Tracking and Reducing Chemicals in Toronto

4th Annual ChemTRAC Report

June 2015

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Chapter 1: Improving Health By Reducing Chemicals In Our Environment

In an urban environment like Toronto, the public's health may be affected by a number of environmental factors, including chemicals that pollute the air, water and land. Exposure to these chemicals can occur in our homes, workplaces and outside.

Smog-forming pollutants and other chemical substances come from different sources. Some come from sources outside the city, others from inside the city itself. Production of electricity, heating of buildings, transportation and commercial and industrial facilities are all important contributors to pollution. Overall, air quality mostly depends on what sources exist in different neighbourhoods and how weather patterns carry pollutants in the air.

We come in contact with these chemicals outdoors and indoors, in homes and workplaces. Prolonged exposure to toxic substances, and in some cases even at low levels, may cause:

- Heart and lung damage
- Cancer
- Birth defects
- Reproductive problems
- Chronic diseases

The ChemTRAC program was developed to help better understand where 25 priority chemicals come from and to encourage pollution prevention to protect health. ChemTRAC collects information from businesses and institutions in Toronto. The information is collected through Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). Similar programs in Canada and other countries have been found to lead to reductions in chemicals used and released from facilities.

The program can be divided into three main areas:

- The Environmental Reporting and Disclosure Bylaw, which requires businesses to track and report their manufacturing, use and release of priority chemicals.
- The analysis and release of chemical data; and
- The greening of businesses through pollution prevention and innovation.

ChemTRAC is a release inventory, a database of air pollution sources and their releases within our local airshed. Data collected in release inventories can be used to better understand contaminant trends over time, highlight key sources and support pollutant modelling studies.

This report contains information on facility operations during the 2013 calendar year. The data was reported to the City of Toronto in 2014.

Chapter 2: ChemTRAC 2013 Data Highlights

Facility Representation By Sector

The Environmental Reporting and Disclosure Bylaw requires facilities in Toronto to annually report their use and release of the 25 priority chemicals, if they meet reporting requirements. In total, more than 750 facilities reported on their 2013 operations. Table 1 shows the number of facilities within each sector that reported chemical information.

Table 1: Number of facilities that reported data on priority substances for 2013 operations

Sector	Number of facilities that reported
Automotive repair and maintenance	102
Chemical and related products manufacturing	112
Chemical wholesale	5
Computer and electronic product manufacturing	14
Dry cleaning and laundry services	94
Electrical equipment, appliance and component manufacturing	15
Fabricated metal product manufacturing	70
Food, beverage and tobacco products manufacturing	69
Funeral services	8
Medical and diagnostic laboratories	3
Non-metallic mineral product manufacturing	23
Paper product manufacturing	12
Power generation	2
Primary metal manufacturing	11
Printing and publishing	65
Waste management and remediation services	6
Water and wastewater treatment	8
Wood products manufacturing	46
All others	87
Total	**752**

Priority Substances Manufactured, Processed or Used

Table 2 shows the total amounts reported as manufactured, processed or otherwise used for each priority substance in 2013. Approximately 96,000 tonnes of priority substances were reported in total. Volatile organic compounds (VOCs), nitrogen oxides (NO_x), $PM_{2.5}$, manganese and tetrachloroethylene were the priority substances with the largest reported amounts. There are four priority substances for which no data have been reported. Toronto Public Health expects that information will come in future years as more facilities report.

Table 2: Total amounts of priority substances manufactured, processed, and otherwise used in 2013

Priority Substance	Manufactured (kg)	Processed (kg)	Otherwise Used (kg)
1,3-Butadiene	2,344	51,251	0
1,2-Dibromoethane	-	-	-
1,2-Dichloroethane	-	-	-
1,4-Dichlorobenzene	0	0	244
Acetaldehyde	1,007	3,246	0
Acrolein	-	-	-
Benzene	0		331
Cadmium	0	9,146	19
Carbon Tetrachloride	-	-	-
Chloroform	114	124	5,330
Chromium, Hexavalent	0	121,484	1,034
Chromium, Non-Hexavalent	0	582,212	3
Dichloromethane	0	228,015	90,271
Formaldehyde	5,503	91,674	24,502
Lead	0	288,013	166,752
Manganese	22	1,906,039	3,365
Mercury	0	106	528
Nickel	0	370,834	4
NO_x	1,537,716	0	0
PAHs	35	41	0
$PM_{2.5}$	749,946	8,152,939	347,499
Tetrachloroethylene	0	583,377	31,198
Trichloroethylene	0	46,965	4,583
Vinyl Chloride	3	90,650	0
VOCs	481,748	77,423,730	3,123,168
Total	**2,778,438**	**89,949,846**	**3,798,831**

(-) represents a null value.

Priority Substances Released to the Environment

Similar to data from 2012 operations, the total releases of priority substances represent a small proportion (about 10 per cent overall) of the total amount reported as manufactured, processed or used by facilities. This proportion varies for each pollutant. Table 3 shows the total amounts released to air, water and land for each substance in 2013. Volatile organic compounds (VOCs), nitrogen oxides (NO_x), $PM_{2.5}$ were the priority substances with the largest reported amounts. There are four priority substances for which no data were reported.

Table 3: Total amounts of priority substances released to air in 2013

Priority Substance	Released to Air (kg)
VOCs	5,944,667
NO_x	1,537,689
$PM_{2.5}$	345,240
Trichloroethylene	31,298
Dichloromethane	20,937
Tetrachloroethylene	13,281
Formaldehyde	12,290
Acetaldehyde	3,251
1,3-Butadiene	2,344
Chromium, Non-hexavalent	1,207
Manganese	840
Nickel	704
Chloroform	639
Chromium, Hexavalent	385
Lead	268
Benzene	150
PAHs	58
Mercury	23
Cadmium	4
1,4-Dichlorobenzene	4
Vinyl chloride	3
Total	**7,915,282**

Health Ranking of Substances

The 25 priority substances vary in their toxicity. Some substances, such as lead and cadmium, are very toxic and could pose a risk even when released in small amounts. Other substances, for example volatile organic compounds (VOCs) and nitrogen oxides (NO_x), have a low toxicity but the overall health risk may be high when they are released in large quantities. One way of taking this different toxicity into account is to rank them by their toxic equivalency potentials (TEPs). Toxic equivalency potential provides a value based on the amount released and the toxicity of a substance. The substances can then be compared with each other to give a better indication of the relative health risk. A high TEP value represents a higher potential to cause harm. The TEP scoring system ranks substances that cause cancer (carcinogens) and substances with other health impacts (non-carcinogens) separately. Some of the 25 priority substances have both carcinogenic and non-carcinogenic effects and are assigned a TEP score for each category. Table 4 shows the reported releases to air ranked by the carcinogenic TEP, and Table 5 ranks the releases by non-carcinogenic TEP. The carcinogenicity ranking indicates that although substances like PAHs, cadmium and hexavalent chromium were reported in small amounts, the overall potential for adverse health impact of these releases are estimated to be much higher than for other substances. For non-carcinogenicity rankings, lead, mercury and cadmium are likely to be of highest health concern.

Table 4: Reported quantities of priority substances released to air in 2013 ranked by carcinogenic toxic equivalent potential (TEP) score

Priority Substance	Released to Air (kg)	Carcinogen TEP value	Carcinogen TEP Score
PAHs	58	6,300	365,400
Cadmium	4	26,000	104,000
Chromium, Hexavalent	385	130	50,050
Tetrachloroethylene	13,281	0.96	12,750
Lead	268	28	7,504
Dichloromethane	20,937	0.20	4,187
Nickel	704	2.80	1,971
Trichloroethylene	31,298	0.05	1,565
1,3-Butadiene	2,344	0.53	1,242
Chloroform	639	1.60	1,022
Formaldehyde	12,290	0.02	246
Benzene	150	1.00	150
Acetaldehyde	3,251	0.01	33
Vinyl chloride	3	1.90	6
1,4-Dichlorobenzene	4	1.40	6

Table 5: Reported quantities of priority substances released to air in 2013 ranked by non-carcinogenic toxic equivalent potential (TEP) score

Priority Substance	Released to Air (kg)	Non-Carcinogen TEP value	Non-Carcinogen TEP Score
Lead	268	580,000	155,440,000
Mercury	23	5,000,000	115,000,000
Cadmium	4	1,900,000	7,600,000
VOCs	5,944,667	1	5,944,667
$PM_{2.5}$	345,240	17	5,869,080
Chromium Total*	1,592	3,100	4,935,200
NO_x	1,537,689	2.20	3,382,916
Nickel	704	3,200	2,252,800
Tetrachloroethylene	13,281	65	863,265
Manganese	840	780	655,200
Formaldehyde	12,290	16	196,640
Dichloromethane	20,937	7	146,559
Acetaldehyde	3,251	9.30	30,234
Trichloroethylene	31,298	0.63	19,718
Chloroform	639	14	8,946
1,3-Butadiene	2,344	2.20	5,157
Benzene	150	8.10	1,215
Vinyl chloride	3	69	207
1,4-Dichlorobenzene	4	2.20	9

**Chromium total includes both Hexavalent and Non-Hexavalent Chromium*

Industry Contribution to Total Release

The information reported by businesses on operations that took place in 2013 can be summarized by industry. Table 6 shows the percentage contribution by industry sectors to 1) total release by mass, 2) Carcinogenic TEP, and 3)Non-carcinogenic TEP.

Table 6: Sector contribution to Total Release (by mass), Carcinogenic TEP and Non-Carcinogenic TEP in 2013

Sector[a]	Percent Contribution to Total Release (by mass)[b]	Percent Contribution to Carcinogen TEP [b]	Percent Contribution to Non-Carcinogen TEP [b]
Automotive	<1	<1	1.0
Chemical Wholesale	3.6	<1	<1
Computer & Elect. Prod. Mfg	<1	<1	<1
Dry Cleaning	<1	1.8	<1
Electrical Equip, Appl/Comp Mfg	1.2	21	1.2
Fab Metal Prod Mfg	4.1	15	1.7
Food & Beverage	8.5	0.0	<1
Funeral Services	0.0	0.0	20
Manufacturing	45	1.1	26
Medical	<1	0.0	0.0
Non Metallic Mineral Prod Mfg	2.0	1.9	7.2
Paper Prod Mfg	4.8	<1	<1
Power Generation	2.9	<1	<1
Primary Metal Mfg	<1	8.0	13
Printing	11	<1	<1
Waste Management	1.2	31	<1
Wastewater Treatment	4.5	11	22
Wood Industries	1.9	0.0	<1
All other	7.0	9.1	4.5
Total	100	100	100

[a] *Sectors are defined based on North American Industry Classification System (NAICS)*
[b] *<1 indicated that a value is less than one*

Chapter 3: Distribution of Facilities in Toronto

The majority of facilities reporting information on their operations to ChemTRAC were found in non-residential areas for 2013.

Figure 1: Distribution of facilities within residential and non-residential areas that provided information on the manufacture, use or release of priority substances in 2013

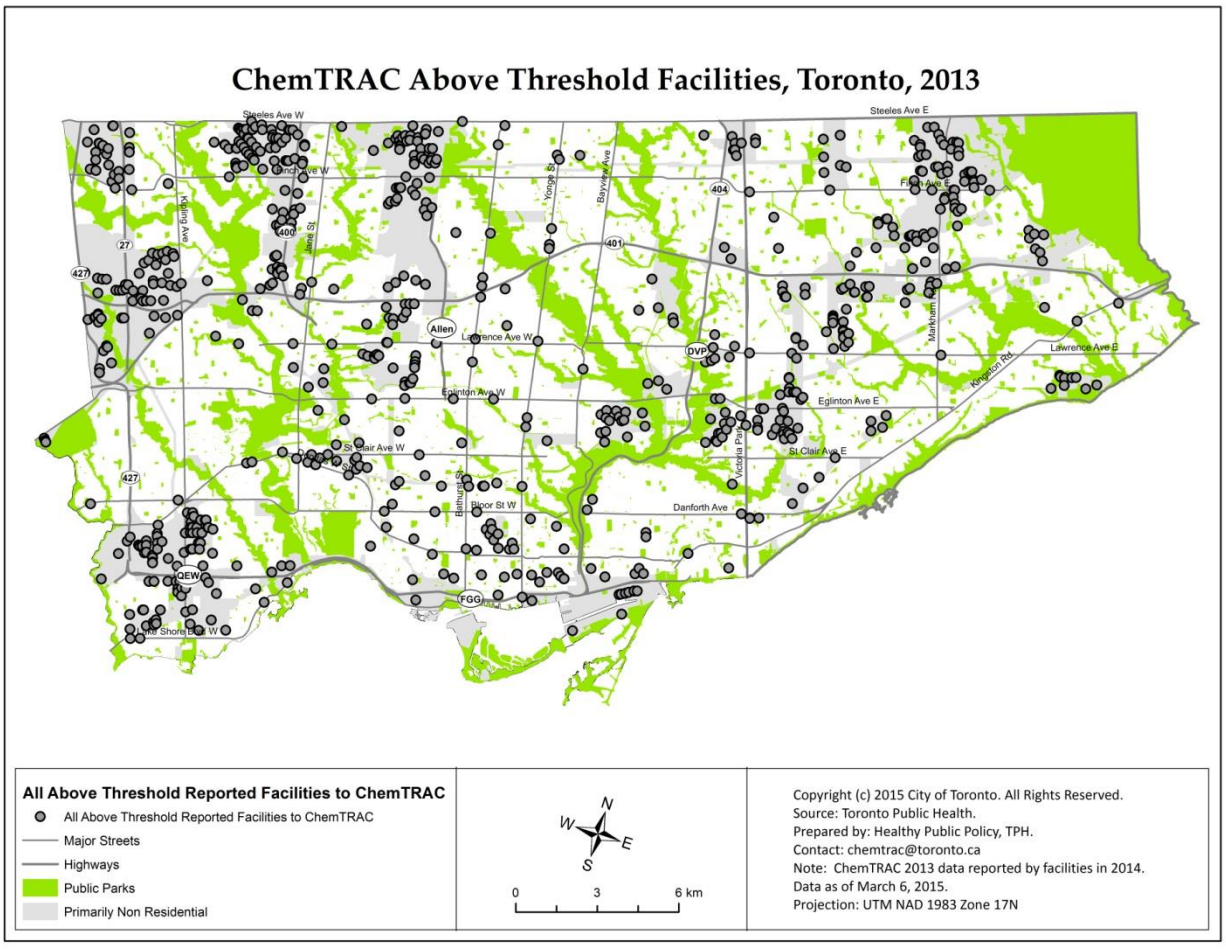


Figure 2: Distribution of facilities that provided information on the manufacture, use or release of priority substances in 2013 and socioeconomic status as represented by proportion of residents living at or below the Low Income Measure

