

Appendix T

Air Quality and GHG Emissions Calculations

Xcel Energy
MMRTP
Construction Emissions 2026-2028
Summary

Construction Components	Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)			
	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Year 2026										
Off-Road Engine Emissions	6.36	10.92	4.79E-03	0.57	0.37	0.37	1123.89	0.02	0.10	1152.93
Fugitive Dust Emissions					35.53	3.86				
On Road Emissions	0.45	0.03	3.42E-04	3.75E-03	0.02	0.01	58.15	1.10E-03	2.68E-04	58.25
Year 2026 Total	6.80	10.95	0.01	0.58	35.92	4.23	1,182.04	0.02	0.10	1,211.19
Year 2027										
Off-Road Engine Emissions	29.02	49.84	0.02	2.62	1.68	1.68	5126.21	0.09	0.44	5258.66
Fugitive Dust Emissions					140.77	14.38				
On Road Emissions	1.18	0.07	9.44E-04	8.76E-03	0.07	0.02	161.06	2.78E-03	9.01E-04	161.40
Year 2027 Total	30.20	49.91	0.02	2.63	142.52	16.08	5,287.28	0.09	0.44	5,420.06
Year 2028										
Off-Road Engine Emissions	29.91	51.36	0.02	2.70	1.73	1.73	5283.68	0.09	0.45	5420.19
Fugitive Dust Emissions					144.98	14.80				
On Road Emissions	1.56	0.09	1.31E-03	1.08E-02	0.09	0.02	223.50	3.64E-03	1.22E-03	223.96
Year 2028 Total	31.47	51.45	0.02	2.71	146.81	16.56	5,507.18	0.10	0.45	5,644.15

Equipment	MOVES Lookup ID	SCAB Lookup ID	Fuel	HP	Typical Hours per day	Typical Days/Year	Count	Total Hours Used
Equipment								
ATV 4 TO 6 WHEEL, W/ DUMP	Off-Highway Trucks	Off-Highway Trucks	Diesel	13.5	2	15	1	30
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	94	2	21	2	84
BUCKET 105' WORK HEIGHT	Aerial Lifts	Aerial Lifts	Diesel	300	8	35	3	840
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	Aerial Lifts	Diesel	350	8	35	1	280
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	Aerial Lifts	Diesel	300	8	15	2	240
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	Cranes	Diesel	450	2	21	1	42
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	Cranes	Diesel	450	8	35	6	1680
DIGGER DERRICK 15 T CAP	Cranes	Cranes	Diesel	330	8	35	4	1120
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	Cranes	Diesel	300	8	15	2	240
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	4	21	1	84
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	190	4	21	1	84
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	6	15	1	90
EXCAVATOR 25 T	Excavators	Excavators	Diesel	172	4	15	1	60
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	Forklifts	Diesel	142	4	35	3	420
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	Rubber Tired Loaders	Diesel	386	4	35	4	560
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	Generator Sets	Diesel	38	8	20	4	640
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	Other Construction Equipment	Diesel	80	2	18	1	36
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	74	2	18	1	36
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	400	2	18	1	36
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	115	2	18	1	36
300T AT Setting Crane	Cranes	Cranes	Diesel	577	6	30	1	180
60T RT Crane	Cranes	Cranes	Diesel	320	4	35	4	560
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	Skid Steer Loaders	Diesel	95	4	35	5	700
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	505	2	35	1	70
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	35	2	280
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	35	6	840
PICKUP TRUCK 3/4 T	Off-highway Trucks	Off-highway Trucks	Diesel	420	8	35	14	3920
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	Off-highway Trucks	Diesel	450	4	21	6	504

Fugitive Dust								
Dust from On Site Activities								
Onroad								
MOVES Vehicle Class	Fuel Type	VMT	Onroad Fuel ID	Year	MOVES Road Type	MOVES Day Type		
Resuspended Road Dust								
Worker Commute (Gas Passenger Truck)	Gasoline	170,100	1	2026	3	5		
Material Hauling (Single Unit Truck)	Diesel	250	2	2026	3	5		

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>)

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.

^f https://www.baaqmd.gov/~media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.aspx

^g Global Warming Potentials from 40 CFR 98 Table A-1

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

ⁱ Calculated from MOVES for Olmsted County, MN Assumption:

1 kWh = 1.34 hp-hr

lb/metric ton

2204.62

Equipment	MOVES Lookup ID	Load Factor ^c	Emission Factors (g/hp-hr) ^{a,b}						Emission Factors (g/hr) ^b				
			CO	NO _x ^e	SO ₂ ^d	VOC ^e	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O ^h	CO ₂ e ^f	
Equipment													
ATV 4 TO 6 WHEEL, W/ DUMP	Off-Highway Trucks	0.59	4.9254	5.3172	0.0020	0.2799	0.5970	0.5970	56738.8018	2.5437	4.8347	58243.1486	
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	0.21	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	23463.4126	0.7832	1.9993	24078.7938	
BUCKET 105' WORK HEIGHT	Aerial Lifts	0.21	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486	
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	0.21	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486	
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	0.21	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486	
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746	
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746	
DIGGER DERRICK 15 T CAP	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746	
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746	
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	0.59	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938	
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	0.59	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	75355.9475	1.9934	6.4211	77319.2766	
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	0.59	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938	
EXCAVATOR 25 T	Excavators	0.59	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	50902.8167	0.8117	4.3375	52215.6719	
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	0.59	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	25425.8129	0.6148	2.1665	26086.8142	
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	0.59	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	107505.0812	0.8359	9.1606	110255.8274	
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	0.43	4.1045	5.3172	0.0020	0.2799	0.4478	0.4478	13890.3485	0.4472	1.1836	14254.2436	
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	0.59	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418	
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	0.59	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418	
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	0.59	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	115320.5588	0.4815	9.8265	118260.9032	
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	0.59	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	36676.8768	0.4815	3.1253	37620.2418	
300T AT Setting Crane	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	137458.6383	1.4314	11.7129	140984.8755	
60T RT Crane	Cranes	0.43	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746	
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	0.21	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	19396.4227	0.6820	1.6528	19906.0015	
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	0.21	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937	
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	0.21	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937	
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	0.21	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937	
PICKUP TRUCK 3/4 T	Off-highway Trucks	0.59	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743	
TRUCK TRACTOR 2-1/2 T 6X4 & S T 6X6	Off-highway Trucks	0.59	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743	

Fugitive Dust												
Dust from On Site Activities												
Emission Factors (g/mi) ⁱ												
Onroad	MOVES Vehicle Class	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e ^f	
	Resuspended Road Dust											
	Worker Commute (Gas Passenger Truck)	31	2.37339	0.14611	0.00182	0.01991	0.00236	0.00208	340.69671	0.00645	0.00143	341.2826883
	Material Hauling (Single Unit Truck)	52	0.77020	1.04966	0.00259	0.05016	0.02313	0.02128	770.30999	0.00695	0.10119	800.6390356

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>)

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.

