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Supplementary Materials:

Craig A. Stroud [1,*], Junhua Zhang [1], Elisa I. Boutzis [1], Tianchu Zhang [2], Rabab Mashayekhi [3], Oumarou Nikiema [3], Mahtab Majdzadeh [1], Sumi N. Wren [1], Xiaohong Xu [2] and Yushan Su [4]

[1] Air Quality Research Division, Environment and Climate Change Canada, 4905 Dufferin Street, Toronto, ON M3H 5T4, Canada; junhua.zhang@ec.gc.ca.ca (J.Z.); elisa.boutzis@ec.gc.ca.ca (E.I.B.); mahtab.majdzadeh@ec.gc.ca.ca (M.M.); sumi.wren@ec.gc.ca.ca (S.N.W.)
[2] Department of Civil and Environmental Engineering, University of Windsor, Windsor, ON N9B 3P4, Canada; zhang14g@uwindsor.ca (T.Z.); xxu@uwindsor.ca (X.X.)
[3] Meteorological Service of Canada, Environment and Climate Change Canada, Dorval, QC H9P 1J3, Canada; rabab.mashayekhi@canada.ca (R.M.); oumarou.nikiema@canada.ca (O.N.)
[4] Ontario Ministry of the Environmental, Conservation and Parks, Toronto, ON M9P 3V6, Canada; yushan.su@ontario.ca
* Correspondence: craig.stroud@ec.gc.ca

The highest contributing factor was evaporative emissions, which accounted for 19% of the ambient VOC concentrations. This factor was dominated by high loadings of propane (56%) and moderate loadings of 2,4-dimethylpentane (31%), butane (24%), ethane (24%), 2,3-dimethylpentane (23%), and iso-butane (20%) (Figure S2). Propane, butane, and iso-butane are key markers of evaporative emission (Brown et al., 2007). According to the Texas Commission on Environmental Quality (TCEQ) report, butane, iso-butane, 2,3-dimethylpentane, and 2,4-dimethylpentane are mostly released into the air from natural gas industries (TECQ 2015; TECQ, 2016). Consequently, evaporative emissions are likely from propane and natural gas filling/storage facilities in Windsor and surrounding areas. For example, Plains Midstream Canada - Windsor Terminal, a company that transports, processes, and stores natural gas, released 53.4 tonnes of propane and 22 tonnes of butane air emissions in 2019. The company is approximately 2 km south of the Windsor monitoring station. Furthermore, residential use is another source of evaporative emissions. In Windsor, natural gas is widely used for home heating during cold seasons due to its affordable price. According to Canada Energy Regulator, 67% of households in Ontario used natural gas as the primary heating source in 2015 (CER, 2022). Some households also utilized natural gas stoves for cooking.

The second-highest contributing factor was industrial process and manufacturing, which accounted for 16% of the total ambient VOC concentrations. This factor is heavily loaded with industrial-related VOC species, such as 1,1,2,2-tetrachloroethane (77%), 1-heptene (45%), hexachlorobutadiene (45%), 1,2,4-trichlorobenzene (44%), 1,2-dichloropropane (42%), 1,1,2-trichloroethane (40%), 1,2-dichlorobenzene (40%), bromoform (39%), chloromethane (38%), and varieties of Freon (33-38%) (Figure S2). For example, 1,1,2,2-tetrachloroethane is released into the atmosphere during the manufacturing process of trichloroethylene and other chlorinated hydrocarbons (ATSDR, 2008). Hexachlorobutadiene is a by-product of the production of certain chemicals and is released into the air by using these chemicals (Government of Canada, 2007). 1,2,4-trichlorobenzene is mostly used as a solvent in textile manufacturing (Government of Canada, 2014). 1,2-dichloropropane is used as a chemical intermediate in several industries (EPA, 2000). In the US, most of the 1,2-dichloropropane released into the atmosphere was from manufacturing and processing facilities in 2018 (ATSDR, 2022). The primary sources of 1,1,2-trichloroethane emissions are the industries that manufacture it or use it in production (Australian Government, 2022). Freons are used as refrigerants and coolants in old refrigerators, car air conditioners, and other machines (Sciencing, 2023).

The third-highest contributing factor was vehicle exhaust 1, which accounted for 13% of the total ambient VOC concentrations. This factor is dominated by high loadings of MTBE (58%) and trichloroethylene (38%), and moderate loadings of ethylene (33%), acetylene (27%), and ethane (25%). MTBE is used almost exclusively as a fuel additive in motor

gasoline in the US (USEPA, 2016). MTBE released into the air is associated with leaking fuel storage tanks and unburned fuel from vehicle exhaust (Franklin et al., 2001). MTBE is commonly used as a tracer of gasoline vehicle emissions (Chen et al., 2014). In addition, the loading of ethylene, acetylene, and ethane in this study is similar to the profiles of ethylene (30%), acetylene (20%), and ethane (20%) from motor vehicle exhaust from a previous study (Baudic et al., 2016).

The sixth-highest contributing factor was gasoline storage, which accounted for 10% of the total ambient VOC concentrations. This factor is dominated by high loadings of 2,2,4-trimethylpentane (38%) and moderate loadings of 2,4-dimethylpentane (33%) and styrene (33%). 2,2,4-trimethylpentane is one of the several isomers of octane (C8H18). It is an important component of gasoline (University of Waterloo, 2016). 2,4-dimethylpentane is an isomer of heptane, which can be found in gasoline (TCEQ, 2016). The profile of 2,2,4-trimethylpentane and styrene in this study is similar to the profile of gasoline production and storage (McCarthy et al., 2013).

The fifth-highest contributing factor was vehicle exhaust 2, which accounted for 11% of the total ambient VOC concentrations. This factor is characterized by high loadings of trans-2-butene (67%), cis-2-butene (55%), and butane (45%), and moderate loadings of 2-methyl-2-butene (36%), trans-2-pentene (32%), and cis-2-pentene (27). The combustion of gasoline is a major mechanism for the release of butane into the atmosphere (TCEQ, 2015). The cis-2-butene and trans-2-butene are released into the ambient air from the combustion of fossil fuels and loss from gas plants (TCEQ, 2013). The profile of trans-2-pentene, butane, and cis-2-pentene in this study is similar to the profile of trans-2-pentene (40%), butane (30%), and cis-2-pentene (50%) in traffic-related sources (Chen et al., 2014).

The fourth-highest contributing factor was diesel exhaust, which accounted for 12% of the total ambient VOC concentrations. This factor is dominated by high loadings of trans-2-octene (100%), trans-3-methyl-2-pentene (67%), methylcyclohexane (49%), octane (43%), nonane (42%), and decane (40%), and moderate loadings of cis-2-hexene (37%), heptane (35%), and 1,2,4-trimethylbenzene (34%). Decane is abundant in diesel exhaust (Chen et al., 2019). High proportions of nonane, 1,2,4-Trimethylbenzene, and octane were reported in the USPEA source profile of diesel exhaust (profile code: 4742, USEPA, 2022).

Each of the next two factors, labelled as solvent usage and chemical process and combustion, contributed to 8% of the ambient VOC concentrations. The solvent usage factor is characterized by high loadings of 1,1-dichloroethylene (64%), toluene (48%), a-pinene (44%), d-limonene (44%), and 1,4-dichlorobenzene (39%), and moderate loadings of m and p-xylene (33%), o-xylene (31%), and ethylbenzene (30%). Dichloroethene is used as a solvent for waxes, resins, acetylcellulose, perfumes, dyes, lacquers, thermoplastics, fats, and phenols (Government of Canada, 2013). The a-pinene (44%), b-pinene (35%), and d-limonene (44%) are fragrance compounds (Lab Effects, 2023). The factor profile of toluene, ethylbenzene, and xylene in this study is similar to the profile of toluene (40%), ethylbenzene (30%), and xylene (40%) in terms of solvent usage (Baudic et al., 2016).

