Appendix F:
Air Emissions Calculations

APPENDIX F: AIR EMISSIONS CALCULATIONS

1. General Information

This report includes the details of equations, inputs, and outputs from the air quality analysis. It is based on the use of the ACAM model and much is a direct output of that model.

Action Location

Base: EIELSON AFB
County(s): Fairbanks North Star Borough
Regulatory Area(s): NOT IN A REGULATORY AREA

Action Title: Add F-35As to Existing Missions at Eielson AFB

Project Number/s (if applicable): None

Projected Action Start Date: 1 / 2016

Action Purpose and Need:

To maintain capable ready forces required for national defense, the Air Force must integrate the F-35A mission while transitioning from legacy fighter aircraft programs. The purpose of the Proposed Action is to maintain efficient and effective combat capability and mission readiness in the PACAF AOR as the Air Force faces deployments across a spectrum of conflicts while also providing for homeland defense. Beddown and operation of the F-35A at a PACAF AOR base would represent a major step toward this goal. This beddown action assures availability of combat-ready pilots in the PACAF AOR flying the most advanced fighter aircraft in the world. The Secretary of the Air Force determined that there was a need to locate F-35A aircraft in the PACAF AOR.

Action Description:

Add two squadrons of F-35As, consisting of 48 Primary Assigned Aircraft (PAA), and 6 Backup Aircraft Inventory (i.e., replacement aircraft when a PAA is not in operation) to the existing missions of the 354th Fighter Wing at Eielson AFB. Proposed Action includes additional military and civilian personnel; increases in airfield and airspace operations; modifications and additions to existing facilities and infrastructure; and construction of new facilities to operate and maintain two F-35 squadrons.

Eielson AFB, Alaska is located in the Fairbanks-Northstar Borough. The Borough is designated partially maintenance for Carbon Monoxide and partially nonattainment for PM2.5-2006 (Fairbanks Regulatory Area). Eielson AFB is not within the boundaries of the Fairbanks Regulatory area; therefore, the base is in attainment for all criteria pollutants.

Note that all building alterations are assumed to be interior construction; therefore, no assessment was performed on these activities.

Point of Contact for Initial Model Runs

Name: James McClain
Title: Contractor for HQ AFCEC/CZTQ
Organization: Solutio Environmental, Inc.
Email: jmcclain@SolutioEnv.com
Phone Number: (210) 740-7000

Activity Location

County Fairbanks North Star Borough
Regulatory Area(s) NOT IN A REGULATORY AREA

Activity List

Number	*Activity Type*	*Activity Title*	*Activity Description:*
2	Personnel	Personnel Increase for FY18	Personnel increases would be incremental, happening over 2 to 3 years, typically preceding (starting in FY19) the scheduled delivery of the aircraft by several months. Aircraft are anticipated to arrive in two phases, with the first squadron starting to arrive in FY19, and the second squadron arriving in 2020. Current projections call for about a third of the F-35 personnel arriving early in FY19 (359 military/yr and 216 civilians/yr), with the remaining arriving in FY20 (717 military/yr and 434 civilians/yr).
3	Personnel	Personnel Increase for FY20	Personnel increases would be incremental, happening over 2 to 3 years, typically preceding (starting in FY19) the scheduled delivery of the aircraft by several months. Aircraft are anticipated to arrive in two phases, with the first squadron starting to arrive in FY19, and the second squadron arriving in 2020. Current projections call for about a third of the F-35 personnel arriving early in FY19 (359 military/yr and 216 civilians/yr), with the remaining arriving in FY20 (717 military/yr and 434 civilians/yr).
4	Aircraft	F-35A Aircraft Operations for 1st Squadron (FY19)	1st squadrons of F-35As, consisting of 24 Primary Assigned Aircraft (PAA), and 3 Backup Aircraft Inventory (i.e., replacement aircraft when a PAA is not in operation) to the existing missions of the 354th Fighter Wing at Eielson AFB. Based on previous analyses of F-35A operations (Air Force 2014), the Proposed Action would result in the addition of approximately 4,320 sorties per year per squadron to existing base flight activities. Aircraft are anticipated to arrive in two phases, with the first squadron starting to arrive in FY19, and the second squadron arriving in 2020.
5	Aircraft	F-35A Aircraft Operations for 2nd Squadron (FY20)	2nd squadrons of F-35As, consisting of 24 Primary Assigned Aircraft (PAA), and 3 Backup Aircraft Inventory (i.e., replacement aircraft when a PAA is not in operation) to the existing missions of the 354th Fighter Wing at Eielson AFB. Based on previous analyses of F-35A operations (Air Force 2014), the Proposed Action would result in the addition of approximately 4,320 sorties per year per squadron to existing base flight activities. Aircraft are anticipated to arrive in two phases, with the first squadron starting to arrive in FY19, and the second squadron arriving in 2020.

Activity List (continued)

Number	*Activity Type*	*Activity Title*	*Activity Description:*
6	Construction / Demolition	Construct 6-Bay Flight Simulator Facility	New construction of a 6-Bay Flight Simulator Facility. Assumed: 1 yr construction period
7	Construction / Demolition	Construct 4-Bay Hangar/Propulsion Maintenance/ Corrosion Control Personnel Dispatch	New construction for 4-Bay Hangar/Propulsion Maintenance/Corrosion Control Personnel Dispatch
8	Construction / Demolition	Construct 4-Bay Hangar/Squadron Operations/AMU	New construction of 4-Bay Hangar/Squadron Operations/AMU (Squadron 2).
9	Construction / Demolition	Construct 8-Bay, 16-Aircraft Weather Shelters (1 of 2)	New construct of 8-Bay 16-Aircraft Weather Shelters.
10	Construction / Demolition	Construct 8-Bay, 16-Aircraft Weather Shelters (2 of 2)	New construction of a 8-Bay 16-Aircraft Weather Shelters
11	Construction / Demolition	Missile Maintenance Facility	Demolish old and Construct new Missile Maintenance Facility
12	Construction / Demolition	Munitions Storage Igloos (Quarry Hill)	Demolish/Construct 6 Munitions Storage Igloos (Quarry Hill)
13	Construction / Demolition	Construct South Heat Plant	New construct of South Heat Plant
14	Construction / Demolition	Construct 200-Person Dormitory	New construction of a 200-person dormitory
15	Construction / Demolition	Construct Covered Parking for R-11 Aircraft Refueling Vehicles	New construction of covered parking for R-11 Aircraft Refueling Vehicles
16	Aircraft	Touch & Go (FY19 - indef)	---
17	Aircraft	Touch & Go (FY20 - indef)	---

