

# APPENDIX C AIR QUALITY

## C.1 CONSTRUCTION

Construction activities associated with the Proposed Action are set to begin July 2020 and be completed by May 2023. Potential sources of construction emissions include construction vehicles and equipment. The Proposed Action construction is composed of six phases throughout four years as detailed in **Table C-1**.

**Table C-1  
CONSTRUCTION PHASING  
Tucson International Airport**

PHASE	ACTIVITY	DURATION (MONTHS)	INPUT	UNIT
<b>2020</b>				
1	Building - Demolition	3	22,800	SF
1	Fencing	1	15,000	linear feet
1	Taxiway Construction	6	1,782,000	SF
<b>2021</b>				
1	Taxiway Construction	3	445,500	SF
2	Demolition - Pavement	1	336,000	SF
2	Taxiway Construction	10	3,779,850	SF
2	Runway Construction	1	143,000	SF
3	Single Story Concrete Masonry Unit*	2	10,000	SF
4a	Fencing	2	28,250	linear feet
4b	Demolition - Pavement	1	595,000	SF
4b	Drainage Basin	1	200,000	SF
4b	Drainage Basin	1	200,000	SF
4b	Fencing Removal	1	8,500	linear feet
4b	Taxiway	11	13,200,000	SF
4b	Runway	11	6,600,000	SF
<b>2022</b>				
4b	Taxiway	1	300,000	SF
4b	Runway	1	150,000	SF
5	Demolition - Pavement	1	336,000	SF
<b>2023</b>				
5	NAVAIDS	2	1,650,000	SF
5	Taxiway Construction	5	480,000	SF
5	Terminal Apron - Markings	1	8,800,000	SF

Source: Landrum & Brown analysis, 2017; "Airfield Safety Enhancement Implementation Study", Tucson International Airport, 2015.

On-road construction vehicle trips, including construction employee vehicle trips to and from the job site, material delivery trips, and off-site hauling trips were estimated. Average employee roundtrip were estimated to be 30 miles. The average material delivery roundtrip from the construction site to material site was estimated to be 40 miles and that the material delivery trucks take two trips per day. Total vehicle miles traveled (VMT) for each type of non-road construction activity during each construction year are provided in **Table C-2**.

**Table C-2  
ON-ROAD CONSTRUCTION VEHICLE TRIPS  
Tucson International Airport**

<b>ON-ROAD VEHICLE ACTIVITY</b>	<b>VMT</b>
<b>2020</b>	
Employee Commute	316,932
Material Delivery	316,933
<b>2021</b>	
Employee Commute	1,966,698
Material Delivery	2,092,873
<b>2022</b>	
Employee Commute	89,654
Material Delivery	150,875
<b>2023</b>	
Employee Commute	242,038
Material Delivery	105,100

Source: Landrum & Brown analysis, 2018.

Total hours of activity for each equipment type during each construction year are provided in **Table C-3**.

**Table C-3  
NON-ROAD CONSTRUCTION EQUIPMENT USE  
Tucson International Airport**

<b>NON-ROAD EQUIPMENT TYPE</b>	<b>AVERAGE HORSEPOWER (HP)</b>	<b>LOAD FACTOR</b>	<b>HOURS OF ACTIVITY</b>
<b>2020</b>			
Cement & Mortar Mixers	600	0.59	167
Chain Saws > 6 HP	11	0.7	152
Chippers/Stump Grinders	100	0.43	152
Crawler Tractor/Dozers	250	0.8	6,376
Dumpers/Tenders	1,200	1.18	8,222
Excavators	350	1.18	3,035
Generator Sets	40	0.43	2,736
Graders	300	0.59	62
Off-highway Trucks	1,800	1.77	5,695
Other Construction Equipment	775	1.02	1,017
Pavers	175	0.59	62
Pumps	11	0.43	7
Rollers	100	0.59	650
Scrapers	600	0.59	206
Skid Steer Loaders	75	0.21	728
Surfacing Equipment	25	0.59	79
<b>2021</b>			
Aerial Lifts	250	1.01	1,760
Air Compressors	100	0.43	1,386
Cement & Mortar Mixers	1,200	1.18	6,488
Chain Saws > 6 HP	11	0.7	1,627
Chippers/Stump Grinders	100	0.43	1,627
Concrete/Industrial Saws	40	0.59	1,386
Cranes	300	0.43	240
Crawler Tractor/Dozers	175	0.59	11,962
Dumpers/Tenders	1,200	1.18	27,521
Excavators	525	1.77	5,984
Forklifts	100	0.59	1,640
Graders	300	0.59	655
Off-highway Trucks	4,200	4.13	58,138
Other Construction Equipment	775	1.02	22,286
Pavers	350	1.18	1,634
Pumps	11	0.43	586
Rollers	100	0.59	7,169
Rubber Tire Loaders	175	0.59	1,386
Skid Steer Loaders	75	0.21	3,326
Scrapers	600	0.59	2,939
Surfacing Equipment	25	0.59	1,704
Tractors/Loaders/Backhoes	2,175	2.78	6,776