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lb/metric ton

2204.62

Equipment	MOVES Lookup ID	Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)			
		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Equipment											
ATV 4 TO 6 WHEEL, W/ DUMP	Off-Highway Trucks	1.30E-03	1.40E-03	5.27E-07	7.37E-05	1.57E-04	1.57E-04	1.70E+00	7.63E-05	1.45E-04	1.75E+00
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	6.82E-03	9.72E-03	3.66E-06	5.12E-04	5.46E-04	5.46E-04	1.97E+00	6.58E-05	1.68E-04	2.02E+00
BUCKET 105' WORK HEIGHT	Aerial Lifts	1.52E-01	2.73E-01	1.17E-04	1.44E-02	8.71E-03	8.71E-03	8.11E+01	3.46E-04	6.91E-03	8.32E+01
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	5.93E-02	1.03E-01	4.54E-05	5.42E-03	3.39E-03	3.39E-03	2.70E+01	1.15E-04	2.30E-03	2.77E+01
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	4.35E-02	7.80E-02	3.33E-05	4.10E-03	2.49E-03	2.49E-03	2.32E+01	9.89E-05	1.97E-03	2.38E+01
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	2.34E-02	4.06E-02	1.79E-05	2.14E-03	1.34E-03	1.34E-03	3.43E+00	6.01E-05	2.92E-04	3.52E+00
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	9.36E-01	1.63E+00	7.17E-04	8.56E-02	5.35E-02	5.35E-02	1.37E+02	2.40E-03	1.17E-02	1.41E+02
DIGGER DERRICK 15 T CAP	Cranes	4.58E-01	7.95E-01	3.50E-04	4.18E-02	2.61E-02	2.61E-02	9.15E+01	1.60E-03	7.80E-03	9.39E+01
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	8.91E-02	1.60E-01	6.83E-05	8.40E-03	5.09E-03	5.09E-03	1.96E+01	3.44E-04	1.67E-03	2.01E+01
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	1.63E-02	2.32E-02	8.74E-06	1.22E-03	1.30E-03	1.30E-03	2.51E+00	1.67E-04	2.14E-04	2.58E+00
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	2.71E-02	4.86E-02	2.08E-05	2.56E-03	1.55E-03	1.55E-03	6.33E+00	1.67E-04	5.39E-04	6.49E+00
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	1.75E-02	2.49E-02	9.37E-06	1.31E-03	1.40E-03	1.40E-03	2.69E+00	1.79E-04	2.29E-04	2.76E+00
EXCAVATOR 25 T	Excavators	2.50E-02	3.14E-02	1.34E-05	1.65E-03	1.50E-03	1.50E-03	3.05E+00	4.87E-05	2.60E-04	3.13E+00
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	1.45E-01	1.81E-01	7.76E-05	9.55E-03	8.68E-03	8.68E-03	1.07E+01	2.58E-04	9.10E-04	1.10E+01
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	3.67E-01	6.38E-01	2.81E-04	3.36E-02	2.10E-02	2.10E-02	6.02E+01	4.68E-04	5.13E-03	6.17E+01
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	4.73E-02	6.13E-02	2.31E-05	3.23E-03	5.16E-03	5.16E-03	8.89E+00	2.86E-04	7.58E-04	9.12E+00
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	6.99E-03	9.96E-03	3.75E-06	5.24E-04	5.59E-04	5.59E-04	1.32E+00	1.73E-05	1.13E-04	1.35E+00
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	6.46E-03	9.21E-03	3.47E-06	4.85E-04	5.17E-04	5.17E-04	1.32E+00	1.73E-05	1.13E-04	1.35E+00
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	2.45E-02	4.25E-02	1.87E-05	2.24E-03	1.40E-03	1.40E-03	4.15E+00	1.73E-05	3.54E-04	4.26E+00
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	1.00E-02	1.26E-02	5.39E-06	6.63E-04	6.03E-04	6.03E-04	1.32E+00	1.73E-05	1.13E-04	1.35E+00
300T AT Setting Crane	Cranes	1.29E-01	2.23E-01	9.85E-05	1.18E-02	7.35E-03	7.35E-03	2.47E+01	2.58E-04	2.11E-03	2.54E+01
60T RT Crane	Cranes	2.22E-01	3.85E-01	1.70E-04	2.03E-02	1.27E-02	1.27E-02	4.57E+01	8.02E-04	3.90E-03	4.69E+01
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	5.74E-02	8.19E-02	3.08E-05	4.31E-03	4.60E-03	4.60E-03	1.36E+01	4.77E-04	1.16E-03	1.39E+01
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	2.14E-02	3.71E-02	1.64E-05	1.95E-03	1.22E-03	1.22E-03	2.42E-01	2.64E-05	2.06E-05	2.49E-01
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	7.11E-02	1.24E-01	5.44E-05	6.50E-03	4.06E-03	4.06E-03	9.68E-01	1.05E-04	8.25E-05	9.96E-01
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	2.13E-01	3.71E-01	1.63E-04	1.95E-02	1.22E-02	1.22E-02	2.91E+00	3.16E-04	2.48E-04	2.99E+00
PICKUP TRUCK 3/4 T	Off-highway Trucks	2.80E+00	4.86E+00	2.14E-03	2.56E-01	1.60E-01	1.60E-01	4.84E+02	9.97E-03	4.13E-02	4.97E+02
TRUCK TRACTOR 2-1/2 T 6X4 & S T 6X6	Off-highway Trucks	3.85E-01	6.69E-01	2.95E-04	3.52E-02	2.20E-02	2.20E-02	6.23E+01	1.28E-03	5.31E-03	6.39E+01

Fugitive Dust		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Dust from On Site Activities		0	0	0	0	3.55E+01	3.86E+00	0	0	0	0
Onroad											
MOVES Vehicle Class		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Resuspended Road Dust		0	0	0	0	2.27E-02	5.67E-03	0	0	0	0
Worker Commute (Gas Passenger Truck)	31	4.45E-01	2.74E-02	3.41E-04	3.73E-03	4.42E-04	3.91E-04	5.80E+01	1.10E-03	2.42E-04	5.81E+01
Material Hauling (Single Unit Truck)	52	2.12E-04	2.89E-04	7.13E-07	1.38E-05	6.37E-06	5.86E-06	1.93E-01	1.74E-06	2.53E-05	2.00E-01

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>)

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC. https://www.baaqmd.gov/~media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.aspx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

ⁱ Calculated from MOVES for Olmsted County, MN Assumption:

1 kWh = 1.34 hp-hr

lb/metric ton

2204.62

CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
6.36	10.92	0.00	0.57	0.37	0.37	1123.89	0.02	0.10	1152.93
0.00	0.00	0.00	0.00	35.53	3.86	0.00	0.00	0.00	0.00
0.45	0.03	0.00	0.00	0.02	0.01	58.15	0.00	0.00	58.25
6.80	10.95	0.01	0.58	35.92	4.23	1,182.04	0.02	0.10	1,211.19

Equipment

Fugitive Dust

Onroad

Total

Equipment	MOVES Lookup ID	SCAB Lookup ID	Fuel	HP	Typical Hours per day	Typical Days/Year	Count	Total Hours Used	Load Factor ^c
Equipment									
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	Off-Highway Trucks	Diesel	13.5	2	66	1	132	0.59
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	94	2	96	2	384	0.21
BUCKET 105' WORK HEIGHT	Aerial Lifts	Aerial Lifts	Diesel	300	8	160	3	3840	0.21
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	Aerial Lifts	Diesel	350	8	160	1	1280	0.21
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	Aerial Lifts	Diesel	300	8	66	2	1056	0.21
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	Cranes	Diesel	450	2	96	1	192	0.43
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	Cranes	Diesel	450	8	160	6	7680	0.43
DIGGER DERRICK 15 T CAP	Cranes	Cranes	Diesel	330	8	160	4	5120	0.43
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	Cranes	Diesel	300	8	66	2	1056	0.43
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	4	96	1	384	0.59
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	190	4	96	1	384	0.59
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	6	66	1	396	0.59
EXCAVATOR 25 T	Excavators	Excavators	Diesel	172	4	66	1	264	0.59
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	Forklifts	Diesel	142	4	160	3	1920	0.59
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	Rubber Tired Loaders	Diesel	386	4	160	4	2560	0.59
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	Generator Sets	Diesel	38	8	90	4	2880	0.43
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	Other Construction Equipment	Diesel	80	2	81	1	162	0.59
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	74	2	81	1	162	0.59
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	400	2	81	1	162	0.59
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	115	2	81	1	162	0.59
300T AT Setting Crane	Cranes	Cranes	Diesel	577	6	135	1	810	0.43
60T RT Crane	Cranes	Cranes	Diesel	320	4	160	4	2560	0.43
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	Skid Steer Loaders	Diesel	95	4	160	5	3200	0.21
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	505	2	160	1	320	0.21
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	160	2	1280	0.21
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	160	6	3840	0.21
PICKUP TRUCK 3/4 T	Off-highway Trucks	Off-highway Trucks	Diesel	420	8	160	14	17920	0.59
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	Off-highway Trucks	Diesel	450	4	96	6	2304	0.59

