Ozone Formation in the San Antonio Area

Kasey Savanich
Data Analyst
Air Quality Division

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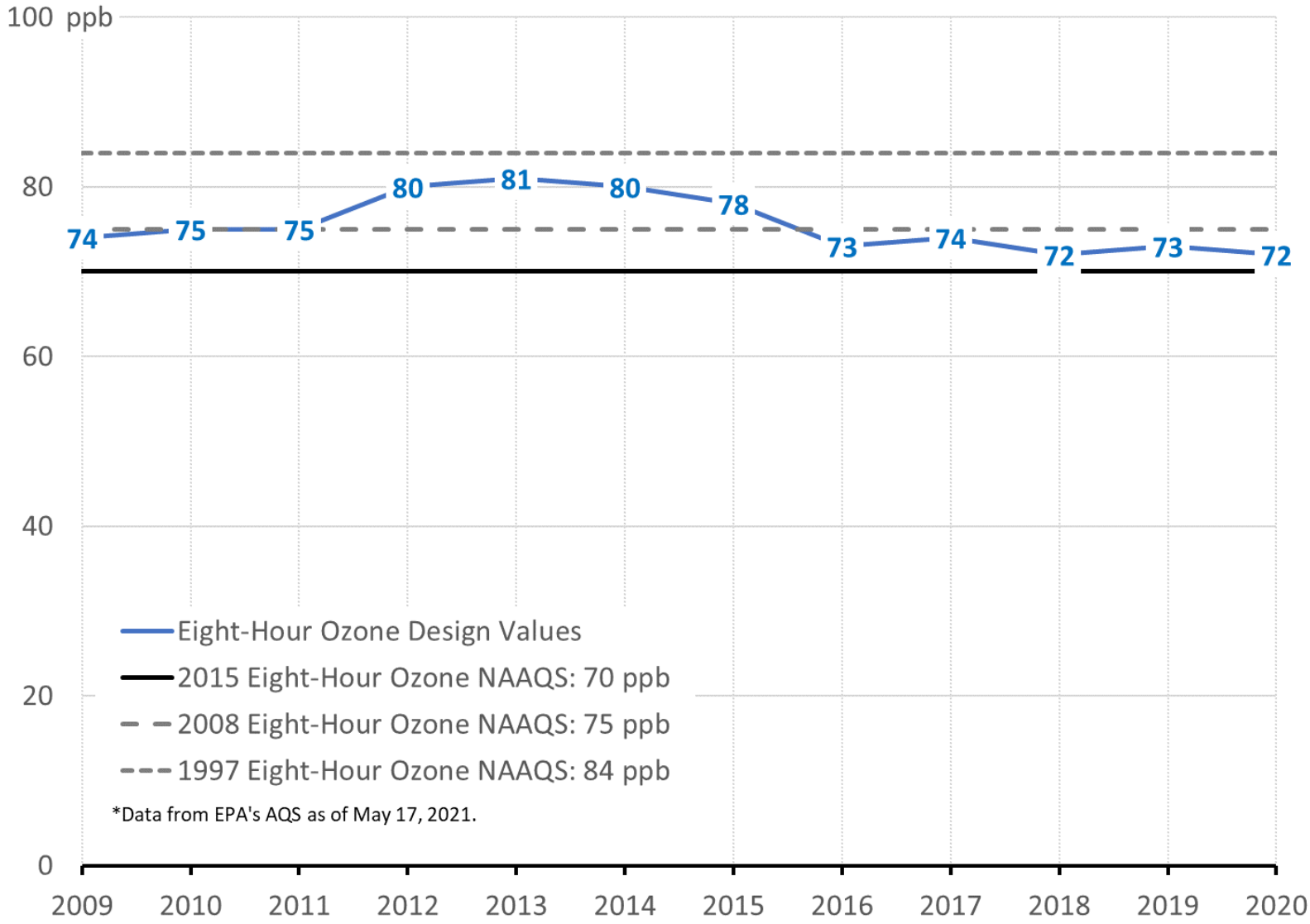
Introduction to Ozone Formation in the San Antonio Area

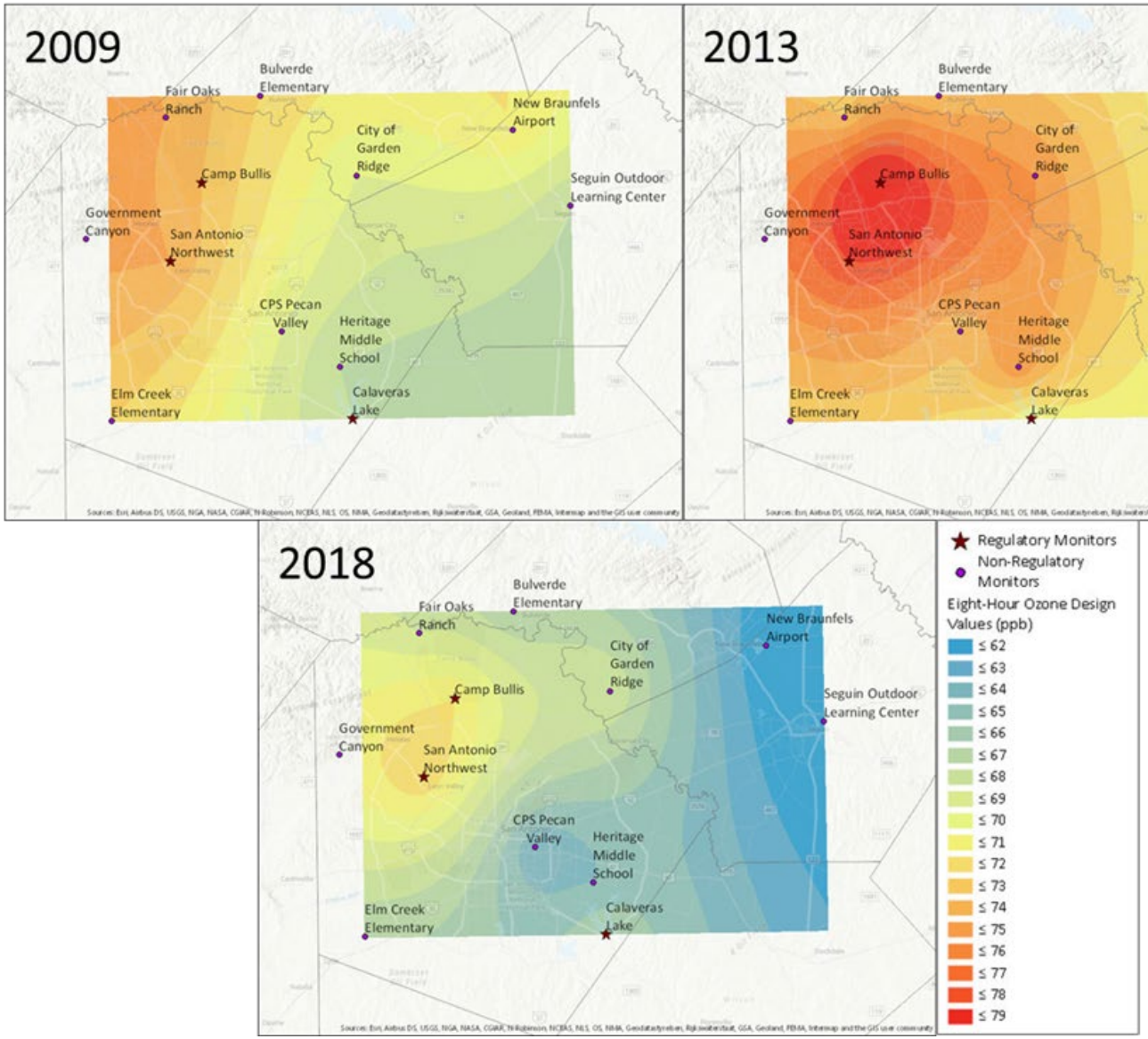
- Conceptual models:
  - Describe ozone formation within an area;
  - Are required by the EPA; and
  - Contain information on ozone, ozone precursors, meteorology, and transport.
- Bexar County was designated as nonattainment for the 2015 eight-hour ozone standard of 70 parts per billion (ppb) on July 17, 2018.
- The San Antonio area conceptual model investigates the following topics:
  - Ozone concentrations and trends;
  - Ozone precursor concentrations and trends;
  - Ozone chemistry; and
  - Meteorology and its affect on ozone.