**Table C-3, Continued  
NON-ROAD CONSTRUCTION EQUIPMENT USE  
Tucson International Airport**

<b>NON-ROAD EQUIPMENT TYPE</b>	<b>AVERAGE HORSEPOWER (HP)</b>	<b>LOAD FACTOR</b>	<b>HOURS OF ACTIVITY</b>
<b>2022</b>			
Air Compressors	100	0.43	111
Cement & Mortar Mixers	600	0.59	490
Chain Saws > 6 HP	11	0.7	132
Chippers/Stump Grinders	100	0.43	132
Concrete/Industrial Saws	40	0.59	111
Crawler Tractor/Dozers	175	0.59	921
Dumpers/Tenders	1,200	1.18	2,040
Excavators	525	1.77	1,143
Graders	300	0.59	53
Off-highway Trucks	2,400	2.36	5,041
Other Construction Equipment	775	1.02	1,659
Pavers	350	1.18	132
Pumps	11	0.43	44
Rollers	100	0.59	552
Rubber Tire Loaders	175	0.59	111
Scrapers	600	0.59	208
Skid Steer Loaders	75	0.21	170
Surfacing Equipment	25	0.59	138
Tractors/Loaders/Backhoes	275	0.8	401
<b>2023</b>			
Air Compressors	100	0.43	113
Cement & Mortar Mixers	600	0.59	383
Chain Saws > 6 HP	11	0.7	71
Chippers/Stump Grinders	100	0.43	71
Concrete/Industrial Saws	40	0.59	89
Cranes	300	0.43	16
Crawler Tractor/Dozers	175	0.59	520
Dumpers/Tenders	1,200	1.18	1,085
Excavators	175	0.59	144
Graders	300	0.59	28
Off-highway Trucks	2,400	2.36	93,753
Other Construction Equipment	775	1.02	46,224
Pavers	175	0.59	89
Pumps	11	0.43	24
Rollers	100	0.59	279
Rubber Tire Loaders	175	0.59	89
Scrapers	600	0.59	111
Skid Steer Loaders	75	0.21	131
Surfacing Equipment	25	0.59	89
Tractors/Loaders/Backhoes	275	0.8	258

Source: Landrum & Brown analysis, 2018.

## **C.2 EMISSION FACTORS**

Emissions for on-road and non-road construction equipment were estimated separately following standard industry practices. Emissions from on-road construction vehicles/equipment were calculated using the methodologies outlined in U.S. EPA AP-42 *Compilation of Air Pollutant Emission Factors fifth Edition, Volume II: Mobile Sources*.

Emission factors for on-road construction equipment were developed using the latest version of the Motor Vehicle Emission Simulator (MOVES2014a) developed by the U.S. Environmental Protection Agency (EPA). For the employee vehicle trips, the model was run using gasoline passenger cars. For the material delivery and off-site haul vehicle trips, diesel combination long-haul trucks were assumed in order to estimate maximum potential emissions. **Table C-4** presents the MOVES2014 emission factors used to calculate emissions for on-road construction equipment for 2023, which were used for all years of the project.

