

Missouri Air Quality Trends

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Air Pollution Control Program

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St. Louis Area Monitoring Agencies

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Presentation Overview

- Emissions Inventory and Trends
- Ambient Air Monitoring and Trends
- Website Resources

National Emissions Inventory (NEI) Source Categories and Examples

- Point- power plants, factories, etc...
- Nonpoint- residential heating, etc...
- Onroad- cars, trucks, etc...
- Nonroad- lawn mowers, locomotives, etc...
- Event- prescribed burns, wildfires, etc...

Complete data source category list:

<https://www.epa.gov/air-emissions-inventories/air-emissions-sources>

Point Source Emissions Reporting

10 CSR 10-6.110 Emissions Data Reporting Rule (EIQ Rule)

- **Part 70 - Full Emissions Report- Annually**
 - potential to emit more than 100 tons per year of any criteria pollutants or
 - 10 tons per year of a single Hazardous air pollutant or
 - 25 tons per year of a combination of Hazardous air pollutants
- **Intermediate - Full Emissions Report - every three years, otherwise reduced* reporting**
 - potential to emit more than 100 tons per year of any criteria pollutants but accepted an emission limit of less than 100 tons per year

*Full Emissions Report is required if there is a 5 tons per year change in emissions or if there is a construction permit action.

Point Source Emissions Reporting

- Small sources - Full once, reduced* subsequently
 - Basic Operating Permit - potential to emit is greater than de minimis levels but less than 100 tons per year.
 - Construction permit only - Construction Permit limits actual emissions to be below de minimis levels.

de minimis Levels: PM_{10} = 15 tons, $PM_{2.5}$ 10 tons, SO_x , NO_x , VOC = 40 tons, CO = 100 tons, Lead = 0.6 tons, HAPs = 10 tons each/25 tons combined

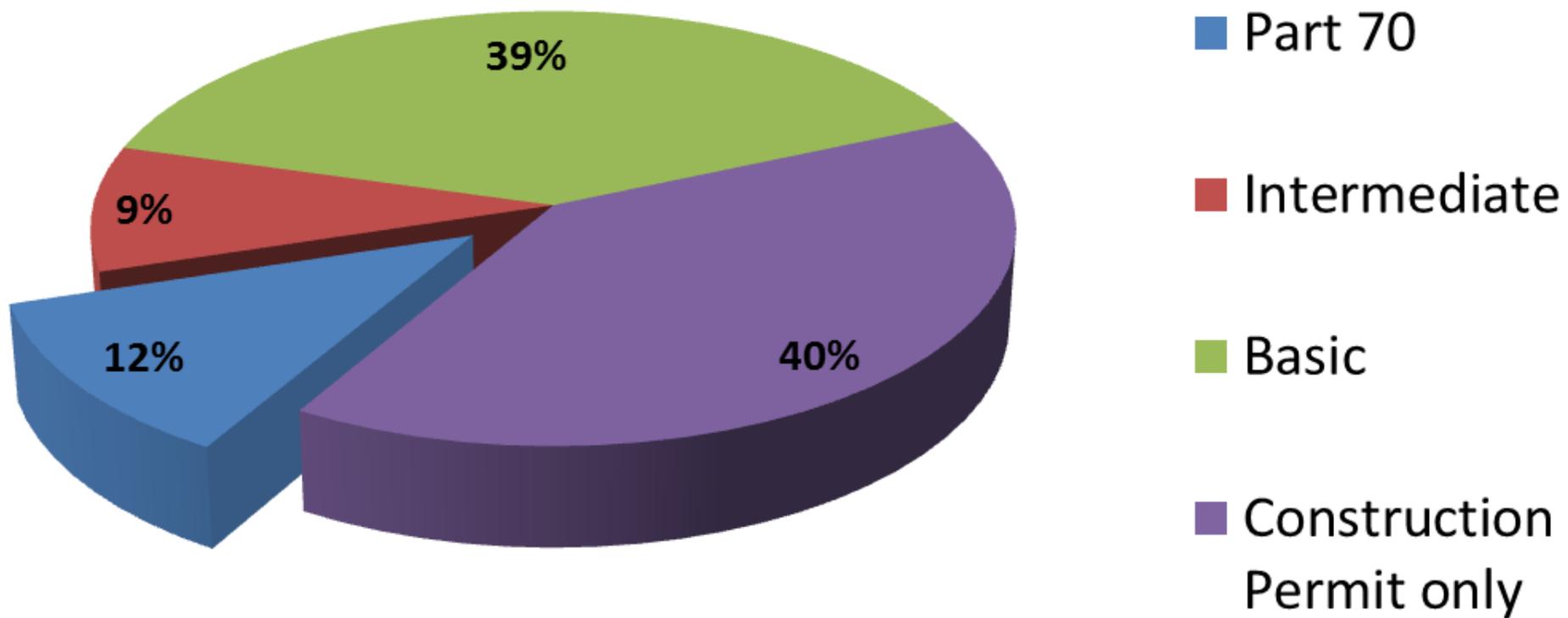
*Full Emissions Report is required if there is a 5 tons per year change in emissions or if there is a construction permit action

How many point source facilities?

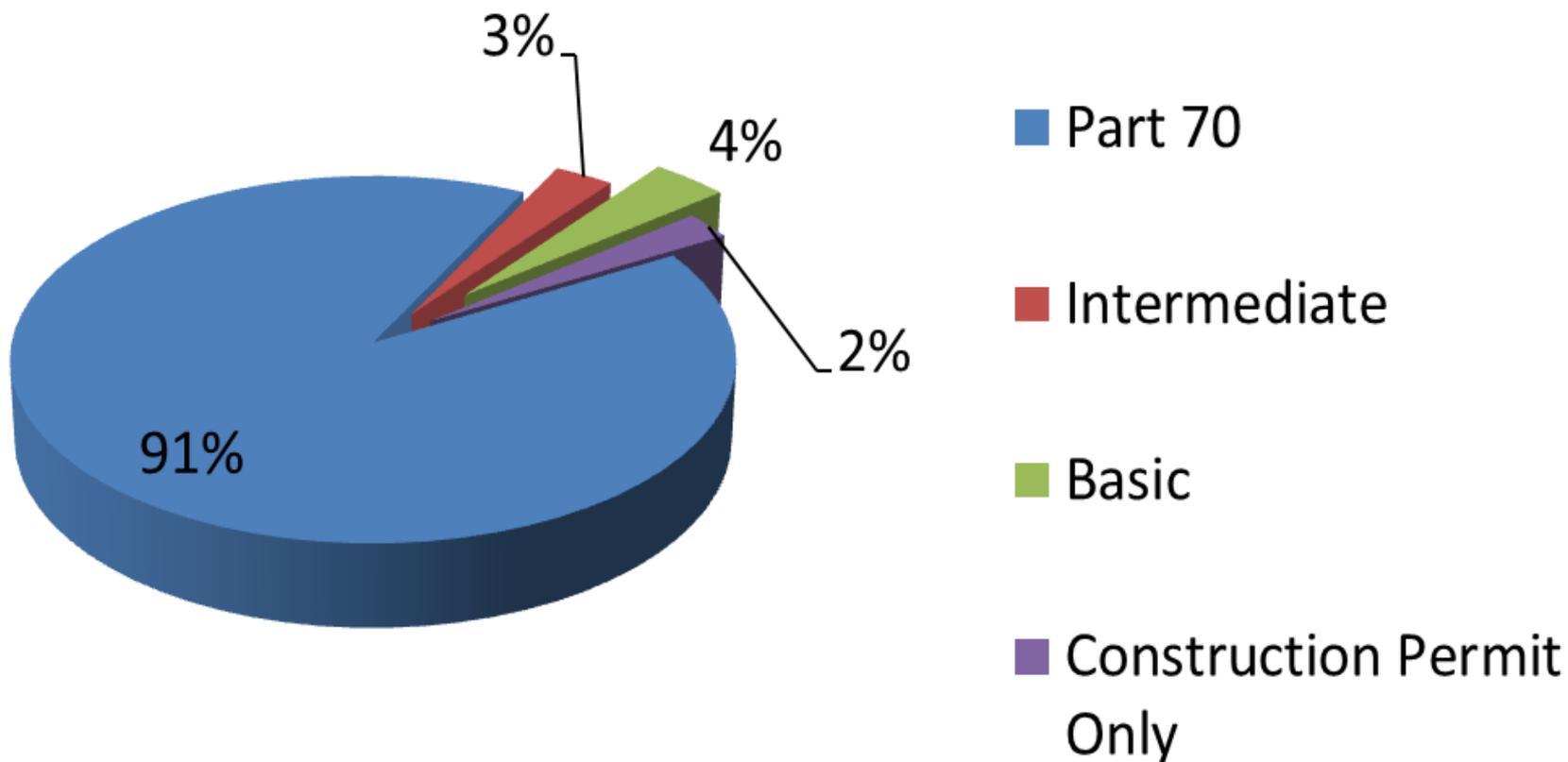
| Permit Type | Type of 2017 EIQ (12/14/17) | | Total Number |
|------------------------------|--------------------------------|--------------|-----------------|
| | Full | Reduced | |
| Part 70 | 258 | 0 | 258 |
| Intermediate | 202 | 0 | 202 |
| Basic | 23 | 788 | 811 |
| Construction Permit only* | 111 | 800 | 911 |
| All permit types | 594 | 1,588 | 2,182 |

*Construction permit limits emissions below De Minimis permit applicability limits. (CP-NOP) 6