The chemical process and combustion factor are dominated by high loadings of trichloroethylene (56%), hexane (50%), and benzylchloride (41%), and moderate loadings of cis-3-methyl-2-pentene (38%) and methylcyclopentane (37%). Trichloroethylene is used as a solvent to remove grease from metal parts and as a chemical that is used to make chemicals. The factor profile of hexane and methylcyclopentane in this study is similar to the profile of hexane (58%) and methylcyclopentane (44%) in chemical processes (Su et al., 2019). Benzylchloride is a marker of electricity generation via combustion (NEI, 2017).

The lowest contribution factor was a biogenic source, which only accounted for 3% of the total ambient VOC concentrations. This factor is characterized by the high loading of isoprene (87%) and low loadings of b-pinene (17%), a-pinene (11%), and d-limonene (11%). Isoprene is known as a chemical marker of biogenic emissions (Baudic et al., 2016). A-pinene and b-pinene are two isomers found in nature, e.g., in pine essential oils (Salehi et al, 2019). The profile of isoprene in this study is similar to that of a biogenic source reported by Baudic et al. (2016).

It should be noted that PMF modeling may not be able to differentiate between certain factors. For example, the PMF was unable to differentiate commercial cooking as a standalone factor in this study, even though it has been noted in other recent urban studies (Wang, H. et al., 2017; Lin, X.B. et al. 2022). The proximity of measurement sites to commercial cooking districts in urban areas may play a role. Concentrations of VOC species related to commercial cooking, such as ethane and ethylene, could be reflected in some of the nine factors resolved in this study, thereby leading to overestimated contributions of other factors.

Canada Energy Regulator (CER), 2022. What is in a Canadian residential natural gas bill?https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/natural-gas/report/canadian-residential-natural-gasbill/index.html. Last accessed on June 15, 2023.

Wang, L., Zhiyuan Xiang, Svetlana Stevanovic, Zoran Ristovski, Farhad Salimi, Jun Gao, Hongli Wang, Li Li, Role of Chinese cooking emissions on ambient air quality and human health, Science of The Total Environment, Volume 589, 2017, Pages 173-181, ISSN 0048-9697,https://doi.org/10.1016/j.scitotenv.2017.02.124.

Pengchuan Lin, Jian Gao, Yisheng Xu, James J. Schauer, Jiaqi Wang, Wanqing He, Lei Nie, Enhanced commercial cooking inventories from the city scale through normalized emission factor dataset and big data, Environmental Pollution, Volume 315, 2022,120320, ISSN 0269-7491, https://doi.org/10.1016/j.envpol.2022.120320.

Table S1. TOG (total organic gas) speciation profile codes for subclass codes in the Ontario area emission inventory.

Subclass Code	Subclass_Code_DESC	TOG Profile	Profile_DESC
50408	General Solvent Use - Institutional & Government	0000	Overall Average
50403	General Solvent Use - Construction	1007	Mineral Products - Asphaltic Concrete
50402	General Solvent Use - Natural Resources	1008	Rubber and Miscellaneous Plastics Products - Fabricated Rubber Products - Styrene/Butadiene, Rubber
50804	Printing - Primary Industry	1191	Graphic Arts - (Printing)
50804	Printing - Primary Industry	1191	Graphic Arts - (Printing)
51004	Surface Coatings - Primary Industry	3138	Aerosol Coatings: Coatings (Unspecified)
51009	Surface Coatings - Private Household (Consumer)	3140	Architectural Coatings: Water Borne
50405	General Solvent Use - Manufacturing & Assembly	3142	Consumer Products Composite: Adhesives And Sealants
50407	General Solvent Use - Commercial Services	3144	Consumer Products Composite: Solvents And Coating Related Products
50404	General Solvent Use - Primary Industry	3144	Consumer Products Composite: Solvents And Coating Related Products

50409	**General Solvent Use - Private Household (Consumer)**	**3146**	**Consumer Products Composite: Household Products**
50406	**General Solvent Use - Distribution & Retail**	**3147**	**Consumer Products Composite: Personal Care Products**
51005	**Surface Coatings - Manufacturing & Assembly**	**3149**	**Aerosol Coatings: Overall Composite**
51006	**Surface Coatings - Distribution & Retail**	**3149**	**Aerosol Coatings: Overall Composite**
51006	**Surface Coatings - Distribution & Retail**	**3149**	**Aerosol Coatings: Overall Composite**
51003	**Surface Coatings - Construction**	**8744**	**Composite Profile - Architectural Coatings: Solvent-borne and Water-borne**

Table S2. Ontario 2015 non-mobile area emission inventory by subclass code, annual total = 226,075 tons (Note: only subclass codes with relatively large VOC emissions are listed).

Species	Annual (tons)	Subclass Code	Subclass_Code_DESC
VOC	**38,199**	**50409**	**General Solvent Use - Private Household (Consumer)**
VOC	**24,228**	**20401**	**Residential Fuel Wood Combustion**
VOC	**19,366**	**50405**	**General Solvent Use - Manufacturing & Assembly**
VOC	**12,491**	**50407**	**General Solvent Use - Commercial Services**
VOC	**12,144**	**20401**	**Residential Fuel Wood Combustion**
VOC	**11,786**	**50404**	**General Solvent Use - Primary Industry**
VOC	**9,671**	**51003**	**Surface Coatings - Construction**
VOC	**8,437**	**20401**	**Residential Fuel Wood Combustion**
VOC	**8,298**	**20401**	**Residential Fuel Wood Combustion**
VOC	**6,557**	**50402**	**General Solvent Use - Natural Resources**
VOC	**6,078**	**51005**	**Surface Coatings - Manufacturing & Assembly**
VOC	**5,800**	**50408**	**General Solvent Use - Institutional & Government**
VOC	**5,379**	**50403**	**General Solvent Use - Construction**
VOC	**5,329**	**51004**	**Surface Coatings - Primary Industry**
VOC	**4,625**	**50804**	**Printing - Primary Industry**
VOC	**4,578**	**12210**	**Bakeries**
VOC	**4,465**	**50701**	**Refined Petroleum Products Retail**
VOC	**3,164**	**20401**	**Residential Fuel Wood Combustion**
VOC	**3,056**	**51009**	**Surface Coatings - Private Household (Consumer)**
VOC	**2,922**	**50406**	**General Solvent Use - Distribution & Retail**
VOC	**2,908**	**20401**	**Residential Fuel Wood Combustion**
VOC	**2,876**	**80701**	**Landfills**
VOC	**2,640**	**50701**	**Refined Petroleum Products Retail**
VOC	**2,421**	**50701**	**Refined Petroleum Products Retail**
VOC	**2,228**	**12108**	**Refined Petroleum Products Bulk Storage and Distribution**
VOC	**2,003**	**20401**	**Residential Fuel Wood Combustion**
VOC	**1,733**	**50701**	**Refined Petroleum Products Retail**
VOC	**1,540**	**80901**	**Prescribed Burning**
VOC	**1,455**	**51301**	**Off-road refueling**

VOC	**1,310**	**51006**	**Surface Coatings - Distribution & Retail**
VOC	**1,229**	**80704**	**Open Burning**
VOC	**1,005**	**50603**	**Commercial Cooking**
VOC	**974**	**20301**	**Residential Fuel Combustion**
VOC	**962**	**11902**	**Panel Board Mills**
Total VOC	**226,075**		
Solvent VOC	**133,504**		
Solvent/ Total_VOC	**59%**		

Table S3. Michigan projected 2017 inventory for solvent emissions (total solvent use VOC = 80,770 tons). TOG profile code is listed in the last column (Note: only SCCs with relatively large VOC emissions are listed).

