St. Louis Community Air Project (CAP) Emission Inventory

NARSTO Workshop

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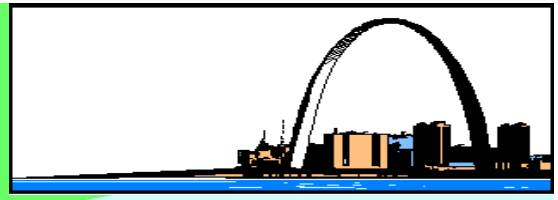
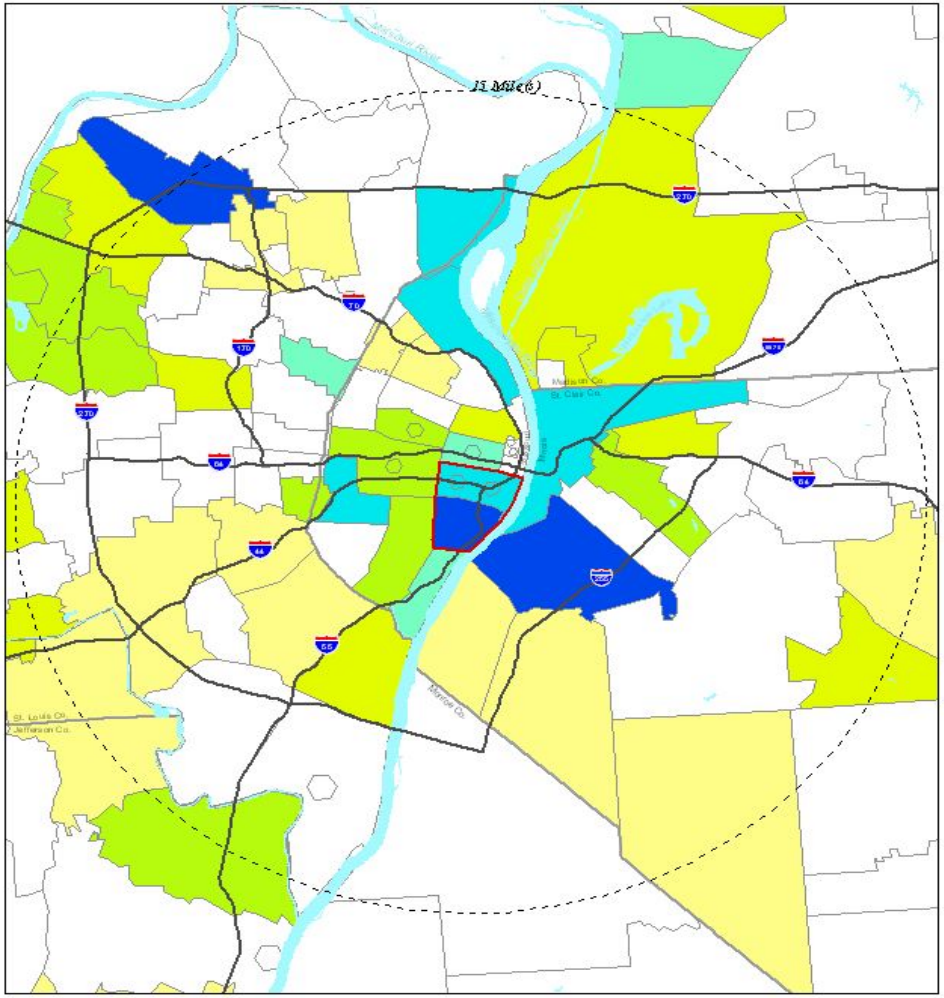
St. Louis Community Air Project
Toxics Emission Inventory Development



Abstract - An innovative, community-based environmental protection project is taking place in St. Louis, to investigate toxic air pollution, and inform and enable city residents and businesses to address the problems that are found. As part of this project, ambient air monitoring of about 90 toxic pollutants has been done, health benchmarks for many of them have been determined, and a toxics emission inventory has been developed. The inventory covers point, area, and on- and offroad mobile sources in the City of St. Louis. Point source toxic emissions were obtained from Emission Inventory Questionnaires (EIQs), and quality controlled such as by comparing and reconciling differences with the Toxics Release Inventory (TRI). Area source toxic emissions were obtained from the 1996 National Toxics Inventory (NTI), and an analysis has been made of their accuracy. Plans for a local bottoms-up area source inventory were also prepared, but found to be too resource intensive to carry out. Onroad mobile modeling and speciation for toxics was conducted first using MOBILE5b, and most recently the latest draft of MOBILE6.2. Offroad mobile emissions were obtained from the 1996 NTI. An analysis of the strengths and errors in the inventory is given. Monitoring found the highest levels of formaldehyde in any city to date. Current efforts to refine the emission inventory and include biogenic sources to account for the high formaldehyde levels are described.

Point Source Emission Inventory Domain



TRI Emissions Density of Target Compounds by Zip Code (1996)
(Tons Per Year Per Sq. Mile)

- No Reported Point Source Emissions
- Under 1.18
- 1.18 - 4.10
- 4.11 - 10.27
- 10.28 - 19.35
- 19.36 - 43.29
- 43.30 - 88.60

- Study Area
- Interstates
- Water Bodies
- Zip Code Boundaries

EPA REGION 7
ENSV DIVISION

St. Louis Community Air Project

Technical Aspects of the Study to Characterize Air Quality:

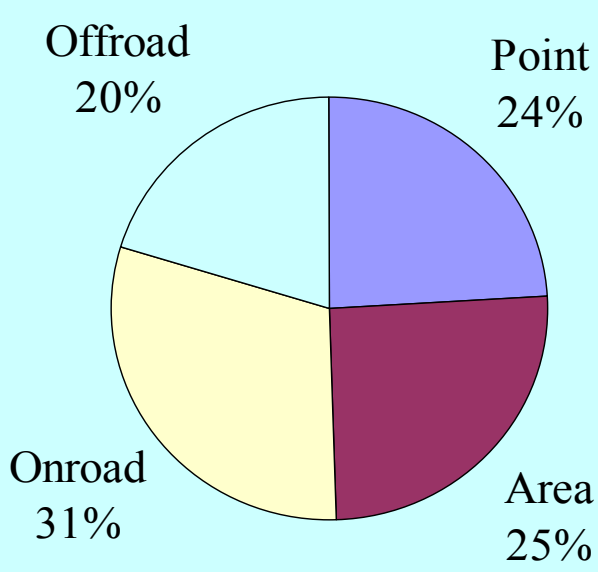
- Monitoring of 90 Toxic Air Pollutants
- Emission Inventory of All Air Toxics
- Health Risk Assessment to Inform Community Action, Education, & Outreach

Emission Inventory Development:

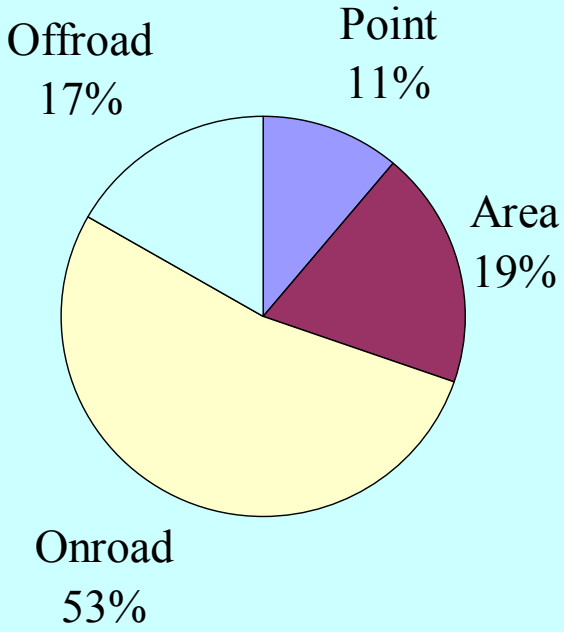
- Point: 1996 and 1999 Emission Inventory Questionnaires (EIQs) reported by major point sources in St. Louis City and County. Quality control procedures included reconciling discrepanies between the EIQ/NTI and TRI data.
- Area: 1996 National Toxics Inventory (NTI). An analysis has been made of their accuracy. A local bottoms-up area source inventory plan was prepared, but not carried out.
- Onroad: 1996, 1999, & 2001 obtained using MOBILE5b, PART5, and speciation methods for 21 mobile source HAPs; subsequently updated with MOBILE6.2.
- Offroad: 1996 NTI estimates using an earlier version NONROAD model.