Ozone Concentrations and Trends

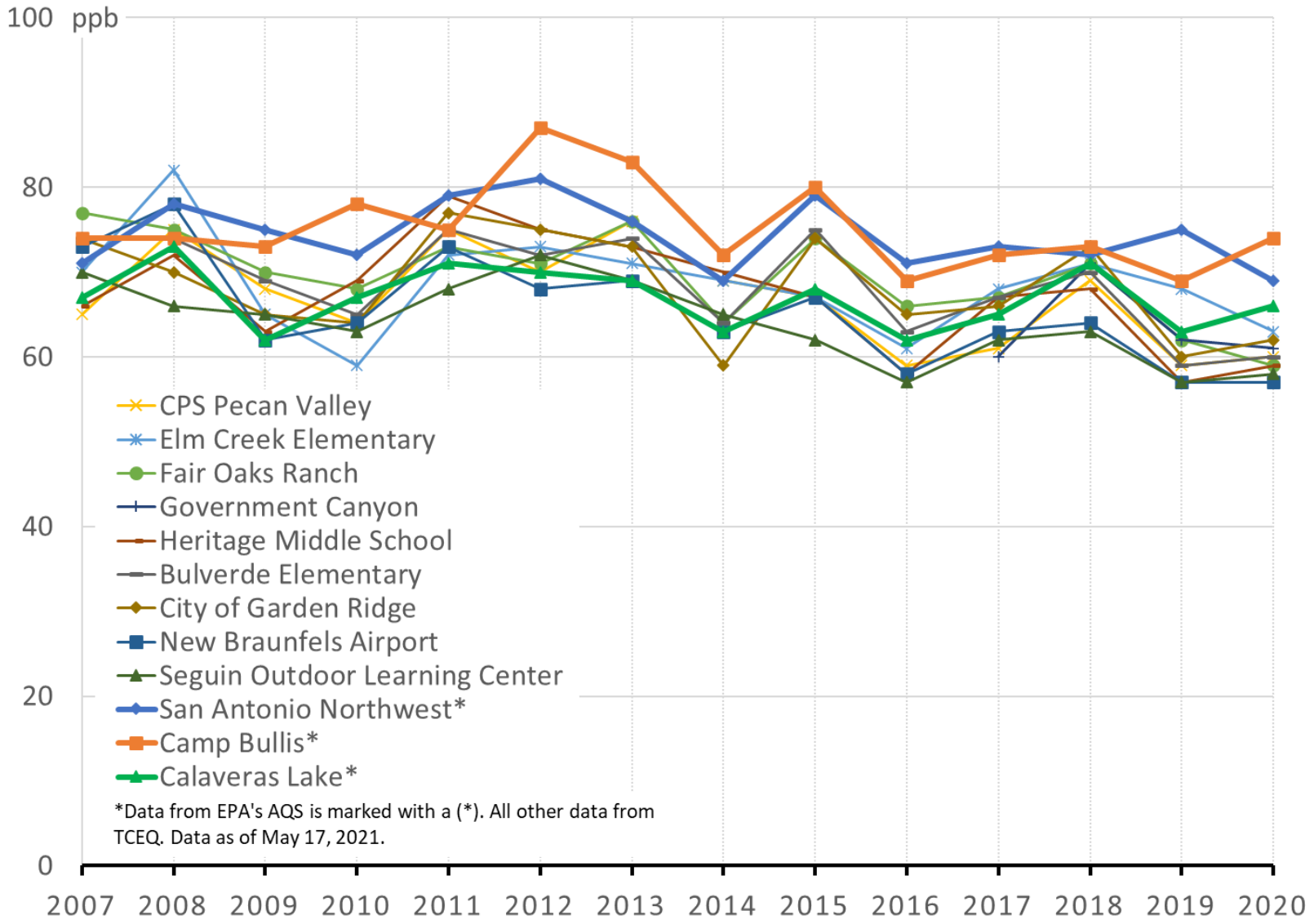
Eight-Hour Ozone Design Values



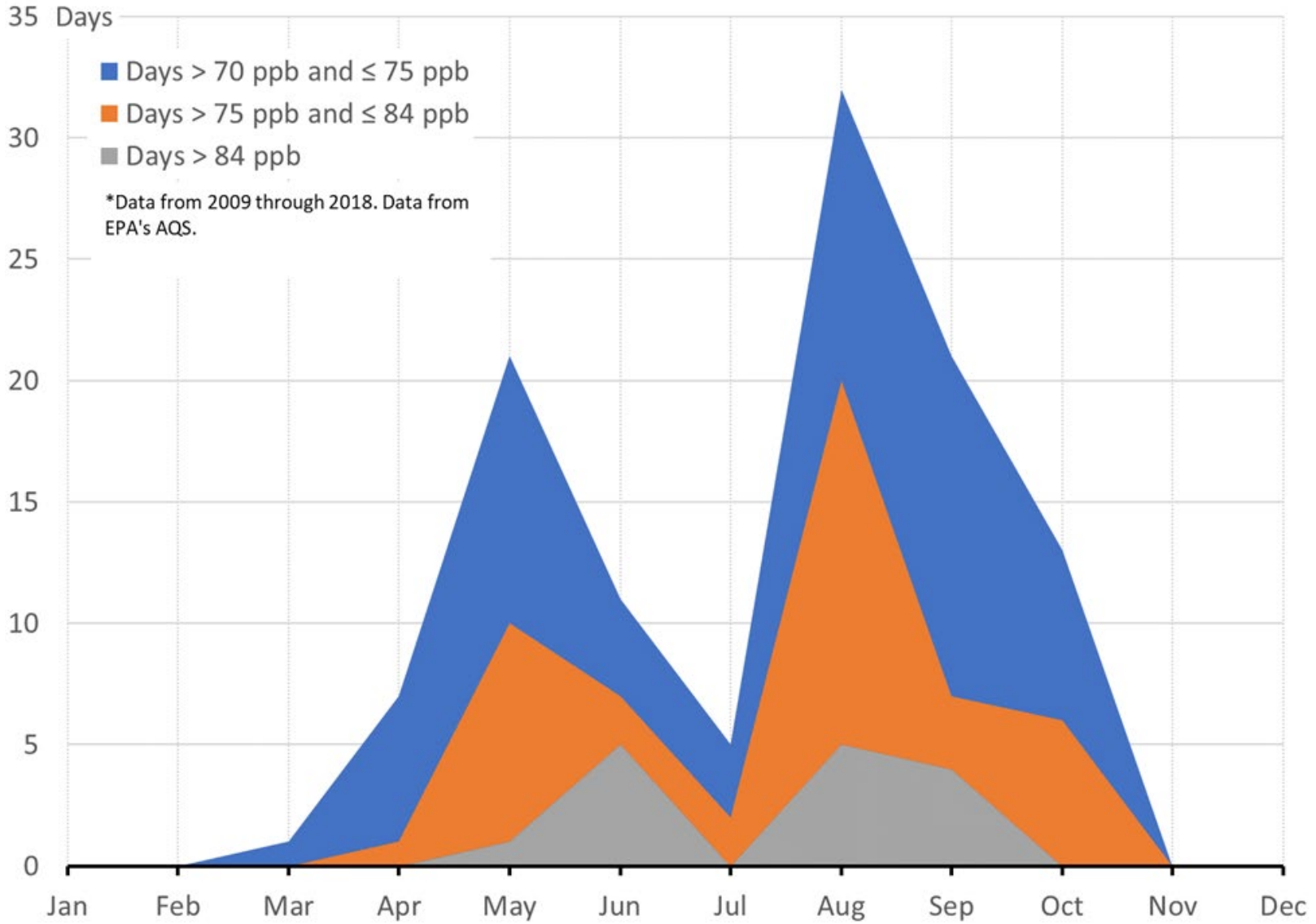