**Table C-4  
ON-ROAD CONSTRUCTION EQUIPMENT EMISSION FACTORS  
Tucson International Airport**

<b>ON-ROAD VEHICLE ACTIVITY</b>	<b>GRAMS PER VMT</b>						
	<b>CO</b>	<b>VOC</b>	<b>NOX</b>	<b>SOX</b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>CO<sub>2</sub></b>
Employee Commute	4.97	0.13	0.49	0.007	0.010	0.009	467.8
Material Delivery	2.00	0.43	7.28	0.017	0.25	0.23	2541.1

Source: MOVES2014a, Landrum & Brown analysis, 2018.

Emission factors for non-road construction equipment were developed using MOVES2014a developed by the EPA. Emission factors associated with diesel engine vary by equipment and horsepower. Therefore, emission factors were assigned by equipment type and average horsepower. Non-road construction equipment emissions were calculated based on the number of operating hours of equipment use and the emission factors. **Table C-5** presents the MOVES2014 emission factors used to calculate emissions for non-road construction equipment for 2023, which were applied for all years of the project.

Potential on-road construction emissions were estimated by multiplying the VMT data by the appropriate emission factors and the necessary conversion factors to present the emissions in tons. Potential non-road construction emissions were estimated by multiplying the estimated number of operating hours of each equipment type by the load factor, appropriate emission factors, and the necessary conversion factors to present the emissions in tons.

The on-road and non-road construction emissions by year and equipment type are provided in **Table C-6** and **Table C-7**.

**Table C-5  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSION FACTORS  
Tucson International Airport**

NON-ROAD EQUIPMENT TYPE	AVERAGE HP	LOAD FACTOR	GRAMS PER HOUR OF ACTIVITY							
			CO	VOC	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
Aerial Lifts	75	0.21	302.2	55.7	255.0	0.3	38.8	37.6	58,207	2.2
Aerial Lifts	100	0.59	302.2	55.7	255.0	0.3	38.8	37.6	58,207	2.2
Air Compressors	100	0.43	58.5	15.4	88.8	0.3	7.2	7.0	49,466	1.2
Cement & Mortar Mixers	600	0.59	261.9	86.5	963.5	1.2	35.8	34.7	213,395	5.1
Chain Saws > 6 HP*	11	0.7	1811.7	467.2	10.4	0.0	66.4	61.1	4,672	8.1
Chippers/Stump Grinders	100	0.43	114.0	25.5	197.5	0.3	18.3	17.8	49,796	1.3
Concrete/Industrial Saws	40	0.59	12.5	6.5	132.1	0.1	1.2	1.2	25,735	0.6
Cranes	300	0.43	30.4	38.3	140.2	0.6	5.0	4.9	126,125	3.2
Crawler Tractor/ Dozers	75	0.21	29.7	8.7	175.1	0.2	2.1	2.0	34,540	0.8
Crawler Tractor/ Dozers	175	0.59	25.7	21.5	55.2	0.4	3.3	3.2	73,004	1.8
Dumpers/Tenders	600	0.59	172.2	54.5	307.0	0.4	35.0	33.9	68,577	2.7
Excavators	175	0.59	22.1	21.5	47.3	0.4	2.2	2.1	73,809	1.8
Forklifts	100	0.59	33.8	13.3	24.1	0.2	0.9	0.9	50,924	1.1
Generator Sets	40	0.43	27.7	8.5	123.9	0.1	5.0	4.9	19,717	0.6
Graders	300	0.59	32.7	36.2	87.4	0.6	3.5	3.4	124,017	3.0
Off-highway Trucks	600	0.59	62.9	65.4	140.1	1.1	5.0	4.9	225,237	5.4
Other Construction Equipment	175	0.43	62.9	39.5	194.9	0.6	10.2	9.9	125,349	3.2
Other Construction Equipment	600	0.59	311.0	82.3	727.4	1.3	43.2	41.9	237,373	6.0
Pavers	175	0.59	29.7	21.6	65.5	0.4	4.4	4.3	72,199	1.8
Pumps	11	0.43	37.7	5.4	37.4	0.0	3.1	3.0	4,981	0.4
Rollers	100	0.59	32.2	21.5	75.7	0.4	5.2	5.0	70,910	1.8
Rubber Tire Loaders	175	0.59	42.4	36.9	124.4	0.6	5.6	5.4	123,371	3.1
Scrapers	600	0.59	128.8	67.9	340.4	1.1	16.5	16.0	226,626	5.6
Skid Steer Loaders	75	0.21	196.5	38.0	243.3	0.2	27.0	26.2	40,028	1.4
Surfacing Equipment	25	0.59	9.4	4.8	97.3	0.1	1.0	0.9	18,878	0.4
Tractors/Loaders/ Backhoes	100	0.21	151.0	46.9	242.4	0.4	30.5	29.6	75,492	3.0
Tractors/Loaders/ Backhoes	175	0.59	151.0	46.9	242.4	0.4	30.5	29.6	75,492	3.0
Tractors/Loaders/ Backhoes	600	0.59	200.3	69.2	372.7	0.7	35.6	34.6	125,115	4.4