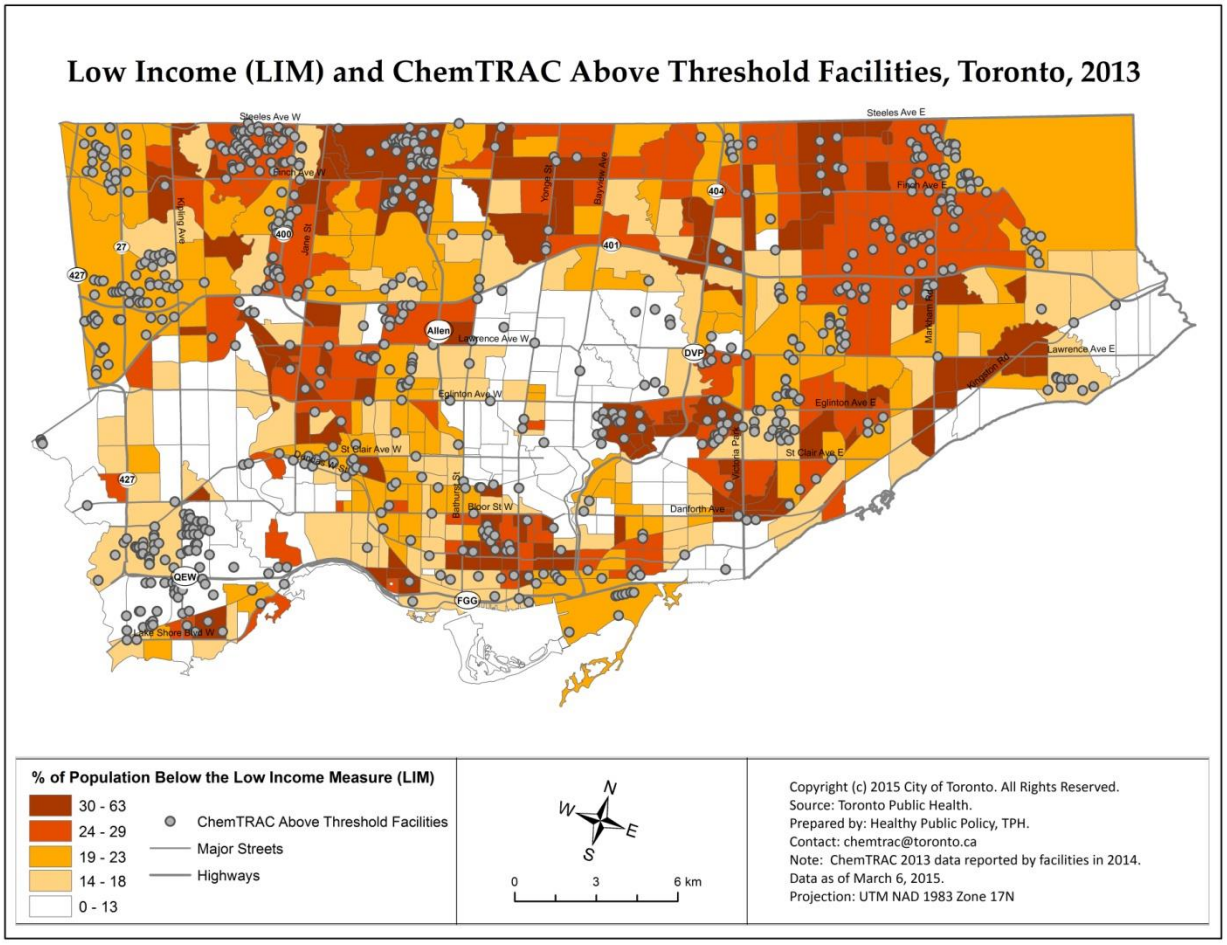


Figure 3: Distribution of Non-Carcinogenic TEP in 2013

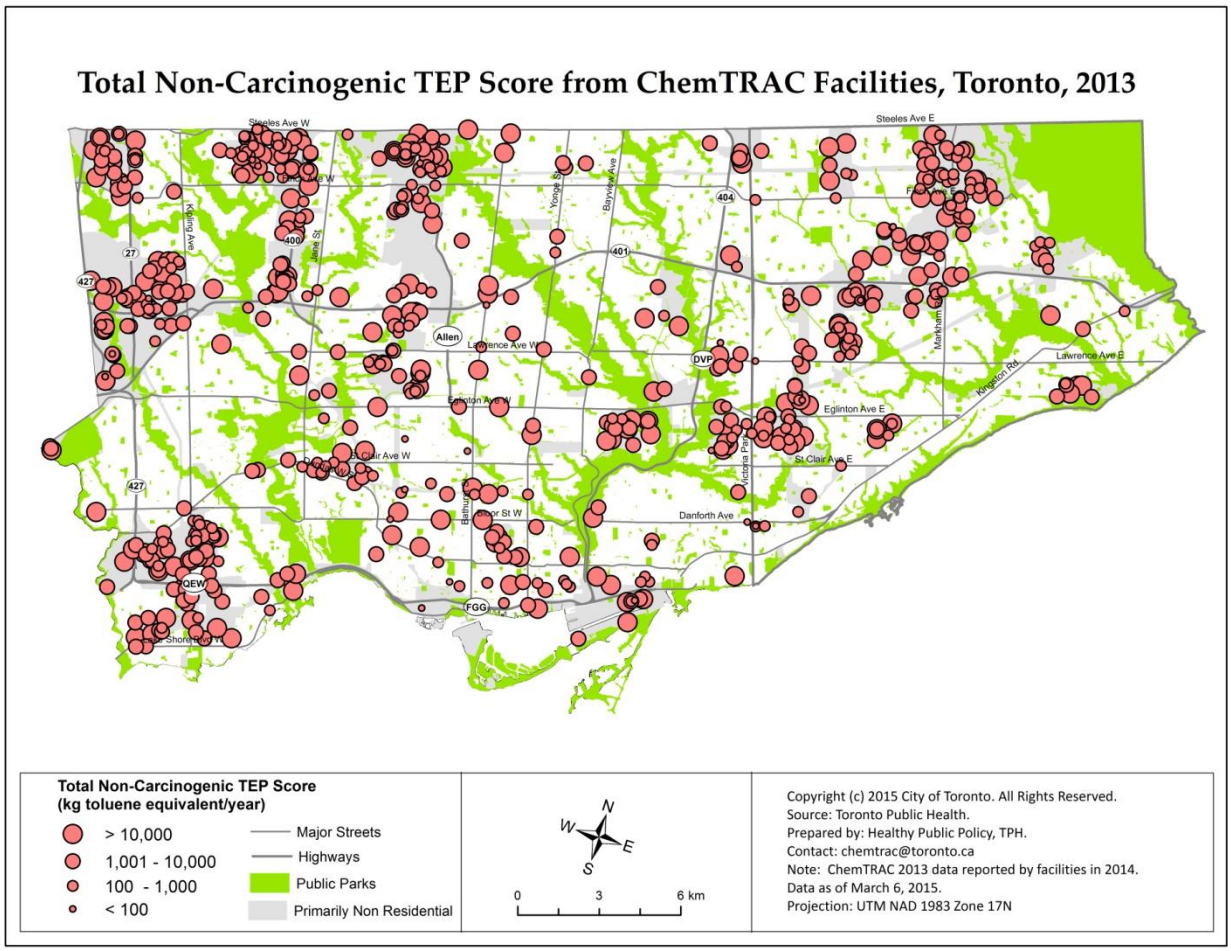
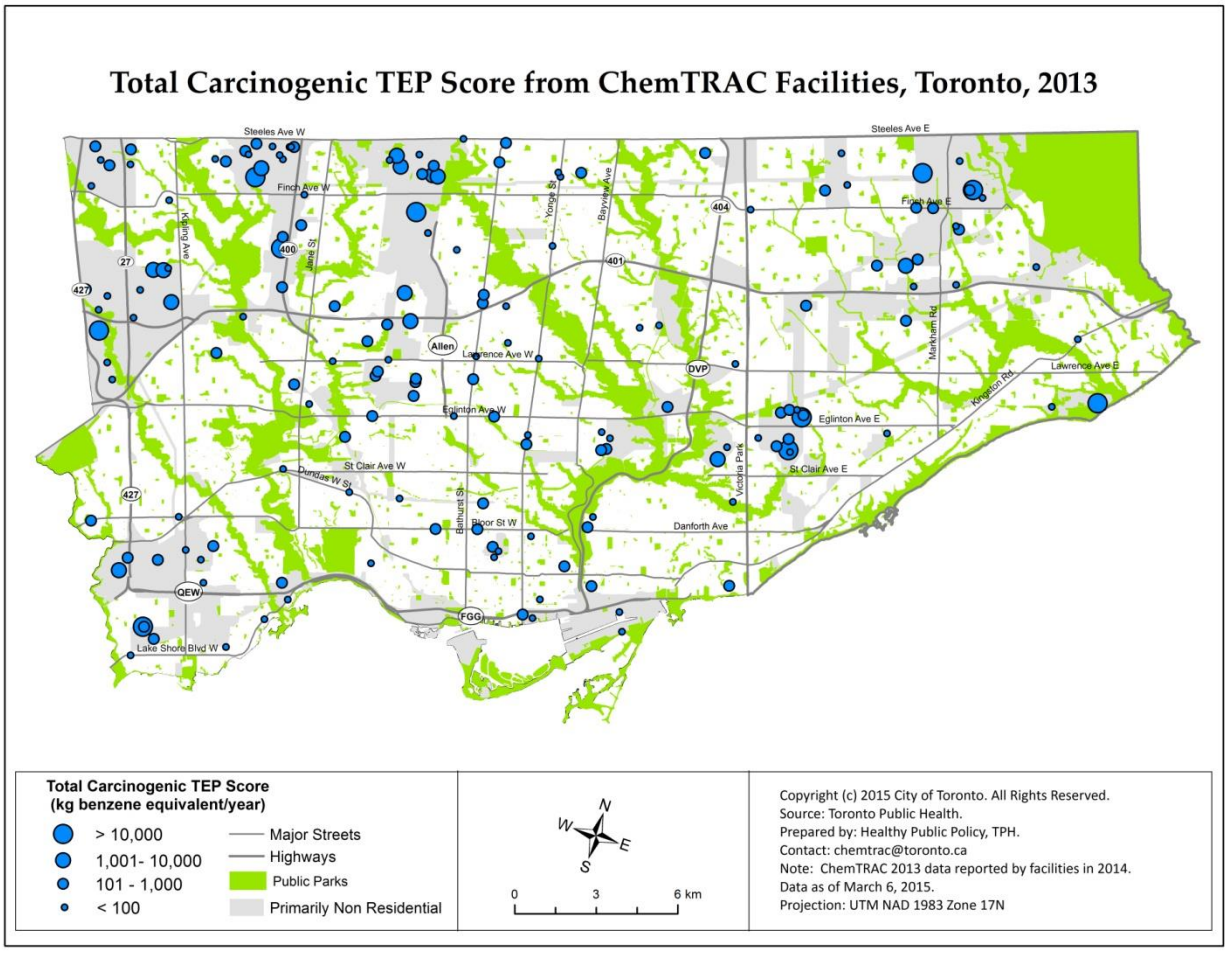


Figure 4: Distribution of Carcinogen TEP in 2013



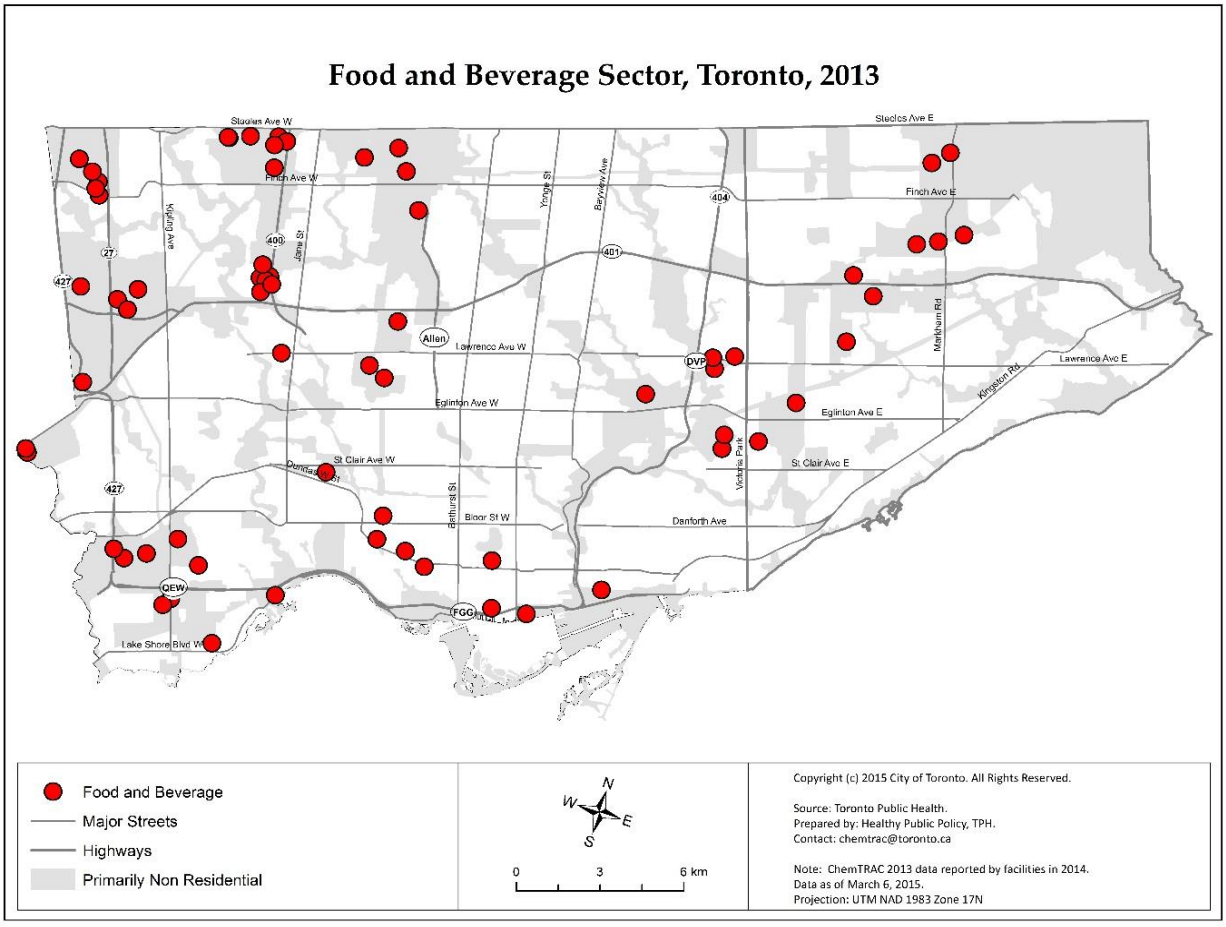
Chapter 4: Sector Quick Facts

The information reported by businesses in 2014 (about operations that took place in 2013) is summarized by industry type below.

Food and Beverage Manufacturing

Types of activities: meat processing, baking, fruit and vegetable canning, frozen food manufacturing and dairy product manufacturing, beverage manufacturing - soft drink, ice, and bottled water manufacturing, beer brewers and wine distillers, and tobacco manufacturing

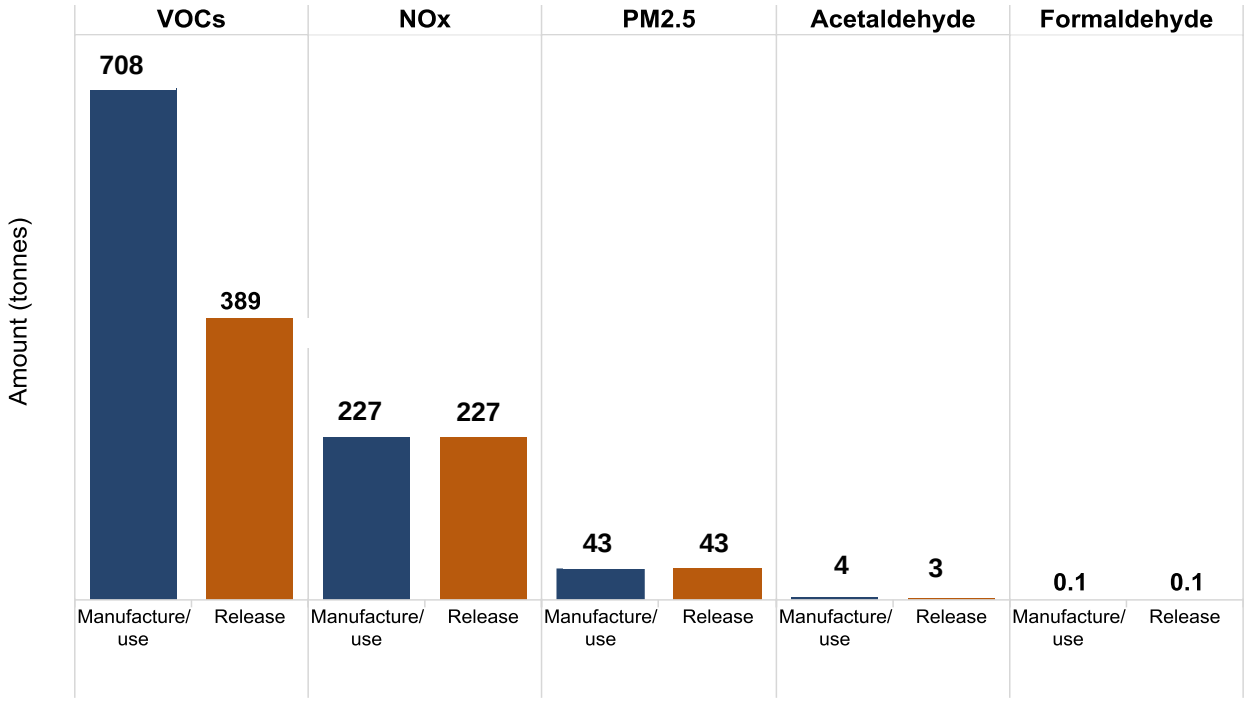
- Number of facilities that met the threshold: 69
- Range in number of employees per facility: 1 to 772
- Total amount released: 674 tonnes
- Total amount manufactured, processed or used: 994 tonnes
- Number of priority substances reported: 5



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Acetaldehyde
- Formaldehyde

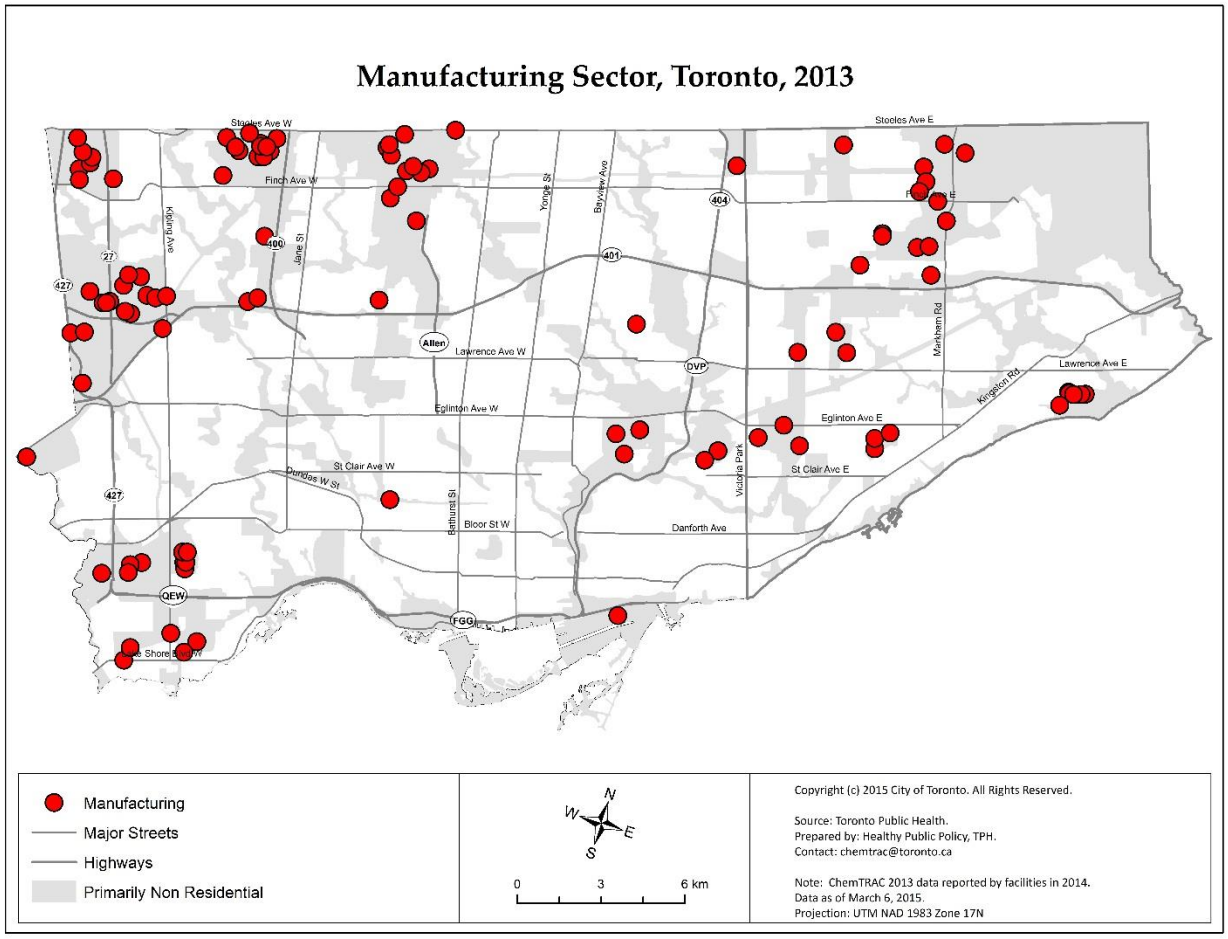
Figure 5: Amount of substances reported by Food and Beverage facilities for 2013