Permit Type as a Percent of Total Facilities 2016 Emissions Year

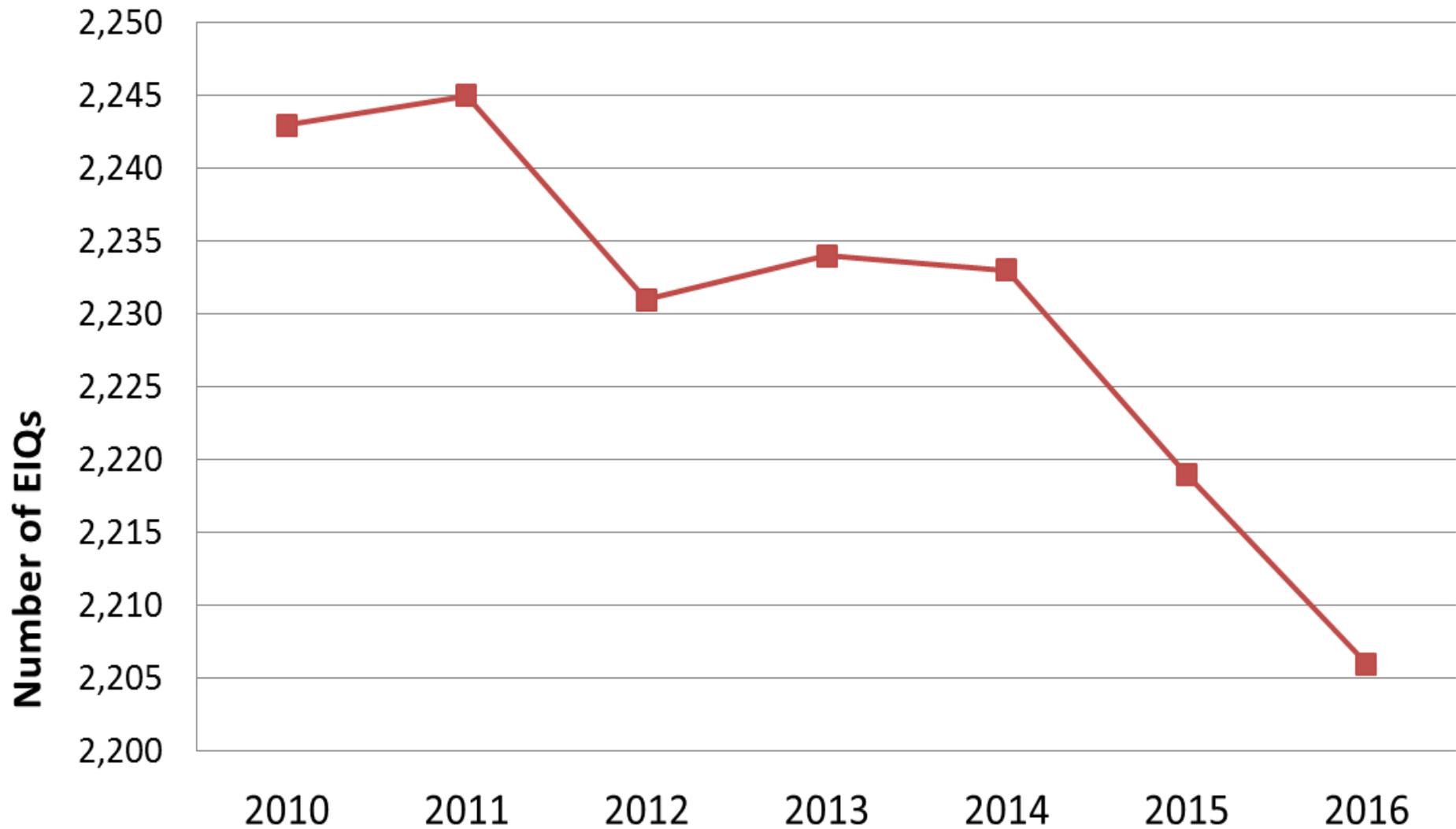


Percentage of Emissions Fees Collected by Permit Type 2016 Emission Year

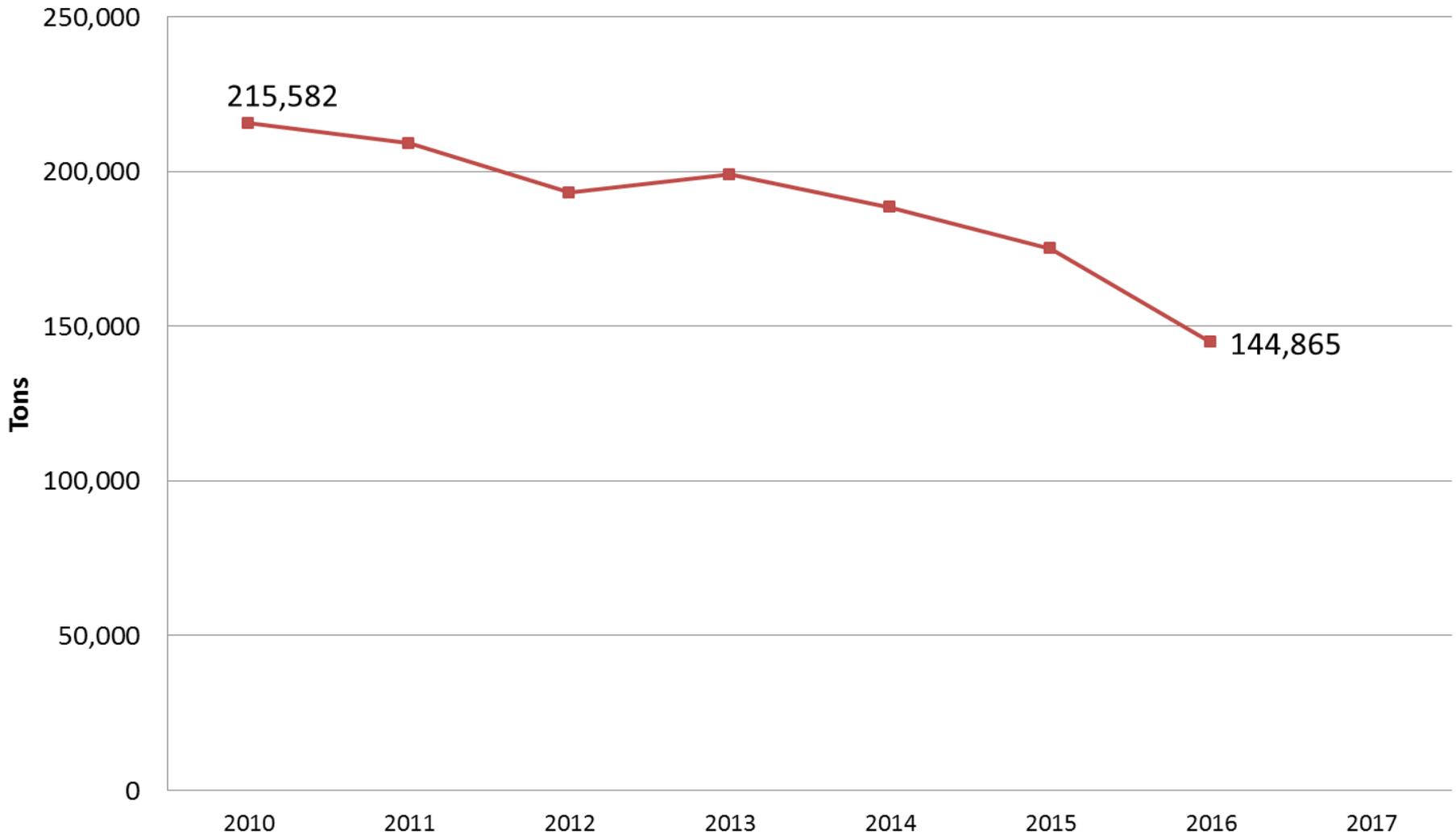


~ \$6.9 Million

Total Emissions Inventory Questionnaires Collected by Year

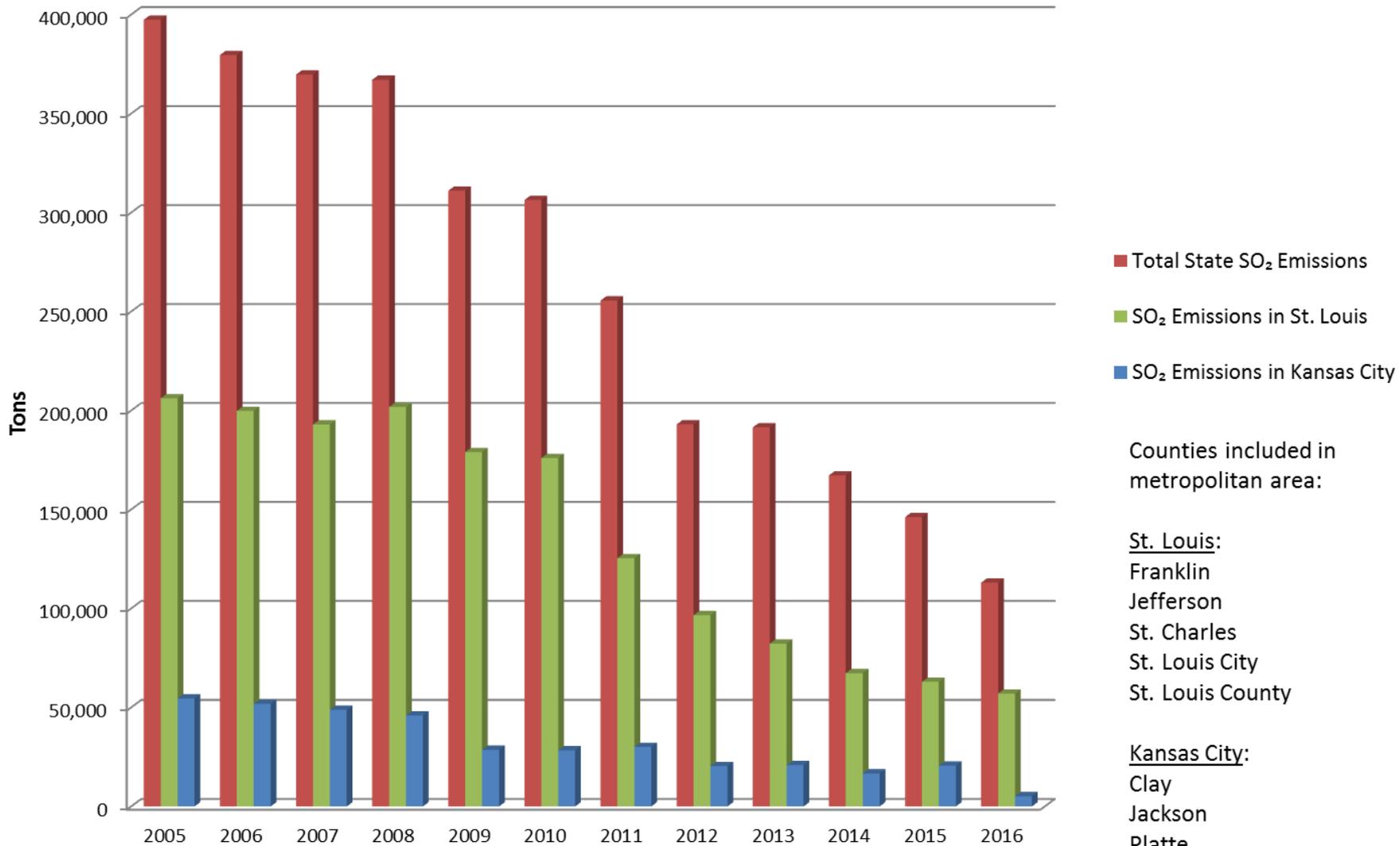


Chargeable Emissions from Point Sources in Missouri



—■ Chargeable Emissions from Point Sources in Missouri

Sulfur Dioxide (SO₂) Emissions from Point Sources in Missouri



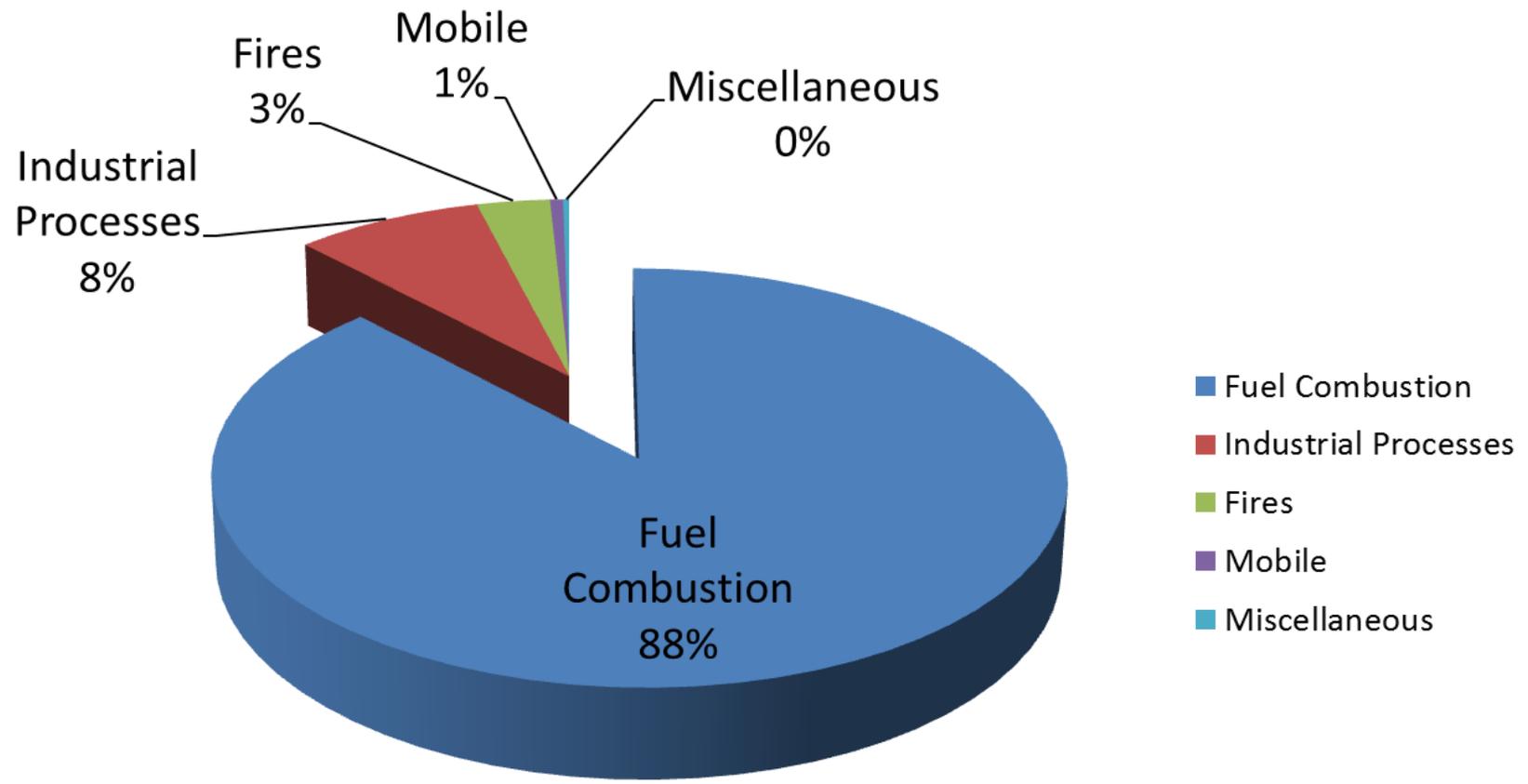
Counties included in metropolitan area:

St. Louis:
 Franklin
 Jefferson
 St. Charles
 St. Louis City
 St. Louis County

Kansas City:
 Clay
 Jackson
 Platte

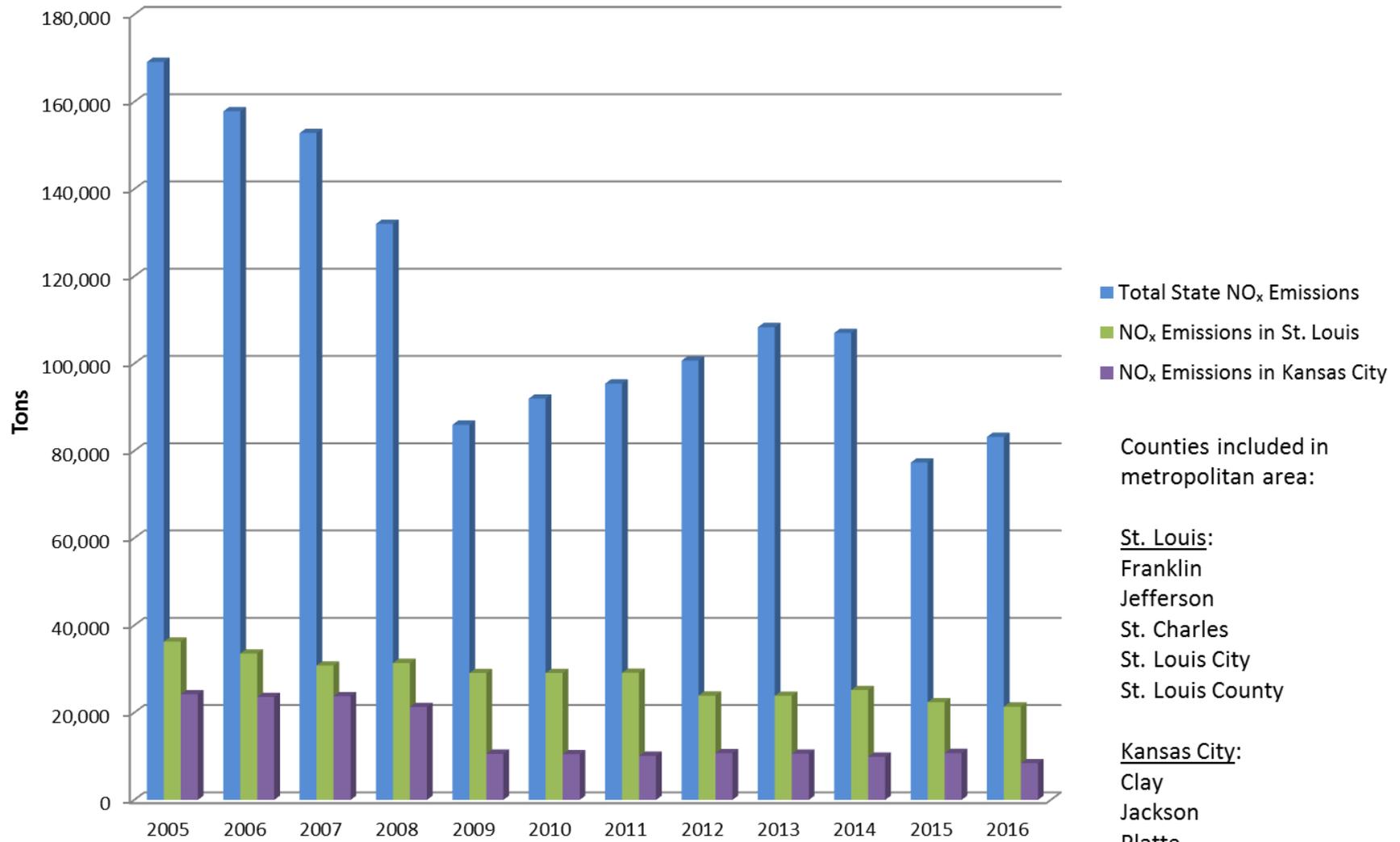


Total Sulfur Dioxide Emissions in Missouri (2014 National Emissions Inventory Version 2)



Data Source <https://www.epa.gov/air-emissions-inventories/air-emissions-sources>
(Percentages are rounded)

Nitrogen Oxides (NO_x) Emissions from Point Sources in Missouri



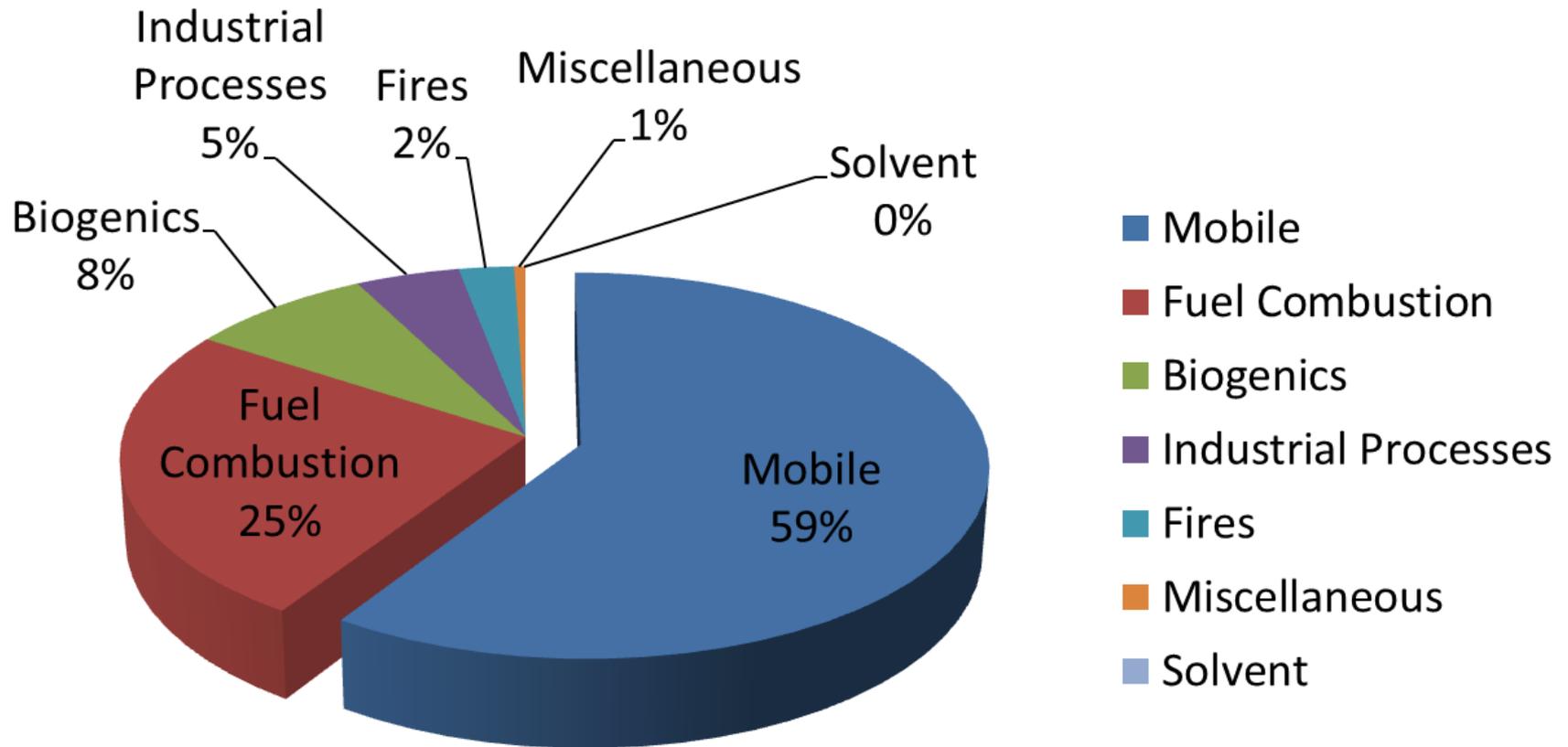
Counties included in metropolitan area:

- St. Louis:
 Franklin
 Jefferson
 St. Charles
 St. Louis City
 St. Louis County

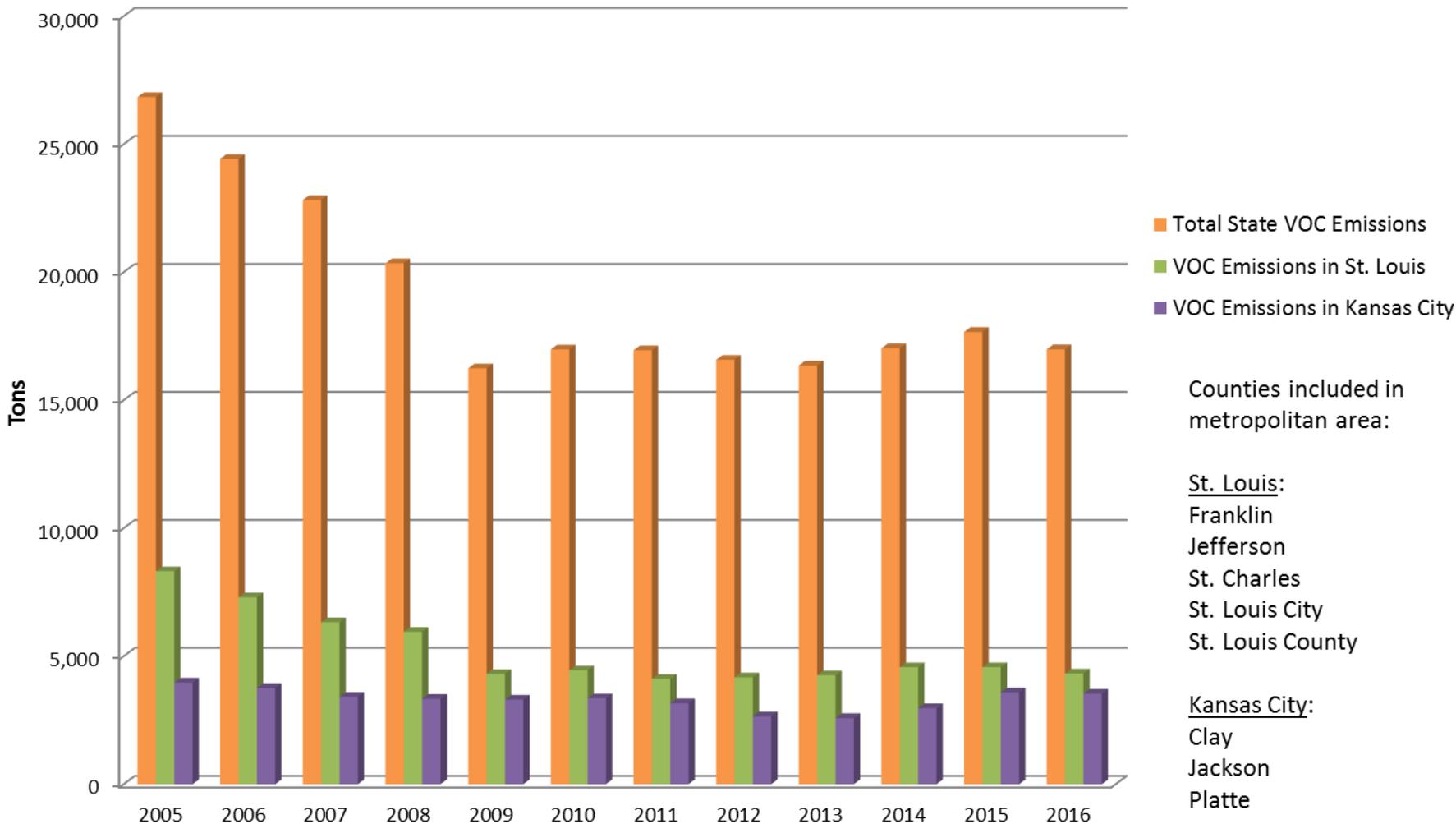
- Kansas City:
 Clay
 Jackson
 Platte



Total Nitrogen Oxides Emissions in Missouri (2014 National Emissions Inventory Version 2)



Volatile Organic Compounds (VOC) Emissions from Point Sources in Missouri



Counties included in metropolitan area:

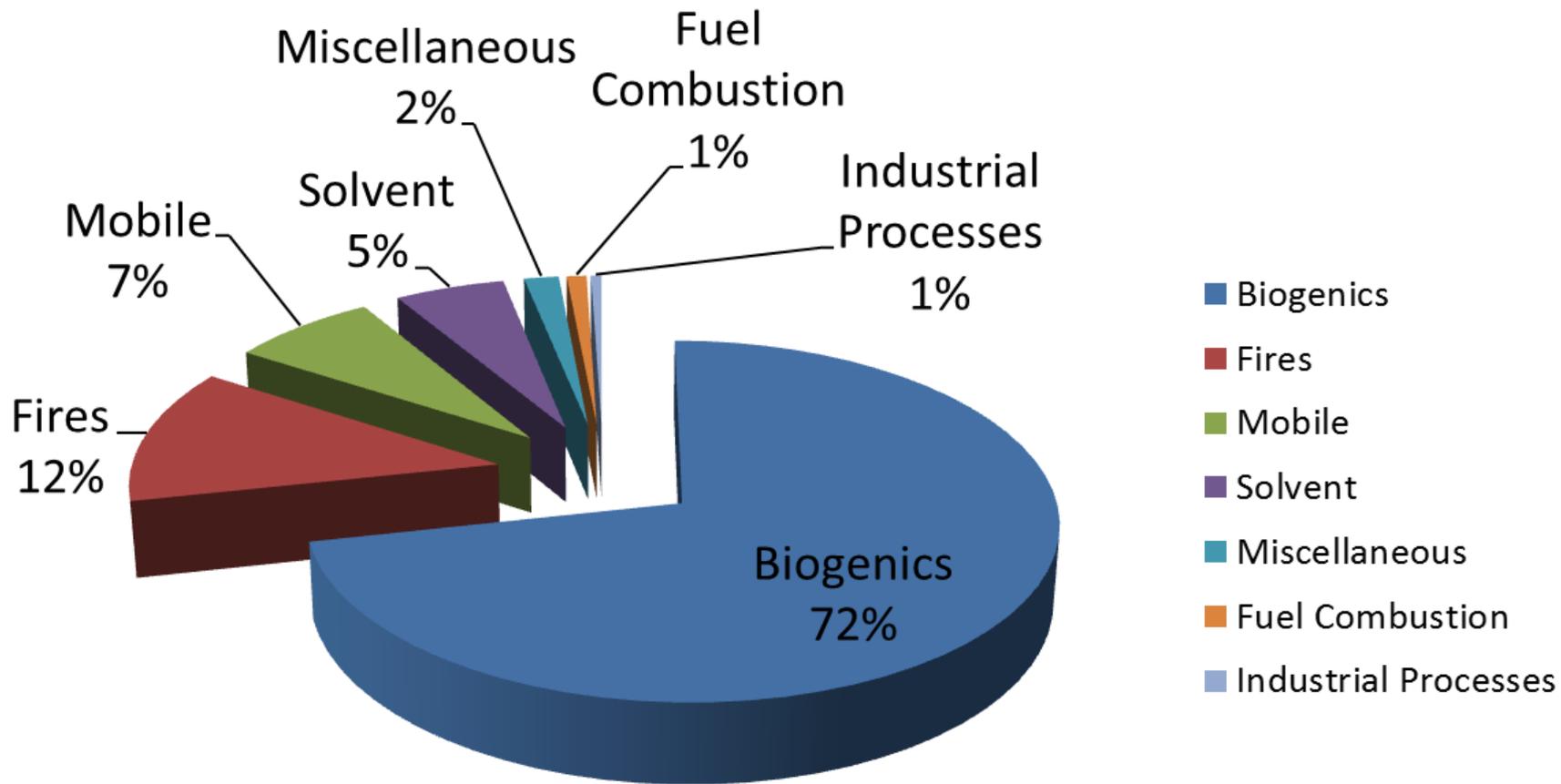
St. Louis:

- Franklin
- Jefferson
- St. Charles
- St. Louis City
- St. Louis County

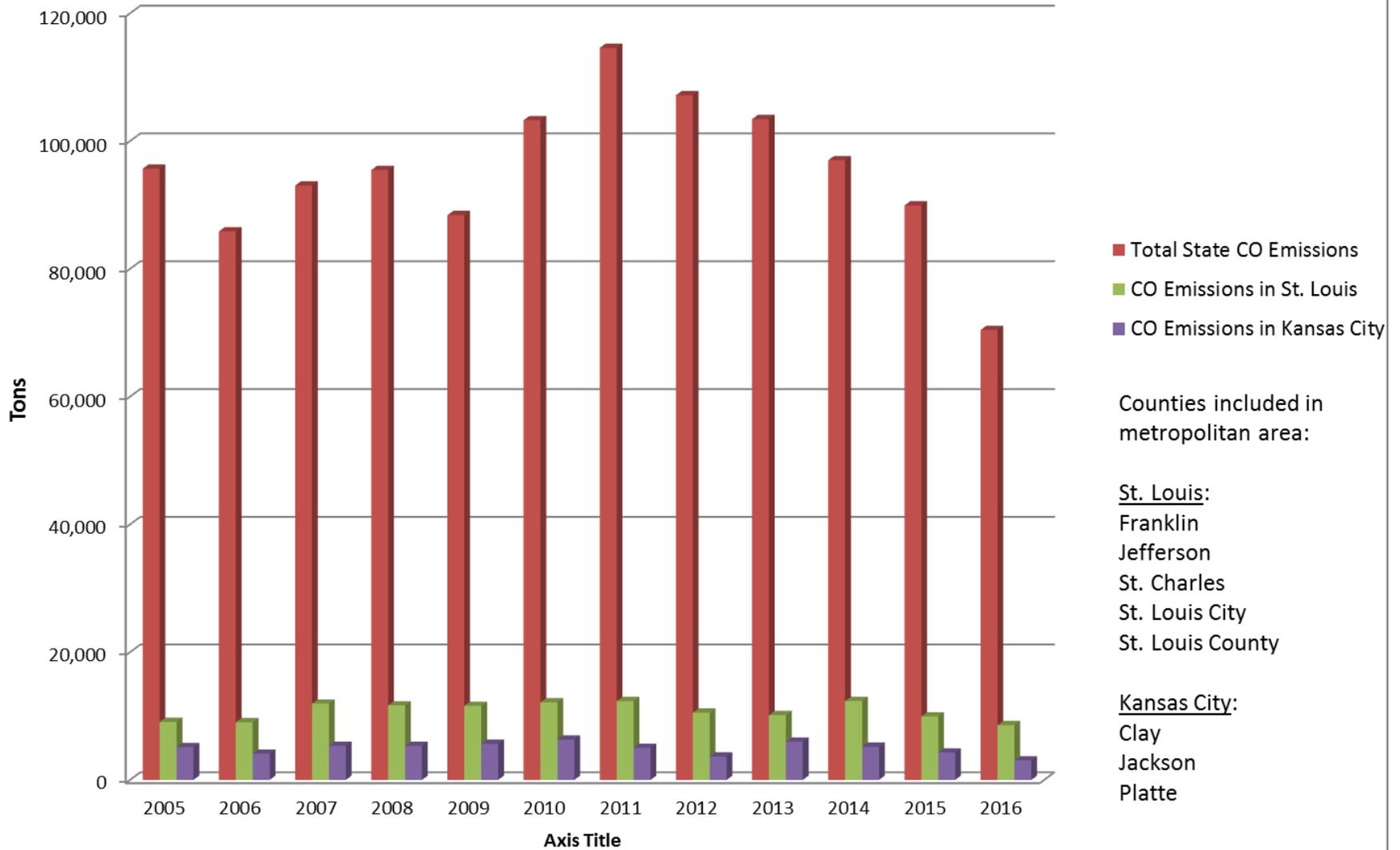
Kansas City:

- Clay
- Jackson
- Platte

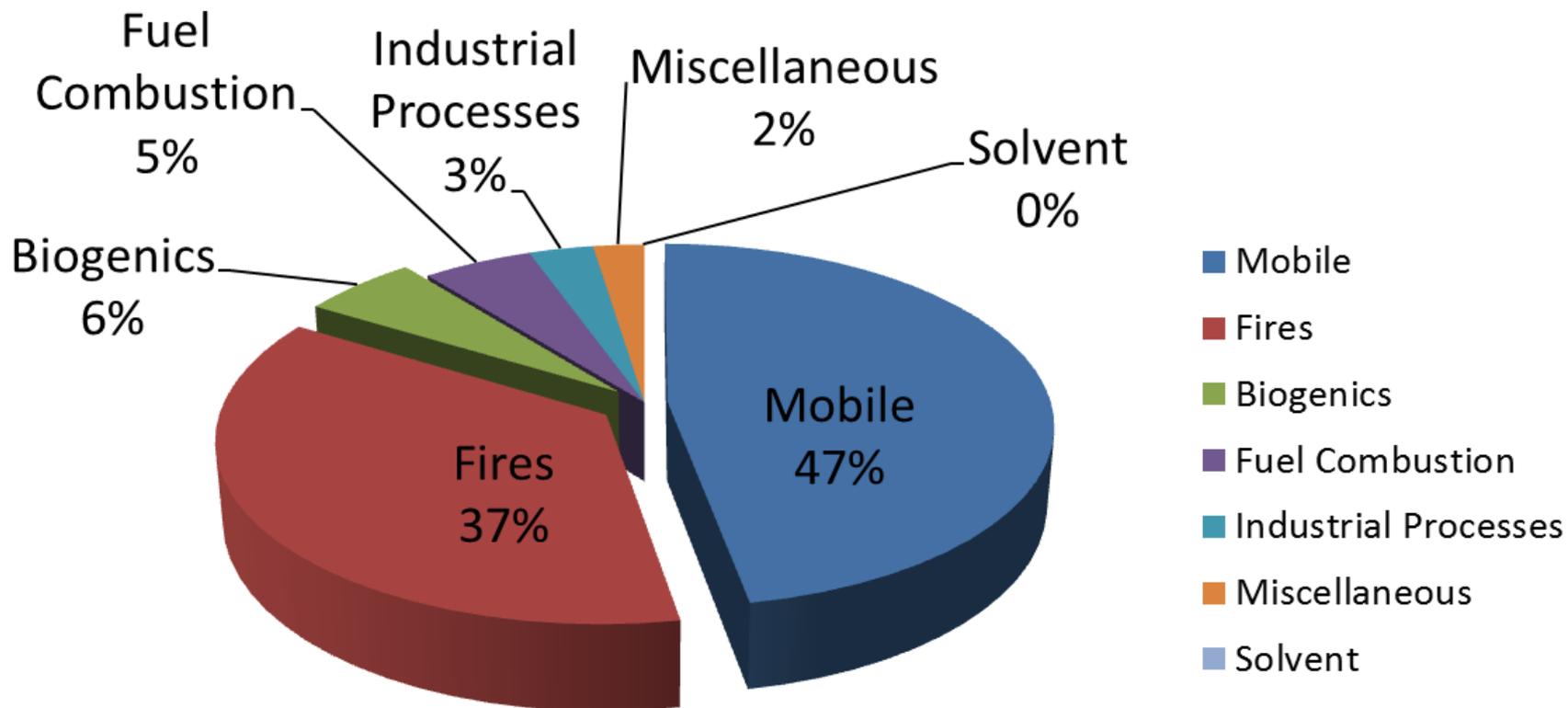
Total Volatile Organic Compounds Emissions in Missouri (2014 National Emissions Inventory Version 2)



