

## Air Pollution Emissions Inventory, 2022

Estimates of annual emissions of air pollutants from Dickinson College activities are presented in this inventory for the period 2008 through 2022. The estimated emissions include the criteria air pollutants nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOC), lead, and mercury. Emissions of carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and other greenhouse gases are not reported here and are accounted for in [Dickinson's Greenhouse Gas Inventory](#).

Emission sources include stationary sources, which combust natural gas and distillate oil for heating the campus, mobile sources, which combust transportation fuels for college travel and employee commuting, and offsite sources that combust various fuels to generate the electricity purchased by the college. Emissions are estimated using data for each of these activities and average emission factors. Estimates of emissions from transportation exclude air and train travel.

Emission factors for Dickinson's stationary sources are derived from the USEPA's Technology Transfer Network Clearinghouse for Inventories & Emissions Factors database (Table 1). The factors selected from the EPA database correspond to characteristics of boilers in Dickinson's central energy plant, which produce steam and chilled water to heat and cool two-thirds of the buildings on campus, a more efficient system for heating and cooling buildings than using individual boilers and condensers. The boilers are dual-fuel 800 horsepower external combustion boilers equipped with flue gas recirculation and low NO<sub>x</sub> burners to control emissions of air pollutants. Because it is both less costly and less polluting, the boilers are run on natural gas most of the time.

Emission factors for mobile sources are derived from the USEPA's MOtor Vehicle Emission Simulator (MOVES) and were provided by Michael Baker International, a contractor for the Tri-County Regional Planning Commission that serves Cumberland, Dauphin and Perry counties. Emission factors for offsite purchased electricity in the RFC East region are derived from the USEPA's Emissions & Generation Resource Integrated Database (eGRID).

*Table 1. Emission Factors*

Source	Source	Units	Nitrogen Oxides (Nox)	Sulfur Dioxide (SO2)	Carbon Monoxide (CO)	Particulate Matter (PM 2.5)	Volatile Organic Compounds (VOC)	Lead	Mercury
Stationary									
Natural gas boilers	1	lb/MMBtu	0.031	0.00058	0.082	0.0074	0.005	4.86E-07	2.53E-07
Distillate oil boilers	1	lb/gal	0.01		0.005	0.0021		9E-09	3E-09
Mobile									
Gasoline passenger vehicle	2	grams/mile	0.21	0.002	2.71		0.24		
E-85 passenger vehicle	2	grams/mile	0.09	0.002	1.91		0.16		
Diesel light truck	2	grams/mile	1.82	0.044	4.45		0.55		
Diesel intercity bus	2	grams/mile	7.3	0.012	1.74		0.38		
Off-site electricity	3	lb/MWh	0.59	0.571					

Sources: 1 – USEPA, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, [Webfire](#); 2 - USEPA, MOtor Vehicle Emission Simulator ([MOVES](#)); 3 - USEPA, Emissions & Generation Resource Integrated Database ([eGRID](#)).

Table 2. Estimated emissions of air pollutants, 2008 - 2022 (short tons)

Fiscal Year	NOx	SO2	CO	PM 2.5	VOC	Lead	Mercury
2008	7.29	5.00	12.19	0.33	0.21	0.000019	0.000010
2009	7.19	4.96	12.11	0.31	0.19	0.000017	0.000009
2010	6.99	4.84	12.50	0.27	0.18	0.000016	0.000008
2011	7.16	5.05	12.72	0.28	0.19	0.000017	0.000009
2012	7.12	5.10	12.53	0.23	0.16	0.000014	0.000007
2013	7.58	5.16	13.80	0.32	0.21	0.000019	0.000010
2014	8.34	5.59	14.33	0.39	0.24	0.000022	0.000011
2015	8.22	5.51	14.89	0.37	0.24	0.000022	0.000011
2016	7.76	5.34	14.23	0.30	0.21	0.000019	0.000010
2017	7.69	5.34	14.66	0.29	0.21	0.000019	0.000010
2018	7.56	4.94	16.05	0.32	0.23	0.000021	0.000011
2019	7.55	5.10	14.76	0.32	0.23	0.000021	0.000011
2020	6.23	4.32	11.41	0.26	0.19	0.000017	0.000009
2021	5.15	3.57	8.66	0.21	0.15	0.000014	0.000007
2022	6.64	4.44	12.44	0.24	0.18	0.000016	0.000008

Fig 1: Emissions of NOx, SO2 and CO (short tons)