Manufacturing (including chemical and petroleum products)

Types of activities: Manufacturing of basic chemicals, synthetic fibers, plastics, pigments, paints, fertilizers, drugs, cosmetics and soaps

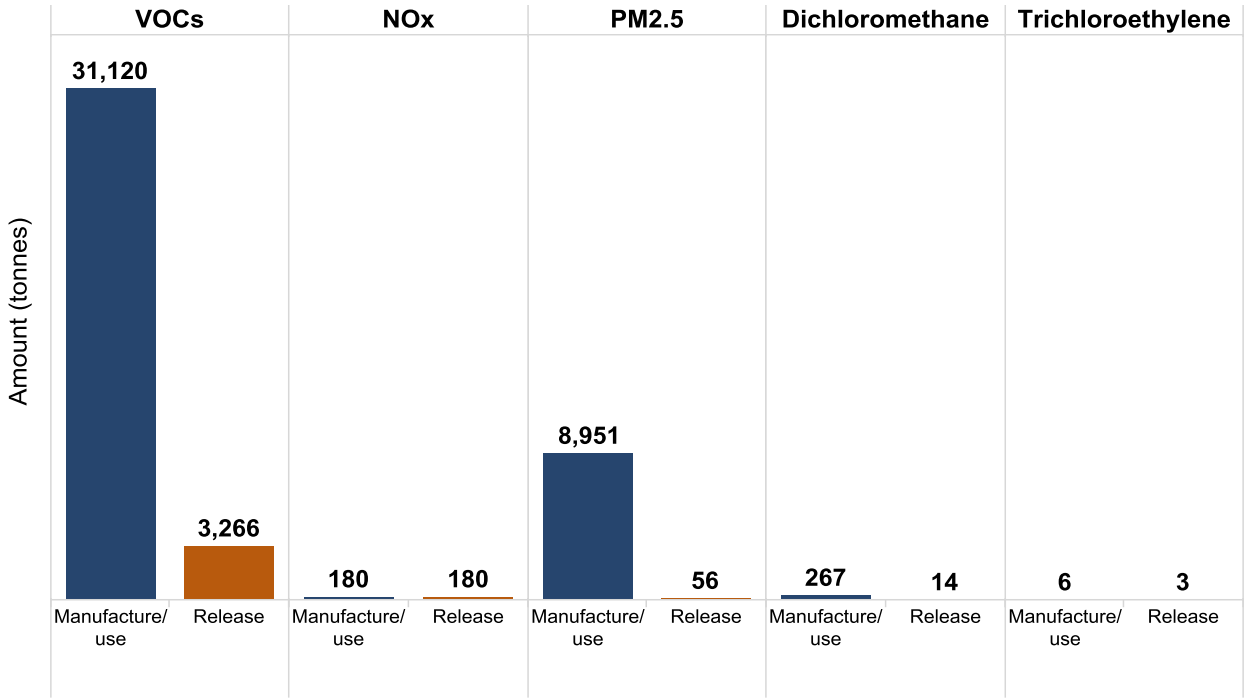
- Number of facilities that met the thresholds: 112
- Range in number of employees per facility: 1 to 1,200
- Total amount released: 3,524 tonnes
- Total amount manufactured, processed or used: 40,951 tonnes
- Number of priority substances reported: 17



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Dichloromethane
- Trichloroethylene

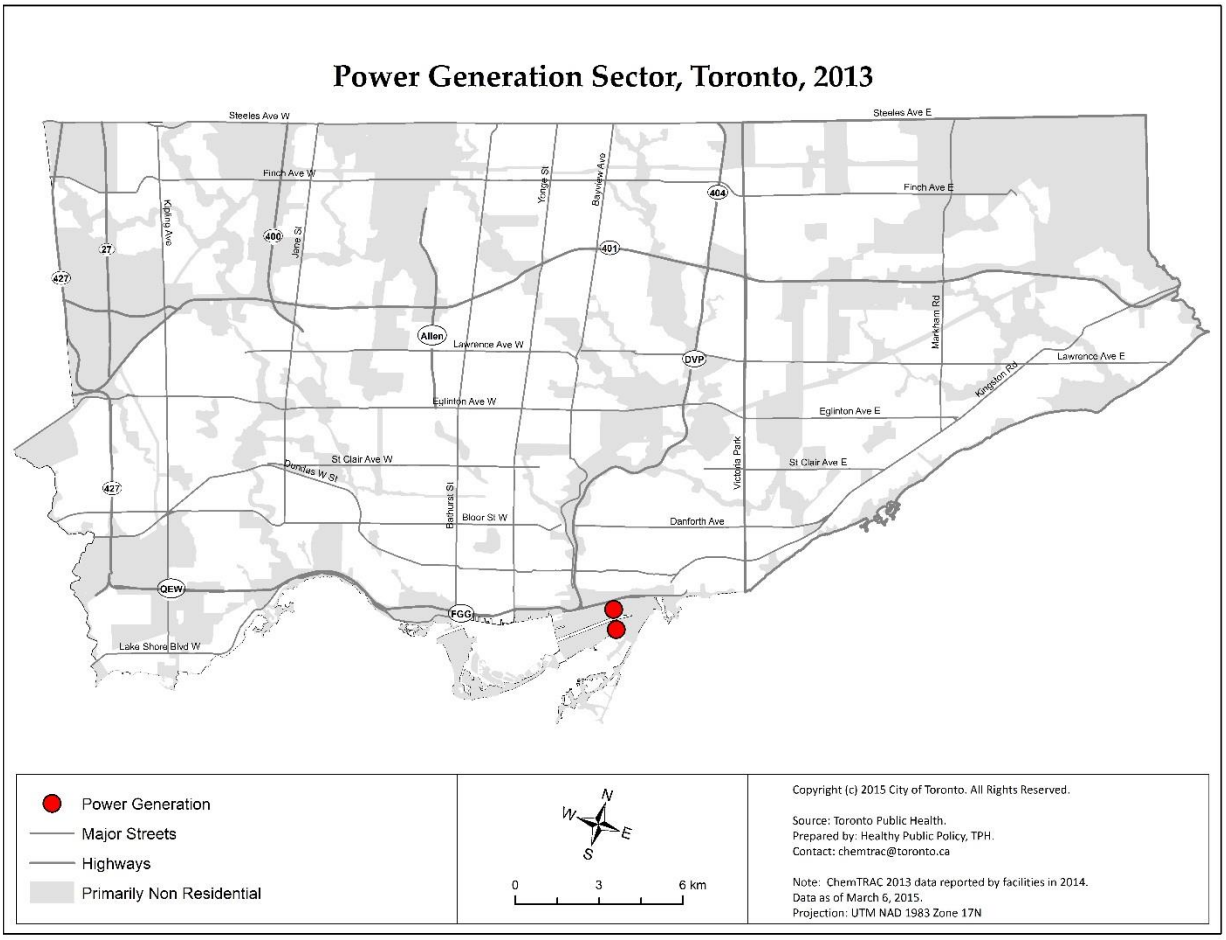
Figure 6: Amount of substances reported by manufacturing facilities for 2013



Power Generation

Types of activities: Generation of bulk electric power

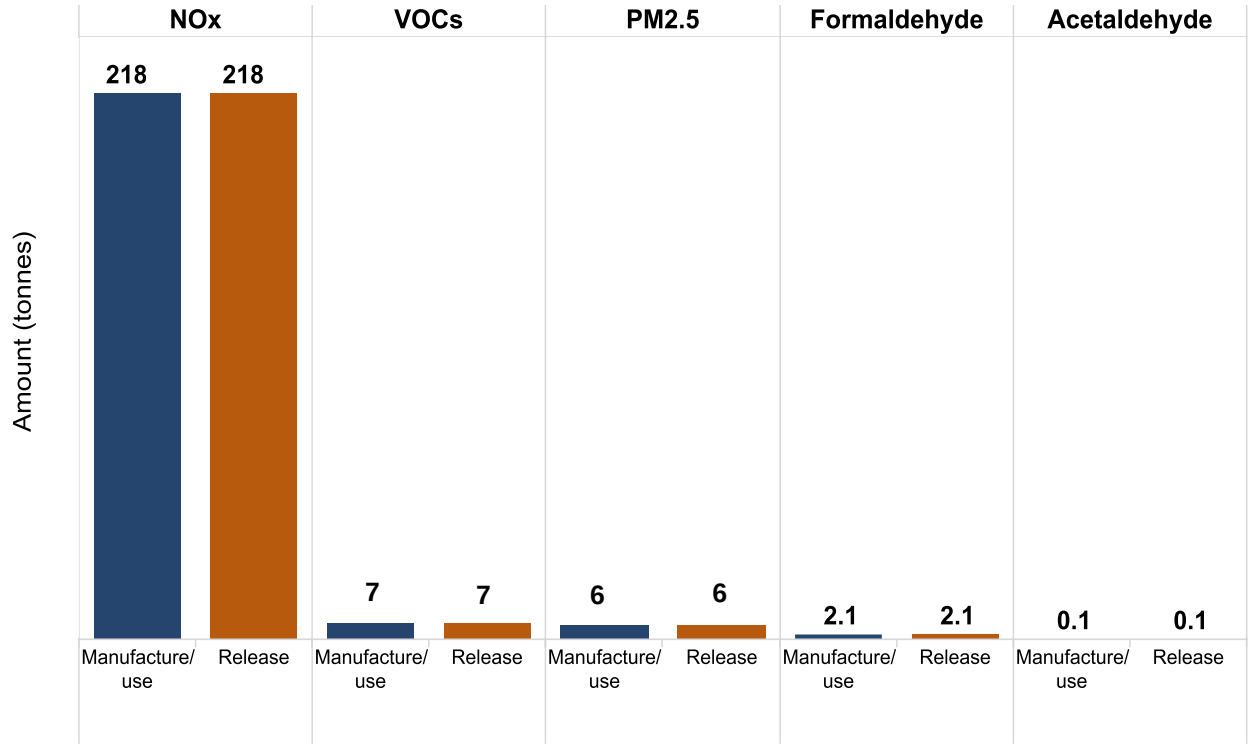
- Number of facilities that met the thresholds: 2
- Range in number of employees per facility: 30 to 363
- Total amount released: 232 tonnes
- Total amount manufactured, processed or used: 398 tonnes
- Number of priority substances reported: 6



Top substances reported are:

- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Formaldehyde
- Acetaldehyde

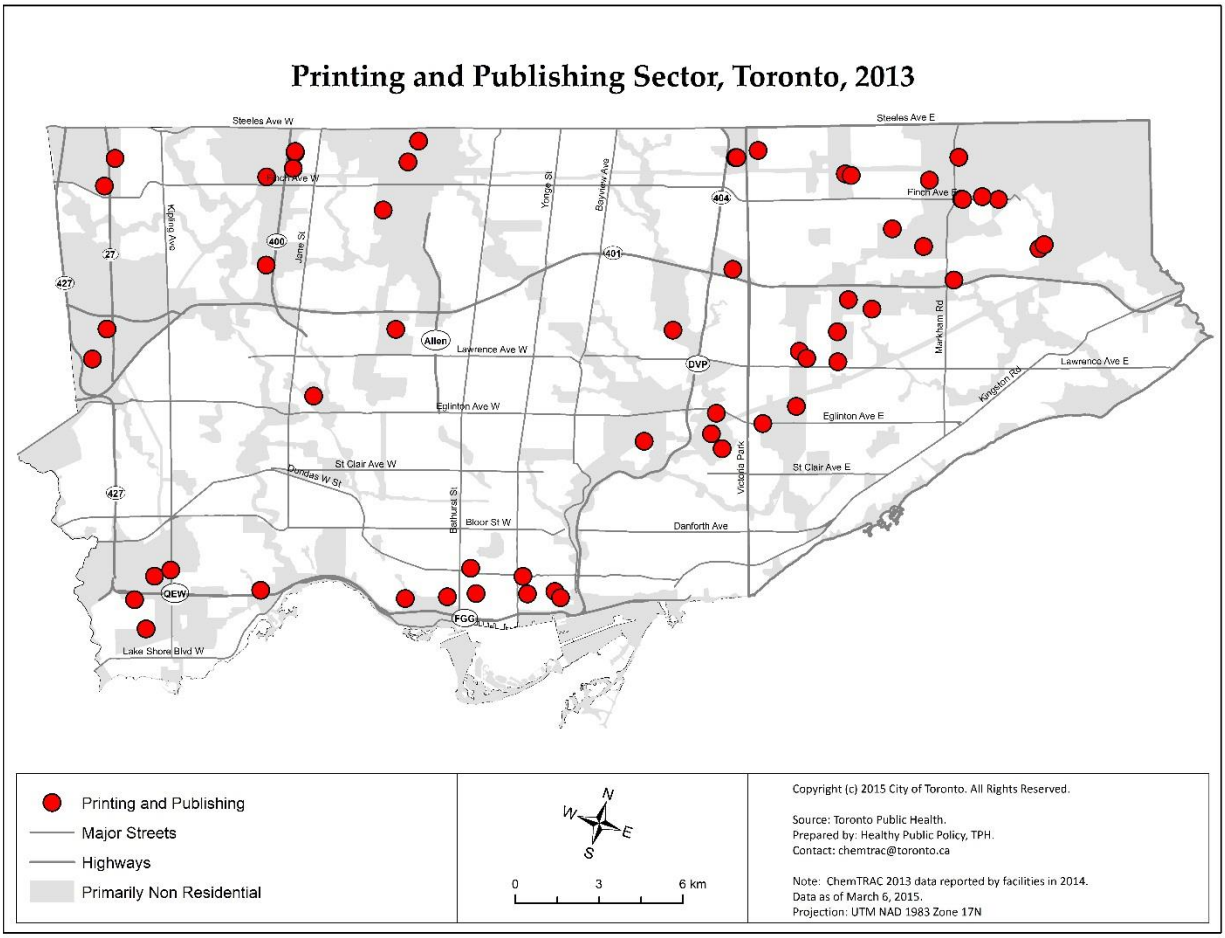
Figure 7: Amount of substances reported by Power Generation facilities for 2013



Printing and Publishing

Types of activities: Printing newspapers, books, labels, business cards, food wrappers, etc.

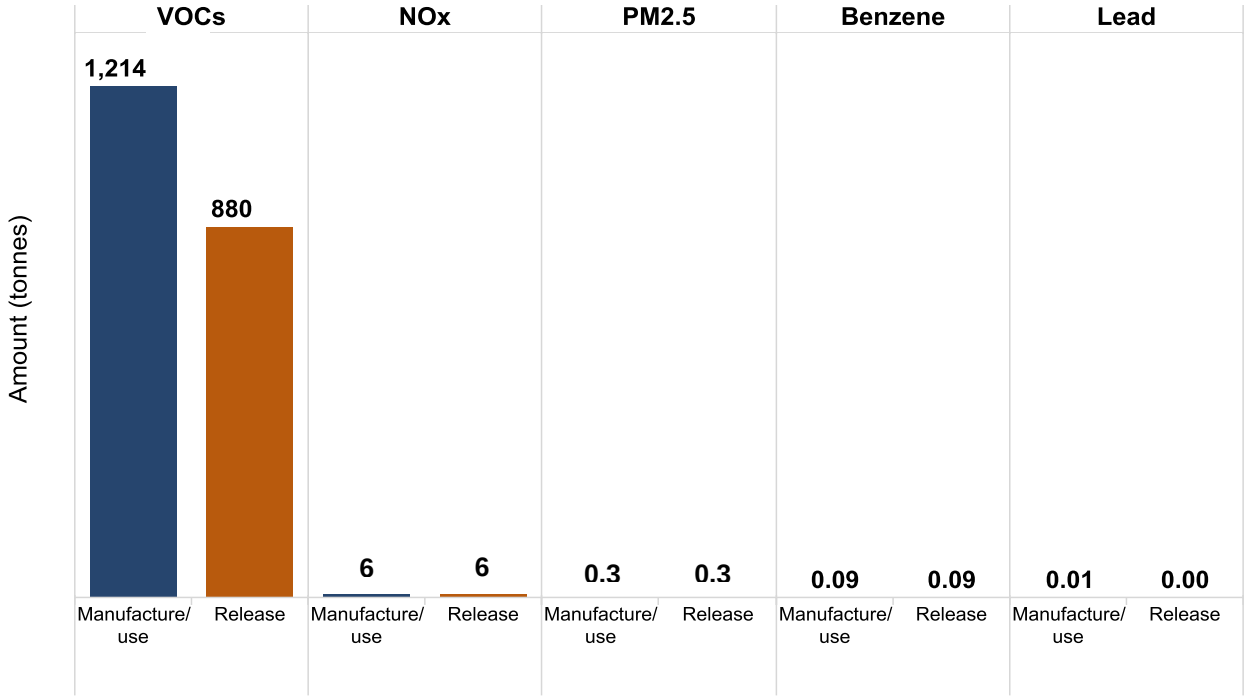
- Number of facilities that met the thresholds: 65
- Range in number of employees per facility: 1 to 200
- Total amount released: 886 tonnes
- Total amount manufactured, processed or used: 1,220 tonnes
- Number of priority substances reported: 4