HAP Emission Inventories Compared Between the U.S. and the City of St. Louis:

1996 National Toxics Inventory



1996/1999 St. Louis CAP Inventory



1996 NTI for the United States
vs.
1996/1999 St. Louis CAP for the City of St. Louis

- 188 HAPs -

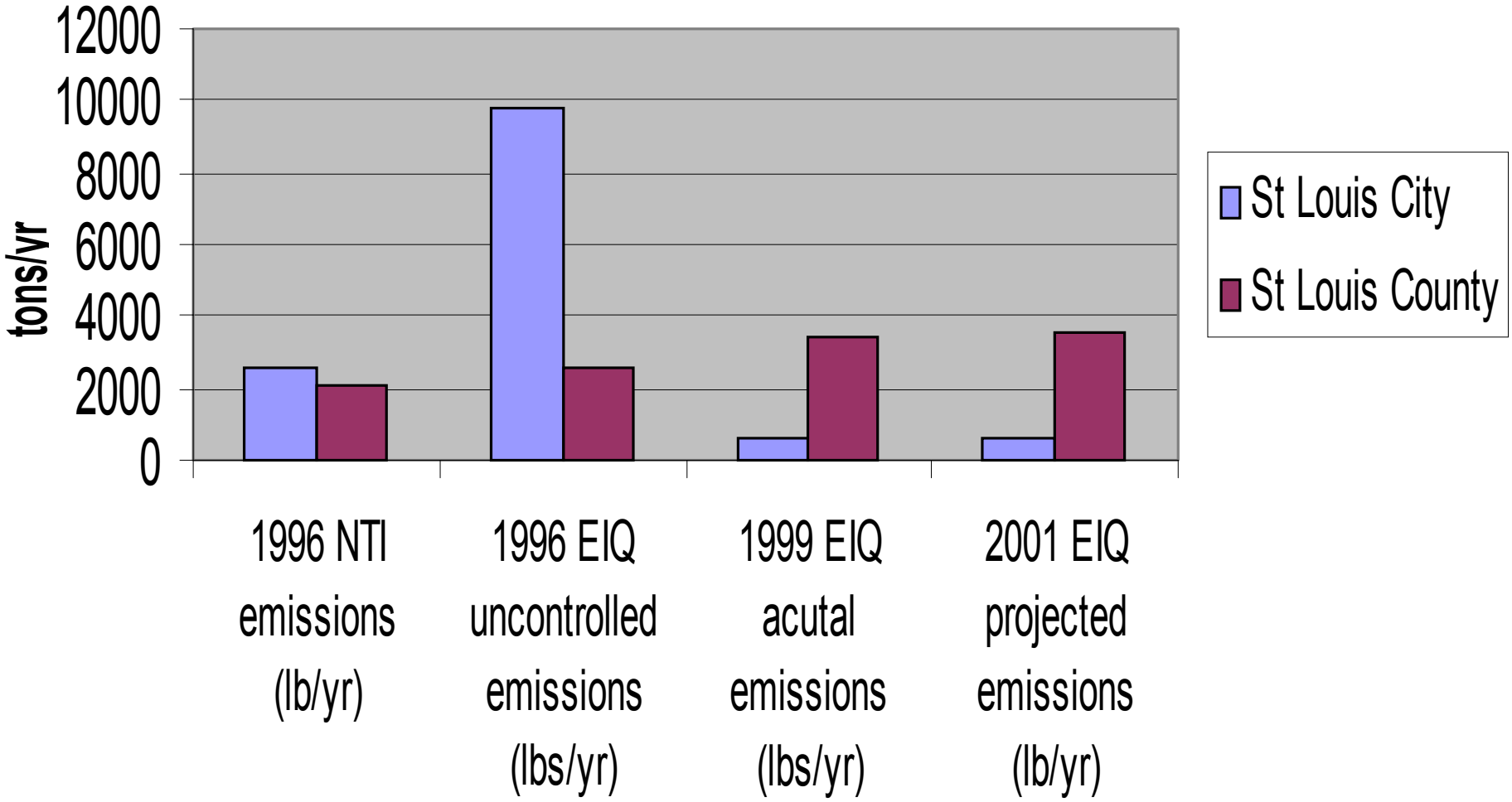
United States

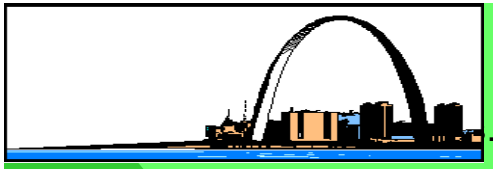
1996 NTI Emissions			
	Lb/yr	tons/yr	%
Point	2,277,289,927	1,138,645	24
Area	2,346,381,637	1,173,191	25
Onroad	2,834,916,125	1,417,458	31
Offroad	1,887,839,460	943,920	20
TOTAL	9,346,427,149	4,673,214	100

City of St. Louis

1996 / 1999 St. Louis CAP Emissions			
	Lb/yr	tons/yr	%
1999 Point	1,202,581	601	11
1996 Area	2,094,001	1,047	19
1999 Onroad	5,802,000	2,901	53
1996 Offroad	1,806,020	903	17
TOTAL	10,904,602	5,452	100

Toxic Emisssions from Point Sources





TRI Data Received from EPA

HAP Emissions >=10/25 TPY?

No

STOP

Yes

Deliver To TSS

Is the Facility in MoEIS?

No

TSS Sent an EIQ to TRI Facility

Facility submit an EIQ HAP>=10/25?

No

Yes

Yes

LOG Into MoEIS

TRI vs EIQ **Criteria** Met?