Carbon Monoxide (CO) Emissions from Point Sources in Missouri



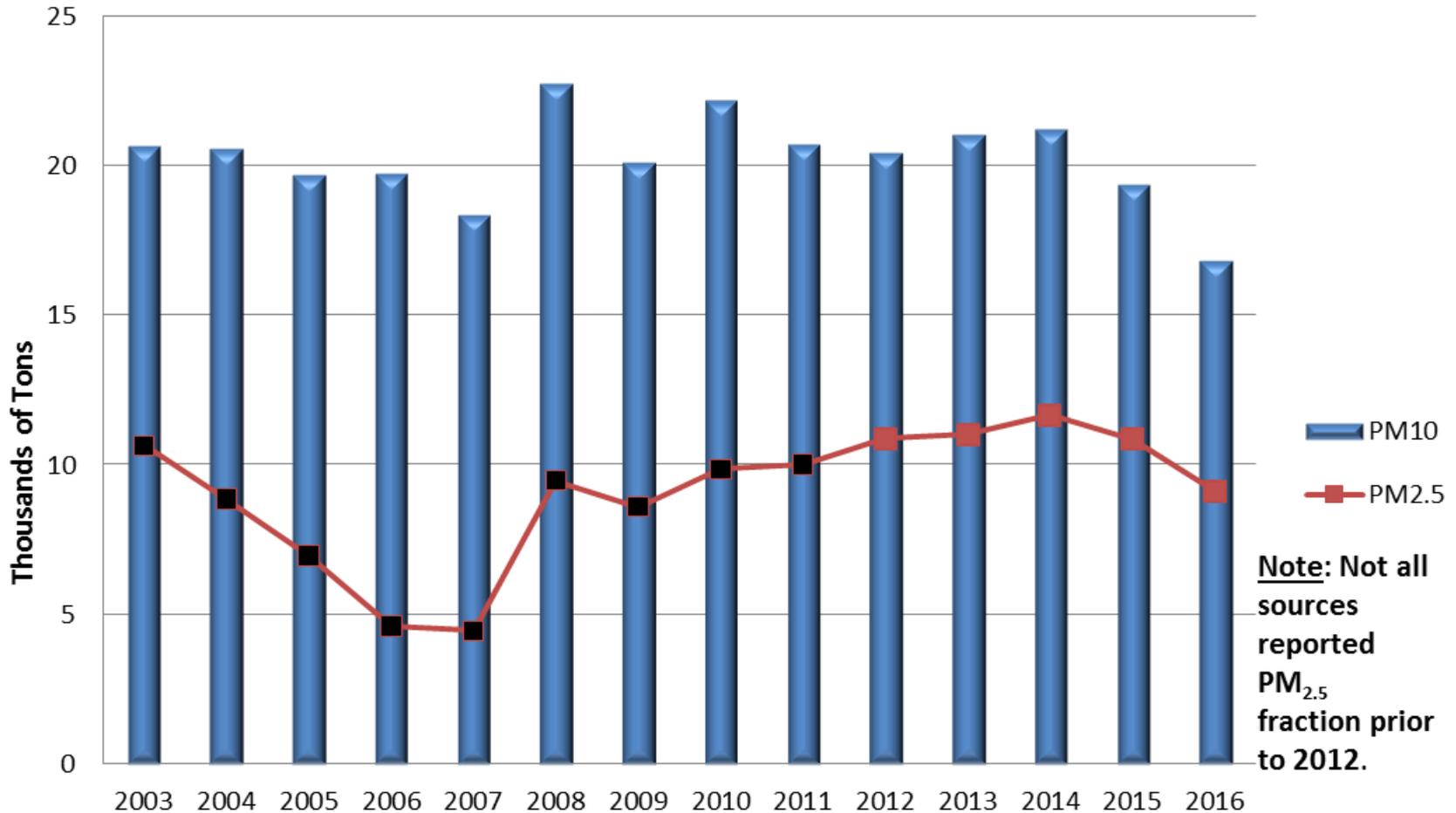
Total Carbon Monoxide Emissions in Missouri (2014 National Emissions Inventory Version 2)



Data Source <https://www.epa.gov/air-emissions-inventories/air-emissions-sources>
(Percentages are rounded)

Particulate Matter (PM₁₀) Emissions from Point Sources in Missouri

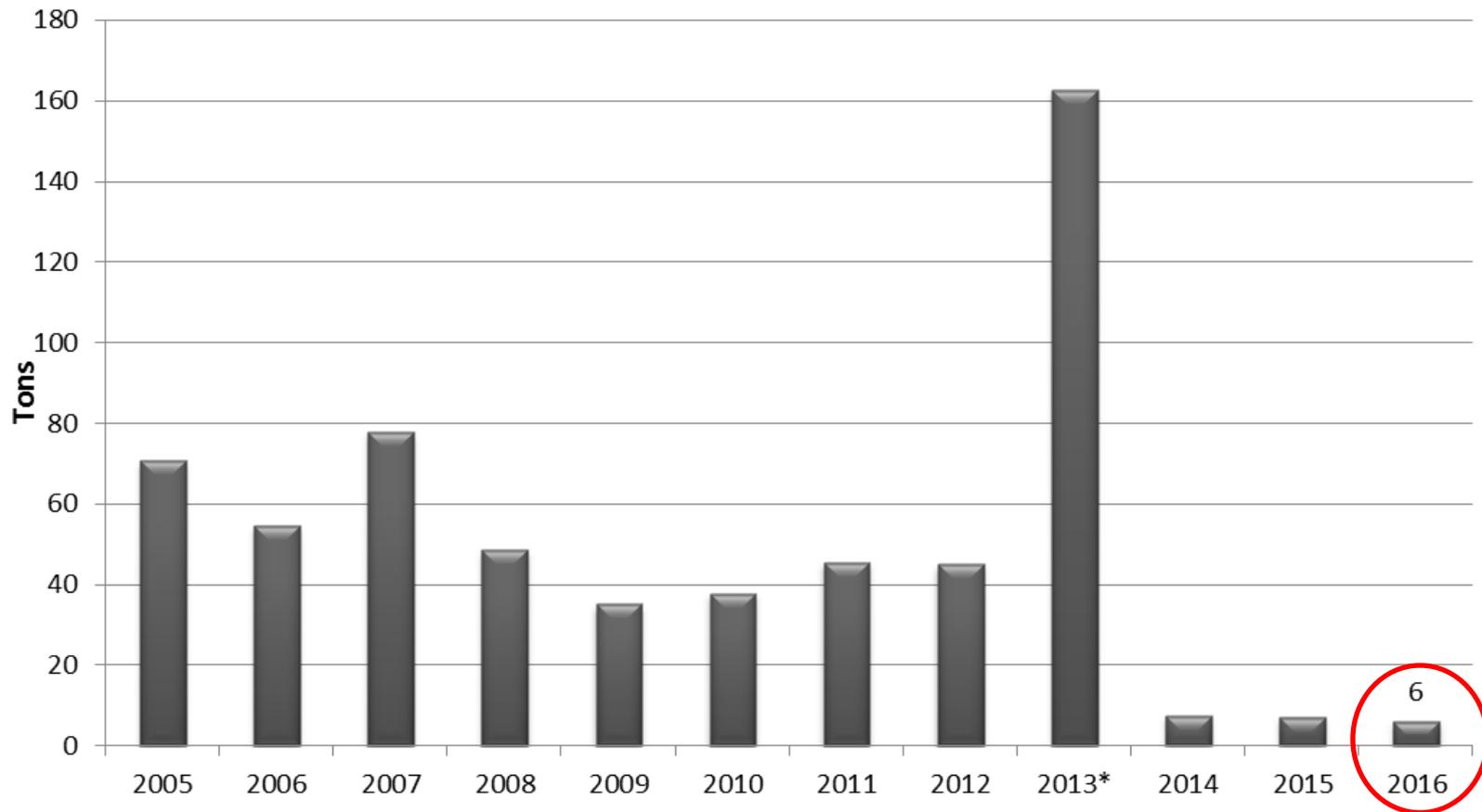
(With PM_{2.5} Fraction)



Note: Not all sources reported PM_{2.5} fraction prior to 2012.

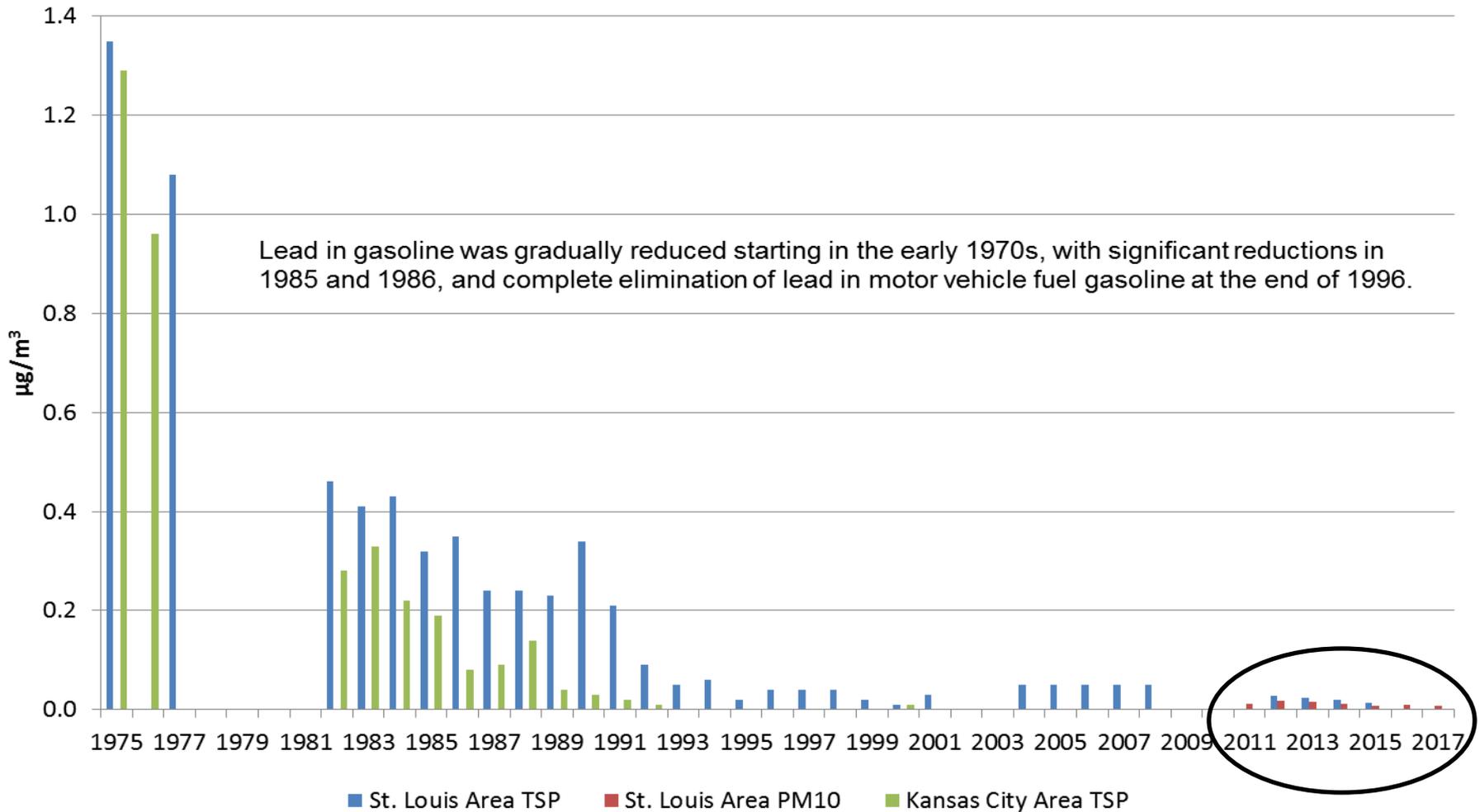


Airborne Lead Emissions from Point Sources in Missouri



* Increased lead emissions for 2013 is the result of stack testing at a single facility. The facility shut down the processes that release emissions through the tested stacks at the end of the 2013 emission year, and the increased emissions are the result of the shut down activities.

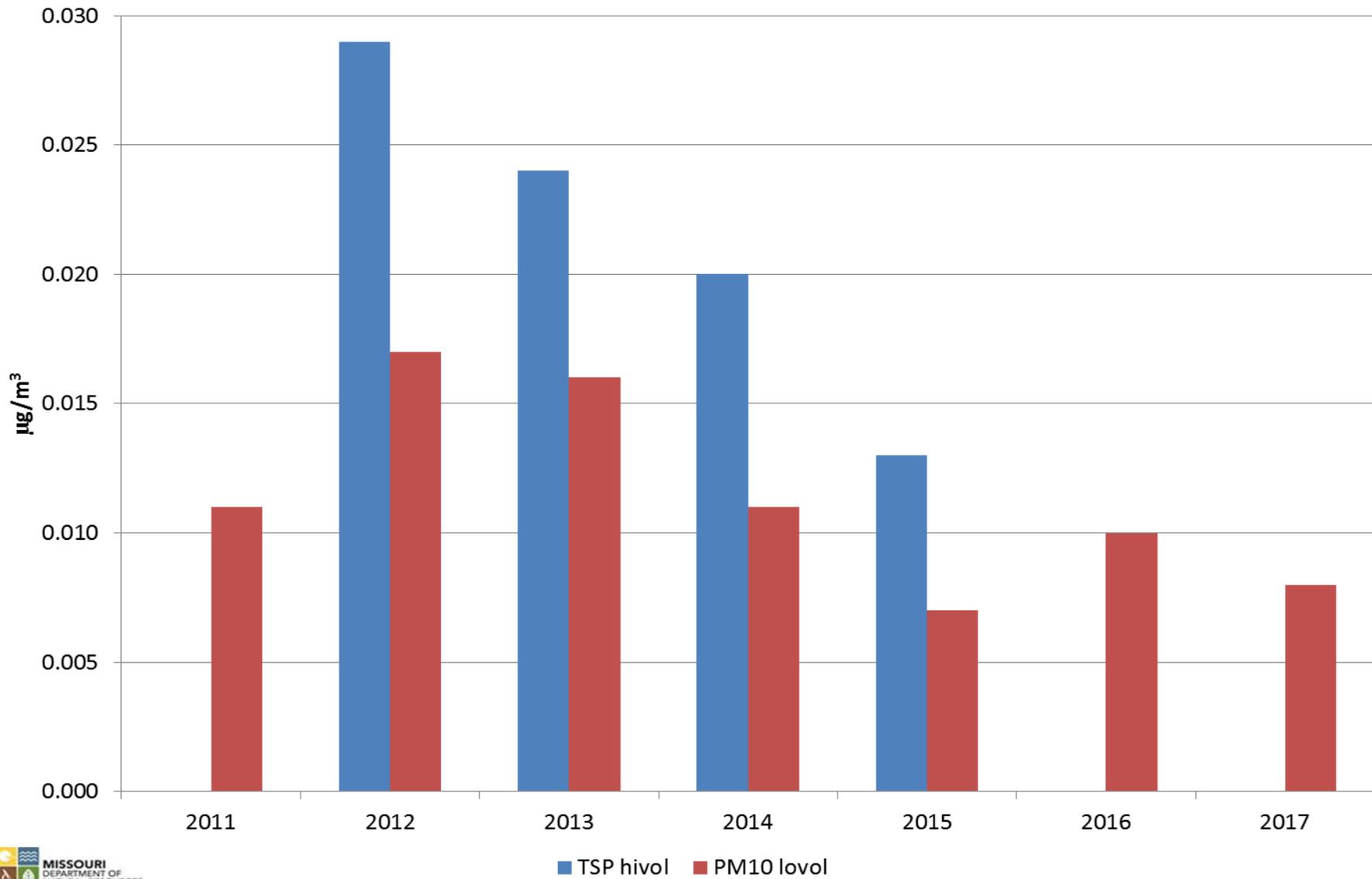
Highest Quarterly Average Lead Concentration in Area (2011-2017, highest 3-month rolling average)



■ St. Louis Area TSP ■ St. Louis Area PM10 ■ Kansas City Area TSP
(not including Jefferson County)

No additional historical lead data were found in AQS from IL and KS sites in the St. L and KC areas.