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Benzene

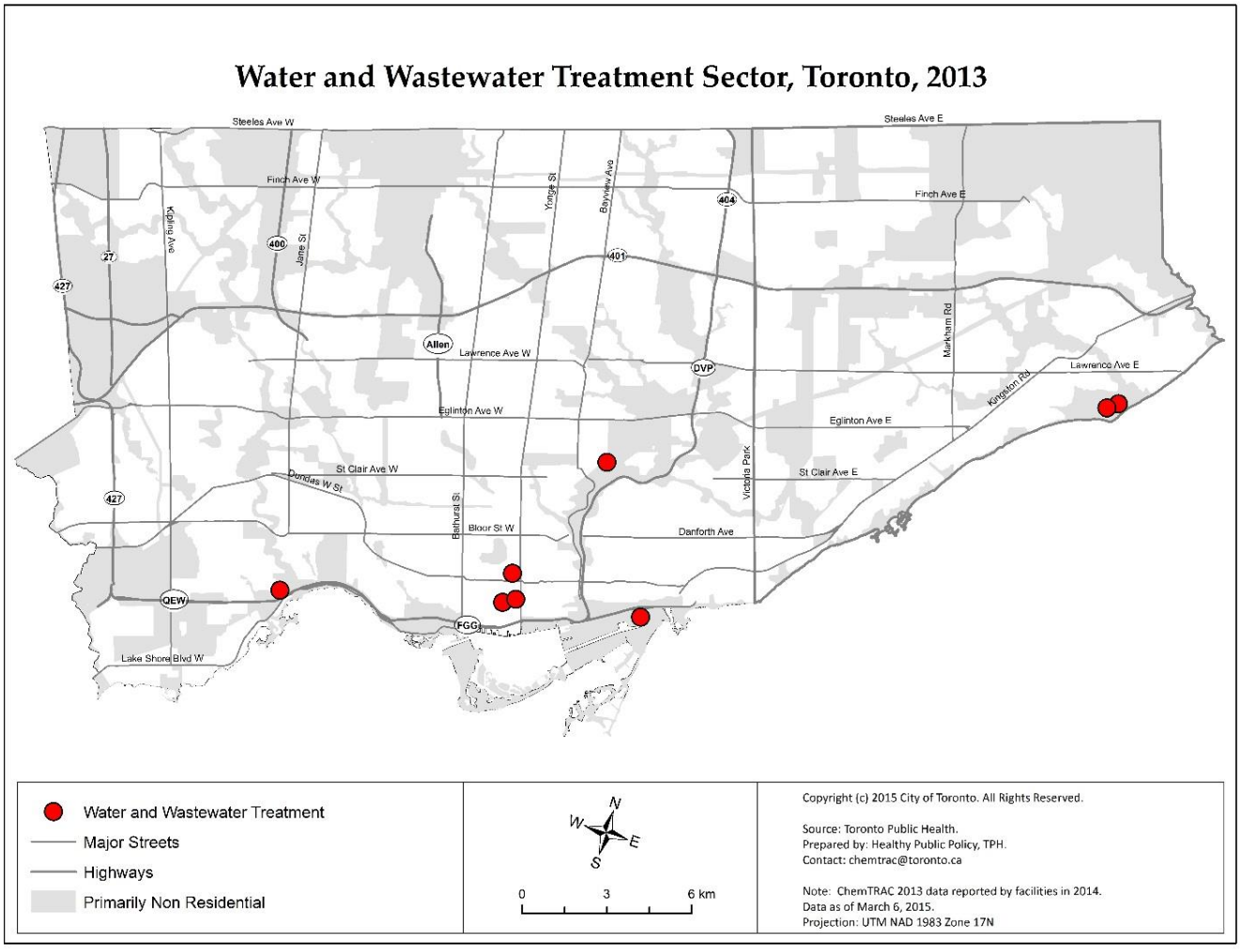
Figure 8: Amounts of substances reported by Printing and Publishing facilities for 2013



Water and Wastewater

Types of activities: Water, wastewater and sewage treatment plants

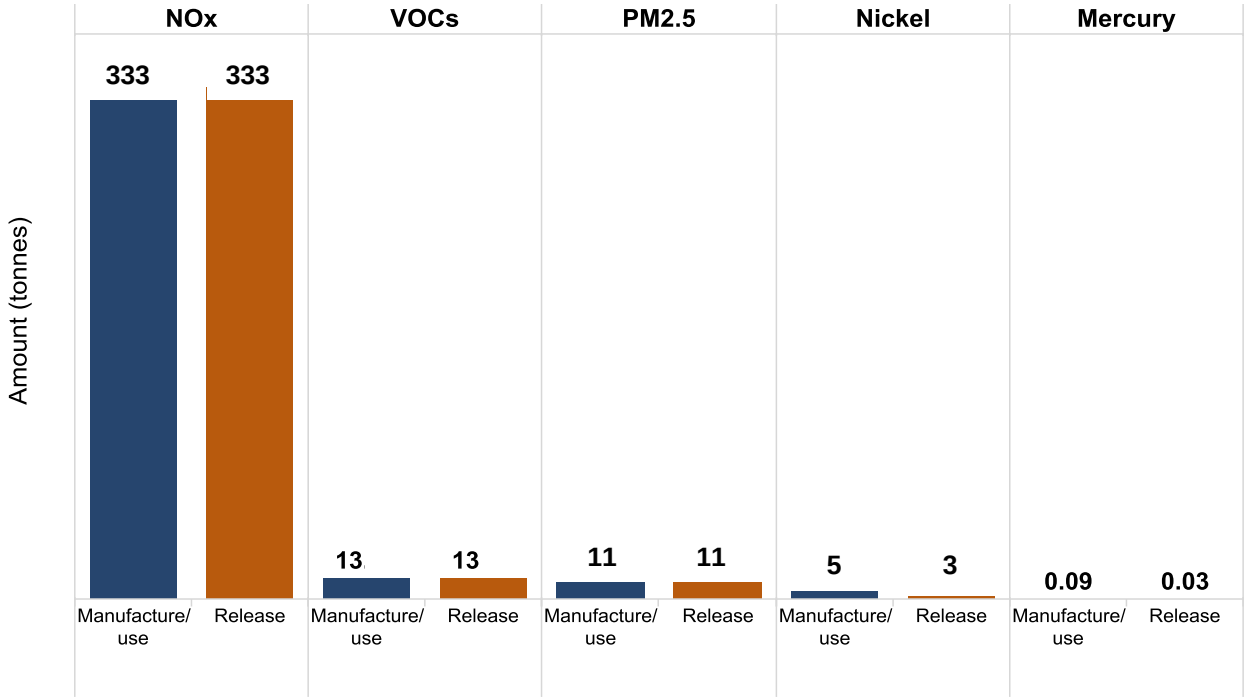
- Number of facilities that met the thresholds: 8
- Range in number of employees per facility: 5 to 174
- Total amount released: 359 tonnes
- Total amount manufactured, processed or used: 366 tonnes
- Number of priority substances reported: 7



Top substances reported are:

- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Nickel
- Mercury

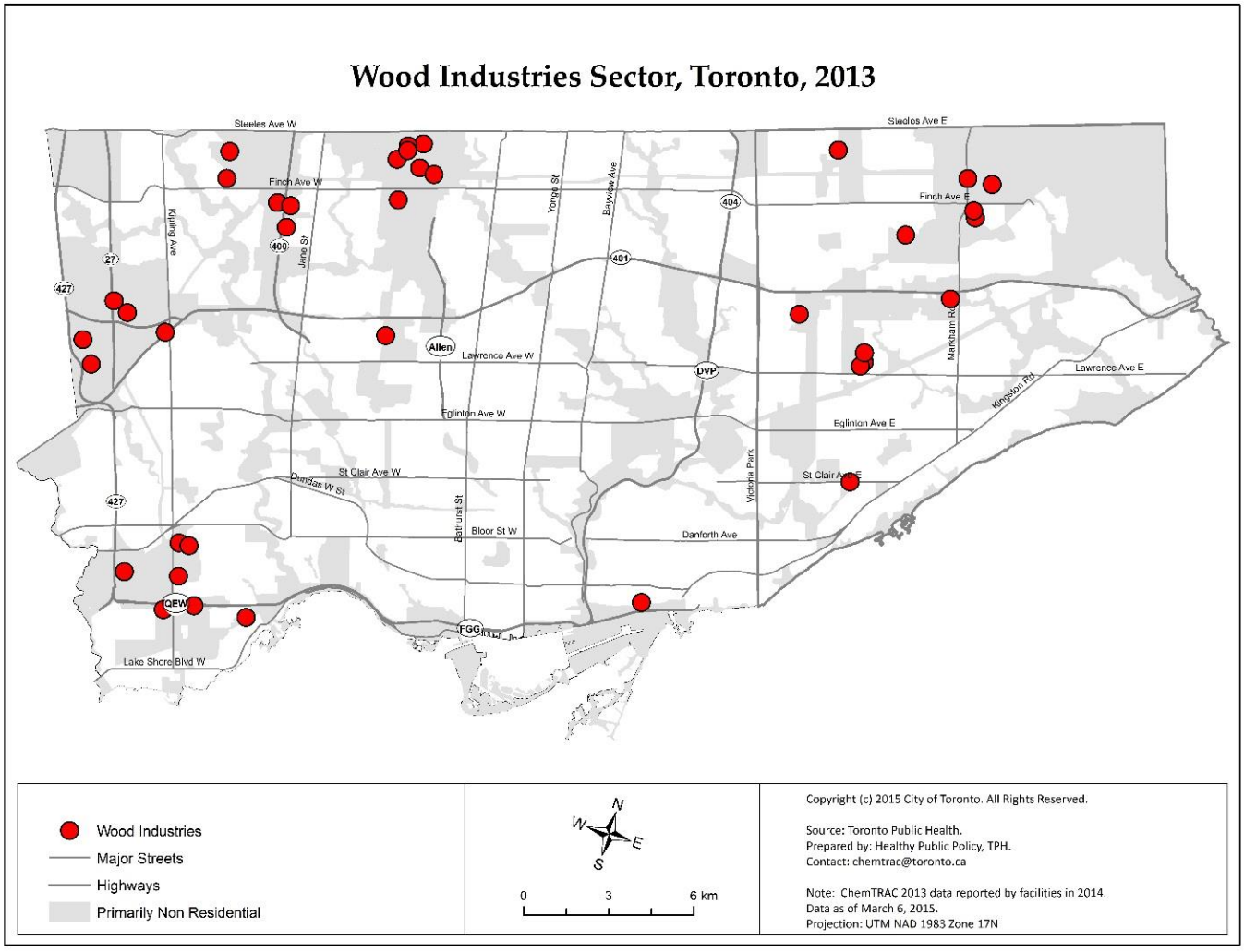
Figure 9: Amounts of substances reported by Water and Wastewater Treatment facilities for 2013



Wood Industries

Types of activities: Creation of wood-based products including paper, cardboard, pallets, furniture and cabinetry

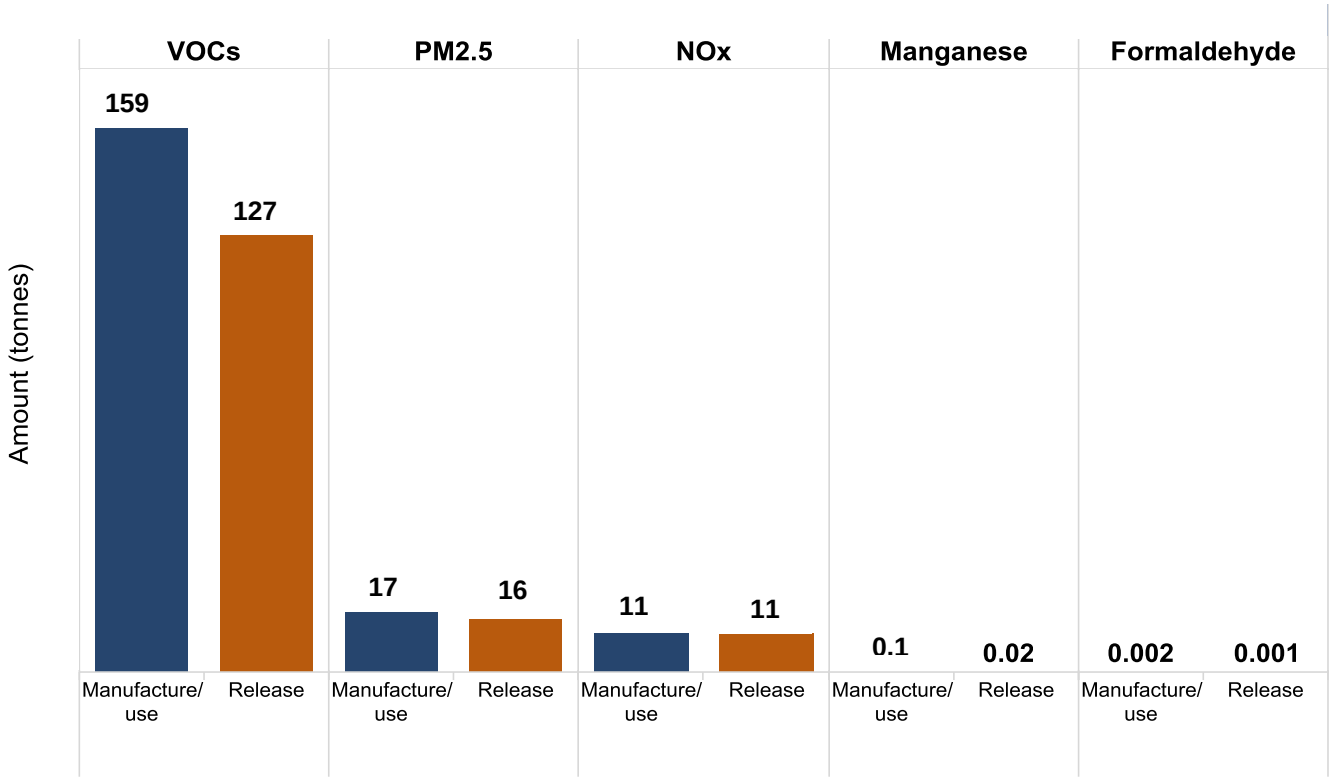
- Number of facilities that met the thresholds: 46
- Range in number of employees per facility: 1 to 681
- Total amount released: 153 tonnes
- Total amount manufactured, processed or used: 187 tonnes
- Number of priority substances reported: 6



Top substances reported are:

- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Nitrogen oxides (NOx)
- Manganese
- Formaldehyde

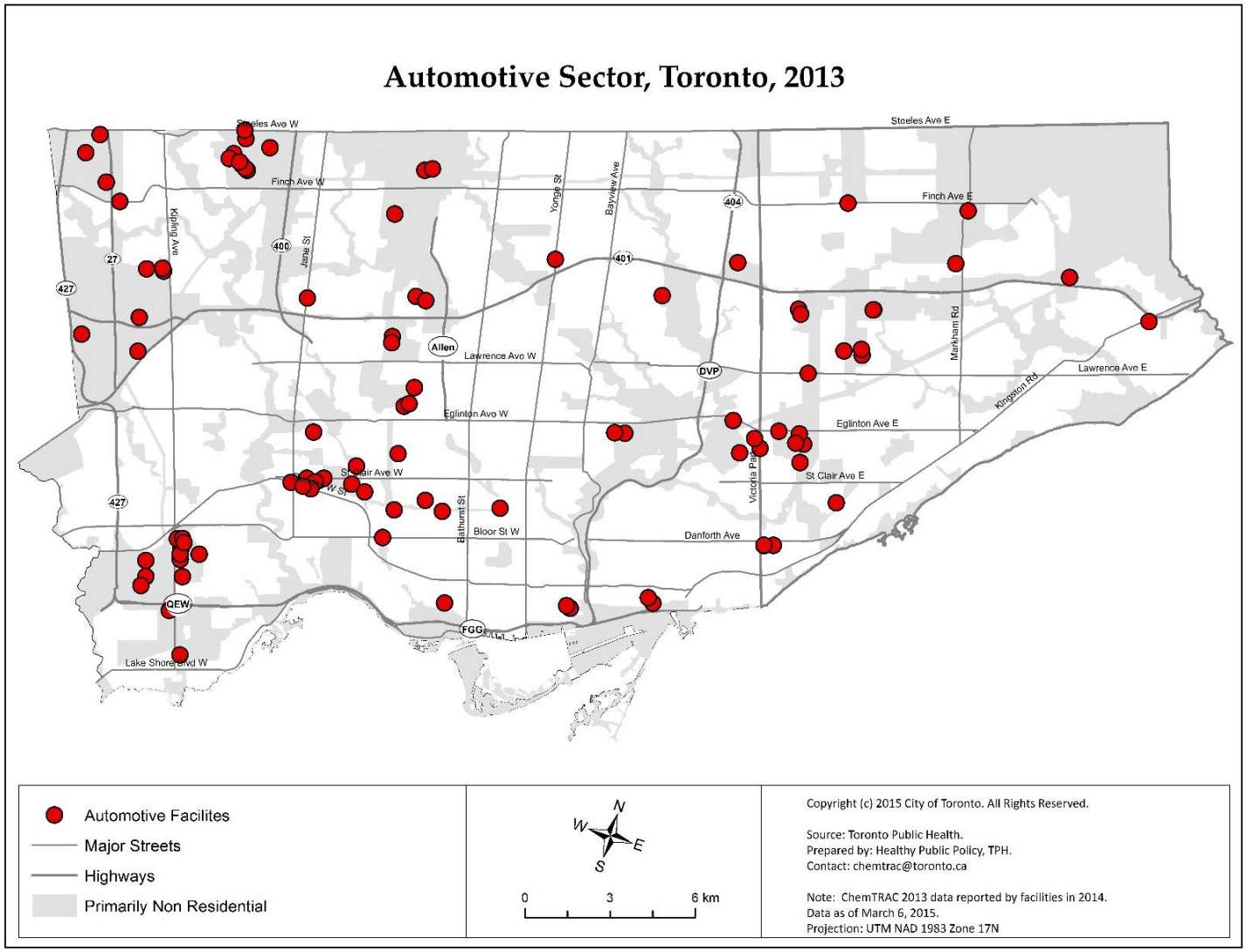
Figure 10: Amounts of substances reported by Wood Industries for 2013