Note: \* Gasoline emission factors for chain saws were used because diesel emission factors were not available in MOVES2014a

Source: MOVES2014a, Landrum & Brown analysis, 2018.

**Table C-6  
ON-ROAD CONSTRUCTION VEHICLE EMISSIONS  
Tucson International Airport**

ON-ROAD CONSTRUCTION VEHICLE ACTIVITY	VMT	EMISSIONS (SHORT TONS)						
		CO	VOC	NOX	SOX	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> *
<b>2020</b>								
Employee Commute	316,932	1.74	0.05	0.17	0.003	0.004	0.003	148.25
Material Delivery	316,933	0.70	0.15	2.54	0.006	0.008	0.081	805.36
<i>On-Road 2020 Subtotal:</i>		<i>2.43</i>	<i>0.19</i>	<i>2.71</i>	<i>0.01</i>	<i>0.09</i>	<i>0.08</i>	<i>953.62</i>
<b>2021</b>								
Employee Commute	1,966,698	1077	0.28	1.06	0.016	0.023	0.020	919.98
Material Delivery	2,092,873	4.61	0.98	16.79	0.039	0.584	0.538	5,318.23
<i>On-Road 2021 Subtotal:</i>		<i>15.38</i>	<i>1.27</i>	<i>17.85</i>	<i>0.06</i>	<i>0.61</i>	<i>0.56</i>	<i>6,238.21</i>
<b>2022</b>								
Employee Commute	89,654	0.49	0.01	0.05	0.001	0.001	0.001	41.94
Material Delivery	150,875	0.33	0.07	1.21	0.003	0.042	0.039	383.39
<i>On-Road 2022 Subtotal:</i>		<i>0.82</i>	<i>0.08</i>	<i>1.26</i>	<i>0.00</i>	<i>0.04</i>	<i>0.04</i>	<i>425.33</i>
<b>2023</b>								
Employee Commute	242,038	1.33	0.04	0.13	0.002	0.003	0.002	113.22
Material Delivery	105,100	0.23	0.05	0.84	0.002	0.029	0.027	267.07
<i>On-Road 2023 Subtotal:</i>		<i>1.56</i>	<i>0.08</i>	<i>0.97</i>	<i>0.00</i>	<i>0.03</i>	<i>0.03</i>	<i>380.29</i>