No

FOCUS Report Identifying **Inconsistency**

Engineer corrects EIQ Contact Facility if necessary

Facility corrects & resubmits EIQ

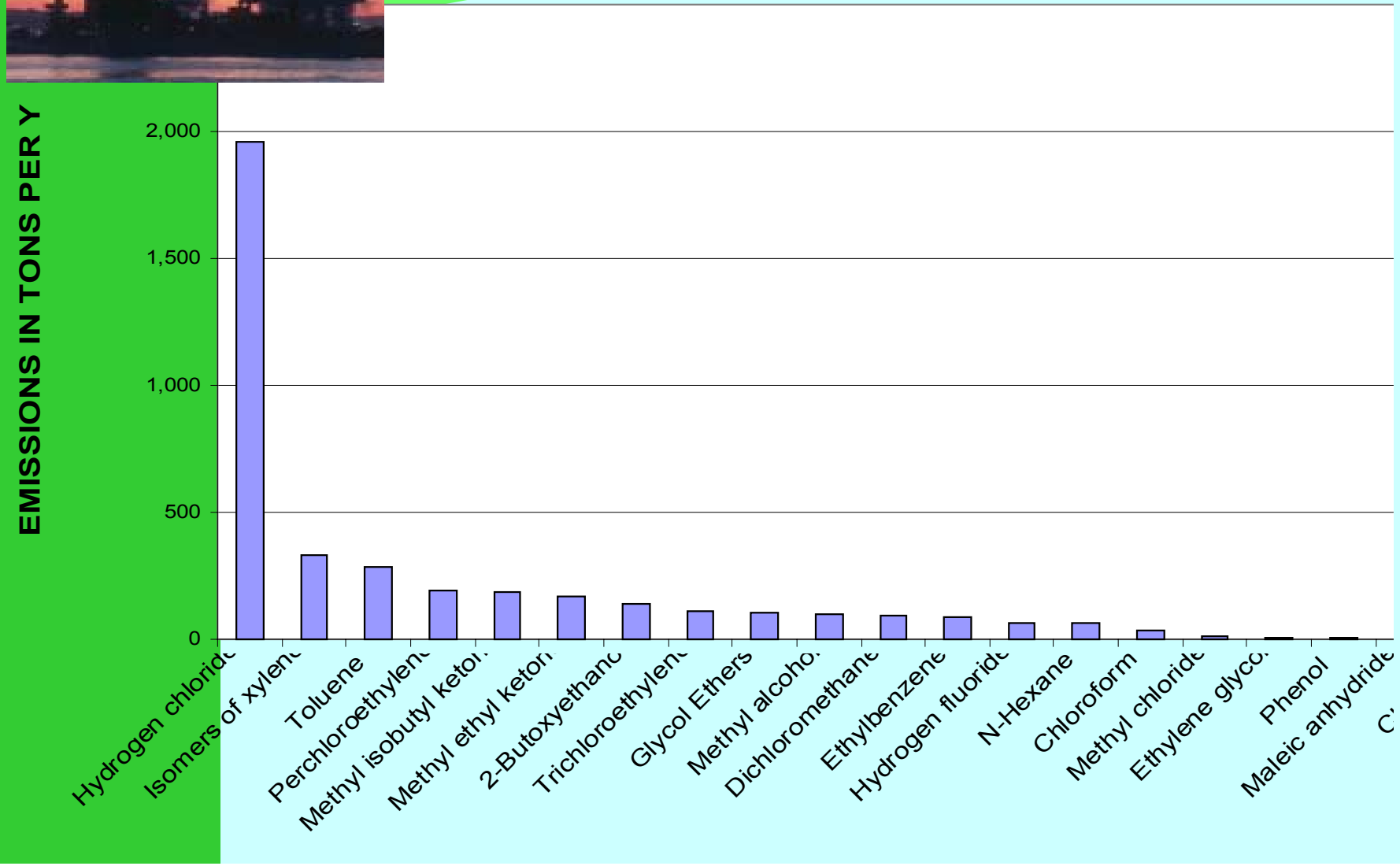
Yes

Internal QC MSDS,Control,SCC, etc

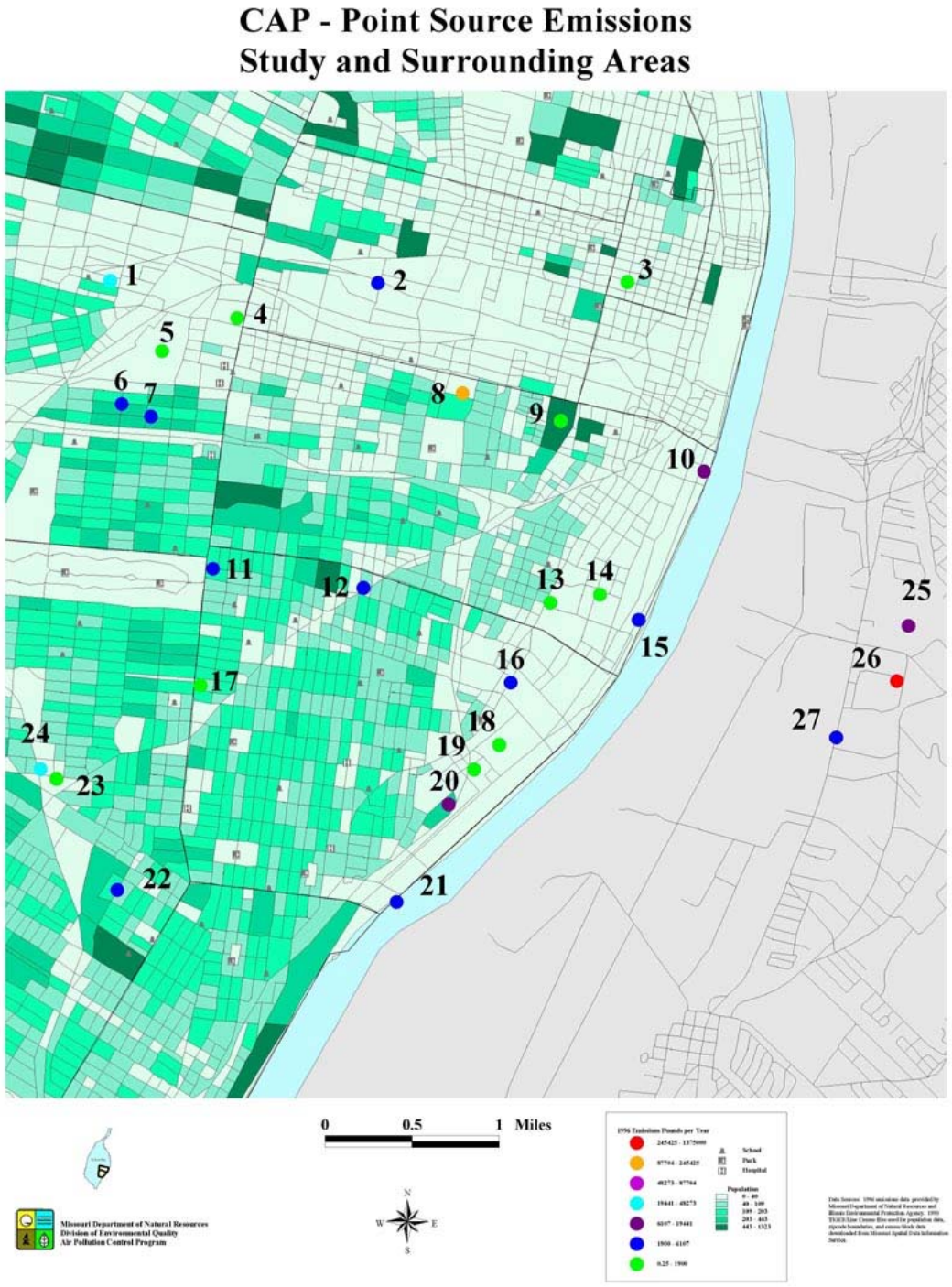
Quality Assured data for Air Planning

Feedback to Facility w/ Corrected TRI Data

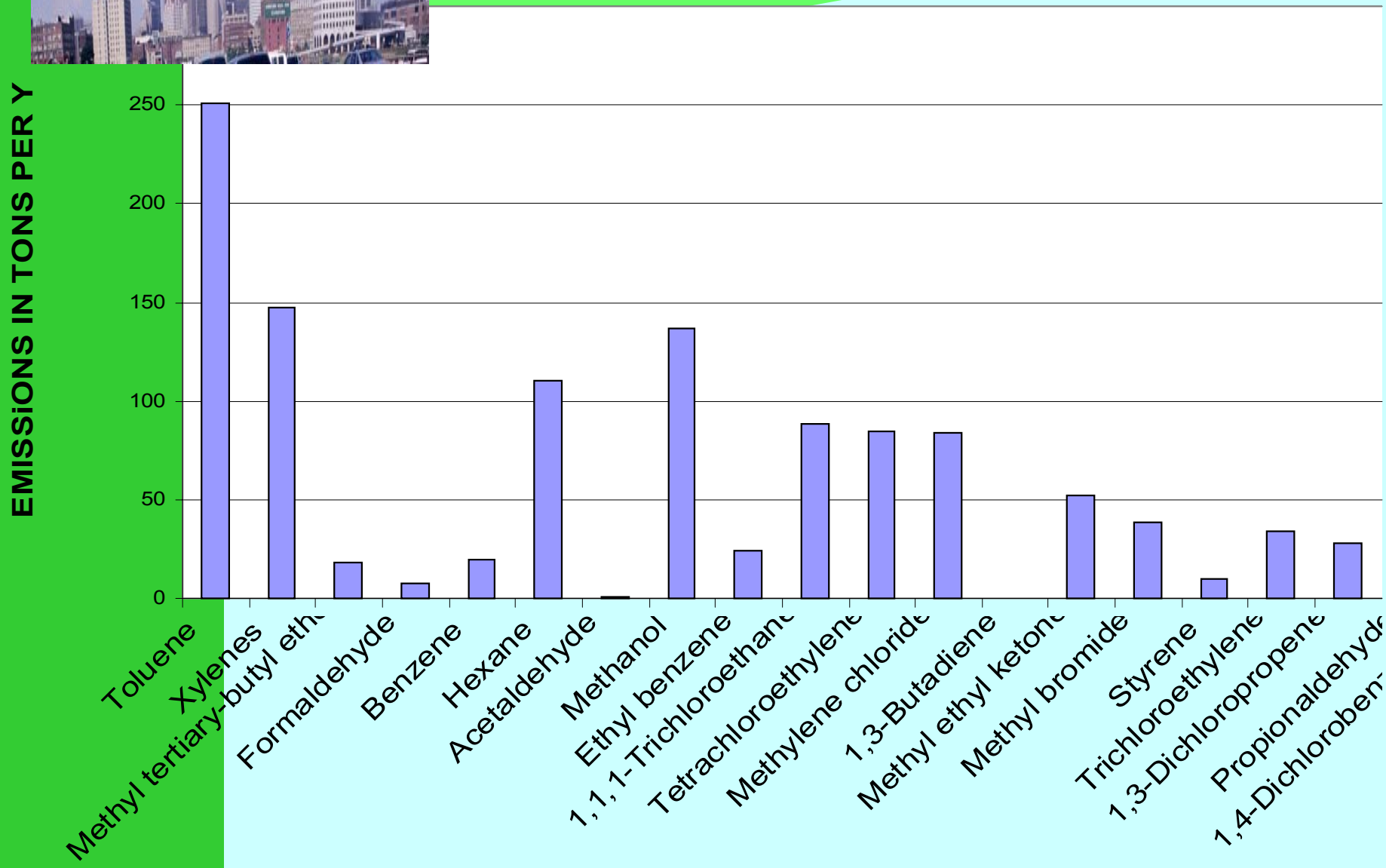
20 Highest Point Source Emissions in St. Louis City & County 1999 EIQ Actual Emissions



