

## **Appendix B**

### **Air Emissions Calculations**

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**Aircraft and Personnel Loading by Alternative for the EA 18G (Growler) Operations at NAS Whidbey Island Complex:  
Ault Field and and OLF Coupeville**

EIS Alternative	Description	Aircraft Loading	Total VAQ Aircraft	Personnel Loading	Total Personnel
Baseline		9 carrier squadrons (45 aircraft) 3 expeditionary squadrons (15 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (17 aircraft)	82	<ul style="list-style-type: none"> <li>• 517 Officer</li> <li>• 3,587 Enlisted</li> </ul>	4,104
Alternative 1	Expand carrier capabilities by adding three additional aircraft to each existing carrier squadron and augmenting the FRS with eight additional aircraft (a net increase of 35 aircraft).	9 carrier squadrons (72 aircraft) 3 expeditionary squadrons (15 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (25 aircraft)	117 (+35)	<ul style="list-style-type: none"> <li>• 597 Officer</li> <li>• 3,842 Enlisted</li> </ul>	4,439 (+335)
Alternative 2	Expand expeditionary and carrier capabilities by establishing two new expeditionary squadrons, adding two additional aircraft to each existing carrier squadron, and augmenting the FRS with eight additional aircraft (a net increase of 36 aircraft).	9 carrier squadrons (63 aircraft) 5 expeditionary squadrons (25 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (25 aircraft)	118 (+36)	<ul style="list-style-type: none"> <li>• 619 Officer</li> <li>• 4,113 Enlisted</li> </ul>	4,732 (+628)
Alternative 3	Expand expeditionary and carrier capabilities by adding three additional aircraft to each existing expeditionary squadron, adding two additional aircraft to each existing carrier squadron, and augmenting the FRS with nine additional aircraft (a net increase of 36 aircraft).	9 carrier squadrons (63 aircraft) 3 expeditionary squadrons (24 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (26 aircraft)	118 (+36)	<ul style="list-style-type: none"> <li>• 597 Officer</li> <li>• 3,848 Enlisted</li> </ul>	4,445 (+341)

No Action: 30% FCLP at Coupville, 70% at Ault Field  
Scenario A: 80% FCLP at Coupville, 20% at Ault Field  
Scenario B: 50% FCLP at Coupville, 50% at Ault Field  
Scenario C: 20% FCLP at Coupville, 80% at Ault Field  
Scenario D: 30% FCLP at Coupville, 70% at Ault Field  
Scenario E: 70% FCLP at Coupville, 30% at Ault Field

**EA-18 G (Growler) (F414-GE-400 Engines) Emission Factors**

Flight Operation	Fuel used (lbs)	Emissions from Single Flight Operation <sup>1,2,3,4</sup> (lb/op)						
		CO	NO <sub>x</sub>	VOC <sup>4</sup>	SO <sub>2</sub> <sup>5</sup>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO <sub>2</sub>
Straight-In Arrival LTO <sup>1</sup>	2413	210.67	29.16	79.04	3.16	17.62	17.62	7285.16
Break Arrival LTO <sup>1</sup>	2329	211.83	29.23	79.70	3.05	16.95	16.95	7014.30
OLF LTO <sup>2</sup>	1,383	112.53	25.79	4.14	1.81	6.60	6.60	4215.07
Touch-and-Go/FCLP <sup>3</sup>	706	0.50	14.47	0.09	0.92	3.95	3.95	2249.53
Depart&Reenter/ GCA Box (GCA Pattern) <sup>3</sup>	1411	1.01	28.95	0.20	1.85	7.89	7.89	4499.05
3.0 minutes at 85%N2 (Approach) <sup>2</sup>	517	0.37	7.63	0.07	0.68	3.39	3.39	1649.71
3.5 Minutes interfacility flight, Ault Field to Coupeville	3.5							
3.5 minutes at 85%N2 (Approach) <sup>2</sup>	603.17	0.44	8.90	0.10	0.79	3.96	3.96	1924.66

Notes:

<sup>1</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines for operations at NAS Whidbey Island based on Table S-1, AESO Memorandum Report No. 9815, Rev I, June 2017, Except adjusted to reduce Max Power Time in mode during Take off from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.

<sup>2</sup> Estimated Air Emissions for a Single F/A-18 LTO Cycle with straight in Arrival--At OLF (no Startup/Taxi/Refuel) and "3.0 minutes at 85%N2" using Table 5 of AESO Memorandum Report No. 9815, Rev I, June 2017. Emissions for interfacility flight based on ratio of # of minutes from Ault field to Coupeville/ 3.

<sup>3</sup> Emission factors for "Touch-and-Go" and "GCA Box" from AESO Memorandum Report No. 9933, Revision E November 2015.

<sup>4</sup> VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev I, June, 2017 as noted for reporting VOCs as defined by the EPA.

<sup>5</sup> SO2 Emission Factor based on fuel used (lbs) from Table S-1, AESO Memorandum Report No. 9933, Revision E November 2015 and AESO Memorandum Report No. 9815, Rev I, June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April, 2017

**Emission Factors for EA-18G (F414-GE-400 Engines) In-Frame Aircraft Maintenance, per test**

Test Type	# tests	Fuel used (lbs)	Emissions from Maintenance Tests <sup>1,2</sup> (lb/test)						
			CO	NOx	VOC <sup>3</sup>	SO <sub>2</sub>	PM2.5	PM10	CO2
Water Wash	1.0	132.0	11.41	0.47	8.71	0.17	1.47	1.47	369.57
Low Power, one engine	1.0	364.07	34.16	1.21	26.12	0.48	4.40	4.40	1085.62
Low Power, two engines	1.0	711.67	68.29	2.31	52.24	0.93	8.79	8.79	2119.19
High Power (two engines)	1.0	6375.13	1043.01	90.67	63.89	8.35	19.61	19.61	18505.40

<sup>1</sup> Fuel used and Emission factors for Estimated annual maintenance operations per test, per engine based on ratio of data from Table 9 of AESO Memorandum Report No. 9815, Rev I, June 2017. See table below

<sup>3</sup> VOC emissions = 1.15 x THC emissions as noted for reporting VOCs as defined by the EPA.

**Emission Factors for EA-18G In-Frame Aircraft Maintenance, Annual estimates per aircraft<sup>1</sup>**

Test Type	Annual # tests	# engines in use	Fuel used (lbs)	Emissions from Maintenance Test (lb/aircraft-yr) <sup>1,2</sup>						
				CO	NOx	HC	SO <sub>2</sub>	PM2.5	PM10	CO2
Water Wash	1.0	1.0	132	11.41	0.47	7.57	0.17	1.47	1.47	369.57
Low Power, 1 engine	15.0	1.0	5461	512.45	18.11	340.70	7.15	65.95	65.95	16284.26
Low Power, 2 engines	30.0	2.0	21,350	2048.81	69.38	1362.69	27.97	263.71	263.71	63575.80
High Power	8.0	2.0	51,001	8344.08	725.39	444.43	66.81	156.87	156.87	148043.20

Notes:

<sup>1</sup> From Table 9, AESO Memorandum Report No. 9815, Rev I, June 2017.

<sup>2</sup> SO2 Emission Factor based on fuel used (lbs) from Table 9, AESO Memorandum Report No. 9815, Rev I, June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017

**Estimated Air Emissions for a Single F/A-18G LTO Cycle with straight in Arrival--At OLF (no Startup/Taxi/Refuel)**

Flight Operation and Flight Mode	Engine Power Setting <sup>1</sup>	No. of Engines in Use <sup>1</sup>	Time-In Mode per Engine (min) <sup>2</sup>	Fuel Flow Rate per Engine (lb/hr) <sup>1</sup>	Fuel Used (lbs) <sup>4,8</sup>	Emission Indexes <sup>2</sup> (pounds per 1,000 pounds fuel)						Emissions from Single Flight Operation <sup>5</sup> (lb/op)					
						EI CO	EI NO <sub>x</sub>	EI HC	EI SO <sub>2</sub> <sup>9</sup>	EI PM <sub>10</sub>	CO <sub>2</sub>	CO	NO <sub>x</sub>	VOC <sup>10</sup>	SO <sub>2</sub>	PM <sub>10</sub>	CO <sub>2</sub>
<b>Departure</b>																	
Engine Run up	80	2	0.5	3079.00	51	1.86	8.98	0.14	1.31	8.780	3205	0.10	0.46	0.01	0.07	0.45	164.46
Take off <sup>6,11,12</sup>	Max	2	0.33	35763.00	397	274.97	9.67	4.87	1.31	2.950	2712	109.26	3.84	2.23	0.52	1.17	1077.66
Climb out <sup>7</sup>	95	2	1.0	11320.00	377	0.7	36.29	0.12	1.31	2.950	3179	0.26	13.69	0.05	0.49	1.11	1199.62
<b>Departure Total</b>					<b>826</b>							<b>109.62</b>	<b>18.00</b>	<b>2.29</b>	<b>1.08</b>	<b>2.74</b>	<b>2441.74</b>
<b>Arrival</b>																	
Approach	85	2	3.0	5169.00	517	0.72	14.75	0.12	1.31	6.56	3191	0.37	7.62	0.07	0.68	3.39	1649.58
On Runway	G Idle	2	1.0	695.00	23	98.18	3.18	65.33	1.31	12.64	2973	2.27	0.07	1.74	0.03	0.29	68.88
Unstick	75	2	0.3	1720.00	17	15.2	5.58	1.98	1.31	10.73	3190	0.26	0.10	0.04	0.02	0.18	54.86
<b>Arrival Total</b>					<b>557</b>							<b>2.91</b>	<b>7.79</b>	<b>1.85</b>	<b>0.73</b>	<b>3.87</b>	<b>1773.33</b>
<b>LTO Total</b>					<b>1,383</b>							<b>112.5</b>	<b>25.8</b>	<b>4.1</b>	<b>1.8</b>	<b>6.6</b>	<b>4,215.1</b>

Source: Table 5, AESO Memorandum Report No. 9815, Rev I, June 2017 (except SO2 emission factors)

**F/A-18E/F Notes:**

- 1) Estimated from 1998 F/A-18A,B,C, D pilot interviews, which are on file at AESO.
- 2) Source for all non APU fuel flow and emission indexes: *Gaseous and Particulate Emission Indexes for the F414-GE-400 Turbofan Engine*; Aircraft Environmental Support Office, FRCSW, San Diego, CA., February 2011, AESO Memorandum Report No. 9725, Revision D
- 3) The APU fuel flow and emission index data is manufacturer information provided by Rick Stanley (36-200 Project Engineer).
- 4) Fuel used = fuel flow x time-in-mode / 60 x no. of engines in use.
- 5) Emissions = fuel used / 1,000 x emission index.
- 6) Takeoff is from brake release to 500 feet above ground level.
- 7) Climbout is from 500 feet above ground level to 3,000 feet above ground level. Climbout time-in-mode reflects an unrestricted climbout departure corridor. Climbout time-in-mode may be longer if departure corridor is restricted in regards to climbout rate and/or hold down altitude.
- 8) For F/A-18E/F, the maximum internal fuel load is 14,460 lbs. The maximum fuel load is 24,272 lbs with 3 external tanks.

- 9) SO2 Emission Factor for JP-5 fuel as recommended for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017
- 10) VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev I, June, 2017 as noted for reporting VOCs as defined by the EPA.
- 11) Time in Mode for Max (Afterburner) power setting has been adjusted from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.
- 12) AB PM 10 and 2.5 data not provided in AESO Memo N. 9815. Per Xu Li-Jones (AESO) comments (6/22/2016), 2.95 lbs/1000 gal fuel is used.

**Estimated Change in Air Emissions for a Single F/A-18G LTO Cycle: adjustment of Max Take off Afterburner use**

Flight Operation and Flight Mode	Engine Power Setting <sup>1</sup>	No. of Engines in Use <sup>1</sup>	Time-In Mode per Engine (min) <sup>2</sup>	Fuel Flow Rate per Engine (lb/hr) <sup>1</sup>	Fuel Used (lbs) <sup>4,8</sup>	Emission Indexes <sup>2</sup> (pounds per 1,000 pounds fuel)						Emissions from Single Flight Operation <sup>5</sup> (lb/op)					
						EI CO	EI NO <sub>x</sub>	EI HC	EI SO <sub>2</sub> <sup>9</sup>	EI PM <sub>10</sub>	CO <sub>2</sub>	CO	NO <sub>x</sub>	VOC <sup>10</sup>	SO <sub>2</sub>	PM <sub>10</sub>	CO <sub>2</sub>
AESO Estimated Take off	Max	2	0.50	35763.00	596	274.97	9.67	4.87	1.31	2.950	2712	163.90	5.76	3.34	0.78	1.76	1616.49
NAS Whidbey Island Estimated Take off	Max	2	0.33	35763.00	397	274.97	9.67	4.87	1.31	2.950	2712	109.26	3.84	2.23	0.52	1.17	1077.66
Difference			0.17	0.00	198.68							54.63	1.92	1.11	0.26	0.59	538.83

**Adjusted EA-18 G (Growler) (F414-GE-400 Engines) Emission Factors**

Flight Operation	Fuel used (lbs)	Emissions from Single Flight Operation (lb/op)						
		CO	NO <sub>x</sub>	VOC <sup>3</sup>	SO <sub>2</sub> <sup>4</sup>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO <sub>2</sub>
AESO Estimated Straight-In Arrival LTO <sup>1</sup>	2612	265.30	31.08	80.16	3.42	18.21	18.21	7823.99
NAS Whidbey Island Estimated Take off <sup>2</sup>	2413	210.67	29.16	79.04	3.16	17.62	17.62	7285.16
AESO Estimated Break Arrival LTO <sup>1</sup>	2528	266.46	31.15	80.81	3.31	17.54	17.54	7553.13
NAS Whidbey Island Break Arrival LTO <sup>2</sup>	2329	211.83	29.23	79.70	3.05	16.95	16.95	7014.30

- <sup>1</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines from Table ES-1, AESO Memorandum Report No. 9815, Rev I, June, 2017, except SO2 and VOC.
- <sup>2</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines for operations at NAS Whidbey Island adjusted to reduce Max Power Time in mode during Take off from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.
- <sup>3</sup> VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev I, June, 2017 as noted
- <sup>4</sup> SO2 Emission Factor based on fuel used (lbs) from Table S-1, AESO Memorandum Report No. 9815, Rev I, June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017

**Baseline Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	45	17	5	15	82
Departures	5,088	6,581	1,225	1,622	14,516
Interfacility Departures	174	192	16	0	382
Straight in Arrivals	1,786	2,712	434	577	5,509
Overhead Break Arrivals	2,980	3,650	725	943	8,298
IFR Arrivals	317	219	64	99	699
Interfacility Arrivals	174	192	17	0	383
FCLP Ops <sup>2</sup>	7,571	7,303	215	0	15,089
Touch & Go Ops <sup>2</sup>	2,881	5,463	510	593	9,447
Depart-Re-enter Ops <sup>2</sup>	1,701	0	428	529	2,658
GCA pattern Ops <sup>2</sup>	3,808	5,732	523	584	10,647
<b>Total</b>	<b>26,480</b>	<b>32,044</b>	<b>4,157</b>	<b>4,947</b>	<b>67,628</b>
<b>OLF Coupeville</b>					
Interfacility Departures	174	192	17	0	383
Interfacility Arrivals	174	192	17	0	383
FCLP Ops <sup>2</sup>	2,441	2,685	229	0	5,355
<b>Total</b>	<b>2,789</b>	<b>3,069</b>	<b>263</b>	<b>0</b>	<b>6,121</b>
<b>Maintenance Run Ups (Ault Field)<sup>3</sup></b>					
Water Wash					82
Low Power, one engine					1,230
Low Power, two engines					2,460
High Power, two engines					656
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab Fops\_BaselineAveMaxYr2, file Ops Tables AveYr\_BL\_20171018.xlsx, as of 12/8/2016. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington, Wyle Laboratories, 2017.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Baseline maintenance run ups from Baseline Static Ops.lxs from Wyle, 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines is not performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing. Source: email from CDR Sean Michaels, May 11, 2016.

**Baseline Average Year Emissions NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	5,509	13,294,962	580.29	80.32	217.72	8.71	48.54	48.54	20,066.98
Break Arrival LTO <sup>2</sup>	9,380	21,848,990	993.47	137.08	373.78	14.31	79.51	79.51	32,897.07
FCLP <sup>4</sup>	7,545	5,326,417	1.89	54.58	0.35	3.49	14.90	14.90	8,485.79
Touch-and-Go <sup>4</sup>	4,724	3,334,791	1.18	34.17	0.22	2.18	9.33	9.33	5,312.83
Depart and Re-enter <sup>4</sup>	1,329	1,875,219	0.67	19.24	0.13	1.23	5.24	5.24	2,989.62
GCA Pattern <sup>4</sup>	5,324	7,511,459	2.69	77.06	0.52	4.92	21.00	21.00	11,975.35
<b>Total Emissions for Ault Field Flight Operation</b>		<b>53,191,837.4</b>	<b>1,580.2</b>	<b>402.5</b>	<b>592.7</b>	<b>34.8</b>	<b>178.5</b>	<b>178.5</b>	<b>81,727.6</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	383	529,798	21.55	4.94	0.79	0.35	1.26	1.26	807.19
FCLP <sup>4</sup>	5,355	3,780,630	1.34	38.74	0.25	2.48	10.58	10.58	6,023.12
Interfacility Transit	383	231,013	0.08	1.70	0.02	0.15	0.76	0.76	368.57
<b>Total Emissions for Coupeville Flight Operation</b>		<b>4,541,440.4</b>	<b>23.0</b>	<b>45.4</b>	<b>1.1</b>	<b>3.0</b>	<b>12.6</b>	<b>12.6</b>	<b>7,198.9</b>
<b>Maintenance Operations</b>									
Water Wash	82	10,824	0.47	0.019	0.36	0.007	0.06	0.06	15.15
Low Power, one engine	1,230	447,802	21.01	0.74	16.06	0.29	2.70	2.70	667.65
Low Power, two engines	2,460	1,750,700	84.00	2.84	64.25	1.15	10.81	10.81	2,606.61
High Power, two engines	656	4,182,082	342.11	29.74	20.95	2.74	6.43	6.43	6,069.77
<b>Total Emissions for Maintenance Operations</b>		<b>6,391,408.0</b>	<b>447.6</b>	<b>33.3</b>	<b>101.6</b>	<b>4.2</b>	<b>20.0</b>	<b>20.0</b>	<b>9,359.2</b>
<b>Total</b>		<b>64,124,685.7</b>	<b>2,050.7</b>	<b>481.2</b>	<b>695.4</b>	<b>42.0</b>	<b>211.1</b>	<b>211.1</b>	<b>98,285.7</b>

9,443,989.06 gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
All Personnel	4,104	25,650,000	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Existing Mobile Emissions**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,580.19	402.45	592.72	34.84	178.53	178.53	81,727.63
OLF Coupeville Aircraft Flight Operations	23.0	45.4	1.1	3.0	12.6	12.6	7,198.9
Aircraft Maintenance Operations	447.6	33.3	101.6	4.2	20.0	20.0	9,359.2
Personnel Commute	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77
<b>Total</b>	<b>2,125.81</b>	<b>490.07</b>	<b>697.04</b>	<b>42.07</b>	<b>299.70</b>	<b>220.95</b>	<b>108,308.46</b>

**No Action Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	45	17	5	15	82
Departures	5,092	6,587	1,226	1,623	14,528
Interfacility Departures	197	206	19	0	422
Straight in Arrivals	1,790	2,698	418	611	5,517
Overhead Break Arrivals	3,009	3,659	727	918	8,313
IFR Arrivals	287	229	81	89	686
Interfacility Arrivals	197	208	19	0	424
FCLP Ops <sup>2</sup>	5,609	5,589	63	0	11,261
Touch & Go Ops <sup>2</sup>	3,011	5,484	532	527	9,554
Depart-Re-enter Ops <sup>2</sup>	1,738	0	459	537	2,734
GCA pattern Ops <sup>2</sup>	4,019	5,774	540	520	10,853
<b>Total</b>	<b>24,949</b>	<b>30,434</b>	<b>4,084</b>	<b>4,825</b>	<b>64,292</b>
<b>OLF Coupeville</b>					
Interfacility Departures	197	208	19	0	424
Interfacility Arrivals	197	206	19	0	422
FCLP Ops <sup>2</sup>	2,452	2,583	239	0	5,274
<b>Total</b>	<b>2,846</b>	<b>2,997</b>	<b>277</b>	<b>0</b>	<b>6,120</b>
<b>Maintenance Run Ups (Ault Field)<sup>3</sup></b>					
Water Wash					82
Low Power, one engine					1,230
Low Power, two engines					2,460
High Power, two engines					656
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab Fops\_NoActionAveYr3, file Ops Tables AveYr\_NoAc20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington, Wyle Laboratories, 2017.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Baseline maintenance run ups from Baseline Static Ops.lxs from Wyle, 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing. Source: email from CDR Sean Michaels, May 11, 2016.



**No Action Average Year Air Emissions NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	5,517	13,314,268	581.13	80.43	218.04	8.72	48.62	48.62	20,096.12
Break Arrival LTO <sup>2</sup>	9,423	21,949,151	998.03	137.71	375.50	14.38	79.88	79.88	33,047.88
FCLP <sup>4</sup>	5,631	3,975,133	1.41	40.74	0.26	2.60	11.12	11.12	6,332.99
Touch-and-Go <sup>4</sup>	4,777	3,372,562	1.19	34.56	0.22	2.21	9.43	9.43	5,373.00
Depart and Re-enter <sup>4</sup>	1,367	1,928,837	0.69	19.79	0.13	1.26	5.39	5.39	3,075.10
GCA Pattern <sup>4</sup>	5,427	7,656,792	2.74	78.55	0.53	5.02	21.41	21.41	12,207.05
<b>Total Emissions for Ault Field Flight Operations</b>		<b>52,196,742.5</b>	<b>1,585.2</b>	<b>391.8</b>	<b>594.7</b>	<b>34.2</b>	<b>175.8</b>	<b>175.8</b>	<b>80,132.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	424	586,512	23.86	5.47	0.88	0.38	1.40	1.40	893.59
FCLP <sup>4</sup>	5,274	3,723,444	1.32	38.16	0.24	2.44	10.42	10.42	5,932.01
Interfacility Transit	424	255,743	0.09	1.89	0.02	0.17	0.84	0.84	408.03
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,565,698.8</b>	<b>25.3</b>	<b>45.5</b>	<b>1.1</b>	<b>3.0</b>	<b>12.7</b>	<b>12.7</b>	<b>7,233.6</b>
<b>Maintenance Operations</b>									
Water Wash	82	10,824	0.47	0.019	0.36	0.007	0.06	0.06	15.15
Low Power, one engine	1,230	447,802	21.01	0.74	16.06	0.29	2.70	2.70	667.65
Low Power, two engines	2,460	1,750,700	84.00	2.84	64.25	1.15	10.81	10.81	2,606.61
High Power, two engines	656	4,182,082	342.11	29.74	20.95	2.74	6.43	6.43	6,069.77
Total In-frame Maintenance Operations		6,391,408	447.59	33.35	101.63	4.19	20.01	20.01	9,359
<b>Total Emissions for Maintenance Operations</b>		<b>6,391,408.0</b>	<b>447.6</b>	<b>33.3</b>	<b>101.6</b>	<b>4.2</b>	<b>20.0</b>	<b>20.0</b>	<b>9,359.2</b>
<b>Total</b>		<b>63,153,849.3</b>	<b>2,058.0</b>	<b>470.6</b>	<b>697.4</b>	<b>41.4</b>	<b>208.5</b>	<b>208.5</b>	<b>96,725.0</b>

9,301,008.73 gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,104	25,650,000	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

<sup>2</sup> See Table X of this Appendix for calculations and emission factors

**Emissions Summary**

Activity	Emissions (tpy)							
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Ault Field Aircraft Flight Operations	1,585.19	391.78	594.68	34.19	175.85	175.85	80,132.13	
OLF Coupeville Aircraft Flight Operations	25.3	45.5	1.1	3.0	12.7	12.7	7,233.6	
Aircraft Maintenance Operations	447.6	33.3	101.6	4.2	20.0	20.0	9,359.2	
Personnel Commute	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77	
<b>Total</b>	<b>2,133.11</b>	<b>479.52</b>	<b>699.08</b>	<b>41.43</b>	<b>297.08</b>	<b>218.32</b>	<b>106,747.73</b>	

**Alternative 1A Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	8,011	6,011	1,236	1,641	16,899
Interfacility Departures	974	564	13	0	1,551
Straight in Arrivals	2,837	2,473	407	593	6,310
Overhead Break Arrivals	4,647	3,290	748	928	9,613
IFR Arrivals	528	249	81	121	979
Interfacility Arrivals	974	566	15	0	1,555
FCLP Ops <sup>2</sup>	3,866	2,140	139	0	6,145
Touch & Go Ops <sup>2</sup>	5,373	5,388	561	559	11,881
Depart-Re-enter Ops <sup>2</sup>	2,669	0	448	536	3,653
GCA pattern Ops <sup>2</sup>	7,724	5,744	565	553	14,586
<b>Total</b>	<b>37,603</b>	<b>26,425</b>	<b>4,213</b>	<b>4,931</b>	<b>73,172</b>
<b>OLF Coupeville</b>					
Interfacility Departures	974	564	13	0	1,551
Interfacility Arrivals	974	566	15	0	1,555
FCLP Ops <sup>2</sup>	13,633	7,909	207	0	21,749
<b>Total</b>	<b>15,581</b>	<b>9,039</b>	<b>235</b>	<b>0</b>	<b>24,855</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1AAveYr, workbook Ops Tables AveYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 1A Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,310	15,228,028	664.66	92.00	249.38	9.97	55.60	55.60	22,984.68
Break Arrival LTO <sup>2</sup>	12,147	28,294,210	1,286.54	177.52	484.04	18.53	102.97	102.97	42,601.36
FCLP <sup>4</sup>	3,073	2,169,185	0.77	22.23	0.14	1.42	6.07	6.07	3,455.84
Touch-and-Go <sup>4</sup>	5,941	4,193,993	1.49	42.98	0.27	2.75	11.73	11.73	6,681.67
Depart and Re-enter <sup>4</sup>	1,827	2,577,192	0.92	26.44	0.18	1.69	7.21	7.21	4,108.76
GCA Pattern <sup>4</sup>	7,293	10,290,423	3.68	105.57	0.71	6.74	28.77	28.77	16,405.79
<b>Total Emissions for Ault Field Flight Operations</b>		<b>62,753,030.2</b>	<b>1,958.1</b>	<b>466.7</b>	<b>734.7</b>	<b>41.1</b>	<b>212.3</b>	<b>212.3</b>	<b>96,238.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,551	2,145,472	87.27	20.00	3.21	1.41	5.12	5.12	3,268.79
FCLP <sup>4</sup>	21,749	15,354,794	5.44	157.35	1.00	10.06	42.95	42.95	24,462.51
Interfacility Transit	1,551	935,512	0.34	6.90	0.07	0.61	3.07	3.07	1,492.58
<b>Total Emissions for Coupeville Flight Operations</b>		<b>18,435,778.0</b>	<b>93.0</b>	<b>184.3</b>	<b>4.3</b>	<b>12.1</b>	<b>51.1</b>	<b>51.1</b>	<b>29,223.9</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>90,308,256.2</b>	<b>2,689.7</b>	<b>698.6</b>	<b>884.0</b>	<b>59.2</b>	<b>292.0</b>	<b>292.0</b>	<b>138,815.9</b>

13,300,185.00 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1A**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,958.05	466.73	734.73	41.10	212.35	212.35	96,238.09
OLF Coupeville Aircraft Flight Operations	93.0	184.3	4.3	12.1	51.1	51.1	29,223.9
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,770.92</b>	<b>708.17</b>	<b>885.78</b>	<b>59.22</b>	<b>387.83</b>	<b>302.65</b>	<b>149,656.83</b>

**Alternative 1B Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

EA 18G (Growler) Operations					
Ault Field	CVW	FRS	RES	EXP	EA-18G Total
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,940	5,964	1,227	1,623	16,754
Interfacility Departures	612	347	13	0	972
Straight in Arrivals	2,777	2,441	409	596	6,223
Overhead Break Arrivals	4,635	3,287	740	927	9,589
IFR Arrivals	528	236	78	99	941
Interfacility Arrivals	612	347	13	0	972
FCLP Ops <sup>2</sup>	9,762	5,602	175	0	15,539
Touch & Go Ops <sup>2</sup>	5,373	5,388	561	559	11,881
Depart-Re-enter Ops <sup>2</sup>	2,669	0	448	536	3,653
GCA pattern Ops <sup>2</sup>	7,724	5,744	565	553	14,586
<b>Total</b>	<b>42,632</b>	<b>29,356</b>	<b>4,229</b>	<b>4,893</b>	<b>81,110</b>
<b>OLF Coupeville</b>					
Interfacility Departures	612	347	13	0	972
Interfacility Arrivals	612	346	14	0	972
FCLP Ops <sup>2</sup>	8,559	4,849	189	0	13,597
<b>Total</b>	<b>9,783</b>	<b>5,542</b>	<b>216</b>	<b>0</b>	<b>15,541</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1BAveYr, workbook Ops Tables AveYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 1B Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,223	15,018,070	655.49	90.73	245.94	9.84	54.84	54.84	22,667.78
Break Arrival LTO <sup>2</sup>	11,502	26,791,800	1,218.22	168.09	458.34	17.55	97.50	97.50	40,339.24
FCLP <sup>4</sup>	7,770	5,485,267	1.94	56.21	0.36	3.59	15.34	15.34	8,738.86
Touch-and-Go <sup>4</sup>	5,941	4,193,993	1.49	42.98	0.27	2.75	11.73	11.73	6,681.67
Depart and Re-enter <sup>4</sup>	1,827	2,577,192	0.92	26.44	0.18	1.69	7.21	7.21	4,108.76
GCA Pattern <sup>4</sup>	7,293	10,290,423	3.68	105.57	0.71	6.74	28.77	28.77	16,405.79
<b>Total Emissions for Ault Field Flight Operations</b>		<b>64,356,744.4</b>	<b>1,881.7</b>	<b>490.0</b>	<b>705.8</b>	<b>42.2</b>	<b>215.4</b>	<b>215.4</b>	<b>98,942.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	972	1,344,551	54.69	12.53	2.01	0.88	3.21	3.21	2,048.52
FCLP <sup>4</sup>	13,597	9,599,482	3.40	98.37	0.63	6.29	26.85	26.85	15,293.43
Interfacility Transit	972	586,278	0.21	4.32	0.05	0.38	1.92	1.92	935.39
<b>Total Emissions for Coupeville Flight Operations</b>		<b>11,530,311.4</b>	<b>58.3</b>	<b>115.2</b>	<b>2.7</b>	<b>7.6</b>	<b>32.0</b>	<b>32.0</b>	<b>18,277.3</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>85,006,503.8</b>	<b>2,578.7</b>	<b>652.8</b>	<b>853.5</b>	<b>55.7</b>	<b>275.9</b>	<b>275.9</b>	<b>130,573.4</b>