Note: \* CO<sub>2</sub> reported in metric tons

Source: Landrum & Brown analysis, 2018

**Table C-7  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSIONS  
Tucson International Airport**

NON-ROAD TYPE EQUIPMENT	AVERAGE HP	LOAD FACTOR	HOURS OF ACTIVITY	EMISSIONS (SHORT TONS)						EMISSIONS (METRIC TONS)	
				CO	VOC	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
<b>2020</b>											
Cement & Mortar Mixers	600	0.59	167	0.028	0.009	0.104	0.000	0.004	0.004	20.984	0.001
Chain Saws > 6 HP	11	0.7	152	0.213	0.055	0.001	0.000	0.008	0.007	0.498	0.001
Chippers/Stump Grinders	100	0.43	152	0.008	0.002	0.014	0.000	0.001	0.001	3.263	0.000
Crawler Tractor/Dozers	75	0.21	5472	0.038	0.011	0.222	0.000	0.003	0.003	39.691	0.001
Crawler Tractor/Dozers	175	0.59	904	0.015	0.013	0.032	0.000	0.002	0.002	38.938	0.001
Dumpers/Tenders	600	0.59	1649	0.185	0.058	0.329	0.000	0.037	0.036	66.730	0.003
Dumpers/Tenders	600	0.59	6572	0.736	0.233	1.312	0.002	0.149	0.145	265.919	0.011
Excavators	175	0.59	299	0.004	0.004	0.009	0.000	0.000	0.000	12.999	0.000
Excavators	175	0.59	2736	0.039	0.038	0.084	0.001	0.004	0.004	119.146	0.003
Generator Sets	40	0.43	2736	0.036	0.011	0.161	0.000	0.007	0.006	23.197	0.001
Graders	300	0.59	62	0.001	0.001	0.004	0.000	0.000	0.000	4.508	0.000
Off-highway Trucks	600	0.59	56	0.002	0.002	0.005	0.000	0.000	0.000	7.375	0.000
Off-highway Trucks	600	0.59	720	0.029	0.031	0.066	0.001	0.002	0.002	95.681	0.002
Off-highway Trucks	600	0.59	4920	0.201	0.209	0.448	0.003	0.016	0.016	653.784	0.016
Other Construction Equipment	175	0.43	962	0.029	0.018	0.089	0.000	0.005	0.005	51.844	0.001
Other Construction Equipment	600	0.59	56	0.011	0.003	0.026	0.000	0.002	0.002	7.773	0.000
Pavers	175	0.59	62	0.001	0.001	0.003	0.000	0.000	0.000	2.633	0.000
Pumps	11	0.43	7	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.000
Rollers	100	0.59	650	0.014	0.009	0.032	0.000	0.002	0.002	27.201	0.001
Scrapers	600	0.59	206	0.017	0.009	0.046	0.000	0.002	0.002	27.550	0.001
Skid Steer Loaders	75	0.21	728	0.033	0.006	0.041	0.000	0.005	0.004	6.124	0.000
Surfacing Equipment	25	0.59	79	0.000	0.000	0.005	0.000	0.000	0.000	0.881	0.000
Tractors/Loaders/Backhoes	100	0.21	732	0.026	0.008	0.041	0.000	0.005	0.005	11.610	0.000
Tractors/Loaders/Backhoes	175	0.59	165	0.016	0.005	0.026	0.000	0.003	0.003	7.339	0.000
<i>Non-Road 2020 Subtotal:</i>				<i>1.684</i>	<i>0.738</i>	<i>3.101</i>	<i>0.008</i>	<i>0.258</i>	<i>0.250</i>	<i>1495.68</i>	<i>0.043</i>