Point Source and Population Profiles for Study Area



20 Highest Area Source Emissions in St. Louis City - 1996 NTI

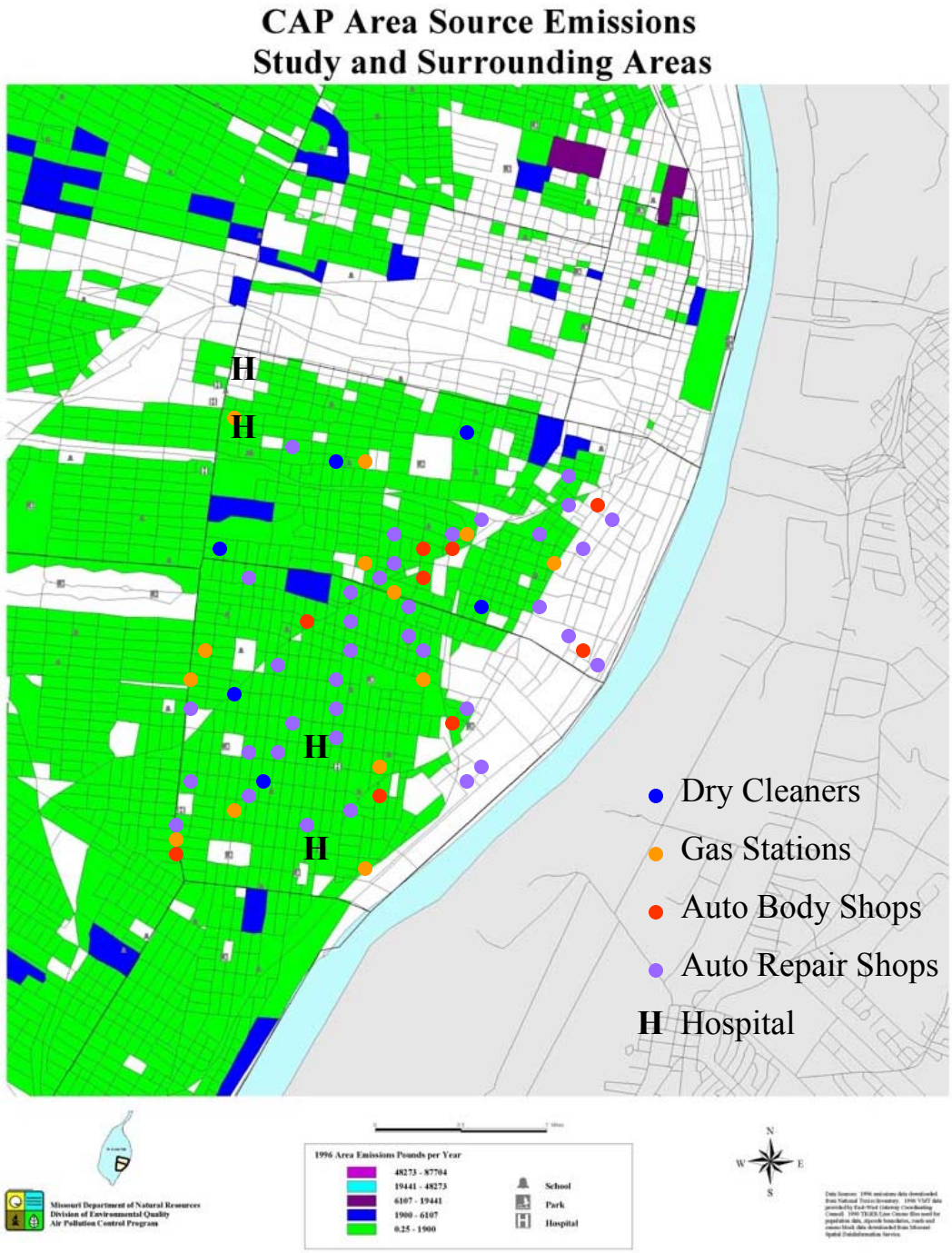


Area Emissions

Green - < 1900 lbs/yr

Blue - 1900 - 6100 lbs/yr

Purple - 6100-19,400 lbs/yr



The 1996 NTI (National Toxic Inventory) 10 Highest-Emitting Area Source Categories in the City of St. Louis

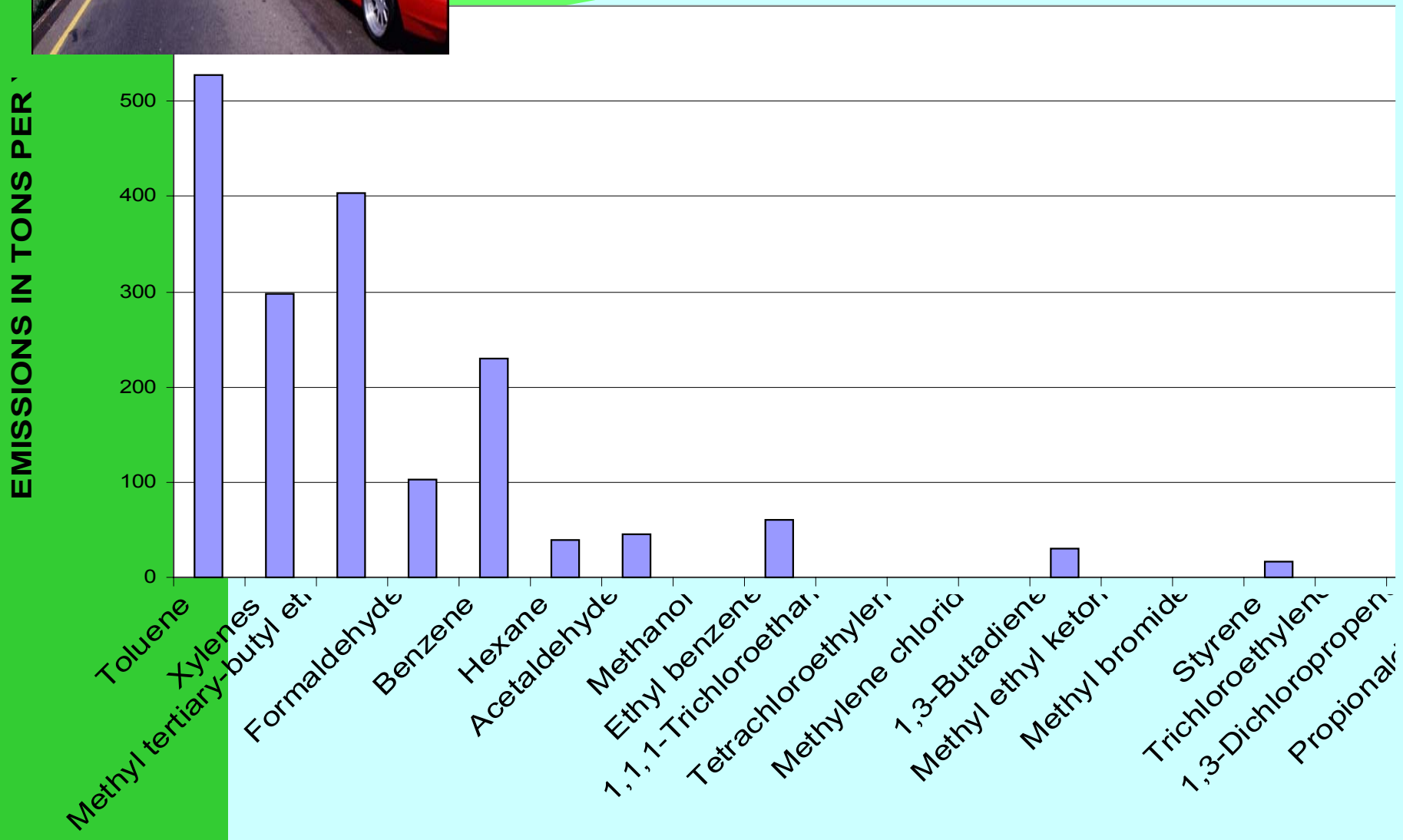
	Area Source Category	Toxic Emissions (lb/yr)	
1	Consumer Products Usage	892,419	
2	Surface Coatings: Architectural	291,060	
3	Autobody Refinishing Paint Application	177,940	
4	Halogenated Solvent Cleaners	148,640	
5	Gasoline Distribution Stage I	137,727	
6	Perchloroethylene Dry Cleaning	67,960	
7	Paints and Allied Products Manufacturing	74,751	
8	Paint Stripping Operations	48,680	
9	Asphalt Paving: Cutback Asphalt	47,901	
10	Natural Gas Transmissions & Storage	41,900	

A Comparison of Selected Area Source Emissions in the City of St. Louis from the 1996 National Toxic Inventory(NTI)