Eight-Hour Ozone Design Values by Monitor



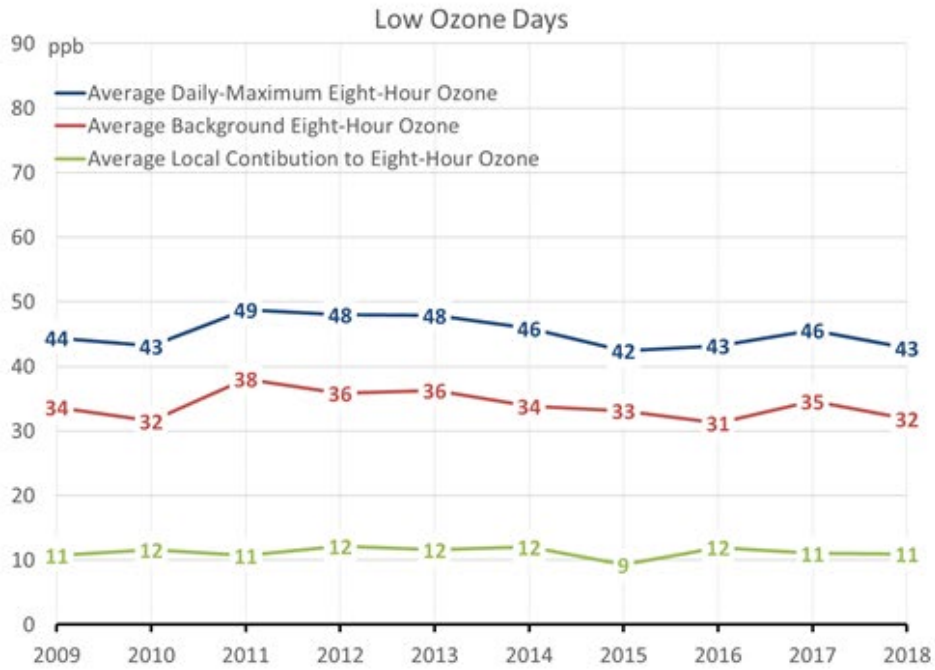
Fourth-Highest Eight-Hour Ozone Values by Monitor