12,519,367.28 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1B**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,881.75	490.02	705.80	42.15	215.39	215.39	98,942.09
NOLF Coupeville Aircraft Flight Operations	58.3	115.2	2.7	7.6	32.0	32.0	18,277.3
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,659.88</b>	<b>662.44</b>	<b>855.26</b>	<b>55.75</b>	<b>371.72</b>	<b>286.54</b>	<b>141,414.30</b>

**Alternative 1C Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,953	5,962	1,228	1,624	16,767
Interfacility Departures	243	136	11	0	390
Straight in Arrivals	2,816	2,432	413	590	6,251
Overhead Break Arrivals	4,631	3,315	737	935	9,618
IFR Arrivals	505	216	78	100	899
Interfacility Arrivals	244	137	11	0	392
FCLP Ops <sup>2</sup>	15,609	9,067	175	0	24,851
Touch & Go Ops <sup>2</sup>	5,373	5,388	561	559	11,881
Depart-Re-enter Ops <sup>2</sup>	2,669	0	448	536	3,653
GCA pattern Ops <sup>2</sup>	7,724	5,744	565	553	14,586
<b>Total</b>	<b>47,767</b>	<b>32,397</b>	<b>4,227</b>	<b>4,897</b>	<b>89,288</b>
<b>OLF Coupeville</b>					
Interfacility Departures	243	136	11	0	390
Interfacility Arrivals	244	137	11	0	392
FCLP Ops <sup>2</sup>	3,404	1,903	138	0	5,445
<b>Total</b>	<b>3,891</b>	<b>2,176</b>	<b>160</b>	<b>0</b>	<b>6,227</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1CAveYr, workbook Ops Tables AveYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 1C Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,251	15,085,642	658.44	91.14	247.05	9.88	55.08	55.08	22,769.77
Break Arrival LTO <sup>2</sup>	10,909	25,410,516	1,155.42	159.43	434.71	16.64	92.47	92.47	38,259.50
FCLP <sup>4</sup>	12,426	8,772,403	3.11	89.90	0.57	5.75	24.54	24.54	13,975.77
Touch-and-Go <sup>4</sup>	5,941	4,193,993	1.49	42.98	0.27	2.75	11.73	11.73	6,681.67
Depart and Re-enter <sup>4</sup>	1,827	2,577,192	0.92	26.44	0.18	1.69	7.21	7.21	4,108.76
GCA Pattern <sup>4</sup>	7,293	10,290,423	3.68	105.57	0.71	6.74	28.77	28.77	16,405.79
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,330,168.5</b>	<b>1,823.1</b>	<b>515.4</b>	<b>683.5</b>	<b>43.4</b>	<b>219.8</b>	<b>219.8</b>	<b>102,201.3</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	392	542,247	22.06	5.05	0.81	0.36	1.29	1.29	826.15
FCLP <sup>4</sup>	5,445	3,844,170	1.36	39.39	0.25	2.52	10.75	10.75	6,124.35
Interfacility Transit	390	235,235	0.08	1.74	0.02	0.15	0.77	0.77	375.31
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,621,652.1</b>	<b>23.5</b>	<b>46.2</b>	<b>1.1</b>	<b>3.0</b>	<b>12.8</b>	<b>12.8</b>	<b>7,325.8</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>80,071,268.6</b>	<b>2,485.2</b>	<b>609.2</b>	<b>829.6</b>	<b>52.4</b>	<b>261.2</b>	<b>261.2</b>	<b>122,881.0</b>

11,792,528.51 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1C**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,823.06	515.45	683.49	43.45	219.81	219.81	102,201.25
OLF Coupeville Aircraft Flight Operations	23.5	46.2	1.08	3.0	12.8	12.8	7,325.8
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,566.39</b>	<b>618.82</b>	<b>831.35</b>	<b>52.52</b>	<b>356.97</b>	<b>271.79</b>	<b>133,721.93</b>

**Alternative 1D Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	8,011	6,011	1,236	1,641	16,899
Interfacility Departures	853	494	11	0	1,358
Straight in Arrivals	2,837	2,473	407	593	6,310
Overhead Break Arrivals	4,647	3,290	748	928	9,613
IFR Arrivals	528	249	81	121	979
Interfacility Arrivals	853	495	13	0	1,361
FCLP Ops <sup>2</sup>	5,800	3,210	209	0	9,219
Touch & Go Ops <sup>2</sup>	5,373	5,388	561	559	11,881
Depart-Re-enter Ops <sup>2</sup>	2,669	0	448	536	3,653
GCA pattern Ops <sup>2</sup>	7,724	5,744	565	553	14,586
<b>Total</b>	<b>39,295</b>	<b>27,354</b>	<b>4,279</b>	<b>4,931</b>	<b>75,859</b>
<b>OLF Coupeville</b>					
Interfacility Departures	853	494	11	0	1,358
Interfacility Arrivals	853	495	13	0	1,361
FCLP Ops <sup>2</sup>	11,929	6,920	182	0	19,031
<b>Total</b>	<b>13,635</b>	<b>7,909</b>	<b>206</b>	<b>0</b>	<b>21,750</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1DAveYr, workbook Ops Tables AveYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



Alternative 1D Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,310	15,228,028	664.66	92.00	249.38	9.97	55.60	55.60	22,984.68
Break Arrival LTO <sup>2</sup>	11,953	27,842,322	1,265.99	174.69	476.31	18.24	101.32	101.32	41,920.97
FCLP <sup>4</sup>	4,610	3,254,307	1.15	33.35	0.21	2.13	9.10	9.10	5,184.60
Touch-and-Go <sup>4</sup>	5,941	4,193,993	1.49	42.98	0.27	2.75	11.73	11.73	6,681.67
Depart and Re-enter <sup>4</sup>	1,827	2,577,192	0.92	26.44	0.18	1.69	7.21	7.21	4,108.76
GCA Pattern <sup>4</sup>	7,293	10,290,423	3.68	105.57	0.71	6.74	28.77	28.77	16,405.79
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,386,264.8</b>	<b>1,937.9</b>	<b>475.0</b>	<b>727.1</b>	<b>41.5</b>	<b>213.7</b>	<b>213.7</b>	<b>97,286.5</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,358	1,878,499	76.41	17.51	2.81	1.23	4.48	4.48	2,862.03
FCLP <sup>4</sup>	19,031	13,435,886	4.76	137.69	0.88	8.80	37.59	37.59	21,405.40
Interfacility Transit	1,358	819,100	0.30	6.04	0.06	0.54	2.69	2.69	1,306.85
<b>Total Emissions for Coupeville Flight Operations</b>		<b>16,133,485.1</b>	<b>81.5</b>	<b>161.2</b>	<b>3.7</b>	<b>10.6</b>	<b>44.8</b>	<b>44.8</b>	<b>25,574.3</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>88,639,197.9</b>	<b>2,658.0</b>	<b>683.8</b>	<b>875.8</b>	<b>58.1</b>	<b>287.0</b>	<b>287.0</b>	<b>136,214.7</b>

13,054,373.77 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,937.89	475.02	727.07	41.52	213.74	213.74	97,286.47
NOLF Coupeville Aircraft Flight Operations	81.5	161.2	3.7	10.6	44.8	44.8	25,574.3
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,739.18</b>	<b>693.45</b>	<b>877.59</b>	<b>58.13</b>	<b>382.84</b>	<b>297.66</b>	<b>147,055.61</b>

**Alternative 1E Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,953	5,962	1,228	1,624	16,767
Interfacility Departures	365	205	17	0	587
Straight in Arrivals	2,816	2,432	413	590	6,251
Overhead Break Arrivals	4,631	3,315	737	935	9,618
IFR Arrivals	505	216	78	100	899
Interfacility Arrivals	367	206	17	0	590
FCLP Ops <sup>2</sup>	13,659	7,934	153	0	21,746
Touch & Go Ops <sup>2</sup>	5,373	5,388	561	559	11,881
Depart-Re-enter Ops <sup>2</sup>	2,669	0	448	536	3,653
GCA pattern Ops <sup>2</sup>	7,724	5,744	565	553	14,586
<b>Total</b>	<b>46,062</b>	<b>31,402</b>	<b>4,217</b>	<b>4,897</b>	<b>86,578</b>
<b>OLF Coupeville</b>					
Interfacility Departures	365	205	17	0	587
Interfacility Arrivals	367	206	17	0	590
FCLP Ops <sup>2</sup>	4,864	2,637	172	0	7,673
<b>Total</b>	<b>5,596</b>	<b>3,048</b>	<b>206</b>	<b>0</b>	<b>8,850</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1EAveYr, workbook Ops Tables AveYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 1E Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,251	15,085,642	658.44	91.14	247.05	9.88	55.08	55.08	22,769.77
Break Arrival LTO <sup>2</sup>	11,107	25,871,720	1,176.39	162.32	442.60	16.95	94.15	94.15	38,953.92
FCLP <sup>4</sup>	10,873	7,676,338	2.72	78.67	0.50	5.03	21.47	21.47	12,229.57
Touch-and-Go <sup>4</sup>	5,941	4,193,993	1.49	42.98	0.27	2.75	11.73	11.73	6,681.67
Depart and Re-enter <sup>4</sup>	1,827	2,577,192	0.92	26.44	0.18	1.69	7.21	7.21	4,108.76
GCA Pattern <sup>4</sup>	7,293	10,290,423	3.68	105.57	0.71	6.74	28.77	28.77	16,405.79
<b>Total Emissions for Ault Field Flight Operations</b>		<b>65,695,308.2</b>	<b>1,843.6</b>	<b>507.1</b>	<b>691.3</b>	<b>43.0</b>	<b>218.4</b>	<b>218.4</b>	<b>101,149.5</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	587	811,987	33.03	7.57	1.21	0.53	1.94	1.94	1,237.12
FCLP <sup>4</sup>	7,673	5,417,138	1.92	55.51	0.35	3.55	15.15	15.15	8,630.32
Interfacility Transit	587	354,059	0.13	2.61	0.03	0.23	1.16	1.16	564.89
<b>Total Emissions for Coupeville Flight Operations</b>		<b>6,583,184.2</b>	<b>35.1</b>	<b>65.7</b>	<b>1.6</b>	<b>4.3</b>	<b>18.3</b>	<b>18.3</b>	<b>10,432.3</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>81,397,940.4</b>	<b>2,517.3</b>	<b>620.4</b>	<b>837.9</b>	<b>53.3</b>	<b>265.2</b>	<b>265.2</b>	<b>124,935.8</b>

11,987,914.63 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,843.64	507.11	691.31	43.03	218.42	218.42	101,149.47
NOLF Coupeville Aircraft Flight Operations	35.1	65.7	1.6	4.3	18.3	18.3	10,432.3
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,598.54</b>	<b>629.99</b>	<b>839.68</b>	<b>53.39</b>	<b>361.02</b>	<b>275.83</b>	<b>135,776.67</b>

**NAS Whidbey Island Complex Annual GHG Emissions, Alternative 1**

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 1A	Alt 1B	Alt 1C	Alt 1D	Alt 1E
<b>Stationary Sources</b>							
statewide Total GHG Emissions (2016 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	89,145	87,730	125,906	118,430	111,453	123,547	113,317
GSE Emissions	130	131	161	155	150	160	152
Personnel Commute Emissions	9,091	9,091	9,833	9,833	9,833	9,833	9,833
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	98,366	96,951	135,900	128,418	121,436	133,539	123,301
<b>Change in Mobile CO<sub>2</sub> Emissions</b>			38,949	31,467	24,485	36,588	26,350
<b>% increase in Mobile CO<sub>2</sub> Emissions</b>			40%	32%	25%	37%	27%
<b>Total Change in Emissions (Stationary and Mobile)</b>			39,405	31,923	24,941	37,044	26,807
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.04%	0.03%	0.03%	0.04%	0.03%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.10%	0.08%	0.06%	0.09%	0.07%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.59%	0.48%	0.37%	0.56%	0.40%

1 . Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29, 2018 from: <https://fortress.wa.gov/ecy/publications/documents/1602025.pdf>

Key:

TPY = Tons per year

CO<sub>2</sub>e = Carbon Dioxide Equivalent

GHG = Greenhouse Gas

metric tons per short ton

= 0.907

**Alternative 2A Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,424	6,044	1,236	2,711	17,415
Interfacility Departures	901	566	14	0	1,481
Straight in Arrivals	2,662	2,469	433	966	6,530
Overhead Break Arrivals	4,298	3,360	721	1,584	9,963
IFR Arrivals	463	216	82	161	922
Interfacility Arrivals	903	566	14	0	1,483
FCLP Ops <sup>2</sup>	3,631	2,158	147	0	5,936
Touch & Go Ops <sup>2</sup>	5,052	5,432	489	882	11,855
Depart-Re-enter Ops <sup>2</sup>	2,456	0	453	950	3,859
GCA pattern Ops <sup>2</sup>	7,214	5,795	507	875	14,391
<b>Total</b>	<b>35,004</b>	<b>26,606</b>	<b>4,096</b>	<b>8,129</b>	<b>73,835</b>
<b>OLF Coupeville</b>					
Interfacility Departures	901	566	14	0	1,481
Interfacility Arrivals	903	566	14	0	1,483
FCLP Ops <sup>2</sup>	12,641	7,919	205	0	20,765
<b>Total</b>	<b>14,445</b>	<b>9,051</b>	<b>233</b>	<b>0</b>	<b>23,729</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2AAveYr, workbook Ops Tables AveYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 2A Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,530	15,758,958	687.83	95.20	258.07	10.32	57.54	57.54	23,786.05
Break Arrival LTO <sup>2</sup>	12,368	28,808,989	1,309.94	180.75	492.85	18.87	104.84	104.84	43,376.44
FCLP <sup>4</sup>	2,968	2,095,408	0.74	21.47	0.14	1.37	5.86	5.86	3,338.30
Touch-and-Go <sup>4</sup>	5,928	4,184,815	1.48	42.89	0.27	2.74	11.71	11.71	6,667.04
Depart and Re-enter <sup>4</sup>	1,930	2,722,525	0.97	27.93	0.19	1.78	7.61	7.61	4,340.46
GCA Pattern <sup>4</sup>	7,196	10,152,851	3.63	104.15	0.70	6.65	28.39	28.39	16,186.46
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,723,544.4</b>	<b>2,004.6</b>	<b>472.4</b>	<b>752.2</b>	<b>41.7</b>	<b>216.0</b>	<b>216.0</b>	<b>97,694.7</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,481	2,048,643	83.33	19.10	3.06	1.34	4.89	4.89	3,121.26
FCLP <sup>4</sup>	20,765	14,660,090	5.19	150.23	0.96	9.60	41.01	41.01	23,355.75
Interfacility Transit	1,481	893,290	0.32	6.59	0.07	0.59	2.93	2.93	1,425.21
<b>Total Emissions for Coupeville Flight Operations</b>		<b>17,602,022.5</b>	<b>88.8</b>	<b>175.9</b>	<b>4.1</b>	<b>11.5</b>	<b>48.8</b>	<b>48.8</b>	<b>27,902.2</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>90,522,958.8</b>	<b>2,737.5</b>	<b>696.3</b>	<b>902.6</b>	<b>59.3</b>	<b>293.6</b>	<b>293.6</b>	<b>139,065.1</b>

13,331,805.42 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2A**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	2,004.61	472.40	752.23	41.74	215.95	215.95	97,694.75
OLF Coupeville Aircraft Flight Operations	88.8	175.9	4.1	11.5	48.8	48.8	27,902.2
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,824.10</b>	<b>706.55</b>	<b>904.44</b>	<b>59.37</b>	<b>395.69</b>	<b>304.89</b>	<b>150,621.53</b>

**Alternative 2B Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,360	5,992	1,224	2,687	17,263
Interfacility Departures	564	350	14	0	928
Straight in Arrivals	2,627	2,465	425	942	6,459
Overhead Break Arrivals	4,322	3,328	729	1,588	9,967
IFR Arrivals	410	198	71	158	837
Interfacility Arrivals	564	350	14	0	928
FCLP Ops <sup>2</sup>	9,047	5,612	176	0	14,835
Touch & Go Ops <sup>2</sup>	5,052	5,432	489	882	11,855
Depart-Re-enter Ops <sup>2</sup>	2,456	0	453	950	3,859
GCA pattern Ops <sup>2</sup>	7,214	5,795	507	875	14,391
<b>Total</b>	<b>39,616</b>	<b>29,522</b>	<b>4,102</b>	<b>8,082</b>	<b>81,322</b>
<b>OLF Coupeville</b>					
Interfacility Departures	564	350	13	0	927
Interfacility Arrivals	564	350	14	0	928
FCLP Ops <sup>2</sup>	7,889	4,907	187	0	12,983
<b>Total</b>	<b>9,017</b>	<b>5,607</b>	<b>214</b>	<b>0</b>	<b>14,838</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2BAveYr, workbook Ops Tables AveYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 2B Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,459	15,587,612	680.35	94.17	255.27	10.21	56.92	56.92	23,527.43
Break Arrival LTO <sup>2</sup>	11,732	27,327,543	1,242.58	171.46	467.51	17.90	99.45	99.45	41,145.89
FCLP <sup>4</sup>	7,418	5,236,755	1.85	53.67	0.34	3.43	14.65	14.65	8,342.94
Touch-and-Go <sup>4</sup>	5,928	4,184,815	1.48	42.89	0.27	2.74	11.71	11.71	6,667.04
Depart and Re-enter <sup>4</sup>	1,930	2,722,525	0.97	27.93	0.19	1.78	7.61	7.61	4,340.46
GCA Pattern <sup>4</sup>	7,196	10,152,851	3.63	104.15	0.70	6.65	28.39	28.39	16,186.46
<b>Total Emissions for Ault Field Flight Operations</b>		<b>65,212,100.5</b>	<b>1,930.9</b>	<b>494.3</b>	<b>724.3</b>	<b>42.7</b>	<b>218.7</b>	<b>218.7</b>	<b>100,210.2</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	927	1,282,304	52.16	11.95	1.92	0.84	3.06	3.06	1,953.68
FCLP <sup>4</sup>	12,983	9,165,998	3.25	93.93	0.60	6.00	25.64	25.64	14,602.82
Interfacility Transit	927	559,136	0.20	4.12	0.04	0.37	1.83	1.83	892.08
<b>Total Emissions for Coupeville Flight Operations</b>		<b>11,007,437.2</b>	<b>55.6</b>	<b>110.0</b>	<b>2.6</b>	<b>7.2</b>	<b>30.5</b>	<b>30.5</b>	<b>17,448.6</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>85,416,929.6</b>	<b>2,630.6</b>	<b>652.3</b>	<b>873.1</b>	<b>55.9</b>	<b>278.0</b>	<b>278.0</b>	<b>131,126.9</b>

12,579,812.91 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2B**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,930.88	494.26	724.28	42.71	218.72	218.72	100,210.22
NOLF Coupeville Aircraft Flight Operations	55.6	110.0	2.6	7.2	30.5	30.5	17,448.6
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,717.13</b>	<b>662.50</b>	<b>874.97</b>	<b>56.02</b>	<b>380.17</b>	<b>289.36</b>	<b>142,683.38</b>



**Alternative 2C Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,360	5,993	1,223	2,693	17,269
Interfacility Departures	225	136	10	0	371
Straight in Arrivals	2,639	2,465	417	972	6,493
Overhead Break Arrivals	4,307	3,338	729	1,570	9,944
IFR Arrivals	415	189	77	151	832
Interfacility Arrivals	226	136	10	0	372
FCLP Ops <sup>2</sup>	14,384	9,148	201	0	23,733
Touch & Go Ops <sup>2</sup>	5,052	5,432	489	882	11,855
Depart-Re-enter Ops <sup>2</sup>	2,456	0	453	950	3,859
GCA pattern Ops <sup>2</sup>	7,214	5,795	507	875	14,391
<b>Total</b>	<b>44,278</b>	<b>32,632</b>	<b>4,116</b>	<b>8,093</b>	<b>89,119</b>
<b>OLF Coupeville</b>					
Interfacility Departures	225	136	10	0	371
Interfacility Arrivals	226	136	11	0	373
FCLP Ops <sup>2</sup>	3,160	1,895	146	0	5,201
<b>Total</b>	<b>3,611</b>	<b>2,167</b>	<b>167</b>	<b>0</b>	<b>5,945</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2CAveYr, workbook Ops Tables AveYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 2C Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,493	15,669,665	683.93	94.66	256.61	10.26	57.22	57.22	23,651.27
Break Arrival LTO <sup>2</sup>	11,148	25,967,222	1,180.73	162.92	444.24	17.01	94.50	94.50	39,097.71
FCLP <sup>4</sup>	11,867	8,377,749	2.97	85.85	0.55	5.49	23.44	23.44	13,347.02
Touch-and-Go <sup>4</sup>	5,928	4,184,815	1.48	42.89	0.27	2.74	11.71	11.71	6,667.04
Depart and Re-enter <sup>4</sup>	1,930	2,722,525	0.97	27.93	0.19	1.78	7.61	7.61	4,340.46
GCA Pattern <sup>4</sup>	7,196	10,152,851	3.63	104.15	0.70	6.65	28.39	28.39	16,186.46
<b>Total Emissions for Ault Field Flight Operations</b>		<b>67,074,826.3</b>	<b>1,873.7</b>	<b>518.4</b>	<b>702.6</b>	<b>43.9</b>	<b>222.9</b>	<b>222.9</b>	<b>103,290.0</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	371	513,198	20.87	4.78	0.77	0.34	1.23	1.23	781.90
FCLP <sup>4</sup>	5,201	3,671,906	1.30	37.63	0.24	2.41	10.27	10.27	5,849.90
Interfacility Transit	371	223,775	0.08	1.65	0.02	0.15	0.73	0.73	357.02
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,408,879.0</b>	<b>22.3</b>	<b>44.1</b>	<b>1.0</b>	<b>2.9</b>	<b>12.2</b>	<b>12.2</b>	<b>6,988.8</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>80,681,097.3</b>	<b>2,540.1</b>	<b>610.5</b>	<b>849.8</b>	<b>52.8</b>	<b>263.9</b>	<b>263.9</b>	<b>123,746.9</b>

11,882,341.28 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2C**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,873.72	518.41	702.56	43.93	222.86	222.86	103,289.97
OLF Coupeville Aircraft Flight Operations	22.3	44.1	1.0	2.9	12.2	12.2	6,988.8
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,626.62</b>	<b>620.70</b>	<b>851.71</b>	<b>52.92</b>	<b>366.00</b>	<b>275.19</b>	<b>135,303.36</b>

**Alternative 2D Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,424	6,044	1,236	2,711	17,415
Interfacility Departures	789	495	13	0	1,297
Straight in Arrivals	2,662	2,469	433	966	6,530
Overhead Break Arrivals	4,298	3,360	721	1,584	9,963
IFR Arrivals	463	216	82	161	922
Interfacility Arrivals	790	495	13	0	1,298
FCLP Ops <sup>2</sup>	5,447	3,238	221	0	8,906
Touch & Go Ops <sup>2</sup>	5,052	5,432	489	882	11,855
Depart-Re-enter Ops <sup>2</sup>	2,456	0	453	950	3,859
GCA pattern Ops <sup>2</sup>	7,214	5,795	507	875	14,391
<b>Total</b>	<b>36,595</b>	<b>27,544</b>	<b>4,168</b>	<b>8,129</b>	<b>76,436</b>
<b>OLF Coupeville</b>					
Interfacility Departures	789	495	13	0	1,297
Interfacility Arrivals	790	495	13	0	1,298
FCLP Ops <sup>2</sup>	11,062	6,929	180	0	18,171
<b>Total</b>	<b>12,641</b>	<b>7,919</b>	<b>206</b>	<b>0</b>	<b>20,766</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2DAveYr, workbook Ops Tables AveYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 2D Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,530	15,758,958	687.83	95.20	258.07	10.32	57.54	57.54	23,786.05
Break Arrival LTO <sup>2</sup>	12,183	28,378,065	1,290.35	178.05	485.48	18.59	103.27	103.27	42,727.61
FCLP <sup>4</sup>	4,453	3,143,818	1.11	32.22	0.20	2.06	8.79	8.79	5,008.58
Touch-and-Go <sup>4</sup>	5,928	4,184,815	1.48	42.89	0.27	2.74	11.71	11.71	6,667.04
Depart and Re-enter <sup>4</sup>	1,930	2,722,525	0.97	27.93	0.19	1.78	7.61	7.61	4,340.46
GCA Pattern <sup>4</sup>	7,196	10,152,851	3.63	104.15	0.70	6.65	28.39	28.39	16,186.46
<b>Total Emissions for Ault Field Flight Operations</b>		<b>64,341,030.8</b>	<b>1,985.4</b>	<b>480.4</b>	<b>744.9</b>	<b>42.1</b>	<b>217.3</b>	<b>217.3</b>	<b>98,716.2</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,297	1,794,118	72.98	16.73	2.68	1.18	4.28	4.28	2,733.47
FCLP <sup>4</sup>	18,171	12,828,726	4.54	131.47	0.84	8.40	35.89	35.89	20,438.10
Interfacility Transit	1,297	782,307	0.28	5.77	0.06	0.51	2.56	2.56	1,248.14
<b>Total Emissions for Coupeville Flight Operations</b>		<b>15,405,151.7</b>	<b>77.8</b>	<b>154.0</b>	<b>3.6</b>	<b>10.1</b>	<b>42.7</b>	<b>42.7</b>	<b>24,419.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>88,943,574.4</b>	<b>2,707.3</b>	<b>682.4</b>	<b>894.7</b>	<b>58.3</b>	<b>288.8</b>	<b>288.8</b>	<b>136,604.0</b>

13,099,200.95 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,985.38	480.44	744.92	42.14	217.32	217.32	98,716.20
OLF Coupeville Aircraft Flight Operations	77.8	154.0	3.6	10.1	42.7	42.7	24,419.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,793.83</b>	<b>692.63</b>	<b>896.63</b>	<b>58.33</b>	<b>390.96</b>	<b>300.16</b>	<b>148,160.49</b>

**Alternative 2E Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,360	5,993	1,223	2,693	17,269
Interfacility Departures	339	205	15	0	559
Straight in Arrivals	2,639	2,465	417	972	6,493
Overhead Break Arrivals	4,307	3,338	729	1,570	9,944
IFR Arrivals	415	189	77	151	832
Interfacility Arrivals	339	205	17	0	561
FCLP Ops <sup>2</sup>	12,586	8,004	175	0	20,765
Touch & Go Ops <sup>2</sup>	5,052	5,432	489	882	11,855
Depart-Re-enter Ops <sup>2</sup>	2,456	0	453	950	3,859
GCA pattern Ops <sup>2</sup>	7,214	5,795	507	875	14,391
<b>Total</b>	<b>42,707</b>	<b>31,626</b>	<b>4,102</b>	<b>8,093</b>	<b>86,528</b>
<b>OLF Coupeville</b>					
Interfacility Departures	339	205	17	0	561
Interfacility Arrivals	339	205	15	0	559
FCLP Ops <sup>2</sup>	4,741	2,843	219	0	7,803
<b>Total</b>	<b>5,419</b>	<b>3,253</b>	<b>251</b>	<b>0</b>	<b>8,923</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2EAveYr, workbook Ops Tables AveYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 2E Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,493	15,669,665	683.93	94.66	256.61	10.26	57.22	57.22	23,651.27
Break Arrival LTO <sup>2</sup>	11,337	26,407,463	1,200.75	165.68	451.77	17.30	96.10	96.10	39,760.56
FCLP <sup>4</sup>	10,383	7,330,045	2.60	75.12	0.48	4.80	20.51	20.51	11,677.87
Touch-and-Go <sup>4</sup>	5,928	4,184,815	1.48	42.89	0.27	2.74	11.71	11.71	6,667.04
Depart and Re-enter <sup>4</sup>	1,930	2,722,525	0.97	27.93	0.19	1.78	7.61	7.61	4,340.46
GCA Pattern <sup>4</sup>	7,196	10,152,851	3.63	104.15	0.70	6.65	28.39	28.39	16,186.46
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,467,363.2</b>	<b>1,893.4</b>	<b>510.4</b>	<b>710.0</b>	<b>43.5</b>	<b>221.5</b>	<b>221.5</b>	<b>102,283.7</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	561	776,022	31.57	7.23	1.16	0.51	1.85	1.85	1,182.33
FCLP <sup>4</sup>	7,803	5,508,918	1.95	56.45	0.36	3.61	15.41	15.41	8,776.54
Interfacility Transit	561	338,377	0.12	2.50	0.03	0.22	1.11	1.11	539.87
<b>Total Emissions for Coupeville Flight Operations</b>		<b>6,623,316.5</b>	<b>33.6</b>	<b>66.2</b>	<b>1.5</b>	<b>4.3</b>	<b>18.4</b>	<b>18.4</b>	<b>10,498.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>82,288,071.6</b>	<b>2,571.1</b>	<b>624.6</b>	<b>857.8</b>	<b>53.9</b>	<b>268.7</b>	<b>268.7</b>	<b>126,250.5</b>

12,119,009.07 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,893.37	510.43	710.02	43.54	221.53	221.53	102,283.67
OLF Coupeville Aircraft Flight Operations	33.6	66.2	1.5	4.3	18.4	18.4	10,498.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,657.65</b>	<b>634.85</b>	<b>859.69</b>	<b>53.98</b>	<b>370.81</b>	<b>280.01</b>	<b>137,806.97</b>