Fugitive Dust									
Dust from On Site Activities									
Onroad									
MOVES Vehicle Class									
			Fuel Type	VMT	Onroad Fuel ID	Year	MOVES Road Type	MOVES Day Type	
Resuspended Road Dust									
Worker Commute (Gas Passenger Truck)									
	31		Gasoline	475,200	1	2027	3	5	
Material Hauling (Single Unit Truck)									
	52		Diesel	2,550	2	2027	3	5	

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC. https://www.baaqmd.gov/~/_media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

Assumption:
1 kWh = 1.34 hp-hr

Equipment	MOVES Lookup ID	Emission Factors (g/hp-hr) ^{ab}						Emission Factors (g/hr) ^b			
		CO	NO _x ^e	SO ₂ ^d	VOC ^e	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O ^h	CO ₂ e ^f
Equipment											
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	4.9254	5.3172	0.0020	0.2799	0.5970	0.5970	56738.8018	2.5437	4.8347	58243.1486
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	23463.4126	0.7832	1.9993	24078.7938
BUCKET 105' WORK HEIGHT	Aerial Lifts	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DIGGER DERRICK 15 T CAP	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	75355.9475	1.9934	6.4211	77319.2766
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938
EXCAVATOR 25 T	Excavators	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	50902.8167	0.8117	4.3375	52215.6719
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	25425.8129	0.6148	2.1665	26086.8142
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	107505.0812	0.8359	9.1606	110255.8274
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	4.1045	5.3172	0.0020	0.2799	0.4478	0.4478	13890.3485	0.4472	1.1836	14254.2436
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	115320.5588	0.4815	9.8265	118260.9032
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	36676.8768	0.4815	3.1253	37620.2418
300T AT Setting Crane	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	137458.6383	1.4314	11.7129	140984.8755
60T RT Crane	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	19396.4227	0.6820	1.6528	19906.0015
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
PICKUP TRUCK 3/4 T	Off-highway Trucks	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743

Emission Factors (g/mi) ⁱ											
MOVES Vehicle Class	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e ^f	
Fugitive Dust											
Dust from On Site Activities											
Onroad											
Resuspended Road Dust											
Worker Commute (Gas Passenger Truck)	31	2.25115	0.12802	0.00179	0.01649	0.00230	0.00204	334.88320	0.00581	0.00135	335.4307235
Material Hauling (Single Unit Truck)	52	0.74725	0.93444	0.00254	0.04249	0.01964	0.01807	755.51917	0.00660	0.10181	786.0235955

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.
https://www.baaqmd.gov/~media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

Assumption:
1 kWh = 1.34 hp-hr

Equipment	MOVES Lookup ID	Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)				
		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e	
Equipment												
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	5.71E-03	6.16E-03	2.32E-06	3.24E-04	6.92E-04	6.92E-04	7.49E+00	3.36E-04	6.38E-04	7.69E+00	
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	3.12E-02	4.44E-02	1.67E-05	2.34E-03	2.49E-03	2.49E-03	9.01E+00	3.01E-04	7.68E-04	9.25E+00	
BUCKET 105' WORK HEIGHT	Aerial Lifts	6.97E-01	1.25E+00	5.33E-04	6.57E-02	3.98E-02	3.98E-02	3.71E+02	1.58E-03	3.16E-02	3.80E+02	
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	2.71E-01	4.71E-01	2.07E-04	2.48E-02	1.55E-02	1.55E-02	1.24E+02	5.28E-04	1.05E-02	1.27E+02	
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	1.92E-01	3.43E-01	1.47E-04	1.81E-02	1.09E-02	1.09E-02	1.02E+02	4.35E-04	8.69E-03	1.05E+02	
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	1.07E-01	1.86E-01	8.19E-05	9.78E-03	6.11E-03	6.11E-03	1.57E+01	2.75E-04	1.34E-03	1.61E+01	
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	4.28E+00	7.43E+00	3.28E-03	3.91E-01	2.44E-01	2.44E-01	6.27E+02	1.10E-02	5.35E-02	6.44E+02	
DIGGER DERRICK 15 T CAP	Cranes	2.09E+00	3.63E+00	1.60E-03	1.91E-01	1.20E-01	1.20E-01	4.18E+02	7.33E-03	3.56E-02	4.29E+02	
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	3.92E-01	7.03E-01	3.00E-04	3.70E-02	2.24E-02	2.24E-02	8.63E+01	1.51E-03	7.35E-03	8.85E+01	
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	7.45E-02	1.06E-01	4.00E-05	5.59E-03	5.96E-03	5.96E-03	1.15E+01	7.65E-04	9.77E-04	1.18E+01	
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	1.24E-01	2.22E-01	9.49E-05	1.17E-02	7.08E-03	7.08E-03	2.89E+01	7.65E-04	2.47E-03	2.97E+01	
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	7.69E-02	1.10E-01	4.12E-05	5.77E-03	6.15E-03	6.15E-03	1.18E+01	7.89E-04	1.01E-03	1.21E+01	
EXCAVATOR 25 T	Excavators	1.10E-01	1.38E-01	5.91E-05	7.27E-03	6.61E-03	6.61E-03	1.34E+01	2.14E-04	1.15E-03	1.38E+01	
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	6.62E-01	8.30E-01	3.55E-04	4.37E-02	3.97E-02	3.97E-02	4.88E+01	1.18E-03	4.16E-03	5.01E+01	
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	1.68E+00	2.92E+00	1.29E-03	1.53E-01	9.59E-02	9.59E-02	2.75E+02	2.14E-03	2.35E-02	2.82E+02	
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	2.13E-01	2.76E-01	1.04E-04	1.45E-02	2.32E-02	2.32E-02	4.00E+01	1.29E-03	3.41E-03	4.11E+01	
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	3.15E-02	4.48E-02	1.69E-05	2.36E-03	2.52E-03	2.52E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00	
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	2.91E-02	4.15E-02	1.56E-05	2.18E-03	2.33E-03	2.33E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00	
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	1.10E-01	1.91E-01	8.43E-05	1.01E-02	6.29E-03	6.29E-03	1.87E+01	7.80E-05	1.59E-03	1.92E+01	
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	4.52E-02	5.67E-02	2.42E-05	2.98E-03	2.71E-03	2.71E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00	
300T AT Setting Crane	Cranes	5.79E-01	1.01E+00	4.43E-04	5.29E-02	3.31E-02	3.31E-02	1.11E+02	1.16E-03	9.49E-03	1.14E+02	
60T RT Crane	Cranes	1.01E+00	1.76E+00	7.77E-04	9.27E-02	5.80E-02	5.80E-02	2.09E+02	3.66E-03	1.78E-02	2.15E+02	
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	2.63E-01	3.74E-01	1.41E-04	1.97E-02	2.10E-02	2.10E-02	6.21E+01	2.18E-03	5.29E-03	6.37E+01	
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	9.77E-02	1.70E-01	7.48E-05	8.93E-03	5.58E-03	5.58E-03	1.11E+00	1.20E-04	9.43E-05	1.14E+00	
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	3.25E-01	5.65E-01	2.49E-04	2.97E-02	1.86E-02	1.86E-02	4.43E+00	4.82E-04	3.77E-04	4.55E+00	
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	9.75E-01	1.69E+00	7.47E-04	8.92E-02	5.57E-02	5.57E-02	1.33E+01	1.45E-03	1.13E-03	1.37E+01	
PICKUP TRUCK 3/4 T	Off-highway Trucks	1.28E+01	2.22E+01	9.79E-03	1.17E+00	7.31E-01	7.31E-01	2.21E+03	4.56E-02	1.89E-01	2.27E+03	
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	1.76E+00	3.06E+00	1.35E-03	1.61E-01	1.01E-01	1.01E-01	2.85E+02	5.86E-03	2.43E-02	2.92E+02	

Fugitive Dust		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Dust from On Site Activities		0	0	0	0	1.41E+02	1.44E+01	0	0	0	0
Onroad		Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)			
MOVES Vehicle Class		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Resuspended Road Dust		0	0	0	0	6.44E-02	1.61E-02	0	0	0	0
Worker Commute (Gas Passenger Truck)	31	1.18E+00	6.71E-02	9.37E-04	8.64E-03	1.21E-03	1.07E-03	1.59E+02	2.76E-03	6.41E-04	1.59E+02
Material Hauling (Single Unit Truck)	52	2.10E-03	2.63E-03	7.13E-06	1.19E-04	5.52E-05	5.08E-05	1.93E+00	1.68E-05	2.60E-04	2.00E+00