General Information and Timeline Assumptions

		Activity															
		2	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***
	Activity Type	Personnel	Personnel	Aircraft	Aircraft	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Construction / Demolition	Aircraft	Aircraft
	Add or Remove Activity from Baseline?	Add	Add	Add	Add	---	---	---	---	---	---	---	---	---	---	Add	Add
	Start Date:																
	Month	10	10	1	1	1	10	9	3	3	2	1	3	3	6	1	1
	Year	2018	2019	2019	20	2016	2016	2016	2017	2017	2017	2017	2017	2017	2017	2019	2020
	End Date:				20												
	Month	(Indefinite)	(Indefinite)	(Indefinite)	(Indefinite)	12	3	3	12	12	12	12	12	12	7	(Indefinite)	(Indefinite)
	Year					2016	2018	2018	2017	2017	2017	2017	2017	2017	2017		
Emissions (Tons/Year)	VOC	1.94637	3.89612	8.77530	8.77530	0.81403	0.80932	1.07233	1.19853	1.14231	0.34422	0.36972	0.32873	0.42074	0.03977	0.00225	0.00225
	SOx	0.02934	0.05874	5.58961	5.58961	0.00449	0.00447	0.00465	0.00489	0.00436	0.00303	0.00279	0.00282	0.00314	0.00045	0.56807	0.56833
	NOx	1.72793	3.45887	51.00005	51.00005	2.61127	2.59655	2.44641	2.65013	2.29342	1.50368	1.37279	1.40337	1.57690	0.23457	8.05657	8.06022
	CO	31.03432	62.12261	117.63059	117.63059	2.39658	2.37205	2.48452	2.55019	2.30051	1.43065	1.33304	1.35560	1.48399	0.24752	0.44058	0.44078
	PM 10	0.09129	0.18273	9.64247	9.64247	0.53441	1.12380	0.88038	0.98631	0.96856	0.95433	0.29567	0.24830	0.41696	0.01328	0.71630	0.71662
	PM 2.5	0.04564	0.09137	8.15926	8.15926	0.14677	0.14472	0.13166	0.14016	0.12248	0.07414	0.06787	0.07025	0.07826	0.01318	0.60159	0.60187
	Pb	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	NH3	0.30972	0.61999	0.00000	0.00000	0.00550	0.00542	0.00671	0.00644	0.00605	0.00305	0.00302	0.00309	0.00318	0.00063	0.00000	0.00000

Personnel Assumptions

	Activity	
	2	***3***
Activity Type	Personnel	Personnel
Number of Personnel:		
Active Duty Personnel	359	717
Civilian Personnel	216	434
Support Contractor Personnel	0	0
Air National Guard (ANG) Personnel	0	0
Reserve Personnel	0	0
Default Setting Used?	Yes	Yes
Average Personnel Round Trip Commute (mile)	20	20
Personnel Work Schedule:		
Active Duty Personnel	5 Days Per Week	5 Days Per Week
Civilian Personnel	5 Days Per Week	5 Days Per Week
Support Contractor Personnel	5 Days Per Week	5 Days Per Week
Air National Guard (ANG) Personnel	4 Days Per Month	4 Days Per Month
Reserve Personnel	4 Days Per Month	4 Days Per Month

Notes: Defaults are used for Average Personnel Round Trip Commute & Personnel Work Schedule.

Personnel On-Road Vehicle Mixture

	Activity			
	2		***3***	
On Road Vehicle Mixture:	POVs	GOVs	POVs	GOVs
LDGV (%)	37.55	54.49	37.55	54.49
LDGT (%)	60.32	37.73	60.32	37.73
HDGV (%)	0	4.67	0	4.67
LDDV (%)	0.03	0	0.03	0
LDDT (%)	0.2		0.2	0
HDDV (%)	0	3.11	0	3.11
MC (%)	1.9	0	1.9	0