NAS Whidbey Island Complex Annual GHG Emissions, Alternative 2

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 2A	Alt 2B	Alt 2C	Alt 2D	Alt 2E
<b>Stationary Sources</b>							
Total GHG Emissions (2014 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	89,145	87,730	126,132	118,932	112,238	123,900	114,509
GSE Emissions	130	131	165	159	154	164	156
Personnel Commute Emissions	9,091	9,091	10,482	10,482	10,482	10,482	10,482
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	<b>98,366</b>	<b>96,951</b>	<b>136,779</b>	<b>129,573</b>	<b>122,875</b>	<b>134,545</b>	<b>125,147</b>
<b>Change in Mobile CO<sub>2</sub> Emissions</b>			<b>39,828</b>	<b>32,622</b>	<b>25,924</b>	<b>37,594</b>	<b>28,196</b>
<b>% increase in Mobile CO<sub>2</sub> Emissions</b>			<b>40%</b>	<b>33%</b>	<b>26%</b>	<b>38%</b>	<b>29%</b>
<b>Total Change in Emissions (Stationary and Mobile)</b>			<b>40,284</b>	<b>33,078</b>	<b>26,380</b>	<b>38,051</b>	<b>28,652</b>
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.04%	0.04%	0.03%	0.04%	0.03%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.10%	0.08%	0.06%	0.09%	0.07%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.61%	0.50%	0.39%	0.57%	0.43%

1. Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29,

metric tons per short ton

0.907

TPY = Tons per year

CO<sub>2</sub>e = Carbon Dioxide Equivalent

GHG = Greenhouse Gas

**Alternative 3A Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	7,442	6,047	1,239	2,628	17,356
Interfacility Departures	899	568	12	0	1,479
Straight in Arrivals	2,650	2,471	437	948	6,506
Overhead Break Arrivals	4,318	3,359	731	1,511	9,919
IFR Arrivals	475	218	70	169	932
Interfacility Arrivals	898	568	13	0	1,479
FCLP Ops <sup>2</sup>	3,647	2,132	146	0	5,925
Touch & Go Ops <sup>2</sup>	4,935	5,406	535	951	11,827
Depart-Re-enter Ops <sup>2</sup>	2,491	0	434	804	3,729
GCA pattern Ops <sup>2</sup>	7,089	5,901	552	938	14,480
<b>Total</b>	<b>34,844</b>	<b>26,670</b>	<b>4,169</b>	<b>7,949</b>	<b>73,632</b>
<b>OLF Coupeville</b>					
Interfacility Departures	898	568	13	0	1,479
Interfacility Arrivals	899	568	12	0	1,479
FCLP Ops <sup>2</sup>	12,583	7,949	182	0	20,714
<b>Total</b>	<b>14,380</b>	<b>9,085</b>	<b>207</b>	<b>0</b>	<b>23,672</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3AAveYr, workbook Ops Tables AveYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



**Alternative 3A Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,506	15,701,038	685.30	94.85	257.12	10.28	57.33	57.33	23,698.63
Break Arrival LTO <sup>2</sup>	12,330	28,720,475	1,305.92	180.20	491.34	18.81	104.52	104.52	43,243.16
FCLP <sup>4</sup>	2,963	2,091,525	0.74	21.43	0.14	1.37	5.85	5.85	3,332.12
Touch-and-Go <sup>4</sup>	5,914	4,174,931	1.48	42.78	0.27	2.73	11.68	11.68	6,651.30
Depart and Re-enter <sup>4</sup>	1,865	2,630,810	0.94	26.99	0.18	1.72	7.36	7.36	4,194.24
GCA Pattern <sup>4</sup>	7,240	10,215,640	3.66	104.80	0.71	6.69	28.56	28.56	16,286.56
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,534,418.2</b>	<b>1,998.0</b>	<b>471.1</b>	<b>749.8</b>	<b>41.6</b>	<b>215.3</b>	<b>215.3</b>	<b>97,406.0</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,479	2,045,876	83.22	19.07	3.06	1.34	4.88	4.88	3,117.04
FCLP <sup>4</sup>	20,714	14,624,084	5.18	149.87	0.95	9.58	40.91	40.91	23,298.38
Interfacility Transit	1,479	892,084	0.32	6.58	0.07	0.58	2.92	2.92	1,423.29
<b>Total Emissions for Coupeville Flight Operations</b>		<b>17,562,043.6</b>	<b>88.7</b>	<b>175.5</b>	<b>4.1</b>	<b>11.5</b>	<b>48.7</b>	<b>48.7</b>	<b>27,838.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>90,293,853.8</b>	<b>2,730.8</b>	<b>694.6</b>	<b>900.1</b>	<b>59.1</b>	<b>292.8</b>	<b>292.8</b>	<b>138,712.8</b>

13,298,063.89 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3A**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,998.04	471.05	749.76	41.62	215.30	215.30	97,406.01
OLF Coupeville Aircraft Flight Operations	88.7	175.5	4.1	11.5	48.7	48.7	27,838.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,812.15</b>	<b>704.18</b>	<b>901.86</b>	<b>59.21</b>	<b>388.73</b>	<b>303.44</b>	<b>149,568.38</b>

**Alternative 3B Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	7,450	6,053	1,240	2,631	17,374
Interfacility Departures	561	351	13	0	925
Straight in Arrivals	2,643	2,474	424	929	6,470
Overhead Break Arrivals	4,327	3,319	743	1,518	9,907
IFR Arrivals	480	260	73	184	997
Interfacility Arrivals	561	351	13	0	925
FCLP Ops <sup>2</sup>	9,034	5,587	175	0	14,796
Touch & Go Ops <sup>2</sup>	4,935	5,406	535	951	11,827
Depart-Re-enter Ops <sup>2</sup>	2,491	0	434	804	3,729
GCA pattern Ops <sup>2</sup>	7,089	5,901	552	938	14,480
<b>Total</b>	<b>39,571</b>	<b>29,702</b>	<b>4,202</b>	<b>7,955</b>	<b>81,430</b>
<b>OLF Coupeville</b>					
Interfacility Departures	561	351	13	0	925
Interfacility Arrivals	561	351	13	0	925
FCLP Ops <sup>2</sup>	7,858	4,914	180	0	12,952
<b>Total</b>	<b>8,980</b>	<b>5,616</b>	<b>206</b>	<b>0</b>	<b>14,802</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3BAveYr, workbook Ops Tables AveYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3B Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,470	15,614,159	681.51	94.33	255.70	10.23	57.01	57.01	23,567.50
Break Arrival LTO <sup>2</sup>	11,829	27,553,487	1,252.86	172.87	471.37	18.05	100.27	100.27	41,486.08
FCLP <sup>4</sup>	7,398	5,222,988	1.85	53.52	0.34	3.42	14.61	14.61	8,321.01
Touch-and-Go <sup>4</sup>	5,914	4,174,931	1.48	42.78	0.27	2.73	11.68	11.68	6,651.30
Depart and Re-enter <sup>4</sup>	1,865	2,630,810	0.94	26.99	0.18	1.72	7.36	7.36	4,194.24
GCA Pattern <sup>4</sup>	7,240	10,215,640	3.66	104.80	0.71	6.69	28.56	28.56	16,286.56
<b>Total Emissions for Ault Field Flight Operations</b>		<b>65,412,014.2</b>	<b>1,942.3</b>	<b>495.3</b>	<b>728.6</b>	<b>42.8</b>	<b>219.5</b>	<b>219.5</b>	<b>100,506.7</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	925	1,279,537	52.05	11.93	1.91	0.84	3.05	3.05	1,949.47
FCLP <sup>4</sup>	12,952	9,144,112	3.24	93.71	0.60	5.99	25.58	25.58	14,567.96
Interfacility Transit	925	557,929	0.20	4.12	0.04	0.37	1.83	1.83	890.16
<b>Total Emissions for Coupeville Flight Operations</b>		<b>10,981,578.3</b>	<b>55.5</b>	<b>109.8</b>	<b>2.6</b>	<b>7.2</b>	<b>30.5</b>	<b>30.5</b>	<b>17,407.6</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>85,590,984.4</b>	<b>2,641.9</b>	<b>653.0</b>	<b>877.4</b>	<b>56.1</b>	<b>278.8</b>	<b>278.8</b>	<b>131,382.4</b>

12,605,446.90 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3B**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,942.29	495.30	728.58	42.84	219.49	219.49	100,506.69
OLF Coupeville Aircraft Flight Operations	55.5	109.8	2.6	7.2	30.5	30.5	17,407.6
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,723.18</b>	<b>662.66</b>	<b>879.14</b>	<b>56.13</b>	<b>374.67</b>	<b>289.38</b>	<b>142,237.93</b>

**Alternative 3C Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	7,390	6,003	1,231	2,608	17,232
Interfacility Departures	225	135	10	0	370
Straight in Arrivals	2,652	2,487	412	940	6,491
Overhead Break Arrivals	4,297	3,306	728	1,498	9,829
IFR Arrivals	440	210	91	170	911
Interfacility Arrivals	226	135	10	0	371
FCLP Ops <sup>2</sup>	14,341	9,132	199	0	23,672
Touch & Go Ops <sup>2</sup>	4,935	5,406	535	951	11,827
Depart-Re-enter Ops <sup>2</sup>	2,491	0	434	804	3,729
GCA pattern Ops <sup>2</sup>	7,089	5,901	552	938	14,480
<b>Total</b>	<b>44,086</b>	<b>32,715</b>	<b>4,202</b>	<b>7,909</b>	<b>88,912</b>
<b>OLF Coupeville</b>					
Interfacility Departures	225	135	10	0	370
Interfacility Arrivals	226	135	10	0	371
FCLP Ops <sup>2</sup>	3,157	1,892	136	0	5,185
<b>Total</b>	<b>3,608</b>	<b>2,162</b>	<b>156</b>	<b>0</b>	<b>5,926</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3CAveYr, workbook Ops Tables AveYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3C Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,491	15,664,838	683.72	94.63	256.53	10.26	57.20	57.20	23,643.99
Break Arrival LTO <sup>2</sup>	11,111	25,881,037	1,176.81	162.38	442.76	16.95	94.19	94.19	38,967.95
FCLP <sup>4</sup>	11,836	8,356,216	2.96	85.63	0.54	5.47	23.38	23.38	13,312.72
Touch-and-Go <sup>4</sup>	5,914	4,174,931	1.48	42.78	0.27	2.73	11.68	11.68	6,651.30
Depart and Re-enter <sup>4</sup>	1,865	2,630,810	0.94	26.99	0.18	1.72	7.36	7.36	4,194.24
GCA Pattern <sup>4</sup>	7,240	10,215,640	3.66	104.80	0.71	6.69	28.56	28.56	16,286.56
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,923,472.5</b>	<b>1,869.6</b>	<b>517.2</b>	<b>701.0</b>	<b>43.8</b>	<b>222.4</b>	<b>222.4</b>	<b>103,056.8</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	370	511,815	20.82	4.77	0.77	0.34	1.22	1.22	779.79
FCLP <sup>4</sup>	5,185	3,660,610	1.30	37.51	0.24	2.40	10.24	10.24	5,831.91
Interfacility Transit	370	223,172	0.08	1.65	0.02	0.15	0.73	0.73	356.06
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,395,596.5</b>	<b>22.2</b>	<b>43.9</b>	<b>1.0</b>	<b>2.9</b>	<b>12.2</b>	<b>12.2</b>	<b>6,967.8</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>80,516,461.0</b>	<b>2,535.9</b>	<b>609.1</b>	<b>848.3</b>	<b>52.7</b>	<b>263.3</b>	<b>263.3</b>	<b>123,492.6</b>

11,858,094.40 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3C**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,869.57	517.22	701.00	43.83	222.36	222.36	103,056.75
NOLF Coupeville Aircraft Flight Operations	22.2	43.9	1.0	2.9	12.2	12.2	6,967.8
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,617.16</b>	<b>618.76</b>	<b>850.03</b>	<b>52.81</b>	<b>359.27</b>	<b>273.97</b>	<b>134,348.17</b>

**Alternative 3D Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	7,442	6,047	1,239	2,628	17,356
Interfacility Departures	786	498	11	0	1,295
Straight in Arrivals	2,650	2,471	437	948	6,506
Overhead Break Arrivals	4,318	3,359	731	1,511	9,919
IFR Arrivals	475	218	70	169	932
Interfacility Arrivals	786	498	12	0	1,296
FCLP Ops <sup>2</sup>	5,471	3,199	219	0	8,889
Touch & Go Ops <sup>2</sup>	4,935	5,406	535	951	11,827
Depart-Re-enter Ops <sup>2</sup>	2,491	0	434	804	3,729
GCA pattern Ops <sup>2</sup>	7,089	5,901	552	938	14,480
<b>Total</b>	<b>36,443</b>	<b>27,597</b>	<b>4,240</b>	<b>7,949</b>	<b>76,229</b>
<b>OLF Coupeville</b>					
Interfacility Departures	786	498	11	0	1,295
Interfacility Arrivals	786	498	12	0	1,296
FCLP Ops <sup>2</sup>	11,010	6,955	159	0	18,124
<b>Total</b>	<b>12,582</b>	<b>7,951</b>	<b>182</b>	<b>0</b>	<b>20,715</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3DAveYr, workbook Ops Tables AveYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3D Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,506	15,701,038	685.30	94.85	257.12	10.28	57.33	57.33	23,698.63
Break Arrival LTO <sup>2</sup>	12,147	28,294,210	1,286.54	177.52	484.04	18.53	102.97	102.97	42,601.36
FCLP <sup>4</sup>	4,445	3,137,817	1.11	32.16	0.20	2.06	8.78	8.78	4,999.02
Touch-and-Go <sup>4</sup>	5,914	4,174,931	1.48	42.78	0.27	2.73	11.68	11.68	6,651.30
Depart and Re-enter <sup>4</sup>	1,865	2,630,810	0.94	26.99	0.18	1.72	7.36	7.36	4,194.24
GCA Pattern <sup>4</sup>	7,240	10,215,640	3.66	104.80	0.71	6.69	28.56	28.56	16,286.56
<b>Total Emissions for Ault Field Flight Operations</b>		<b>64,154,445.3</b>	<b>1,979.0</b>	<b>479.1</b>	<b>742.5</b>	<b>42.0</b>	<b>216.7</b>	<b>216.7</b>	<b>98,431.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,295	1,791,352	72.86	16.70	2.68	1.17	4.28	4.28	2,729.26
FCLP <sup>4</sup>	18,124	12,795,544	4.53	131.13	0.83	8.38	35.79	35.79	20,385.24
Interfacility Transit	1,295	781,101	0.28	5.76	0.06	0.51	2.56	2.56	1,246.22
<b>Total Emissions for Coupeville Flight Operations</b>		<b>15,367,996.8</b>	<b>77.7</b>	<b>153.6</b>	<b>3.6</b>	<b>10.1</b>	<b>42.6</b>	<b>42.6</b>	<b>24,360.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>88,719,834.0</b>	<b>2,700.8</b>	<b>680.7</b>	<b>892.4</b>	<b>58.1</b>	<b>288.1</b>	<b>288.1</b>	<b>136,259.9</b>

13,066,249.49 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,979.03	479.10	742.54	42.02	216.67	216.67	98,431.10
NOLF Coupeville Aircraft Flight Operations	77.7	153.6	3.6	10.1	42.6	42.6	24,360.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,782.10</b>	<b>690.30</b>	<b>894.12</b>	<b>58.18</b>	<b>384.02</b>	<b>298.73</b>	<b>147,115.47</b>

**Alternative 3E Average Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	7,390	6,003	1,231	2,608	17,232
Interfacility Departures	338	203	15	0	556
Straight in Arrivals	2,652	2,487	412	940	6,491
Overhead Break Arrivals	4,297	3,306	728	1,498	9,829
IFR Arrivals	440	210	91	170	911
Interfacility Arrivals	339	203	16	0	558
FCLP Ops <sup>2</sup>	12,549	7,991	174	0	20,714
Touch & Go Ops <sup>2</sup>	4,935	5,406	535	951	11,827
Depart-Re-enter Ops <sup>2</sup>	2,491	0	434	804	3,729
GCA pattern Ops <sup>2</sup>	7,089	5,901	552	938	14,480
<b>Total</b>	<b>42,520</b>	<b>31,710</b>	<b>4,188</b>	<b>7,909</b>	<b>86,327</b>
<b>OLF Coupeville</b>					
Interfacility Departures	338	203	15	0	556
Interfacility Arrivals	339	203	16	0	558
FCLP Ops <sup>2</sup>	4,736	2,839	205	0	7,780
<b>Total</b>	<b>5,413</b>	<b>3,245</b>	<b>236</b>	<b>0</b>	<b>8,894</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3EAveYr, workbook Ops Tables AveYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



**Alternative 3E Average Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,491	15,664,838	683.72	94.63	256.53	10.26	57.20	57.20	23,643.99
Break Arrival LTO <sup>2</sup>	11,298	26,316,620	1,196.62	165.11	450.21	17.24	95.77	95.77	39,623.79
FCLP <sup>4</sup>	10,357	7,312,042	2.59	74.93	0.48	4.79	20.46	20.46	11,649.19
Touch-and-Go <sup>4</sup>	5,914	4,174,931	1.48	42.78	0.27	2.73	11.68	11.68	6,651.30
Depart and Re-enter <sup>4</sup>	1,865	2,630,810	0.94	26.99	0.18	1.72	7.36	7.36	4,194.24
GCA Pattern <sup>4</sup>	7,240	10,215,640	3.66	104.80	0.71	6.69	28.56	28.56	16,286.56
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,314,880.7</b>	<b>1,889.0</b>	<b>509.3</b>	<b>708.4</b>	<b>43.4</b>	<b>221.0</b>	<b>221.0</b>	<b>102,049.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	556	769,106	31.28	7.17	1.15	0.50	1.84	1.84	1,171.79
FCLP <sup>4</sup>	7,780	5,492,680	1.95	56.29	0.36	3.60	15.37	15.37	8,750.67
Interfacility Transit	556	335,361	0.12	2.47	0.03	0.22	1.10	1.10	535.06
<b>Total Emissions for Coupeville Flight Operations</b>		<b>6,597,146.2</b>	<b>33.3</b>	<b>65.9</b>	<b>1.5</b>	<b>4.3</b>	<b>18.3</b>	<b>18.3</b>	<b>10,457.5</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>82,109,418.9</b>	<b>2,566.4</b>	<b>623.2</b>	<b>856.2</b>	<b>53.8</b>	<b>268.1</b>	<b>268.1</b>	<b>125,974.7</b>

12,092,697.92 total gallons of fuel

114,259.03

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person. Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,889.01	509.25	708.38	43.44	221.02	221.02	102,049.06
NOLF Coupeville Aircraft Flight Operations	33.3	65.9	1.5	4.3	18.3	18.3	10,457.5
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,647.75</b>	<b>632.79</b>	<b>857.93</b>	<b>53.85</b>	<b>364.04</b>	<b>278.74</b>	<b>136,830.24</b>

NAS Whidbey Island Complex Annual GHG Emissions, Alternative 3

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 3A	Alt 3B	Alt 3C	Alt 3D	Alt 3E
<b>Stationary Sources</b>							
Sitewide Total GHG Emissions (2014 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	89,145	87,730	125,813	119,164	112,008	123,588	114,259
GSE Emissions	130	131	165	160	154	167	160
Personnel Commute Emissions	9,091	9,091	9,846	9,846	9,846	9,846	9,846
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	<b>98,366</b>	<b>96,951</b>	<b>135,823</b>	<b>129,170</b>	<b>122,008</b>	<b>133,601</b>	<b>124,265</b>
<b>Change in Mobile CO<sub>2</sub> Emissions</b>		<b>-1,415</b>	<b>38,872</b>	<b>32,219</b>	<b>25,057</b>	<b>36,650</b>	<b>27,314</b>
<b>% increase in Mobile CO<sub>2</sub> Emissions</b>			<b>40%</b>	<b>33%</b>	<b>25%</b>	<b>37%</b>	<b>28%</b>
<b>Total Change in Emissions (Stationary and Mobile)</b>			<b>39,329</b>	<b>32,675</b>	<b>25,513</b>	<b>37,106</b>	<b>27,770</b>
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.04%	0.03%	0.03%	0.04%	0.03%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.10%	0.08%	0.06%	0.09%	0.07%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.59%	0.49%	0.38%	0.56%	0.42%

<sup>1</sup> . Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29, 2018  
metric tons per short ton  
0.907  
TPY = Tons per year  
CO<sub>2</sub>e = Carbon Dioxide Equivalent  
GHG = Greenhouse Gas

### Onroad Vehicle Exhaust Emission Factors

Equipment Type	Fuel Type	Exhaust Emission Factor <sup>1</sup> (g/VMT)									Road Dust Emission Factor <sup>d</sup> (g/VMT)		Total PM Emission Factor <sup>e</sup> (g/VMT)	
		VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CH4	N2O	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Cars and Light Trucks	Gasoline	0.06	2.66	0.31	0.0024	0.0066	0.0058	0.0038	0.0021	354	3.13	0.341	3.13	0.347
Delivery Vehicles	Diesel	0.28	1.10	8.06	0.158	0.17	0.17			1,400	3.13	0.341	3.30	0.511

Notes:

1. MOVES Onroad run for analysis year 2017, Island Count, WA. Includes weekdays and weekends, January through December, all hours of day. 'Cars and Light Trucks' Assumes 50% Passenger Car, 50% Passenger Truck

d. See emission factor derivation table below.

e. Sum of exhaust and road dust emission factors.

#### Paved Roads - Emission Factor Derivation

$$E = (k(sL/2)^{0.65}(W/3)^{1.5} \cdot C) \quad \text{AP-42 Section 13.2.1 (11/06 version)}$$

where:

E = particulate emission factor (lb/VMT)

k = particle size multiplier

sL = road surface silt loading (g/m<sup>2</sup>)

W = average vehicle weight (tons)

C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM <sub>10</sub>	PM <sub>2.5</sub>	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	g/VMT	7.3	1.1	Table 13.2-1.1
Silt Loading, sL	g/m <sup>2</sup>	0.6	0.6	Table 13.2.1-3
Emission factor, C	g/VMT	0.2119	0.1617	Table 13.2.1-2
Emission factor, E	g/VMT	3.13	0.341	Table 13.2.1-3

Ground Transportation Vehicle Emissions for Existing POV: Growler Squadron Personnel only

Source	# of vehicles <sup>2</sup>	Avg Daily mileage	Annual days of Commute	Total Annual Miles <sup>3</sup>	Emission Factors (lbs/mi) <sup>1</sup>							Emissions (tpy)						
					VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>No Action</b>																		
Total Military and Non Military Personnel	4,104	25	250	25,650,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.63	75.07	8.88	0.067	10023	88.56	9.81
<b>Alternative 1</b>																		
Total Military and Non Military Personnel	4,439	25	250	27,743,750	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.77	81.20	9.61	0.072	10841	95.79	10.61
Change in Personnel	335	25	250	2,093,750	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.13	6.13	0.73	0.005	818	7.23	0.80
<b>Alternative 2</b>																		
Total Military and Non Military Personnel	4,732	25	250	29,575,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.88	86.56	10.24	0.077	11556	102.12	11.31
Change in Personnel	628	25	250	3,925,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.25	11.49	1.36	0.010	1534	13.55	1.50
<b>Alternative 3</b>																		
Total Military and Non Military Personnel	4,445	25	250	27,781,250	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.77	81.31	9.62	0.072	10856	95.92	10.63
Change in Personnel	341	25	250	2,131,250	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.14	6.24	0.74	0.006	833	7.36	0.82

<sup>1</sup> See Emission factors in Previous Table of this Appendix

<sup>2</sup> Assumes one vehicle per person, based on Total Military personnel at NAS Whidbey island, revised 2017

<sup>3</sup> Based on 250 days for commute

**GSE Equipment Exhaust Emission Factors and Estimated Emissions**

Equipment types, sizes, operations, ratio to LTOs and emission factors from those listed for NAS LeMoore in Navy F-35c West Coast Conformity Determination  
 All NAS Whidbey Equipment types, sizes, operations and emissions estimated based NAS LeMoore data and ratio of NAS Whidbey LTOs to NAS LeMoore LTOs  
 NAS Whidbey LTOs = Departures + Interfacility Departures

GSE Equipment Exhaust Emission Factors													LeMoore Baseline LTO: 32966														
Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Load Factor	Emission factors									Emissions (lbs/yr)									MT/year	
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year		CO <sub>2</sub> e
Tow Tractor	88	48	0.0107	4.89	72.29	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	1,160.76	24.18	657.76	0.50	38.69	37.48	172,174.30	9.84	4.41	173,734.55	
Tow Tractor	192	1	0.0003	10.67	0.93	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.32	0.01	0.38	0.00	0.00	0.00	100.38	0.01	0.00	101.29	
Turbine	396	5	0.0002	22.00	0.25	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.51	0.03	0.35	0.00	0.00	0.00	284.41	0.02	0.01	286.99	
Air Compressor	58	2	0.0002	3.22	1.53	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.64	0.01	0.36	0.00	0.02	0.02	100.38	0.01	0.00	101.29	
Hydraulic Power Supply	111	37	0.0010	6.17	5.56	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	43.21	1.54	52.09	0.04	0.17	0.17	12,875.60	0.74	0.33	12,992.28	
Aircon	210	8	0.0003	11.67	0.85	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	1.45	0.07	0.98	0.00	0.01	0.01	803.05	0.05	0.02	810.33	
MEPP	215	37	0.0080	11.94	22.19	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	179.57	9.24	121.47	0.27	1.32	1.32	99,538.27	5.69	2.55	100,440.29	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>1,386.46</b>	<b>35.09</b>	<b>833.40</b>	<b>0.80</b>	<b>40.22</b>	<b>39.01</b>				
																	<b>Totals in Tons</b>	<b>0.69</b>	<b>0.02</b>	<b>0.42</b>	<b>0.02</b>	<b>0.02</b>					
																	<b>Total Metric tons</b>							<b>285.88</b>	<b>0.02</b>	<b>0.01</b>	<b>288.47</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
GWP	1	25	298

EPA, 2016.U.S. Inventory of Greenhouse Gas Emissions and Sinks 1990-2014, April 2016. Accessed March 21, 2018 at  
<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>  
 (latest final report: Draft 2016 inventory was released February 6, 2018)

GSE Equipment Exhaust Emission Factors													NAS Whidbey Baseline LTOs: 14,898														
Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors									Emissions (lbs/yr)									MT/year	
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year		CO <sub>2</sub> e
Tow Tractor	88	48	0.0107	4.89	32.67	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	524.57	10.93	297.26	0.22	17.49	16.94	77,809.04	4.45	1.99	78,514.15	
Tow Tractor	192	1	0.0003	10.67	0.42	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.14	0.01	0.17	0.00	0.00	0.00	45.36	0.00	0.00	45.78	
Turbine	396	5	0.0002	22.00	0.12	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.23	0.01	0.16	0.00	0.00	0.00	128.53	0.01	0.00	129.70	
Air Compressor	58	2	0.0002	3.22	0.69	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.29	0.01	0.16	0.00	0.01	0.01	45.36	0.00	0.00	45.78	
Hydraulic Power Supply	111	37	0.0010	6.17	2.51	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	19.53	0.69	23.54	0.02	0.08	0.08	5,818.74	0.33	0.15	5,871.47	
Aircon	210	8	0.0003	11.67	0.38	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.65	0.03	0.44	0.00	0.00	0.00	362.92	0.02	0.01	366.20	
MEPP	215	37	0.0080	11.94	10.03	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	81.15	4.18	54.90	0.12	0.60	0.60	44,983.35	2.57	1.15	45,390.99	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>626.57</b>	<b>15.86</b>	<b>376.63</b>	<b>0.36</b>	<b>18.18</b>	<b>17.63</b>				
																	<b>Totals in Tons</b>	<b>0.31</b>	<b>0.01</b>	<b>0.19</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>				
																	<b>Total Metric tons</b>							<b>129.19</b>	<b>0.01</b>	<b>0.00</b>	<b>130.36</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

GSE Equipment Exhaust Emission Factors													NAS Whidbey No Action LTOs: 14,950														
Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors									Emissions (lbs/yr)									MT/year	
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year		CO <sub>2</sub> e
Tow Tractor	88	48	0.0107	4.89	32.78	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	526.40	10.97	298.29	0.22	17.55	17.00	78,080.62	4.46	2.00	78,788.19	
Tow Tractor	192	1	0.0003	10.67	0.42	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.15	0.01	0.17	0.00	0.00	0.00	45.52	0.00	0.00	45.94	
Turbine	396	5	0.0002	22.00	0.12	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.23	0.01	0.16	0.00	0.00	0.00	128.98	0.01	0.00	130.15	
Air Compressor	58	2	0.0002	3.22	0.70	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.29	0.01	0.16	0.00	0.01	0.01	45.52	0.00	0.00	45.94	
Hydraulic Power Supply	111	37	0.0010	6.17	2.52	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	19.60	0.70	23.62	0.02	0.08	0.08	5,839.05	0.33	0.15	5,891.97	
Aircon	210	8	0.0003	11.67	0.38	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.66	0.03	0.44	0.00	0.00	0.00	364.18	0.02	0.01	367.48	
MEPP	215	37	0.0080	11.94	10.06	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	81.44	4.19	55.09	0.12	0.60	0.60	45,140.36	2.58	1.16	45,549.42	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>628.78</b>	<b>15.91</b>	<b>377.94</b>	<b>0.37</b>	<b>18.24</b>	<b>17.69</b>				
																	<b>Totals in Tons</b>	<b>0.31</b>	<b>0.01</b>	<b>0.19</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>				
																	<b>Total Metric tons</b>							<b>129.64</b>	<b>0.01</b>	<b>0.00</b>	<b>130.82</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

GSE Equipment Exhaust Emission Factors													NAS Whidbey Alt 1A: 18,450													
Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors									Emissions (lbs/yr)									MT/year
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	
Tow Tractor	88	48	0.0107	4.89	40.46	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	649.64	13.53	368.13	0.28	21.65	20.98	96,360.36	5.51	2.47	97,233.59
Tow Tractor	192	1	0.0003	10.67	0.52	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	56.18	0.00	0.00	56.69
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.29	0.01	0.19	0.00	0.00	0.00	159.18	0.01	0.00	160.62
Air Compressor	58	2	0.0002	3.22	0.86	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.36	0.01	0.20	0.00	0.01	0.01	56.18	0.00	0.00	56.69
Hydraulic Power Supply	111	37	0.0010	6.17	3.11	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	24.18	0.86	29.15	0.02	0.10	0.10	7,206.05	0.41	0.18	7,271.36
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.81	0.04	0.55	0.00	0.01	0.01	449.44	0.03	0.01	453.51
MEPP	215	37	0.0080	11.94	12.42	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.010														