	Area Source Category	Toxic Emissions (lb/yr)	
1	Consumer Products Usage	892,419	
10	Natural Gas Transmission and Storage	41,900	
37	Institutional/Commercial Heating: Natural Gas	643	
41	Residential Heating: Natural Gas	498	

Natural Gas Transmission and Storage for Missouri is 104,000 lb/yr

20 Highest Onroad Mobile Source Emissions in St. Louis City - MOBILE6.2



Mobile Sources

Green < 1,900 lbs/year

Blue 1,900-6,100 lbs/year

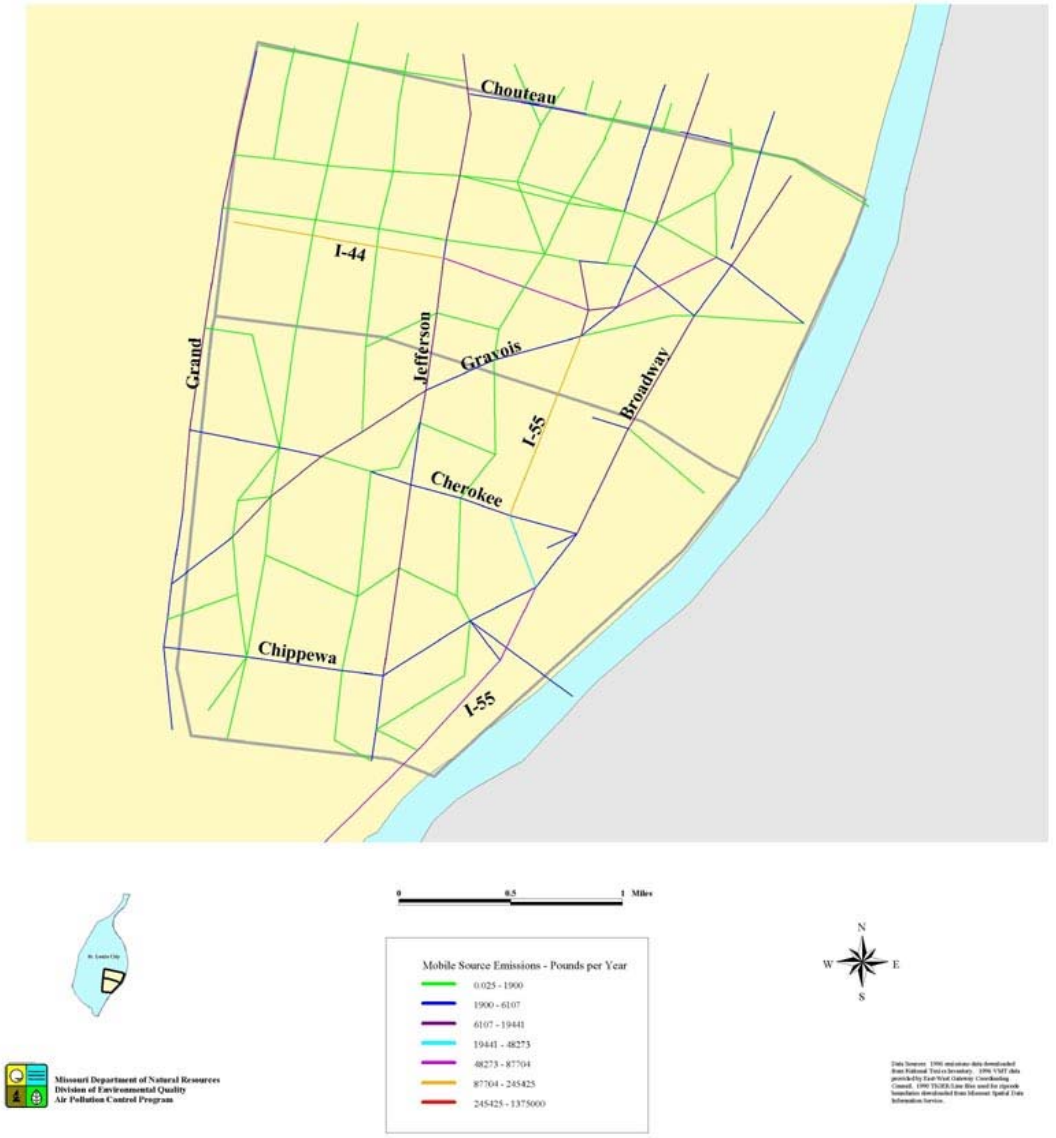
Purple 6,100-19,400 lbs/year

Lt. Blue 19,400 - 48,200 lbs/yr

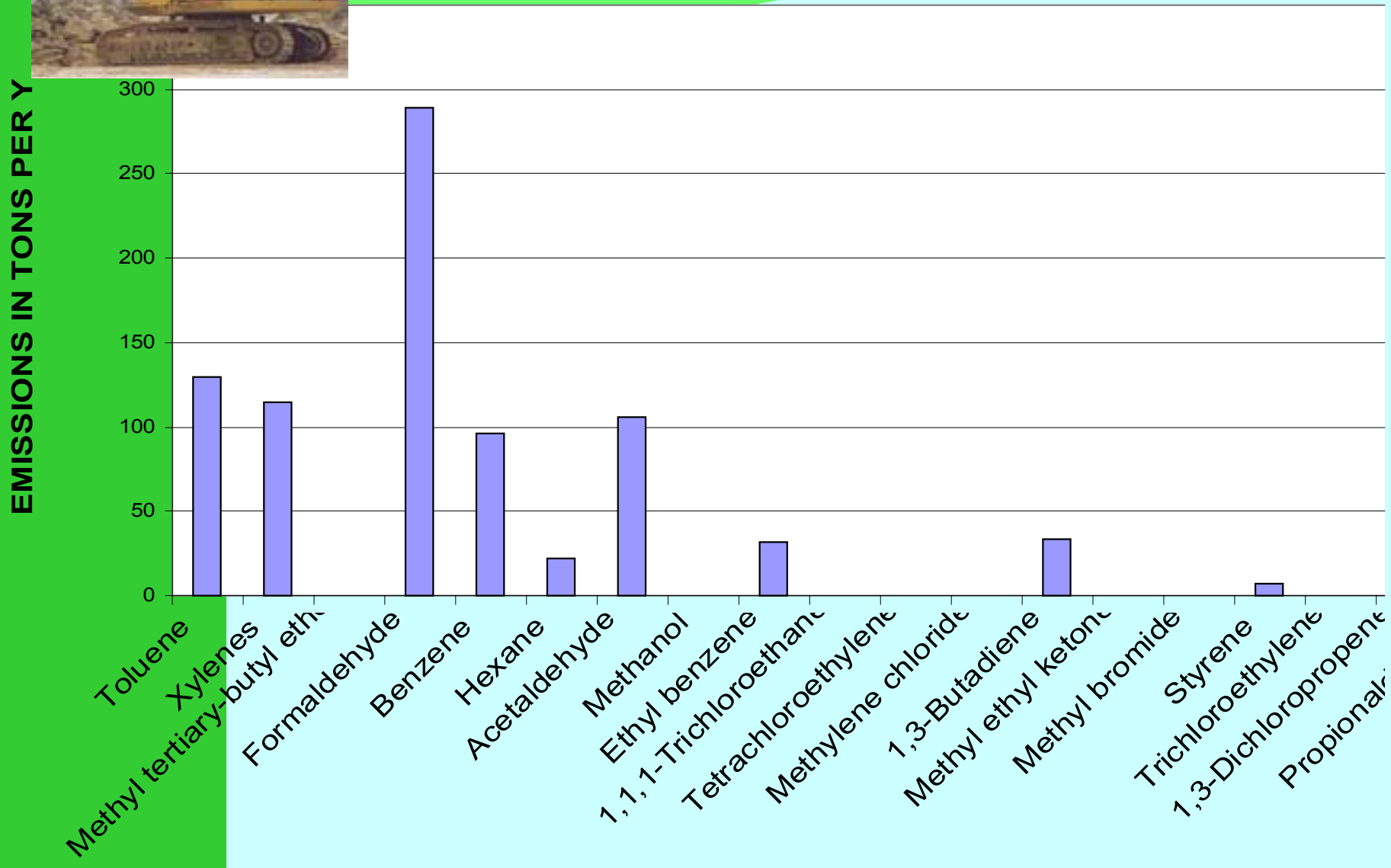
Violet 48,200 - 87,700 lbs/yr

Tan 87,700-245,000 lbs/yr

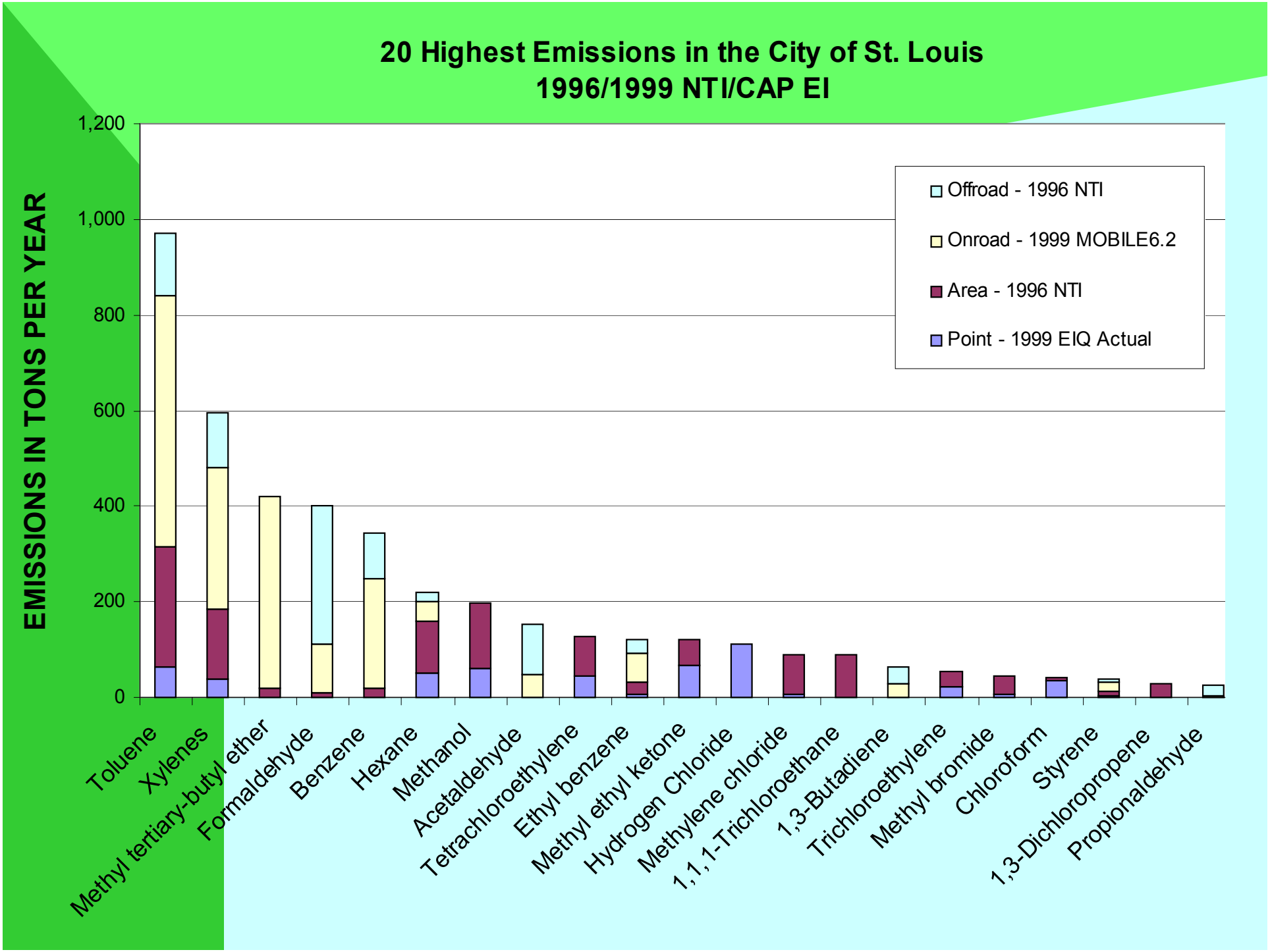
CAP - Mobile Source Emissions Study Area



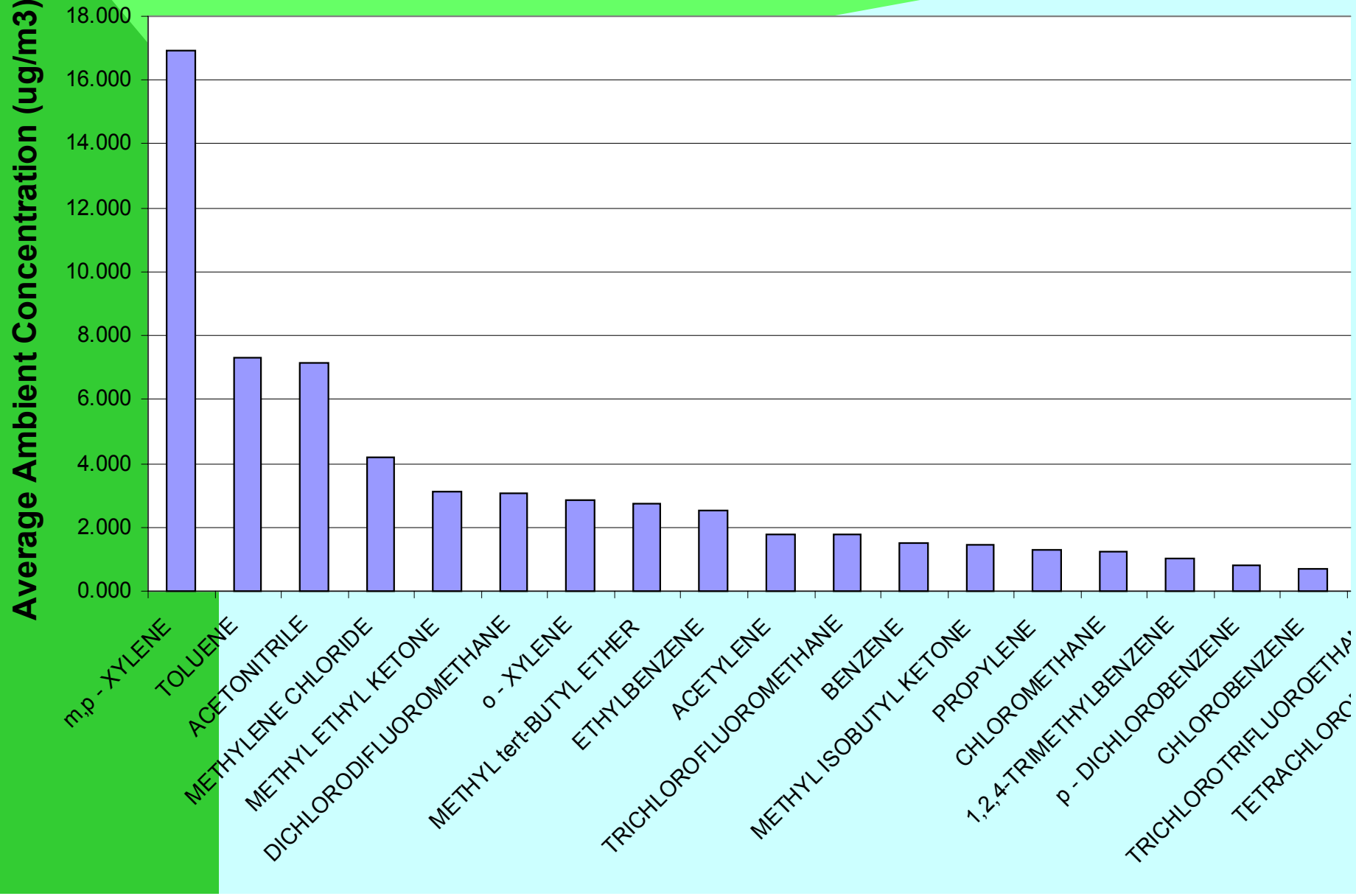
20 Highest Offroad Mobile Source Emissions in St. Louis City - 1996 NTI