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis/handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.
[https://www.baaqmd.gov/~media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.aspx](https://www.baaqmd.gov/~/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.aspx)

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

Assumption:
1 kWh = 1.34 hp-hr

CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
29.02	49.84	0.02	2.62	1.68	1.68	5126.21	0.09	0.44	5258.66
0.00	0.00	0.00	0.00	140.77	14.38	0.00	0.00	0.00	0.00
1.18	0.07	0.00	0.01	0.07	0.02	161.06	0.00	0.00	161.40
30.20	49.91	0.02	2.63	142.52	16.08	5,287.28	0.09	0.44	5,420.06

Equipment

Fugitive Dust

Onroad

Total

Equipment	MOVES Lookup ID	SCAB Lookup ID	Fuel	HP	Typical Hours per day	Typical Days/Year	Count	Total Hours Used	Load Factor ^c
Equipment									
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	Off-Highway Trucks	Diesel	13.5	2	69	1	138	0.59
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	94	2	99	2	396	0.21
BUCKET 105' WORK HEIGHT	Aerial Lifts	Aerial Lifts	Diesel	300	8	165	3	3960	0.21
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	Aerial Lifts	Diesel	350	8	165	1	1320	0.21
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	Aerial Lifts	Diesel	300	8	69	2	1104	0.21
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	Cranes	Diesel	450	2	99	1	198	0.43
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	Cranes	Diesel	450	8	165	6	7920	0.43
DIGGER DERRICK 15 T CAP	Cranes	Cranes	Diesel	330	8	165	4	5280	0.43
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	Cranes	Diesel	300	8	69	2	1104	0.43
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	4	99	1	396	0.59
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	190	4	99	1	396	0.59
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	Crawler Tractors	Diesel	80	6	69	1	414	0.59
EXCAVATOR 25 T	Excavators	Excavators	Diesel	172	4	69	1	276	0.59
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	Forklifts	Diesel	142	4	165	3	1980	0.59
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	Rubber Tired Loaders	Diesel	386	4	165	4	2640	0.59
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	Generator Sets	Diesel	38	8	90	4	2880	0.43
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	Other Construction Equipment	Diesel	80	2	81	1	162	0.59
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	74	2	81	1	162	0.59
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	400	2	81	1	162	0.59
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	Other Construction Equipment	Diesel	115	2	81	1	162	0.59
300T AT Setting Crane	Cranes	Cranes	Diesel	577	6	135	1	810	0.43
60T RT Crane	Cranes	Cranes	Diesel	320	4	165	4	2640	0.43
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	Skid Steer Loaders	Diesel	95	4	165	5	3300	0.21
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	505	2	165	1	330	0.21
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	165	2	1320	0.21
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	Dumpers/Tenders Composite	Diesel	420	4	165	6	3960	0.21
PICKUP TRUCK 3/4 T	Off-highway Trucks	Off-highway Trucks	Diesel	420	8	165	14	18480	0.59
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	Off-highway Trucks	Diesel	450	4	99	6	2376	0.59

Equipment	MOVES Vehicle Class	Fuel Type	VMT	Onroad Fuel ID	Year	MOVES Road Type	MOVES Day Type
Fugitive Dust							
Dust from On Site Activities							
Onroad							
Resuspended Road Dust							
Worker Commute (Gas Passenger Truck)	31	Gasoline	668,250	1	2028	3	5
Material Hauling (Single Unit Truck)	52	Diesel	3,650	2	2028	3	5

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC. https://www.baaqmd.gov/-/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

Assumption:
1 kWh = 1.34 hp-hr

Equipment	MOVES Lookup ID	Emission Factors (g/hp-hr) ^{ab}						Emission Factors (g/hr) ^b			
		CO	NO _x ^e	SO ₂ ^d	VOC ^e	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O ^h	CO ₂ e ^f
Equipment											
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	4.9254	5.3172	0.0020	0.2799	0.5970	0.5970	56738.8018	2.5437	4.8347	58243.1486
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	23463.4126	0.7832	1.9993	24078.7938
BUCKET 105' WORK HEIGHT	Aerial Lifts	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	96549.7784	0.4122	8.2271	99011.7486
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DIGGER DERRICK 15 T CAP	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	2.6119	4.6791	0.0020	0.2463	0.1493	0.1493	75355.9475	1.9934	6.4211	77319.2766
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	29851.1565	1.9934	2.5436	30658.9938
EXCAVATOR 25 T	Excavators	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	50902.8167	0.8117	4.3375	52215.6719
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	25425.8129	0.6148	2.1665	26086.8142
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	107505.0812	0.8359	9.1606	110255.8274
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	4.1045	5.3172	0.0020	0.2799	0.4478	0.4478	13890.3485	0.4472	1.1836	14254.2436
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	36676.8768	0.4815	3.1253	37620.2418
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	115320.5588	0.4815	9.8265	118260.9032
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	3.7313	4.6791	0.0020	0.2463	0.2239	0.2239	36676.8768	0.4815	3.1253	37620.2418
300T AT Setting Crane	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	137458.6383	1.4314	11.7129	140984.8755
60T RT Crane	Cranes	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	81692.4933	1.4314	6.9611	83802.6746
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	3.7313	5.3172	0.0020	0.2799	0.2985	0.2985	19396.4227	0.6820	1.6528	19906.0015
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	3458.3652	0.3764	0.2947	3555.5937
PICKUP TRUCK 3/4 T	Off-highway Trucks	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	2.6119	4.5373	0.0020	0.2388	0.1493	0.1493	123528.4545	2.5437	10.5259	126728.7743

Fugitive Dust												
Dust from On Site Activities												
Emission Factors (g/mi) ^l												
Onroad	MOVES Vehicle Class	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e ^f	
	Resuspended Road Dust											
	Worker Commute (Gas Passenger Truck)	31	2.11264	0.11115	0.00177	0.01440	0.00215	0.00190	330.40116	0.00542	0.00127	330.9135593
	Material Hauling (Single Unit Truck)	52	0.72884	0.84225	0.00249	0.03655	0.01548	0.01425	742.72918	0.00630	0.10234	773.3824351

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.
https://www.baaqmd.gov/~media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