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 1D: 18,257

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	40.03	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	642.84	13.39	364.28	0.27	21.43	20.76	95,352.37	5.45	2.44	96,216.46							
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.59	0.00	0.00	56.10							
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	157.51	0.01	0.00	158.94							
Air Compressor	58	2	0.0002	3.22	0.85	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.59	0.00	0.00	56.10							
Hydraulic Power Supply	111	37	0.0010	6.17	3.08	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.93	0.85	28.85	0.02	0.09	0.09	7,130.67	0.41	0.18	7,195.29							
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.80	0.04	0.54	0.00	0.01	0.01	444.74	0.03	0.01	448.77							
MEPP	215	37	0.0080	11.94	12.29	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	99.45	5.12	67.27	0.15	0.73	0.73	55,125.59	3.15	1.41	55,625.14							
<b>Total Equipment:</b>		<b>138</b>															<b>767.84</b>	<b>19.43</b>	<b>461.55</b>	<b>0.45</b>	<b>22.27</b>	<b>21.60</b>											
																	Totals in lbs	767.84	19.43	461.55	0.45	22.27	21.60										
																	Totals in Tons	0.38	0.01	0.23	0.00	0.01	0.01										
																	Total Metric tons							158.32	0.01	0.00							
																	Total MT CO <sub>2</sub> e																159.76

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 1E: 17,354

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	38.05	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	611.05	12.73	346.26	0.26	20.37	19.73	90,636.19	5.18	2.32	91,457.54							
Tow Tractor	192	1	0.0003	10.67	0.49	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.20	0.00	0.00	0.00	52.84	0.00	0.00	53.32							
Turbine	396	5	0.0002	22.00	0.13	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.27	0.01	0.18	0.00	0.00	0.00	149.72	0.01	0.00	151.08							
Air Compressor	58	2	0.0002	3.22	0.81	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.34	0.01	0.19	0.00	0.01	0.01	52.84	0.00	0.00	53.32							
Hydraulic Power Supply	111	37	0.0010	6.17	2.93	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	22.75	0.81	27.42	0.02	0.09	0.09	6,777.99	0.39	0.17	6,839.41							
Aircon	210	8	0.0003	11.67	0.45	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.76	0.04	0.52	0.00	0.01	0.01	422.74	0.02	0.01	426.57							
MEPP	215	37	0.0080	11.94	11.68	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	94.53	4.87	63.95	0.14	0.70	0.70	52,399.05	2.99	1.34	52,873.89							
<b>Total Equipment:</b>		<b>138</b>															<b>729.86</b>	<b>18.47</b>	<b>438.72</b>	<b>0.42</b>	<b>21.17</b>	<b>20.54</b>											
																	Totals in lbs	729.86	18.47	438.72	0.42	21.17	20.54										
																	Totals in Tons	0.36	0.01	0.22	0.00	0.01	0.01										
																	Total Metric tons							150.49	0.01	0.00							
																	Total MT CO <sub>2</sub> e																151.88

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 2A: 18,896

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	41.43	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	665.34	13.86	377.03	0.28	22.18	21.48	98,689.73	5.64	2.53	99,584.06							
Tow Tractor	192	1	0.0003	10.67	0.53	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.22	0.00	0.00	0.00	57.54	0.00	0.00	58.06							
Turbine	396	5	0.0002	22.00	0.15	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.29	0.02	0.20	0.00	0.00	0.00	163.03	0.01	0.00	164.50							
Air Compressor	58	2	0.0002	3.22	0.88	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.37	0.01	0.21	0.00	0.01	0.01	57.54	0.00	0.00	59.06							
Hydraulic Power Supply	111	37	0.0010	6.17	3.19	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	24.77	0.88	29.86	0.02	0.10	0.10	7,380.25	0.42	0.19	7,447.13							
Aircon	210	8	0.0003	11.67	0.49	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.83	0.04	0.56	0.00	0.01	0.01	460.31	0.03	0.01	464.48							
MEPP	215	37	0.0080	11.94	12.72	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	102.93	5.30	69.63	0.16	0.76	0.76	57,055.00	3.26	1.46	57,572.03							
<b>Total Equipment:</b>		<b>138</b>															<b>794.71</b>	<b>20.11</b>	<b>477.70</b>	<b>0.46</b>	<b>23.05</b>	<b>22.36</b>											
																	Totals in lbs	794.71	20.11	477.70	0.46	23.05	22.36										
																	Totals in Tons	0.40	0.01	0.24	0.00	0.01	0.01										
																	Total Metric tons							163.86	0.01	0.00							
																	Total MT CO <sub>2</sub> e																165.35

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 2B: 18,191

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e		
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year
Tow Tractor	88	48	0.0107	4.89	39.89	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	640.52	13.34	362.96	0.27	21.35	20.68	95,007.66	5.43	2.43	95,868.63
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.39	0.00	0.00	55.89
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	156.94	0.01	0.00	158.37
Air Compressor	58	2	0.0002	3.22	0.85	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.39	0.00	0.00	55.89
Hydraulic Power Supply	111	37	0.0010	6.17	3.07	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.84	0.85	28.75	0.02	0.09	0.09	7,104.90	0.41	0.18	7,169.28
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.													

GSE Equipment Exhaust Emission Factors NAS Whidbey Alt 2E: 17,828

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	39.09	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	627.74	13.08	355.72	0.27	20.92	20.27	93.111	79	5.32	2.39	93,955.58								
Tow Tractor	192	1	0.0003	10.67	0.50	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.21	0.00	0.00	0.00	54.29	0.00	0.00	0.00	54.78								
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	153.81	0.01	0.00	0.00	155.20								
Air Compressor	58	2	0.0002	3.22	0.83	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	54.29	0.00	0.00	0.00	54.78								
Hydraulic Power Supply	111	37	0.0010	6.17	3.01	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.37	0.83	28.17	0.02	0.09	0.09	6,963.12	0.40	0.18	0.18	7,026.22								
Aircon	210	8	0.0003	11.67	0.46	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.78	0.04	0.53	0.00	0.01	0.01	434.29	0.02	0.01	0.01	438.23								
MEPP	215	37	0.0080	11.94	12.00	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	97.11	5.00	65.69	0.15	0.71	0.71	53,830.26	3.08	1.38	1.38	54,318.07								
<b>Total Equipment:</b>		<b>138</b>															<b>749.80</b>	<b>18.98</b>	<b>456.70</b>	<b>0.44</b>	<b>21.75</b>	<b>21.10</b>													
																	Totals in lbs	749.80	18.98	456.70	0.44	21.75	21.10												
																	Totals in Tons	0.37	0.01	0.23	0.00	0.01	0.01												
																	Total Metric tons							154.60	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		156.00

GSE Equipment Exhaust Emission Factors NAS Whidbey Alt 3A: 18,835

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	41.30	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	663.19	13.82	375.81	0.28	22.11	21.42	98,371.14	5.62	2.52	2.52	99,262.58								
Tow Tractor	192	1	0.0003	10.67	0.53	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.22	0.00	0.00	0.00	57.35	0.00	0.00	0.00	57.87								
Turbine	396	5	0.0002	22.00	0.15	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.29	0.02	0.20	0.00	0.00	0.00	162.50	0.01	0.00	0.00	163.97								
Air Compressor	58	2	0.0002	3.22	0.88	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.37	0.01	0.21	0.00	0.01	0.01	57.35	0.00	0.00	0.00	57.87								
Hydraulic Power Supply	111	37	0.0010	6.17	3.18	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	24.69	0.88	29.76	0.02	0.10	0.10	7,356.42	0.42	0.19	0.19	7,423.09								
Aircon	210	8	0.0003	11.67	0.48	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.83	0.04	0.56	0.00	0.01	0.01	458.82	0.03	0.01	0.01	462.98								
MEPP	215	37	0.0080	11.94	12.68	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	102.60	5.28	69.40	0.15	0.75	0.75	56,870.81	3.25	1.46	1.46	57,386.18								
<b>Total Equipment:</b>		<b>138</b>															<b>792.15</b>	<b>20.05</b>	<b>476.16</b>	<b>0.46</b>	<b>22.98</b>	<b>22.29</b>													
																	Totals in lbs	792.15	20.05	476.16	0.46	22.98	22.29												
																	Totals in Tons	0.40	0.01	0.24	0.00	0.01	0.01												
																	Total Metric tons							163.33	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		164.81

GSE Equipment Exhaust Emission Factors NAS Whidbey Alt 3B: 18,299

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	40.12	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	644.32	13.42	365.12	0.28	21.48	20.81	95,571.72	5.46	2.45	2.45	96,437.80								
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.72	0.00	0.00	0.00	56.23								
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	157.87	0.01	0.00	0.00	159.31								
Air Compressor	58	2	0.0002	3.22	0.85	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.72	0.00	0.00	0.00	56.23								
Hydraulic Power Supply	111	37	0.0010	6.17	3.09	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.99	0.85	28.92	0.02	0.09	0.09	7,147.08	0.41	0.18	0.18	7,214.84								
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.80	0.04	0.54	0.00	0.01	0.01	445.76	0.03	0.01	0.01	449.80								
MEPP	215	37	0.0080	11.94	12.32	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	99.68	5.13	67.43	0.15	0.73	0.73	55,252.40	3.16	1.42	1.42	55,753.10								
<b>Total Equipment:</b>		<b>138</b>															<b>769.61</b>	<b>19.48</b>	<b>462.61</b>	<b>0.45</b>	<b>22.33</b>	<b>21.65</b>													
																	Totals in lbs	769.61	19.48	462.61	0.45	22.33	21.65												
																	Totals in Tons	0.38	0.01	0.23	0.00	0.01	0.01												
																	Total Metric tons							158.69	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		160.12

GSE Equipment Exhaust Emission Factors NAS Whidbey Alt 3C: 17,602

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e	
Tow Tractor	88	48	0.0107	4.89	38.60	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	619.78	12.91	351.21	0.26	20.66	20.01	91,931.44	5.25	2.35	2.35	92,764.53
Tow Tractor	192	1	0.0003	10.67	0.50	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.20	0.00	0.00	0.00	53.60	0.00	0.00	0.00	54.08
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.27	0.01	0.19	0.00	0.00	0.00	151.86	0.01	0.00	0.00	153.24
Air Compressor	58	2	0.0002	3.22	0.82	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.34	0.01	0.19	0.00	0.01	0.01	53.60	0.00	0.00	0.00	54.08
Hydraulic Power Supply	111	37	0.0010	6.17	2.97	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.07	0.82	27.81	0.02	0.09	0.					

**Total Change in Criteria Pollutant and GHG Emissions, Average Operations, All Alternatives**

Alternative	Emissions (tpy) <sup>2</sup>						MT CO <sub>2</sub> e CO <sub>2</sub>
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	
Alternative 1 A	229.1	190.3	638.1	18.0	90.8	84.4	39,405
Alternative 1 B	183.3	159.8	527.0	14.5	74.7	68.2	31,923
Alternative 1 C	139.7	135.9	433.5	11.3	59.9	53.5	24,941
Alternative 1 D	214.3	182.1	606.3	16.9	85.8	79.4	37,044
Alternative 1 E	150.9	144.2	465.7	12.1	64.0	57.5	26,807
Alternative 2 A	227.5	209.0	691.2	18.1	98.6	86.6	40,284
Alternative 2 B	183.4	175.9	584.3	14.8	83.1	71.1	33,078
Alternative 2 C	141.6	152.6	493.8	11.7	68.9	56.9	26,380
Alternative 2 D	213.5	197.6	661.0	17.1	93.9	81.9	38,051
Alternative 2 E	155.7	160.6	524.8	12.7	73.8	61.7	28,652
Alternative 3 A	225.1	202.8	679.3	17.9	91.7	85.1	39,329
Alternative 3 B	183.6	180.1	590.3	14.9	77.6	71.1	32,675
Alternative 3 C	139.6	154.6	484.3	11.5	62.2	55.7	25,513
Alternative 3 D	211.2	198.7	649.2	16.9	87.0	80.4	37,106
Alternative 3 E	153.7	162.5	514.9	12.6	67.0	60.4	27,770

**Total Change in GHG Emissions, All Alternatives**

Alternative/Scenario	Average Operations	High-Tempo Operations	Percent Difference
	MT CO <sub>2</sub> e		
<b>Alternative 1</b>			
Scenario A	39,405	40,828	4%
Scenario B	31,923	32,770	3%
Scenario C	24,941	25,254	1%
Scenario D	37,044	38,254	3%
Scenario E	26,807	27,854	4%
Scenario A	40,284	42,538	6%
Scenario B	33,078	34,653	5%
Scenario C	26,380	27,407	4%
Scenario D	38,051	40,047	5%
Scenario E	28,652	29,889	4%
Scenario A	39,329	40,702	3%
Scenario B	32,675	33,690	3%
Scenario C	25,513	25,982	2%
Scenario D	37,106	38,209	3%
Scenario E	27,770	28,463	2%

Key:

CO<sub>2</sub>e = carbon dioxide equivalent

MT = metric ton



**Aircraft and Personnel Loading by Alternative for the EA 18G (Growler) Operations at NAS Whidbey Island Complex: Ault Field and and OLF Coupeville**

EIS Alternative	Description	Aircraft Loading	Total VAQ Aircraft	Personnel Loading	Total Personnel
Baseline		9 carrier squadrons (45 aircraft) 3 expeditionary squadrons (15 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (17 aircraft)	82	<ul style="list-style-type: none"> <li>• 517 Officer</li> <li>• 3,587 Enlisted</li> </ul>	4,104
Alternative 1	Expand carrier capabilities by adding three additional aircraft to each existing carrier squadron and augmenting the FRS with eight additional aircraft (a net increase of 35 aircraft).	9 carrier squadrons (72 aircraft) 3 expeditionary squadrons (15 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (25 aircraft)	117 (+35)	<ul style="list-style-type: none"> <li>• 597 Officer</li> <li>• 3,842 Enlisted</li> </ul>	4,439 (+335)
Alternative 2	Expand expeditionary and carrier capabilities by establishing two new expeditionary squadrons, adding two additional aircraft to each existing carrier squadron, and augmenting the FRS with eight additional aircraft (a net increase of 36 aircraft).	9 carrier squadrons (63 aircraft) 5 expeditionary squadrons (25 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (25 aircraft)	118 (+36)	<ul style="list-style-type: none"> <li>• 619 Officer</li> <li>• 4,113 Enlisted</li> </ul>	4,732 (+628)
Alternative 3	Expand expeditionary and carrier capabilities by adding three additional aircraft to each existing expeditionary squadron, adding two additional aircraft to each existing carrier squadron, and augmenting the FRS with nine additional aircraft (a net increase of 36 aircraft).	9 carrier squadrons (63 aircraft) 3 expeditionary squadrons (24 aircraft) 1 Reserve Squadron (5 aircraft) 1 training squadron (26 aircraft)	118 (+36)	<ul style="list-style-type: none"> <li>• 597 Officer</li> <li>• 3,848 Enlisted</li> </ul>	4,445 (+341)

No Action: 30% FCLP at Coupeville, 70% at Ault Field

Scenario A: 80% FCLP at Coupeville, 20% at Ault Field

Scenario B: 50% FCLP at Coupeville, 50% at Ault Field

Scenario C: 20% FCLP at Coupeville, 80% at Ault Field

**EA-18 G (Growler) (F414-GE-400 Engines) Emission Factors**

Flight Operation	Fuel used (lbs)	Emissions from Single Flight Operation <sup>1,2,3,4</sup> (lb/op)						
		CO	NO <sub>x</sub>	VOC <sup>4</sup>	SO <sub>2</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO <sub>2</sub>
Straight-In Arrival LTO <sup>1</sup>	2413	210.67	29.16	79.04	3.16	17.62	17.62	7285.16
Break Arrival LTO <sup>1</sup>	2329	211.83	29.23	79.70	3.05	16.95	16.95	7014.30
OLF LTO <sup>2</sup>	1,383	112.53	25.79	4.14	1.81	6.60	6.60	4215.07
Touch-and-Go/FCLP <sup>3</sup>	706	0.50	14.47	0.09	0.92	3.95	3.95	2249.53
Depart&Reenter/ GCA Box (GCA Pattern) <sup>3</sup>	1411	1.01	28.95	0.20	1.85	7.89	7.89	4499.05
3.0 minutes at 85%N2 (Approach) <sup>2</sup>	517	0.37	7.63	0.07	0.68	3.39	3.39	1649.71
3.5 Minutes interfacility flight, Ault Field to Coupeville								
3.5 minutes at 85%N2 (Approach) <sup>2</sup>	603.17	0.44	8.90	0.10	0.79	3.96	3.96	1924.66

Notes:

<sup>1</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines for operations at NAS Whidbey Island based on Table S-1, AESO Memorandum Report No. 9815, Rev I, June 2017. Except adjusted to reduce Max Power Time in mode during Take off from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.

<sup>2</sup> Estimated Air Emissions for a Single F/A-18 LTO Cycle with straight in Arrival--At OLF (no Startup/Taxi/Refuel) and "3.0 minutes at 85%N2" using Table 5 of AESO Memorandum Report No. 9815, Rev I, June 2017. Emissions for interfacility flight based on ratio of # of minutes from Ault field to Coupeville/ 3.

<sup>3</sup> Emission factors for "Touch-and-Go" and "GCA Box" from AESO Memorandum Report No. 9933, Revision E November 2015.

<sup>4</sup> VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev I, June, 2017 as noted for reporting VOCs as defined by the EPA.

<sup>5</sup> SO2 Emission Factor based on fuel used (lbs) from Table S-1, AESO Memorandum Report No. 9933, Revision E November 2015 and AESO Memorandum Report No. 9815, Rev I, June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April, 2017

**Emission Factors for EA-18G (F414-GE-400 Engines) In-Frame Aircraft Maintenance, per test**

Test Type	# tests	Fuel used (lbs)	Emissions from Maintenance Tests <sup>1,2</sup> (lb/test)						
			CO	NO <sub>x</sub>	VOC <sup>3</sup>	SO <sub>2</sub>	PM2.5	PM10	CO2
Water Wash	1.0	132.0	11.41	0.47	8.71	0.17	1.47	1.47	369.57
Low Power, one engine	1.0	364.07	34.16	1.21	26.12	0.48	4.40	4.40	1085.62
Low Power, two engines	1.0	711.67	68.29	2.31	52.24	0.93	8.79	8.79	2119.19
High Power (two engines)	1.0	6375.13	1043.01	90.67	63.89	8.35	19.61	19.61	18505.40

<sup>1</sup> Fuel used and Emission factors for Estimated annual maintenance operations per test, per engine based on ratio of data from Table 9 of AESO Memorandum Report No. 9815, Rev I, June 2017. See table below

<sup>2</sup> VOC emissions = 1.15 x THC emissions as noted for reporting VOCs as defined by the EPA.

**Emission Factors for EA-18G In-Frame Aircraft Maintenance, Annual estimates per aircraft<sup>1</sup>**

Test Type	Annual # tests	# engines in use	Fuel used (lbs)	Emissions from Maintenance Test (lb/aircraft-yr) <sup>1,2</sup>						
				CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM2.5	PM10	CO2
Water Wash	1.0	1.0	132	11.41	0.47	7.57	0.17	1.47	1.47	369.57
Low Power, 1 engine	15.0	1.0	5461	512.45	18.11	340.70	7.15	65.95	65.95	16284.26
Low Power, 2 engines	30.0	2.0	21,350	2048.81	69.38	1362.69	27.97	263.71	263.71	63575.80
High Power	8.0	2.0	51,001	8344.08	725.39	444.43	66.81	156.87	156.87	148043.20

Notes:

<sup>1</sup> From Table 9, AESO Memorandum Report No. 9815, Rev I, June 2017.

<sup>2</sup> SO2 Emission Factor based on fuel used (lbs) from Table 9, AESO Memorandum Report No. 9815, Rev I, June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017

**Estimated Air Emissions for a Single F/A-18G LTO Cycle with straight in Arrival-At OLF (no Startup/Taxi/Refuel)**

Flight Operation and Flight Mode	Engine Power Setting <sup>1</sup>	No. of Engines in Use <sup>1</sup>	Time-In Mode per Engine (min) <sup>2</sup>	Fuel Flow Rate per Engine (lb/hr) <sup>1</sup>	Fuel Used (lbs) <sup>4,8</sup>	Emission Indexes <sup>2</sup> (pounds per 1,000 pounds fuel)						Emissions from Single Flight Operation <sup>5</sup> (lb/ op)					
						EI CO	EI NO <sub>x</sub>	EI HC	EI SO <sub>2</sub> <sup>9</sup>	EI PM <sub>10</sub>	CO <sub>2</sub>	CO	NO <sub>x</sub>	VOC <sup>10</sup>	SO <sub>2</sub>	PM <sub>10</sub>	CO <sub>2</sub>
<b>Departure</b>																	
Engine Run up	80	2	0.5	3079.00	51	1.86	8.98	0.14	1.31	8.780	3205	0.10	0.46	0.01	0.07	0.45	164.46
Take off <sup>6,11,12</sup>	Max	2	0.33	35763.00	397	274.97	9.67	4.87	1.31	2.950	2712	109.26	3.84	2.23	0.52	1.17	1077.66
Climb out <sup>7</sup>	95	2	1.0	11320.00	377	0.7	36.29	0.12	1.31	2.950	3179	0.26	13.69	0.05	0.49	1.11	1199.62
<b>Departure Total</b>					<b>826</b>							<b>109.62</b>	<b>18.00</b>	<b>2.29</b>	<b>1.08</b>	<b>2.74</b>	<b>2441.74</b>
<b>Arrival</b>																	
Approach	85	2	3.0	5169.00	517	0.72	14.75	0.12	1.31	6.56	3191	0.37	7.62	0.07	0.68	3.39	1649.58
On Runway	G Idle	2	1.0	695.00	23	98.18	3.18	65.33	1.31	12.64	2973	2.27	0.07	1.74	0.03	0.29	68.88
Unstick	75	2	0.3	1720.00	17	15.2	5.58	1.98	1.31	10.73	3190	0.26	0.10	0.04	0.02	0.18	54.86
<b>Arrival Total</b>					<b>557</b>							<b>2.91</b>	<b>7.79</b>	<b>1.85</b>	<b>0.73</b>	<b>3.87</b>	<b>1773.33</b>
<b>LTO Total</b>					<b>1,383</b>							<b>112.5</b>	<b>25.8</b>	<b>4.1</b>	<b>1.8</b>	<b>6.6</b>	<b>4,215.1</b>

Source: Table 5, AESO Memorandum Report No. 9815, Rev 1 June 2017 (except SO2 emission factors)

**F/A-18E/F Notes:**

- Estimated from 1998 F/A-18A,B,C, D pilot interviews, which are on file at AESO.
- Source for all non APU fuel flow and emission indexes: *Gaseous and Particulate Emission Indexes for the F414-GE-400 Turbofan Engine*; Aircraft Environmental Support Office; FRCSW, San Diego, CA., February 2011, AESO Memorandum Report No. 9725, Revision D
- The APU fuel flow and emission index data is manufacturer information provided by Rick Stanley (36-200 Project Engineer).
- Fuel used = fuel flow x time-in-mode / 60 x no. of engines in use.
- Emissions = fuel used / 1,000 x emission index.
- Takeoff is from brake release to 500 feet above ground level.
- Climbout is from 500 feet above ground level to 3,000 feet above ground level. Climbout time-in-mode reflects an unrestricted climbout departure corridor. Climbout time-in-mode may be longer if departure corridor is restricted in regards to climbout rate and/or hold down altitude.
- For F/A-18E/F, the maximum internal fuel load is 14,460 lbs. The maximum fuel load is 24,272 lbs with 3 external tanks.

9) SO2 Emission Factor for JP-5 fuel as recommended for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017

10) VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev 1 June, 2017 as noted for reporting VOCs as defined by the EPA.

11) Time in Mode for Max (Afterburner) power setting has been adjusted from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.

12) AB PM 10 and 2.5 data not provided in AESO Memo N. 9815. Per Xu Li-Jones (AESO) comments (6/22/2016), 2.95 lbs/1000 gal fuel is used.

**Estimated Change in Air Emissions for a Single F/A-18G LTO Cycle: adjustment of Max Take off Afterburner use**

Flight Operation and Flight Mode	Engine Power Setting <sup>1</sup>	No. of Engines in Use <sup>1</sup>	Time-In Mode per Engine (min) <sup>2</sup>	Fuel Flow Rate per Engine (lb/hr) <sup>1</sup>	Fuel Used (lbs) <sup>4,8</sup>	Emission Indexes <sup>2</sup> (pounds per 1,000 pounds fuel)						Emissions from Single Flight Operation <sup>5</sup> (lb/ op)					
						EI CO	EI NO <sub>x</sub>	EI HC	EI SO <sub>2</sub> <sup>9</sup>	EI PM <sub>10</sub>	CO <sub>2</sub>	CO	NO <sub>x</sub>	VOC <sup>10</sup>	SO <sub>2</sub>	PM <sub>10</sub>	CO <sub>2</sub>
AESO Estimated Take off	Max	2	0.50	35763.00	596	274.97	9.67	4.87	1.31	2.950	2712	163.90	5.76	3.34	0.78	1.76	1616.49
NAS Whidbey Island Estimated Take off	Max	2	0.33	35763.00	397	274.97	9.67	4.87	1.31	2.950	2712	109.26	3.84	2.23	0.52	1.17	1077.66
Difference			0.17	0.00	198.68							54.63	1.92	1.11	0.26	0.59	538.83

**Adjusted EA-18 G (Growler) (F414-GE-400 Engines) Emission Factors**

Flight Operation	Fuel use <sup>1</sup> (lbs)	Emissions from Single Flight Operation (lb/op)						
		CO	NO <sub>x</sub>	VOC <sup>3</sup>	SO <sub>2</sub> <sup>4</sup>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO <sub>2</sub>
AESO Estimated Straight-In Arrival LTO <sup>1</sup>	2612	265.30	31.08	80.16	3.42	18.21	18.21	7823.99
NAS Whidbey Island Estimated Take off <sup>2</sup>	2413	210.67	29.16	79.04	3.16	17.62	17.62	7285.16
AESO Estimated Break Arrival LTO <sup>1</sup>	2528	266.46	31.15	80.81	3.31	17.54	17.54	7553.13
NAS Whidbey Island Break Arrival LTO <sup>2</sup>	2329	211.83	29.23	79.70	3.05	16.95	16.95	7014.30

<sup>1</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines from Table ES-1, AESO Memorandum Report No. 9815, Rev 1 June, 2017, except SO2 and VOC.

<sup>2</sup> Fuel used and Emission factors for "Straight-In Arrival LTO," and "Break Arrival LTO" for F414-GE-400 Engines for operations at NAS Whidbey Island adjusted to reduce Max Power Time in mode during Take off from 30 seconds to 20 seconds, per email from CDR Sean Michaels, May 12, 2016.