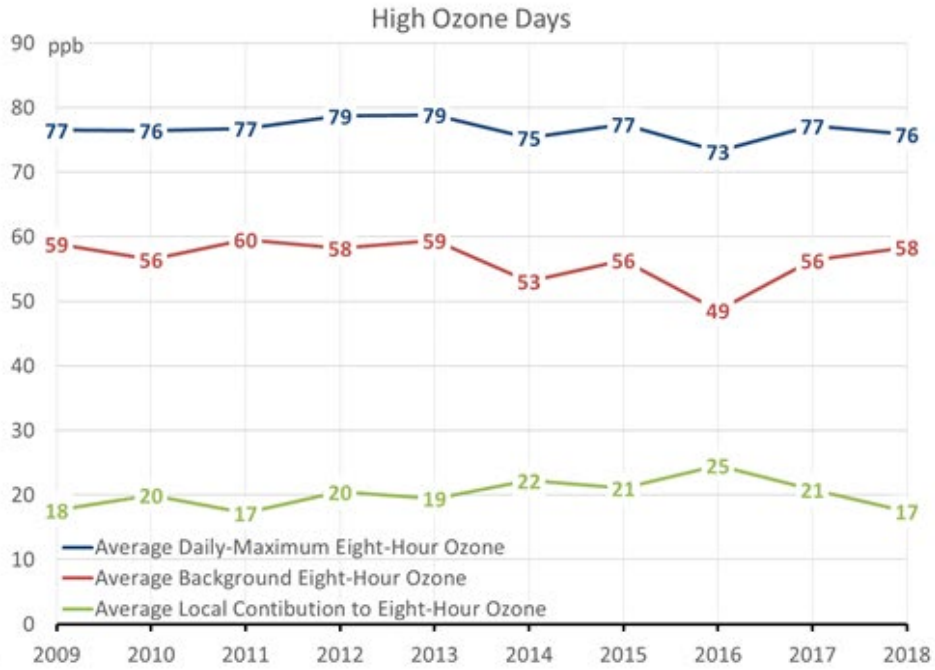


Eight-Hour Ozone Exceedance Days by Month



Regional Background Ozone During the Ozone Season

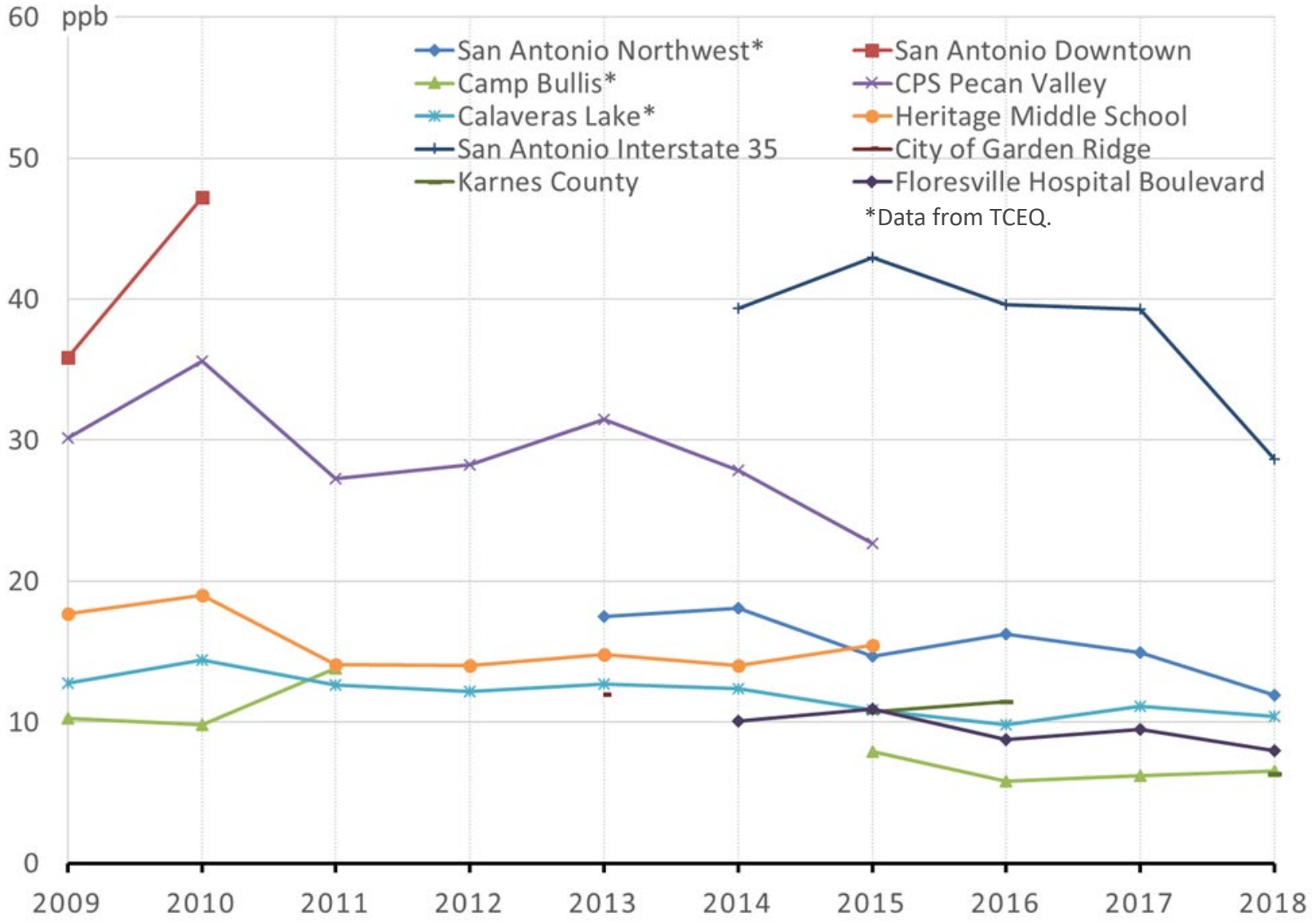




*Data from TCEQ.