Blair Street Lead, Maximum 3-Month Rolling Average in Calendar Year



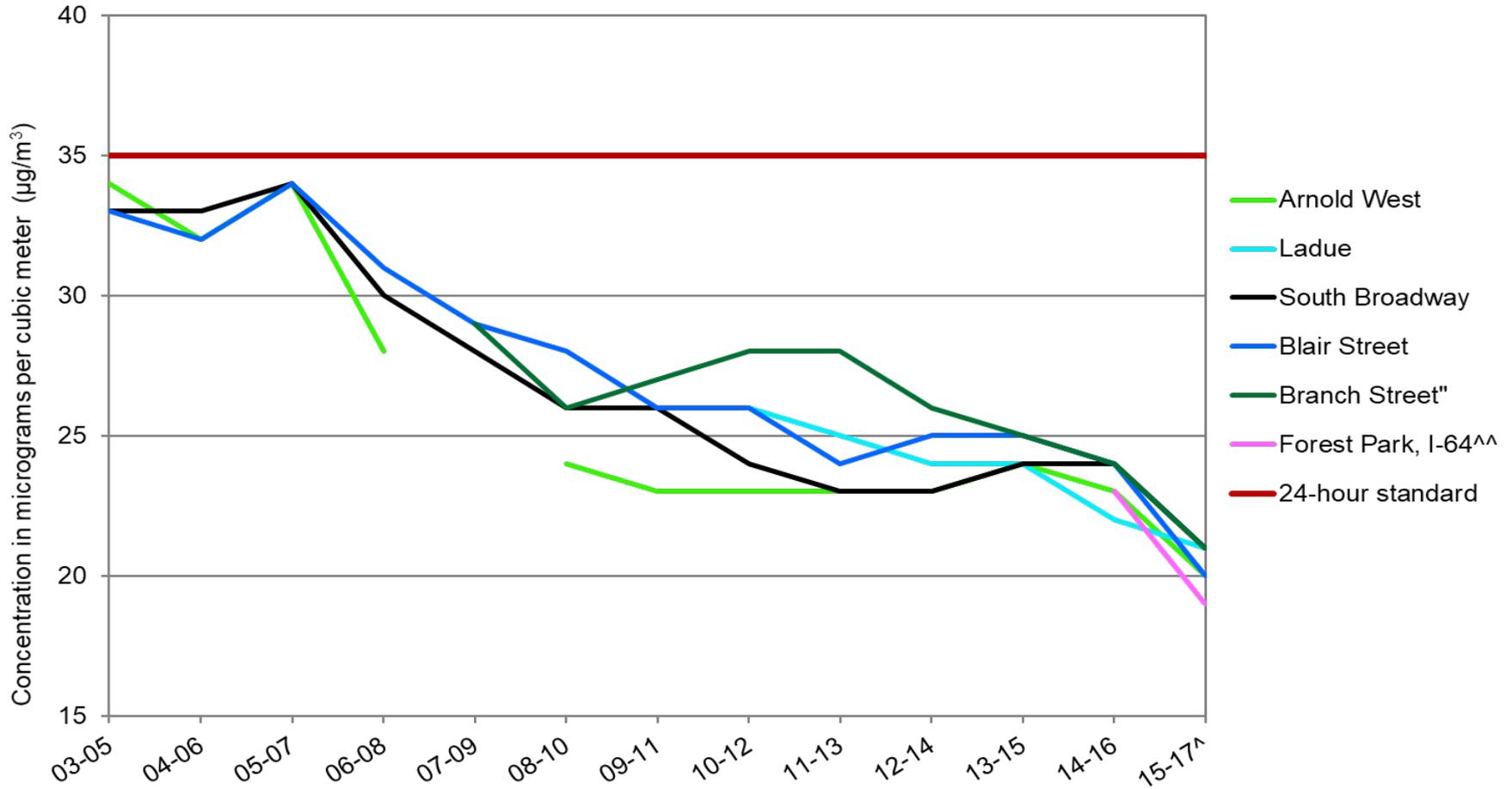
Ambient Air Monitoring Trends

- Area wide criteria pollutant long term monitoring trends are decreasing.
- Some single source and area specific National Ambient Air Quality Standards violations are being addressed.

Monitoring Compliance

- NO_2 : 1-hour (100 ppb) & annual (53 ppb) 2010 standard
- SO_2 : 1-hour (75 ppb) 2010 standard
- $\text{PM}_{2.5}$: Annual ($12 \mu\text{g}/\text{m}^3$) and 24-hour ($35 \mu\text{g}/\text{m}^3$) 2012 standards
- PM_{10} : 24-hour ($150 \mu\text{g}/\text{m}^3$) 1987 standard
- CO : 1-hour (35 ppm) or 8-hour (9 ppm) 1971 standard

St. Louis Area, MO Trends in PM_{2.5} Design Values Based on 24-hour Averages, 2003-2017



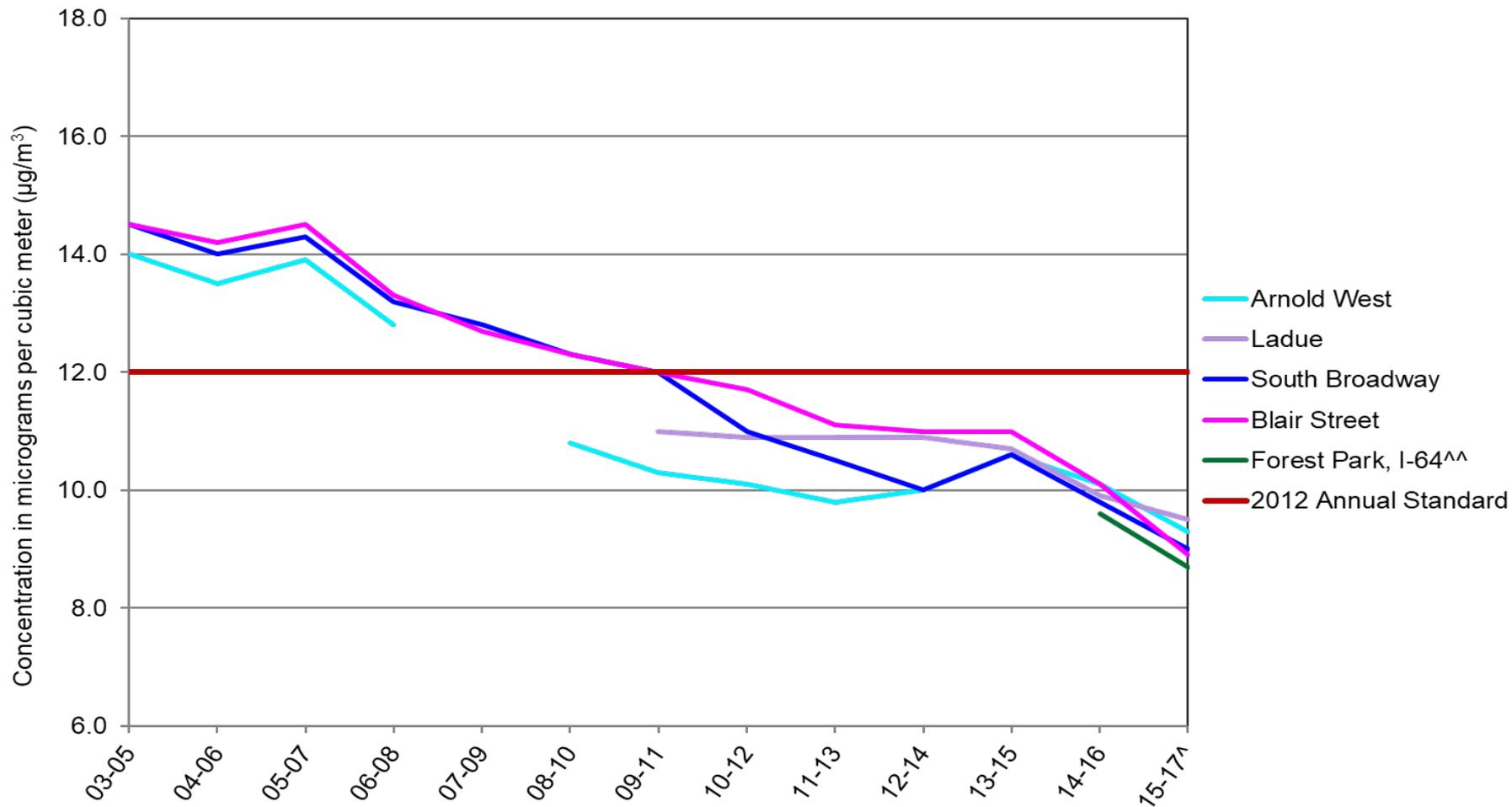
^Quality assured data through December 31, 2017

^^Near roadway monitor

" Branch Street is a middle scale (100 meters to 0.5 kilometers) monitor and therefore cannot be compared to the standard



St. Louis (Mo.) Trends in PM_{2.5} Design Values Based on Annual Averages, 2003-2017



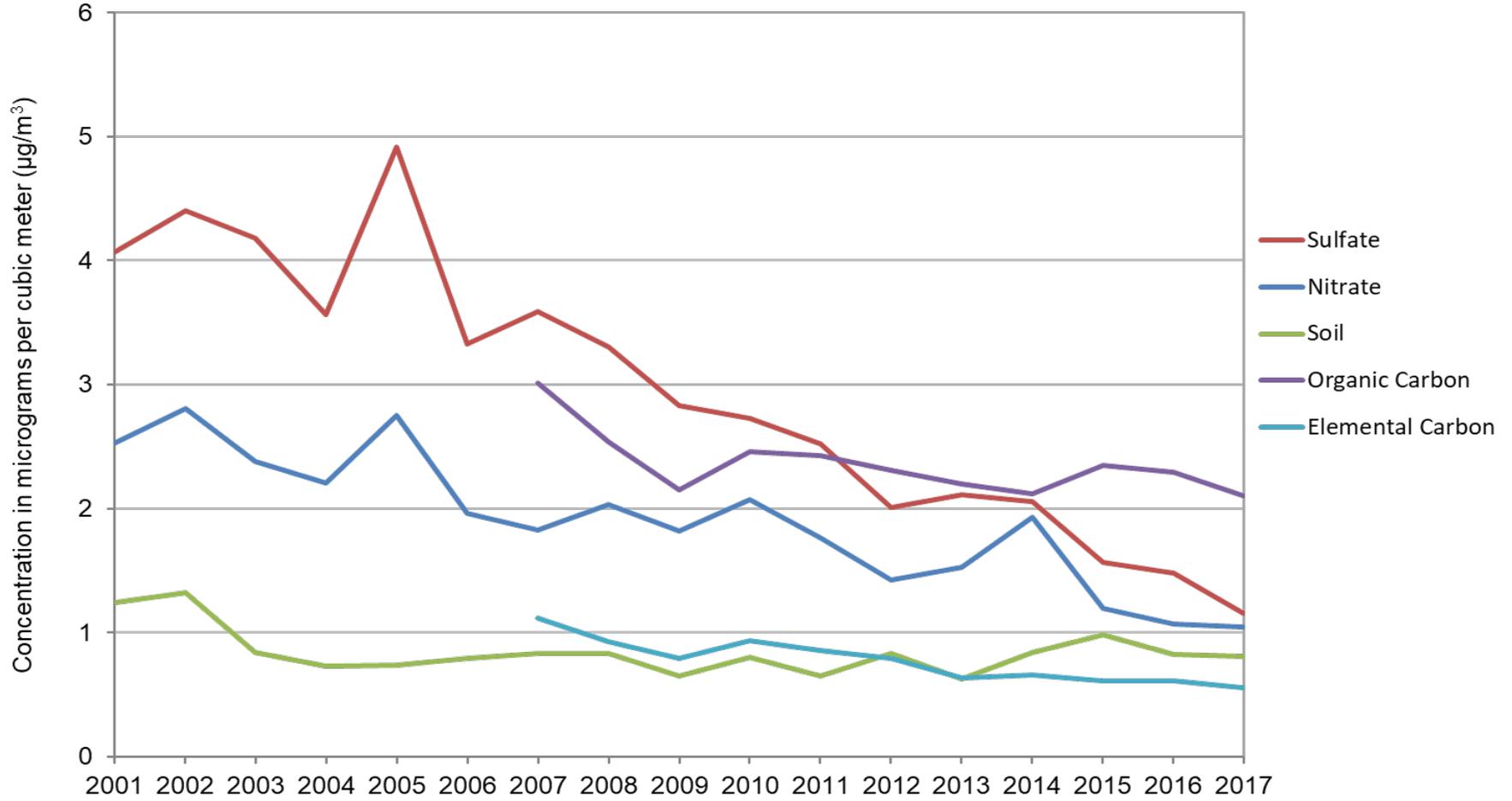
[^]Quality assured data through December 31, 2017