<sup>3</sup> VOC emissions = 1.15 x THC emissions as reported in Table S-1, AESO Memorandum Report No. 9815, Rev 1 June, 2017 as noted for

<sup>4</sup> SO2 Emission Factor based on fuel used (lbs) from Table S-1, AESO Memorandum Report No. 9815, Rev 1 June, 2017 and SO2 factor of 1.31 lbs/1000 lbs JP-5 fuel for operations after 2016 in AESO Memorandum report No 2012-01E, April 2017

**Baseline High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	45	17	5	15	82
Departures	4,766	6,556	1,207	1,933	14,462
Interfacility Departures	166	198	19	0	383
Straight in Arrivals	1,655	2,652	418	716	5,441
Overhead Break Arrivals	2,766	3,635	712	1,075	8,188
IFR Arrivals	338	269	74	140	821
Interfacility Arrivals	166	198	18	0	382
FCLP Ops <sup>2</sup>	9,544	7,510	170	0	17,224
Touch & Go Ops <sup>2</sup>	3,030	5,422	542	644	9,638
Depart-Re-enter Ops <sup>2</sup>	1,504	0	410	624	2,538
GCA pattern Ops <sup>2</sup>	4,062	5,656	552	634	10,904
<b>Total</b>	<b>27,997</b>	<b>32,096</b>	<b>4,122</b>	<b>5,766</b>	<b>69,981</b>
<b>OLF Coupeville</b>					
Interfacility Departures	166	198	18	0	382
Interfacility Arrivals	166	198	19	0	383
FCLP Ops <sup>2</sup>	2,332	2,764	259	0	5,355
<b>Total</b>	<b>2,664</b>	<b>3,160</b>	<b>296</b>	<b>0</b>	<b>6,120</b>
<b>Maintenance Run Ups (Ault Field)<sup>3</sup></b>					
Water Wash					82
Low Power, one engine					1,230
Low Power, two engines					2,460
High Power, two engines					656
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab Fops\_BaselineAveMaxYr2, file Ops Tables MaxYr\_BL\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington, Wyle Laboratories, 2017.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Baseline maintenance run ups from Baseline Static Ops.lxs from Wyle, 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines is not at performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Baseline High Tempo Year Emissions NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	5,441	13,130,856	573.12	79.33	215.03	8.60	47.95	47.95	19,819.28
Break Arrival LTO <sup>2</sup>	9,391	21,874,613	994.64	137.24	374.22	14.33	79.61	79.61	32,935.65
FCLP <sup>4</sup>	8,612	6,080,072	2.15	62.31	0.40	3.98	17.01	17.01	9,686.48
Touch-and-Go <sup>4</sup>	4,819	3,402,214	1.20	34.87	0.22	2.23	9.52	9.52	5,420.24
Depart and Re-enter <sup>4</sup>	1,269	1,790,559	0.64	18.37	0.12	1.17	5.01	5.01	2,854.65
GCA Pattern <sup>4</sup>	5,452	7,692,772	2.75	78.92	0.53	5.04	21.51	21.51	12,264.41
<b>Total Emissions for Ault Field Flight Operations</b>	<b>53,971,085.8</b>	<b>1,574.5</b>	<b>411.0</b>	<b>590.5</b>	<b>35.4</b>	<b>180.6</b>	<b>180.6</b>	<b>82,980.7</b>	
<b>NOLF Coupeville</b>									
Interfacility LTO <sup>2</sup>	382	528,414	21.49	4.93	0.79	0.35	1.26	1.26	805.08
FCLP <sup>4</sup>	5,355	3,780,630	1.34	38.74	0.25	2.48	10.58	10.58	6,023.12
Interfacility Transit	382	230,410	0.08	1.70	0.02	0.15	0.76	0.76	367.61
<b>Total Emissions for Coupeville Flight Operation</b>	<b>4,539,453.9</b>	<b>22.9</b>	<b>45.4</b>	<b>1.1</b>	<b>3.0</b>	<b>12.6</b>	<b>12.6</b>	<b>7,195.8</b>	
<b>Maintenance Operations</b>									
Water Wash	82	10,824	0.47	0.019	0.36	0.007	0.06	0.06	15.15
Low Power, one engine	1,230	447,802	21.01	0.74	16.06	0.29	2.70	2.70	667.65
Low Power, two engines	2,460	1,750,700	84.00	2.84	64.25	1.15	10.81	10.81	2,606.61
High Power, two engines	656	4,182,082	342.11	29.74	20.95	2.74	6.43	6.43	6,069.77
<b>Total Emissions for Maintenance Operations</b>	<b>6,391,408.0</b>	<b>447.6</b>	<b>33.3</b>	<b>101.6</b>	<b>4.2</b>	<b>20.0</b>	<b>20.0</b>	<b>9,359.2</b>	
<b>Total</b>	<b>64,901,947.7</b>	<b>2,045.0</b>	<b>489.7</b>	<b>693.2</b>	<b>42.5</b>	<b>213.2</b>	<b>213.2</b>	<b>99,535.7</b>	

9,558,460.63 gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
All Personnel	4,104	25,650,000	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Existing Mobile Emissions**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,574.51	411.03	590.53	35.35	180.59	180.59	82,980.71
OLF Coupeville Aircraft Flight Operations	22.9	45.4	1.1	3.0	12.6	12.6	7,195.8
Aircraft Maintenance Operations	447.6	33.3	101.6	4.2	20.0	20.0	9,359.2
Personnel Commute	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77
<b>Total</b>	<b>2,120.09</b>	<b>498.63</b>	<b>694.85</b>	<b>42.58</b>	<b>301.76</b>	<b>223.01</b>	<b>109,558.47</b>

**No Action High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	45	17	5	15	82
Departures	4,783	6,564	1,207	1,938	14,492
Interfacility Departures	197	206	19	0	422
Straight in Arrivals	1,730	2,687	404	722	5,543
Overhead Break Arrivals	2,775	3,650	720	1,100	8,245
IFR Arrivals	275	227	81	111	694
Interfacility Arrivals	197	208	19	0	424
FCLP Ops <sup>2</sup>	7,256	6,566	178	0	14,000
Touch & Go Ops <sup>2</sup>	3,056	5,558	530	676	9,820
Depart-Re-enter Ops <sup>2</sup>	1,524	0	468	664	2,656
GCA pattern Ops <sup>2</sup>	4,214	5,830	564	670	11,278
<b>Total</b>	<b>26,007</b>	<b>31,496</b>	<b>4,190</b>	<b>5,881</b>	<b>67,574</b>
<b>OLF Coupeville</b>					
Interfacility Departures	197	208	19	0	424
Interfacility Arrivals	197	206	19	0	422
FCLP Ops <sup>2</sup>	2,452	2,583	239	0	5,274
<b>Total</b>	<b>2,846</b>	<b>2,997</b>	<b>277</b>	<b>0</b>	<b>6,120</b>
<b>Maintenance Run Ups (Ault Field)<sup>3</sup></b>					
Water Wash					82
Low Power, one engine					1,230
Low Power, two engines					2,460
High Power, two engines					656
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab Fops\_NoActionMaxYr3, file Ops Tables MaxYr\_NoAc20171018.xlsx, Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington, Wyle Laboratories, 2017.

<sup>2</sup> One circuit counted at two operations (one take off and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Baseline maintenance run ups from Baseline Static Ops.lxs from Wyle, 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**No Action High Tempo Year Air Emissions NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	5,543	13,377,014	583.87	80.81	219.07	8.76	48.84	48.84	20,190.82
Break Arrival LTO <sup>2</sup>	9,363	21,809,392	991.67	136.83	373.11	14.29	79.37	79.37	32,837.45
FCLP <sup>4</sup>	7,000	4,942,000	1.75	50.65	0.32	3.24	13.83	13.83	7,873.36
Touch-and-Go <sup>4</sup>	4,910	3,466,460	1.23	35.52	0.23	2.27	9.70	9.70	5,522.60
Depart and Re-enter <sup>4</sup>	1,328	1,873,808	0.67	19.22	0.13	1.23	5.24	5.24	2,987.37
GCA Pattern <sup>4</sup>	5,639	7,956,629	2.85	81.62	0.55	5.21	22.25	22.25	12,685.07
<b>Total Emissions for Ault Field Flight Operations</b>		<b>53,425,303.2</b>	<b>1,582.0</b>	<b>404.7</b>	<b>593.4</b>	<b>35.0</b>	<b>179.2</b>	<b>179.2</b>	<b>82,096.7</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	424	586,512	23.86	5.47	0.88	0.38	1.40	1.40	893.59
FCLP <sup>4</sup>	5,274	3,723,444	1.32	38.16	0.24	2.44	10.42	10.42	5,932.01
Interfacility Transit	424	255,743	0.09	1.89	0.02	0.17	0.84	0.84	408.03
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,565,698.8</b>	<b>25.3</b>	<b>45.5</b>	<b>1.1</b>	<b>3.0</b>	<b>12.7</b>	<b>12.7</b>	<b>7,233.6</b>
<b>Maintenance Operations</b>									
Water Wash	82	10,824	0.47	0.019	0.36	0.007	0.06	0.06	15.15
Low Power, one engine	1,230	447,802	21.01	0.74	16.06	0.29	2.70	2.70	667.65
Low Power, two engines	2,460	1,750,700	84.00	2.84	64.25	1.15	10.81	10.81	2,606.61
High Power, two engines	656	4,182,082	342.11	29.74	20.95	2.74	6.43	6.43	6,069.77
Total In-frame Maintenance Operations		6,391,408	447.59	33.35	101.63	4.19	20.01	20.01	9,359
<b>Total Emissions for Maintenance Operations</b>		<b>6,391,408.0</b>	<b>447.6</b>	<b>33.3</b>	<b>101.6</b>	<b>4.2</b>	<b>20.0</b>	<b>20.0</b>	<b>9,359.2</b>
<b>Total</b>		<b>64,382,410.0</b>	<b>2,054.9</b>	<b>483.5</b>	<b>696.2</b>	<b>42.2</b>	<b>211.9</b>	<b>211.9</b>	<b>98,689.5</b>

9,481,945.51 gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,104	25,650,000	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

<sup>2</sup> See Table X of this Appendix for calculations and emission factors

**Emissions Summary**

Activity	Emissions (tpy)							
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Ault Field Aircraft Flight Operations	1,582.04	404.66	593.40	34.99	179.22	179.22	82,096.66	
OLF Coupeville Aircraft Flight Operations	25.3	45.5	1.1	3.0	12.7	12.7	7,233.6	
Aircraft Maintenance Operations	447.6	33.3	101.6	4.2	20.0	20.0	9,359.2	
Personnel Commute	75.07	8.88	1.63	0.07	88.56	9.81	10,022.77	
<b>Total</b>	<b>2,129.96</b>	<b>492.41</b>	<b>697.80</b>	<b>42.24</b>	<b>300.45</b>	<b>221.70</b>	<b>108,712.26</b>	

**Alternative 1A High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,516	5,961	1,212	1,946	16,635
Interfacility Departures	1,137	556	16	0	1,709
Straight in Arrivals	2,670	2,439	399	721	6,229
Overhead Break Arrivals	4,388	3,309	759	1,088	9,544
IFR Arrivals	459	213	54	137	863
Interfacility Arrivals	1,137	556	15	0	1,708
FCLP Ops <sup>2</sup>	4,550	2,147	141	0	6,838
Touch & Go Ops <sup>2</sup>	5,576	5,331	582	656	12,145
Depart-Re-enter Ops <sup>2</sup>	2,525	0	407	602	3,534
GCA pattern Ops <sup>2</sup>	8,226	5,722	580	646	15,174
<b>Total</b>	<b>38,184</b>	<b>26,234</b>	<b>4,165</b>	<b>5,796</b>	<b>74,379</b>
<b>OLF Coupeville</b>					
Interfacility Departures	1,137	556	16	0	1,709
Interfacility Arrivals	1,137	556	15	0	1,708
FCLP Ops <sup>2</sup>	15,908	7,780	215	0	23,903
<b>Total</b>	<b>18,182</b>	<b>8,892</b>	<b>246</b>	<b>0</b>	<b>27,320</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1AMaxYr, workbook Ops Tables MaxYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



Alternative 1A High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,229	15,032,550	656.13	90.81	246.18	9.85	54.89	54.89	22,689.63
Break Arrival LTO <sup>2</sup>	12,115	28,219,671	1,283.15	177.05	482.77	18.48	102.70	102.70	42,489.13
FCLP <sup>4</sup>	3,419	2,413,814	0.85	24.74	0.16	1.58	6.75	6.75	3,845.57
Touch-and-Go <sup>4</sup>	6,073	4,287,185	1.52	43.93	0.28	2.81	11.99	11.99	6,830.14
Depart and Re-enter <sup>4</sup>	1,767	2,493,237	0.89	25.58	0.17	1.63	6.97	6.97	3,974.91
GCA Pattern <sup>4</sup>	7,587	10,705,257	3.83	109.82	0.74	7.01	29.93	29.93	17,067.15
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,151,713.9</b>	<b>1,946.4</b>	<b>471.9</b>	<b>730.3</b>	<b>41.4</b>	<b>213.2</b>	<b>213.2</b>	<b>96,896.5</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,709	2,364,031	96.16	22.04	3.53	1.55	5.64	5.64	3,601.78
FCLP <sup>4</sup>	23,903	16,875,518	5.98	172.94	1.10	11.05	47.21	47.21	26,885.26
Interfacility Transit	1,709	1,030,812	0.37	7.60	0.08	0.68	3.38	3.38	1,644.62
<b>Total Emissions for Coupeville Flight Operations</b>		<b>20,270,361.1</b>	<b>102.5</b>	<b>202.6</b>	<b>4.7</b>	<b>13.3</b>	<b>56.2</b>	<b>56.2</b>	<b>32,131.7</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>92,541,523.0</b>	<b>2,687.5</b>	<b>722.1</b>	<b>880.0</b>	<b>60.6</b>	<b>298.0</b>	<b>298.0</b>	<b>142,382.1</b>

13,629,090.28 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1A**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,946.37	471.94	730.30	41.36	213.23	213.23	96,896.52
NOLF Coupeville Aircraft Flight Operations	102.5	202.6	4.7	13.3	56.2	56.2	32,131.7
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,768.70</b>	<b>731.71</b>	<b>881.79</b>	<b>60.69</b>	<b>393.81</b>	<b>308.63</b>	<b>153,223.05</b>

**Alternative 1B High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,470	5,926	1,208	1,934	16,538
Interfacility Departures	698	355	14	0	1,067
Straight in Arrivals	2,627	2,447	382	725	6,181
Overhead Break Arrivals	4,303	3,221	754	1,072	9,350
IFR Arrivals	539	258	73	136	1,006
Interfacility Arrivals	698	355	14	0	1,067
FCLP Ops <sup>2</sup>	11,316	5,583	178	0	17,077
Touch & Go Ops <sup>2</sup>	5,576	5,331	582	656	12,145
Depart-Re-enter Ops <sup>2</sup>	2,525	0	407	602	3,534
GCA pattern Ops <sup>2</sup>	8,226	5,722	580	646	15,174
<b>Total</b>	<b>43,978</b>	<b>29,198</b>	<b>4,192</b>	<b>5,771</b>	<b>83,139</b>
<b>OLF Coupeville</b>					
Interfacility Departures	698	355	14	0	1,067
Interfacility Arrivals	698	355	14	0	1,067
FCLP Ops <sup>2</sup>	9,772	4,977	202	0	14,951
<b>Total</b>	<b>11,168</b>	<b>5,687</b>	<b>230</b>	<b>0</b>	<b>17,085</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1BMaxYr, workbook Ops Tables MaxYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 1B High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,181	14,916,710	651.07	90.12	244.28	9.77	54.47	54.47	22,514.79
Break Arrival LTO <sup>2</sup>	11,423	26,607,784	1,209.86	166.94	455.19	17.43	96.83	96.83	40,062.18
FCLP <sup>4</sup>	8,539	6,028,181	2.13	61.78	0.39	3.95	16.86	16.86	9,603.81
Touch-and-Go <sup>4</sup>	6,073	4,287,185	1.52	43.93	0.28	2.81	11.99	11.99	6,830.14
Depart and Re-enter <sup>4</sup>	1,767	2,493,237	0.89	25.58	0.17	1.63	6.97	6.97	3,974.91
GCA Pattern <sup>4</sup>	7,587	10,705,257	3.83	109.82	0.74	7.01	29.93	29.93	17,067.15
<b>Total Emissions for Ault Field Flight Operations</b>		<b>65,038,354.6</b>	<b>1,869.3</b>	<b>498.2</b>	<b>701.1</b>	<b>42.6</b>	<b>217.1</b>	<b>217.1</b>	<b>100,053.0</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,067	1,475,963	60.04	13.76	2.21	0.97	3.52	3.52	2,248.74
FCLP <sup>4</sup>	14,951	10,555,406	3.74	108.17	0.69	6.91	29.53	29.53	16,816.36
Interfacility Transit	1,067	643,579	0.23	4.75	0.05	0.42	2.11	2.11	1,026.81
<b>Total Emissions for Coupeville Flight Operations</b>		<b>12,674,948.2</b>	<b>64.0</b>	<b>126.7</b>	<b>2.9</b>	<b>8.3</b>	<b>35.2</b>	<b>35.2</b>	<b>20,091.9</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>86,832,750.8</b>	<b>2,571.9</b>	<b>672.4</b>	<b>849.0</b>	<b>56.9</b>	<b>280.8</b>	<b>280.8</b>	<b>133,498.8</b>

12,788,328.53 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1B**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,869.30	498.16	701.06	42.60	217.06	217.06	100,052.97
OLF Coupeville Aircraft Flight Operations	64.0	126.7	2.9	8.3	35.2	35.2	20,091.9
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,653.14</b>	<b>682.03</b>	<b>850.78</b>	<b>56.95</b>	<b>376.56</b>	<b>291.38</b>	<b>144,339.74</b>

**Alternative 1C High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,513	5,939	1,212	1,940	16,604
Interfacility Departures	274	143	12	0	429
Straight in Arrivals	2,674	2,399	417	727	6,217
Overhead Break Arrivals	4,322	3,295	731	1,060	9,408
IFR Arrivals	517	246	64	152	979
Interfacility Arrivals	274	143	11	0	428
FCLP Ops <sup>2</sup>	18,092	9,068	151	0	27,311
Touch & Go Ops <sup>2</sup>	5,576	5,331	582	656	12,145
Depart-Re-enter Ops <sup>2</sup>	2,525	0	407	602	3,534
GCA pattern Ops <sup>2</sup>	8,226	5,722	580	646	15,174
<b>Total</b>	<b>49,993</b>	<b>32,286</b>	<b>4,167</b>	<b>5,783</b>	<b>92,229</b>
<b>OLF Coupeville</b>					
Interfacility Departures	274	143	12	0	429
Interfacility Arrivals	274	143	11	0	428
FCLP Ops <sup>2</sup>	3,831	1,999	159	0	5,989
<b>Total</b>	<b>4,379</b>	<b>2,285</b>	<b>182</b>	<b>0</b>	<b>6,846</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1CMaxYr, workbook Ops Tables MaxYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 1C High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,217	15,003,590	654.86	90.64	245.70	9.83	54.78	54.78	22,645.92
Break Arrival LTO <sup>2</sup>	10,815	25,191,560	1,145.46	158.05	430.97	16.50	91.68	91.68	37,929.83
FCLP <sup>4</sup>	13,656	9,640,783	3.41	98.80	0.63	6.31	26.97	26.97	15,359.23
Touch-and-Go <sup>4</sup>	6,073	4,287,185	1.52	43.93	0.28	2.81	11.99	11.99	6,830.14
Depart and Re-enter <sup>4</sup>	1,767	2,493,237	0.89	25.58	0.17	1.63	6.97	6.97	3,974.91
GCA Pattern <sup>4</sup>	7,587	10,705,257	3.83	109.82	0.74	7.01	29.93	29.93	17,067.15
<b>Total Emissions for Ault Field Flight Operations</b>		<b>67,321,611.5</b>	<b>1,810.0</b>	<b>526.8</b>	<b>678.5</b>	<b>44.1</b>	<b>222.3</b>	<b>222.3</b>	<b>103,807.2</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	428	592,045	24.08	5.52	0.89	0.39	1.41	1.41	902.02
FCLP <sup>4</sup>	5,989	4,228,234	1.50	43.33	0.28	2.77	11.83	11.83	6,736.22
Interfacility Transit	429	258,759	0.09	1.91	0.02	0.17	0.85	0.85	412.84
<b>Total Emissions for Coupeville Flight Operations</b>		<b>5,079,037.8</b>	<b>25.7</b>	<b>50.8</b>	<b>1.2</b>	<b>3.3</b>	<b>14.1</b>	<b>14.1</b>	<b>8,051.1</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>81,520,097.2</b>	<b>2,474.3</b>	<b>625.2</b>	<b>824.7</b>	<b>53.4</b>	<b>265.0</b>	<b>265.0</b>	<b>125,212.2</b>

12,005,905.34 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1C**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,809.98	526.83	678.49	44.10	222.33	222.33	103,807.17
OLF Coupeville Aircraft Flight Operations	25.7	50.8	1.18	3.3	14.1	14.1	8,051.1
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,555.48</b>	<b>634.77</b>	<b>826.44</b>	<b>53.47</b>	<b>360.76</b>	<b>275.58</b>	<b>136,053.12</b>

**Alternative 1D High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,516	5,961	1,212	1,946	16,635
Interfacility Departures	995	487	14	0	1,496
Straight in Arrivals	2,670	2,439	399	721	6,229
Overhead Break Arrivals	4,388	3,309	759	1,088	9,544
IFR Arrivals	459	213	54	137	863
Interfacility Arrivals	995	487	13	0	1,495
FCLP Ops <sup>2</sup>	6,825	3,221	212	0	10,258
Touch & Go Ops <sup>2</sup>	5,576	5,331	582	656	12,145
Depart-Re-enter Ops <sup>2</sup>	2,525	0	407	602	3,534
GCA pattern Ops <sup>2</sup>	8,226	5,722	580	646	15,174
<b>Total</b>	<b>40,175</b>	<b>27,170</b>	<b>4,232</b>	<b>5,796</b>	<b>77,373</b>
<b>OLF Coupeville</b>					
Interfacility Departures	995	487	14	0	1,496
Interfacility Arrivals	995	487	13	0	1,495
FCLP Ops <sup>2</sup>	13,920	6,808	188	0	20,916
<b>Total</b>	<b>15,910</b>	<b>7,782</b>	<b>215</b>	<b>0</b>	<b>23,907</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1DMaxYr, workbook Ops Tables MaxYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 1D High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,229	15,032,550	656.13	90.81	246.18	9.85	54.89	54.89	22,689.63
Break Arrival LTO <sup>2</sup>	11,902	27,723,527	1,260.59	173.94	474.28	18.16	100.89	100.89	41,742.10
FCLP <sup>4</sup>	5,129	3,621,074	1.28	37.11	0.24	2.37	10.13	10.13	5,768.92
Touch-and-Go <sup>4</sup>	6,073	4,287,185	1.52	43.93	0.28	2.81	11.99	11.99	6,830.14
Depart and Re-enter <sup>4</sup>	1,767	2,493,237	0.89	25.58	0.17	1.63	6.97	6.97	3,974.91
GCA Pattern <sup>4</sup>	7,587	10,705,257	3.83	109.82	0.74	7.01	29.93	29.93	17,067.15
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,862,829.5</b>	<b>1,924.2</b>	<b>481.2</b>	<b>721.9</b>	<b>41.8</b>	<b>214.8</b>	<b>214.8</b>	<b>98,072.8</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,496	2,069,392	84.17	19.29	3.09	1.36	4.94	4.94	3,152.87
FCLP <sup>4</sup>	20,916	14,766,696	5.23	151.33	0.96	9.67	41.31	41.31	23,525.58
Interfacility Transit	1,496	902,337	0.33	6.66	0.07	0.59	2.96	2.96	1,439.65
<b>Total Emissions for Coupeville Flight Operations</b>		<b>17,738,425.2</b>	<b>89.7</b>	<b>177.3</b>	<b>4.1</b>	<b>11.6</b>	<b>49.2</b>	<b>49.2</b>	<b>28,118.1</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>90,720,702.7</b>	<b>2,652.6</b>	<b>706.1</b>	<b>871.0</b>	<b>59.4</b>	<b>292.6</b>	<b>292.6</b>	<b>139,544.9</b>

13,360,928.23 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,924.24	481.20	721.89	41.83	214.81	214.81	98,072.85
OLF Coupeville Aircraft Flight Operations	89.7	177.3	4.1	11.6	49.2	49.2	28,118.1
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,733.79</b>	<b>715.66</b>	<b>872.79</b>	<b>59.49</b>	<b>388.36</b>	<b>303.18</b>	<b>150,385.82</b>

**Alternative 1E High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	72	25	5	15	117
Departures	7,513	5,939	1,212	1,940	16,604
Interfacility Departures	411	215	18	0	644
Straight in Arrivals	2,674	2,399	417	727	6,217
Overhead Break Arrivals	4,322	3,295	731	1,060	9,408
IFR Arrivals	517	246	64	152	979
Interfacility Arrivals	411	215	17	0	643
FCLP Ops <sup>2</sup>	15,831	7,935	132	0	23,898
Touch & Go Ops <sup>2</sup>	5,576	5,331	582	656	12,145
Depart-Re-enter Ops <sup>2</sup>	2,525	0	407	602	3,534
GCA pattern Ops <sup>2</sup>	8,226	5,722	580	646	15,174
<b>Total</b>	<b>48,006</b>	<b>31,297</b>	<b>4,160</b>	<b>5,783</b>	<b>89,246</b>
<b>OLF Coupeville</b>					
Interfacility Departures	411	215	18	0	644
Interfacility Arrivals	411	215	17	0	643
FCLP Ops <sup>2</sup>	5,747	2,999	239	0	8,985
<b>Total</b>	<b>6,569</b>	<b>3,429</b>	<b>274</b>	<b>0</b>	<b>10,272</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					117
Low Power, one engine					1,755
Low Power, two engines					3,510
High Power, two engines					936
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt1EMaxYr, workbook Ops Tables MaxYr\_Alt1\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



Alternative 1E High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,217	15,003,590	654.86	90.64	245.70	9.83	54.78	54.78	22,645.92
Break Arrival LTO <sup>2</sup>	11,030	25,692,363	1,168.23	161.20	439.53	16.83	93.50	93.50	38,683.87
FCLP <sup>4</sup>	11,949	8,435,994	2.99	86.45	0.55	5.53	23.60	23.60	13,439.82
Touch-and-Go <sup>4</sup>	6,073	4,287,185	1.52	43.93	0.28	2.81	11.99	11.99	6,830.14
Depart and Re-enter <sup>4</sup>	1,767	2,493,237	0.89	25.58	0.17	1.63	6.97	6.97	3,974.91
GCA Pattern <sup>4</sup>	7,587	10,705,257	3.83	109.82	0.74	7.01	29.93	29.93	17,067.15
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,617,625.6</b>	<b>1,832.3</b>	<b>517.6</b>	<b>687.0</b>	<b>43.6</b>	<b>220.8</b>	<b>220.8</b>	<b>102,641.8</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	644	890,834	36.24	8.30	1.33	0.58	2.13	2.13	1,357.25
FCLP <sup>4</sup>	8,985	6,343,410	2.25	65.01	0.41	4.15	17.75	17.75	10,106.01
Interfacility Transit	644	388,439	0.14	2.87	0.03	0.25	1.27	1.27	619.74
<b>Total Emissions for Coupeville Flight Operations</b>		<b>7,622,683.8</b>	<b>38.6</b>	<b>76.2</b>	<b>1.8</b>	<b>5.0</b>	<b>21.1</b>	<b>21.1</b>	<b>12,083.0</b>
<b>Maintenance Operations</b>									
Water Wash	117	15,444	0.67	0.027	0.51	0.010	0.09	0.09	21.62
Low Power, one engine	1,755	638,937	29.98	1.06	22.92	0.42	3.86	3.86	952.63
Low Power, two engines	3,510	2,497,950	119.86	4.06	91.67	1.64	15.43	15.43	3,719.18
High Power, two engines	936	5,967,117	488.13	42.44	29.90	3.91	9.18	9.18	8,660.53
Total In-frame Maintenance Operations		9,119,448	639	48	145	6	29	29	13,354
<b>Total Emissions for Maintenance Operations</b>		<b>9,119,448.0</b>	<b>638.6</b>	<b>47.6</b>	<b>145.0</b>	<b>6.0</b>	<b>28.5</b>	<b>28.5</b>	<b>13,354.0</b>
<b>Total</b>		<b>83,359,757.4</b>	<b>2,509.6</b>	<b>641.4</b>	<b>833.8</b>	<b>54.6</b>	<b>270.5</b>	<b>270.5</b>	<b>128,078.8</b>

12,276,842.03 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,439	27,743,750	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 1E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,832.32	517.62	686.98	43.63	220.78	220.78	102,641.80
OLF Coupeville Aircraft Flight Operations	38.6	76.2	1.8	5.0	21.1	21.1	12,083.0
Aircraft Maintenance Operations	638.6	47.6	145.0	6.0	28.5	28.5	13,354.0
Employee Commute	81.20	9.61	1.77	0.07	95.79	10.61	10,840.91
<b>Total</b>	<b>2,590.77</b>	<b>650.99</b>	<b>835.53</b>	<b>54.67</b>	<b>366.27</b>	<b>281.09</b>	<b>138,919.68</b>

**NAS Whidbey Island Complex Annual GHG Emissions, Alternative 1**

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 1A	Alt 1B	Alt 1C	Alt 1D	Alt 1E
<b>Stationary Sources</b>							
tewide Total GHG Emissions (2014 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	0	0	0	0	0	0	0
GSE Emissions	130	131	161	154	149	159	151
Personnel Commute Emissions	0	0	0	0	0	0	0
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	130	131	161	154	149	159	151
<b>Change in Mobile CO<sub>2</sub> Emissions</b>			30	24	19	28	20
<b>% increase in Mobile CO<sub>2</sub> Emissions</b>			23%	18%	14%	22%	16%
<b>Total Change in Emissions (Stationary and Mobile)</b>			486	480	475	484	477
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.00%	0.00%	0.00%	0.00%	0.00%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.00%	0.00%	0.00%	0.00%	0.00%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.00%	0.00%	0.00%	0.00%	0.00%

1. Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29, 2018 from: <https://fortress.wa.gov/ecy/publications/documents/1602025.pdf>

Key:

TPY = Tons per year

CO<sub>2</sub>e = Carbon Dioxide Equivalent

GHG = Greenhouse Gas

metric tons per short ton = 0.907

**Alternative 2A High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,006	6,030	1,221	3,197	17,454
Interfacility Departures	1,055	564	12	0	1,631
Straight in Arrivals	2,479	2,486	432	1,135	6,532
Overhead Break Arrivals	4,098	3,337	699	1,873	10,007
IFR Arrivals	428	208	90	188	914
Interfacility Arrivals	1,055	564	12	0	1,631
FCLP Ops <sup>2</sup>	4,022	2,224	167	0	6,413
Touch & Go Ops <sup>2</sup>	5,210	5,452	469	1,026	12,157
Depart-Re-enter Ops <sup>2</sup>	2,282	0	439	1,128	3,849
GCA pattern Ops <sup>2</sup>	7,675	5,735	483	1,018	14,911
<b>Total</b>	<b>35,310</b>	<b>26,600</b>	<b>4,024</b>	<b>9,565</b>	<b>75,499</b>
<b>OLF Coupeville</b>					
Interfacility Departures	1,055	564	12	0	1,631
Interfacility Arrivals	1,055	564	12	0	1,631
FCLP Ops <sup>2</sup>	14,766	7,916	183	0	22,865
<b>Total</b>	<b>16,876</b>	<b>9,044</b>	<b>207</b>	<b>0</b>	<b>26,127</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2AAveYr, workbook Ops Tables MaxYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 2A High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,532	15,763,784	688.04	95.23	258.15	10.33	57.56	57.56	23,793.34
Break Arrival LTO <sup>2</sup>	12,552	29,237,583	1,329.43	183.44	500.18	19.15	106.40	106.40	44,021.75
FCLP <sup>4</sup>	3,207	2,263,789	0.80	23.20	0.15	1.48	6.33	6.33	3,606.56
Touch-and-Go <sup>4</sup>	6,079	4,291,421	1.52	43.98	0.28	2.81	12.01	12.01	6,836.88
Depart and Re-enter <sup>4</sup>	1,925	2,715,470	0.97	27.86	0.19	1.78	7.59	7.59	4,329.21
GCA Pattern <sup>4</sup>	7,456	10,519,711	3.77	107.92	0.73	6.89	29.41	29.41	16,771.33
<b>Total Emissions for Ault Field Flight Operations</b>		<b>64,791,757.3</b>	<b>2,024.5</b>	<b>481.6</b>	<b>759.7</b>	<b>42.4</b>	<b>219.3</b>	<b>219.3</b>	<b>99,359.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,631	2,256,135	91.77	21.03	3.37	1.48	5.39	5.39	3,437.39
FCLP <sup>4</sup>	22,865	16,142,690	5.72	165.43	1.05	10.57	45.16	45.16	25,717.75
Interfacility Transit	1,631	983,765	0.35	7.26	0.08	0.64	3.23	3.23	1,569.56
<b>Total Emissions for Coupeville Flight Operations</b>		<b>19,382,590.0</b>	<b>97.8</b>	<b>193.7</b>	<b>4.5</b>	<b>12.7</b>	<b>53.8</b>	<b>53.8</b>	<b>30,724.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>93,371,739.2</b>	<b>2,766.5</b>	<b>723.3</b>	<b>910.4</b>	<b>61.2</b>	<b>301.9</b>	<b>301.9</b>	<b>143,551.9</b>