Aircraft Assumptions

	Activity			
	4	**5**	**16**	**17**
Flight Engine Assumptions:				
Aircraft& Engine:				
Aircraft Designation	F-35A	F-35A	F-35A	F-35A
Engine Model	F135-PW-100	F135-PW-100	F135-PW-100	F135-PW-100
Primary Function	Combat	Combat	Combat	Combat
Number of Engines	1	1	1	1
Aircraft & Engine Surrogate				
Is Aircraft & Engine a Surrogate?	No	No	No	No
Original Aircraft Name	---	---	---	---
Original Engine Name	---	---	---	---
Flight Operations Assumptions				
Flight Operations:				
Number of Aircraft	24	24	24	24
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft	4320	4320	0	0
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft	0	0	2206	2207
Number of Annual Trim Test(s) per Aircraft	0	0	0	0
Default Settings Used:	No	No	No	No
Flight Operations TIMs (Time In Mode):				
Taxi/Idle Out (mins)	18.5	18.5	0	0
Takeoff (mins)	1.15	1.15	0.23	0.23
Climb Out (mins)	0	0	0.78	0.78
Approach (mins)	3.05	3.05	1.82	1.82
Taxi/Idle In (mins)	11.3	11.3	0	0
Trim Test:				
Idle (mins):	12	12	12	12
Approach (mins)	27	27	27	27
Intermediate (mins)	9	9	9	9
Military (mins)	9	0	9	9
AfterBurn (mins)	3	3	3	3
Auxiliary Power Unit (APU) Assumptions:				
Default Settings Used?	Yes	Yes	No	No
Number of APU per Aircraft	---	---	---	---
Operation Hours for Each LTO	---	---	---	---
Exempt Source?	---	---	---	---
Designation	---	---	---	---
Manufacturer	---	---	---	---
Aerospace Ground Equipment (AGE) Assumptions:				
Default Settings Used?	Yes	Yes	---	---
AGE Usage:				
Number of Annual LTO (Landing and Take-off) cycles for AGE	4320	4320	---	---

Aerospace Ground Equipment (default) - Activity 4 and 5

	Activity			
	4	***5***	***16***	***17***
Total Number of	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
1	2	No	Air Compressor	MC-11
1	1	No	Bomb Lift	MJ-1B
1	0.33	No	Generator Set	A/M32A-86D
1	0.5	No	Heater	H1
1	0.5	No	Hydraulic Test Stand	MJ-2/TTU-228 - 130hp
1	8	No	Light Cart	NF-2
1	0.33	No	Start Cart	A/M32A-60A

Construction Assumptions

			Activity									
			6	7	8	9	10	11	12	13	14	15
Construction Activity	Demolition	Start Month	---	---	---	---	---	2	1	---	---	---
		Quarter of the month [1]	---	---	---	---	---	1	1	---	---	---
		Year	---	---	---	---	---	2017	2017	---	---	---
		Number of Month	---	---	---	---	---	0	0	---	---	---
		Number of Days	---	---	---	---	---	19	20	---	---	---
		Area of Building to be	---	---	---	---	---	9500	13314	---	---	---
		Height of Building to be demolished (Ft)	---	---	---	---	---	10	10	---	---	---
	Site Grading	Start Month	1	10	10	3	3	3	3	3	3	---
		Quarter of the month [1]	1	1	1	1	1	3	3	1	1	---
		Year	2016	2016	2016	2017	2017	2017	2017	2017	2017	---
		Number of Month	0	0	0	0	0	0	0	0	1	---
		Number of Days	18	19	19	19	19	19	19	19	0	---
		Area of Site to be Graded	65000	152000	115000	130640	130640	130000	27000	18500	29000	---
		Amount of Material to be Hauled On-Site	10	20	20	20	10	20	10	20	20	---
		Amount of Material to be Hauled Off-Site	10	20	20	20	10	20	10	20	20	---
	Excavating/ Trenching	Start Month	2	10	9	3	3	3	3	3	3	---
		Quarter of the month [1]	4	4	3	4	4	1	1	3	2	---
		Year	2016	2016	2016	2017	2017	2017	2017	2017	2017	---
		Number of Month	0	0	0	0	0	1	0	0	1	---
		Number of Days	19	19	19	19	19	0	19	19	0	---
		Area of Site to be Trenched	500	5000	5000	5000	5000	5000	5000	10000	5000	---
		Amount of Material to be Hauled On-Site	0	0	10	10	5	10	10	10	10	---
		Amount of Material to be Hauled Off-Site	0	0	0	10	5	10	10	10	10	---
	Building Construction	Start Month	3	6	6	3	3	3	3	4	4	7
		Quarter of the month [1]	3	3	3	3	3	3	3	1	1	1
		Year	2016	2017	2017	2017	2017	2017	2017	2017	2017	2017
		Number of Month	9	9	9	9	9	9	9	9	9	1
		Number of Days	0	0	0	0	0	0	0	0	0	0
		Building Category [3]	Office or Industrial	Office or Industrial	Office or Industrial	Office or Industrial	Office or Industrial	Office or Industrial	Office or Industrial	Office or Industrial	Commercial or Retail	Commercial or Retail
		Area of Building (sf)	32,399	30,315	56836	65320	65320	9500	13314	9235	14683	1566
		Height of Building (ft)	10	12	20	15	15	10	10	15	20	1
		Number of Units	---	---	---	---	---	---	---	---	---	---
	Architectural Coatings	Start Month	8	9	8	8	7	8	8	8	8	---
		Quarter of the month [1]	1	1	3	3	3	1	1	1	2	---
		Year	2016	2017	2017	2017	2017	2017	2017	2017	2017	---
		Number of Month	0	0	0	0	0	0	1	0	0	---
		Number of Days	19	19	19	19	19	19	0	15	15	---
		Building Category [3]	---	---	---	---	---	---	---	---	Non-	---
		Total Square Footage	32399	32399	56836	65320	65320	9500	13314	9235	15000	---
		Number of Units	---	---	---	---	---	---	---	---	---	---
	Paving	Start Month	9	9	9	8	---	8	8	8	8	6
		Quarter of the month [1]	1	2	2	2	---	2	1	1	1	1
		Year	2016	2017	2017	2017	---	2017	2017	2017	2017	2017
		Number of Month	1	0	0	0	---	0	0	1	1	1
		Number of Days	0	19	19	19	---	19	19	0	0	0
		Paving Area	100000	90000	25000	150000	---	10000	9000	27000	44000	1566

Construction Assumptions (continued)