Auto Body, Collision Repair and Auto Refinishing Sector

Types of activities: Painting, repairing and customizing cars, trucks, vans and commercial trailers

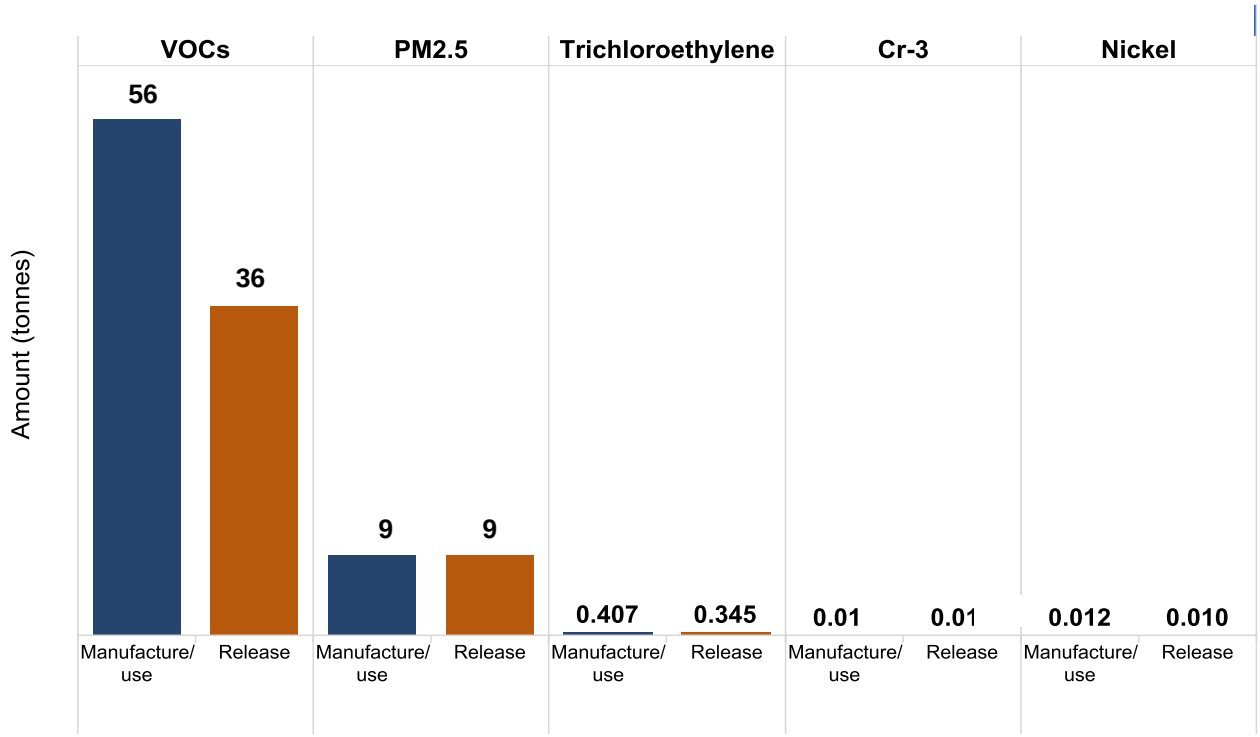
- Number of facilities that met the thresholds: 102
- Range in number of employees per facility: 1 to 65
- Total amount released: 45 tonnes
- Total amount manufactured, processed or used: 65 tonnes
- Number of priority substances reported: 8



Top substances reported are:

- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Trichloroethylene
- Chromium Non-Hexavalent and its compounds (Cr-3)
- Nickel

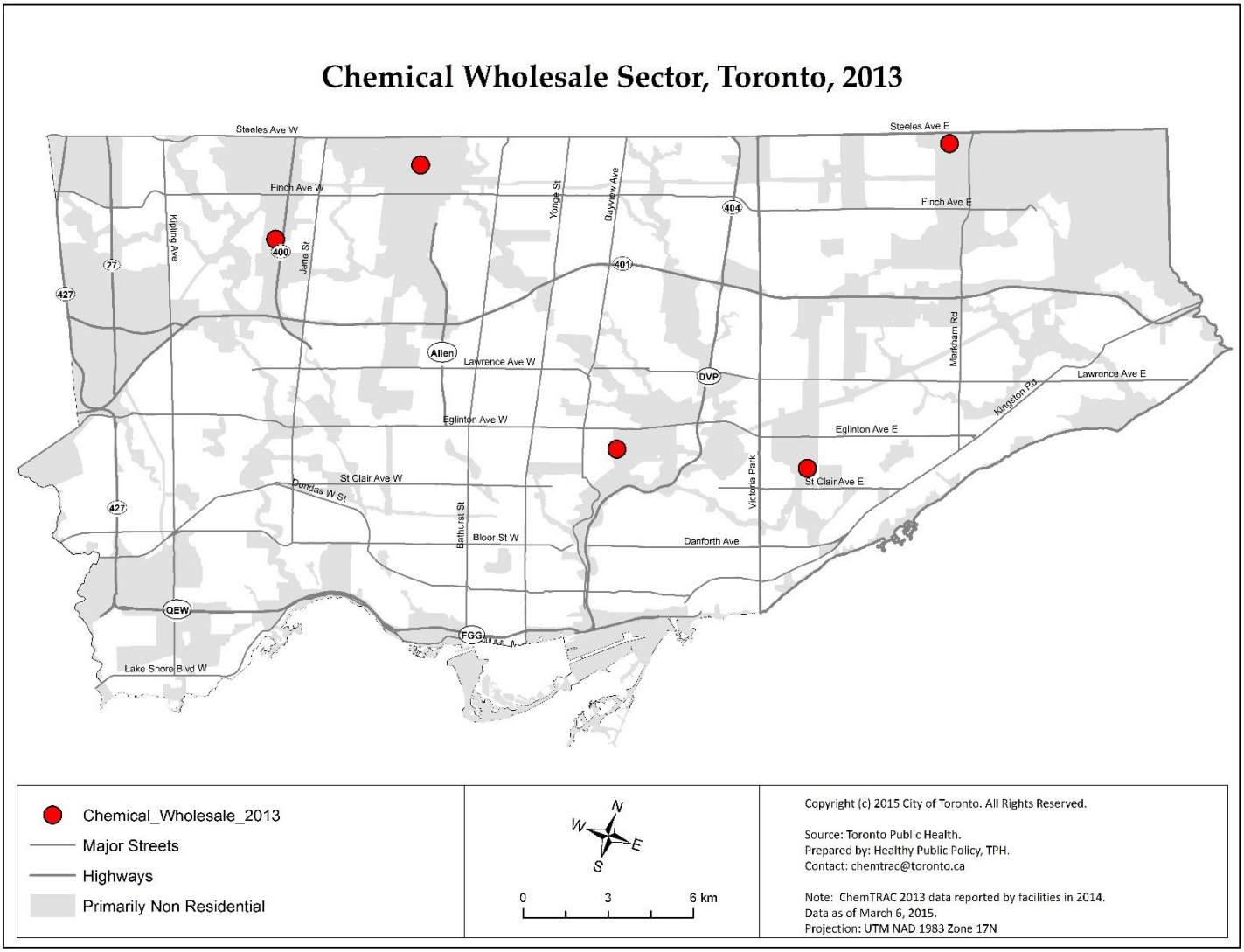
Figure 11: Amounts of substances reported by Autobody Refinishing facilities for 2013



Chemical Wholesale

Types of activities: Wholesale of industrial and household chemicals, cleaning compounds and preparations, plastics resins, plastic basic forms and shapes, and industrial gases

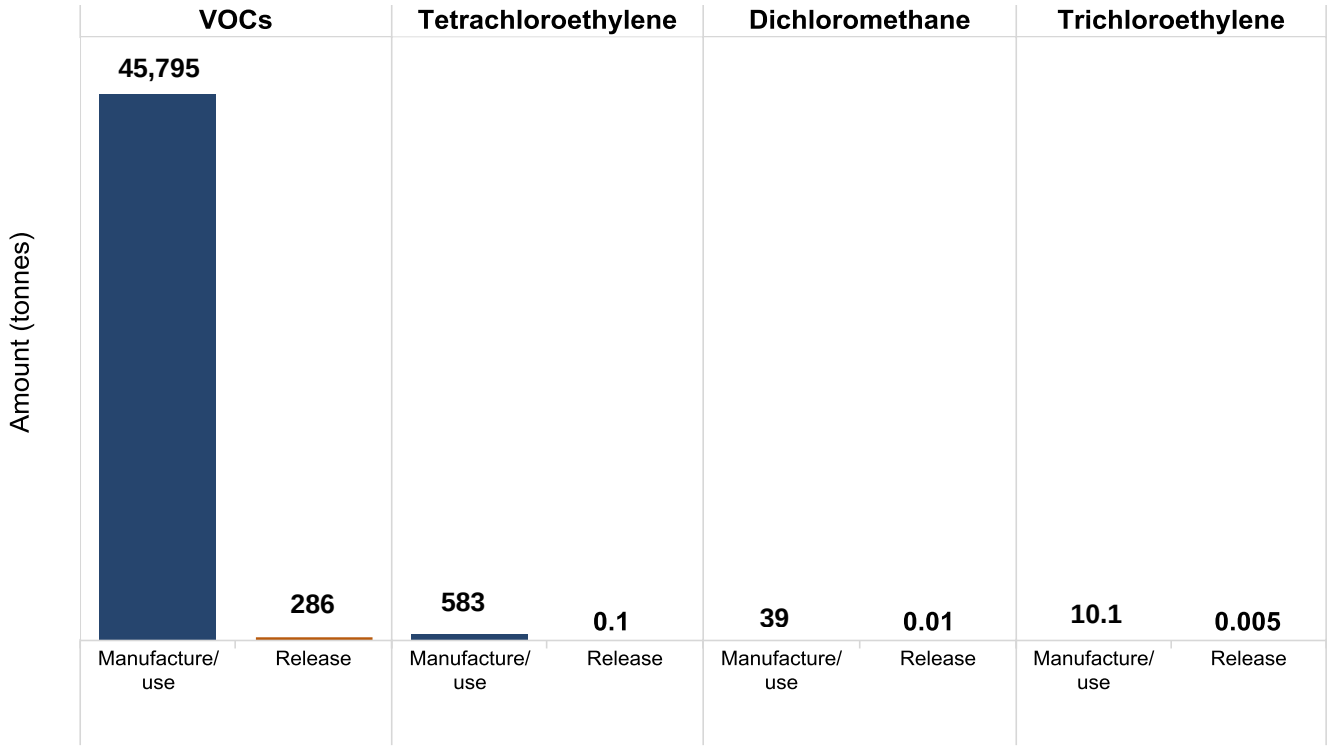
- Number of facilities that met the thresholds: 5
- Range in number of employees per facility: 14 to 125
- Total amount released: 286 tonnes
- Total amount manufactured, processed or used: 46,427 tonnes
- Number of priority substances reported: 4



Top substances reported are:

- Volatile organic compounds (VOCs)
- Tetrachloroethylene (Perchloroethylene)
- Dichloromethane and
- Trichloroethylene

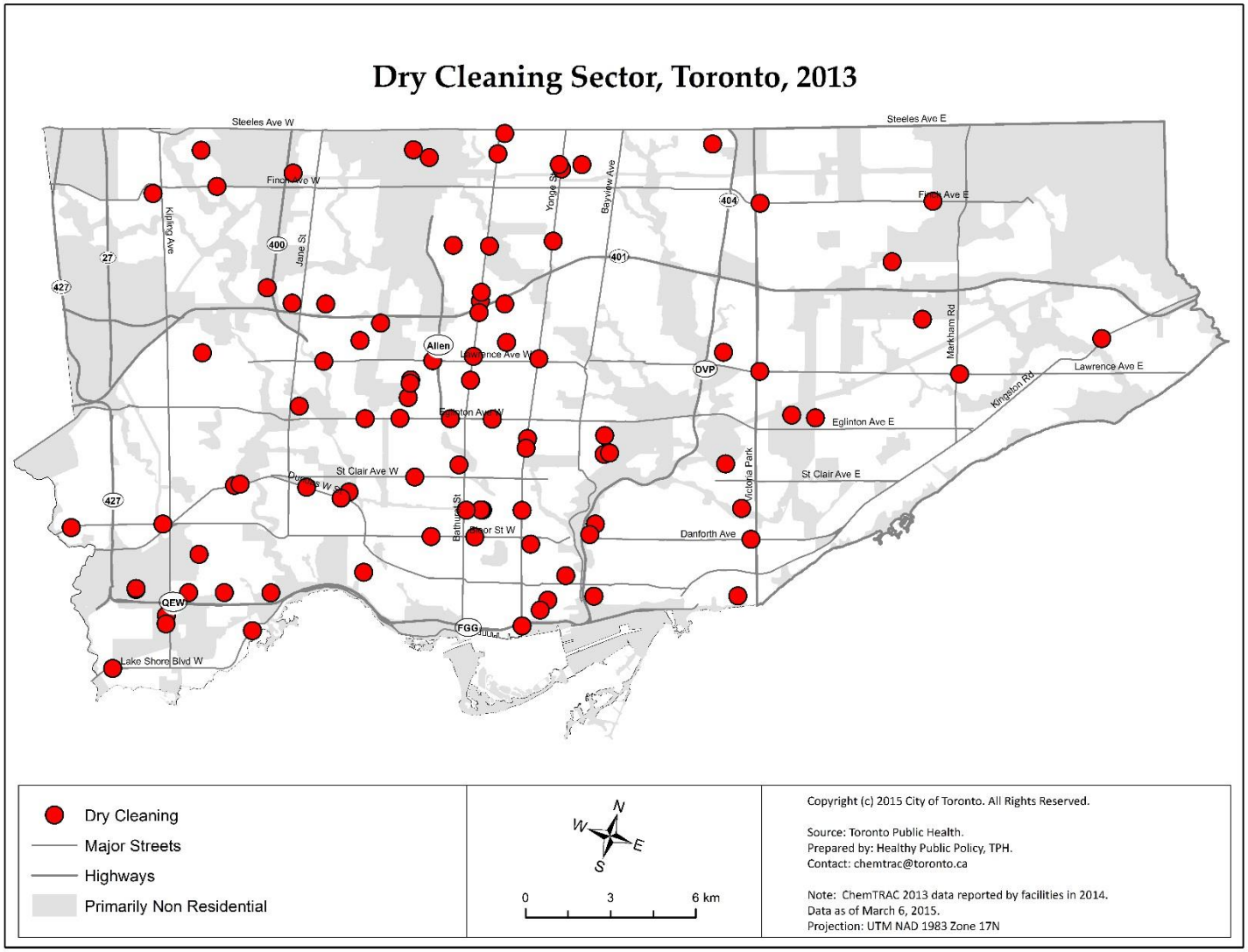
Figure 12: Amount of substances reported for Chemical Wholesale in 2013



Dry Cleaning and Industrial Laundry

Types of activities: Self-service laundry, laundering services, laundering and supplying laundered uniforms, linens and other fabric items and dry cleaning

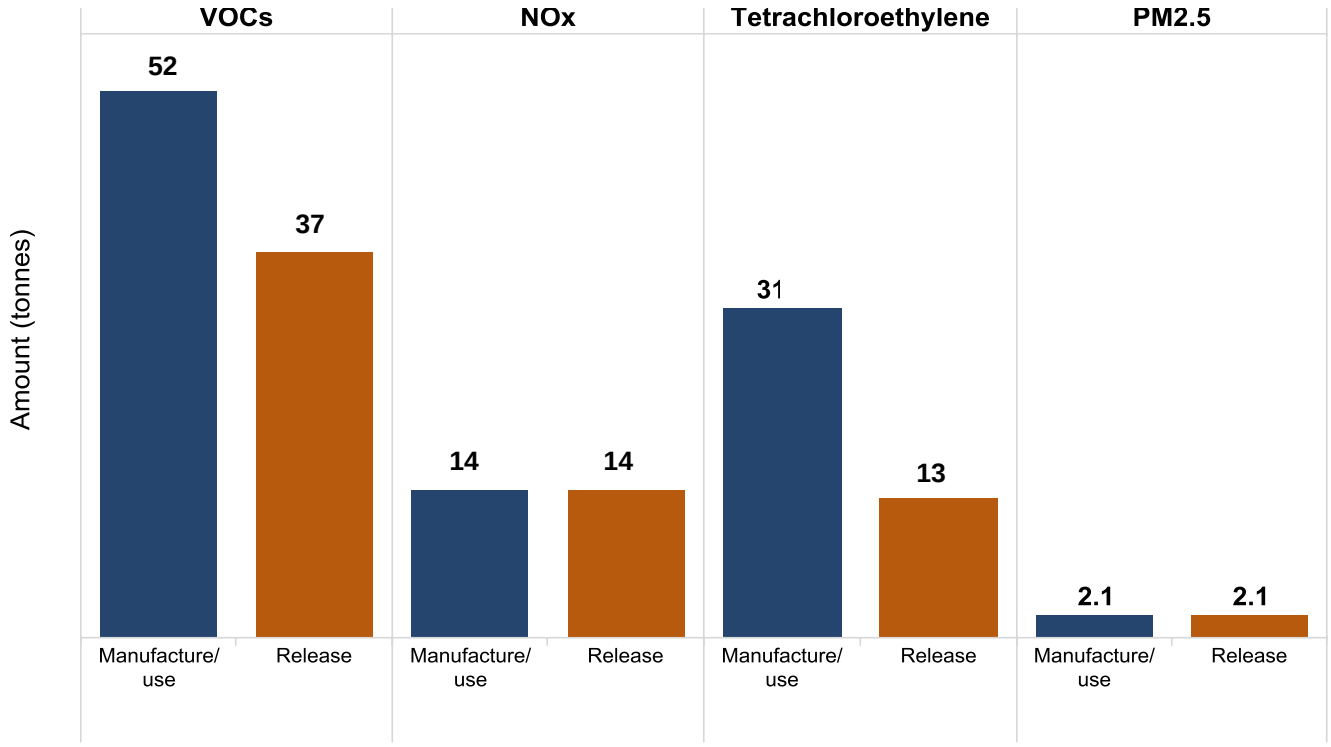
- Number of facilities that met the thresholds: 94
- Range in number of employees per facility: 1 to 240
- Total amount released: 66 tonnes
- Total amount manufactured, processed or used: 99 tonnes
- Number of priority substances reported: 4