**Table C-7, Continued  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSIONS  
Tucson International Airport**

NON-ROAD TYPE EQUIPMENT	AVERAGE HP	LOAD FACTOR	HOURS OF ACTIVITY	EMISSIONS (SHORT TONS)						EMISSIONS (METRIC TONS)	
				CO	VOC	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
<b>2021</b>											
Aerial Lifts	75	0.21	120	0.008	0.002	0.007	0.000	0.001	0.001	0.000	0.000
Aerial Lifts	75	0.21	1200	0.084	0.015	0.071	0.000	0.011	0.010	0.001	0.001
Aerial Lifts	100	0.59	440	0.086	0.016	0.073	0.000	0.011	0.011	0.001	0.001
Air Compressors	100	0.43	1386	0.038	0.010	0.058	0.000	0.005	0.005	0.001	0.001
Cement & Mortar Mixers	600	0.59	60	0.010	0.003	0.038	0.000	0.001	0.001	0.000	0.000
Cement & Mortar Mixers	600	0.59	6428	1.095	0.362	4.028	0.005	0.150	0.145	0.019	0.019
Chain Saws > 6 HP	11	0.7	1627	2.275	0.587	0.013	0.000	0.083	0.077	0.009	0.009
Chippers/Stump Grinders	100	0.43	1627	0.088	0.020	0.152	0.000	0.014	0.014	0.001	0.001
Concrete/Industrial Saws	40	0.59	1386	0.011	0.006	0.119	0.000	0.001	0.001	0.000	0.000
Cranes	300	0.43	240	0.003	0.004	0.016	0.000	0.001	0.001	0.000	0.000
Crawler Tractor/Dozers	175	0.59	11962	0.200	0.167	0.430	0.003	0.026	0.025	0.013	0.013
Dumpers/Tenders	600	0.59	7257	0.813	0.257	1.449	0.002	0.165	0.160	0.012	0.012
Dumpers/Tenders	600	0.59	20264	2.270	0.718	4.046	0.005	0.461	0.447	0.033	0.033
Excavators	175	0.59	1241	0.036	0.035	0.076	0.001	0.004	0.003	0.003	0.003
Excavators	175	0.59	3501	0.050	0.049	0.108	0.001	0.005	0.005	0.004	0.004
Forklifts	100	0.59	1640	0.036	0.014	0.026	0.000	0.001	0.001	0.001	0.001
Graders	300	0.59	655	0.014	0.015	0.037	0.000	0.001	0.001	0.001	0.001
Off-highway Trucks	600	0.59	8	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Off-highway Trucks	600	0.59	10	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Off-highway Trucks	600	0.59	400	0.016	0.017	0.036	0.000	0.001	0.001	0.001	0.001
Off-highway Trucks	600	0.59	565	0.023	0.024	0.052	0.000	0.002	0.002	0.002	0.002
Off-highway Trucks	600	0.59	7200	0.294	0.306	0.656	0.005	0.023	0.023	0.023	0.023
Off-highway Trucks	600	0.59	13178	0.539	0.561	1.201	0.009	0.043	0.042	0.042	0.042
Off-highway Trucks	600	0.59	36777	1.504	1.565	3.351	0.026	0.120	0.116	0.118	0.118
Other Construction Equipment	175	0.43	21721	0.647	0.407	2.006	0.007	0.105	0.102	0.030	0.030
Other Construction Equipment	600	0.59	565	0.114	0.030	0.267	0.000	0.016	0.015	0.002	0.002
Pavers	175	0.59	249	0.005	0.003	0.011	0.000	0.001	0.001	0.000	0.000
Pavers	175	0.59	1386	0.027	0.019	0.059	0.000	0.004	0.004	0.001	0.001
Pumps	11	0.43	586	0.010	0.002	0.010	0.000	0.001	0.001	0.000	0.000
Rollers	100	0.59	7169	0.150	0.100	0.353	0.002	0.024	0.023	0.008	0.008