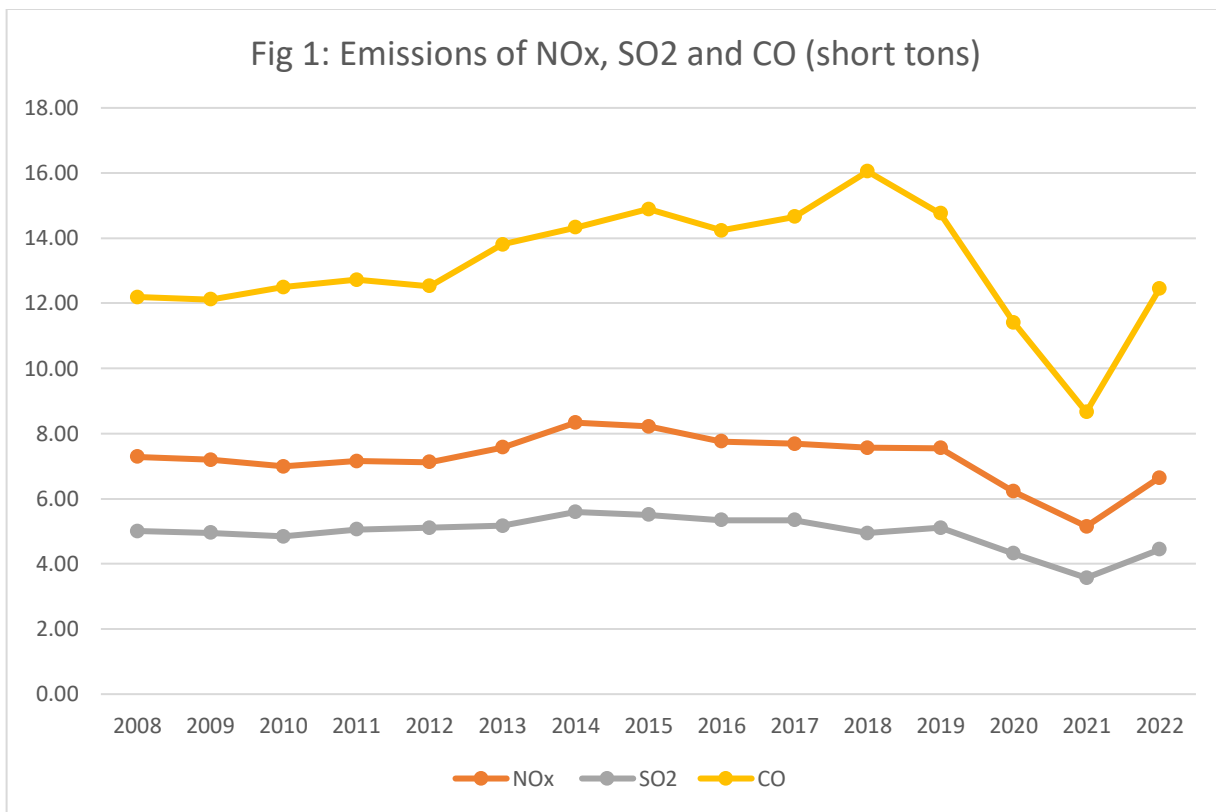


Fig 2: NOx Emissions by Source, 2022

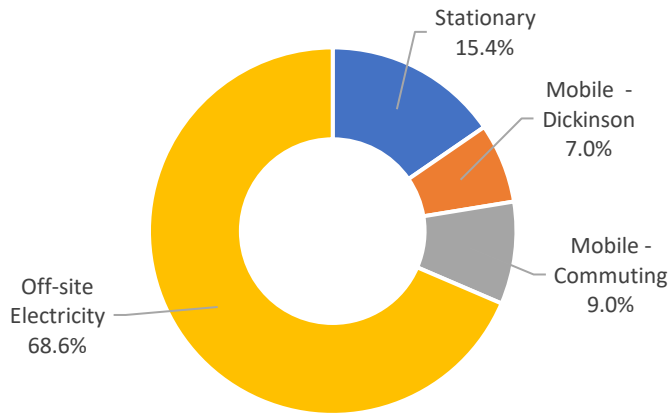


Fig 3: SO2 Emissions by Source, 2022

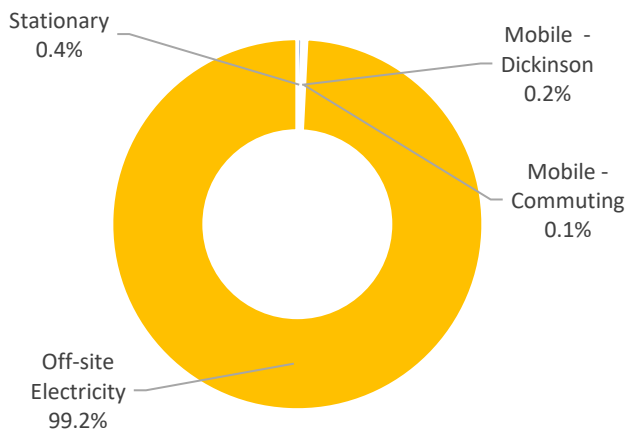
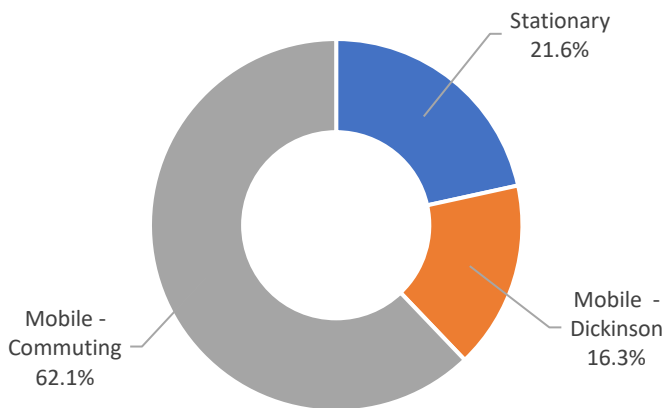


Fig 4: CO Emissions by Source, 2022



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## References

USEPA, Emissions & Generation Resource Integrated Database (eGRID), <https://www.epa.gov/egrid>.

USEPA, Motor Vehicle Emission Simulator (MOVES), <https://www.epa.gov/moves>.

USEPA, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, <https://cfpub.epa.gov/webfire/index.cfm?action=fire.detailedsearch>.