^{^^}Near roadway monitor

St. Louis (Mo) PM_{2.5} Speciation Trends

Blair Street

Monitoring Data for all CSN Sampled Days

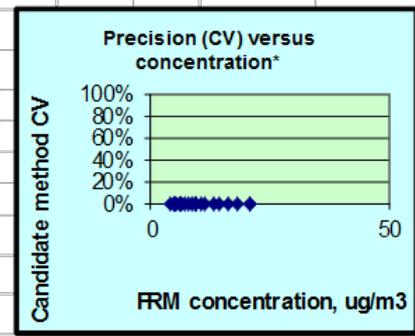


Quality assured data through June 30, 2017



PM_{2.5} Method: Teledyne 640x

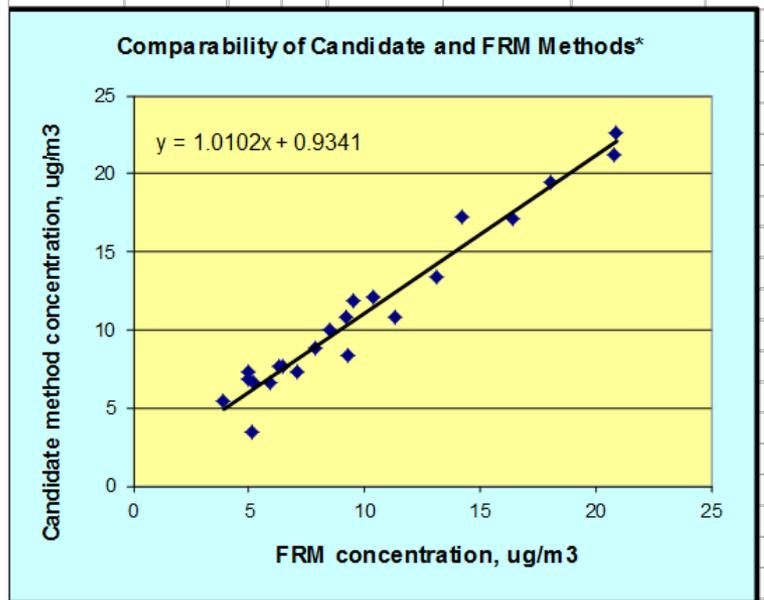
| Precision (if data are available) | Data set mean, µg/m ³ | | Data set precision, µg/m ³ | | Relative precision (CV) | |
|--|----------------------------------|-----------|---------------------------------------|-----------|-------------------------|-----------|
| | FRM | Candidate | FRM | Candidate | FRM | Candidate |
| Mean: | 10.0 | 11.0 | | | | |
| Maximum: | 20.9 | 22.6 | | | | |
| Minimum: | 3.9 | 3.5 | | | | |
| Candidate / FRM Ratio: | 110.4% | | | | | |
| RMS Relative Precision for this site: | | | | | | |
| Test requirements - Class III: | | | | | 10.0% | 15.0% |
| Precision Test Results for site: | | | | | | |



| Regression statistics | Slope ¹ | Intercept ² | Correlation (r) |
|--------------------------------|--------------------|------------------------|-----------------|
| Statistics for this test site: | 1.010 | 0.934 | 0.97906 |
| Limits for Class III | Upper: 1.100 | 1.715 | |
| | Lower: 0.900 | -2.000 | 0.95000 |
| Test Results (Pass/Fail): | PASS | PASS | PASS |

Note: Precision statistics can be calculated only for data sets containing multiple FRM or multiple candidate ARM

¹Multiplicative bias ²Additive bias

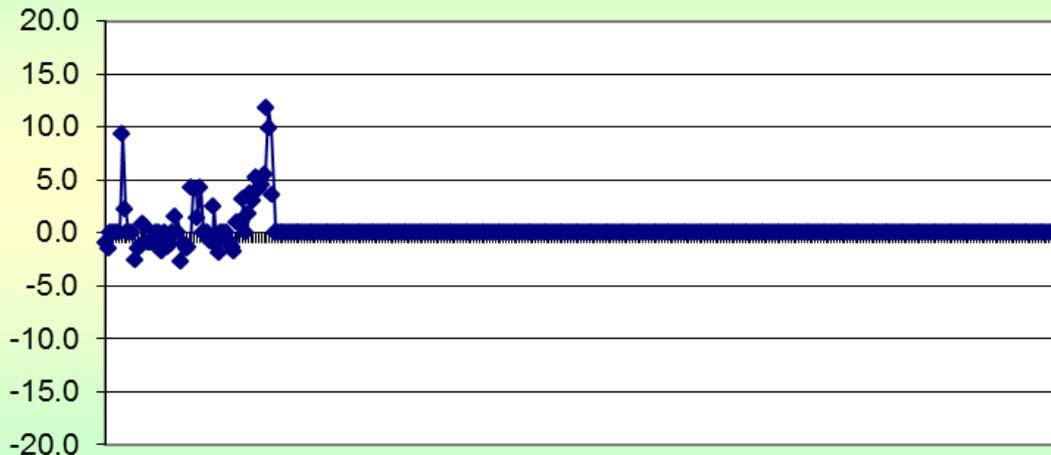


New PM_{2.5} Method Comparison

Teledyne 640x vs. 640x
Collocated Monitor Precision

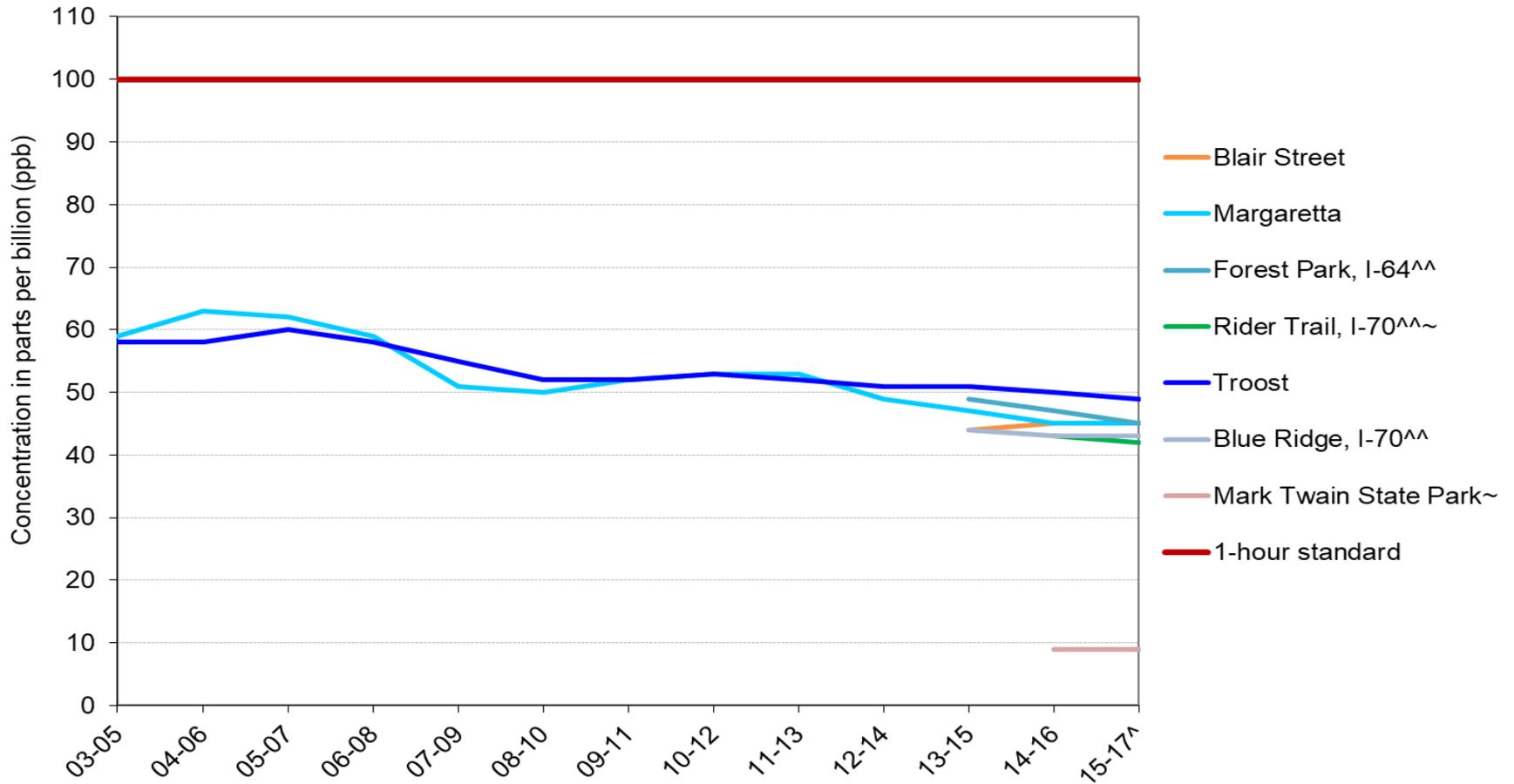
1/2/18 through 4/25/18
Preliminary Results:

Blair PM25 FEM%Differences



- Meets Class III FRM/FEM equivalency criteria
- Biased higher than FRM in winter
- Coefficient of Variation (CV) = 1.2% (CV goal is 10%)
- Continuing to evaluate method in other seasons

Missouri Trends in Nitrogen Dioxide (NO₂) Design Values, 2003-2017



[^]Quality assured data through December 31, 2017

^{^^}Near roadway monitor

[~]Mark Twain and Rider Trail monitors have been operating for less than three years, so the department cannot compare their data to the standard



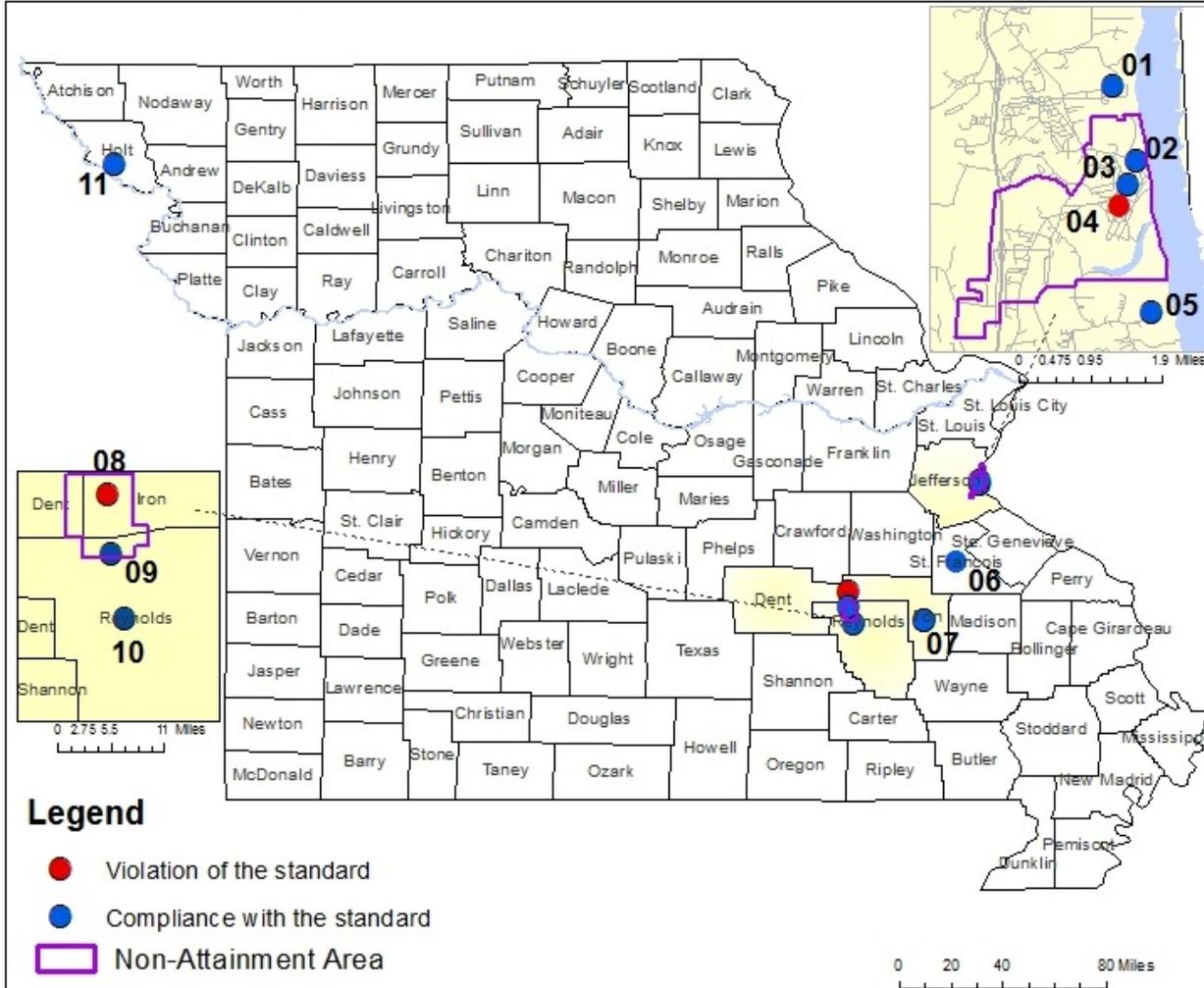
Areas Not Monitoring Compliance

- **Ozone:** 8-hour (70 ppb) 2015 standard
 - One Area, St. Louis, one monitor
- **Lead:** 3-month avg. ($0.15 \mu\text{g}/\text{m}^3$) 2010 standard
 - Two Areas
 - Buick: No new violation since August 2016
 - Herculaneum: Violation in 2017 due to non-recurring smelter demolition activity



Missouri State Operated Lead (Pb) Monitoring Network, 2017

Rolling 3-month average standard = 0.15 ug/m³



2015-2017 Design Values (ug/m³)[^]

Herculaneum Area

- 01 Pevely (0.02)
- 02 Herculaneum, Sherman (0.04)
- 03 Herculaneum, Dunklin High School (0.06)
- 04 Herculaneum, Mott St. (**0.21**)
- 05 Ursuline North (0.01)

Old Pb Belt Area

- 06 St. Joe State Park (0.03)

New Pb Belt Area

- 07 Glover (0.07)
- 08 Buick NE (**0.16**)
- 09 Oates (0.04)
- 10 Fletcher (0.05)

Outstate Area

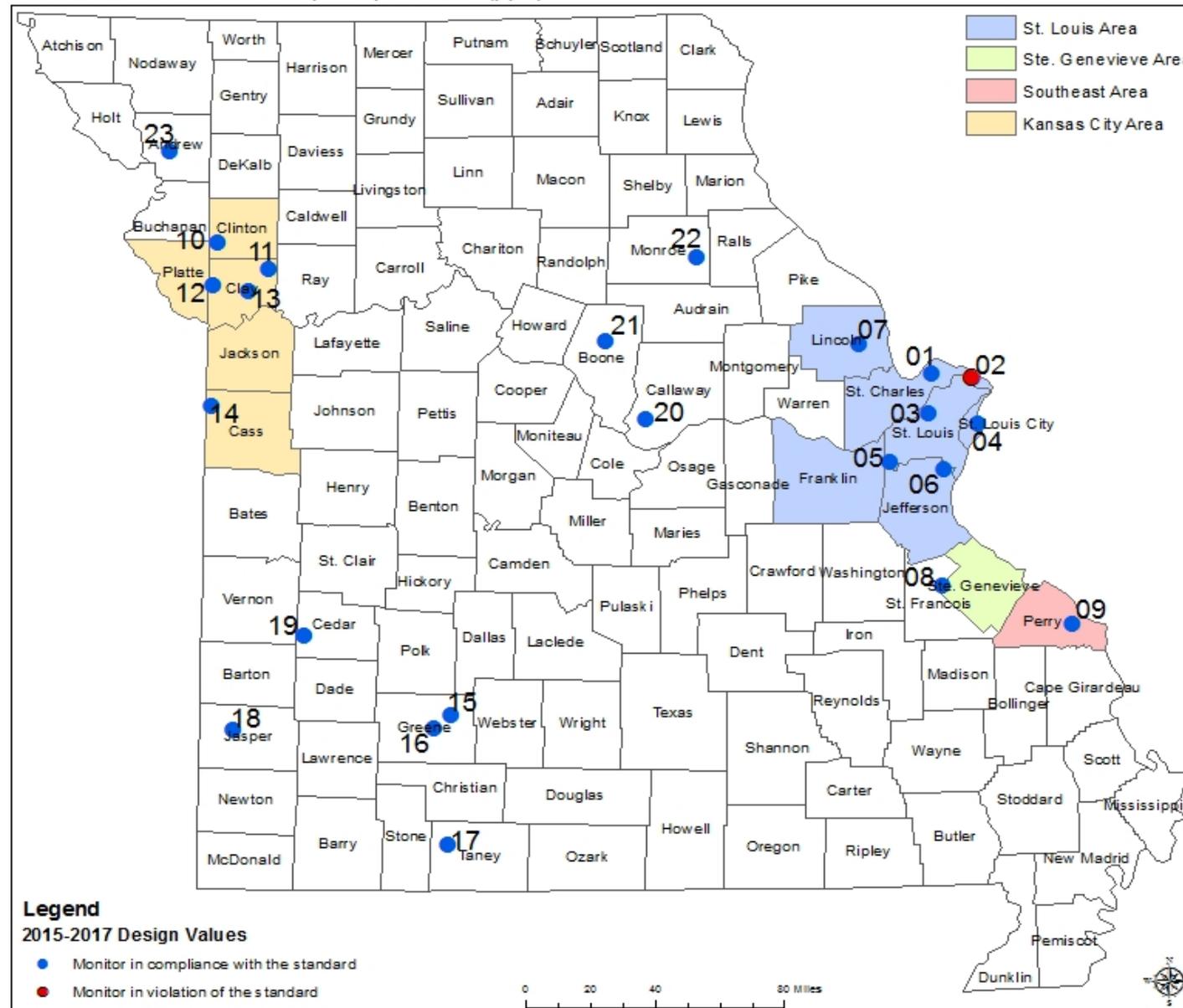
- 11 Forest City, Exide Levee (0.02)