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Tetrachloroethylene (Perchloroethylene)
- Particulate matter 2.5 ($PM_{2.5}$)

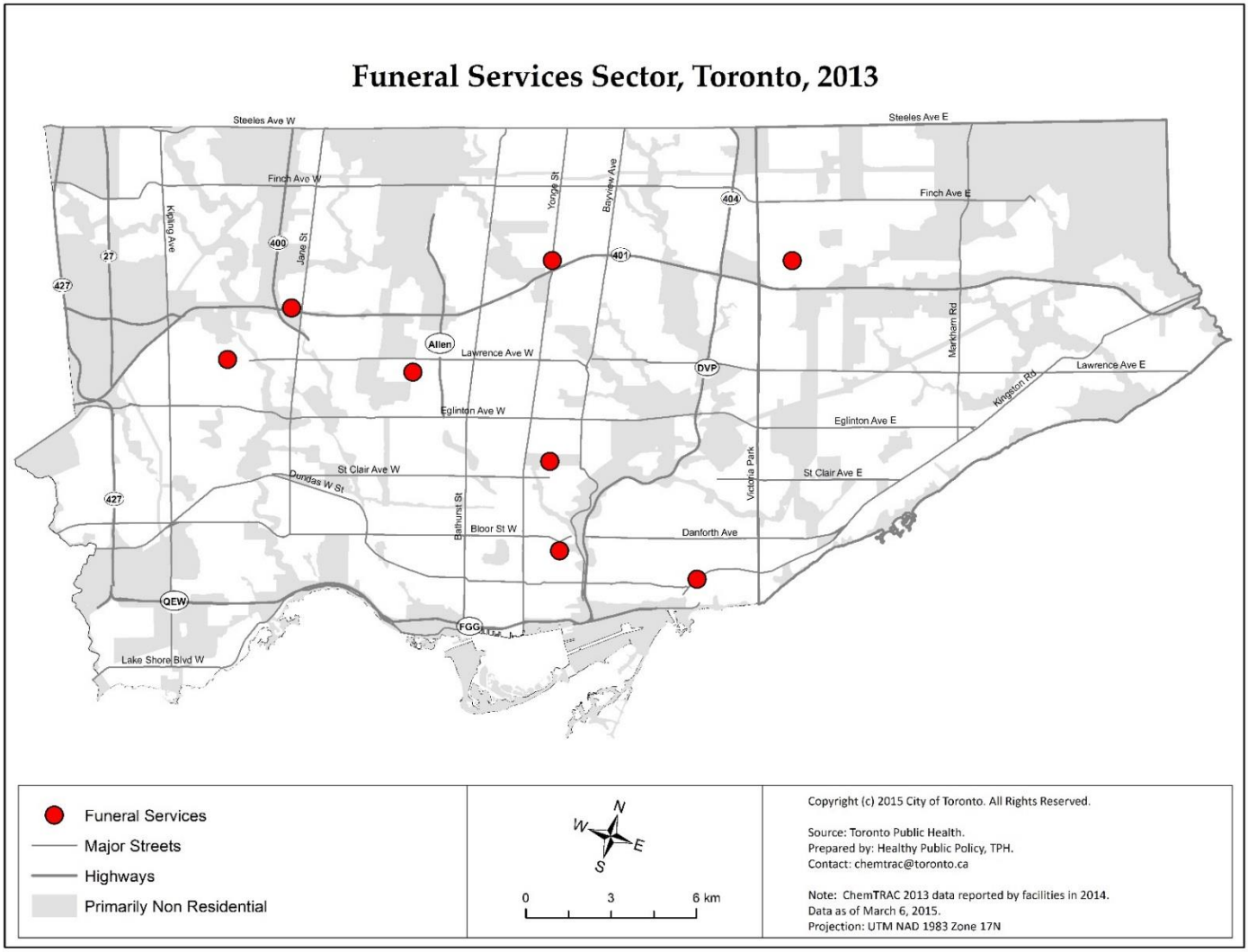
Figure 13: Amounts of substances reported by Dry Cleaning and Industrial Laundry facilities for 2013



Funeral Services

Types of activities: Funeral homes, cemeteries and crematoria

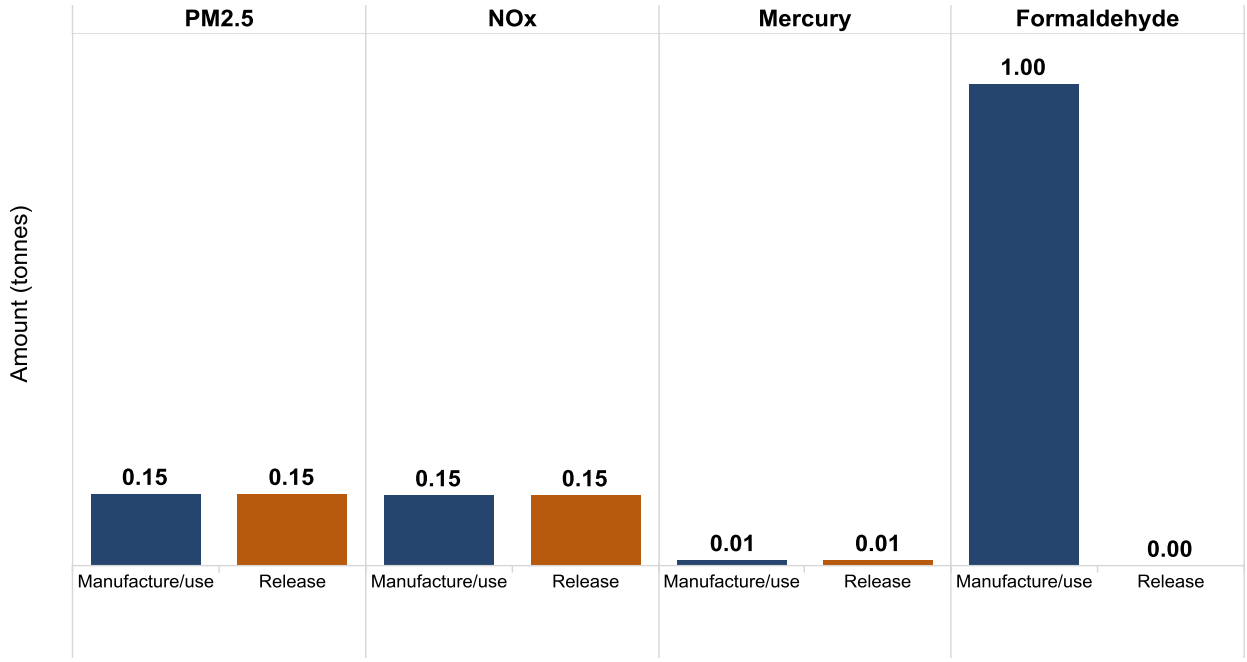
- Number of facilities that met the thresholds: 8
- Range in number of employees per facility: 1 to 30
- Total amount released: 0.31 tonnes
- Total amount manufactured, processed or used: 1 tonne
- Number of priority substances reported: 4



Top substances reported are:

- Particulate matter 2.5 ($PM_{2.5}$)
- Nitrogen oxides (NOx)
- Mercury and its compounds
- Formaldehyde

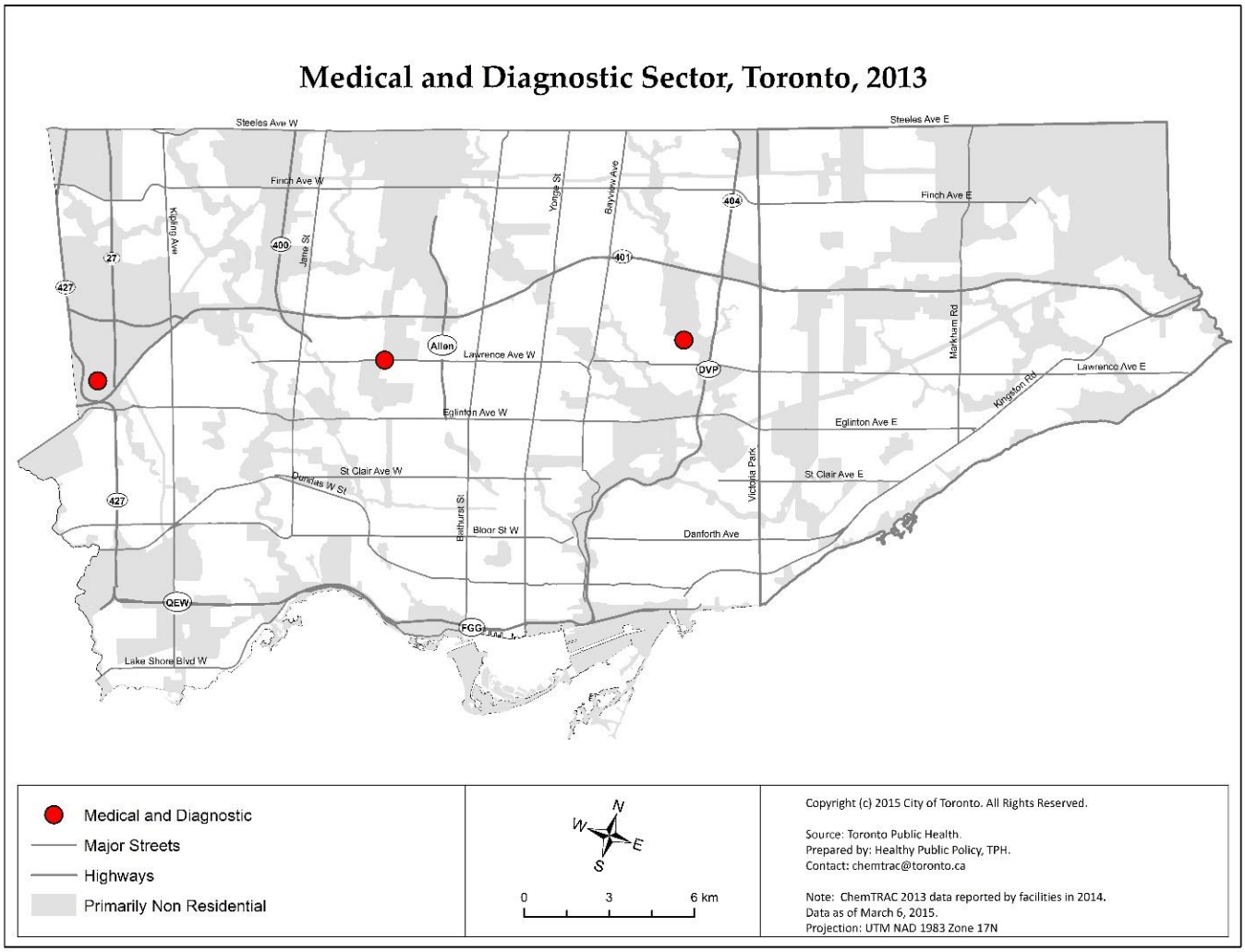
Figure 14: Amount of substances reported for Funeral Services in 2013



Medical and Diagnostic

Types of activities: Analytic or diagnostic services to the medical profession or patient on referral from a health practitioner

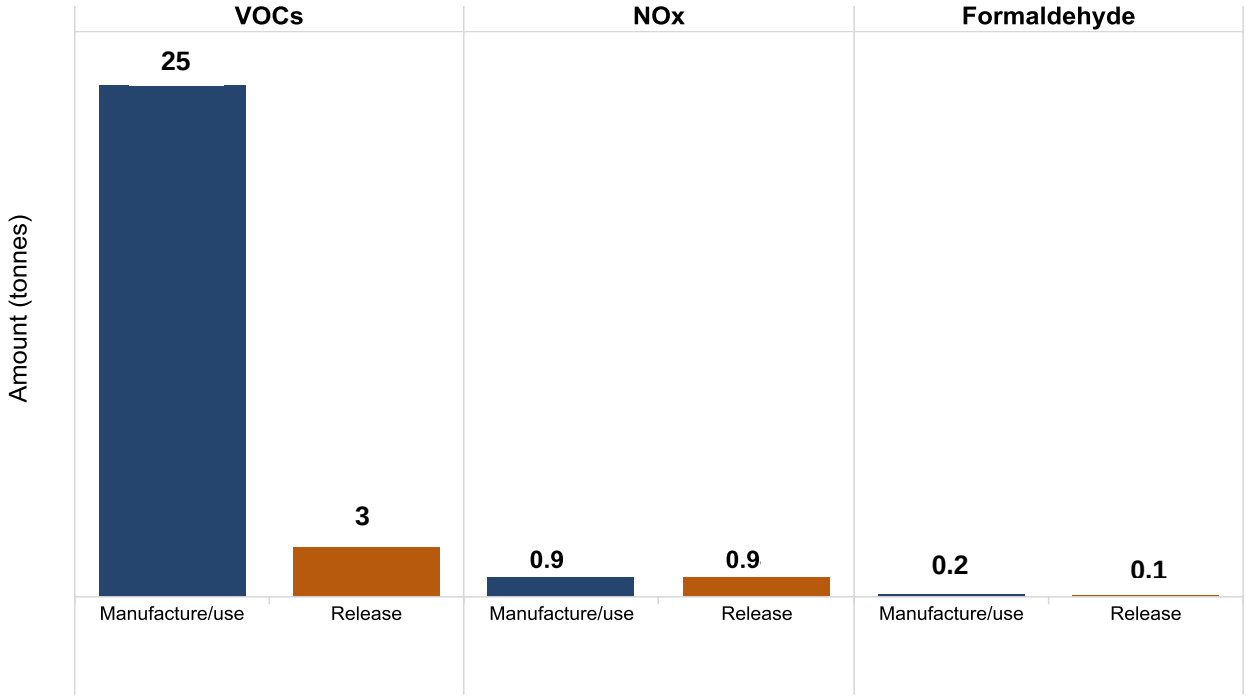
- Number of facilities that met the thresholds: 3
- Range in number of employees per facility: 88 to 600
- Total amount released: 3 tonnes
- Total amount manufactured, processed or used: 26 tonnes
- Number of priority substances reported: 3



Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Formaldehyde

Figure 15: Amounts of substances reported by Medical and Diagnostic services for 2013



Waste Management and Remediation

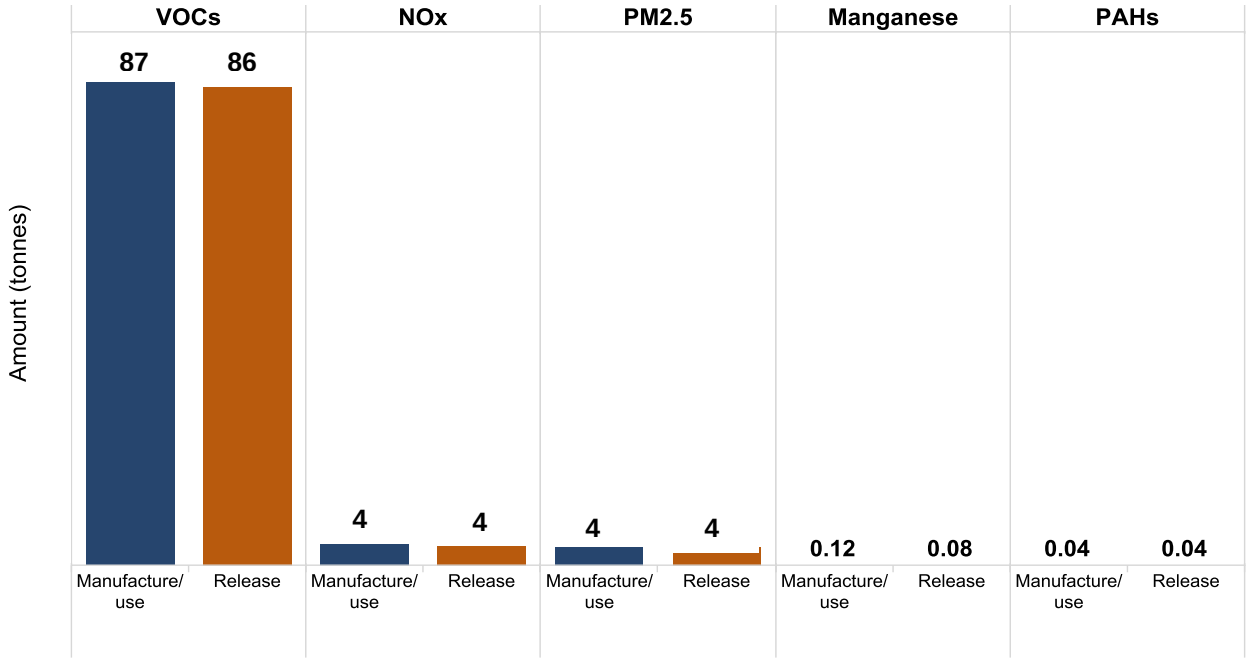
Types of activities: Waste collection, treatment and disposal services, environmental remediation services, septic tank pumping services and recovery facilities

- Number of facilities that met the thresholds: 6
- Range in number of employees per facility: 1 to 193
- Total amount released: 93 tonnes
- Total amount manufactured, processed or used: 187 tonnes
- Number of priority substances reported: 12

Top substances reported are:

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Manganese
- Polycyclic Aromatic Hydrocarbons (PAHs)