Assumption:
1 kWh = 1.34 hp-hr

Equipment	MOVES Lookup ID	Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)			
		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Equipment											
ATV 4 TO 6 WHEEL W/ DUMP	Off-Highway Trucks	5.97E-03	6.44E-03	2.42E-06	3.39E-04	7.23E-04	7.23E-04	7.83E+00	3.51E-04	6.67E-04	8.04E+00
BACKHOE W/ LOADER 4X4	Tractors/Loaders/Backhoes	3.22E-02	4.58E-02	1.72E-05	2.41E-03	2.57E-03	2.57E-03	9.29E+00	3.10E-04	7.92E-04	9.54E+00
BUCKET 105' WORK HEIGHT	Aerial Lifts	7.18E-01	1.29E+00	5.50E-04	6.77E-02	4.10E-02	4.10E-02	3.82E+02	1.63E-03	3.26E-02	3.92E+02
BUCKET 125' WORK HEIGHT 8X6	Aerial Lifts	2.79E-01	4.85E-01	2.14E-04	2.55E-02	1.60E-02	1.60E-02	1.27E+02	5.44E-04	1.09E-02	1.31E+02
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	Aerial Lifts	2.00E-01	3.59E-01	1.53E-04	1.89E-02	1.14E-02	1.14E-02	1.07E+02	4.55E-04	9.08E-03	1.09E+02
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	Cranes	1.10E-01	1.92E-01	8.45E-05	1.01E-02	6.30E-03	6.30E-03	1.62E+01	2.83E-04	1.38E-03	1.66E+01
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	Cranes	4.41E+00	7.66E+00	3.38E-03	4.03E-01	2.52E-01	2.52E-01	6.47E+02	1.13E-02	5.51E-02	6.64E+02
DIGGER DERRICK 15 T CAP	Cranes	2.16E+00	3.75E+00	1.65E-03	1.97E-01	1.23E-01	1.23E-01	4.31E+02	7.56E-03	3.68E-02	4.42E+02
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	Cranes	4.10E-01	7.35E-01	3.14E-04	3.87E-02	2.34E-02	2.34E-02	9.02E+01	1.58E-03	7.69E-03	9.25E+01
DOZER 10 THRU 12 T, W/ WINCH	Crawler Tractor/Dozers	7.69E-02	1.10E-01	4.12E-05	5.77E-03	6.15E-03	6.15E-03	1.18E+01	7.89E-04	1.01E-03	1.21E+01
DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	1.28E-01	2.29E-01	9.79E-05	1.21E-02	7.30E-03	7.30E-03	2.98E+01	7.89E-04	2.54E-03	3.06E+01
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	Crawler Tractor/Dozers	8.04E-02	1.15E-01	4.31E-05	6.03E-03	6.43E-03	6.43E-03	1.24E+01	8.25E-04	1.05E-03	1.27E+01
EXCAVATOR 25 T	Excavators	1.15E-01	1.44E-01	6.17E-05	7.60E-03	6.91E-03	6.91E-03	1.40E+01	2.24E-04	1.20E-03	1.44E+01
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	Forklifts	6.82E-01	8.56E-01	3.66E-04	4.50E-02	4.09E-02	4.09E-02	5.03E+01	1.22E-03	4.29E-03	5.17E+01
FRONT END LOADER 68,000# 4X4	Rubber Tire Loaders	1.73E+00	3.01E+00	1.33E-03	1.58E-01	9.89E-02	9.89E-02	2.84E+02	2.21E-03	2.42E-02	2.91E+02
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	Generator Sets	2.13E-01	2.76E-01	1.04E-04	1.45E-02	2.32E-02	2.32E-02	4.00E+01	1.29E-03	3.41E-03	4.11E+01
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	Other Construction Equipment	3.15E-02	4.48E-02	1.69E-05	2.36E-03	2.52E-03	2.52E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	Other Construction Equipment	2.91E-02	4.15E-02	1.56E-05	2.18E-03	2.33E-03	2.33E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	1.10E-01	1.91E-01	8.43E-05	1.01E-02	6.29E-03	6.29E-03	1.87E+01	7.80E-05	1.59E-03	1.92E+01
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	Other Construction Equipment	4.52E-02	5.67E-02	2.42E-05	2.98E-03	2.71E-03	2.71E-03	5.94E+00	7.80E-05	5.06E-04	6.09E+00
300T AT Setting Crane	Cranes	5.79E-01	1.01E+00	4.43E-04	5.29E-02	3.31E-02	3.31E-02	1.11E+02	1.16E-03	9.49E-03	1.14E+02
60T RT Crane	Cranes	1.05E+00	1.82E+00	8.01E-04	9.56E-02	5.98E-02	5.98E-02	2.16E+02	3.78E-03	1.84E-02	2.21E+02
SKID STEER LOADER TRACK MTD 80 > 75 HP	Skid Steer Loaders	2.71E-01	3.86E-01	1.45E-04	2.03E-02	2.17E-02	2.17E-02	6.40E+01	2.25E-03	5.45E-03	6.57E+01
DUMP BOX TRUCK 2-1/2 T 6X6	Dumpers/Tenders	1.01E-01	1.75E-01	7.72E-05	9.21E-03	5.76E-03	5.76E-03	1.14E+00	1.24E-04	9.72E-05	1.17E+00
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	3.35E-01	5.82E-01	2.57E-04	3.06E-02	1.92E-02	1.92E-02	4.57E+00	4.97E-04	3.89E-04	4.69E+00
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	Dumpers/Tenders	1.01E+00	1.75E+00	7.70E-04	9.19E-02	5.75E-02	5.75E-02	1.37E+01	1.49E-03	1.17E-03	1.41E+01
PICKUP TRUCK 3/4 T	Off-highway Trucks	1.32E+01	2.29E+01	1.01E-02	1.21E+00	7.53E-01	7.53E-01	2.28E+03	4.70E-02	1.95E-01	2.34E+03
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	Off-highway Trucks	1.82E+00	3.16E+00	1.39E-03	1.66E-01	1.04E-01	1.04E-01	2.94E+02	6.04E-03	2.50E-02	3.01E+02

Fugitive Dust		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Dust from On Site Activities		0	0	0	0	1.45E+02	1.48E+01	0	0	0	0
Onroad		Criteria Air Pollutant Emissions (ton / year)						GHG Emissions (metric ton/year)			
MOVES Vehicle Class		CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
Resuspended Road Dust		0	0	0	0	9.06E-02	2.27E-02	0	0	0	0
Worker Commute (Gas Passenger Truck)	31	1.56E+00	8.19E-02	1.30E-03	1.06E-02	1.58E-03	1.40E-03	2.21E+02	3.62E-03	8.45E-04	2.21E+02
Material Hauling (Single Unit Truck)	52	2.93E-03	3.39E-03	1.00E-05	1.47E-04	6.23E-05	5.73E-05	2.71E+00	2.30E-05	3.74E-04	2.82E+00

^a EPA Tier II Emissions

^b South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis/handbook/off-road-mobile-source-emission-factors>) Load factor equal to 1 for these emission factors.

^c Load Factors from MOVES4

^d EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines.

^e Assumed breakdown of 5% for NMHC and 95% for NO_x emissions. NMHC used as VOC.
https://www.baaqmd.gov/-/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx

^f Global Warming Potentials from 40 CFR 98 Table A-1

^g N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^h N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimateregistry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O	CO ₂ e
29.91	51.36	0.02	2.70	1.73	1.73	5283.68	0.09	0.45	5420.19
0.00	0.00	0.00	0.00	144.98	14.80	0.00	0.00	0.00	0.00
1.56	0.09	0.00	0.01	0.09	0.02	223.50	0.00	0.00	223.96
31.47	51.45	0.02	2.71	146.81	16.56	5,507.18	0.10	0.45	5,644.15

Equipment

Fugitive Dust

Onroad

Total

0.010751742
0.010751742

Assumption:
1 kWh = 1.34 hp-hr

Resuspended Road Dust from Construction
Year: 2026

SpeedBin	MOVES ID	Weight tons	Total Vehicle Miles Traveled (VMT) per Speed Bin						16
			Low ADT Road			High ADT Road			
			5	6	7	12	13		
Passenger Truck		31	5	0	0	0	170100	0	0
Single Unit Truck		52	20	0	0	0	250	0	0

Vehicle Type	Pollutant	Road Type	k (g/VMT)	sL	W	P	VMT	Emissions (tons)
Passenger Truck	PM _{2.5}	High ADT Road	0.25	0.12	5	110	170100	0.0056
Passenger Truck	PM ₁₀	High ADT Road	1	0.12	5	110	170100	0.0226
Passenger Truck	PM _{2.5}	Low ADT Road	0.25	0.6	5	110	0	0.0000
Passenger Truck	PM ₁₀	Low ADT Road	1	0.6	5	110	0	0.0000
Single Unit Truck	PM _{2.5}	High ADT Road	0.25	0.12	20	110	250	0.0000
Single Unit Truck	PM ₁₀	High ADT Road	1	0.12	20	110	250	0.0001
Single Unit Truck	PM _{2.5}	Low ADT Road	0.25	0.6	20	110	0	0.0000
Single Unit Truck	PM ₁₀	Low ADT Road	1	0.6	20	110	0	0.0000

Silt Loading	AP-42 Roadway Category	sL (Winter)
High ADT Road	5000-10000 ADT	0.12
Low ADT Road	500-5000 ADT	0.6

Total	
PM _{2.5}	0.005674821 tons
PM ₁₀	0.022699285 tons

Formula used from AP-42 Section 13.2.1 "Paved Roads"

$$E = k (sL/2)^{0.91} (W/3)^{1.02} (1-P/4N)$$

E = particulate emission factor (having units matching the units of k)

k = particle size multiplier for particle size range and units of interest, From AP-42 Table 13.2-1.1

sL = road surface silt loading (grams per square meter) (g/m²), Assume winter time condition

W = average weight (tons) of the vehicles traveling the road

Figure 13.2.1-2 estimates that days of precipitation >0.01 inch per year (P) is approximately 80; N is 365 days.