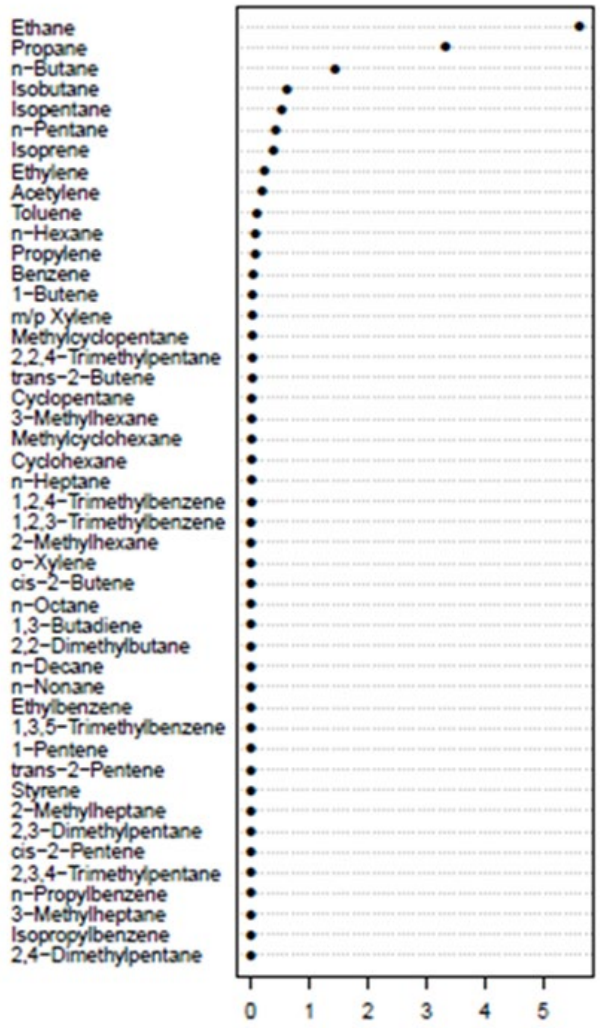
Ozone Precursor Concentrations and Trends

Ozone Season Average Daily-Maximum Nitrogen Oxide (NO_X) Trends

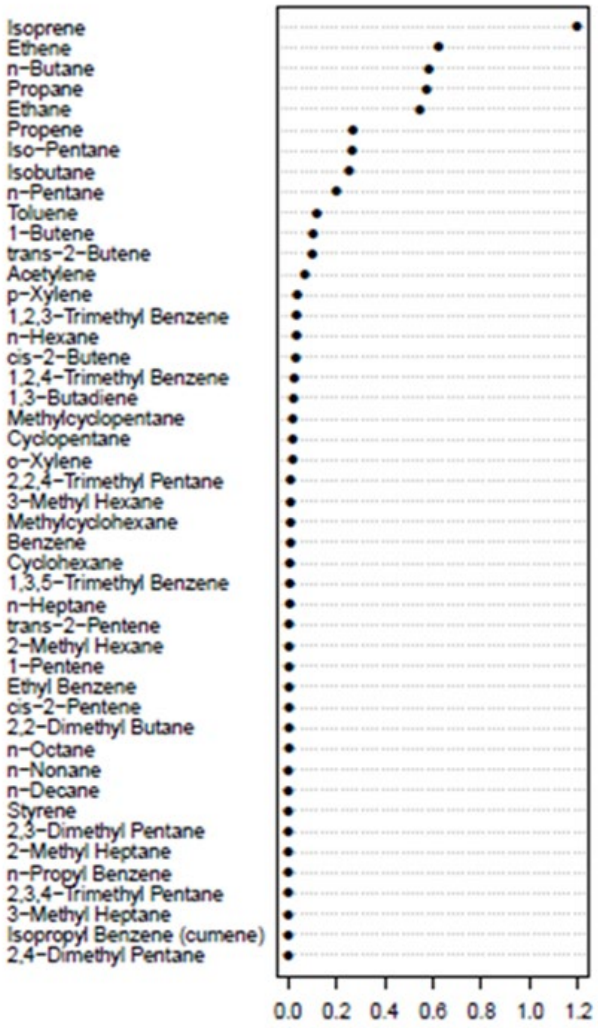


Camp Bullis Volatile Organic Compound (VOC)
June 1, 2016 – February 28, 2017

Mean Concentration (ppbC)