Construction Activity			Activity 6	Activity 7
	Demolition	Default Settings Used?	---	---
		Average Day(s) worked per week	---	---
		Construction Exhaust -Equipment:		
		Concrete/Industrial Saws	---	---
		Rubber Tired Dozers Composite	---	---
		Tractors/Loaders/Backhoes	---	---
	Site Grading	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	---	---
		Graders Composite	1 equipment per 6 hrs/day	1 equipment per 8 hrs/day
		Other Construction Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Rubber Tired Dozers Composite	1 equipment per 6 hrs/day	1 equipment per 8 hrs/day
		Scrapers Composite	---	---
		Tractors/Loaders/Backhoes	1 equipment per 7 hrs/day	2 equipment per 7 hrs/day
	Excavating/ Trenching	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	2 equipment per 8 hrs/day	2 equipment per 8 hrs/day
		Other General Industrial Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
	Building Construction	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cranes Composite	1 equipment per 6 hrs/day	1 equipment per 6 hrs/day
		Forklifts Composite	2 equipment per 6 hrs/day	2 equipment per 6 hrs/day
		Generator Sets Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Welders Composite	3 equipment per 8 hrs/day	3 equipment per 8 hrs/day
	Architectural Coatings	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
	Paving	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cement and Mortar Mixers	4 equipment per 6 hrs/day	4 equipment per 6 hrs/day
		Pavers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Paving Equipment Composite	2 equipment per 6 hrs/day	2 equipment per 6 hrs/day
		Rollers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day

Construction Assumptions (continued)

			Activity	
			8	9
Construction Activity	Demolition	Default Settings Used?	---	---
		Average Day(s) worked per week	---	---
		Construction Exhaust -Equipment:		
		Concrete/Industrial Saws	---	---
		Rubber Tired Dozers Composite	---	---
		Tractors/Loaders/Backhoes	---	---
	Site Grading	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Graders Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Other Construction Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Rubber Tired Dozers Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Scrapers Composite	---	2 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	2 equipment per 7 hrs/day	2 equipment per 7 hrs/day
	Excavating/ Trenching	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	2 equipment per 8 hrs/day	2 equipment per 8 hrs/day
		Other General Industrial Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
	Building Construction	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cranes Composite	1 equipment per 6 hrs/day	1 equipment per 6 hrs/day
		Forklifts Composite	2 equipment per 6 hrs/day	2 equipment per 6 hrs/day
		Generator Sets Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Welders Composite	3 equipment per 8 hrs/day	3 equipment per 8 hrs/day
	Architectural Coatings	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
	Paving	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cement and Mortar Mixers	4 equipment per 6 hrs/day	4 equipment per 6 hrs/day
		Pavers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Paving Equipment Composite	1 equipment per 8 hrs/day	2 equipment per 6 hrs/day
		Rollers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 7 hrs/day	---

Construction Assumptions (continued)

			Activity	
			10	11
Construction Activity	Demolition	Default Settings Used?	---	Yes
		Average Day(s) worked per week	---	5 (default)
		Construction Exhaust -Equipment:		
		Concrete/Industrial Saws	---	1 equipment per 8 hrs/day
		Rubber Tired Dozers Composite	---	1 equipment per 1 hrs/day
		Tractors/Loaders/Backhoes	---	2 equipment per 6 hrs/day
	Site Grading	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	---	---
		Graders Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Other Construction Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Rubber Tired Dozers Composite	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Scrapers Composite	---	---
		Tractors/Loaders/Backhoes	2 equipment per 7 hrs/day	2 equipment per 7 hrs/day
	Excavating/ Trenching	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	2 equipment per 8 hrs/day	2 equipment per 8 hrs/day
		Other General Industrial Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
	Building Construction	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cranes Composite	1 equipment per 6 hrs/day	1 equipment per 4 hrs/day
		Forklifts Composite	2 equipment per 6 hrs/day	2 equipment per 6 hrs/day
		Generator Sets Composite	1 equipment per 8 hrs/day	---
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Welders Composite	3 equipment per 8 hrs/day	---
	Architectural Coatings	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
	Paving	**Default Settings Used?**	---	Yes
		Average Day(s) worked per week	---	5 (default)
		Construction Exhaust -Equipment:	---	
		Cement and Mortar Mixers	---	4 equipment per 6 hrs/day
		Pavers Composite	---	1 equipment per 7 hrs/day
		Paving Equipment Composite	---	---
		Rollers Composite	---	1 equipment per 7 hrs/day
		Tractors/Loaders/Backhoes	---	1 equipment per 7 hrs/day

Construction Assumptions (continued)

			Activity	
			12	***13***
Construction Activity	***Demolition***	Default Settings Used?	Yes	---
		Average Day(s) worked per week	5 (default)	---
		Construction Exhaust -Equipment:		
		Concrete/Industrial Saws	1 equipment per 8 hrs/day	---
		Rubber Tired Dozers Composite	1 equipment per 1 hrs/day	---
		Tractors/Loaders/Backhoes	2 equipment per 6 hrs/day	---
	Site Grading	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	---	---
		Graders Composite	1 equipment per 6 hrs/day	1 equipment per 6 hrs/day
		Other Construction Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Rubber Tired Dozers Composite	1 equipment per 6 hrs/day	1 equipment per 6 hrs/day
		Scrapers Composite	---	---
		Tractors/Loaders/Backhoes	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
	Excavating/ Trenching	Default Settings Used?	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Excavators Composite	2 equipment per 8 hrs/day	2 equipment per 8 hrs/day
		Other General Industrial Equipment	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
	Building Construction	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cranes Composite	1 equipment per 4 hrs/day	1 equipment per 4 hrs/day
		Forklifts Composite	2 equipment per 6 hrs/day	2 equipment per 6 hrs/day
		Generator Sets Composite	---	---
		Tractors/Loaders/Backhoes	1 equipment per 8 hrs/day	1 equipment per 8 hrs/day
		Welders Composite	---	---
	Architectural Coatings	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
	Paving	**Default Settings Used?**	Yes	Yes
		Average Day(s) worked per week	5 (default)	5 (default)
		Construction Exhaust -Equipment:		
		Cement and Mortar Mixers	4 equipment per 6 hrs/day	4 equipment per 6 hrs/day
		Pavers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Paving Equipment Composite	---	1 equipment per 8 hrs/day
		Rollers Composite	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day
		Tractors/Loaders/Backhoes	1 equipment per 7 hrs/day	1 equipment per 7 hrs/day