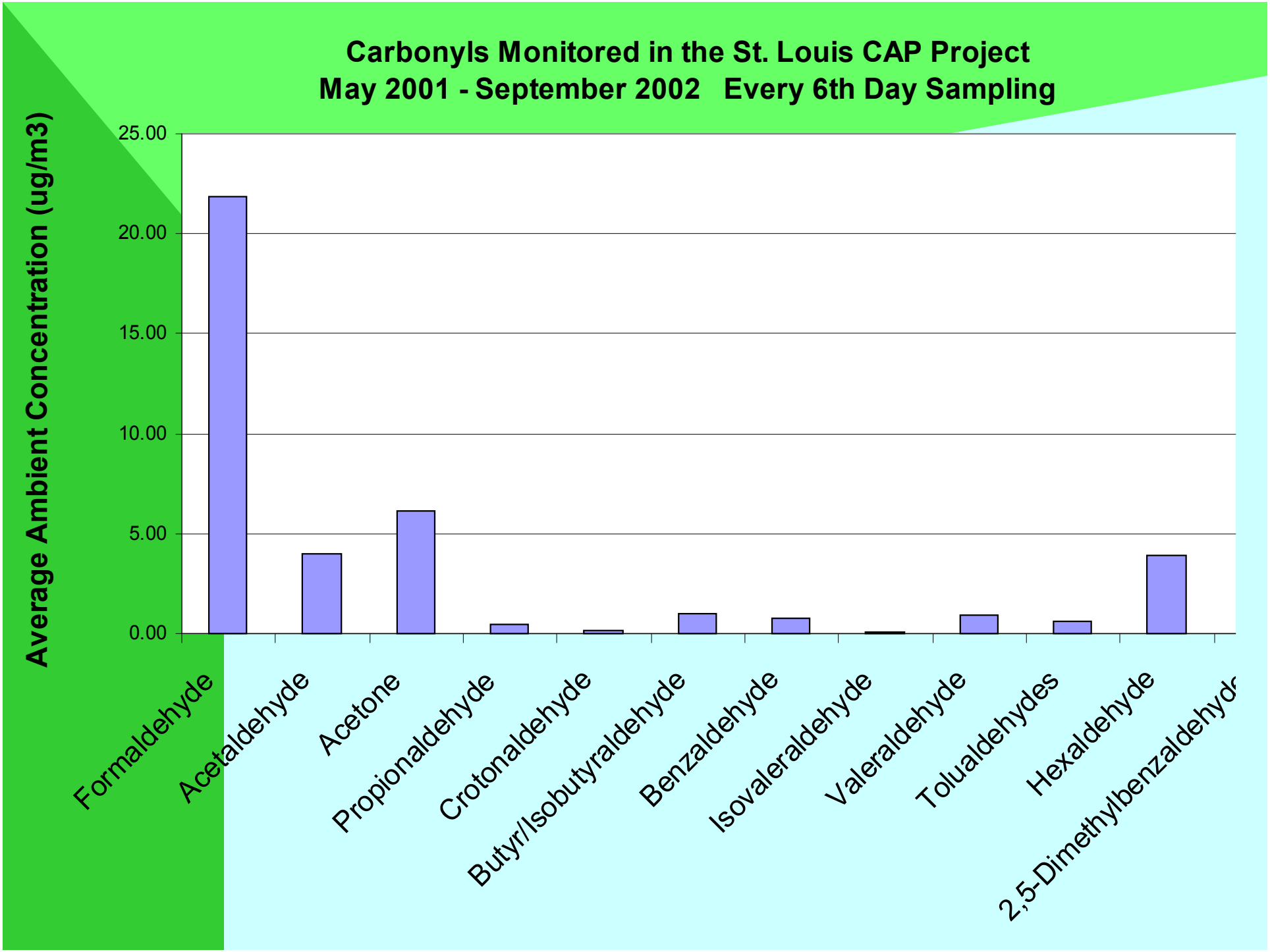
20 Highest Emissions in the City of St. Louis
1996/1999 NTI/CAP EI

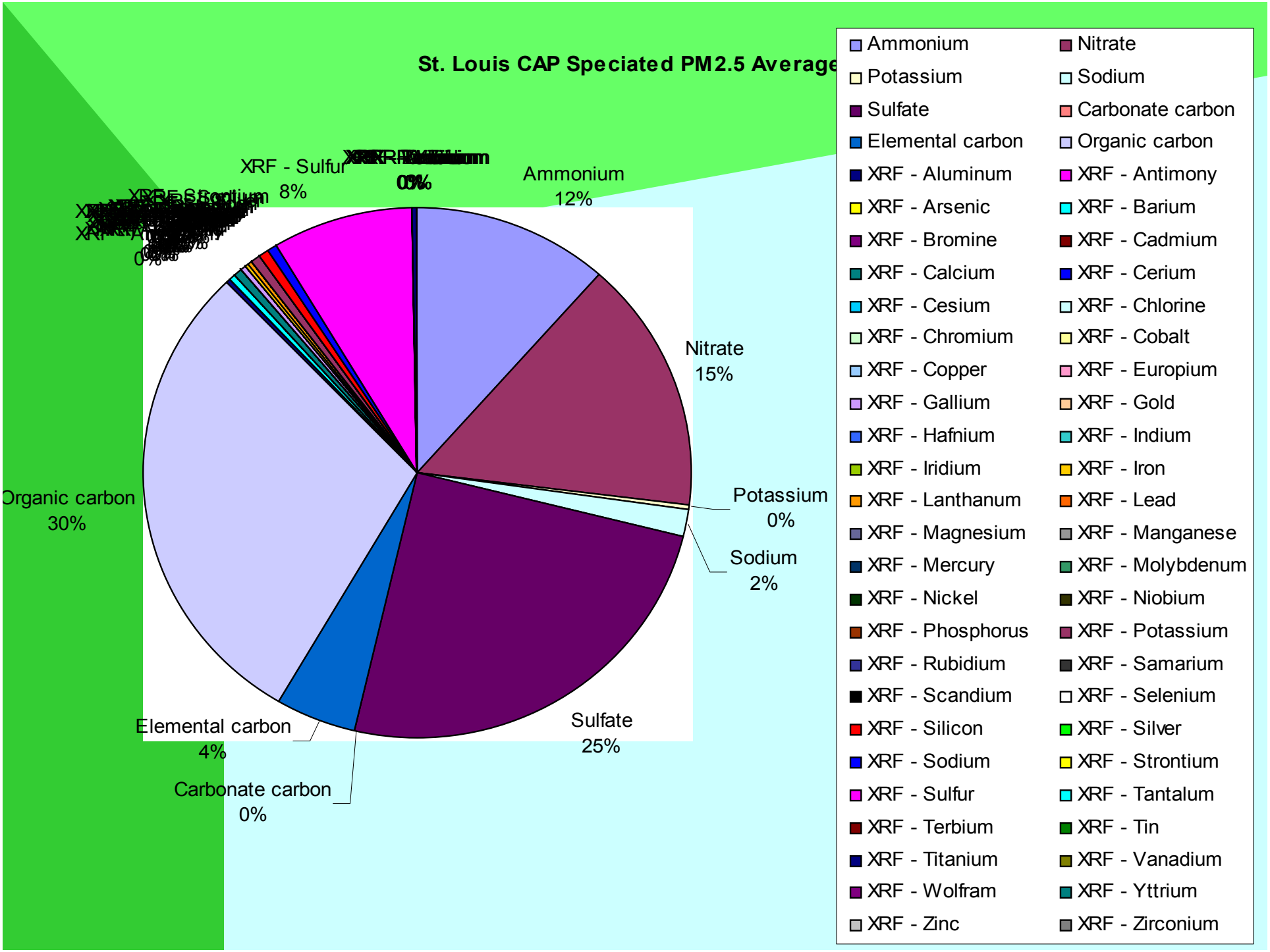


20 Highest VOCs Monitored in the St. Louis CAP Project
May 2001 - September 2002 Every 6th Day Sampling

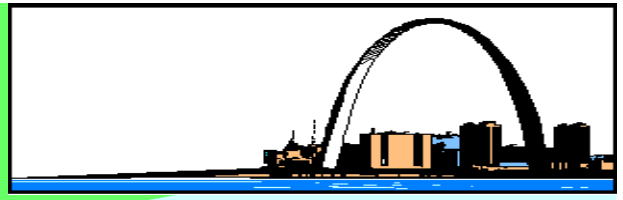


Carbonyls Monitored in the St. Louis CAP Project
May 2001 - September 2002 Every 6th Day Sampling