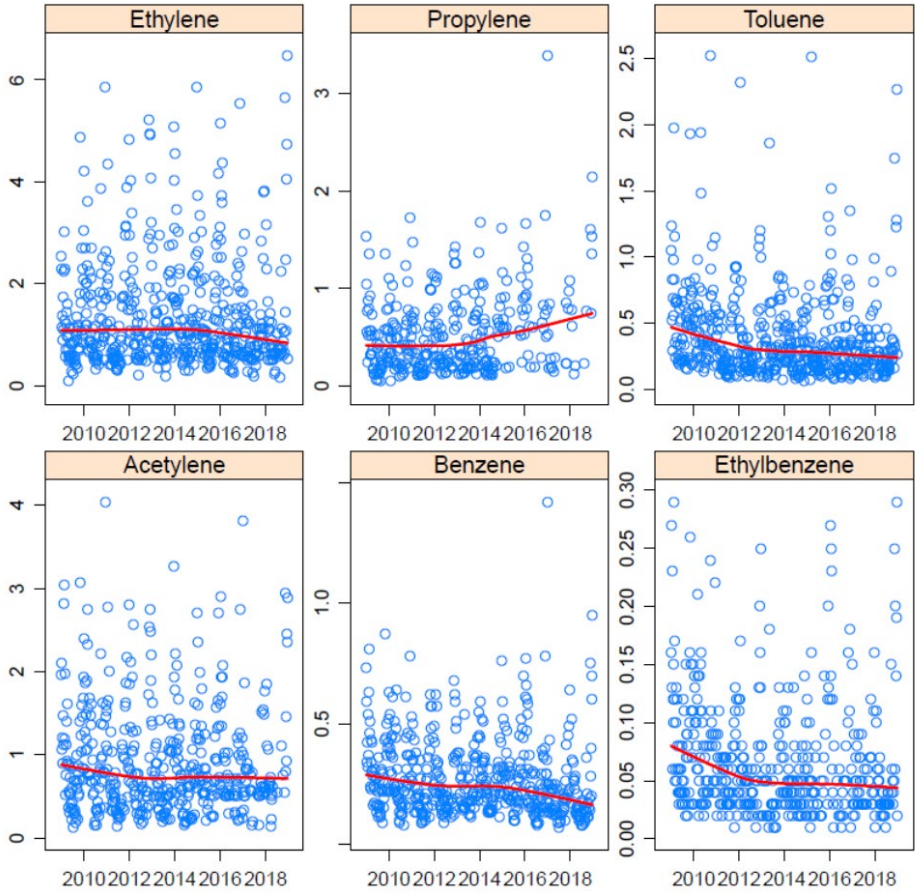
Mean MIR Weighted Concentration



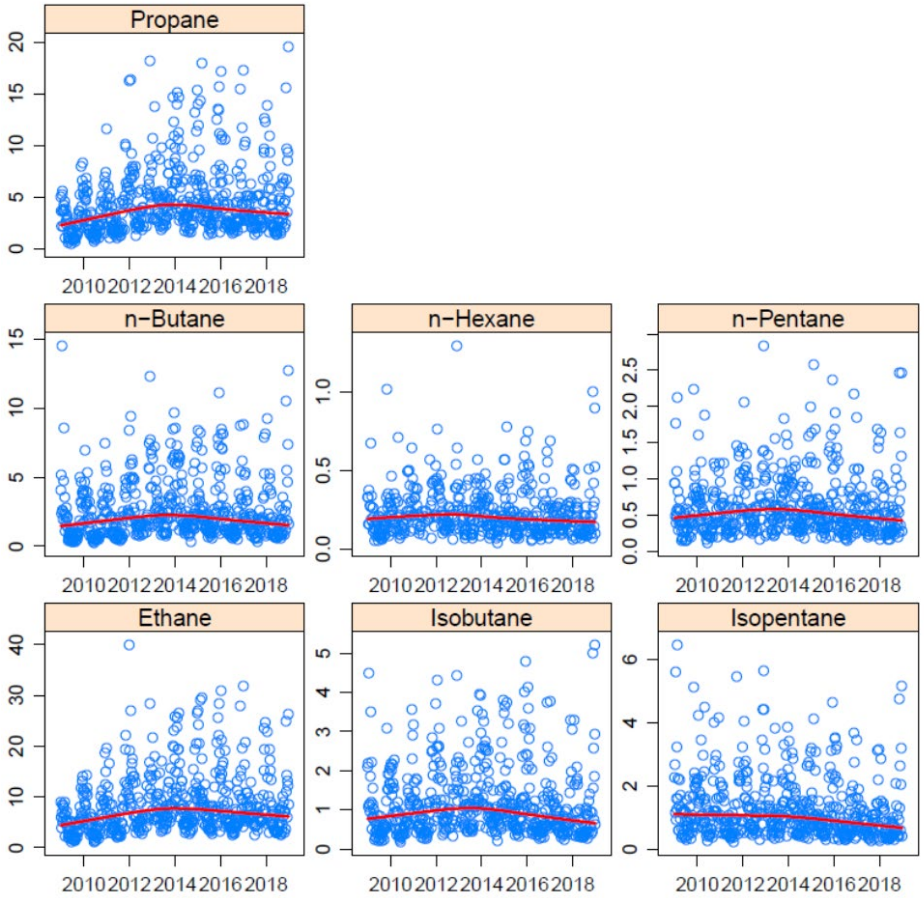
*Data from TCEQ.