Construction Assumptions (continued)

			Activity									
			6	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***
Construction Activity	***Demolition***	**Vehicle Exhaust:**										
		Average Hauling Truck Capacity (yd3):	---	---	---	---	---	20	20	---	---	---
		Average Hauling Truck Round Trip Commute (mile)	---	---	---	---	---	20 (default)	20 (default)	---	---	---
		Vehicle Exhaust Vehicle Mixture-POVs:										
		LDGV (%)	---	---	---	---	---	0	0	---	---	---
		LDGT (%)	---	---	---	---	---	0	0	---	---	---
		HDGV (%)	---	---	---	---	---	0	0	---	---	---
		LDDV (%)	---	---	---	---	---	0	0	---	---	---
		LDDT (%)	---	---	---	---	---	0	0	---	---	---
		HDDV (%)	---	---	---	---	---	100	100	---	---	---
		MC (%)	---	---	---	---	---	0	0	---	---	---
		Worker Trips:										
		Average Worker Round Trip	---	---	---	---	---	20	20	---	---	---
		Worker Trips Vehicle Mixture- POVs	---	---	---	---	---			---	---	---
		LDGV (%)	---	---	---	---	---	50	50	---	---	---
		LDGT (%)	---	---	---	---	---	50	50	---	---	---
		HDGV (%)	---	---	---	---	---	0	0	---	---	---
		LDDV (%)	---	---	---	---	---	0	0	---	---	---
		LDDT (%)	---	---	---	---	---	0	0	---	---	---
		HDDV (%)	---	---	---	---	---	0	0	---	---	---
		MC (%)	---	---	---	---	---	0	0	---	---	---

Construction Assumptions (continued)

			Activity									
			6	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***
Construction Activity	***Site Grading***	**Vehicle Exhaust:**										
		Average Hauling Truck Capacity (yd3)	20	20	20	20	20	20	20	20	20	---
		Average Hauling Truck Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	---
		Vehicle Exhaust Vehicle Mixture-POVs:										
		LDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDGT (%)	0	0	0	0	0	0	0	0	0	---
		HDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDDV (%)	0	0	0	0	0	0	0	0	0	---
		LDDT (%)	0	0	0	0	0	0	0	0	0	---
		HDDV (%)	100	100	100	100	100	100	100	100	100	---
		MC (%)	0	0	0	0	0	0	0	0	0	---
		Worker Trips:										
		Average Worker Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	---
		Worker Trips Vehicle Mixture- POVs:										
		LDGV (%)	50	50	50	50	50	50	50	50	50	---
		LDGT (%)	50	50	50	50	50	50	50	50	50	---
		HDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDDV (%)	0	0	0	0	0	0	0	0	0	---
		LDDT (%)	0	0	0	0	0	0	0	0	0	---
		HDDV (%)	0	0	0	0	0	0	0	0	0	---
		MC (%)	0	0	0	0	0	0	0	0	0	---

Construction Assumptions (continued)

			Activity									
			6	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***
Construction Activity	***Excavating/ Trenching***	**Vehicle Exhaust:**										
		Average Hauling Truck Capacity (yd3):	20	20	20	20	20	20	20	20	20	---
		Average Hauling Truck Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	---
		Vehicle Exhaust Vehicle Mixture-POVs:										
		LDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDGT (%)	0	0	0	0	0	0	0	0	0	---
		HDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDDV (%)	0	0	0	0	0	0	0	0	0	---
		LDDT (%)	0	0	0	0	0	0	0	0	0	---
		HDDV (%)	100	100	100	100	100	100	100	100	100	---
		MC (%)	0	0	0	0	0	0	0	0	0	---
		Worker Trips:										
		Average Worker Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	---
		Worker Trips Vehicle Mixture- POVs										
		LDGV (%)	50	50	50	50	50	50	50	50	50	---
		LDGT (%)	50	50	50	50	50	50	50	50	50	---
		HDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDDV (%)	0	0	0	0	0	0	0	0	0	---
		LDDT (%)	0	0	0	0	0	0	0	0	0	---
		HDDV (%)	0	0	0	0	0	0	0	0	0	---
		MC (%)	0	0	0	0	0	0	0	0	0	---

Construction Assumptions (continued)

			Activity									
			6	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
Construction Activity	*Building Construction*	**Vehicle Exhaust:**										
		Average Hauling Truck Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)
		Vehicle Exhaust Vehicle Mixture-POVs:										
		LDGV (%)	0	0	0	0	0	0	0	0	0	0
		LDGT (%)	0	0	0	0	0	0	0	0	0	0
		HDGV (%)	0	0	0	0	0	0	0	0	0	0
		LDDV (%)	0	0	0	0	0	0	0	0	0	0
		LDDT (%)	0	0	0	0	0	0	0	0	0	0
		HDDV (%)	100	100	100	100	100	100	100	100	100	100
		MC (%)	0	0	0	0	0	0	0	0	0	0
		Worker Trips:										
		Average Worker Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)
		Worker Trips Vehicle Mixture- POVs										
		LDGV (%)	50	50	50	50	50	50	50	50	50	50
		LDGT (%)	50	50	50	50	50	50	50	50	50	50
		HDGV (%)	0	0	0	0	0	0	0	0	0	0
		LDDV (%)	0	0	0	0	0	0	0	0	0	0
		LDDT (%)	0	0	0	0	0	0	0	0	0	0
		HDDV (%)	0	0	0	0	0	0	0	0	0	0
		MC (%)	0	0	0	0	0	0	0	0	0	0
		Vendor Trips:										
		Average Vendor Round Trip Commute (mile)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)	40 (default)
		Vendor Trips Vehicle Mixture- POVs										
		LDGV (%)	0	0	0	0	0	0	0	0	0	0
		LDGT (%)	0	0	0	0	0	0	0	0	0	0
		HDGV (%)	0	0	0	0	0	0	0	0	0	0
		LDDV (%)	0	0	0	0	0	0	0	0	0	0
		LDDT (%)	0	0	0	0	0	0	0	0	0	0
		HDDV (%)	100	100	100	100	100	100	100	100	100	100
		MC (%)	0	0	0	0	0	0	0	0	0	0

