297	37,568	41,985
747200	4,537	0	0
747400	27,321	41,273	46,125
757300	959	1,243	1,389
767300	2,929	3,795	4,241
777300	455	589	19,493
737N17	4,867	6,307	0
757PW	2,630	3,407	3,808
A319-131	1,197	1,551	1,733
Business Jet			
CL600	121	157	176
ECLIPSE500	295	383	428
GII	619	403	0
GV	1,880	2,836	3,620
LEAR35	5,372	6,961	7,779
MU3001	776	1,005	1,124
Helicopter			
B206L	533	691	772
R22	1,971	2,553	2,854
Military			
C130E	2,150	512	0
E3A	52	27	27
F15E20	16	8	8
S70	2,167	1,120	1,120
Propeller			
1900D	29,025	37,607	42,029
BEC58P	12,390	10,087	17,394
CNA182FLT	25,547	28,126	33,897
CNA206	4,302	4,823	5,772
CNA208	19,733	22,120	26,475
CNA441	10,784	8,779	15,140
DC3	761	985	0
DHC-2FLT	665	746	892
DHC6	11,458	14,846	16,592
DHC8	9,988	13,536	16,676
EMB120	1,184	1,534	1,714
GASEPF	7,630	9,148	10,710
GASEPV	518	503	602
SF340	17,611	22,818	25,501
Total Operations	**256,632**	**307,735**	**360,293**

Source: Landrum & Brown, 2012.

Appendix B: AEM Model

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

Federal Aviation Administration
Office of Environment and Energy
http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aem_model

Area Equivalent Method (AEM) Version 2c SP2

Airport Name/Code:	ANC

DNL (dBA)	Baseline Area (Sq. Mi.)	Alternative Area (Sq. Mi.)	Percent Change in Area
65	4.1	4.4	5.2%
70	1.6	1.7	4.4%
75	0.7	0.7	3.6%
80	0.3	0.3	2.8%
85	0.1	0.1	2.1%

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
707				
720				
737				
7478			18.00	
707120				
707320				
717200				
727100				
727200				
737300				
737400				
737500				
737700	7.76		7.76	
737800	102.86		102.86	
747100				
747200				
747400	113.00		113.00	
757300	3.40		3.40	
767300	10.39		10.39	
767400				
777200				
777300	1.61		1.61	
1900D	102.96		102.96	
707QN				
720B				
727D15				
727D17				
727EM1				
727EM2				
727Q15				
727Q7				
727Q9				

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
727QF				
7373B2				
737D17				
737N17	17.27		17.27	
737N9				
737QN				
74710Q				
74720A				
74720B				
747SP				
757PW	9.33		9.33	
757RR				
767CF6				
767JT9				
7773ER				
7878R				
A10A				
A3				
A300-622R				
A300B4-203				
A310-304				
A319-131	4.25		4.25	
A320-211				
A320-232				
A321-232				
A330-301				
A330-343				
A340-211				
A340-642				
A37				
A380-841				
A380-861				
A4C				
A6A				
A7D				
A7E				
B1				
B2A				
B52BDE				
B52G				
B52H				
B57E				
BAC111				
BAE146				
BAE300				
BEC58P	27.62		27.62	
C118				
C12				
C130				
C130AD				
C130E	1.40		1.40	

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
C-130E				
C130HP				
C131B				
C135A				
C135B				
C137				
C140				
C141A				
C17				
C18A				
C-20				
C21A				
C22				
C23				
C5A				
C7A				
C9A				
CIT3				
CL600	0.43		0.43	
CL601				
CNA172				
CNA182				
CNA182FLT	77.00		77.00	
CNA206	13.20		13.20	
CNA208	60.56		60.56	
CNA20T				
CNA441	24.04		24.04	
CNA500				
CNA510				
CNA525C				
CNA55B				
CNA560E				
CNA560U				
CNA560XL				
CNA680				
CNA750				
COMJET				
COMSEP				
CONCRD				
CRJ9-ER				
CRJ9-LR				
CVR580				
DC1010	1.62		1.62	
DC1030				
DC1040				
DC3	2.70		2.70	
DC6				
DC820				
DC850				
DC860				
DC870				

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
DC8QN				
DC910				
DC930				
DC93LW				
DC950				
DC95HW				
DC9Q7				
DC9Q9				
DHC-2FLT	2.04		2.04	
DHC6	40.65		40.65	
DHC6QP				
DHC7				
DHC8	37.06		37.06	
DHC830				
DO228				
DO328				
E3A	0.07		0.07	
E4				
EA6B				
ECLIPSE500	1.05		1.05	
EMB120	4.20		4.20	
EMB145				
EMB14L				
EMB170				
EMB175				
EMB190				
EMB195				
F10062				
F10065				
F100D				
F101B				
F102				
F104G				
F105D				
F106				
F111AE				
F111D				
F-111F				
F117A				
F14A				
F15A				
F15E20	0.02		0.02	
F15E29				
F16A				
F16GE				
F16PW0				
F-18				
F28MK2				
F28MK4				
F4C				
F-4C				

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
F5AB				
F5E				
F8				
FAL20				
FB111A				
GASEPF	25.05		25.05	
GASEPV	1.38		1.38	
GII	1.10		1.10	
GIIB				
GIV				
GV	7.76		7.76	
HS748A				
IA1125				
JAGUAR				
KC10A				
KC135				
KC-135				
KC135B				
KC135R				
L1011				
L10115				
L188				
LEAR25				
LEAR35	19.06		19.06	
MD11GE	44.52		44.52	
MD11PW				
MD81				
MD82				
MD83				
MD9025				
MD9028				
MU3001	2.75		2.75	
OV10A				
P3A				
PA28				
PA30				
PA31				
PA42				
S3A&B				
SABR80				
SD330				
SF340	62.47		62.47	
SR71				
T1				
T29				
T-2C				
T3				
T33A				
T34				
T37B				
T-38A				

Federal Aviation Administration
Office of Environment and Energy

6/6/2022

	BASE Case		ALTERNATIVE Case	
Aircraft Type	Daytime LTO Cycles	Nighttime LTO Cycles	Daytime LTO Cycles	Nighttime LTO Cycles
T39A				
T41				
T42				
T-43A				
T44				
TORNAD				
TR1				
U2				
U21				
U6				
U8F				
Total LTOs	830.58		848.58	