Old Hwy 90 24-Hour VOC Trends

Mobile Source VOC

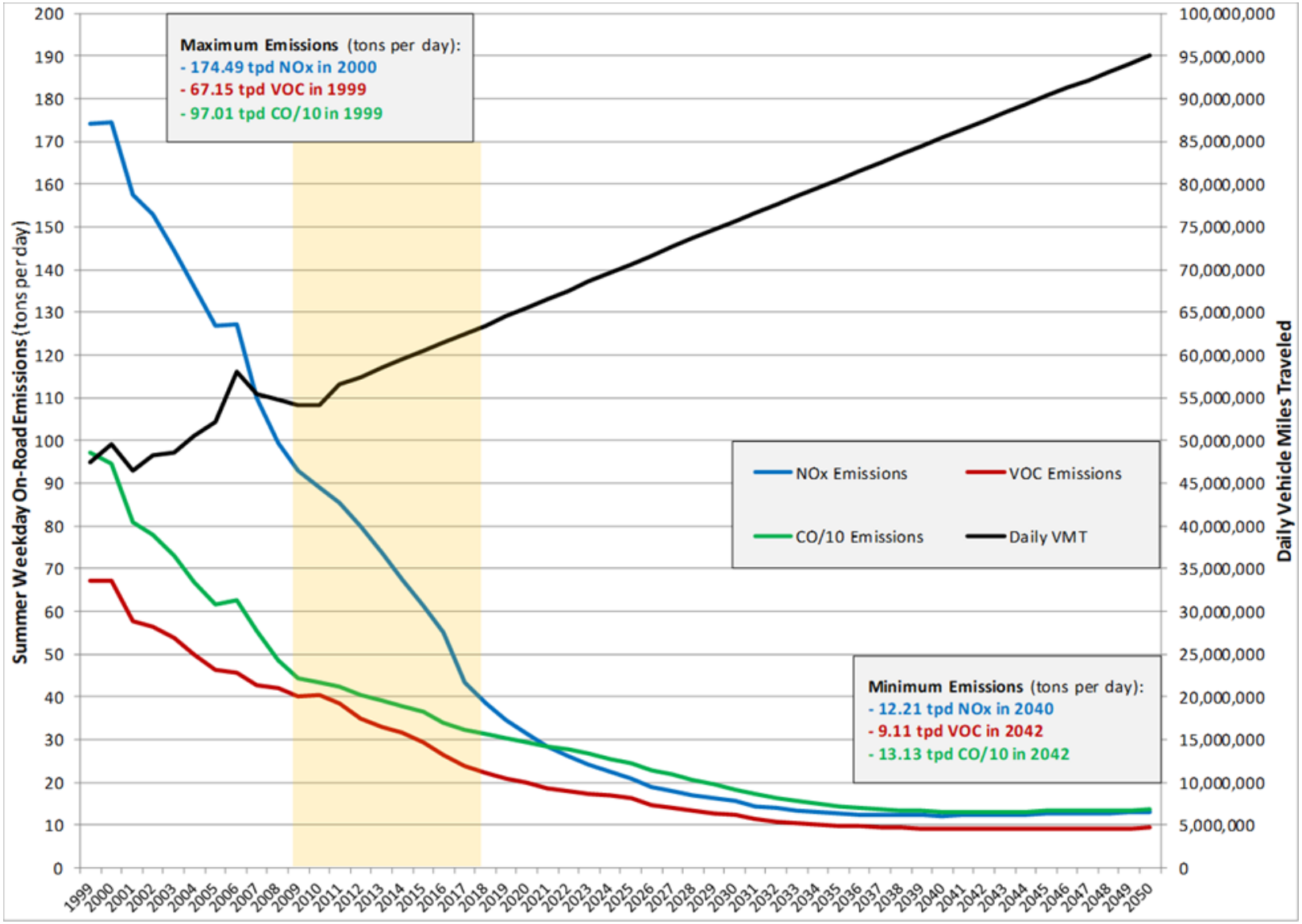


Oil and Gas VOC



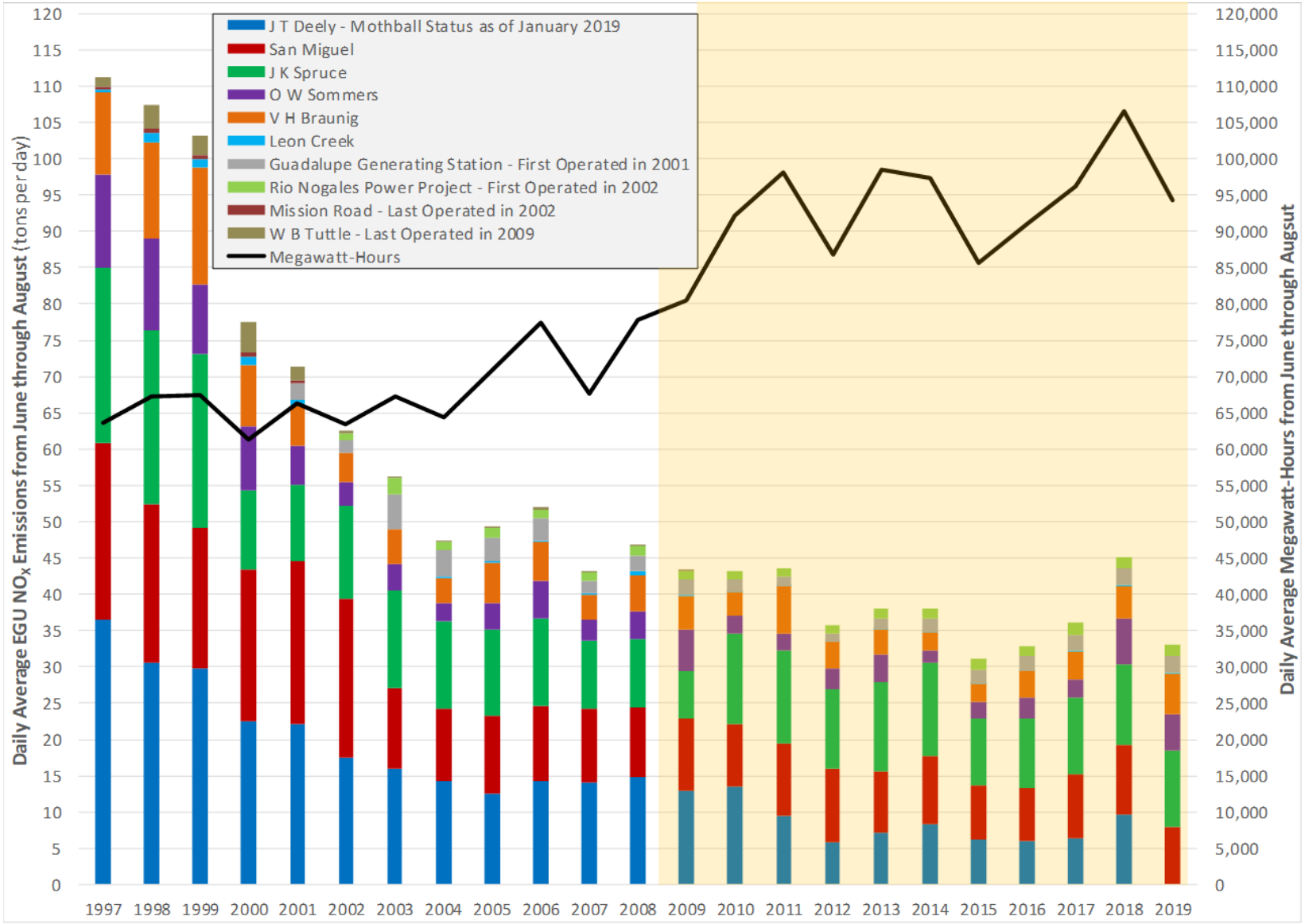
*Data from TCEQ.