[^]Quality assured data through December 31, 2017

Red and bold is violation of the standard

Missouri Statewide Ozone (O3) Monitoring Network, 2017

2015 8-hour standard = 70 parts per billion (ppb)



Site# SiteName (2015-2017 DV[^])

- St. Louis Area**
- 01 Orchard Farm (70)
 - 02 West Alton (**72**)
 - 03 Maryland Heights (69)
 - 04 Blair Street (66)
 - 05 Pacific (64)
 - 06 Arnold West (68)
 - 07 Foley West (66)
- Ste. Genevieve Area**
- 08 Bonne Terre (65)
- Southeast Area**
- 09 Farrar (67)
- Kansas City Area**
- 10 Trimble (67)
 - 11 Watkins Mill (66)
 - 12 Rocky Creek (69)
 - 13 Liberty (65)
 - 14 Richards Gebaur-South (63)
- Springfield Area**
- 15 Fellows Lake (60)
 - 16 Hillcrest High School (60)
- Outstate Area**
- 17 Branson-SPM* (57)
 - 18 Alba (60)
 - 19 El Dorado Springs (60)
 - 20 New Bloomfield (62)
 - 21 Finger Lakes (63)
 - 22 Mark Twain State Park (59)
 - 23 Savannah (62)

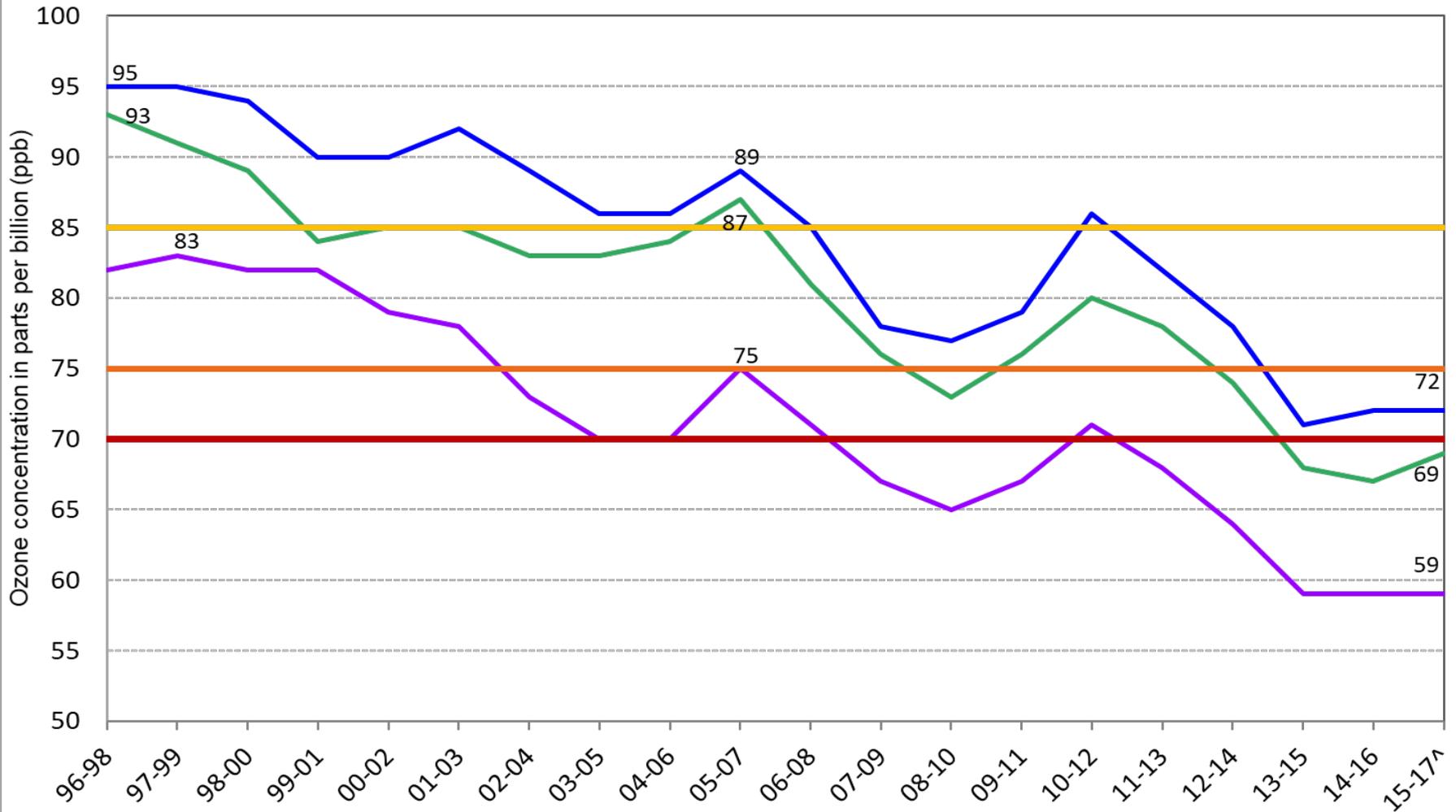
[^]Quality assured data through December 31, 2017

*Special Purpose Monitor (Closed October 31, 2017)

Violation: Bold & Red

Trends in Eight-hour Ozone Design Values St. Louis and Kansas City Areas and Rural Site (Mark Twain)

(*Quality assured data through December 2017)



— St. Louis Area

— Kansas City Area

— Mark Twain State Park

— 1997 eight-hour standard

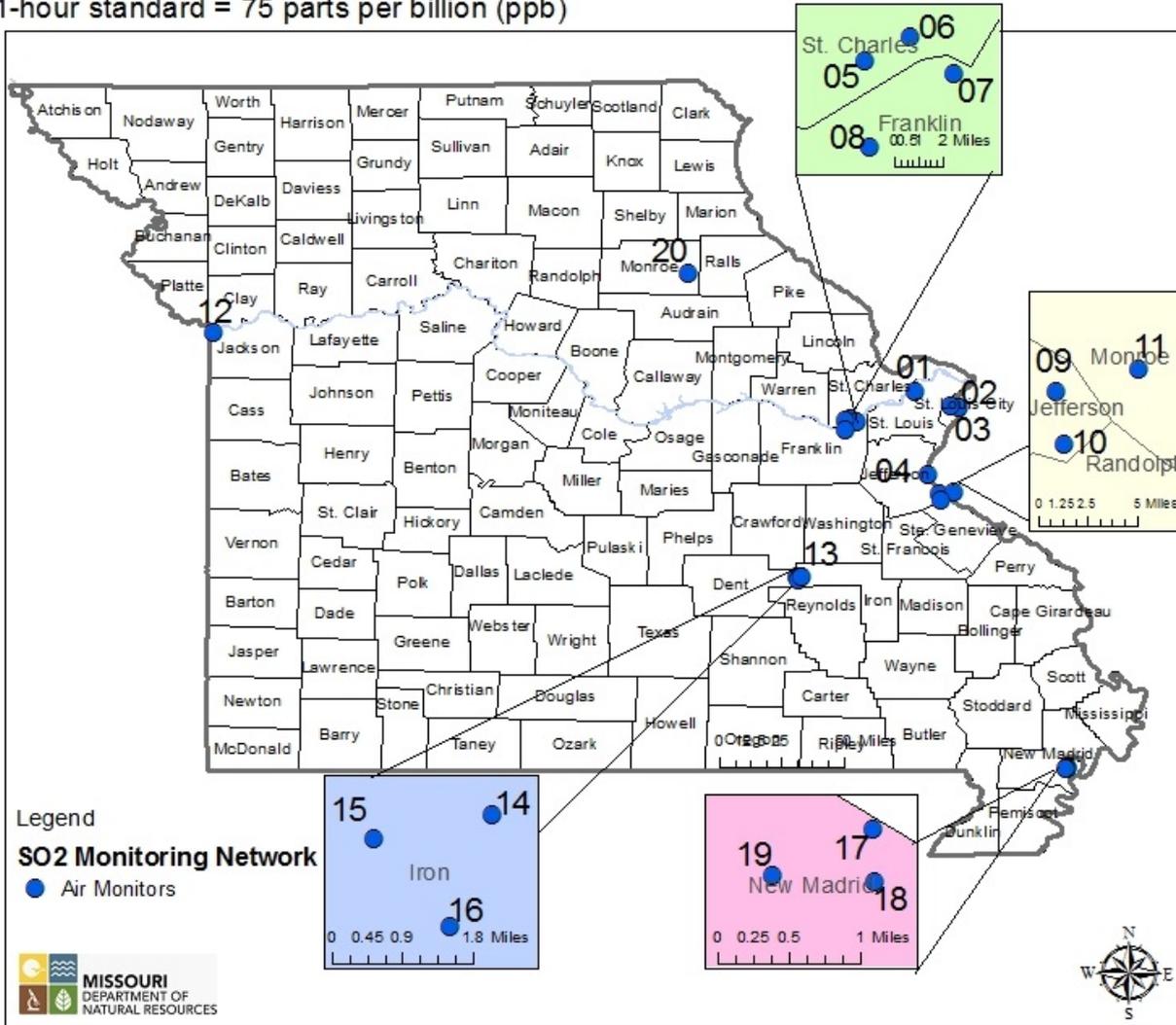
— 2008 eight-hour standard

— 2015 eight-hour standard



Statewide Sulfur Dioxide (SO₂) Monitoring Network, 2017

1-hour standard = 75 parts per billion (ppb)



2015-2017 Design Values (ppb)[^]

St. Louis Area, MO

- 01 Rider Trail, I-70[~] (15)
- 02 Margaretta (12)
- 03 Blair Street (15)
- 04 Herculaneum, Mott Street (23)
- 05 Ameren-Northwest^{*~} (25)
- 06 Ameren-North^{+~} (30)
- 07 Ameren-Valley^{*~} (27)
- 08 Ameren-Southwest^{+~} (22)
- 09 Ameren-Weaver & Hwy AA^{*~} (23)
- 10 Ameren-Natchez^{*~} (23)
- 11 Ameren-Fults, IL^{*~} (21)

Kansas City Area, MO

- 12 Troost (57)

Outstate Area, MO

- 13 Buick NE (44)
- 14 Hwy 32 Northeast^{+~} (51)
- 15 County Road 75^{+~} (47)
- 16 West Entrance^{+~} (44)

Outstate Area, MO

- 17 M7M Site #1-AECI Water Tower^{+~} (13)
- 18 M7M Site #2-East Graveyard^{+~} (5)
- 19 M7M Site #3-West Entrance^{+~} (7)
- 20 Mark Twain State Park (5)

[^]Quality assured data through December 31, 2017

[~]Special Purpose Monitor

^{*}Industry Monitor

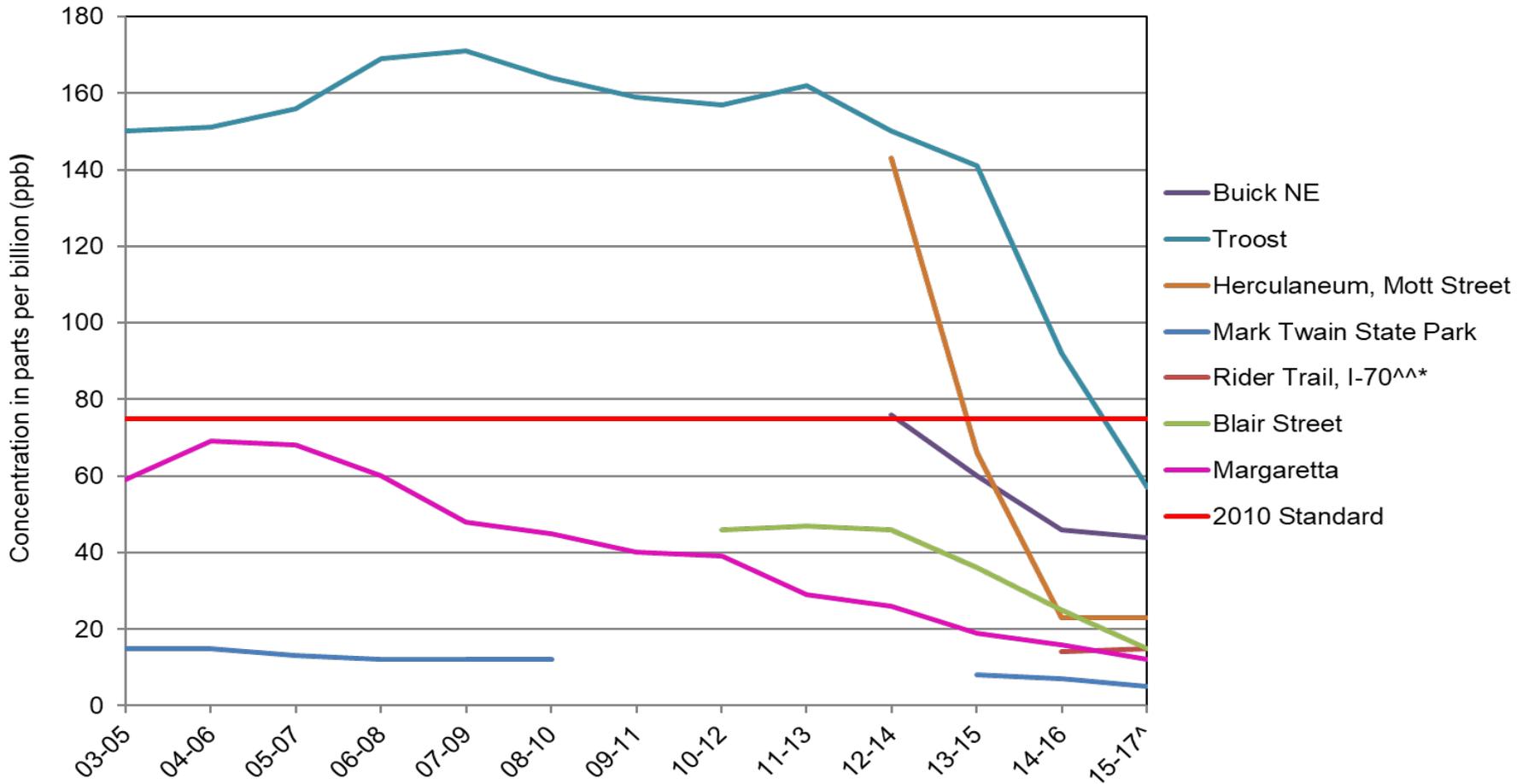
[~]Less than 3 years of data

⁺Began Monitoring in 2017

Green: EPA's Data Requirements Rule Sites

M7M: Magnitude 7 Metals

Trends in Sulfur Dioxide (SO₂) Design Values for Missouri State Operated Sites, 2003-2017