SCC	VOC (ton)	SCC_DESC	TOG_Profile
2401001000	**11,605**	**Solvent Utilization; Surface Coating; Architectural Coatings; Total: All Solvent Types**	**8744**
2460100000	**9,382**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Personal Care Products; Total: All Solvent Types**	**3147**
2460200000	**8,889**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Household Products; Total: All Solvent Types**	**3146**
2460800000	**8,790**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All FIFRA Related Products; Total: All Solvent Types**	**3145**
2461850000	**7,945**	**Solvent Utilization; Miscellaneous Non-industrial: Commercial; Pesticide Application: Agricultural; All Processes**	**3001**
2460400000	**6,716**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Automotive Aftermarket Products; Total: All Solvent Types**	**8520**
2460500000	**4,691**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Coatings and Related Products; Total: All Solvent Types**	**3144**
2415000000	**4,471**	**Solvent Utilization; Degreasing; All Processes/All Industries; Total: All Solvent Types**	**8745**
2401100000	**2,978**	**Solvent Utilization; Surface Coating; Industrial Maintenance Coatings; Total: All Solvent Types**	**3138**
2460600000	**2,815**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Adhesives and Sealants; Total: All Solvent Types**	**3142**
2401025000	**2,275**	**Solvent Utilization; Surface Coating; Metal Furniture: SIC 25; Total: All Solvent Types**	**2406**
2401070000	**1,903**	**Solvent Utilization; Surface Coating; Motor Vehicles: SIC 371; Total: All Solvent Types**	**3131**

2401005000	**1,885**	**Solvent Utilization; Surface Coating; Auto Refinishing: SIC 7532; Total: All Solvent Types**	**2402**
2461021000	**1,599**	**Solvent Utilization; Miscellaneous Non-industrial: Commercial; Cutback Asphalt; Total: All Solvent Types**	**1007**
2461022000	**947**	**Solvent Utilization; Miscellaneous Non-industrial: Commercial; Emulsified Asphalt; Total: All Solvent Types**	**1007**
2401020000	**735**	**Solvent Utilization; Surface Coating; Wood Furniture: SIC 25; Total: All Solvent Types**	**2405**
2401090000	**694**	**Solvent Utilization; Surface Coating; Miscellaneous Manufacturing; Total: All Solvent Types**	**3149**
2425000000	**542**	**Solvent Utilization; Graphic Arts; All Processes; Total: All Solvent Types**	**1191**
2401040000	**440**	**Solvent Utilization; Surface Coating; Metal Cans: SIC 341; Total: All Solvent Types**	**2408**
2460900000	**346**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; Miscellaneous Products (Not Otherwise Covered); Total: All Solvent Types**	**3144**
2401055000	**288**	**Solvent Utilization; Surface Coating; Machinery and Equipment: SIC 35; Total: All Solvent Types**	**3149**
2401030000	**288**	**Solvent Utilization; Surface Coating; Paper: SIC 26; Total: All Solvent Types**	**2552**
2401008000	**178**	**Solvent Utilization; Surface Coating; Traffic Markings; Total: All Solvent Types**	**3135**
2401015000	**162**	**Solvent Utilization; Surface Coating; Factory Finished Wood: SIC 2426 thru 242; Total: All Solvent Types**	**2405**
2401060000	**56**	**Solvent Utilization; Surface Coating; Large Appliances: SIC 363; Total: All Solvent Types**	**2411**
2401080000	**46**	**Solvent Utilization; Surface Coating; Marine: SIC 373; Total: All Solvent Types**	**2415**
2401200000	**32**	**Solvent Utilization; Surface Coating; Other Special Purpose Coatings; Total: All Solvent Types**	**3138**
2401075000	**23**	**Solvent Utilization; Surface Coating; Aircraft: SIC 372; Total: All Solvent Types**	**2414**
2401065000	**18**	**Solvent Utilization; Surface Coating; Electronic and Other Electrical: SIC 36 - 363; Total: All Solvent Types**	**3138**
2420000000	**17**	**Solvent Utilization; Dry Cleaning; All Processes; Total: All Solvent Types**	**2422**
2401085000	**15**	**Solvent Utilization; Surface Coating; Railroad: SIC 374; Total: All Solvent Types**	**2416**

Table S4. TOG (total organic gas) speciation profiles mapped to GEM-MACH VOC speciation. Columns are profile number, TOG, GEM-MACH speciation, fraction of TOG, and molecular weight.

PROFILE#	TOG	ADOMII-Species	Fraction_TOG	Molecular Weight
0282	TOG	EA3	1.47	93.43
0282	TOG	EARO	0.13	117.97
1007	TOG	EA2	0.02	57.3
1007	TOG	EA3	0.46	93.43
1007	TOG	EARO	0.32	117.97
1007	TOG	EMEK	0.01	72.1
1008	TOG	EA2	0.86	57.3
1008	TOG	ETOL	0.35	92.13
1086	TOG	EMEK	0.65	72.1
1086	TOG	EOTH	0.42	100
1086	TOG	ETOL	0.06	92.13
1191	TOG	EA2	0.00	57.3
1191	TOG	EA3	0.66	93.43
1191	TOG	EARO	0.10	117.97
1191	TOG	ECRE	0.00	108.13
1191	TOG	EOTH	0.00	100
2402	TOG	EA3	0.40	93.43
2402	TOG	EARO	0.30	117.97
2402	TOG	EC38	0.01	44.09
2402	TOG	EMEK	0.14	72.1
2402	TOG	EOTH	0.11	100
2402	TOG	ETOL	0.13	92.13
2405	TOG	EA3	0.50	93.43
2405	TOG	EARO	0.17	117.97
2405	TOG	EC38	0.01	44.09
2405	TOG	EMEK	0.11	72.1
2405	TOG	EOTH	0.07	100
2405	TOG	ETOL	0.26	92.13
2406	TOG	EA3	0.49	93.43
2406	TOG	EARO	0.23	117.97
2406	TOG	EC38	0.01	44.09
2406	TOG	EMEK	0.07	72.1
2406	TOG	EOTH	0.14	100
2406	TOG	ETOL	0.10	92.13
2408	TOG	EA3	0.61	93.43
2408	TOG	EARO	0.14	117.97
2408	TOG	EC38	0.00	44.09
2408	TOG	EMEK	0.12	72.1
2408	TOG	EOTH	0.07	100
2408	TOG	ETOL	0.12	92.13
2409	TOG	EA3	0.53	93.43
2409	TOG	EARO	0.29	117.97
2409	TOG	EC38	0.00	44.09
2409	TOG	EMEK	0.07	72.1
2409	TOG	EOTH	0.11	100
2409	TOG	ETOL	0.08	92.13

2411	**TOG**	**EA3**	**0.49**	**93.43**
2411	**TOG**	**EARO**	**0.28**	**117.97**
2411	**TOG**	**EMEK**	**0.07**	**72.1**
2411	**TOG**	**EOTH**	**0.15**	**100**
2411	**TOG**	**ETOL**	**0.09**	**92.13**
2414	**TOG**	**EA3**	**0.39**	**93.43**
2414	**TOG**	**EARO**	**0.07**	**117.97**
2414	**TOG**	**EMEK**	**0.12**	**72.1**
2414	**TOG**	**EOTH**	**0.38**	**100**
2414	**TOG**	**ETOL**	**0.18**	**92.13**
2415	**TOG**	**EA3**	**0.35**	**93.43**
2415	**TOG**	**EARO**	**0.25**	**117.97**
2415	**TOG**	**EC38**	**0.02**	**44.09**
2415	**TOG**	**EMEK**	**0.08**	**72.1**
2415	**TOG**	**EOTH**	**0.21**	**100**
2415	**TOG**	**ETOL**	**0.12**	**92.13**
2416	**TOG**	**EA3**	**0.44**	**93.43**
2416	**TOG**	**EARO**	**0.15**	**117.97**
2416	**TOG**	**EMEK**	**0.11**	**72.1**
2416	**TOG**	**EOTH**	**0.06**	**100**
2416	**TOG**	**ETOL**	**0.25**	**92.13**
2421	**TOG**	**EOTH**	**0.60**	**100**
2422	**TOG**	**EA3**	**0.59**	**93.43**
2422	**TOG**	**EARO**	**0.05**	**117.97**
2422	**TOG**	**EOTH**	**0.21**	**100**
2543	**TOG**	**EA3**	**1.12**	**93.43**
2543	**TOG**	**EARO**	**0.10**	**117.97**
2544	**TOG**	**EA3**	**1.12**	**93.43**
2544	**TOG**	**EARO**	**0.10**	**117.97**
2545	**TOG**	**EA3**	**0.92**	**93.43**
2545	**TOG**	**EARO**	**0.07**	**117.97**
2545	**TOG**	**EOTH**	**0.04**	**100**
2545	**TOG**	**ETOL**	**0.25**	**92.13**
2552	**TOG**	**EA3**	**0.20**	**93.43**
2552	**TOG**	**EARO**	**0.21**	**117.97**
2552	**TOG**	**EC38**	**0.02**	**44.09**
2552	**TOG**	**EOTH**	**0.39**	**100**
2552	**TOG**	**ETOL**	**0.08**	**92.13**
3001	**TOG**	**EA2**	**0.01**	**57.3**
3001	**TOG**	**EA3**	**0.48**	**93.43**
3001	**TOG**	**EARO**	**0.01**	**117.97**
3001	**TOG**	**EMEK**	**0.01**	**72.1**
3001	**TOG**	**EOTH**	**0.45**	**100**
3127	**TOG**	**EA3**	**0.16**	**93.43**
3127	**TOG**	**EARO**	**0.08**	**117.97**
3127	**TOG**	**EC38**	**0.18**	**44.09**
3127	**TOG**	**EMEK**	**0.00**	**72.1**
3127	**TOG**	**EOTH**	**0.35**	**100**
3127	**TOG**	**ETOL**	**0.38**	**92.13**