Resuspended Road Dust from Construction
Year: 2027

SpeedBin	MOVES ID	Weight tons	Total Vehicle Miles Traveled (VMT) per Speed Bin						16
			Low ADT Road			High ADT Road			
			5	6	7	12	13		
Passenger Truck	31	5	0	0	0	475200	0	0	
Single Unit Truck	52	20	0	0	0	2550	0	0	

Vehicle Type	Pollutant	Road Type	k (g/VMT)	sL	W	P	VMT	Emissions (tons)
Passenger Truck	PM _{2.5}	High ADT Road	0.25	0.12	5	110	475200	0.0158
Passenger Truck	PM ₁₀	High ADT Road	1	0.12	5	110	475200	0.0630
Passenger Truck	PM _{2.5}	Low ADT Road	0.25	0.6	5	110	0	0.0000
Passenger Truck	PM ₁₀	Low ADT Road	1	0.6	5	110	0	0.0000
Single Unit Truck	PM _{2.5}	High ADT Road	0.25	0.12	20	110	2550	0.0003
Single Unit Truck	PM ₁₀	High ADT Road	1	0.12	20	110	2550	0.0014
Single Unit Truck	PM _{2.5}	Low ADT Road	0.25	0.6	20	110	0	0.0000
Single Unit Truck	PM ₁₀	Low ADT Road	1	0.6	20	110	0	0.0000

Silt Loading	AP-42 Roadway Category	sL (Winter)
High ADT Road	5000-10000 ADT	0.12
Low ADT Road	500-5000 ADT	0.6

Total	
PM _{2.5}	0.016105977 tons
PM ₁₀	0.064423909 tons

Formula used from AP-42 Section 13.2.1 "Paved Roads"

$$E = k (sL/2)^{0.91} (W/3)^{1.02} (1-P/4N)$$

E = particulate emission factor (having units matching the units of k)

k = particle size multiplier for particle size range and units of interest, From AP-42 Table 13.2-1.1

sL = road surface silt loading (grams per square meter) (g/m²), Assume winter time condition

W = average weight (tons) of the vehicles traveling the road

Figure 13.2.1-2 estimates that days of precipitation >0.01 inch per year (P) is approximately 80; N is 365 days.

Resuspended Road Dust from Construction
Year: 2028

SpeedBin	MOVES ID	Weight tons	Total Vehicle Miles Traveled (VMT) per Speed Bin						16
			Low ADT Road			High ADT Road			
			5	6	7	12	13		
Passenger Truck	31	5	0	0	0	668250	0	0	
Single Unit Truck	52	20	0	0	0	3650	0	0	

Vehicle Type	Pollutant	Road Type	k (g/VMT)	sL	W	P	VMT	Emissions (tons)
Passenger Truck	PM _{2.5}	High ADT Road	0.25	0.12	5	110	668250	0.0222
Passenger Truck	PM ₁₀	High ADT Road	1	0.12	5	110	668250	0.0886
Passenger Truck	PM _{2.5}	Low ADT Road	0.25	0.6	5	110	0	0.0000
Passenger Truck	PM ₁₀	Low ADT Road	1	0.6	5	110	0	0.0000
Single Unit Truck	PM _{2.5}	High ADT Road	0.25	0.12	20	110	3650	0.0005
Single Unit Truck	PM ₁₀	High ADT Road	1	0.12	20	110	3650	0.0020
Single Unit Truck	PM _{2.5}	Low ADT Road	0.25	0.6	20	110	0	0.0000
Single Unit Truck	PM ₁₀	Low ADT Road	1	0.6	20	110	0	0.0000

Silt Loading	AP-42 Roadway Category	sL (Winter)
High ADT Road	5000-10000 ADT	0.12
Low ADT Road	500-5000 ADT	0.6

Total	
PM _{2.5}	0.022657767 tons
PM ₁₀	0.090631068 tons

Formula used from AP-42 Section 13.2.1 "Paved Roads"

$$E = k (sL/2)^{0.91} (W/3)^{1.02} (1-P/4N)$$

E = particulate emission factor (having units matching the units of k)

k = particle size multiplier for particle size range and units of interest, From AP-42 Table 13.2-1.1

sL = road surface silt loading (grams per square meter) (g/m²), Assume winter time condition

W = average weight (tons) of the vehicles traveling the road

Figure 13.2.1-2 estimates that days of precipitation >0.01 inch per year (P) is approximately 80; N is 365 days.

Construction Fugitive Dust
Year: 2026

Activities	Construction Duration (Days)	Area Affected (ac) or Mileage ⁶	WRAP Level ¹	Duration or Tonnage ⁵	Emission Factor ^{2,3}			Control Efficiency ⁴	Emission (tons/year)	
					Emission Factor Unit	PM ₁₀	PM _{2.5}		PM ₁₀	PM _{2.5}
ROW (Soil Disturbance)	42	382.7	1	1.4	ton/ac-month	0.11	0.011	50%	29.468	2.947
Passenger Trucks Onsite Mileage (Passenger Truck)	42	0	4	5	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Support Trucks Onsite Mileage (Heavy Vehicle)	42	0	4	20	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Wind Erosion	42	382.7		1.00	ton/ac-year	0.38	0.057	50%	6.059	0.909
Fugitive Dust Total									35.528	3.856

¹ WRAP level from Table 3-2.Ch 3 of WRAP Fugitive Dust Handbook Sep/2006: https://www.wrapair.org/forums/dejfdh/content/FDHandbook_Rev_06.pdf

² PM2.5/PM10 is set at 0.1 per guideline listed on section 3.31 of WRAP handbook, 0.15 for Wind Erosion per Section 9.2 of WRAP handbook

³ Wind Erosion Emission Factor extracted from WRAP handbook Table 11-6, assumed 100% of TSP is PM10

⁴ 50% of Wet Suppression per WRAP handbook Page 8

⁵ The unit for Duration is either month or year depending on the Emission Factor Unit. 20 tons was assume for Heavy Truck, 5 tons for passenger trucks

⁶ Assume no on-site mileage from passenger or support trucks. Acreage applicable for the longest alignment alternative and a 20-foot buffer.

Construction Fugitive Dust
Year: 2027

Activities	Construction Duration (Days)	Area Affected (ac) or Mileage ⁶	WRAP Level ¹	Duration or Tonnage ⁵	Emission Factor ^{2,3}			Control Efficiency ⁴	Emission (tons/year)	
					Emission Factor Unit	PM ₁₀	PM _{2.5}		PM ₁₀	PM _{2.5}
ROW (Soil Disturbance)	192	382.7	1	6.4	ton/ac-month	0.11	0.011	50%	134.712	13.471
Passenger Trucks Onsite Mileage (Passenger Truck)	192	0	4	5	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Support Trucks Onsite Mileage (Heavy Vehicle)	192	0	4	20	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Wind Erosion	192	382.7		1.00	ton/ac-year	0.38	0.057	50%	6.059	0.909
Fugitive Dust Total									140.772	14.380

¹ WRAP level from Table 3-2.Ch 3 of WRAP Fugitive Dust Handbook Sep/2006: https://www.wrapair.org/forums/dejfdh/content/FDHandbook_Rev_06.pdf

² PM2.5/PM10 is set at 0.1 per guideline listed on section 3.31 of WRAP handbook, 0.15 for Wind Erosion per Section 9.2 of WRAP handbook

³ Wind Erosion Emission Factor extracted from WRAP handbook Table 11-6, assumed 100% of TSP is PM10

⁴ 50% of Wet Suppression per WRAP handbook Page 8

⁵ The unit for Duration is either month or year depending on the Emission Factor Unit. 20 tons was assume for Heavy Truck, 5 tons for passenger trucks

⁶ Assume no on-site mileage from passenger or support trucks. Acreage applicable for the longest alignment alternative and a 20-foot buffer.