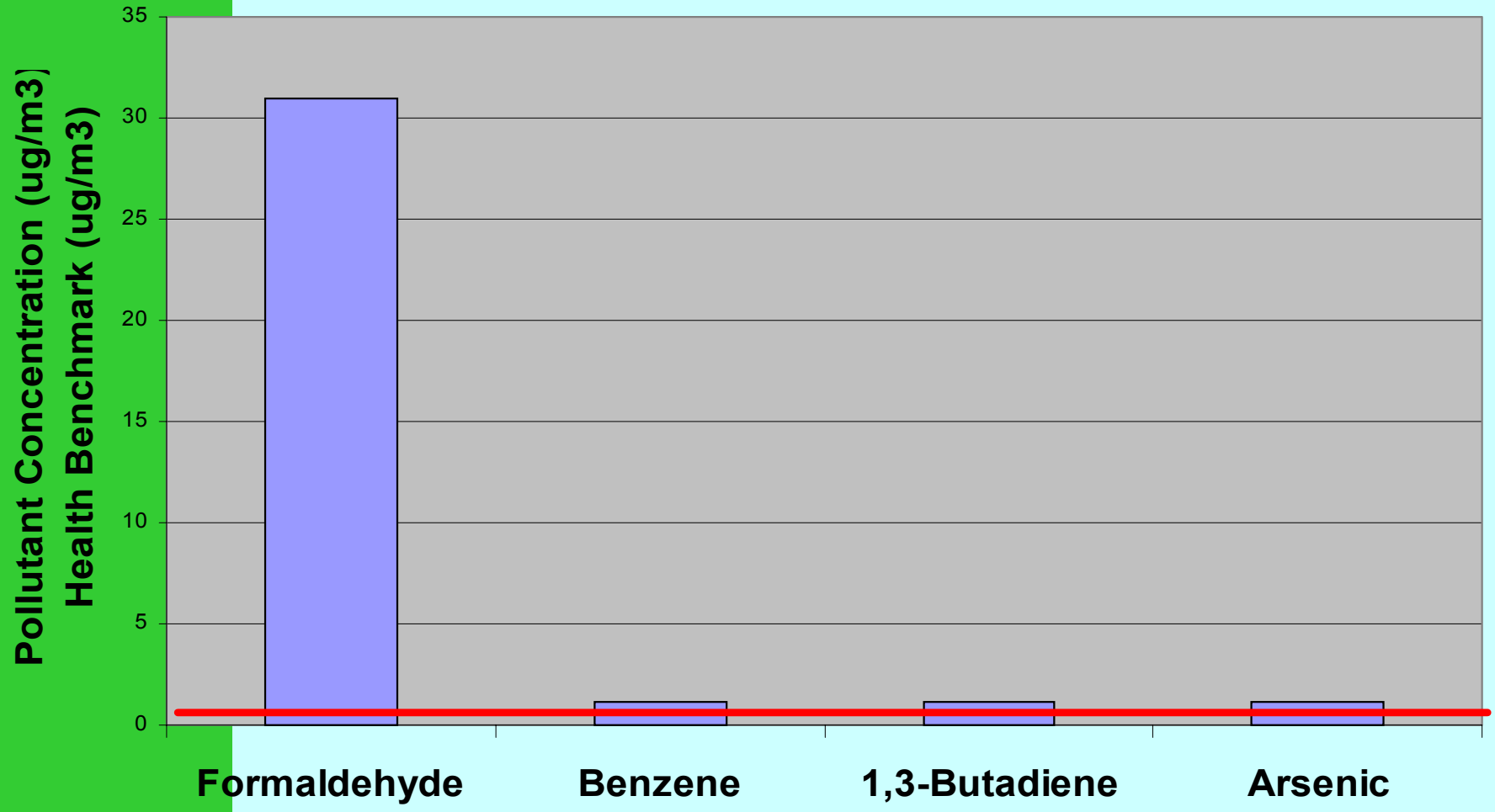



St. Louis CAP Speciated PM2.5 Average
Ammonium
12%
Nitrate
15%
Potassium
0%
Sodium
2%
Sulfate
25%
Elemental carbon
4%
Carbonate carbon
0%
Organic carbon
30%
XRF - Sulfur
8%
Ammonium
Nitrate
Potassium
Sodium
Sulfate
Carbonate carbon
Elemental carbon
Organic carbon
XRF - Aluminum
XRF - Antimony
XRF - Arsenic
XRF - Barium
XRF - Bromine
XRF - Cadmium
XRF - Calcium
XRF - Cerium
XRF - Cesium
XRF - Chlorine
XRF - Chromium
XRF - Cobalt
XRF - Copper
XRF - Europium
XRF - Gallium
XRF - Gold
XRF - Hafnium
XRF - Indium
XRF - Iridium
XRF - Iron
XRF - Lanthanum
XRF - Lead
XRF - Magnesium
XRF - Manganese
XRF - Mercury
XRF - Molybdenum
XRF - Nickel
XRF - Niobium
XRF - Phosphorus
XRF - Potassium
XRF - Rubidium
XRF - Samarium
XRF - Scandium
XRF - Selenium
XRF - Silicon
XRF - Silver
XRF - Sodium
XRF - Strontium
XRF - Sulfur
XRF - Tantalum
XRF - Terbium
XRF - Tin
XRF - Titanium
XRF - Vanadium
XRF - Wolfram
XRF - Yttrium
XRF - Zinc
XRF - Zirconium

St. Louis Community Air Project

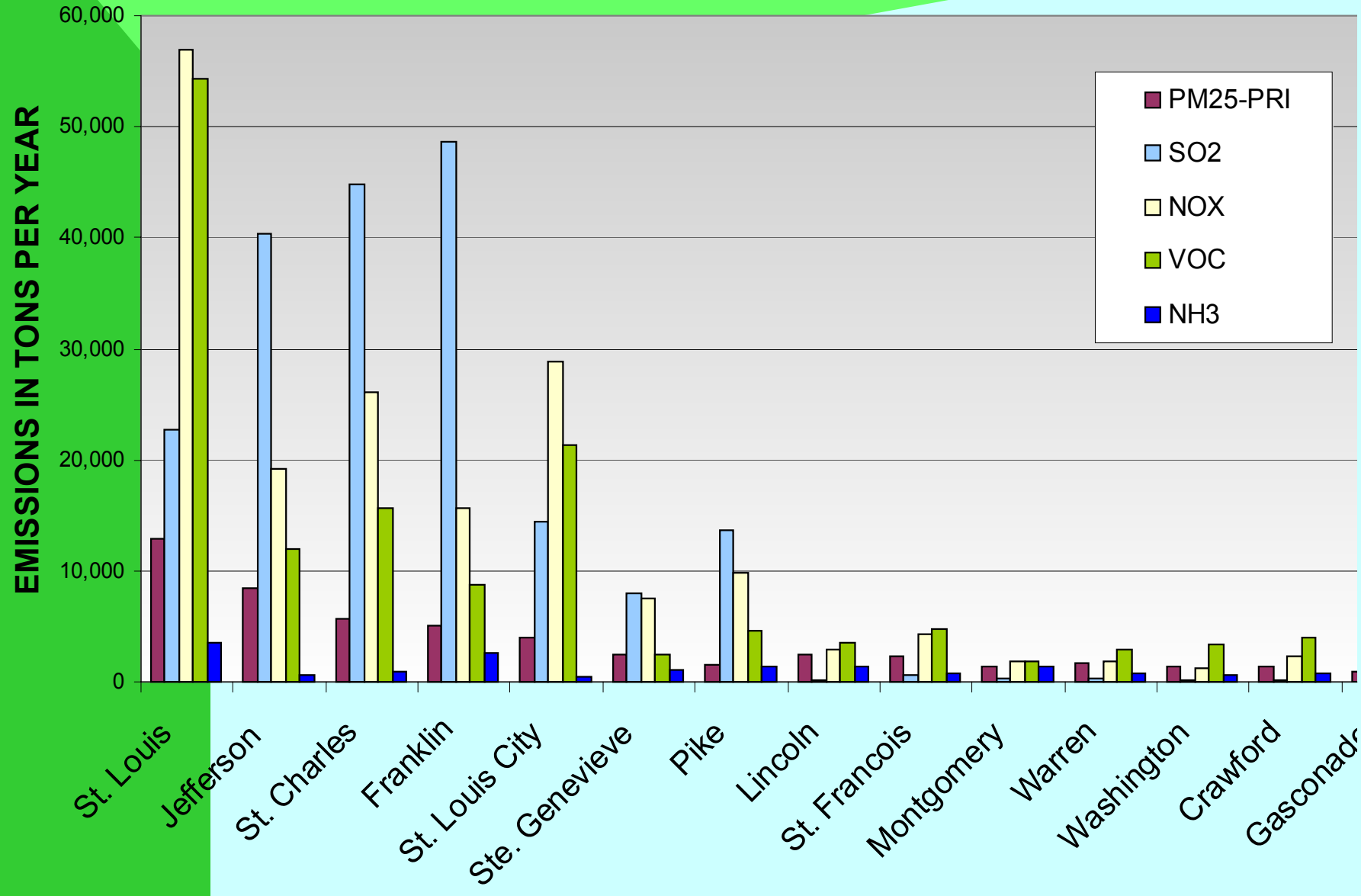


Average Monitored Concentrations of Pollutants in St. Louis Relative to their respective Health Benchmarks



Current St Louis Area Emissions - Criteria Pollutants

1999 NEI DRAFT V.3 - 2001 MoEIS - 2001 TRI



St. Louis
Community Air Project (CAP)

Emission Inventory

Future Directions:

- Expanded formaldehyde emissions
- Diesel emissions from EPA
- Trends in mobile source emissions
- Refinements to the Point Source Inventory
- Local Area Source Data - Residential/Commercial Survey; Business Inventory Questionnaires