3131	**TOG**	**EA3**	**0.12**	**93.43**
3131	**TOG**	**EARO**	**0.15**	**117.97**
3131	**TOG**	**EC38**	**0.11**	**44.09**
3131	**TOG**	**EMEK**	**0.01**	**72.1**
3131	**TOG**	**EOTH**	**0.94**	**100**
3131	**TOG**	**ETOL**	**0.12**	**92.13**
3135	**TOG**	**EA3**	**0.33**	**93.43**
3135	**TOG**	**EARO**	**0.17**	**117.97**
3135	**TOG**	**EC38**	**0.16**	**44.09**
3135	**TOG**	**EMEK**	**0.00**	**72.1**
3135	**TOG**	**EOTH**	**0.47**	**100**
3135	**TOG**	**ETOL**	**0.10**	**92.13**
3137	**TOG**	**EA3**	**0.15**	**93.43**
3137	**TOG**	**EARO**	**0.03**	**117.97**
3137	**TOG**	**EC38**	**0.11**	**44.09**
3137	**TOG**	**EMEK**	**0.10**	**72.1**
3137	**TOG**	**EOTH**	**0.56**	**100**
3137	**TOG**	**ETOL**	**0.23**	**92.13**
3138	**TOG**	**EA2**	**0.00**	**57.3**
3138	**TOG**	**EA3**	**0.35**	**93.43**
3138	**TOG**	**EARO**	**0.04**	**117.97**
3138	**TOG**	**EC38**	**0.14**	**44.09**
3138	**TOG**	**EMEK**	**0.01**	**72.1**
3138	**TOG**	**EOTH**	**0.75**	**100**
3138	**TOG**	**ETOL**	**0.04**	**92.13**
3139	**TOG**	**EA2**	**0.00**	**57.3**
3139	**TOG**	**EA3**	**0.74**	**93.43**
3139	**TOG**	**EARO**	**0.12**	**117.97**
3139	**TOG**	**EC38**	**0.00**	**44.09**
3139	**TOG**	**ECRE**	**0.00**	**108.13**
3139	**TOG**	**EMEK**	**0.03**	**72.1**
3139	**TOG**	**EOTH**	**0.06**	**100**
3139	**TOG**	**ETOL**	**0.04**	**92.13**
3140	**TOG**	**EA2**	**0.00**	**57.3**
3140	**TOG**	**EA3**	**1.02**	**93.43**
3140	**TOG**	**EALD**	**0.00**	**44.05**
3140	**TOG**	**EARO**	**0.01**	**117.97**
3140	**TOG**	**EC38**	**0.03**	**44.09**
3140	**TOG**	**EHCH**	**0.00**	**30.03**
3140	**TOG**	**EOTH**	**0.08**	**100**
3140	**TOG**	**ETOL**	**0.00**	**92.13**
3142	**TOG**	**EA2**	**0.00**	**57.3**
3142	**TOG**	**EA3**	**0.67**	**93.43**
3142	**TOG**	**EARO**	**0.02**	**117.97**
3142	**TOG**	**EC38**	**0.04**	**44.09**
3142	**TOG**	**EMEK**	**0.10**	**72.1**
3142	**TOG**	**EOTH**	**0.22**	**100**
3142	**TOG**	**ETOL**	**0.06**	**92.13**
3144	**TOG**	**EA2**	**0.00**	**57.3**

3144	**TOG**	**EA3**	**0.40**	**93.43**
3144	**TOG**	**EARO**	**0.07**	**117.97**
3144	**TOG**	**EC38**	**0.07**	**44.09**
3144	**TOG**	**ECRE**	**0.01**	**108.13**
3144	**TOG**	**EMEK**	**0.02**	**72.1**
3144	**TOG**	**EOTH**	**0.54**	**100**
3144	**TOG**	**ETOL**	**0.05**	**92.13**
3145	**TOG**	**EA3**	**0.92**	**93.43**
3145	**TOG**	**EALD**	**0.00**	**44.05**
3145	**TOG**	**EARO**	**0.06**	**117.97**
3145	**TOG**	**EC38**	**0.05**	**44.09**
3145	**TOG**	**EMEK**	**0.00**	**72.1**
3145	**TOG**	**EOTH**	**0.12**	**100**
3145	**TOG**	**ETOL**	**0.00**	**92.13**
3146	**TOG**	**EA2**	**0.01**	**57.3**
3146	**TOG**	**EA3**	**0.81**	**93.43**
3146	**TOG**	**EALD**	**0.00**	**44.05**
3146	**TOG**	**EARO**	**0.03**	**117.97**
3146	**TOG**	**EC38**	**0.06**	**44.09**
3146	**TOG**	**ECRE**	**0.00**	**108.13**
3146	**TOG**	**EMEK**	**0.00**	**72.1**
3146	**TOG**	**EOTH**	**0.14**	**100**
3146	**TOG**	**ETOL**	**0.00**	**92.13**
3147	**TOG**	**EA2**	**0.00**	**57.3**
3147	**TOG**	**EA3**	**1.13**	**93.43**
3147	**TOG**	**EARO**	**0.00**	**117.97**
3147	**TOG**	**EC38**	**0.03**	**44.09**
3147	**TOG**	**ECRE**	**0.00**	**108.13**
3147	**TOG**	**EMEK**	**0.00**	**72.1**
3147	**TOG**	**EOTH**	**0.09**	**100**
3147	**TOG**	**ETOL**	**0.00**	**92.13**
3149	**TOG**	**EA2**	**0.00**	**57.3**
3149	**TOG**	**EA3**	**0.22**	**93.43**
3149	**TOG**	**EARO**	**0.12**	**117.97**
3149	**TOG**	**EC38**	**0.14**	**44.09**
3149	**TOG**	**EMEK**	**0.03**	**72.1**
3149	**TOG**	**EOTH**	**0.66**	**100**
3149	**TOG**	**ETOL**	**0.12**	**92.13**
8520	**TOG**	**EA2**	**0.00**	**57.3**
8520	**TOG**	**EA3**	**0.37**	**93.43**
8520	**TOG**	**EARO**	**0.04**	**117.97**
8520	**TOG**	**EC38**	**0.38**	**44.09**
8520	**TOG**	**ECRE**	**0.00**	**108.13**
8520	**TOG**	**EMEK**	**0.00**	**72.1**
8520	**TOG**	**EOTH**	**0.26**	**100**
8520	**TOG**	**ETOL**	**0.03**	**92.13**
8744	**TOG**	**EA2**	**0.00**	**57.3**
8744	**TOG**	**EA3**	**0.83**	**93.43**
8744	**TOG**	**EALD**	**0.00**	**44.05**

8744	TOG	EARO	0.08	117.97
8744	TOG	EC38	0.01	44.09
8744	TOG	ECRE	0.00	108.13
8744	TOG	EHCH	0.00	30.03
8744	TOG	EMEK	0.02	72.1
8744	TOG	EOTH	0.07	100
8744	TOG	ETOL	0.03	92.13
8745	TOG	EA2	0.04	57.3
8745	TOG	EA3	0.43	93.43
8745	TOG	EALD	0.00	44.05
8745	TOG	EARO	0.08	117.97
8745	TOG	EC38	0.04	44.09
8745	TOG	ECRE	0.00	108.13
8745	TOG	EMEK	0.00	72.1
8745	TOG	EOTH	0.36	100
8745	TOG	ETOL	0.05	92.13

Table S5. Michigan 2017 inventory for solvent emissions (total solvent use VOC = 112,230 tons) with TOG profiles.