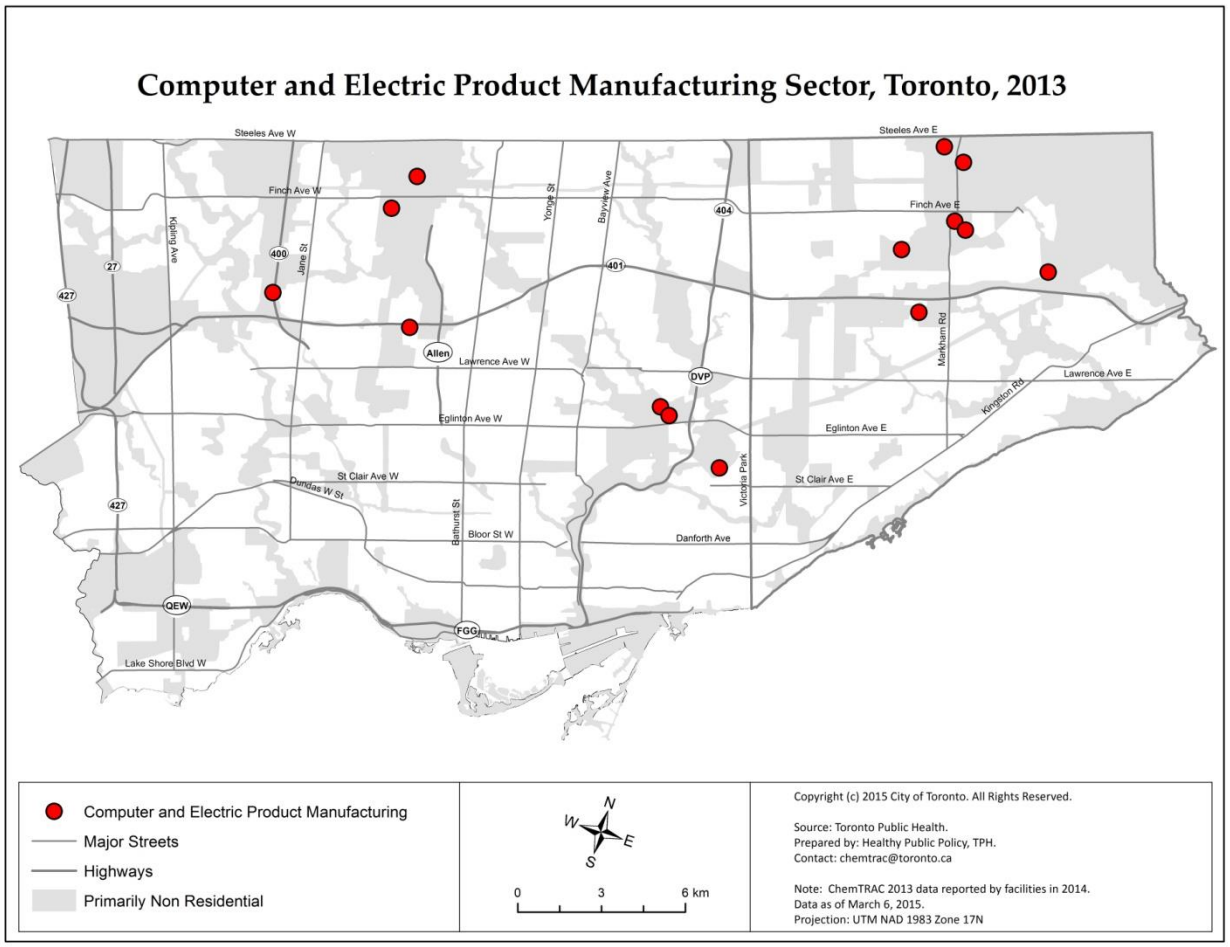
Figure 16: Amounts of substances reported by Waste Management facilities for 2013



Computer and Electric Product Manufacturing

Types of activities: Manufacture of computers, computer peripherals, and communications equipment.

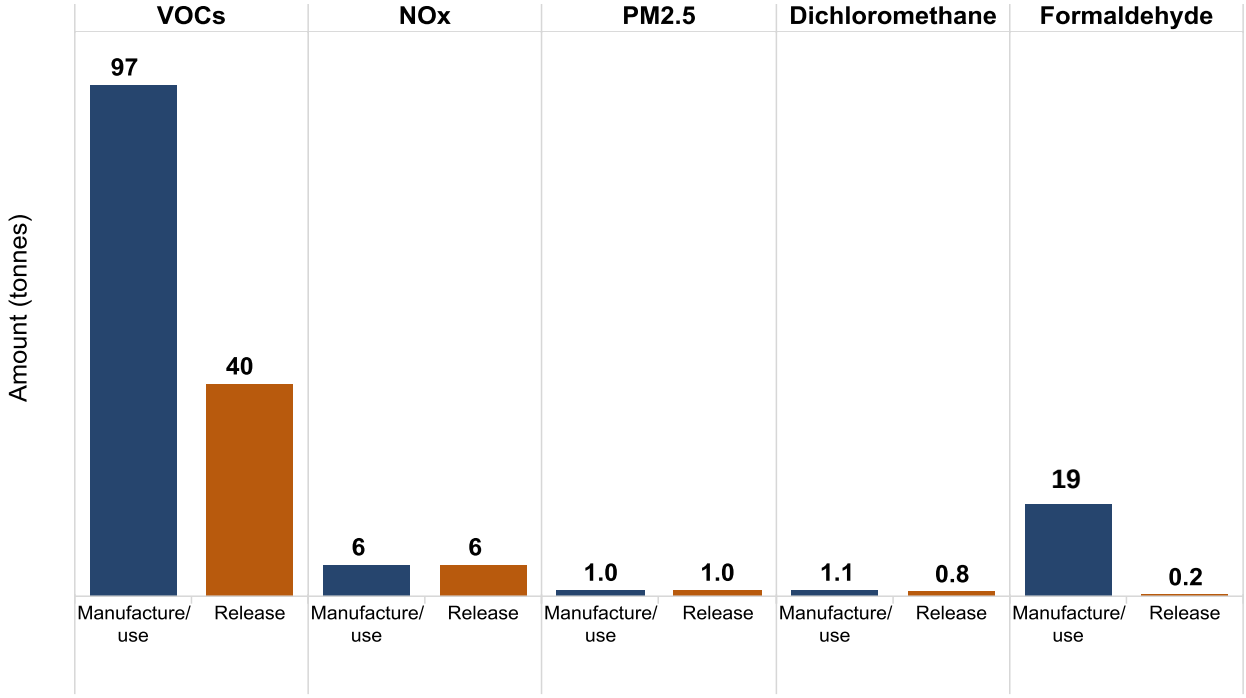
- Number of facilities that met the thresholds: 14
- Range in number of employees per facility: 7 to 800
- Total amount released: 48 tonnes
- Total amount manufactured, processed or used: 140 tonnes
- Number of priority substances reported: 9



Top substances reported are

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Dichloromethane
- Formaldehyde

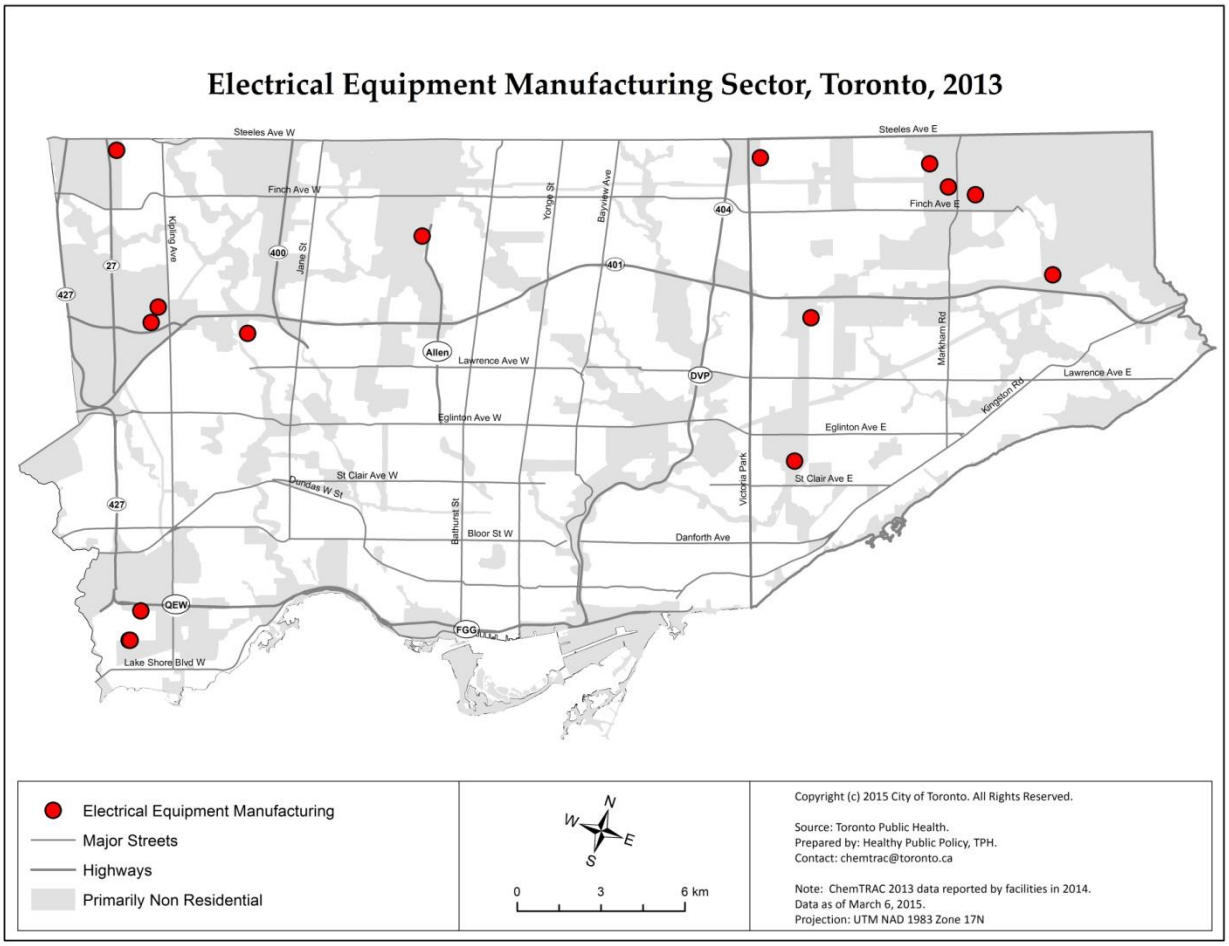
Figure 17: Amounts of substances reported by Computer and Electric Product Manufacturing facilities for 2013



Electrical Equipment, Appliance and Component Manufacturing

Types of activities: Manufacture of product that generate, use and distribute electrical power. Common activities include Metal cutting, metal processing, painting and welding

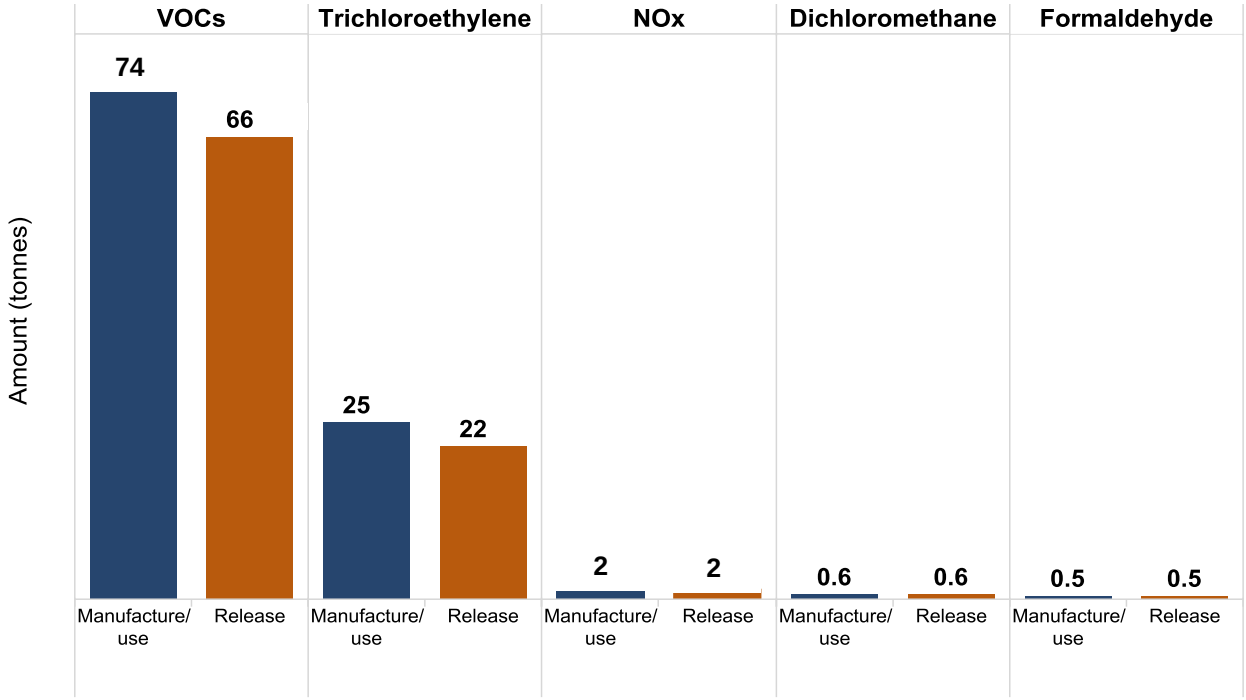
- Number of facilities that met the thresholds: 15
- Range in number of employees per facility: 15 to 320
- Total amount released: 91 tonnes
- Total amount manufactured, processed or used: 255 tonnes
- Number of priority substances reported: 11



Top substances reported are

- Volatile organic compounds (VOCs)
- Trichloroethylene
- Nitrogen oxides (NOx)
- Dichloromethane
- Formaldehyde
- Particulate matter 2.5 ($PM_{2.5}$)

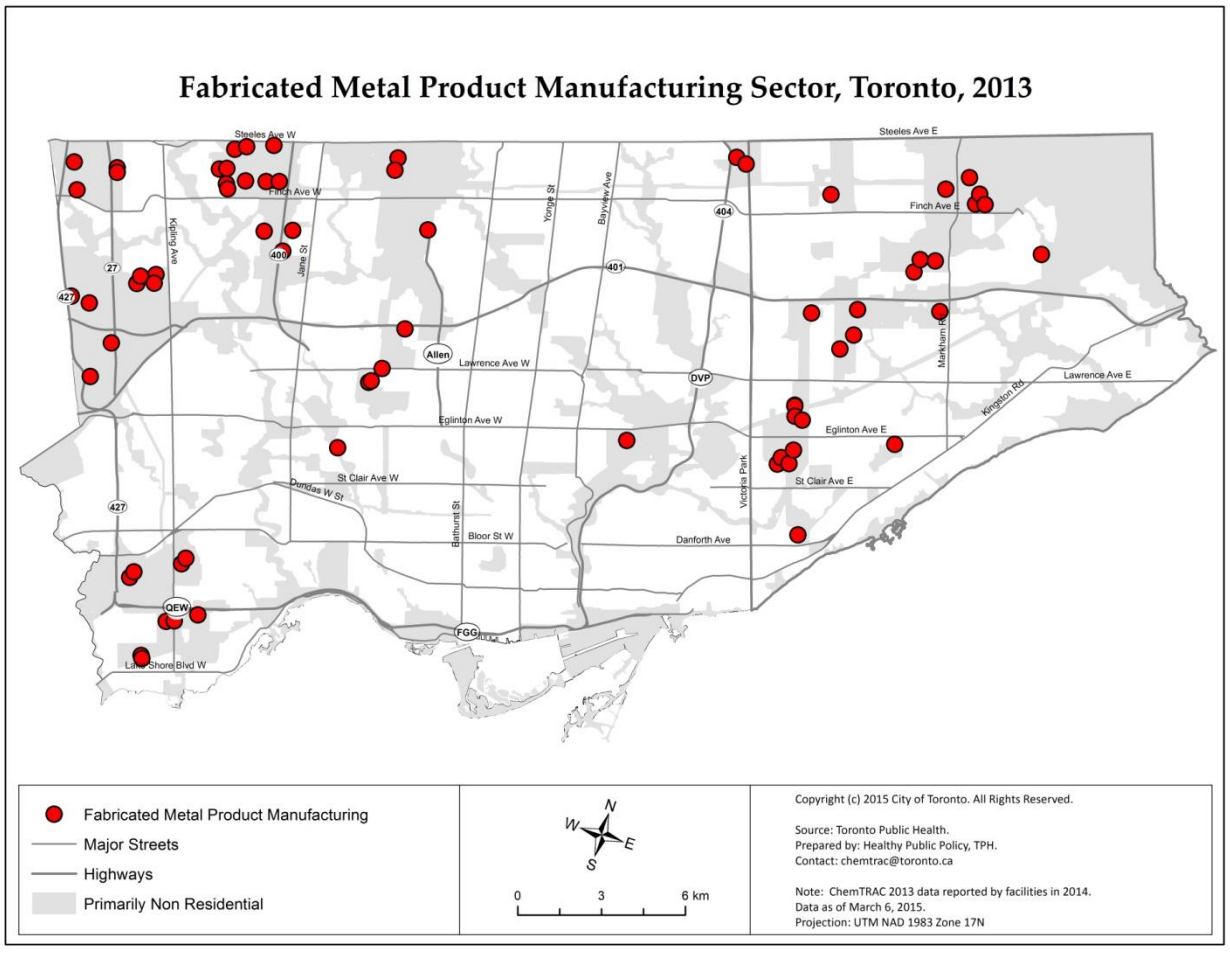
Figure 18: Amounts of substances reported by Electrical Equipment, Appliance and Component Manufacturing facilities for 2013



Fabricated Metal Product Manufacturing

Types of activities: Transformation of metal to end-use products by forging, stamping, bending, forming, machining, welding and assembling