**Table C-7, Continued  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSIONS  
Tucson International Airport**

NON-ROAD TYPE EQUIPMENT	AVERAGE HP	LOAD FACTOR	HOURS OF ACTIVITY	EMISSIONS (SHORT TONS)						EMISSIONS (METRIC TONS)	
				CO	VOC	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
Rubber Tire Loaders	175	0.59	1386	0.038	0.033	0.112	0.001	0.005	0.005	111.184	0.003
Scrapers	600	0.59	2939	0.246	0.130	0.651	0.002	0.031	0.031	433.218	0.010
Skid Steer Loaders	75	0.21	3326	0.151	0.029	0.187	0.000	0.021	0.020	30.816	0.001
Surfacing Equipment	25	0.59	1704	0.010	0.005	0.108	0.000	0.001	0.001	20.923	0.000
Tractors/Loaders/Backhoes	100	0.21	320	0.011	0.003	0.018	0.000	0.002	0.002	5.592	0.000
Tractors/Loaders/Backhoes	100	0.21	4192	0.146	0.045	0.235	0.000	0.030	0.029	73.264	0.003
Tractors/Loaders/Backhoes	175	0.59	2071	0.203	0.063	0.326	0.001	0.041	0.040	101.687	0.004
Tractors/Loaders/ Backhoes	600	0.59	4	0.001	0.000	0.001	0.000	0.000	0.000	0.325	0.000
Tractors/Loaders/ Backhoes	600	0.59	16	0.002	0.001	0.004	0.000	0.000	0.000	1.302	0.000
Tractors/Loaders/ Backhoes	600	0.59	172	0.022	0.008	0.042	0.000	0.004	0.004	13.996	0.000
<i>Non-Road 2021 Subtotal:</i>				<i>11.281</i>	<i>5.635</i>	<i>20.434</i>	<i>0.072</i>	<i>1.416</i>	<i>1.370</i>	<i>13003.7</i>	<i>0.347</i>
<b>2022</b>											
Air Compressors	100	0.43	111	0.003	0.001	0.005	0.000	0.000	0.000	2.361	0.000
Cement & Mortar Mixers	600	0.59	490	0.083	0.028	0.307	0.000	0.011	0.011	61.727	0.001
Chain Saws > 6 HP	11	0.7	132	0.185	0.048	0.001	0.000	0.007	0.006	0.432	0.001
Chippers/Stump Grinders	100	0.43	132	0.007	0.002	0.012	0.000	0.001	0.001	2.826	0.000
Concrete/Industrial Saws	40	0.59	111	0.001	0.000	0.010	0.000	0.000	0.000	1.685	0.000
Crawler Tractor/Dozers	175	0.59	921	0.015	0.013	0.033	0.000	0.002	0.002	39.669	0.001
Dumpers/Tenders	600	0.59	468	0.052	0.017	0.093	0.000	0.011	0.010	18.919	0.001
Dumpers/Tenders	600	0.59	1573	0.176	0.056	0.314	0.000	0.036	0.035	63.624	0.003
Excavators	175	0.59	247	0.004	0.003	0.008	0.000	0.000	0.000	10.762	0.000
Excavators	175	0.59	448	0.013	0.013	0.028	0.000	0.001	0.001	39.019	0.001
Graders	300	0.59	53	0.001	0.001	0.003	0.000	0.000	0.000	3.888	0.000
Off-highway Trucks	600	0.59	48	0.002	0.002	0.004	0.000	0.000	0.000	6.361	0.000
Off-highway Trucks	600	0.59	480	0.020	0.020	0.044	0.000	0.002	0.002	63.787	0.002
Off-highway Trucks	600	0.59	1029	0.042	0.044	0.094	0.001	0.003	0.003	136.687	0.003
Off-highway Trucks	600	0.59	3484	0.142	0.148	0.317	0.002	0.011	0.011	463.011	0.011
Other Construction Equipment	175	0.43	1611	0.048	0.030	0.149	0.000	0.008	0.008	86.820	0.002
Other Construction Equipment	600	0.59	48	0.010	0.003	0.023	0.000	0.001	0.001	6.704	0.000
Pavers	175	0.59	21	0.000	0.000	0.001	0.000	0.000	0.000	0.887	0.000
Pavers	175	0.59	111	0.002	0.002	0.005	0.000	0.000	0.000	4.728	0.000