SCC	poll	annual (tons)	TOG_Profile	SCC_DESC	Profile_DESC
2460110000	TOG	22,332	MYR_SPCPD	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; Personal Care Products: Hair Care Products; Total: All Solvent Types	Time Series Solvents - PCP_Daily_Use_Products
2401100000	TOG	21,563	MYR_SCOIN	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings; Total: All Solvent Types	Time Series Solvents - COAT_Industrial
2460290000	TOG	20,319	MYR_SCPG	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; Household Products: Miscellaneous Household	Time Series Solvents - CP_General_Cleaners

			Products; Total: All Solvent Types	
2402000000 TOG	10,639	MYR_SCOAL	Solvent Utilization; Paint Strippers; Chemical Strippers; Application, Degradation, and Coating Removal Steps: Others Not Listed	Time Series Solvents - COAT_Allied
2401001000 TOG	9,819	MYR_SCOAR	Solvent Utilization; Surface Coating; Architectural Coatings; Total: All Solvent Types	Time Series Solvents - COAT_Architectural
2425000000 TOG	9,737	MYR_SPI	Solvent Utilization; Graphic Arts; All Processes; Total: All Solvent Types	Time Series Solvents - PI_Printing_Inks
2460600000 TOG	8,382	MYR_SAS	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Adhesives and Sealants; Total: All Solvent Types	Time Series Solvents - AS_Adhesives_Sealants
2460500000 TOG	3,205	MYR_SCOAE	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Coatings and Related Products; Total: All Solvent Types	Time Series Solvents - COAT_Aerosol
2461850000 TOG	2,960	MYR_SPEA	Solvent Utilization; Miscellaneous	Time Series Solvents - PEST_Agricultural

			Non-industrial: Commercial; Pesticide Application: Agricultural; All Processes	
2460200000 TOG	1,310	MYR_SCPD	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Household Products; Total: All Solvent Types	Time Series Solvents - CP_Detergents_Soaps
2461800000 TOG	821	MYR_SPEF	Solvent Utilization; Miscellaneous Non-industrial: Commercial; Pesticide Application: All Processes; Total: All Solvent Types	Time Series Solvents - PEST_FIFRA
2477777777 TOG	388	MYR_SOG	Fake SCC temporarily used for OG_Oil_Gas	Time Series Solvents - OG_Oil_Gas
2460190000 TOG	255	MYR_SPCPS	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; Personal Care Products: Miscellaneous Personal Care Products; Total: All Solvent Types	Time Series Solvents - PCP_Short_Use_Products
2460100000 TOG	220	MYR_SFL	Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; All Personal Care Products; Total:	Time Series Solvents - FL_Fuels_Lighter

			All Solvent Types	
2460900000 TOG	**188**	**MYR_SM**	**Solvent Utilization; Miscellaneous Non-industrial: Consumer and Commercial; Miscellaneous Products (Not Otherwise Covered); Total: All Solvent Types**	**Time Series Solvents - Misc_All**
2420000000 TOG	**90**	**MYR_SDC**	**Solvent Utilization; Dry Cleaning; All Processes; Total: All Solvent Types**	**Time Series Solvents - DC_Dry_Cleaning**

Table S6. TOG chemical profiles used to process the 2017 US VCPy solvent emissions.

PROFILE#	TOG	ADOMII-Species	Fraction_TOG	Molecular Weight
MYR_SAS	TOG	EA3	0.733323163	93.43
MYR_SAS	TOG	EA2	0.016017847	57.3
MYR_SAS	TOG	EARO	0.046988721	117.97
MYR_SAS	TOG	EC38	0.02603509	44.09
MYR_SAS	TOG	EMEK	0.009936941	72.1
MYR_SAS	TOG	EOTH	0.123205392	100
MYR_SAS	TOG	ETOL	0.031528846	92.13
MYR_SCOAE	TOG	EA3	0.207665547	93.43
MYR_SCOAE	TOG	EA2	9.34E-05	57.3
MYR_SCOAE	TOG	EARO	0.115081632	117.97
MYR_SCOAE	TOG	EC38	0.139465948	44.09
MYR_SCOAE	TOG	EMEK	0.024617283	72.1
MYR_SCOAE	TOG	EOTH	0.695011256	100
MYR_SCOAE	TOG	ETOL	0.122630921	92.13
MYR_SCOAL	TOG	EA3	0.539414305	93.43
MYR_SCOAL	TOG	EA2	0.000948982	57.3
MYR_SCOAL	TOG	EARO	0.045254128	117.97
MYR_SCOAL	TOG	EC38	0.070819509	44.09
MYR_SCOAL	TOG	ECRE	0.000178041	108.13
MYR_SCOAL	TOG	EMEK	0.025944081	72.1
MYR_SCOAL	TOG	EOTH	0.354409119	100
MYR_SCOAL	TOG	ETOL	0.056363498	92.13
MYR_SCOAR	TOG	EALD	0.000277392	44.05
MYR_SCOAR	TOG	EA3	1.003428222	93.43
MYR_SCOAR	TOG	EARO	0.014809182	117.97
MYR_SCOAR	TOG	EC38	0.014564934	44.09
MYR_SCOAR	TOG	ECRE	0.000492395	108.13

MYR_SCOAR	TOG	EMEK	0.00139957	72.1
MYR_SCOAR	TOG	EOTH	0.089530707	100
MYR_SCOAR	TOG	ETOL	0.002529788	92.13
MYR_SCOIN	TOG	EA3	0.221629133	93.43
MYR_SCOIN	TOG	EA2	0.00033605	57.3
MYR_SCOIN	TOG	EARO	0.115652056	117.97
MYR_SCOIN	TOG	EC38	0.140017673	44.09
MYR_SCOIN	TOG	EMEK	0.026840116	72.1
MYR_SCOIN	TOG	EOTH	0.667832316	100
MYR_SCOIN	TOG	ETOL	0.128877524	92.13
MYR_SCPD	TOG	EA3	1.320039998	93.43
MYR_SCPD	TOG	EC38	0.047807357	44.09
MYR_SCPD	TOG	EOTH	0.001746614	100
MYR_SCPG	TOG	EALD	0.000184691	44.05
MYR_SCPG	TOG	EA3	0.7276893	93.43
MYR_SCPG	TOG	EA2	0.00557166	57.3
MYR_SCPG	TOG	EARO	0.010926479	117.97
MYR_SCPG	TOG	EC38	0.058876831	44.09
MYR_SCPG	TOG	ECRE	0.000538604	108.13
MYR_SCPG	TOG	EMEK	0.000639401	72.1
MYR_SCPG	TOG	EOTH	0.31880654	100
MYR_SCPG	TOG	ETOL	0.025911144	92.13
MYR_SDC	TOG	EA3	0.889130076	93.43
MYR_SDC	TOG	EOTH	0.24704855	100
MYR_SFL	TOG	EA3	0.784210859	93.43
MYR_SFL	TOG	EA2	0.016224379	57.3
MYR_SFL	TOG	EARO	0.003547072	117.97
MYR_SFL	TOG	EC38	0.054396119	44.09
MYR_SFL	TOG	EOTH	0.039260984	100
MYR_SFL	TOG	ETOL	0.000240313	92.13
MYR_SM	TOG	EA3	1.115323416	93.43
MYR_SM	TOG	EARO	0.046790957	117.97
MYR_SM	TOG	EC38	0.000869838	44.09
MYR_SM	TOG	ECRE	0.001398434	108.13
MYR_SM	TOG	EMEK	0.03950523	72.1
MYR_SM	TOG	EOTH	0.061197857	100
MYR_SM	TOG	ETOL	0.009007564	92.13
MYR_SOG	TOG	EA3	0.305636651	93.43
MYR_SOG	TOG	EARO	0.016078263	117.97
MYR_SOG	TOG	EC38	0.697638339	44.09
MYR_SOG	TOG	EMEK	0.002713681	72.1
MYR_SOG	TOG	EOTH	0.02994298	100
MYR_SOG	TOG	ETOL	0.020736925	92.13
MYR_SPCPD	TOG	EA3	0.988240192	93.43
MYR_SPCPD	TOG	EA2	0.000436448	57.3
MYR_SPCPD	TOG	EARO	0.002876789	117.97
MYR_SPCPD	TOG	EC38	0.007872236	44.09
MYR_SPCPD	TOG	ECRE	0.00538276	108.13
MYR_SPCPD	TOG	EOTH	0.166693676	100