Construction Fugitive Dust
Year: 2028

Activities	Construction Duration (Days)	Area Affected (ac) or Mileage ⁶	WRAP Level ¹	Duration or Tonnage ⁵	Emission Factor ^{2,3}			Control Efficiency ⁴	Emission (tons/year)	
					Emission Factor Unit	PM ₁₀	PM _{2.5}		PM ₁₀	PM _{2.5}
ROW (Soil Disturbance)	198	382.7	1	6.6	ton/ac-month	0.11	0.011	50%	138.922	13.892
Passenger Trucks Onsite Mileage (Passenger Truck)	198	0	4	5	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Support Trucks Onsite Mileage (Heavy Vehicle)	198	0	4	20	lb/ton-mile	0.21	0.021	50%	0.000	0.000
Wind Erosion	198	382.7		1.00	ton/ac-year	0.38	0.057	50%	6.059	0.909
Fugitive Dust Total									144.981	14.801

¹ WRAP level from Table 3-2.Ch 3 of WRAP Fugitive Dust Handbook Sep/2006: https://www.wrapair.org/forums/dejff/fdh/content/FDHandbook_Rev_06.pdf

² PM2.5/PM10 is set at 0.1 per guideline listed on section 3.31 of WRAP handbook, 0.15 for Wind Erosion per Section 9.2 of WRAP handbook

³ Wind Erosion Emission Factor extracted from WRAP handbook Table 11-6, assumed 100% of TSP is PM10

⁴ 50% of Wet Suppression per WRAP handbook Page 8

⁵ The unit for Duration is either month or year depending on the Emission Factor Unit. 20 tons was assume for Heavy Truck, 5 tons for passenger trucks

⁶ Assume no on-site mileage from passenger or support trucks. Acreage applicable for the longest alignment alternative and a 20-foot buffer.

HOOPER AND RENTAL EQUIPMENT (POWERED)	Quantity	Anticipated Horsepower	Typical Hour/day	Typical Days/week	Weeks
Worker Commuting Vehicles	45	300	2	6	72
ATV 4 TO 6 WHEEL, W/ DUMP	1	13.5	2	3	50
BACKHOE W/ LOADER 4X4	2	94	2	3	72
BUCKET 105' WORK HEIGHT	3	300	8	5	72
BUCKET 125' WORK HEIGHT 8X6	1	350	8	5	72
BUCKET 77' WORK HEIGHT SWAMP TRK MTD	2	300	8	3	50
TRUCK MTD 4 T ARTICULATING BOOM W/ FORKS & CLAM	1	450	2	3	72
CRANE TRUCK 45 T HYDRAULIC 6 AXLE	6	450	8	5	72
DIGGER DERRICK 15 T CAP	4	330	8	5	72
DIGGER DERRICK 15 T CAP SWAMP TRACK MTD	2	300	8	3	50
DOZER 10 THRU 12 T, W/ WINCH	1	80	4	3	72
DOZER 18 T W/ WINCH	1	190	4	3	72
CRAWLER CARRIER W/ 360 DUMP BOX OR DOZER 18 T W/ WINCH	1	80	6	3	50
EXCAVATOR 25 T	1	172	4	3	50
FORKLIFT 11,000 THRU 12,000# TELESCOPIC BOOM	3	142	4	5	72
FRONT END LOADER 68,000# 4X4	4	386	4	5	72
GENERATOR 23KW THRU 60KW TRAILER MOUNTED TOW TYPE	4	38	8	5	40
HYDRAULIC BULLWHEEL BUNDLE TENSIONER	1	80	2	3	60
PULLER ROPE TRAILER 4,000# CAP W/ SPLIT REEL TOW TYPE TANDEM AXLE	1	74	2	3	60
PULLER CABLE TRAILER 30,000# CAP TOW TYPE TANDEM AXLE	1	400	2	3	60
PULLER ROPE TRAILER 4 DRUM 3,500# CAP TOW TYPE TANDEM AXLE	1	115	2	3	60
300T AT Setting Crane	1	577	6	5	60
60T RT Crane	4	320	4	5	72
SKID STEER LOADER TRACK MTD 80 > 75 HP	5	95	4	5	72
DUMP BOX TRUCK 2-1/2 T 6X6	1	505	2	5	72
DUMP BOX TRUCK 1-1/4 & 1-1/2 T	2	420	4	5	72
FLATBED (FRAMING) TRUCK 1-1/4 & 1-1/2 T	6	420	4	5	72
PICKUP TRUCK 3/4 T	14	420	8	5	72
TRUCK TRACTOR 2-1/2 T 6X4 & 5 T 6X6	6	450	4	3	72

Total Construction Days
432
150
216
360
360
150
216
360
360
150
216
216
150
150
360
360
200
180
180
180
180
300
360
360
360
360
360
360
216

9.2% 44.6% 46.2%		
Weeks by Year		
2026	2027	2028
7	32	33
5	22	23
7	32	33
7	32	33
7	32	33
5	22	23
7	32	33
7	32	33
7	32	33
5	22	23
7	32	33
7	32	33
7	32	33
5	22	23
5	22	23
7	32	33
7	32	33
4	18	18
6	27	27
6	27	27
6	27	27
6	27	27
6	27	27
7	32	33
7	32	33
7	32	33
7	32	33
7	32	33
7	32	33
7	32	33
7	32	33

9.2% 44.6% 46.2%		
Days by Year		
2026	2027	2028
42	192	198
15	66	69
21	96	99
35	160	165
35	160	165
15	66	69
21	96	99
21	96	99
15	66	69
15	66	69
35	160	165
35	160	165
20	90	90
18	81	81
18	81	81
18	81	81
18	81	81
30	135	135
35	160	165
35	160	165
35	160	165
35	160	165
35	160	165
35	160	165
21	96	99

Data Request

1. Construction Year (s)
2. County where construction occurs
3. Total area of disturbance (acres)

4. Staging area size if it is not included in the total area of disturbance (acres)

5. Worker commute round trip mileage broken down for every construction year and average speed of the commute

6. Vehicle used and fuel type for worker commute.
7. Material hauling round trip mileage broken down in every construction year and average speed of the hauling. Diesel assumed for the material hauling trips.
8. Route for worker commute and material hauling.
9. Construction equipment list, including horsepower and hour usage broken down for every construction year
10. Fuel type of the construction equipment.
11. Work Schedule per year

Response

2026, 2027 & 2028
Blue Earth, Goodhue, LeSueur, Omsted, Rice, Wabasha, Waseca
4333.23 (acres)
It is anticipated that there will be 5 to 6 yards averaging 10 acres each, spaced at approximately 20 miles and located within 5 miles of the project. For the purposes of this estimate, yards were assumed near the following cities: Mankato, Morristown, Faribault, Kenyon, Rochester, and Plainview.

1. Assume around 45 workers.
2. Assume most of the commutes would be at hwy speeds (55mph) with some slower speeds on smaller roads.
3. Average Commuter Round Trip mileage (one day's mileage): 90mi (2026), 55mi (2027), and 75mi (2028)
Assume F150 with Gas (not diesel)
1. Assume diesel.
2. Assume most of the commutes would be at hwy speeds (55mph) with some slower speeds on smaller roads.
3. Total material hauling mileage by year: 250mi (2026), 2550mi (2027), and 3650mi (2028)
Assume major roads used: HWY's 35, 66, 60, 13, 56, & 14 with other township roads used as well.
Weeks of equipment usage provided by Hooper have been broken out into construction years based on the percentages of work in each year.
Assume diesel fuel for equipment.