Construction Assumptions (concluded)

			Activity									
			6	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***
Construction Activity	***Architectural Coatings***	**Worker Trips:**										
		Average Worker Round Trip Commute	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)	---
		Worker Trips Vehicle Mixture- POVs:										
		LDGV (%)	50	50	50	50	50	50	50	50	50	---
		LDGT (%)	50	50	50	50	50	50	50	50	50	---
		HDGV (%)	0	0	0	0	0	0	0	0	0	---
		LDDV (%)	0	0	0	0	0	0	0	0	0	---
		LDDT (%)	0	0	0	0	0	0	0	0	0	---
		HDDV (%)	0	0	0	0	0	0	0	0	0	---
		MC (%)	0	0	0	0	0	0	0	0	0	---
	Paving	**Vehicle Exhaust:**										
		Average Hauling Truck Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	---	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)
		Vehicle Exhaust Vehicle Mixture-POVs:	0	0	0	0	---	0	0	0	0	0
		LDGV (%)	0	0	0	0	---	0	0	0	0	0
		LDGT (%)	0	0	0	0	---	0	0	0	0	0
		HDGV (%)	0	0	0	0	---	0	0	0	0	0
		LDDV (%)	0	0	0	0	---	0	0	0	0	0
		LDDT (%)	0	0	0	0	---	0	0	0	0	0
		HDDV (%)	100	100	100	100	---	100	100	100	100	100
		MC (%)	0	0	0	0	---	0	0	0	0	0
		Worker Trips:										
		Average Worker Round Trip Commute (mile)	20 (default)	20 (default)	20 (default)	20 (default)	---	20 (default)	20 (default)	20 (default)	20 (default)	20 (default)
		Worker Trips Vehicle Mixture- POVs:					---					
		LDGV (%)	50	50	50	50	---	50	50	50	50	50
		LDGT (%)	50	50	50	50	---	50	50	50	50	50
		HDGV (%)	0	0	0	0	---	0	0	0	0	0
		LDDV (%)	0	0	0	0	---	0	0	0	0	0
		LDDT (%)	0	0	0	0	---	0	0	0	0	0
		HDDV (%)	0	0	0	0	---	0	0	0	0	0
		MC (%)	0	0	0	0	---	0	0	0	0	0

Personnel Emission Factor(s)

On Road Vehicle Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2018	LDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2018	LDGT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2018	HDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2018	LDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	Activity 2
2018	LDDT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2018	HDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2018	MC	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	LDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	LDGT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	HDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	LDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	Activity 3
2019	LDDT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	HDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2019	MC	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	

Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

Aerospace Ground Equipment Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flo	wVOC	SOx	NOx	CO	PM 10	PM 2.5	CO2e
MC-11	1.8	0.276	0.004	0.177	12.262	0.109	0.1	34.8
MJ-1B	0	3.04	0.219	4.78	3.04	0.8	0.776	141.2
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147
H1	0.4	0.1	0.011	0.16	0.18	0.006	0.006	8.9
MJ-2/TTU-22	7.4	0.195	0.053	3.396	0.794	0.089	0.086	168.8
NF-2	0	0.01	0.043	0.11	0.08	0.01	0.01	22.1
A/M32A-60A	0	0.27	0.306	1.82	5.48	0.211	0.205	221.1

Construction/Demolition Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Year	*Equipment*	*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*CH4*	*CO2*	*Emission Factors are Used for These Construction Activity*
2017	Concrete/ Industrial Saws Composite	0.0678	0.0006	0.4267	0.3892	0.0297	0.0297	0.0061	58.463	Activity 11 & 12
2017	Rubber Tired Dozers Composite	0.2464	0.0024	1.9508	0.93	0.0796	0.0796	0.0222	239.08	
2017	Tractors/ Loaders/ Backhoes Composite	0.0558	0.0007	0.368	0.3666	0.0221	0.0221	0.005	66.797	

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-Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2017	LDGV	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	Activity 11 & 12
2017	LDGT	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	
2017	HDGV	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	
2017	LDDV	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	
2017	LDDT	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	
2017	HDDV	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	
2017	MC	0.6	0.01	0.5	9.52	0.028	0.014		0.1	501	

Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Year	*Equipment*	*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*CH4*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	Graders	0.12	0.001	0.887	0.588	0.044	0.0441	0.011	132.7	Activity 6,7& 8
2016	Other Construction Equipment Composite	0.072	0.001	0.568	0.36	0.023	0.0233	0.006	122.6	
2016	Rubber Tired Dozers	0.259	0.002	2.089	0.983	0.086	0.0858	0.023	239.1	
2016	Tractors/ Loaders/ Backhoes	0.061	7.00E-04	0.407	0.369	0.026	0.0258	0.006	66.8	
2016	Excavators Composite	0.099	0.001	0.66	0.521	0.033	0.0332	0.009	119.6	
2017	Excavators Composite	0.092	0.001	0.586	0.518	0.029	0.0288	0.008	119.6	Activity 9, 10, 11, 12, 13 & 14
2017	Graders	0.112	0.001	0.801	0.584	0.04	0.0396	0.01	132.7	
2017	Other Construction Equipment Composite	0.067	0.001	0.504	0.357	0.021	0.0206	0.006	122.5	
2017	Rubber Tired Dozers	0.246	0.002	1.951	0.93	0.08	0.0796	0.022	239.1	
2017	Scrapers Composite	0.226	0.003	1.748	0.871	0.072	0.0716	0.02	262.5	
2017	Tractors/Loaders/ Backhoes	0.056	7.00E-04	0.368	0.367	0.022	0.0221	0.005	66.8	

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	LDGV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	Activity 6,7 & 8
2016	LDGT	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	HDGV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	LDDV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	LDDT	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	HDDV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	MC	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2017	LDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	Activity 9,10,11,12,13 & 14
2017	LDGT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	HDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	LDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	LDDT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	HDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	MC	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	

Trenching/Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Year	*Equipment*	*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*CH4*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	Graders Composite	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74	Activity 6,7 & 8
2016	Other Construction Equipment Composite	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56	
2016	Rubber Tired Dozers	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09	
2016	Tractors/ Loaders/ Backhoes	0.061	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797	
2016	Excavators Composite	0.0987	0.0013	0.6602	0.5212	0.0332	0.0332	0.0089	119.58	
2017	Excavators Composite	0.0915	0.0013	0.5857	0.5183	0.0288	0.0288	0.0082	119.57	Activity 9, 10,11,12,13 &14
2017	Graders	0.112	0.0014	0.8007	0.5843	0.0396	0.0396	0.0101	132.74	
2017	Other Construction Equipment Composite	0.0674	0.0012	0.5044	0.3568	0.0206	0.0206	0.006	122.54	
2017	Rubber Tired Dozers	0.2464	0.0024	1.9508	0.93	0.0796	0.0796	0.0222	239.08	
2017	Scrapers Composite	0.2256	0.0026	1.7483	0.8713	0.0716	0.0716	0.0203	262.48	
2017	Tractors/Loaders/Backhoes Composite	0.0558	0.0007	0.368	0.3666	0.0221	0.0221	0.005	66.797	

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*EmissionFactors are Used for These Construction Activity*
2016	LDGV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	Activity 6,7 & 8
2016	LDGT	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	HDGV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	LDDV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	LDDT	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	HDDV	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2016	MC	0.625	0.009	0.571	9.736	0.028	0.014		0.095	500	
2017	LDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	Activity 9,10,11,12,13 & 14
2017	LDGT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	HDGV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	LDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	LDDT	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	HDDV	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	
2017	MC	0.597	0.009	0.53	9.519	0.028	0.014		0.095	500.8	

Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Year	*Equipment*	*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*CH4*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	Cranes	0.1136	0.0013	0.9387	0.4263	0.0387	0.0387	0.0102	128.62	Activity 6
2016	Forklifts Composite	0.0427	0.0006	0.2815	0.2189	0.0136	0.0136	0.0038	54.395	
2016	Generator Sets Composite	0.058	0.0006	0.4369	0.2862	0.024	0.024	0.0052	60.992	
2016	Tractors/ Loaders/ Backhoes Composite	0.061	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797	
2016	Welders Composite	0.0482	0.0003	0.2173	0.195	0.0168	0.0168	0.0043	25.602	
2017	Cranes	0.1073	0.0013	0.8624	0.4152	0.0352	0.0352	0.0096	128.62	Activity 7, 8, 9, 10, 11, 12,13,14 & 15
2017	Forklifts Composite	0.0399	0.0006	0.2492	0.2181	0.0118	0.0118	0.0036	54.395	
2017	Generator Sets Composite	0.0526	0.0006	0.4052	0.282	0.0215	0.0215	0.0047	60.992	
2017	Tractors/ Loaders/ Backhoes Composite	0.0558	0.0007	0.368	0.3666	0.0221	0.0221	0.005	66.797	
2017	Welders Composite	0.0433	0.0003	0.2054	0.1912	0.015	0.015	0.0039	25.602	

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	LDGV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	LDGT	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	HDGV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	LDDV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	Activity 6
2016	LDDT	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	HDDV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	MC	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2017	LDGV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	LDGT	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	HDGV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	Activity 7, 8,
2017	LDDV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	9, 10, 11, 12,
2017	LDDT	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	13, 14 & 15
2017	HDDV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	MC	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	

Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

Year		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	LDGV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	Activity 6
2016	LDGT	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	HDGV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	LDDV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	LDDT	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	HDDV	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2016	MC	0.63	0.01	0.57	9.74	0.028	0.014		0.1	500	
2017	LDGV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	Activity 7,8,9,10,11,12 ,13 & 14
2017	LDGT	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	HDGV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	LDDV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	LDDT	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	HDDV	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	
2017	MC	0.6	0.01	0.53	9.52	0.028	0.014		0.1	501	

Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Year	Start Month	Equipment	VOC	SOx	NOx	CO	PM10	PM2.5	CH4	CO2	Emission Factors are Used for These Construction Activity
2016	9	Graders Composite	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74	Activity 6
2016	9	Other Construction Equipment	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56	
2016	9	Rubber Tired Dozers	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09	
2016	9	Tractors/ Loaders/ Backhoes	0.061	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797	
2017	8	Excavators	0.0915	0.0013	0.5857	0.5183	0.0288	0.0288	0.0082	119.57	Activity 9,11,12,13, & 14
2017	8	Graders Composite	0.112	0.0014	0.8007	0.5843	0.0396	0.0396	0.0101	132.74	
2017	8	Other Construction Equipment	0.0674	0.0012	0.5044	0.3568	0.0206	0.0206	0.006	122.54	
2017	8	Rubber Tired Dozers	0.2464	0.0024	1.9508	0.93	0.0796	0.0796	0.0222	239.08	
2017	8	Scrapers Composite	0.2256	0.0026	1.7483	0.8713	0.0716	0.0716	0.0203	262.48	
2017	8	Tractors/ Loaders/ Backhoes	0.0558	0.0007	0.368	0.3666	0.0221	0.0221	0.005	66.797	
2017	9	Excavators	0.0987	0.0013	0.6602	0.5212	0.0332	0.0332	0.0089	119.58	Activity 7 & 8
2017	9	Graders Composite	0.1196	0.0014	0.8866	0.5883	0.0441	0.0441	0.0107	132.74	
2017	9	Other Construction Equipment	0.0719	0.0012	0.5679	0.3602	0.0233	0.0233	0.0064	122.56	
2017	9	Rubber Tired Dozers	0.2591	0.0024	2.0891	0.9833	0.0858	0.0858	0.0233	239.09	
2017	9	Tractors/ Loaders/ Backhoes	0.061	0.0007	0.4069	0.3689	0.0258	0.0258	0.0055	66.797	

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

Year	*Start Month*		*VOC*	*SOx*	*NOx*	*CO*	*PM 10*	*PM 2.5*	*Pb*	*NH3*	*CO2*	*Emission Factors are Used for These Construction Activity*
2016	9	HDDV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	Activity 6
2016	9	HDGV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2016	9	LDDT	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2016	9	LDDV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2016	9	LDGT	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2016	9	LDGV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2016	9	MC	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	6	HDDV	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	Activity 15
2017	6	HDGV	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	6	LDDT	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	6	LDDV	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	6	LDGT	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	6	LDGV	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	6	MC	0.74	0.01	0.74	10.67	0.03	0.016		0.1	496	
2017	8	HDDV	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	Activity 9,11,12,13, & 14
2017	8	HDGV	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	8	LDDT	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	8	LDDV	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	8	LDGT	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	8	LDGV	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	8	MC	0.6	0.01	0.53	9.519	0.028	0.014		0.1	501	
2017	9	HDDV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	Activity 7 & 8
2017	9	HDGV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	9	LDDT	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	9	LDDV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	9	LDGT	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	9	LDGV	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	
2017	9	MC	0.63	0.01	0.57	9.736	0.028	0.014		0.1	500	

2. Air Quality Model Report Detail

FORMULAS

Personnel Formula(s)

Personnel Vehicle Miles Travel for Work Days per Year

$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year) NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

Total Vehicle Miles Travel per Year

$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Aircraft

Flight Operations Formula(s)

Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs) TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel) NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for LTOs per Year

AELTO = AEMIDLE_IN + AEMIDLE_OUT + AEMAPPROACH + AEMCLIMBOUT + AEMTAKEOFF

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for TGOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs) TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel) NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for TGOs per Year
AETGO = AEMAPPROACH + AEMCLIMBOUT + AEMTAKEOFF

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL}$ = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs) TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel) NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

Aircraft Emissions for Trim per Year
AETRIM = AEPSIDLE + AEPSAPPROACH + AEPSINTERMEDIATE + AEPSMILITARY + AEPSAFTERBURN

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

Auxiliary Power Unit (APU) Formula(s)

Auxiliary Power Unit (APU) Emissions per Year
APU_{POL} = APU * OH * LTO * NA * EF_{POL} / 2000

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs) APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour) LTO: Number of LTOs
NA: Number of Aircraft
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Aerospace Ground Equipment (AGE) Formula(s)

Aerospace Ground Equipment (AGE) Emissions per Year
AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs) AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Construction/Demolition
Demolition Phase Formula(s)

Fugitive Dust Emissions per Phase
$PM10_{FD}$ = (0.00042 * BA * BH) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
0.00042: Emission Factor (lb/ft^3)
BA: Area of Building to be demolished (ft^2) BH: Height of Building to be demolished (ft)
2000: Conversion Factor pounds to tons

Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

Vehicle Exhaust Emissions per Phase
VMT_{VE} = BA * BH * (1 / 27) * 0.25 * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) BA: Area of Building being demolish (ft^2)
BH: Height of Building being demolish (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
0.25: Volume reduction factor (material reduced by 75% to account for air space) HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip) V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000
V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles) WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Site Grading Phase Formula(s)

Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3) $HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3) HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles) WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Trenching / Excavating Phase Formula(s)

Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day) ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days) H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

Vehicle Exhaust Emissions per Phase

$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3) $HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3) HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles) WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Architectural Coatings Phase Formula(s)

Worker Trips Emissions per Phase

$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile) PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Off-Gassing Emissions per Phase

$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (TONs) BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

Paving Phase Formula(s)

Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days) H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3) HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre) PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / $acre)^2$ / acre)

Building Construction Phase Formula(s) – Construction 6 to 13

Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles) WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles) BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Building Construction Phase Formula(s) – Construction 14 & 15

Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs) NE: Number of Equipment
WD: Number of Total Work Days (days) H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.32 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles) BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.32 / 1000): Conversion Factor ft^3 to trips (0.32 trip / 1000 ft^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (milesp) WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.05 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles) BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.05 / 1000): Conversion Factor ft^3 to trips (0.05 trip / 1000 ft^3) HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile) VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

3. General Conclusions

Short term construction emissions will occur over a 2 to 3 year period but since operation increases will be in a staged fashion, overall emissions per year will be smaller than the peak expected. Emissions from the increased operations will peak and be at a steady-state in 2021. Total emission increases for the region will be small.