MYR_SPCPD	TOG	ETOL	0.001313152	92.13
MYR_SPCPS	TOG	EA3	1.043227461	93.43
MYR_SPCPS	TOG	EC38	0.039048871	44.09
MYR_SPCPS	TOG	EMEK	0.000702685	72.1
MYR_SPCPS	TOG	EOTH	0.180497722	100
MYR_SPEA	TOG	EA3	0.787034444	93.43
MYR_SPEA	TOG	EA2	0.000767638	57.3
MYR_SPEA	TOG	EARO	0.01294589	117.97
MYR_SPEA	TOG	EC38	0.100627723	44.09
MYR_SPEA	TOG	EMEK	0.001204033	72.1
MYR_SPEA	TOG	EOTH	0.063546284	100
MYR_SPEA	TOG	ETOL	0.001301904	92.13
MYR_SPEF	TOG	EA3	0.787034444	93.43
MYR_SPEF	TOG	EA2	0.000767638	57.3
MYR_SPEF	TOG	EARO	0.01294589	117.97
MYR_SPEF	TOG	EC38	0.100627723	44.09
MYR_SPEF	TOG	EMEK	0.001204033	72.1
MYR_SPEF	TOG	EOTH	0.063546284	100
MYR_SPEF	TOG	ETOL	0.001301904	92.13
MYR_SPI	TOG	EA3	0.501433771	93.43
MYR_SPI	TOG	EARO	0.091057857	117.97
MYR_SPI	TOG	EC38	0.016001792	44.09
MYR_SPI	TOG	EMEK	0.095921649	72.1
MYR_SPI	TOG	EOTH	0.068683061	100
MYR_SPI	TOG	ETOL	0.131450438	92.13

Table S7. OH-rate coefficients at 300 K for the 107 measured VOCs.

VOC Species	OH-rate coefficients at 300 K (cm^3 $molecule^{-1}$ s^{-1})	References
1,1,1-Trichloroethane	1.24E-14	Carter, 2010
1,1,2,2-Tetrachloroethane	1.26E-13	UNEP, 2002
1,1,2-Trichloroethane	2.00E-13	Carter, 2010
1,1-Dichloroethane	2.60E-13	Carter, 2010
1,1-Dichloroethylene	1.12E-11	Zhang et al., 1991
1,2,3-Trimethylbenzene	3.27E-11	Carter, 2010
1,2,4-Trichlorobenzene	5.00E-13	Rinke and Zetzsch, 1984
1,2,4-Trimethylbenzene	3.25E-11	Carter, 2010
1,2-Dichlorobenzene	6.20E-13	Pfannerstill et al., 2019
1,2-Dichloroethane	2.53E-13	Carter, 2010
1,2-Dichloropropane	4.50E-13	Carter, 2010
1,3,5-Trimethylbenzene	5.67E-11	Carter, 2010
1,3-Butadiene	6.59E-11	Carter, 2010
1,3-Dichlorobenzene	6.20E-13	Pfannerstill et al., 2019
1,3-Diethylbenzene	2.20E-11	Shaw et al., 2020
1,4-Dichlorobenzene	5.55E-13	Carter, 2010
1,4-Diethylbenzene	1.60E-11	Shaw et al., 2020
1-Butene/Isobutene	5.08E-11	Carter, 2010
1-Heptene	4.00E-11	Carter, 2010

1-Hexene/2-Methyl-1-Pentene	3.70E-11	Carter, 2010
1-Pentene	3.14E-11	Carter, 2010
2,2,4-Trimethylpentane	3.38E-12	Carter, 2010
2,2-Dimethylbutane	5.95E-12	Permar et al., 2023
2,3,4-Trimethylpentane	6.60E-12	Carter, 2010
2,3-Dimethylbutane	6.00E-12	Heimann and Warneck, 1992
2,3-Dimethylpentane	7.15E-12	Carter, 2010
2,4-Dimethylhexane	8.57E-12	Carter, 2010
2,4-Dimethylpentane	4.77E-12	Carter, 2010
2,5-Dimethylhexane	8.29E-12	Carter, 2010
2-Ethyltoluene	1.19E-11	Carter, 2010
2-Methyl-1-butene	6.10E-11	Carter, 2010
2-Methyl-2-butene	8.60E-11	Carter, 2010
2-Methylheptane	8.31E-12	Carter, 2010
2-Methylhexane	6.70E-12	Permar et al., 2023
2-Methylpentane	5.20E-12	Carter, 2010
3-Ethyltoluene	1.86E-11	Carter, 2010
3-Methyl-1-Butene	3.14E-11	Carter, 2010
3-Methylheptane	8.59E-12	Carter, 2010
3-Methylhexane	6.30E-12	Permar et al., 2023
3-Methylpentane	5.20E-12	Carter, 2010
4-Ethyltoluene	1.18E-11	Carter, 2010
4-Methylheptane	8.59E-12	Carter, 2010
Acetylene	7.56E-13	Carter, 2010
A-Pinene	5.18E-11	Carter, 2010
Benzene	1.22E-12	Carter, 2010
Benzylchloride	2.80E-12	Tuazon et al., 1990
B-Pinene	7.35E-11	Carter, 2010
Bromoform	2.71E-13	Orkin et al., 2013
Bromomethane	4.12E-14	Carter, 2010
Butane	2.38E-12	Carter, 2010
Camphene	1.63E-10	Permar et al., 2023
Carbontetrachloride		Not found
Chlorobenzene	7.70E-13	Carter, 2010
Chloroethane	4.18E-13	Carter, 2010
Chloroform	1.06E-13	Carter, 2010
Chloromethane	4.48E-14	Carter, 2010
cis-1,2-Dimethylcyclohexane	1.19E-11	Carter, 2010
cis-2-Butene	5.58E-11	Carter, 2010
cis-2-Hexene	6.60E-11	Carter, 2010
cis-2-Pentene	6.50E-11	Carter, 2010
cis-3-Methyl-2-Pentene	8.85E-11	Carter, 2010
Cyclohexane	7.02E-12	Carter, 2010
Cyclopentane	5.02E-12	Carter, 2010
Decane	1.10E-11	Carter, 2010
Dichloromethane	1.45E-13	Carter, 2010
D-Limonene	1.63E-10	Carter, 2010