13,751,360.71 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2A**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	2,024.53	481.62	759.68	42.44	219.30	219.30	99,359.07
OLF Coupeville Aircraft Flight Operations	97.8	193.7	4.5	12.7	53.8	53.8	30,724.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,853.02</b>	<b>733.57</b>	<b>912.31</b>	<b>61.24</b>	<b>403.98</b>	<b>313.18</b>	<b>155,108.34</b>

**Alternative 2B High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	6,939	5,970	1,211	3,159	17,279
Interfacility Departures	657	349	14	0	1,020
Straight in Arrivals	2,445	2,483	419	1,098	6,445
Overhead Break Arrivals	4,018	3,270	700	1,823	9,811
IFR Arrivals	478	216	91	238	1,023
Interfacility Arrivals	657	350	14	0	1,021
FCLP Ops <sup>2</sup>	10,496	5,660	180	0	16,336
Touch & Go Ops <sup>2</sup>	5,210	5,452	469	1,026	12,157
Depart-Re-enter Ops <sup>2</sup>	2,282	0	439	1,128	3,849
GCA pattern Ops <sup>2</sup>	7,675	5,735	483	1,018	14,911
<b>Total</b>	<b>40,857</b>	<b>29,485</b>	<b>4,020</b>	<b>9,490</b>	<b>83,852</b>
<b>OLF Coupeville</b>					
Interfacility Departures	657	349	14	0	1,020
Interfacility Arrivals	657	350	14	0	1,021
FCLP Ops <sup>2</sup>	9,195	4,904	198	0	14,297
<b>Total</b>	<b>10,509</b>	<b>5,603</b>	<b>226</b>	<b>0</b>	<b>16,338</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2BAveYr, workbook Ops Tables MaxYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 2B High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,445	15,553,826	678.88	93.96	254.71	10.19	56.79	56.79	23,476.43
Break Arrival LTO <sup>2</sup>	11,855	27,614,049	1,255.61	173.25	472.41	18.09	100.49	100.49	41,577.27
FCLP <sup>4</sup>	8,168	5,766,608	2.04	59.10	0.38	3.78	16.13	16.13	9,187.08
Touch-and-Go <sup>4</sup>	6,079	4,291,421	1.52	43.98	0.28	2.81	12.01	12.01	6,836.88
Depart and Re-enter <sup>4</sup>	1,925	2,715,470	0.97	27.86	0.19	1.78	7.59	7.59	4,329.21
GCA Pattern <sup>4</sup>	7,456	10,519,711	3.77	107.92	0.73	6.89	29.41	29.41	16,771.33
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,461,084.0</b>	<b>1,942.8</b>	<b>506.1</b>	<b>728.7</b>	<b>43.5</b>	<b>222.4</b>	<b>222.4</b>	<b>102,178.2</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,020	1,410,949	57.39	13.15	2.11	0.92	3.37	3.37	2,149.68
FCLP <sup>4</sup>	14,297	10,093,682	3.57	103.44	0.66	6.61	28.24	28.24	16,080.77
Interfacility Transit	1,020	615,230	0.22	4.54	0.05	0.40	2.02	2.02	981.58
<b>Total Emissions for Coupeville Flight Operations</b>		<b>12,119,861.0</b>	<b>61.2</b>	<b>121.1</b>	<b>2.8</b>	<b>7.9</b>	<b>33.6</b>	<b>33.6</b>	<b>19,212.0</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>87,778,337.0</b>	<b>2,648.1</b>	<b>675.2</b>	<b>877.8</b>	<b>57.5</b>	<b>284.8</b>	<b>284.8</b>	<b>134,858.3</b>

12,927,590.13 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2B**

Activity	Emissions (tpy)							
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Ault Field Aircraft Flight Operations	1,942.79	506.07	728.69	43.53	222.43	222.43	102,178.21	
OLF Coupeville Aircraft Flight Operations	61.2	121.1	2.8	7.9	33.6	33.6	19,212.0	
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1	
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47	
<b>Total</b>	<b>2,734.62</b>	<b>685.43</b>	<b>879.64</b>	<b>57.57</b>	<b>386.96</b>	<b>296.16</b>	<b>146,414.80</b>	

**Alternative 2C High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	6,949	5,987	1,211	3,176	17,323
Interfacility Departures	264	135	10	0	409
Straight in Arrivals	2,488	2,443	406	1,127	6,464
Overhead Break Arrivals	4,000	3,318	699	1,838	9,855
IFR Arrivals	462	226	106	212	1,006
Interfacility Arrivals	264	135	10	0	409
FCLP Ops <sup>2</sup>	16,678	9,237	225	0	26,140
Touch & Go Ops <sup>2</sup>	5,210	5,452	469	1,026	12,157
Depart-Re-enter Ops <sup>2</sup>	2,282	0	439	1,128	3,849
GCA pattern Ops <sup>2</sup>	7,675	5,735	483	1,018	14,911
<b>Total</b>	<b>46,272</b>	<b>32,668</b>	<b>4,058</b>	<b>9,525</b>	<b>92,523</b>
<b>OLF Coupeville</b>					
Interfacility Departures	264	135	10	0	409
Interfacility Arrivals	265	135	10	0	410
FCLP Ops <sup>2</sup>	3,709	1,884	130	0	5,723
<b>Total</b>	<b>4,238</b>	<b>2,154</b>	<b>150</b>	<b>0</b>	<b>6,542</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2CAveYr, workbook Ops Tables MaxYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 2C High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,464	15,599,679	680.88	94.24	255.46	10.22	56.96	56.96	23,545.64
Break Arrival LTO <sup>2</sup>	11,270	26,251,399	1,193.65	164.70	449.10	17.19	95.54	95.54	39,525.59
FCLP <sup>4</sup>	13,070	9,227,420	3.27	94.56	0.60	6.04	25.81	25.81	14,700.68
Touch-and-Go <sup>4</sup>	6,079	4,291,421	1.52	43.98	0.28	2.81	12.01	12.01	6,836.88
Depart and Re-enter <sup>4</sup>	1,925	2,715,470	0.97	27.86	0.19	1.78	7.59	7.59	4,329.21
GCA Pattern <sup>4</sup>	7,456	10,519,711	3.77	107.92	0.73	6.89	29.41	29.41	16,771.33
<b>Total Emissions for Ault Field Flight Operations</b>		<b>68,605,098.8</b>	<b>1,884.1</b>	<b>533.3</b>	<b>706.4</b>	<b>44.9</b>	<b>227.3</b>	<b>227.3</b>	<b>105,709.3</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	409	565,763	23.01	5.27	0.85	0.37	1.35	1.35	861.98
FCLP <sup>4</sup>	5,723	4,040,438	1.43	41.41	0.26	2.65	11.30	11.30	6,437.03
Interfacility Transit	409	246,695	0.09	1.82	0.02	0.16	0.81	0.81	393.59
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,852,896.1</b>	<b>24.5</b>	<b>48.5</b>	<b>1.1</b>	<b>3.2</b>	<b>13.5</b>	<b>13.5</b>	<b>7,692.6</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>82,655,386.8</b>	<b>2,552.7</b>	<b>629.7</b>	<b>853.7</b>	<b>54.1</b>	<b>269.6</b>	<b>269.6</b>	<b>126,870.0</b>

12,173,105.57 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2C**

Activity	Emissions (tpy)							
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Ault Field Aircraft Flight Operations	1,884.05	533.26	706.36	44.94	227.32	227.32	105,709.33	
OLF Coupeville Aircraft Flight Operations	24.5	48.5	1.1	3.2	13.5	13.5	7,692.6	
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1	
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47	
<b>Total</b>	<b>2,639.23</b>	<b>639.99</b>	<b>855.62</b>	<b>54.22</b>	<b>371.69</b>	<b>280.89</b>	<b>138,426.50</b>	



**Alternative 2D High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	7,006	6,030	1,221	3,197	17,454
Interfacility Departures	923	494	11	0	1,428
Straight in Arrivals	2,479	2,486	432	1,135	6,532
Overhead Break Arrivals	4,098	3,337	699	1,873	10,007
IFR Arrivals	428	208	90	188	914
Interfacility Arrivals	923	494	11	0	1,428
FCLP Ops <sup>2</sup>	6,033	3,336	251	0	9,620
Touch & Go Ops <sup>2</sup>	5,210	5,452	469	1,026	12,157
Depart-Re-enter Ops <sup>2</sup>	2,282	0	439	1,128	3,849
GCA pattern Ops <sup>2</sup>	7,675	5,735	483	1,018	14,911
<b>Total</b>	<b>37,057</b>	<b>27,572</b>	<b>4,106</b>	<b>9,565</b>	<b>78,300</b>
<b>OLF Coupeville</b>					
Interfacility Departures	923	494	11	0	1,428
Interfacility Arrivals	924	494	11	0	1,429
FCLP Ops <sup>2</sup>	12,920	6,927	160	0	20,007
<b>Total</b>	<b>14,767</b>	<b>7,915</b>	<b>182</b>	<b>0</b>	<b>22,864</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2DAveYr, workbook Ops Tables MaxYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 2D High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,532	15,763,784	688.04	95.23	258.15	10.33	57.56	57.56	23,793.34
Break Arrival LTO <sup>2</sup>	12,349	28,764,732	1,307.93	180.47	492.09	18.84	104.68	104.68	43,309.80
FCLP <sup>4</sup>	4,810	3,395,860	1.20	34.80	0.22	2.22	9.50	9.50	5,410.12
Touch-and-Go <sup>4</sup>	6,079	4,291,421	1.52	43.98	0.28	2.81	12.01	12.01	6,836.88
Depart and Re-enter <sup>4</sup>	1,925	2,715,470	0.97	27.86	0.19	1.78	7.59	7.59	4,329.21
GCA Pattern <sup>4</sup>	7,456	10,519,711	3.77	107.92	0.73	6.89	29.41	29.41	16,771.33
<b>Total Emissions for Ault Field Flight Operations</b>		<b>65,450,977.0</b>	<b>2,003.4</b>	<b>490.3</b>	<b>751.7</b>	<b>42.9</b>	<b>220.8</b>	<b>220.8</b>	<b>100,450.7</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,428	1,975,329	80.35	18.41	2.95	1.29	4.72	4.72	3,009.56
FCLP <sup>4</sup>	20,007	14,124,942	5.00	144.75	0.92	9.25	39.51	39.51	22,503.17
Interfacility Transit	1,428	861,322	0.31	6.35	0.07	0.56	2.82	2.82	1,374.21
<b>Total Emissions for Coupeville Flight Operations</b>		<b>16,961,592.6</b>	<b>85.7</b>	<b>169.5</b>	<b>3.9</b>	<b>11.1</b>	<b>47.1</b>	<b>47.1</b>	<b>26,886.9</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>91,609,961.6</b>	<b>2,733.2</b>	<b>707.8</b>	<b>901.8</b>	<b>60.0</b>	<b>296.6</b>	<b>296.6</b>	<b>140,805.7</b>

13,491,894.19 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	2,003.43	490.26	751.66	42.87	220.75	220.75	100,450.68
OLF Coupeville Aircraft Flight Operations	85.7	169.5	3.9	11.1	47.1	47.1	26,886.9
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,819.74</b>	<b>718.01</b>	<b>903.73</b>	<b>60.08</b>	<b>398.71</b>	<b>307.91</b>	<b>152,362.19</b>

**Alternative 2E High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	5	16
# Aircraft	63	25	5	25	118
Departures	6,949	5,987	1,211	3,176	17,323
Interfacility Departures	396	203	15	0	614
Straight in Arrivals	2,488	2,443	406	1,127	6,464
Overhead Break Arrivals	4,000	3,318	699	1,838	9,855
IFR Arrivals	462	226	106	212	1,006
Interfacility Arrivals	398	203	15	0	616
FCLP Ops <sup>2</sup>	14,593	8,082	197	0	22,872
Touch & Go Ops <sup>2</sup>	5,210	5,452	469	1,026	12,157
Depart-Re-enter Ops <sup>2</sup>	2,282	0	439	1,128	3,849
GCA pattern Ops <sup>2</sup>	7,675	5,735	483	1,018	14,911
<b>Total</b>	<b>44,453</b>	<b>31,649</b>	<b>4,040</b>	<b>9,525</b>	<b>89,667</b>
<b>OLF Coupeville</b>					
Interfacility Departures	396	203	15	0	614
Interfacility Arrivals	396	203	15	0	614
FCLP Ops <sup>2</sup>	5,564	2,826	195	0	8,585
<b>Total</b>	<b>6,356</b>	<b>3,232</b>	<b>225</b>	<b>0</b>	<b>9,813</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt2EAveYr, workbook Ops Tables MaxYr\_Alt2\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 2E High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,464	15,599,679	680.88	94.24	255.46	10.22	56.96	56.96	23,545.64
Break Arrival LTO <sup>2</sup>	11,477	26,733,567	1,215.58	167.73	457.35	17.51	97.29	97.29	40,251.57
FCLP <sup>4</sup>	11,436	8,073,816	2.86	82.74	0.53	5.29	22.59	22.59	12,862.81
Touch-and-Go <sup>4</sup>	6,079	4,291,421	1.52	43.98	0.28	2.81	12.01	12.01	6,836.88
Depart and Re-enter <sup>4</sup>	1,925	2,715,470	0.97	27.86	0.19	1.78	7.59	7.59	4,329.21
GCA Pattern <sup>4</sup>	7,456	10,519,711	3.77	107.92	0.73	6.89	29.41	29.41	16,771.33
<b>Total Emissions for Ault Field Flight Operations</b>		<b>67,933,663.3</b>	<b>1,905.6</b>	<b>524.5</b>	<b>714.5</b>	<b>44.5</b>	<b>225.8</b>	<b>225.8</b>	<b>104,597.4</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	614	849,336	34.55	7.92	1.27	0.56	2.03	2.03	1,294.03
FCLP <sup>4</sup>	8,585	6,061,010	2.15	62.11	0.39	3.97	16.96	16.96	9,656.11
Interfacility Transit	614	370,344	0.13	2.73	0.03	0.24	1.21	1.21	590.87
<b>Total Emissions for Coupeville Flight Operations</b>		<b>7,280,690.3</b>	<b>36.8</b>	<b>72.8</b>	<b>1.7</b>	<b>4.8</b>	<b>20.2</b>	<b>20.2</b>	<b>11,541.0</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>84,411,745.6</b>	<b>2,586.5</b>	<b>645.2</b>	<b>862.5</b>	<b>55.3</b>	<b>274.8</b>	<b>274.8</b>	<b>129,606.5</b>

12,431,774.02 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,732	29,575,000	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 2E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,905.57	524.46	714.53	44.50	225.85	225.85	104,597.45
OLF Coupeville Aircraft Flight Operations	36.8	72.8	1.7	4.8	20.2	20.2	11,541.0
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	86.56	10.24	1.88	0.08	102.12	11.31	11,556.47
<b>Total</b>	<b>2,673.04</b>	<b>655.46</b>	<b>864.36</b>	<b>55.37</b>	<b>376.95</b>	<b>286.15</b>	<b>141,163.02</b>

NAS Whidbey Island Complex Annual GHG Emissions, Alternative 2

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 2A	Alt 2B	Alt 2C	Alt 2D	Alt 2E
<b>Stationary Sources</b>							
e Total GHG Emissions (2014 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% Increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	90,279	89,511	130,202	122,317	115,071	127,711	117,553
GSE Emissions	130	131	167	160	155	165	157
Personnel Commute Emissions	9,091	9,091	10,482	10,482	10,482	10,482	10,482
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	<b>99,499</b>	<b>98,733</b>	<b>140,850</b>	<b>132,958</b>	<b>125,708</b>	<b>138,358</b>	<b>128,192</b>
<b>Change in Mobile CO<sub>2</sub> Emissions</b>			<b>42,118</b>	<b>34,226</b>	<b>26,975</b>	<b>39,625</b>	<b>29,459</b>
<b>% Increase in Mobile CO<sub>2</sub> Emissions</b>			<b>42%</b>	<b>34%</b>	<b>27%</b>	<b>40%</b>	<b>30%</b>
<b>Total Change in Emissions (Stationary and Mobile)</b>			<b>42,574</b>	<b>34,682</b>	<b>27,432</b>	<b>40,082</b>	<b>29,916</b>
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.05%	0.04%	0.03%	0.04%	0.03%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.10%	0.08%	0.07%	0.10%	0.07%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.64%	0.52%	0.41%	0.60%	0.45%

1. Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29, 2018 from: <https://fortress.wa.gov/ecy/publications/documents/1602025.pdf>

metric tons per short ton

0.907

TPY = Tons per year

CO<sub>2</sub>e = Carbon Dioxide Equivalent

GHG = Greenhouse Gas

**Alternative 3A High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	6,955	5,973	1,212	2,694	16,834
Interfacility Departures	1,058	565	13	0	1,636
Straight in Arrivals	2,503	2,413	426	918	6,260
Overhead Break Arrivals	3,894	3,292	715	1,773	9,674
IFR Arrivals	557	268	71	281	1,177
Interfacility Arrivals	1,059	565	13	0	1,637
FCLP Ops <sup>2</sup>	4,120	2,205	142	0	6,467
Touch & Go Ops <sup>2</sup>	5,050	5,312	531	1,041	11,934
Depart-Re-enter Ops <sup>2</sup>	2,311	0	444	1,019	3,774
GCA pattern Ops <sup>2</sup>	7,546	5,794	545	1,025	14,910
<b>Total</b>	<b>35,053</b>	<b>26,387</b>	<b>4,112</b>	<b>8,751</b>	<b>74,303</b>
<b>OLF Coupeville</b>					
Interfacility Departures	1,058	565	13	0	1,636
Interfacility Arrivals	1,059	565	13	0	1,637
FCLP Ops <sup>2</sup>	14,829	7,905	182	0	22,916
<b>Total</b>	<b>16,946</b>	<b>9,035</b>	<b>208</b>	<b>0</b>	<b>26,189</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3AAveYr, workbook Ops Tables MaxYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

Alternative 3A High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,260	15,107,362	659.39	91.27	247.40	9.90	55.16	55.16	22,802.55
Break Arrival LTO <sup>2</sup>	12,488	29,088,507	1,322.65	182.50	497.63	19.05	105.86	105.86	43,797.29
FCLP <sup>4</sup>	3,234	2,282,851	0.81	23.39	0.15	1.50	6.39	6.39	3,636.93
Touch-and-Go <sup>4</sup>	5,967	4,212,702	1.49	43.17	0.27	2.76	11.78	11.78	6,711.47
Depart and Re-enter <sup>4</sup>	1,887	2,662,557	0.95	27.31	0.18	1.74	7.44	7.44	4,244.85
GCA Pattern <sup>4</sup>	7,455	10,519,005	3.76	107.91	0.73	6.89	29.41	29.41	16,770.21
<b>Total Emissions for Ault Field Flight Operations</b>		<b>63,872,983.9</b>	<b>1,989.1</b>	<b>475.6</b>	<b>746.4</b>	<b>41.8</b>	<b>216.0</b>	<b>216.0</b>	<b>97,963.3</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,636	2,263,052	92.05	21.10	3.38	1.48	5.40	5.40	3,447.93
FCLP <sup>4</sup>	22,916	16,178,696	5.73	165.80	1.05	10.60	45.26	45.26	25,775.11
Interfacility Transit	1,636	986,781	0.36	7.28	0.08	0.65	3.24	3.24	1,574.37
<b>Total Emissions for Coupeville Flight Operations</b>		<b>19,428,528.2</b>	<b>98.1</b>	<b>194.2</b>	<b>4.5</b>	<b>12.7</b>	<b>53.9</b>	<b>53.9</b>	<b>30,797.4</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>92,498,904.1</b>	<b>2,731.3</b>	<b>717.7</b>	<b>897.1</b>	<b>60.6</b>	<b>298.7</b>	<b>298.7</b>	<b>142,228.8</b>

13,622,813.56 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3A**

Activity	Emissions (tpy)							
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Ault Field Aircraft Flight Operations	1,989.06	475.56	746.37	41.84	216.05	216.05	97,963.31	
OLF Coupeville Aircraft Flight Operations	98.1	194.2	4.5	12.7	53.9	53.9	30,797.4	
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1	
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56	
<b>Total</b>	<b>2,812.60</b>	<b>727.34</b>	<b>898.90</b>	<b>60.66</b>	<b>394.66</b>	<b>309.36</b>	<b>153,084.38</b>	

**Alternative 3B High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	6,943	5,964	1,210	3,101	17,218
Interfacility Departures	657	354	12	0	1,023
Straight in Arrivals	2,528	2,432	416	1,087	6,463
Overhead Break Arrivals	3,899	3,216	722	1,752	9,589
IFR Arrivals	514	316	72	262	1,164
Interfacility Arrivals	657	353	12	0	1,022
FCLP Ops <sup>2</sup>	10,576	5,655	139	0	16,370
Touch & Go Ops <sup>2</sup>	5,050	5,312	531	1,041	11,934
Depart-Re-enter Ops <sup>2</sup>	2,311	0	444	1,019	3,774
GCA pattern Ops <sup>2</sup>	7,546	5,794	545	1,025	14,910
<b>Total</b>	<b>40,681</b>	<b>29,396</b>	<b>4,103</b>	<b>9,287</b>	<b>83,467</b>
<b>OLF Coupeville</b>					
Interfacility Departures	657	354	12	0	1,023
Interfacility Arrivals	657	353	12	0	1,022
FCLP Ops <sup>2</sup>	9,209	4,955	166	0	14,330
<b>Total</b>	<b>10,523</b>	<b>5,662</b>	<b>190</b>	<b>0</b>	<b>16,375</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3BAveYr, workbook Ops Tables MaxYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.



Alternative 3B High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,463	15,597,266	680.77	94.23	255.43	10.22	56.95	56.95	23,542.00
Break Arrival LTO <sup>2</sup>	11,775	27,427,704	1,247.14	172.08	469.22	17.97	99.82	99.82	41,296.70
FCLP <sup>4</sup>	8,185	5,778,610	2.05	59.22	0.38	3.78	16.17	16.17	9,206.20
Touch-and-Go <sup>4</sup>	5,967	4,212,702	1.49	43.17	0.27	2.76	11.78	11.78	6,711.47
Depart and Re-enter <sup>4</sup>	1,887	2,662,557	0.95	27.31	0.18	1.74	7.44	7.44	4,244.85
GCA Pattern <sup>4</sup>	7,455	10,519,005	3.76	107.91	0.73	6.89	29.41	29.41	16,770.21
<b>Total Emissions for Ault Field Flight Operations</b>		<b>66,197,843.4</b>	<b>1,936.2</b>	<b>503.9</b>	<b>726.2</b>	<b>43.4</b>	<b>221.6</b>	<b>221.6</b>	<b>101,771.4</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	1,023	1,415,099	57.56	13.19	2.12	0.93	3.38	3.38	2,156.01
FCLP <sup>4</sup>	14,330	10,116,980	3.58	103.68	0.66	6.63	28.30	28.30	16,117.88
Interfacility Transit	1,023	617,040	0.22	4.55	0.05	0.40	2.02	2.02	984.46
<b>Total Emissions for Coupeville Flight Operations</b>		<b>12,149,118.4</b>	<b>61.4</b>	<b>121.4</b>	<b>2.8</b>	<b>8.0</b>	<b>33.7</b>	<b>33.7</b>	<b>19,258.4</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>87,544,353.7</b>	<b>2,641.6</b>	<b>673.3</b>	<b>875.3</b>	<b>57.3</b>	<b>284.1</b>	<b>284.1</b>	<b>134,497.9</b>

12,893,130.15 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3B**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,936.17	503.93	726.21	43.36	221.57	221.57	101,771.43
OLF Coupeville Aircraft Flight Operations	61.4	121.4	2.8	8.0	33.7	33.7	19,258.4
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,722.93</b>	<b>682.96</b>	<b>877.05</b>	<b>57.41</b>	<b>379.99</b>	<b>294.69</b>	<b>145,353.44</b>

**Alternative 3C High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	6,912	5,923	1,205	3,082	17,122
Interfacility Departures	265	135	10	0	410
Straight in Arrivals	2,470	2,478	414	1,122	6,484
Overhead Break Arrivals	3,949	3,210	703	1,736	9,598
IFR Arrivals	493	233	88	225	1,039
Interfacility Arrivals	266	135	10	0	411
FCLP Ops <sup>2</sup>	16,839	9,198	153	0	26,190
Touch & Go Ops <sup>2</sup>	5,050	5,312	531	1,041	11,934
Depart-Re-enter Ops <sup>2</sup>	2,311	0	444	1,019	3,774
GCA pattern Ops <sup>2</sup>	7,546	5,794	545	1,025	14,910
<b>Total</b>	<b>46,101</b>	<b>32,418</b>	<b>4,103</b>	<b>9,250</b>	<b>91,872</b>
<b>OLF Coupeville</b>					
Interfacility Departures	265	135	10	0	410
Interfacility Arrivals	266	135	10	0	411
FCLP Ops <sup>2</sup>	3,720	1,886	130	0	5,736
<b>Total</b>	<b>4,251</b>	<b>2,156</b>	<b>150</b>	<b>0</b>	<b>6,557</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3CAveYr, workbook Ops Tables MaxYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3C High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,484	15,647,945	682.99	94.53	256.26	10.25	57.14	57.14	23,618.49
Break Arrival LTO <sup>2</sup>	11,048	25,734,291	1,170.14	161.46	440.25	16.86	93.65	93.65	38,747.00
FCLP <sup>4</sup>	13,095	9,245,070	3.27	94.74	0.60	6.06	25.86	25.86	14,728.80
Touch-and-Go <sup>4</sup>	5,967	4,212,702	1.49	43.17	0.27	2.76	11.78	11.78	6,711.47
Depart and Re-enter <sup>4</sup>	1,887	2,662,557	0.95	27.31	0.18	1.74	7.44	7.44	4,244.85
GCA Pattern <sup>4</sup>	7,455	10,519,005	3.76	107.91	0.73	6.89	29.41	29.41	16,770.21
<b>Total Emissions for Ault Field Flight Operations</b>		<b>68,021,569.8</b>	<b>1,862.6</b>	<b>529.1</b>	<b>698.3</b>	<b>44.6</b>	<b>225.3</b>	<b>225.3</b>	<b>104,820.8</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	410	567,146	23.07	5.29	0.85	0.37	1.35	1.35	864.09
FCLP <sup>4</sup>	5,736	4,049,616	1.43	41.50	0.26	2.65	11.33	11.33	6,451.65
Interfacility Transit	410	247,298	0.09	1.82	0.02	0.16	0.81	0.81	394.56
<b>Total Emissions for Coupeville Flight Operations</b>		<b>4,864,060.5</b>	<b>24.6</b>	<b>48.6</b>	<b>1.1</b>	<b>3.2</b>	<b>13.5</b>	<b>13.5</b>	<b>7,710.3</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>82,083,022.3</b>	<b>2,531.3</b>	<b>625.7</b>	<b>845.7</b>	<b>53.8</b>	<b>267.6</b>	<b>267.6</b>	<b>125,999.2</b>

12,088,810.35 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3C**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,862.61	529.13	698.30	44.55	225.29	225.29	104,820.82
OLF Coupeville Aircraft Flight Operations	24.6	48.6	1.1	3.2	13.5	13.5	7,710.3
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,612.60</b>	<b>635.35</b>	<b>847.44</b>	<b>53.84</b>	<b>363.50</b>	<b>278.20</b>	<b>136,854.78</b>

**Alternative 3D High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	6,955	5,973	1,212	2,694	16,834
Interfacility Departures	926	494	11	0	1,431
Straight in Arrivals	2,503	2,413	426	918	6,260
Overhead Break Arrivals	3,894	3,292	715	1,773	9,674
IFR Arrivals	557	268	71	281	1,177
Interfacility Arrivals	927	494	11	0	1,432
FCLP Ops <sup>2</sup>	6,180	3,308	213	0	9,701
Touch & Go Ops <sup>2</sup>	5,050	5,312	531	1,041	11,934
Depart-Re-enter Ops <sup>2</sup>	2,311	0	444	1,019	3,774
GCA pattern Ops <sup>2</sup>	7,546	5,794	545	1,025	14,910
<b>Total</b>	<b>36,849</b>	<b>27,348</b>	<b>4,179</b>	<b>8,751</b>	<b>77,127</b>
<b>OLF Coupeville</b>					
Interfacility Departures	927	494	11	0	1,432
Interfacility Arrivals	926	494	11	0	1,431
FCLP Ops <sup>2</sup>	12,975	6,917	159	0	20,051
<b>Total</b>	<b>14,828</b>	<b>7,905</b>	<b>181</b>	<b>0</b>	<b>22,914</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3DAveYr, workbook Ops Tables MaxYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3D High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,260	15,107,362	659.39	91.27	247.40	9.90	55.16	55.16	22,802.55
Break Arrival LTO <sup>2</sup>	12,283	28,610,997	1,300.94	179.51	489.46	18.74	104.12	104.12	43,078.33
FCLP <sup>4</sup>	4,851	3,424,453	1.21	35.09	0.22	2.24	9.58	9.58	5,455.67
Touch-and-Go <sup>4</sup>	5,967	4,212,702	1.49	43.17	0.27	2.76	11.78	11.78	6,711.47
Depart and Re-enter <sup>4</sup>	1,887	2,662,557	0.95	27.31	0.18	1.74	7.44	7.44	4,244.85
GCA Pattern <sup>4</sup>	7,455	10,519,005	3.76	107.91	0.73	6.89	29.41	29.41	16,770.21
<b>Total Emissions for Ault Field Flight Operations</b>		<b>64,537,076.0</b>	<b>1,967.8</b>	<b>484.3</b>	<b>738.3</b>	<b>42.3</b>	<b>217.5</b>	<b>217.5</b>	<b>99,063.1</b>
<b>NOLF Coupeville</b>									
Interfacility LTO <sup>2</sup>	1,432	1,980,862	80.57	18.47	2.96	1.30	4.73	4.73	3,017.99
FCLP <sup>4</sup>	20,051	14,156,006	5.01	145.07	0.92	9.27	39.60	39.60	22,552.66
Interfacility Transit	1,432	863,735	0.31	6.37	0.07	0.57	2.83	2.83	1,378.06
<b>Total Emissions for Coupeville Flight Operations</b>		<b>17,000,602.4</b>	<b>85.9</b>	<b>169.9</b>	<b>4.0</b>	<b>11.1</b>	<b>47.2</b>	<b>47.2</b>	<b>26,948.7</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>90,735,070.4</b>	<b>2,697.7</b>	<b>702.2</b>	<b>888.5</b>	<b>59.4</b>	<b>293.5</b>	<b>293.5</b>	<b>139,479.9</b>

13,363,044.23 total gallons of fuel

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS Whidbey Island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3D**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,967.75	484.27	738.28	42.27	217.50	217.50	99,063.09
OLF Coupeville Aircraft Flight Operations	85.9	169.9	4.0	11.1	47.2	47.2	26,948.7
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,779.05</b>	<b>711.78</b>	<b>890.24</b>	<b>59.50</b>	<b>389.38</b>	<b>304.08</b>	<b>150,335.46</b>

**Alternative 3E High Tempo Year EA-18G (Growler) Operations NAS Whidbey Island Complex**

Ault Field	EA 18G (Growler) Operations				EA-18G Total
	CVW	FRS	RES	EXP	
# Squadrons	9	1	1	3	14
# Aircraft	63	24	5	26	118
Departures	6,912	5,923	1,205	3,082	17,122
Interfacility Departures	398	203	15	0	616
Straight in Arrivals	2,470	2,478	414	1,122	6,484
Overhead Break Arrivals	3,949	3,210	703	1,736	9,598
IFR Arrivals	493	233	88	225	1,039
Interfacility Arrivals	398	203	15	0	616
FCLP Ops <sup>2</sup>	14,734	8,048	134	0	22,916
Touch & Go Ops <sup>2</sup>	5,050	5,312	531	1,041	11,934
Depart-Re-enter Ops <sup>2</sup>	2,311	0	444	1,019	3,774
GCA pattern Ops <sup>2</sup>	7,546	5,794	545	1,025	14,910
<b>Total</b>	<b>44,261</b>	<b>31,404</b>	<b>4,094</b>	<b>9,250</b>	<b>89,009</b>
<b>OLF Coupeville</b>					
Interfacility Departures	398	203	15	0	616
Interfacility Arrivals	398	203	15	0	616
FCLP Ops <sup>2</sup>	5,580	2,829	195	0	8,604
<b>Total</b>	<b>6,376</b>	<b>3,235</b>	<b>225</b>	<b>0</b>	<b>9,836</b>
<b>Maintenance Run Ups (at Ault Field)<sup>3</sup></b>					
Water Wash					118
Low Power, one engine					1,770
Low Power, two engines					3,540
High Power, two engines					944
<b>Test Cell Maintenance Run Ups (at Ault Field)<sup>4</sup></b>					

<sup>1</sup> Operations information from Tab SEIS\_Alt3EAveYr, workbook Ops Tables MaxYr\_Alt3\_20171018.xlsx. Preliminary data provided by Wyle from "Aircraft Noise Study for Naval Air Station Whidbey Island Complex, Washington (Wyle report X-X), Wyle Laboratories, TBD.