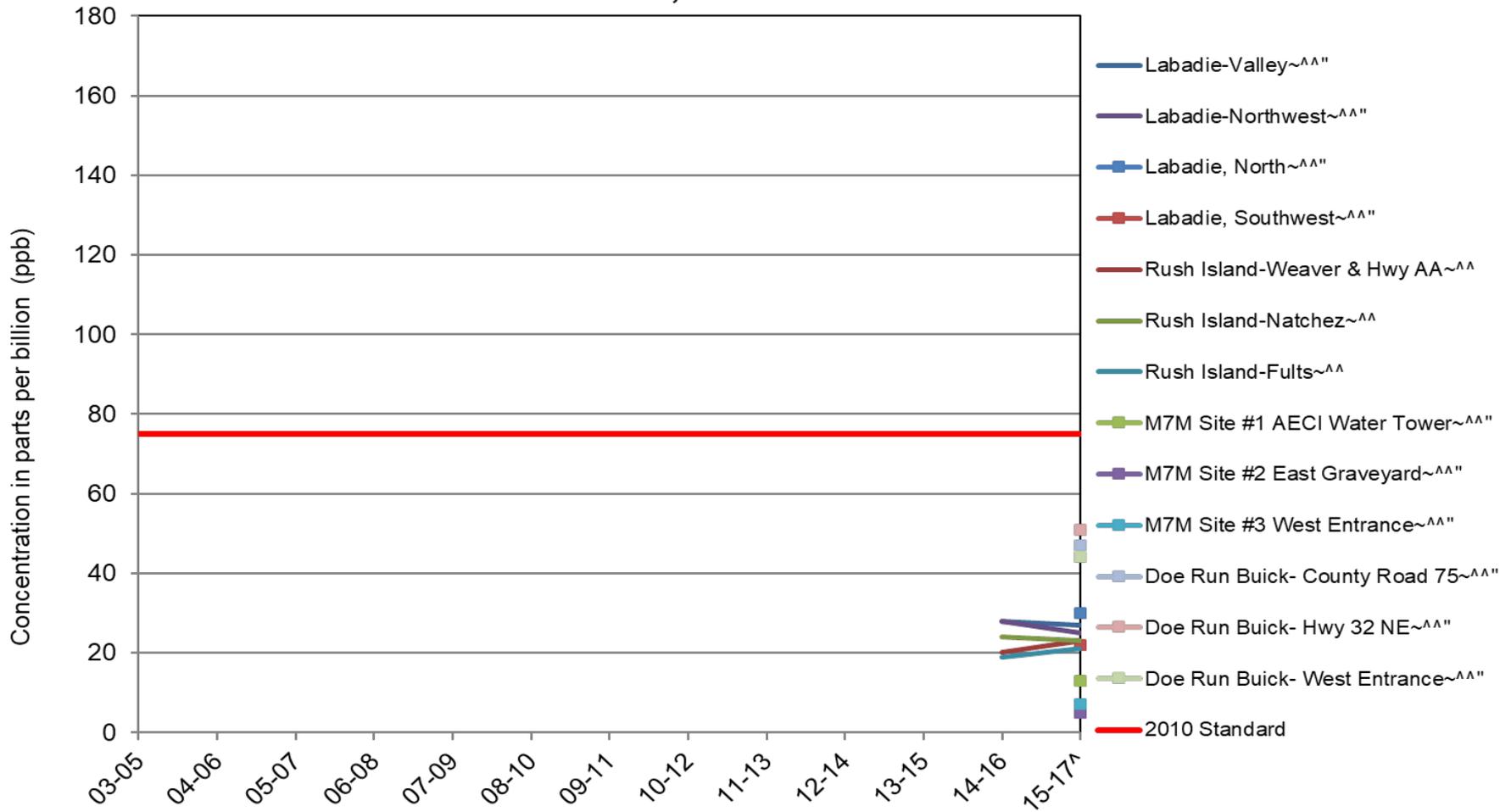
^AQuality assured data through December 31, 2017

^{^^}Rider Trail has been monitoring SO₂ for less than three years; thus the Department cannot compare data to the standard.

^{*}Special Purpose Monitor



Trends in Sulfur Dioxide (SO₂) Design Values for Missouri Industrial Sites, 2003-2017



[^]Quality assured data through December 31, 2017

[~]Industry monitor

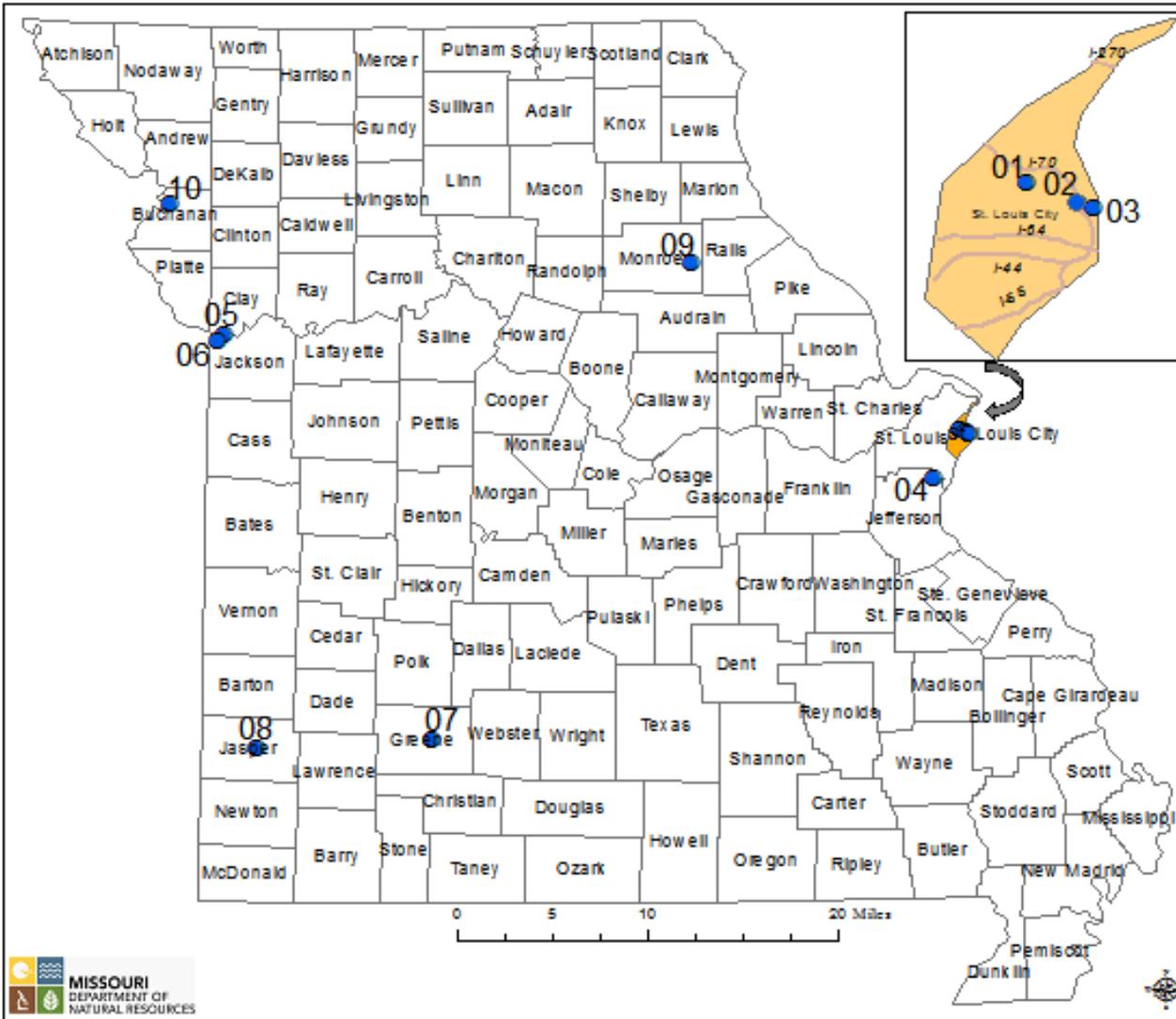
^{^^}Sites have been monitoring SO₂ for less than three years; thus the department cannot compare data to the standard.

[^]Site associated with EPA's Data Requirements Rule (DRR)





PM₁₀ Monitoring Network, 2017



Number of Expected Exceedances[^]

St. Louis Area, MO

- 01 Margaretta (0.0)
- 02 Blair Street* (0.0)
- 03 Branch Street (0.3)
- 04 Arnold West ^{^^} (0.0)

Kansas City, MO

- 05 Front Street (0.0)
- 06 Troost (0.0)

Springfield Area, MO

- 07 Hillcrest High School^{^^} (0.0)

Outstate Area, MO

- 08 Carthage (0.3)
- 09 Mark Twain State Park (0.0)
- 10 St. Joseph Pump Station (0.0)

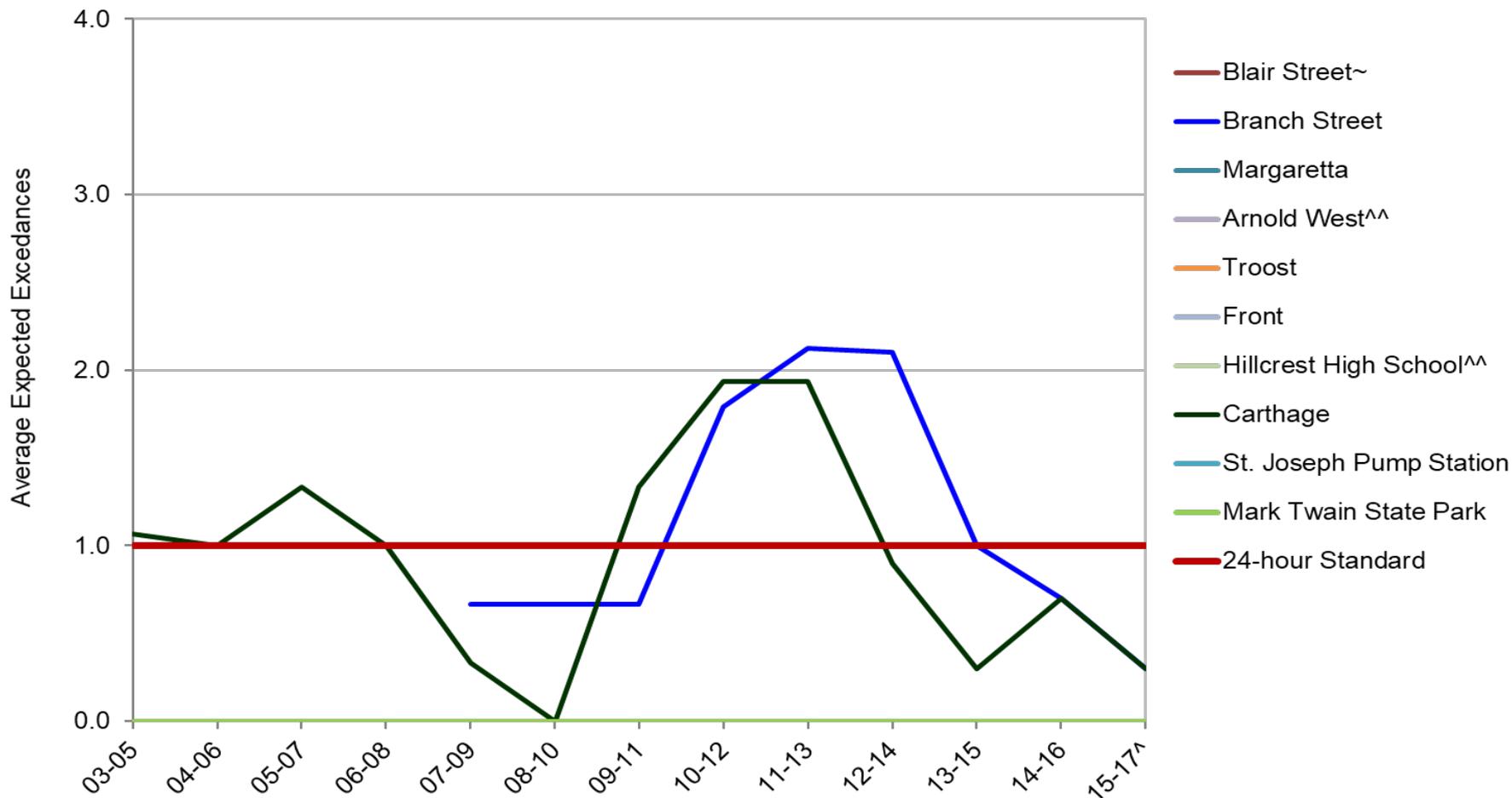
[^]Quality assured data through December 31, 2017

^{^^}Less than 3 years of data

*Filter based monitor

The 24-hour standard is attained when the expected number of exceedances is less than or equal to one (1) when averaged over three (3) calendar years.

Trends of the 3-year Averages of the Expected Exceedance of the PM₁₀ 24-hour Standard



^Quality Assured data through December 31, 2017.

^^Site has been monitoring PM₁₀ for less than three years; thus the department cannot compare data to the standard.

~Filter based monitor

Website Resources



Air Pollution Control Program

Our mission is to maintain the purity of Missouri's air to protect the health, general welfare and property of the people. Whether urban citizen or rural resident, everyone who lives in Missouri needs and deserves clean air. In other words, the 6 million residents of Missouri are our customers.



What has Missouri done to improve our air?

Visit this link for more information on **Missouri Skies Now and Then**.

Which pollutants does EPA monitor most closely?

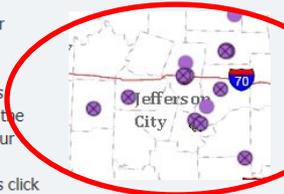
Click [here](#) to learn about the six criteria pollutants.

How does the scientific community rate air quality?

With the Air Quality Index we track ozone and particle pollution. This report tells you how clean (or polluted) the air is to help you understand what local air quality means in relation to your health. Each color code corresponds to a different level of health concern. The specific colors of the Air Quality Index makes it easier to understand where the air quality falls on the scale. [More...](#)

How does Missouri track air pollution?

We track our air pollution with a network of air monitoring sites located around the state. To visit our network of air monitoring sites click on the map.



- Program Home Page
- Air Conservation Commission
- Air Pollutants**
- Air Program Advisory Forum
- Air Quality
- Asbestos
- Clean Power Plan
- Forms and Applications
- Gateway Vehicle Inspection Program
- Laws and Regulations
- NAAQS Boundary Designations
- Ozone
- Permits
- Public Notices-Comment Periods
- QAPP Template**
- Air Pollution Compliance/Regulatory Assistance
- State Plans
- Vapor Recovery Information and Compliance Requirements

Monitoring Information- 'Bookmark'

- Design Value Reports
- Preliminary hourly data reports
- Monitoring Network Plans and More
- More improvements coming...

Convenience Fee Applicable to Credit Card Payments

Effective July 1, 2014, per Chapter 37, Section 37.007, of the Missouri Revised Statutes, a convenience fee will be charged to all customers who wish to pay by electronic method. The convenience fee will be retained by a third-party vendor, Collector Solutions, Inc., not the Missouri Department of Natural Resources.

Transaction Dollar Amount

Fee

Contact Information

Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102

How To Stay Informed

Public notices – rules, permits, state plans:

dnr.mo.gov/env/apcp/public-notices.htm

Air Program Advisory Forum:

dnr.mo.gov/env/apcp/airadvisory/apcpstakeholder.htm



**Get Updates
on this
Issue**

Questions?

Stephen M. Hall

Air Quality Analysis Section Chief

Missouri Department of Natural Resources

Air Pollution Control Program

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573-526-1985 direct line

Call toll-free 800-361-4827

stephen.hall@dnr.mo.gov

Find us on the web at <https://dnr.mo.gov/env/apcp/>