Dodecane	1.32E-11	Carter, 2010
Ethane	2.54E-13	Carter, 2010
Ethylbenzene	7.00E-12	Carter, 2010
Ethylene	8.15E-12	Carter, 2010
Freon 11		Not found
Freon 114		Not found
Freon 12		Not found
Freon 22		Not found
Heptane	6.81E-12	Carter, 2010
Hexachlorobutadiene	2.60E-11	Carter, 2010
Hexane	5.25E-12	Carter, 2010
Indane	5.04E-11	Permar et al., 2023
Isobutane	2.14E-12	Carter, 2010
Isopentane	3.60E-12	Carter, 2010
Isoprene	9.96E-11	Carter, 2010
Iso-Propylbenzene	6.30E-12	Carter, 2010
m and p-Xylene	2.31E-11	Carter, 2010
Methylcyclohexane	9.64E-12	Carter, 2010
Methylcyclopentane	5.68E-12	Carter, 2010
MTBE	2.79E-12	Iuga et al., 2015
Naphthalene	2.30E-11	Carter, 2010
Nonane	9.75E-12	Carter, 2010
n-Propylbenzene	5.80E-12	Carter, 2010
Octane	8.16E-12	Carter, 2010
o-Xylene	1.36E-11	Carter, 2010
p-Cymene	1.45E-11	Carter, 2010
Pentane	3.84E-12	Carter, 2010
Propane	1.11E-12	Carter, 2010
Propylene	2.60E-11	Carter, 2010
Styrene	5.80E-11	Carter, 2010
Tetrachloroethylene		Not found
Toluene	5.58E-12	Carter, 2010
trans-2-Butene	6.32E-11	Carter, 2010
trans-2-Hexene	6.60E-11	Carter, 2010
trans-2-Octene	6.89E-11	Carter, 2010
trans-2-Pentene	6.70E-11	Carter, 2010
trans-3-Methyl-2-Pentene	8.85E-11	Carter, 2010
trans-4-Methyl-2-Pentene	5.98E-11	Carter, 2010
Trichloroethylene	2.34E-12	Carter, 2010
Undecane	1.23E-11	Carter, 2010
Vinylchloride	6.90E-12	Carter, 2010

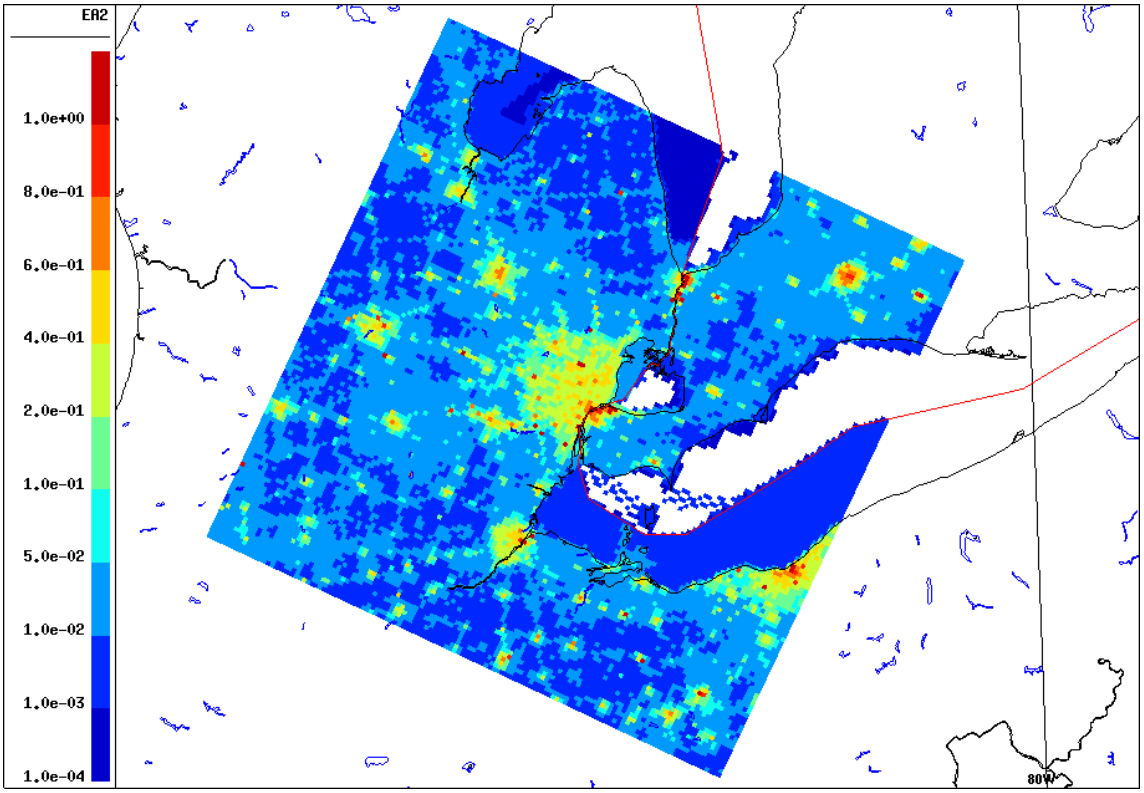
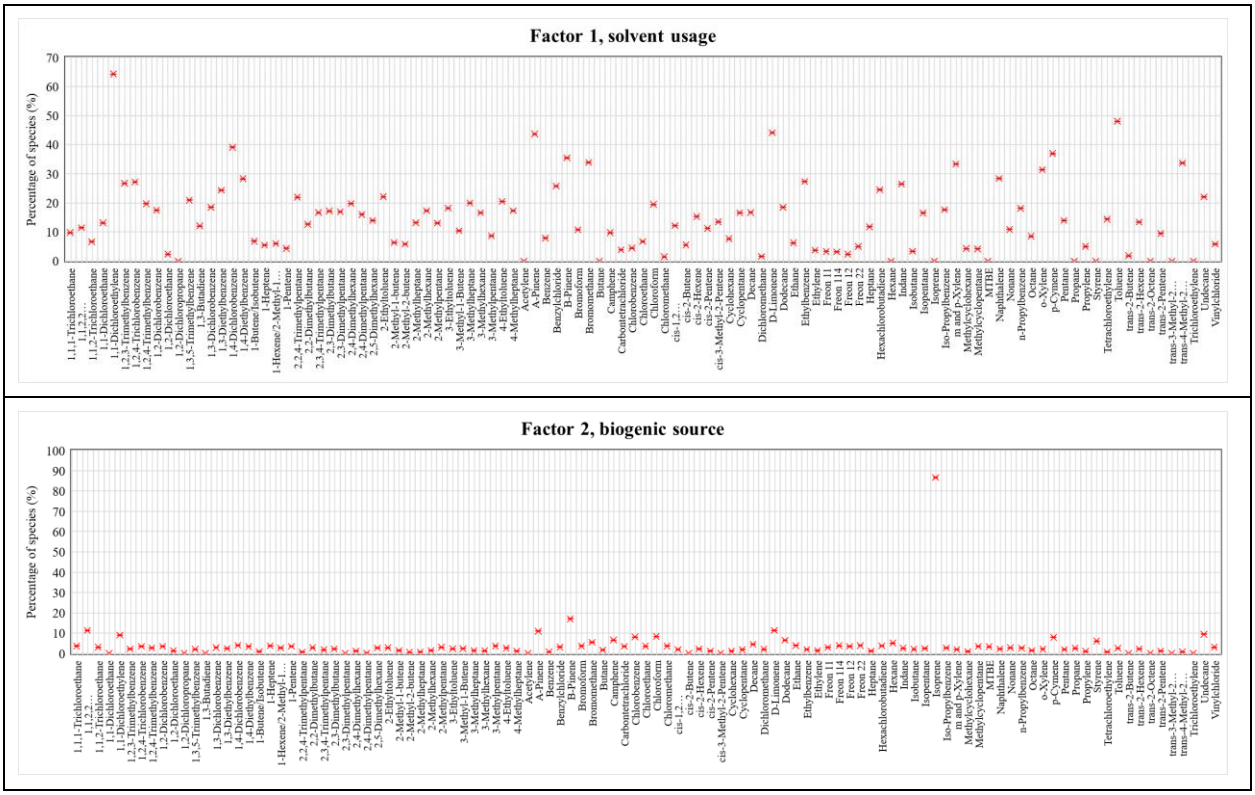
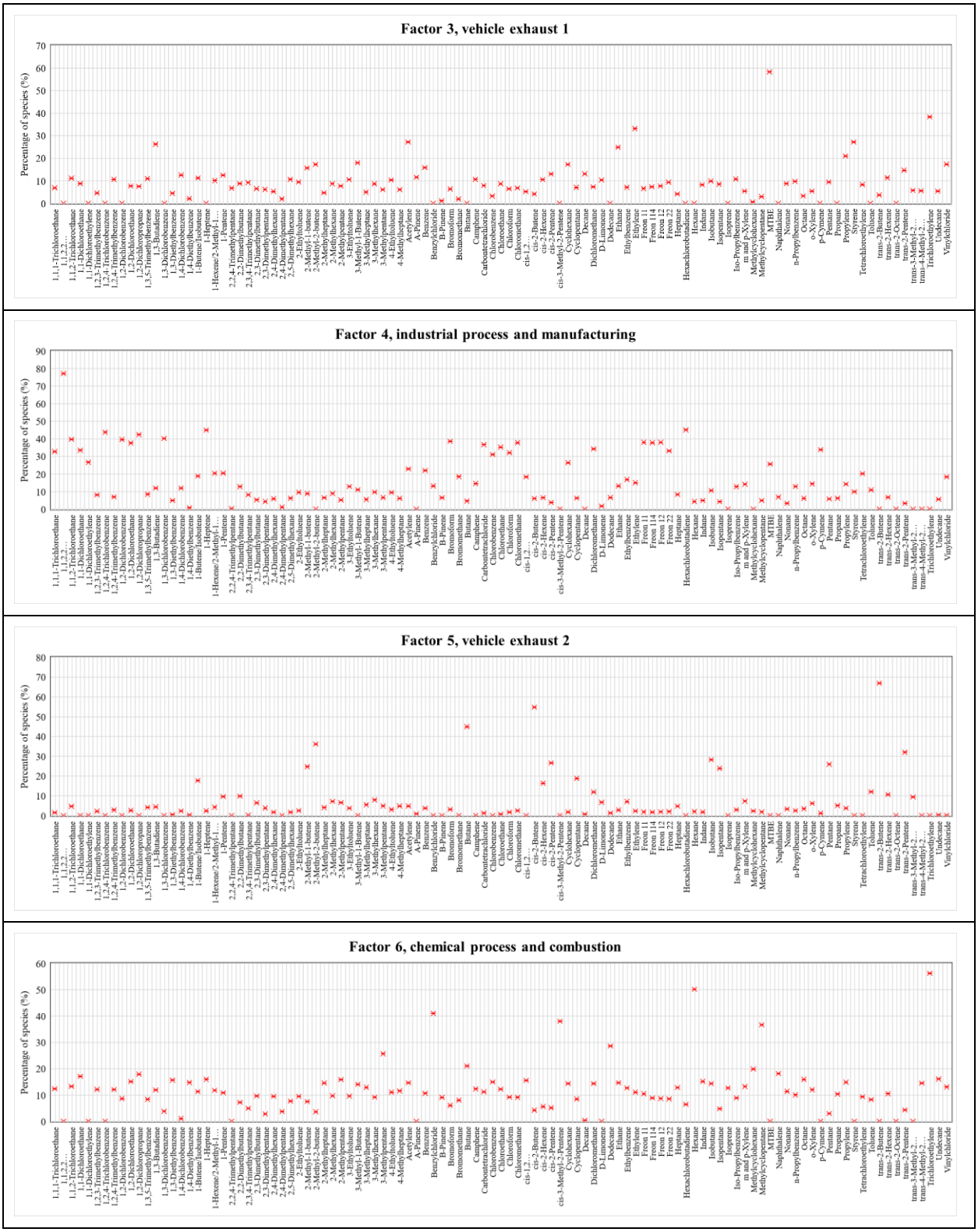