<sup>2</sup> One circuit counted at two operations (one take of and one landing), while emission factors are applied to the entire circuit--therefore reported operations on air tables will be half operations reported by noise analysis as listed in these tables

<sup>3</sup> Maintenance run ups from "Alternates Static Ops.xls" from Wyle 12/16/2015

<sup>4</sup> Out-of-Frame testing of F414 engines will not be performed at the test cell facilities at NAS Whidbey Island. All engine testing is assumed to be In-frame testing, Source: email from CDR Sean Michaels, May 11, 2016.

**Alternative 3E High Tempo Year EA-18G (Growler) Air Emissions, NAS Whidbey Island Complex**

Operation	No. of Operations <sup>1</sup>	Fuel use (lbs)	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
<b>Flight Operations</b>									
<b>Ault Field</b>									
Straight-In Arrival LTO <sup>2</sup>	6,484	15,647,945	682.99	94.53	256.26	10.25	57.14	57.14	23,618.49
Break Arrival LTO <sup>2</sup>	11,253	26,211,800	1,191.85	164.46	448.42	17.17	95.39	95.39	39,465.96
FCLP <sup>4</sup>	11,458	8,089,348	2.86	82.90	0.53	5.30	22.63	22.63	12,887.56
Touch-and-Go <sup>4</sup>	5,967	4,212,702	1.49	43.17	0.27	2.76	11.78	11.78	6,711.47
Depart and Re-enter <sup>4</sup>	1,887	2,662,557	0.95	27.31	0.18	1.74	7.44	7.44	4,244.85
GCA Pattern <sup>4</sup>	7,455	10,519,005	3.76	107.91	0.73	6.89	29.41	29.41	16,770.21
<b>Total Emissions for Ault Field Flight Operations</b>		<b>67,343,357.7</b>	<b>1,883.9</b>	<b>520.3</b>	<b>706.4</b>	<b>44.1</b>	<b>223.8</b>	<b>223.8</b>	<b>103,698.5</b>
<b>NOLF Coupeville</b>									
Interfacility LTO2	616	852,103	34.66	7.94	1.27	0.56	2.03	2.03	1,298.24
FCLP <sup>4</sup>	8,604	6,074,424	2.15	62.25	0.40	3.98	16.99	16.99	9,677.48
Interfacility Transit	616	371,551	0.13	2.74	0.03	0.24	1.22	1.22	592.80
<b>Total Emissions for Coupeville Flight Operations</b>		<b>7,298,077.2</b>	<b>36.9</b>	<b>72.9</b>	<b>1.7</b>	<b>4.8</b>	<b>20.2</b>	<b>20.2</b>	<b>11,568.5</b>
<b>Maintenance Operations</b>									
Water Wash	118	15,576	0.67	0.028	0.51	0.010	0.09	0.09	21.80
Low Power, one engine	1,770	644,398	30.23	1.07	23.12	0.42	3.89	3.89	960.77
Low Power, two engines	3,540	2,519,300	120.88	4.09	92.46	1.65	15.56	15.56	3,750.97
High Power, two engines	944	6,018,118	492.30	42.80	30.15	3.94	9.26	9.26	8,734.55
Total In-frame Maintenance Operations		9,197,392	644	48	146	6	29	29	13,468
<b>Total Emissions for Maintenance Operations</b>		<b>9,197,392.0</b>	<b>644.1</b>	<b>48.0</b>	<b>146.2</b>	<b>6.0</b>	<b>28.8</b>	<b>28.8</b>	<b>13,468.1</b>
<b>Total</b>		<b>83,838,826.9</b>	<b>2,564.9</b>	<b>641.2</b>	<b>854.3</b>	<b>54.9</b>	<b>272.8</b>	<b>272.8</b>	<b>128,735.2</b>

12,347,397.19 total gallons of fuel

116,762.79

Notes:

<sup>1</sup> See Previous Table of this Appendix for Estimated Operations

<sup>2</sup> All LTOs represent 2 operations, a Departure and Break or Straight-In Arrival

<sup>3</sup> Emissions calculated using AESO Report emission factors: #Ops x EF(lbs emission/op)/2000

<sup>4</sup> Touch and Go/FCLP, and Depart&Reenter/GCA Pattern operations are counted as two operations in Wyle calculations, but only once for air emission calculation purposes

**Employee Commute Emissions**

Population	No. of Vehicles <sup>1</sup>	VMT	Emissions (tpy) <sup>3</sup>						
			CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Associated Personnel	4,445	27,781,250	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56

<sup>1</sup> Based on one vehicle per person, Total Military and Non-Military personnel from NAS whidbey island loading sheet master (March 2015).xls

**Total Emissions, Alternative 3E**

Activity	Emissions (tpy)						
	CO	NO <sub>x</sub>	HC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ault Field Aircraft Flight Operations	1,883.91	520.28	706.39	44.11	223.80	223.80	103,698.55
OLF Coupeville Aircraft Flight Operations	36.9	72.9	1.7	4.8	20.2	20.2	11,568.5
Aircraft Maintenance Operations	644.1	48.0	146.2	6.0	28.8	28.8	13,468.1
Employee Commute	81.31	9.62	1.77	0.07	95.92	10.63	10,855.56
<b>Total</b>	<b>2,646.25</b>	<b>650.83</b>	<b>856.10</b>	<b>54.99</b>	<b>368.76</b>	<b>283.46</b>	<b>139,590.72</b>

NAS Whidbey Island Complex Annual GHG Emissions, Alternative 3

Emission Source	CO2 Emissions (Metric TPY)						
	Existing	No Action	Alt 3A	Alt 3B	Alt 3C	Alt 3D	Alt 3E
<b>Stationary Sources</b>							
Sitewide Total GHG Emissions (2014 Reported)	13,575	13,575					
New Electricity Building Use (Indirect)	0	0	181	181	181	181	181
New Natural Gas Building Use (Direct)	0	0	276	276	276	276	276
<b>Total Change in Stationary CO<sub>2</sub> Emissions (MTPY)</b>			456	456	456	456	456
<b>% increase in Stationary CO<sub>2</sub> Emissions</b>			3%	3%	3%	3%	3%
<b>Mobile Sources</b>							
Aircraft Operations	90,279	89,511	129,002	121,990	114,281	126,508	116,763
GSE Emissions	130	131	162	160	153	160	155
Personnel Commute Emissions	9,091	9,091	9,846	9,846	9,846	9,846	9,846
<b>Total Mobile CO<sub>2</sub> Emissions (MTPY)</b>	<b>99,499</b>	<b>98,733</b>	<b>139,009</b>	<b>131,995</b>	<b>124,281</b>	<b>136,514</b>	<b>126,764</b>
<b>Change in Mobile CO<sub>2</sub> Emissions</b>			<b>40,277</b>	<b>33,263</b>	<b>25,548</b>	<b>37,782</b>	<b>28,031</b>
<b>% increase in Mobile CO<sub>2</sub> Emissions</b>			<b>40%</b>	<b>33%</b>	<b>26%</b>	<b>38%</b>	<b>28%</b>
<b>Total Change in Emissions (Stationary and Mobile)</b>			<b>40,733</b>	<b>33,719</b>	<b>26,004</b>	<b>38,238</b>	<b>28,488</b>
2013 Total CO <sub>2</sub> e from all sources in Washington State <sup>1</sup>			94,400,000				
Change in Emissions (Stationary and Mobile) as % of Total 2013 CO <sub>2</sub> e Emissions in Washington State			0.04%	0.04%	0.03%	0.04%	0.03%
2013 Total CO <sub>2</sub> from Transportation in Washington State <sup>1</sup>			40,400,000				
Change in Mobile Emissions as % of Total 2013 Transportation CO <sub>2</sub> e Emissions in Washington State			0.10%	0.08%	0.06%	0.09%	0.07%
2013 Total CO <sub>2</sub> e from Aircraft in Washington State <sup>1</sup>			6,570,000				
Change in Aircraft Emissions as % of Total 2013 Aircraft CO <sub>2</sub> e Emissions in Washington State			0.61%	0.51%	0.39%	0.58%	0.43%

<sup>1</sup>. Inventory 1990-2013 (2016). Report to the Legislature on Washington Greenhouse Gas Emissions Inventory: 2010 – 2013 (Publication 16-02-025) October 2016. Retrieved March 29,

2018 from: <https://fortress.wa.gov/ecy/publications/documents/1602025.pdf>

metric tons per short ton 0.907

TPY = Tons per year

CO<sub>2</sub>e = Carbon Dioxide Equivalent

GHG = Greenhouse Gas



### Onroad Vehicle Exhaust Emission Factors

Equipment Type	Fuel Type	Exhaust Emission Factor <sup>1</sup> (g/VMT)									Road Dust Emission Factor <sup>d</sup> (g/VMT)		Total PM Emission Factor <sup>e</sup> (g/VMT)	
		VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Cars and Light Trucks	Gasoline	0.06	2.66	0.31	0.0024	0.0066	0.0058	0.0038	0.0021	354	3.13	0.341	3.13	0.347
Delivery Vehicles	Diesel	0.28	1.10	8.06	0.158	0.17	0.17			1,400	3.13	0.341	3.30	0.511

Notes:

1. MOVES Onroad run for analysis year 2017, Island Count, WA. Includes weekdays and weekends, January through December, all hours of day. 'Cars and Light Trucks' Assumes 50% Passenger Car, 50% Passenger Truck

d. See emission factor derivation table below.

e. Sum of exhaust and road dust emission factors.

#### Paved Roads - Emission Factor Derivation

$$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C) \quad \text{AP-42 Section 13.2.1 (11/06 version)}$$

where:

E = particulate emission factor (lb/VMT)

k = particle size multiplier

sL = road surface silt loading (g/m<sup>2</sup>)

W = average vehicle weight (tons)

C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM <sub>10</sub>	PM <sub>2.5</sub>	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	g/VMT	7.3	1.1	Table 13.2-1.1
Silt Loading, sL	g/m <sup>2</sup>	0.6	0.6	Table 13.2-1-3
Emission factor, C	g/VMT	0.2119	0.1617	Table 13.2-1-2
Emission factor, E	g/VMT	3.13	0.341	Table 13.2-1-3

Ground Transportation Vehicle Emissions for Existing POV: Growler Squadron Personnel only

Source	# of vehicles <sup>2</sup>	Avg Daily mileage	Annual days of Commute	Total Annual Miles <sup>3</sup>	Emission Factors (lbs/mi) <sup>1</sup>							Emissions (tpy)						
					VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>No Action</b>																		
Total Military and Non Military Personnel	4,104	25	250	25,650,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.63	75.07	8.88	0.067	10023	88.56	9.81
<b>Alternative 1</b>																		
Total Military and Non Military Personnel	4,439	25	250	27,743,750	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.77	81.20	9.61	0.072	10841	95.79	10.61
Change in Personnel	335	25	250	2,093,750	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.13	6.13	0.73	0.005	818	7.23	0.80
<b>Alternative 2</b>																		
Total Military and Non Military Personnel	4,732	25	250	29,575,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.88	86.56	10.24	0.077	11556	102.12	11.31
Change in Personnel	628	25	250	3,925,000	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.25	11.49	1.36	0.010	1534	13.55	1.50
<b>Alternative 3</b>																		
Total Military and Non Military Personnel	4,445	25	250	27,781,250	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	1.77	81.31	9.62	0.072	10856	95.92	10.63
Change in Personnel	341	25	250	2,131,250	0.0001	0.0059	0.0007	0.000005	0.7815	0.0069	0.0008	0.14	6.24	0.74	0.006	833	7.36	0.82

<sup>1</sup> See Emission factors in Previous Table of this Appendix

<sup>2</sup> Assumes one vehicle per person, based on Total Military personnel at NAS Whidbey island, revised 2017

<sup>3</sup> Based on 250 days for commute

**GSE Equipment Exhaust Emission Factors and Estimated Emissions**

Equipment types, sizes, operations, ratio to LTOs and emission factors from those listed for NAS LeMoore in Navy F-35c West Coast Conformity Determination  
 All NAS Whidbey Equipment types, sizes, operations and emissions estimated based NAS LeMoore data and ratio of NAS Whidbey LTOs to NAS LeMoore LTOs  
 NAS Whidbey LTOs = Departures + Interfacility Departures

**GSE Equipment Exhaust Emission Factors**

**LeMoore Baseline LTO: 32966**

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Load Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O		CO <sub>2</sub> e
								g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/gal	g/gal	g/gal	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	kg/year	kg/year	kg/year		
Tow Tractor	88	48	0.0107	4.89	72.29	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	1,160.76	24.18	657.76	0.50	38.69	37.48	172,174.30	9.84	4.41	173,734.55	
Tow Tractor	192	1	0.0003	10.67	0.93	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.32	0.01	0.38	0.00	0.00	0.00	100.38	0.01	0.00	101.29	
Turbine	396	5	0.0002	22.00	0.25	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.51	0.03	0.35	0.00	0.00	0.00	284.41	0.02	0.01	286.99	
Air Compressor	58	2	0.0002	3.22	1.53	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.64	0.01	0.36	0.00	0.02	0.02	100.38	0.01	0.00	101.29	
Hydraulic Power Supply	111	37	0.0010	6.17	5.56	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	43.21	1.54	52.09	0.04	0.17	0.17	12,875.60	0.74	0.33	12,992.28	
Aircon	210	8	0.0030	11.67	8.48	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	14.49	0.75	9.80	0.02	0.11	0.11	8,030.52	0.46	0.21	8,103.29	
MEPP	215	37	0.0080	11.94	22.19	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	179.57	9.24	121.47	0.27	1.32	1.32	99,538.27	5.69	2.55	100,440.29	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>1,399.50</b>	<b>35.76</b>	<b>842.22</b>	<b>0.82</b>	<b>40.32</b>	<b>39.11</b>				
																	<b>Totals in Tons</b>	<b>0.70</b>	<b>0.02</b>	<b>0.42</b>	<b>0.00</b>	<b>0.02</b>	<b>0.02</b>				
																	<b>Total Metric tons</b>							<b>293.10</b>	<b>0.02</b>	<b>0.01</b>	<b>295.76</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
GWP	1	25	298

EPA, 2016.U.S. Inventory of Greenhouse Gas Emissions and Sinks 1990-2014, April 2016. Accessed March 21, 2018 at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>  
 (latest final report: Draft 2016 inventory was released February 6, 2018)

**GSE Equipment Exhaust Emission Factors**

**NAS Whidbey Baseline LTOs: 14,845**

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O		CO <sub>2</sub> e
								g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/gal	g/gal	g/gal	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	kg/year	kg/year	kg/year		
Tow Tractor	88	48	0.0107	4.89	32.55	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	522.70	10.89	296.20	0.22	17.42	16.88	77,532.23	4.43	1.99	78,234.83	
Tow Tractor	192	1	0.0003	10.67	0.42	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.14	0.01	0.17	0.00	0.00	0.00	45.20	0.00	0.00	45.61	
Turbine	396	5	0.0002	22.00	0.11	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.23	0.01	0.16	0.00	0.00	0.00	128.08	0.01	0.00	129.24	
Air Compressor	58	2	0.0002	3.22	0.69	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.29	0.01	0.16	0.00	0.01	0.01	45.20	0.00	0.00	45.61	
Hydraulic Power Supply	111	37	0.0010	6.17	2.50	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	19.46	0.69	23.46	0.02	0.08	0.08	5,798.04	0.33	0.15	5,850.58	
Aircon	210	8	0.0003	11.67	0.38	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.65	0.03	0.44	0.00	0.00	0.00	361.62	0.02	0.01	364.90	
MEPP	215	37	0.0080	11.94	9.99	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	80.86	4.16	54.70	0.12	0.59	0.59	44,823.32	2.56	1.15	45,229.51	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>624.34</b>	<b>15.80</b>	<b>375.29</b>	<b>0.36</b>	<b>18.11</b>	<b>17.57</b>				
																	<b>Totals in Tons</b>	<b>0.31</b>	<b>0.01</b>	<b>0.19</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>				
																	<b>Total Metric tons</b>							<b>128.73</b>	<b>0.01</b>	<b>0.00</b>	<b>129.90</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

**GSE Equipment Exhaust Emission Factors**

**NAS Whidbey No Action LTOs: 14,914**

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O		CO <sub>2</sub> e
								g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/gal	g/gal	g/gal	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	kg/year	kg/year	kg/year		
Tow Tractor	88	48	0.0107	4.89	32.70	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	525.13	10.94	297.58	0.22	17.50	16.96	77,892.60	4.45	2.00	78,598.47	
Tow Tractor	192	1	0.0003	10.67	0.42	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.14	0.01	0.17	0.00	0.00	0.00	45.41	0.00	0.00	45.82	
Turbine	396	5	0.0002	22.00	0.12	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.23	0.01	0.16	0.00	0.00	0.00	128.67	0.01	0.00	129.84	
Air Compressor	58	2	0.0002	3.22	0.69	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.29	0.01	0.16	0.00	0.01	0.01	45.41	0.00	0.00	45.82	
Hydraulic Power Supply	111	37	0.0010	6.17	2.52	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	19.55	0.70	23.57	0.02	0.08	0.08	5,824.99	0.33	0.15	5,877.78	
Aircon	210	8	0.0003	11.67	0.38	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.66	0.03	0.44	0.00	0.00	0.00	363.31	0.02	0.01	366.60	
MEPP	215	37	0.0080	11.94	10.04	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	81.24	4.18	54.96	0.12	0.60	0.60	45,031.66	2.57	1.15	45,439.74	
<b>Total Equipment:</b>		<b>138</b>															<b>Totals in lbs</b>	<b>627.24</b>	<b>15.87</b>	<b>377.03</b>	<b>0.36</b>	<b>18.20</b>	<b>17.65</b>				
																	<b>Totals in Tons</b>	<b>0.31</b>	<b>0.01</b>	<b>0.19</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>				
																	<b>Total Metric tons</b>							<b>129.33</b>	<b>0.01</b>	<b>0.00</b>	<b>130.50</b>
																	<b>Total MT CO<sub>2</sub>e</b>										

**GSE Equipment Exhaust Emission Factors**

**NAS Whidbey Alt 1A: 18,344**

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O		CO <sub>2</sub> e
								g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/gal	g/gal	g/gal	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	lbs/year	kg/year	kg/year	kg/year		
Tow Tractor	88	48	0.0107	4.89	40.22	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	645.91	13.46	366.01	0.28	21.53	20					

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 1D: 18,131

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	39.76	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	638.41	13.30	381.76	0.27	21.28	20.62	94,694.30	5.41	2.43	95,552.42							
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.21	0.00	0.00	55.71							
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	156.43	0.01	0.00	157.84							
Air Compressor	58	2	0.0002	3.22	0.84	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.21	0.00	0.00	55.71							
Hydraulic Power Supply	111	37	0.0010	6.17	3.06	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.77	0.85	28.65	0.02	0.09	0.09	7,081.46	0.40	0.18	7,145.63							
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.80	0.04	0.54	0.00	0.01	0.01	441.67	0.03	0.01	445.67							
MEPP	215	37	0.0080	11.94	12.20	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	98.76	5.08	66.81	0.15	0.73	0.73	54,745.14	3.13	1.40	55,241.24							
<b>Total Equipment:</b>		<b>138</b>															<b>762.54</b>	<b>19.30</b>	<b>458.36</b>	<b>0.44</b>	<b>22.12</b>	<b>21.46</b>											
																	Totals in lbs	762.54	19.30	458.36	0.44	22.12	21.46										
																	Totals in Tons	0.38	0.01	0.23	0.00	0.01	0.01										
																	Total Metric tons							157.23	0.01	0.00							
																	Total MT CO <sub>2</sub> e																158.65

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 1E: 17,248

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	37.82	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	607.31	12.65	344.14	0.26	20.24	19.61	90,082.58	5.15	2.31	90,898.91							
Tow Tractor	192	1	0.0003	10.67	0.49	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.20	0.00	0.00	0.00	52.52	0.00	0.00	53.00							
Turbine	396	5	0.0002	22.00	0.13	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.27	0.01	0.18	0.00	0.00	0.00	148.81	0.01	0.00	150.16							
Air Compressor	58	2	0.0002	3.22	0.80	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.33	0.01	0.19	0.00	0.01	0.01	52.52	0.00	0.00	53.00							
Hydraulic Power Supply	111	37	0.0010	6.17	2.91	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	22.61	0.80	27.26	0.02	0.09	0.09	6,736.59	0.38	0.17	6,797.63							
Aircon	210	8	0.0003	11.67	0.44	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.76	0.04	0.51	0.00	0.01	0.01	420.16	0.02	0.01	423.97							
MEPP	215	37	0.0080	11.94	11.61	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	93.95	4.84	63.56	0.14	0.69	0.69	52,078.99	2.98	1.33	52,550.93							
<b>Total Equipment:</b>		<b>138</b>															<b>725.40</b>	<b>18.36</b>	<b>436.04</b>	<b>0.42</b>	<b>21.04</b>	<b>20.41</b>											
																	Totals in lbs	725.40	18.36	436.04	0.42	21.04	20.41										
																	Totals in Tons	0.36	0.01	0.22	0.00	0.01	0.01										
																	Total Metric tons							149.57	0.01	0.00							
																	Total MT CO <sub>2</sub> e																150.93

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 2A: 19,085

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year							
Tow Tractor	88	48	0.0107	4.89	41.85	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	672.00	14.00	380.80	0.29	22.40	21.70	99,676.83	5.70	2.55	100,580.11							
Tow Tractor	192	1	0.0003	10.67	0.54	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.19	0.01	0.22	0.00	0.00	0.00	58.11	0.00	0.00	58.64							
Turbine	396	5	0.0002	22.00	0.15	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.30	0.02	0.20	0.00	0.00	0.00	164.66	0.01	0.00	166.15							
Air Compressor	58	2	0.0002	3.22	0.89	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.37	0.01	0.21	0.00	0.01	0.01	58.11	0.00	0.00	59.64							
Hydraulic Power Supply	111	37	0.0010	6.17	3.22	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	25.02	0.89	30.16	0.02	0.10	0.10	7,454.07	0.43	0.19	7,521.62							
Aircon	210	8	0.0003	11.67	0.49	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.84	0.04	0.57	0.00	0.01	0.01	464.91	0.03	0.01	469.12							
MEPP	215	37	0.0080	11.94	12.85	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	103.96	5.35	70.33	0.16	0.76	0.76	57,625.67	3.29	1.48	58,147.88							
<b>Total Equipment:</b>		<b>138</b>															<b>802.66</b>	<b>20.31</b>	<b>482.48</b>	<b>0.47</b>	<b>23.28</b>	<b>22.58</b>											
																	Totals in lbs	802.66	20.31	482.48	0.47	23.28	22.58										
																	Totals in Tons	0.40	0.01	0.24	0.00	0.01	0.01										
																	Total Metric tons							165.50	0.01	0.00							
																	Total MT CO <sub>2</sub> e																167.00

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 2B: 18,299

Equipment Type	Size <sup>3</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors								Emissions (lbs/yr)								MT/year CO <sub>2</sub> e		
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year		CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year
Tow Tractor	88	48	0.0107	4.89	40.12	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	644.32	13.42	385.12	0.28	21.48	20.81	95,571.72	5.46	2.45	96,437.80
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.72	0.00	0.00	56.23
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	157.87	0.01	0.00	159.31
Air Compressor	58	2	0.0002	3.22	0.85	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.72	0.00	0.00	56.23
Hydraulic Power Supply	111	37	0.0010	6.17	3.09	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.99	0.85	28.92	0.02	0.09	0.09	7,147.08	0.41	0.18	7,211.84
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0													

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 2E: 17,937

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	39.33	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	631.57	13.16	357.89	0.27	21.05	20.39	93.681	0.8	5.35	2.40	94,530.02								
Tow Tractor	192	1	0.0003	10.67	0.50	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.21	0.00	0.00	0.00	54.62	0.00	0.00	0.00	55.11								
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	154.75	0.01	0.00	0.00	156.15								
Air Compressor	58	2	0.0002	3.22	0.83	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	54.62	0.00	0.00	0.00	55.11								
Hydraulic Power Supply	111	37	0.0010	6.17	3.03	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.51	0.84	28.34	0.02	0.09	0.09	7,005.69	0.40	0.18	7,069.18									
Aircon	210	8	0.0003	11.67	0.46	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.79	0.04	0.53	0.00	0.01	0.01	436.95	0.02	0.01	440.90									
MEPP	215	37	0.0080	11.94	12.07	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	97.71	5.03	66.10	0.15	0.72	0.72	54,159.37	3.09	1.39	54,650.17									
<b>Total Equipment:</b>		<b>138</b>															<b>754.38</b>	<b>19.09</b>	<b>453.46</b>	<b>0.44</b>	<b>21.88</b>	<b>21.23</b>													
																	Totals in lbs	754.38	19.09	453.46	0.44	21.88	21.23												
																	Totals in Tons	0.38	0.01	0.23	0.00	0.01	0.01												
																	Total Metric tons							155.55	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		156.96

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 3A: 18,470

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	40.50	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	650.34	13.55	368.53	0.28	21.68	21.00	96,464.82	5.51	2.47	97,338.99									
Tow Tractor	192	1	0.0003	10.67	0.52	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	56.24	0.00	0.00	0.00	56.75								
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.29	0.01	0.19	0.00	0.00	0.00	159.35	0.01	0.00	0.00	160.79								
Air Compressor	58	2	0.0002	3.22	0.86	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.36	0.01	0.20	0.00	0.01	0.01	56.24	0.00	0.00	0.00	56.75								
Hydraulic Power Supply	111	37	0.0010	6.17	3.11	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	24.21	0.86	29.19	0.02	0.10	0.10	7,213.86	0.41	0.18	7,279.24									
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.81	0.04	0.55	0.00	0.01	0.01	449.93	0.03	0.01	454.01									
MEPP	215	37	0.0080	11.94	12.43	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	100.61	5.18	68.06	0.15	0.74	0.74	55,768.72	3.19	1.43	56,274.10									
<b>Total Equipment:</b>		<b>138</b>															<b>776.80</b>	<b>19.66</b>	<b>466.93</b>	<b>0.45</b>	<b>22.53</b>	<b>21.86</b>													
																	Totals in lbs	776.80	19.66	466.93	0.45	22.53	21.86												
																	Totals in Tons	0.39	0.01	0.23	0.00	0.01	0.01												
																	Total Metric tons							160.17	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		161.62

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 3B: 18,241

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year									
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e									
Tow Tractor	88	48	0.0107	4.89	40.00	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	642.28	13.38	363.96	0.27	21.41	20.74	95,268.80	5.44	2.44	96,132.14									
Tow Tractor	192	1	0.0003	10.67	0.51	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.18	0.01	0.21	0.00	0.00	0.00	55.54	0.00	0.00	0.00	56.05								
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.28	0.01	0.19	0.00	0.00	0.00	157.37	0.01	0.00	0.00	158.80								
Air Compressor	58	2	0.0002	3.22	0.85	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.35	0.01	0.20	0.00	0.01	0.01	55.54	0.00	0.00	0.00	56.05								
Hydraulic Power Supply	111	37	0.0010	6.17	3.08	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	23.91	0.85	28.82	0.02	0.09	0.09	7,124.42	0.41	0.18	7,189.93									
Aircon	210	8	0.0003	11.67	0.47	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.80	0.04	0.54	0.00	0.01	0.01	444.35	0.03	0.01	448.38									
MEPP	215	37	0.0080	11.94	12.28	Diesel	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	99.36	5.11	67.22	0.15	0.73	0.73	55,077.28	3.15	1.41	55,576.39									
<b>Total Equipment:</b>		<b>138</b>															<b>767.17</b>	<b>19.42</b>	<b>461.14</b>	<b>0.45</b>	<b>22.25</b>	<b>21.59</b>													
																	Totals in lbs	767.17	19.42	461.14	0.45	22.25	21.59												
																	Totals in Tons	0.38	0.01	0.23	0.00	0.01	0.01												
																	Total Metric tons							158.18	0.01	0.00									
																	Total MT CO <sub>2</sub> e																		159.62