Xcel Energy
MMRTP
Operations and Maintenance Emissions
Summary

Activity	CO2	CH4	N2O	CO2e
Equipment	16.75	7.06E-04	1.43E-03	17.19
Helicopter	3.57	1.48E-04	2.97E-05	3.58
Onroad	0.01	2.19E-07	5.12E-08	0.01
Total	20.33	8.55E-04	1.46E-03	20.79

Xcel Energy
MMRTP
Operations and Maintenance Emissions
Per Year

Equipment ^b	SCAB Lookup ID	Fuel	HP ^b	Number of Units ^b	Total Operation Time (hr) ^b				
Equipment									
E4_OTL EQP_PICKUP TRUCK-F350_CREW CAB_8001-11K_4X4	Off-Highway Trucks	Diesel	500	1	15				
K8_OTL EQP_HEAVY BUCKET TRUCK100 FT_RUBBER TIRE_6X6	Off-Highway Trucks	Diesel	500	1	15				
N4_OTL EQP_TRUCK MOUNTEDCRANE_45T/50T_RUBBER TIRE	Cranes	Diesel	500	1	15				
S2_OTL EQP_BACKHOE-LOADER RUBBER TIRE_4X4	Tractors/Loaders/Backhoes	Diesel	120	1	15				
U1_OTL EQP_SKID STEERLOADER_TRACKED	Skid Steer Loaders	Diesel	120	1	15				
W2_OTL EQP_ATV/UTV POLARIS/CANAM/ARGO RUBBER	Rubber Tired Loaders	Diesel	25	1	60				
R1_OTL EQP_TRAILERUTV/FRAMING/ENCLOSED_<=12K_RUBBER TIRE_TAN	Other Construction Equipment	Diesel	120	1	60				
D2_OTL EQP_PICKUP TRUCK-F150_6001-8K_4X4	Off-Highway Trucks	Diesel	500	1	60				
R2_OTL EQP_TRAILER MEDIUM EQUIP_12001-20K_RUBBER TIRE_TANDEM	Other Construction Equipment	Diesel	120	1	15				
R3_OTL EQP_TRAILER LARGE EQUIP_>20K_RUBBER TIRE_TANDEM	Other Construction Equipment	Diesel	120	1	15				

Helicopter Emissions	Engine Mode	Quantity	Hours/day ^f	Number of days per year	Total Hours	Fuel Flow (Kg/s) ^g	Max Power (HP)	Load Factor ^g	Loaded Power (HP)
Helicopter	Ground Idle	1	1.00	1	1	0.015	420	0.13000	55
Helicopter	Hover and Climb	1	1.25	1	1.25	0.033	420	0.87000	365
Helicopter	Approach	1	1.25	1	1.25	0.025	420	0.46000	193
Helicopter	Flight	1	8.00	1	8	0.031	420	0.80000	336

Onroad	MOVES Vehicle Class	Fuel Type	VMT per day	Number of days per year ⁱ	Onroad Fuel ID	Year	MOVES Road Type	MOVES Day Type	
Ground Patrols (Gas Passenger Truck)	31	Gasoline	10	4.05	1	2028	3	5	

^a South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors>)

^b Based from similar project, values are adjusted proportional to mileage

^c N₂O emissions estimated based on the ratio of g N₂O per gallon of construction diesel to gallons of diesel per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^d N₂O emissions estimated based on the ratio of g N₂O per gallon of construction gasoline to gallons of gasoline per g CO₂, obtained from Tables 2.7 and 2.1, respectively, of the 2022 Climate Registry Default Emission Factors. Retrieved from <https://theclimaterestry.org/wp-content/uploads/2022/11/2022-Default-Emission-Factors-Final.pdf> on April 7, 2023.

^e Global Warming Potentials from 40 CFR 98 Table A-1

^f Conservatively, a maximum of 8 hours of flight time is allocated. Based on the helicopter's flying speed of 30 mph over a distance of 162 miles, the estimated actual flight time is approximately 5.4 hours.

^g Source: Guidance on the Determination of Helicopter Emissions Edition 2 - December 2015. https://www.bazl.admin.ch/dam/bazl/de/dokumente/Fachleute/Regulationen_und_Grundlagen/guidance_on_the_determinationofhelicopteremissions.pdf.download.pdf/guidance_on_the_determinationofhelicopteremissions.pdf

^h GHG Emission factors from Title 40 Subchapter C Part 98 Subpart C, Table C-1 and C-2

ⁱ Approximately takes 16.2 days at 10 miles per day to complete the full inspection. Ground patrols are done every 4 years. Value represents an annual average over time.

^j Calculated from MOVES for Olmsted County, MN

Equipment ^b	Emission Factors (g/hr) ^a				GHG Emissions (metric ton/year)			
	CO ₂	CH ₄	N ₂ O ^{c,d}	CO ₂ e ^e	CO ₂	CH ₄	N ₂ O	CO ₂ e
Equipment								
E4_OTL_EQP_PICKUP TRUCK-F350_CREW CAB_8001-11K_4X4	123528.4545	4.8426	10.5259	126786.2464	1.85E+00	7.26E-05	1.58E-04	1.90E+00
K8_OTL_EQP_HEAVY BUCKET TRUCK100 FT_RUBBER TIRE_6X6	123528.4545	4.8426	10.5259	126786.2464	1.85E+00	7.26E-05	1.58E-04	1.90E+00
N4_OTL_EQP_TRUCK MOUNTEDCRANE_45T/50T_RUBBER TIRE	81692.4933	3.5108	6.9611	83854.6611	1.23E+00	5.27E-05	1.04E-04	1.26E+00
S2_OTL_EQP_BACKHOE-LOADER RUBBER TIRE_4X4	23463.4126	1.1492	1.9993	24087.9424	3.52E-01	1.72E-05	3.00E-05	3.61E-01
U1_OTL_EQP_SKID STEERLOADER_TRACKED	19396.4227	0.7142	1.6528	19906.8062	2.91E-01	1.07E-05	2.48E-05	2.99E-01
W2_OTL_EQP_ATV/UTV POLARIS/CANAM/ARGO RUBBER	7678.9339	0.8359	0.6543	7894.8194	4.61E-01	5.02E-05	3.93E-05	4.74E-01
R1_OTL_EQP_TRAILERUTV/FRAMING/ENCLOSED_<=12K_RUBBER TIRE_TAN	36676.8768	1.5524	3.1253	37647.0126	2.20E+00	9.31E-05	1.88E-04	2.26E+00
D2_OTL_EQP_PICKUP TRUCK-F150_6001-8K_4X4	123528.4545	4.8426	10.5259	126786.2464	7.41E+00	2.91E-04	6.32E-04	7.61E+00
R2_OTL_EQP_TRAILER MEDIUM EQUIP_12001-20K RUBBER TIRE TANDEM	36676.8768	1.5524	3.1253	37647.0126	5.50E-01	2.33E-05	4.69E-05	5.65E-01
R3_OTL_EQP_TRAILER LARGE EQUIP_>20K RUBBER TIRE TANDEM	36676.8768	1.5524	3.1253	37647.0126	5.50E-01	2.33E-05	4.69E-05	5.65E-01

Helicopter Emissions	Fuel Usage (kg fuel)	Fuel Usage (mmBtu)	Emission Factors (kg/mmBtu) ^b				GHG Emissions (metric ton/year)			
			CO ₂	CH ₄	N ₂ O	CO ₂ e ^e	CO ₂	CH ₄	N ₂ O	CO ₂ e
Helicopter	52.79	2.16	72.22000	0.00300	0.00060	72.4738	1.56E-01	6.47E-06	1.29E-06	1.56E-01
Helicopter	147.17	6.01	72.22000	0.00300	0.00060	72.4738	0.434200433	1.80E-05	3.61E-06	4.36E-01
Helicopter	112.43	4.59	72.22000	0.00300	0.00060	72.4738	3.32E-01	1.38E-05	2.76E-06	3.33E-01
Helicopter	898.21	36.69	72.22000	0.00300	0.00060	72.4738	2.65E+00	1.10E-04	2.20E-05	2.66E+00

Onroad	Emission Factors (g/mi) ⁱ				GHG Emissions (metric ton/year)			
	CO ₂	CH ₄	N ₂ O	CO ₂ e ^e	CO ₂	CH ₄	N ₂ O	CO ₂ e
Ground Patrols (Gas Passenger Truck)	330.40116	0.00542	0.00127	330.9135593	1.34E-02	2.19E-07	5.12E-08	1.34E-02

^a South Coast AQMD Off Road- Model Mobile Source Emission Factors (<https://www.aqmd.com/analysis-handbook/off-road-mobile-source-emission-factors>)

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^h GHG Emission factors from Title 40 Subchapter C Part 98 Subpart C, Table C-1 and C-2

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