Figure S1. Windsor/Detroit border domain for emission characterization. Alkene emission rate in grams/sec is shown for illustrative purposes. In total, 25% of land cover area is Canadian and 75% US.




Factor 3, vehicle exhaust 1
Factor 4, industrial process and manufacturing
Factor 5, vehicle exhaust 2
Factor 6, chemical process and combustion
Percentage of species (%)

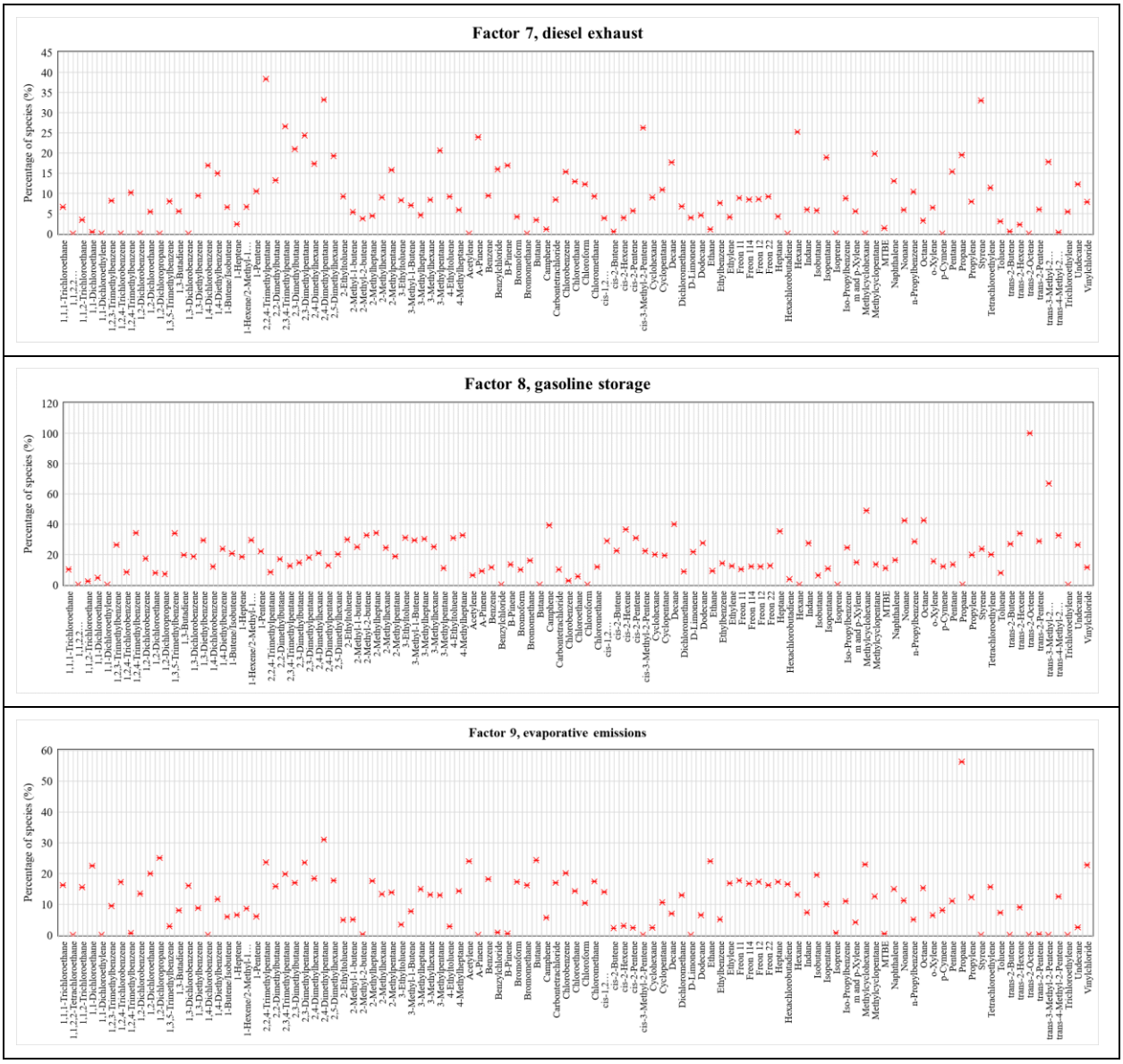


Figure S2. Chemical profiles of nine factors identified from the PMF model for ambient VOCs in Windsor. Value is the percentage of species mass concentrations assigned to that factor.