GSE Equipment Exhaust Emission Factors

NAS Whidbey Alt 3C: 17,532

Equipment Type	Size <sup>1</sup> (hp)	Number of Equipment	Gallons fuel/unit/LTO	Estimated fuel flow (gal/hr)	Annual hours per unit	Fuel Type	Factor	Emission factors										Emissions (lbs/yr)								MT/year	
								NO <sub>x</sub> g/hp-hr	VOC g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/gal	CH <sub>4</sub> g/gal	N <sub>2</sub> O g/gal	NO <sub>x</sub> lbs/year	VOC lbs/year	CO lbs/year	SO <sub>2</sub> lbs/year	PM <sub>10</sub> lbs/year	PM <sub>2.5</sub> lbs/year	CO <sub>2</sub> kg/year	CH <sub>4</sub> kg/year	N <sub>2</sub> O kg/year	CO <sub>2</sub> CO <sub>2</sub> e	
Tow Tractor	88	48	0.0107	4.89	38.44	Diesel	0.36	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	617.31	12.86	349.81	0.26	20.58	19.93	91,565.85	5.23	2.35	92,395.63	
Tow Tractor	192	1	0.0003	10.67	0.49	Diesel	0.36	2.27000	0.09000	2.70000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.17	0.01	0.20	0.00	0.00	0.00	53.38	0.00	0.00	0.00	53.87
Turbine	396	5	0.0002	22.00	0.14	JP-5	0.34	1.36000	0.07000	0.92000	0.00205	0.01000	0.01000	10.150	0.58	0.26	0.27	0.01	0.18	0.00	0.00	0.00	151.26	0.01	0.00	0.00	152.69
Air Compressor	58	2	0.0002	3.22	0.82	Diesel	0.34	4.80000	0.10000	2.72000	0.00205	0.16000	0.15500	10.150	0.58	0.26	0.34	0.01	0.19	0.00	0.01	0.01	53.38	0.00	0.00	0.00	53.87
Hydraulic Power Supply	111	37	0.0010	6.17	2.96	Diesel	0.34	2.53000	0.09000	3.05000	0.00205	0.01000	0.01000	10.150	0.58	0.26	22.98	0.82	27.70								

**Total Change in Criteria Pollutant and GHG Emissions, High Tempo Operations, All Alternatives**

Alternative	Emissions (tpy) <sup>2</sup>						MT CO <sub>2</sub> e
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Alternative 1 A	239.7	187.6	639.0	18.6	93.4	87.0	486
Alternative 1 B	190.0	156.6	523.4	14.9	76.1	69.7	480
Alternative 1 C	142.8	132.2	425.8	11.4	60.3	53.9	475
Alternative 1 D	223.7	178.6	604.1	17.4	87.9	81.5	484
Alternative 1 E	159.0	141.3	461.1	12.6	65.8	59.4	477
Alternative 2 A	241.6	218.1	723.3	19.2	103.6	91.5	42,574
Alternative 2 B	193.4	185.4	604.9	15.5	86.5	74.5	34,682
Alternative 2 C	148.0	161.4	509.5	12.1	71.3	59.2	27,432
Alternative 2 D	226.0	209.5	690.0	18.0	98.3	86.2	40,082
Alternative 2 E	163.5	170.2	543.3	13.3	76.5	64.5	29,916
Alternative 3 A	235.4	204.7	682.9	18.6	94.2	87.7	40,733
Alternative 3 B	191.0	182.9	593.2	15.3	79.6	73.0	33,719
Alternative 3 C	143.3	153.2	482.9	11.8	63.1	56.5	26,004
Alternative 3 D	219.8	196.0	649.3	17.4	89.0	82.4	38,238
Alternative 3 E	158.8	161.9	516.5	12.9	68.3	61.8	28,488

### Facility Construction - NAS Whidbey Island Complex

Alternative	total sq ft	Acres
<b>Alternative 1, 2 and 3</b>		
Armament Storage	4,660	0.11
Hangar 12 Expansion for FRS	55,606	1.28
Mobile Maintenance Facility Storage	32,000	0.73
Temporary Hangers	43,601	1.00
Two Squadron Hangar	37,500	0.86
<b>Total New Construction</b>	<b>173,367</b>	<b>3.98</b>
Privately Owned Vehicle Parking Expansion	70,860	1.63
Taxiway Juliet Repair for Attrition Aircraft	173,781	3.99
<b>New Paving</b>	<b>244,641</b>	<b>5.62</b>
Demolition (Building 151)	38,632	0.89
<b>Total Construction Area</b>	<b>456,640</b>	<b>10.48</b>

Area provided based on Figure 2.3-1 of DEIS

Emission calculations assume all activities will be performed within one year

**Nonroad Construction Equipment Exhaust Emission Factors**

Equipment Type	Fuel Type	SCC	Size <sup>1</sup> (hp)	Engine Size Range <sup>2</sup>	Emission Factor <sup>3</sup> (g/hr)							Equipment Emission Rate <sup>4</sup> (lbs-hr)						
					VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Asphalt Paving Machine	Diesel	2270002003	100	75<hp≤100	20.460	190.904	206.642	0.289	24.693	23.952	49552.899	0.045	0.421	0.456	0.001	0.054	0.053	109.244
Paver/Roller	Diesel	2270002009	100	75<hp≤100	17.321	169.807	176.275	0.287	21.878	21.222	50475.026	0.038	0.374	0.389	0.001	0.048	0.047	111.277
Generators	Diesel	2270006005	25	16 < hp <= 25	9.478	50.640	94.054	0.085	7.420	7.197	12548.679	0.021	0.112	0.207	0.000	0.016	0.016	27.665
Air Compressors	Diesel	2270006015	40	25<hp≤40	6.361	27.166	123.285	0.112	4.087	3.965	20332.505	0.014	0.060	0.272	0.000	0.009	0.009	44.825
Tractors/Loaders/Backhoes	Diesel	2270002066	100	75<hp≤100	66.136	426.666	343.491	0.368	60.829	59.005	60459.265	0.146	0.941	0.757	0.001	0.134	0.130	133.288
Aerial Lifts (Cherry Pickers)	Diesel	2270003010	50	40<hp≤50	63.308	247.349	238.955	0.197	35.930	34.852	31438.171	0.140	0.545	0.527	0.000	0.079	0.077	69.308
Excavators	Diesel	2270002069	175	100<hp≤175	21.099	70.182	165.305	0.394	15.944	15.466	73800.564	0.047	0.155	0.364	0.001	0.035	0.034	162.700
Off-Highway Trucks	Diesel	2270002051	600	300<hp≤600	58.490	156.315	445.272	1.161	22.665	21.985	225228.578	0.129	0.345	0.982	0.003	0.050	0.048	496.536

Notes:

1. hp value set at Max of engine size range.
2. hp range used to select Emission Factors
3. Emission factors from EPA's NONROAD model (Year 2017) for Island County, Washington. VOC emissions include both Exhaust and Crankcase Emissions
4. Equipment Emission Rate = Emission Factor x 453.6 g/lb.



## Onroad Vehicle Exhaust Emission Factors

Equipment Type	Fuel Type	Exhaust Emission Factor <sup>1</sup> (g/VMT)									Road Dust Emission Factor <sup>d</sup> (g/VMT)		Total PM Emission Factor <sup>e</sup> (g/VMT)	
		VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Cars and Light Trucks	Gasoline	0.06	2.66	0.31	0.0024	0.0066	0.0058	0.0038	0.0021	354	3.13	0.341	3.13	0.347
Delivery Vehicles	Diesel	0.28	1.10	8.06	0.158	0.17	0.17			1,400	3.13	0.341	3.30	0.511

Notes:

1. MOVES Onroad run for analysis year 2017, Island Count, WA. Includes weekdays and weekends, January through December, all hours of day. 'Cars and Light Trucks' Assumes 50% Passenger Car, 50% Passenger Truck

d. See emission factor derivation table below.

e. Sum of exhaust and road dust emission factors.

### Paved Roads - Emission Factor Derivation

$$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C) \quad \text{AP-42 Section 13.2.1 (11/06 version)}$$

where:

E = particulate emission factor (lb/VMT)

k = particle size multiplier

sL = road surface silt loading (g/m<sup>2</sup>)

W = average vehicle weight (tons)

C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM <sub>10</sub>	PM <sub>2.5</sub>	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	g/VMT	7.3	1.1	Table 13.2-1.1
Silt Loading, sL	g/m <sup>2</sup>	0.6	0.6	Table 13.2.1-3
Emission factor, C	g/VMT	0.2119	0.1617	Table 13.2.1-2
Emission factor, E	g/VMT	3.13	0.341	Table 13.2.1-3

**Equipment Exhaust Emissions, Construction and Demolition Equipment Use On Site, All Alternatives**

Activity	Equipment List	Eqpt qty	Days Used	Emission Factors (lb/day/unit) <sup>1</sup>							Emissions (TPY)						
				VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Demolition	Loader	1	60	1.17	7.52	6.06	0.01	1.07	1.04	1066.30	0.03	0.23	0.18	0.0002	0.03	0.03	31.99
	Haul Truck	1	60	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.03	0.08	0.24	0.0006	0.01	0.01	119.17
Excavation	Backhoe Loader	1	60	1.17	7.52	6.06	0.01	1.07	1.04	1066.30	0.03	0.23	0.18	0.0002	0.03	0.03	31.99
	Haul Truck	1	60	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.03	0.08	0.24	0.0006	0.01	0.01	119.17
Cut and fill	Tractor	1	125	1.17	7.52	6.06	0.01	1.07	1.04	1066.30	0.07	0.47	0.38	0.0004	0.07	0.07	66.64
	Excavator	1	125	0.37	1.24	2.92	0.01	0.28	0.27	1301.60	0.02	0.08	0.18	0.0004	0.02	0.02	81.35
	Water Truck	1	125	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.06	0.17	0.49	0.0013	0.02	0.02	248.27
Trenching	Trencher	1	125	0.37	1.24	2.92	0.01	0.28	0.27	1301.60	0.02	0.08	0.18	0.0004	0.02	0.02	81.35
	Track loader	1	125	1.17	7.52	6.06	0.01	1.07	1.04	1066.30	0.07	0.47	0.38	0.0004	0.07	0.07	66.64
Grading	Grader	1	125	0.37	1.24	2.92	0.01	0.28	0.27	1301.60	0.02	0.08	0.18	0.0004	0.02	0.02	81.35
	Excavator	1	125	0.37	1.24	2.92	0.01	0.28	0.27	1301.60	0.02	0.08	0.18	0.0004	0.02	0.02	81.35
	Water Truck	1	125	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.06	0.17	0.49	0.0013	0.02	0.02	248.27
Concrete Slab pouring	Cement Truck	1	125	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.06	0.17	0.49	0.0013	0.02	0.02	248.27
	Compactor	1	125	1.17	7.52	6.06	0.01	1.07	1.04	1066.30	0.07	0.47	0.38	0.0004	0.07	0.07	66.64
Portable Equipment	Generator	3	125	0.17	0.89	1.66	0.00	0.13	0.13	221.32	0.03	0.17	0.31	0.0003	0.02	0.02	41.50
	Air Compressor	3	125	0.11	0.48	2.17	0.00	0.07	0.07	358.60	0.02	0.09	0.41	0.0004	0.01	0.01	67.24
Paving	Asphalt Paving Machine	1	60	0.36	3.37	3.64	0.01	0.44	0.42	873.95	0.01	0.10	0.11	0.0002	0.01	0.01	26.22
	Paver/Roller	1	60	0.31	2.99	3.11	0.01	0.39	0.37	890.21	0.01	0.09	0.09	0.0002	0.01	0.01	26.71
	Haul Truck	2	60	1.03	2.76	7.85	0.02	0.40	0.39	3972.29	0.06	0.17	0.47	0.0012	0.02	0.02	238.34
Architectural Coatings	Air Compressor	5	60	0.11	0.48	2.17	0.00	0.07	0.07	358.60	0.02	0.07	0.33	0.0003	0.01	0.01	53.79
		29		<b>Annual Emissions (TPY)</b>							<b>0.8</b>	<b>3.5</b>	<b>5.9</b>	<b>0.011</b>	<b>0.532</b>	<b>0.516</b>	<b>2026.2</b>

<sup>1</sup> Calculated using EPA NONROAD equipment emission rates (see Table 2.1), assuming operation for 8 hours per day.

## Air Quality Calculations

### EIS for the Construction and Operation of an OLF on the East Coast of the U.S.

#### Particulate Emissions from Construction

Activity	ACRES	ACTIVITY DAYS	BULLDOZING (LBS)(1)	PAN SCRAPING SOIL REMOV(LBS)(2)	PAN SCRAPING ETHMOVING (LBS)(3)	EMISSIONS	
						lbs	Tons
Total Disturbed Acreage	10.48	60	360	168	106	634	0.32

(1) Bulldozing dust emissions based on 8hr/activity day

(2) Soil removal dust emissions based on 20.25 VMT/acre

(3) Earthmoving dust emissions based on soil removal miles

EPA 1992 Fugitive Dust Background document (EPA-450/2-92-004) used as data reference.

#### VOC Emissions from Paving

Activity	Acres Paved	Emission Factor(1) (lbs/acre)	EMISSIONS	
			LBS/YR	TPY
Paving	5.62	2.62	441.4	0.221

(1) URBEMIS 9.2.4, 2007

#### VOC Emissions from Architectural Coatings

Activity	Sq ft surfaces <sup>1</sup>	Est. Paint Qty (gal) <sup>2</sup>	Avg VOC Content (lb/gal)	EMISSIONS	
				LBS/YR	TPY
New Built Space	520,102	1734	5	8668	4.33

<sup>1</sup>assumes sq ft of painted surface three times total sq ft of built space

<sup>2</sup>assumes one gallon covers 300 sq ft

**On Road Vehicle Emissions for Construction Vehicles, Criteria Pollutants, All Alternatives**

Source	# of vehicles <sup>2</sup>	Avg Daily mileage <sup>3</sup>	Total Annual Miles	Emission Factors (lbs/mi) <sup>1</sup>						Emissions (tpy)					
				VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
Worker commute	29	30	217,500	0.0001	0.0059	0.0007	0.0000	0.0069	0.0008	0.01	0.64	0.08	0.001	0.75	0.08
Deliveries	2	50	25,000	0.0006	0.0024	0.0178	0.0003	0.0073	0.0011	0.01	0.03	0.22	0.004	0.09	0.01
<b>Total Ground Vehicle Emissions</b>										<b>0.02</b>	<b>0.67</b>	<b>0.30</b>	<b>0.00</b>	<b>0.84</b>	<b>0.10</b>

<sup>1</sup> See Emission factors in Table 2.2 of this Appendix

<sup>2</sup> See Construction Assumptions, Table 1 of this Appendix

<sup>3</sup> Based on use of local landfills for wastes and local sources for construction materials.

**On Road Vehicle Emissions for Construction Vehicles, Greenhouse Gas Emissions, All Alternatives**

Source	# of vehicles <sup>2</sup>	Avg Daily mileage <sup>3</sup>	Total Annual Miles	Emission Factors (lbs/mi) <sup>1</sup>			Emissions (tpy)			Emissions (MT CO <sub>2</sub> e) <sup>4</sup>			Total
				CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>	
Worker commute	29	30	217,500	0.000008	0.000005	0.7815	0.0225	0.1524	84.9884	0.02	0.14	77.08	77.243
Deliveries	2	50	25,000	0.000000	0.000000	3.0864	0.0000	0.0000	38.5802	0.00	0.00	34.99	34.992
<b>Total Ground Vehicle Emissions</b>										<b>0.02</b>	<b>0.14</b>	<b>112.08</b>	<b>112.24</b>

<sup>1</sup> See Emission factors in Table 2.2 of this Appendix

<sup>2</sup> See Construction Assumptions, Table 1 of this Appendix

<sup>3</sup> Based on use of local landfills for wastes and local sources for construction materials.

<sup>4</sup> Based on Global Warming Potential (GWP) from U.S. Inventory of Greenhouse Gas Emissions and Sinks 1990-2013, 2015.

[Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013.](#)

	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
GWP	1	25	298

**Table 6 Summary of Construction Emissions NAS Whidbey Island, All Alternatives**

Activity	Emissions (TPY)						MT/year
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
Construction equipment	5.89	0.79	3.54	0.011	0.53	0.52	1,838
VOCs from paving and painting		4.55					
PM <sub>10</sub> from grading and demolition					0.32	0.03	
Worker Commute and Deliveries	0.30	0.02	0.67	0.005	0.84	0.10	112
<b>Total</b>	<b>6.19</b>	<b>5.36</b>	<b>4.21</b>	<b>0.016</b>	<b>1.69</b>	<b>0.65</b>	<b>1,950</b>

Key:

CO = Carbon monoxide.

NO<sub>x</sub> = Nitrogen oxides.

PM<sub>10</sub> = Particulate matter less than 10 microns in diameter.

Tpy = Tons per year.

VOC = Volatile organic compound.

**Building Energy Use Associated with the EA 18G (Growler) Operations at NAS Whidbey Island Complex**

Alternative/ Buildings	New building space (Sqft) <sup>1</sup>	Space Type (CBECS) <sup>2</sup>	CBESC 2003	CBESC 2003	Estimated Electricity use (kWh) <sup>5</sup>	% of Site total	Estimated Natural Gas Use	
			Electricity Intensity (kWh/Sq ft)	Natural Gas Intensity (ccf/Sq ft)			(ccf) <sup>4</sup>	% of Site total
<b>Total</b>	<b>129,766</b>				<b>1,645,821</b>	<b>3.3%</b>	<b>50,063</b>	<b>2.11%</b>
Armament Storage	4,660	Warehouse/ Storage	7.14	0.23	23,305		763	
Hangar 12 Expansion for FRS	55,606	Other	22.44	0.68	873,443		26,313	
Mobile Maintenance Facility Storage	32,000	Warehouse/ Storage	7.14	0.23	160,032		5,242	
Two Squadron Hangar	37,500	Other	22.44	0.68	589,041		17,745	
					<b>1,462,484.40</b>			

1. New building space based on GIS data provided by Navy. See Chapter 2, Figures 2.3.1

2. Space type used to determine emission factors from EIA 2003 Commercial Buildings Energy Consumption Survey

3. 2003 CBECS Energy Intensity from Table E6: [http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set19/2003html/e06.html](http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003html/e06.html)

4. 2003 CBECS Energy Intensity from Table E8: [http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set19/2003html/e08.html](http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003html/e08.html)

5. Energy use estimated using CBECS 2003 Energy Intensity, building sq ft, and assuming a 30% improvement in energy efficiency for new buildings as required by Federal building standards <https://www.energycodes.gov/energy-efficiency-standards-federal-buildings>

FY15 Reported Electricity use, site wide (MMBTU)	FY15 Reported Electricity use, site wide (kWh)	FY15	
		Reported Natural Gas Use (MMBtu)	Estimated Natural Gas Use (ccf) <sup>5</sup>
171,511	50,303,662	244426	2,375,374.15

Source: NAS Whidbey Island. 2015. FY 2015 Shore Installation Energy and Water Management Annual Report

Fiscal Year	Energy Consumed (Million BTU)	Energy Intensity (Million BTU/KSF)	% Progress from Previous Year	% Progress from Baseline
FY2003 Baseline	630,431.72	179.20		
<b>FY2015</b>	<b>421,069.00</b>	<b>107.58</b>	<b>-4.17%</b>	<b>-39.97%</b>
FY2014	439,392.00	112.26	-4.50%	-37.35%
FY2013	460,113.02	117.56	-4.52%	-34.40%
FY2012	481,913.32	123.13	2.03%	-31.29%
FY2011	478,246.19	120.68	2.35%	-32.66%
FY2010	467,287.60	117.91	-6.22%	-34.20%
FY2009	498,278.15	125.73		-29.84%

Source: NAS Whidbey 2016. FY 2015 Shore Installation Energy and Water Management Annual Report

## CBECs 2003 Energy Intensity Factors

Energy Intensity by Building Use, Existing (CBECs2003)		
Building Use	Electricity intensity (kWh/sq ft) <sup>1</sup>	Natural Gas
		Energy Intensity (cubic feet/square foot) <sup>2</sup>
Education .....	11.039	36.9
Food Sales .....	48.606	50.2
Food Service .....	38.089	141.2
Health Care .....	23.079	92.5
Inpatient .....	27.297	109.8
Outpatient .....	15.898	50.2
Lodging .....	13.540	48.9
Mercantile .....	0.000	32.5
Enclosed and Strip Malls .....	0.000	30.9
Retail (Other Than Mall).....	14.362	33.4
Office .....	17.284	31.8
Public Assembly .....	12.440	36.4
Public Order and Safety .....	15.596	43.7
Religious Worship .....	4.795	30.3
Service .....	10.864	54.1
Warehouse and Storage .....	7.144	23.4
Other .....	22.440	67.6
Vacant .....	1.558	23.0

1. [http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set19/2003html/e06.html](http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003html/e06.html)

2. [http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed\\_tables\\_2003/2003set19/2003html/e08.html](http://www.eia.gov/consumption/commercial/data/archive/cbecs/cbecs2003/detailed_tables_2003/2003set19/2003html/e08.html)

## Household Average Site Energy Consumption, 2009 RECS

West, AK, HI, OR, and WA Households (Millions)	Average Site Energy Consumption (per household)	
	Electricity	Natural Gas
	(kWh)	(1000 cf)
4.7	12,570	73

(Table CE2.5: Household Site Fuel Consumption in the West Region, Totals and Averages, 2009, Physical Units, Final)

<http://www.eia.gov/consumption/residential/data/2009/index.cfm?view=consumption#fuel-consumption>



**Estimated Emissions from Electricity in new buildings, NAS Whidbey Island Complex**

Total Annual Increase in Electricity Use			Emissions factors (lbs/MWH)			Emissions per year (tons)		Emissions per year (MT)
Alternative	Unit	Total	NOX	SO2	CO2	NOX	SO2	CO2
All Alternatives	MWH	1,646	0.30	0.2	242	0.25	0.16	180.62

Washington Electricity Profile 2013 Edition, July 8, 2015 release

<http://www.eia.gov/electricity/state/washington/index.cfm>

MWH KWH

Net Generation 114,172,916 114,172,916,000

Pollutant	Emissions (see unit)	Metric tons	lbs	lbs/KWH
Sulfur Dioxide (short tons)	13259	12,026	26512599.83	0.00023221
Nitrogen Oxide (short tons)	17975	16,303	35942679.08	0.00031481
Carbon Dioxide (thousand MT)	12,543	12,543,000	27652581523	0.24219914
Sulfur Dioxide (lbs/MWh)	0.2			
Nitrogen Oxide (lbs/MWh)	0.3			
Carbon Dioxide (lbs/MWh)	242			

CO2 emission rates are the lowest in the country

Source type	MWH	%
Total electric industry	114,172,916	100%
Coal	6,740,425	5.90%
Hydroelectric	78,155,087	68.45%
Natural gas	11,424,310	10.01%
Nuclear	8,460,890	7.41%
Other	129,103	0.11%
Other biomass	283,904	0.25%
Other gas	409,786	0.36%
Petroleum	24,363	0.02%
Pumped storage	7,188	0.01%
Solar	762	0.00%
Wind	7,004,365	6.13%
Wood	1,532,734	1.34%
Total renewable	86,976,852	76.18%

**Estimated Emissions from Natural Gas use in new buildings, NAS Whidbey Island Complex**

Total Annual Increase in Electricity Use			Emissions per year (tons) <sup>1</sup>							Emissions per year (MT)
Alternative	Unit <sup>2</sup>	Total	NOx	VOC	CO	SO2	PM10	PM2.5	CO2	CO2
All Alternatives	MMBtu	5,151.458	0.10	0.01	0.21	0.00	0.02	0.02	303.94	275.67

1. Annual emissions (tons) = Natural Gas use in MMBtu x EF (lb/MMBtu) / 2000

2. 1 ccf = 0.1029 MMBtu

Unit	Emissions factors (EF) (lbs/MMBtu) <sup>1</sup>						
	NOx <sup>2</sup>	VOC	CO	SO2	PM10	PM2.5	CO2
Unit 3 Process 1	0.0392	0.00539	0.0824	0.000588	0.00745	0.00745	118

1. From NAS Whidbey Island's CY2014 Air Emission Inventory Report. April 9, 2015.

2. Assuming 60% NOx control from Flue gas recirculation and Low NOx Burner

**Stationary VOC Emission Increase Estimates: Growler Operations**

<i>Source</i>	<i>Year</i>	<i>VOC</i>
Gas Stations	2015	24.20
	2016	25.50
	2017	28.00
	Average	25.90
	per capita	0.00
	increase	1.64
Painting, Area Coating and Solvent use in Growler Hangars and Facilities		
	Annual	4.28
	per aircraft	0.05
	increase	1.93
<b>Total estimated VOC increase, All Alternatives</b>		<b>3.57</b>

Gas station average annual emissions based on reported gas station emissions from 2015, 2016, and 2017 AEI Reports

Per capita gas station emissions based on existing population at NASWI

Gas station emission increases based on largest projected increase, 628

Painting, Area Coating and Solvent Use in Growler Hangars annual emission totals based on data provided by Jen Stewart, NASWI, May 15, 2018.

Painting, Area Coating and Solvent Use in Growler Hangars based on existing and projected aircraft:

Existing Growlers	82
New Growlers	37
Population	9908
Alt 1 increase	335
Alt 2 increase	628
Alt 3 increase	341

Sources:

NASWI. (2017). *NAS Whidbey Island's CY2016 air emission inventory report*. Updated April 12, 2017.

NASWI. (2016). *NAS Whidbey Island's CY2015 air emission inventory report*. Updated April 12, 2016.

NASWI. (2018). *NAS Whidbey Island's CY2017 air emission inventory report*. April 13, 2018.

NASWI. (2018). *NAS Whidbey Island's VAQ Emissions from painting and depainting operations*. May 16, 2018.

**NASWI**  
**2015 Air Emissions Inventory Report**  
**Facility Wide Emissions**

Pollutant	Reported CY2014 Totals (TPY)	CY 2015 Emissions (TPY)							CY 2015 Totals
		Boilers	Generators	Test Engines	Gas Stations	Paved/ Unpaved Roads	Area Coating and Solvent Use	Paint Booths	
VOC	29.6	0.5	0.2	0.0	24.2	0.0	3.5	2.0	30.4
PM	18.4	0.7	0.2	0.0	0.0	7.0	1.0	0.0	8.9
PM10	15.3	0.7	0.2	0.0	0.0	4.1	1.0	0.0	6.0
PM2.5	14.2	0.7	0.2	0.0	0.0	3.4	0.5	0.0	4.8
SO2	2.3	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.3
NOx	7.7	3.5	2.8	1.1	0.0	0.0	0.0	0.0	7.3
CO	11.9	7.6	0.7	0.0	0.0	0.0	0.0	0.0	8.2
Ammonia	0.6	94.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**NASWI**  
**2016 Air Emissions Inventory Report**  
**Facility Wide Emissions**

Pollutant	Reported CY2015 Totals (TPY)	CY 2016 Emissions (TPY)							CY2016 Totals (TPY)
		Boilers	Generators	Test Engines	Gas Stations	Paved/ Unpaved Roads	Area Coating and Solvent Use	Paint Booths	
VOC	30.4	0.6	0.2	0.0	25.5	0.0	19.4	6.1	51.7
PM	8.9	0.8	0.1	0.0	0.0	7.5	6.3	0.2	14.9
PM10	6.0	0.8	0.3	0.0	0.0	4.2	0.0	0.0	5.3
PM2.5	4.8	0.8	0.3	0.0	0.0	3.5	0.0	0.0	4.6
SO2	0.3	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.4
NOx	7.3	4.8	2.9	1.6	0.0	0.0	0.0	0.0	9.4
CO	8.2	8.5	0.8	0.0	0.0	0.0	0.0	0.0	9.2
Ammonia	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1

**NASWI**  
**2017 Air Emissions Inventory Report**  
**Facility Wide Emissions**

Pollutant	Reported CY2016 Totals (TPY)	CY 2017 Emissions (TPY)							CY2017 Totals (TPY)
		Boilers	Generators	Test Engines	Gas Stations	Paved/ Unpaved Roads	Area Coating and Solvent Use	Paint Booths	
VOC	51.7	0.6	0.3	-	28.0	-	4.8	1.4	35.2
PM	14.9	0.9	0.2	-	-	7.3	0.0	0.0	8.4
PM10	5.3	0.9	0.4	-	-	4.2	0.0	0.0	5.5
PM2.5	4.6	0.9	0.4	-	-	3.5	0.0	0.0	4.8
SO2	0.4	0.1	0.4	-	-	-	-	-	0.5
NOx	9.4	5.6	4.3	2.1	-	-	-	-	12.1
CO	9.2	9.7	1.0	-	-	-	-	-	10.7
Ammonia	0.1	0.1	0.0	-	-	-	-	-	0.1

**Summary of Increased Stationary Emissions NAS Whidbey Island Complex, All Alternatives**

Activity	Emissions (TPY)						Metric tons
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2e</sub>
Electricity Use (Indirect)	0.25	N/A	N/A	0.165	N/A	N/A	180.62
Natural Gas Use (Direct)	0.10	0.01	0.21	0.002	0.02	0.02	275.67
Painting, Solvent, and Gas Station Use		3.57					
<b>Total</b>	<b>0.35</b>	<b>3.59</b>	<b>0.21</b>	<b>0.166</b>	<b>0.02</b>	<b>0.02</b>	<b>456.29</b>

Key:

CO = Carbon monoxide.

NO<sub>x</sub> = Nitrogen oxides.

PM<sub>10</sub> = Particulate matter less than 10 microns in diameter.

Tpy = Tons per year.

VOC = Volatile organic compound.