**Table C-7, Continued  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSIONS  
Tucson International Airport**

NON-ROAD TYPE EQUIPMENT	AVERAGE HP	LOAD FACTOR	HOURS OF ACTIVITY	EMISSIONS (SHORT TONS)						EMISSIONS (METRIC TONS)	
				CO	VOC	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
Pumps	11	0.43	44	0.001	0.000	0.001	0.000	0.000	0.000	0.094	0.000
Rollers	100	0.59	552	0.012	0.008	0.027	0.000	0.002	0.002	23.078	0.001
Rubber Tire Loaders	175	0.59	111	0.003	0.003	0.009	0.000	0.000	0.000	8.080	0.000
Scrapers	600	0.59	208	0.017	0.009	0.046	0.000	0.002	0.002	27.828	0.001
Skid Steer Loaders	75	0.21	170	0.008	0.001	0.010	0.000	0.001	0.001	1.428	0.000
Surfacing Equipment	25	0.59	138	0.001	0.000	0.009	0.000	0.000	0.000	1.533	0.000
Tractors/Loaders/Backhoes	100	0.21	238	0.008	0.003	0.013	0.000	0.002	0.002	3.772	0.000
Tractors/Loaders/Backhoes	175	0.59	163	0.016	0.005	0.026	0.000	0.003	0.003	7.280	0.000
<i>Non-Road 2022 Subtotal:</i>				<i>0.873</i>	<i>0.459</i>	<i>1.590</i>	<i>0.006</i>	<i>0.106</i>	<i>0.103</i>	<i>1087.0</i>	<i>0.029</i>
<b>2023</b>											
Air Compressors	100	0.43	113	0.003	0.001	0.005	0.000	0.000	0.000	2.399	0.000
Cement & Mortar Mixers	600	0.59	383	0.065	0.022	0.240	0.000	0.009	0.009	48.263	0.001
Chain Saws > 6 HP	11	0.7	71	0.099	0.026	0.001	0.000	0.004	0.003	0.232	0.000
Chippers/Stump Grinders	100	0.43	71	0.004	0.001	0.007	0.000	0.001	0.001	1.516	0.000
Concrete/Industrial Saws	40	0.59	89	0.001	0.000	0.008	0.000	0.000	0.000	1.348	0.000
Cranes	300	0.43	16	0.000	0.000	0.001	0.000	0.000	0.000	0.868	0.000
Crawler Tractor/Dozers	175	0.59	520	0.009	0.007	0.019	0.000	0.001	0.001	22.378	0.001
Dumpers/Tenders	600	0.59	247	0.028	0.009	0.049	0.000	0.006	0.005	9.977	0.000
Dumpers/Tenders	600	0.59	839	0.094	0.030	0.167	0.000	0.019	0.018	33.933	0.001
Excavators	175	0.59	144	0.002	0.002	0.004	0.000	0.000	0.000	6.264	0.000
Graders	300	0.59	28	0.001	0.001	0.002	0.000	0.000	0.000	2.081	0.000
Off-highway Trucks	600	0.59	26	0.001	0.001	0.002	0.000	0.000	0.000	3.405	0.000
Off-highway Trucks	600	0.59	1200	0.049	0.051	0.109	0.001	0.004	0.004	159.47	0.004
Off-highway Trucks	600	0.59	45806	1.873	1.950	4.174	0.032	0.149	0.145	6087.1	0.147
Off-highway Trucks	600	0.59	46721	1.911	1.989	4.257	0.033	0.152	0.148	6208.8	0.150
Other Construction Equipment	175	0.43	46198	1.376	0.866	4.267	0.014	0.224	0.217	2490.1	0.064
Other Construction Equipment	600	0.59	26	0.005	0.001	0.012	0.000	0.001	0.001	3.588	0.000
Pavers	175	0.59	89	0.002	0.001	0.004	0.000	0.000	0.000	3.783	0.000
Pumps	11	0.43	24	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.000
Rollers	100	0.59	279	0.006	0.004	0.014	0.000	0.001	0.001	11.682	0.000
Rubber Tire Loaders	175	0.59	89	0.002	0.002	0.007	0.000	0.000	0.000	6.464	0.000

**Table C-7, Continued  
NON-ROAD CONSTRUCTION EQUIPMENT EMISSIONS  
Tucson International Airport**

NON-ROAD TYPE EQUIPMENT	AVERAGE HP	LOAD FACTOR	HOURS OF ACTIVITY	EMISSIONS (SHORT TONS)						EMISSIONS (METRIC TONS)	
				CO	VOC	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
Scrapers	600	0.59	111	0.009	0.005	0.025	0.000	0.001	0.001	14.842	0.000
Skid Steer Loaders	75	0.21	131	0.006	0.001	0.007	0.000	0.001	0.001	1.098	0.000
Surfacing Equipment	25	0.59	89	0.001	0.000	0.006	0.000	0.000	0.000	0.989	0.000
Tractors/Loaders/Backhoes	100	0.21	176	0.006	0.002	0.010	0.000	0.001	0.001	2.789	0.000
Tractors/Loaders/Backhoes	175	0.59	82	0.008	0.003	0.013	0.000	0.002	0.002	3.655	0.000
<i>Non-Road 2023 Subtotal:</i>				<i>5.561</i>	<i>4.974</i>	<i>13.410</i>	<i>0.081</i>	<i>0.577</i>	<i>0.560</i>	<i>15127.1</i>	<i>0.371</i>

Source: Landrum & Brown analysis, 2018