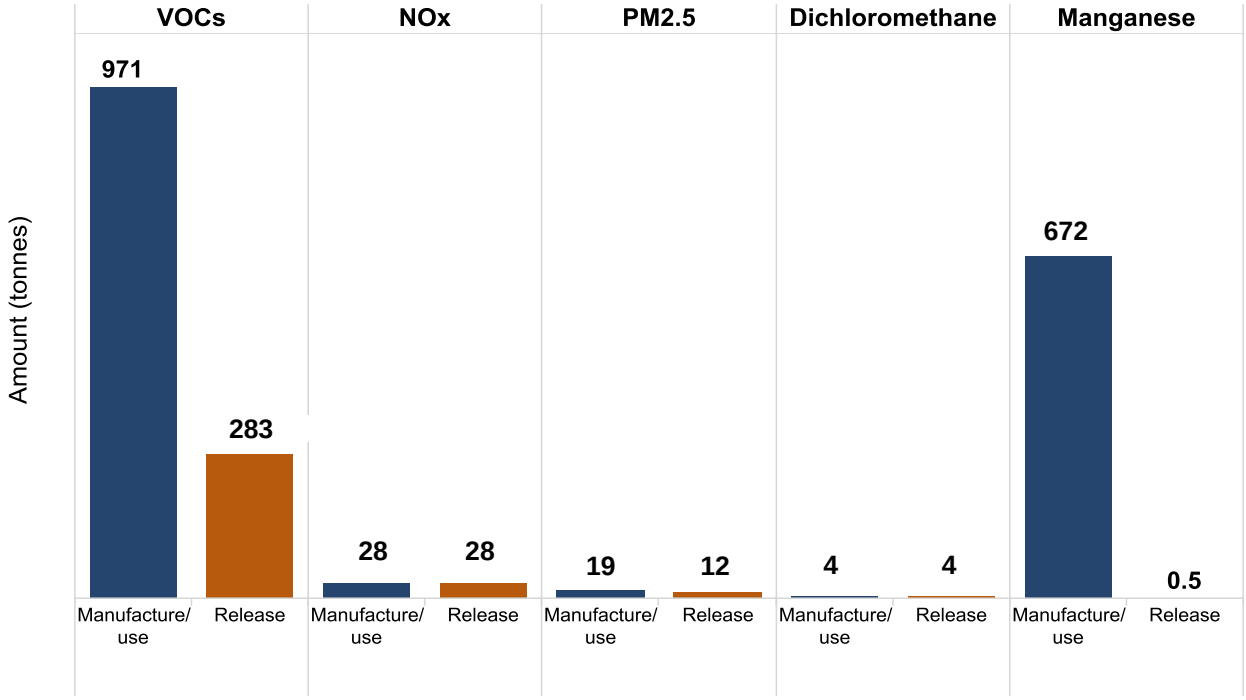
- Number of facilities that met the thresholds: 70
- Range in number of employees per facility: 1 to 293
- Total amount released: 328 tonnes
- Total amount manufactured, processed or used: 2,106 tonnes
- Number of priority substances reported: 14



Top substances reported are

- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Particulate matter 2.5 ($PM_{2.5}$)
- Dichloromethane
- Manganese

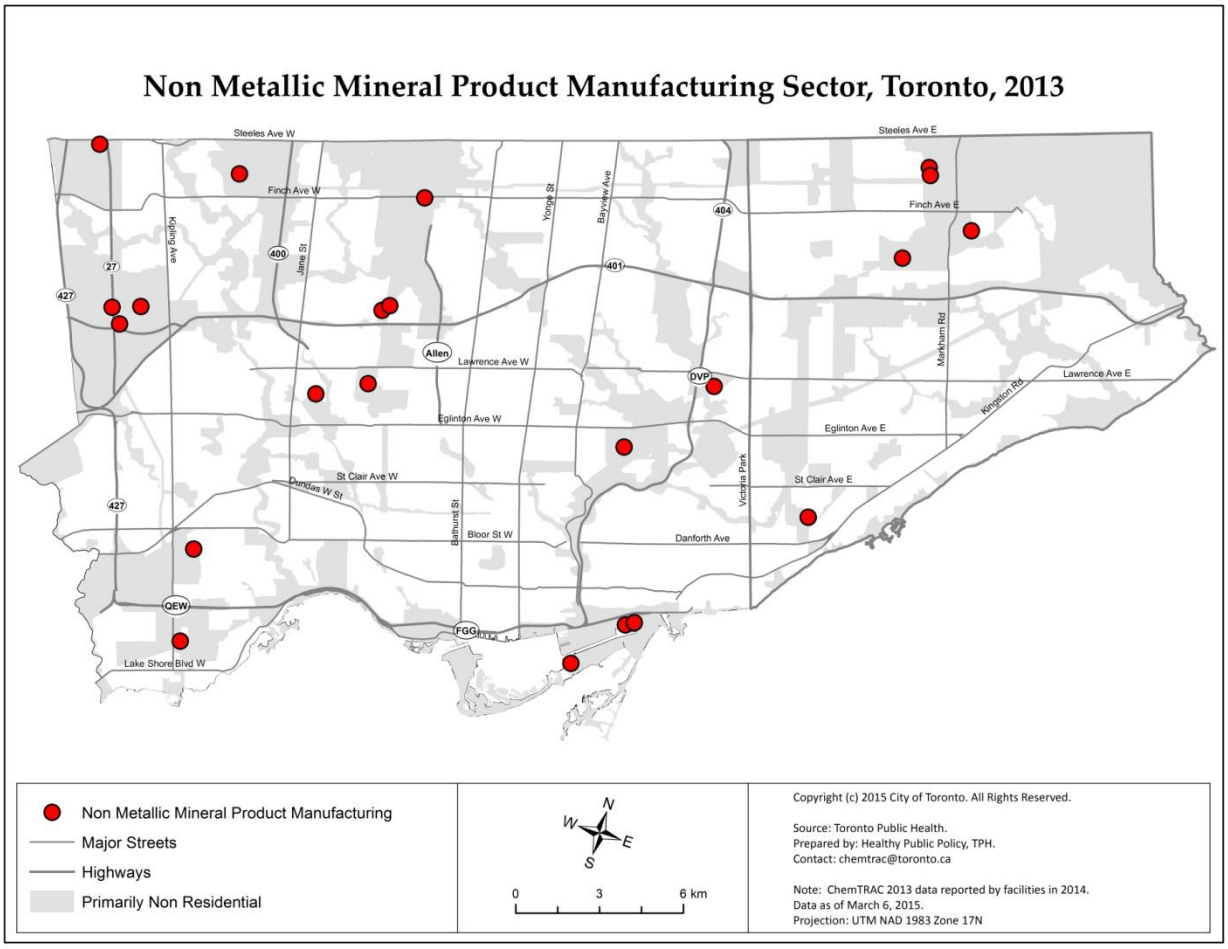
Figure 19: Amounts of substances reported by Fabricated Metal Product Manufacturing facilities for 2013



Non-Metallic Mineral Product Manufacturing

Types of activities: Transformers of mined or quarried non-metallic minerals, such as sand, gravel, stone, clay, and refractory materials into products for intermediate or final consumption. Processes used include grinding, mixing, cutting, shaping, and honing.

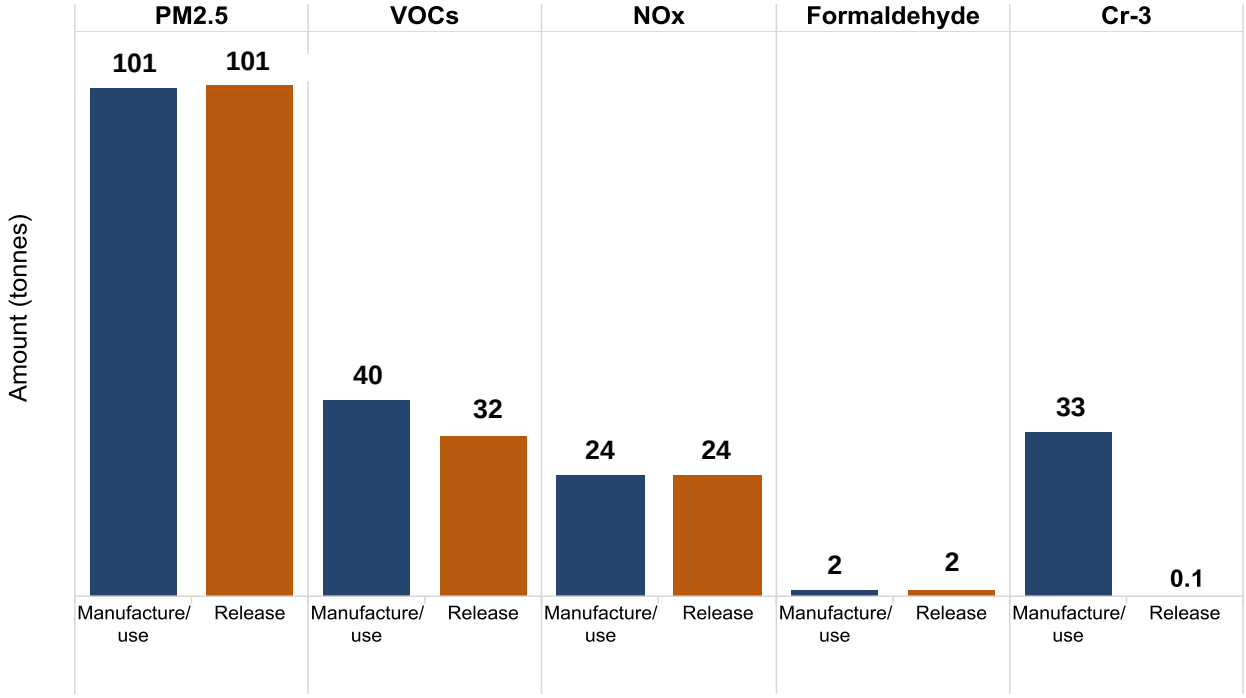
- Number of facilities that met the thresholds: 23
- Range in number of employees per facility: 1 to 140
- Total amount released: 157 tonnes
- Total amount manufactured, processed or used: 692 tonnes
- Number of priority substances reported: 9



Top substances reported are:

- Particulate matter 2.5 ($PM_{2.5}$)
- Volatile organic compounds (VOCs)
- Nitrogen oxides (NOx)
- Formaldehyde
- Chromium non Hexavalent (Cr-3)

Figure 20: Amounts of substances reported by Non-Metallic Mineral Product Manufacturing facilities for 2013



Paper Product Manufacturing

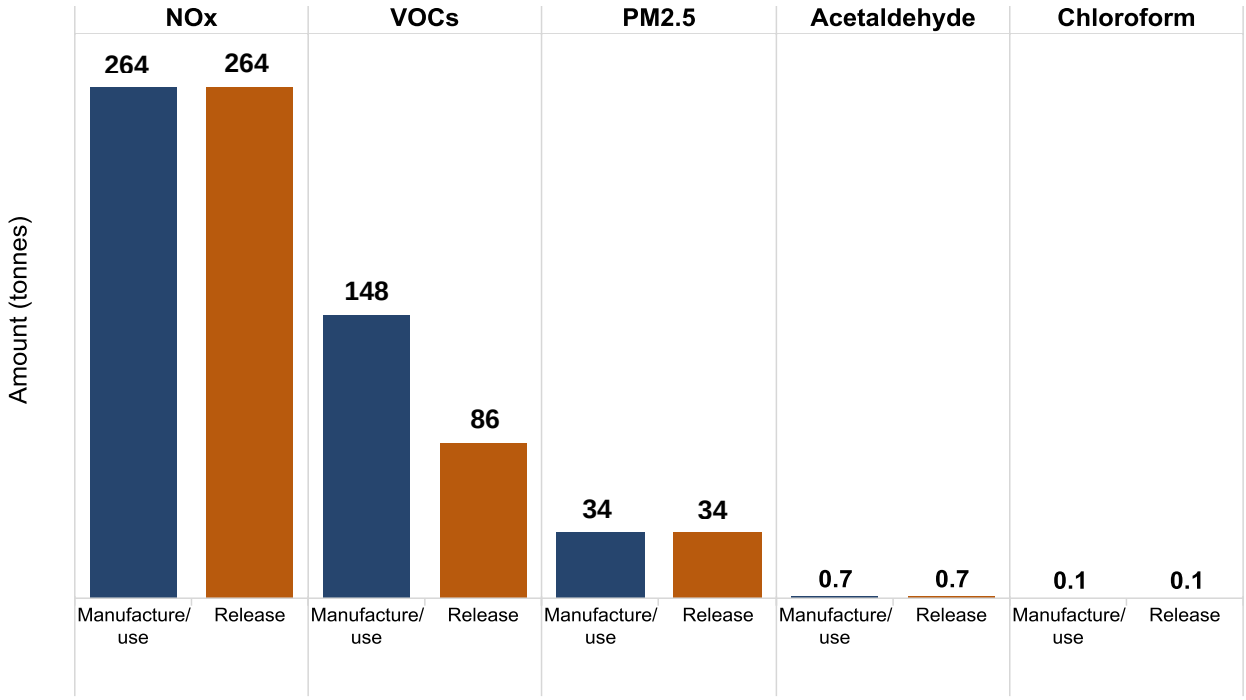
Types of activities: Manufacturer pulp, paper and paper products. The manufacture of pulp involves separating the cellulose fibres from other impurities in wood, used paper or other fibre sources. The manufacture of paper involves matting these fibres into a sheet. Converted paper products are produced from paper and other materials by various cutting and shaping techniques.

- Number of facilities that met the thresholds: 12
- Range in number of employees per facility: 6 to 457
- Total amount released: 384 tonnes
- Total amount manufactured, processed or used: 446 tonnes
- Number of priority substances reported: 6

Top substances reported are

- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Particulate matter 2.5 ($PM_{2.5}$)
- Acetaldehyde
- Chloroform

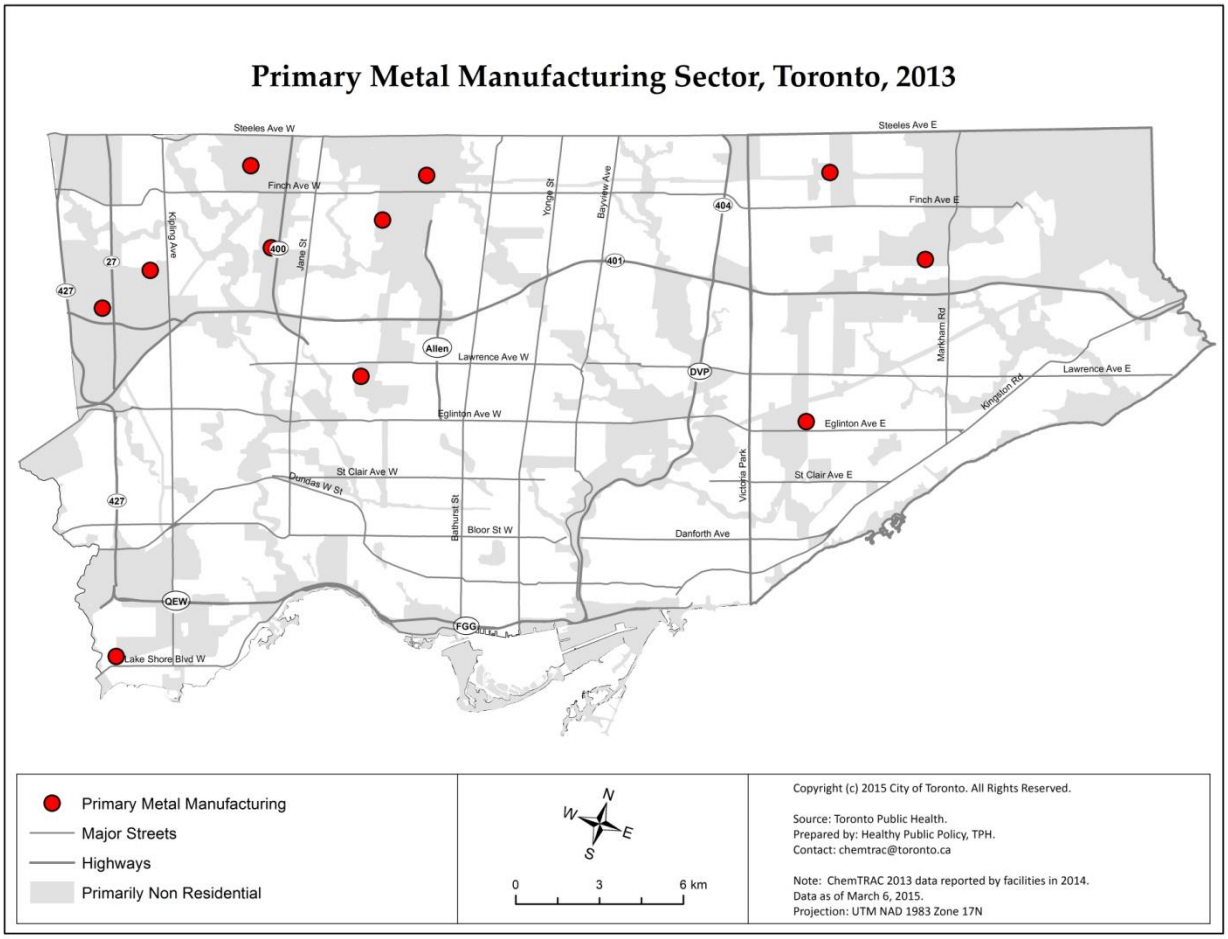
Figure 21: Amounts of substances reported by Paper Product Manufacturing facilities for 2013



Primary Metal Manufacturing

Types of activities: Primarily engaged in smelting and refining ferrous and non-ferrous metals from ore, pig or scrap in blast or electric furnaces. The output of smelting and refining is used in rolling and drawing operations to produce sheet, strip, bars, rods and wire, and in molten form to produce castings and other basic metal products.

- Number of facilities that met the thresholds: 11
- Range in number of employees per facility: 1 to 350
- Total amount released: 37 tonnes
- Total amount manufactured, processed or used: 397 tonnes
- Number of priority substances reported: 8



Top substances reported are

- Particulate matter 2.5 ($PM_{2.5}$)
- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Chromium, Non-hexavalent (Cr-3)
- Nickel

Figure 22: Amounts of substances reported by Primary Metal Manufacturing facilities for 2013