On-Road Vehicle Summer Emissions



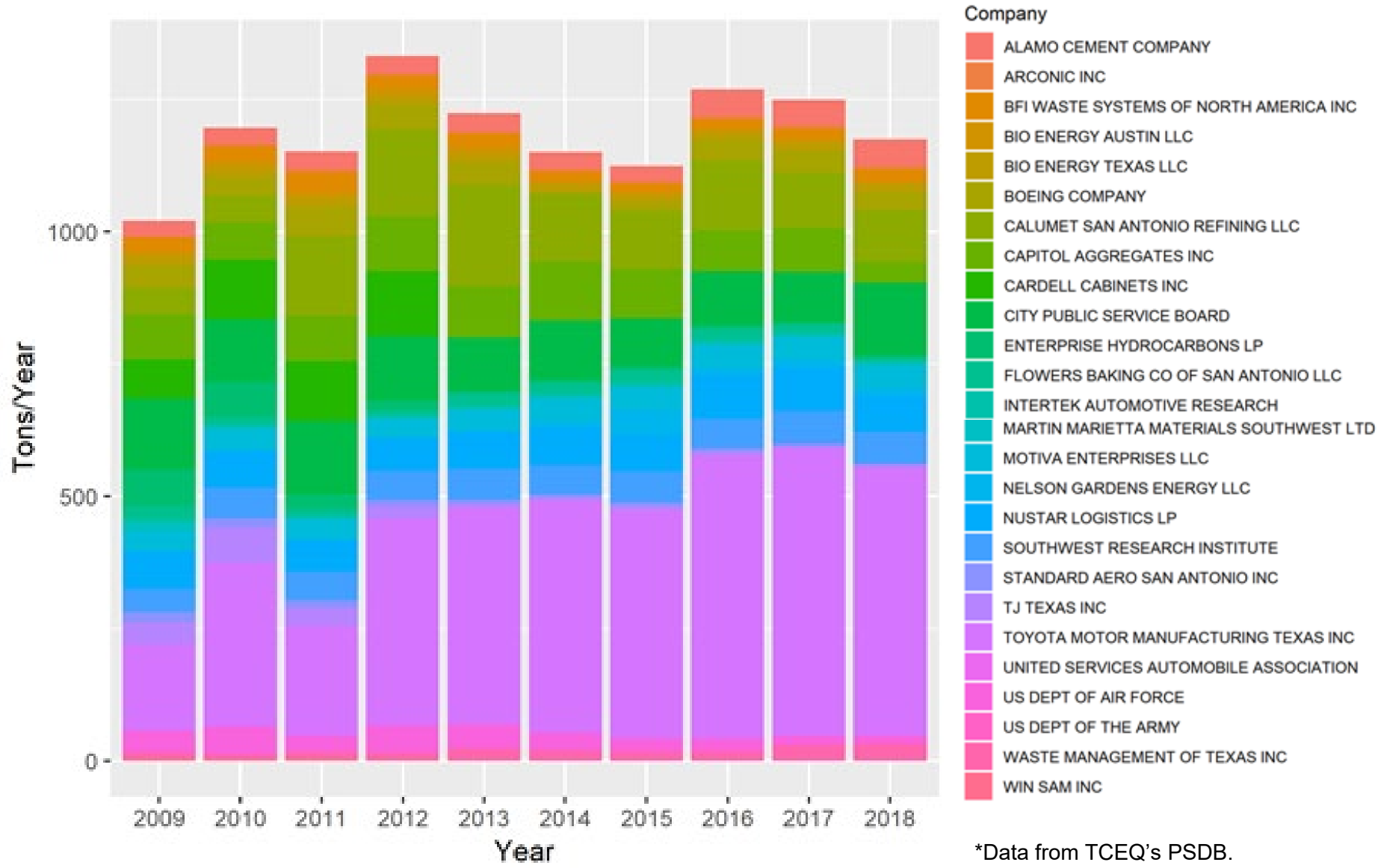
*Data from on-road mobile source trend emissions inventories for all 254 counties in Texas for 1999-2050, August 2015.

Electric Generating Unit (EGU) Summer NO_x Emissions



*Data from EPA Air Markets Program Data (AMPD).

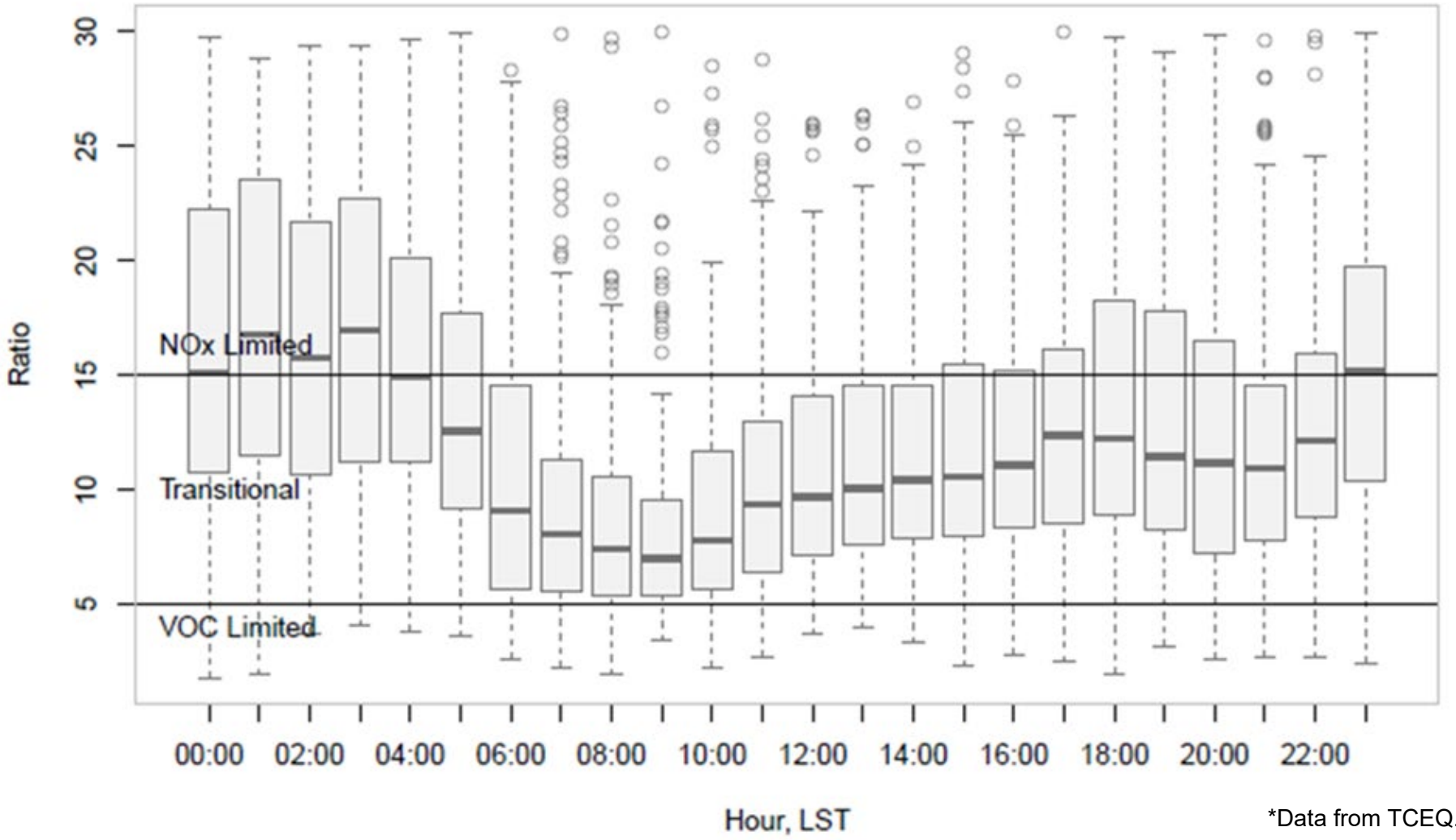
Point Source Summer VOC Emissions for Sources > 15 Tons/Year



*Data from TCEQ's PSDB.

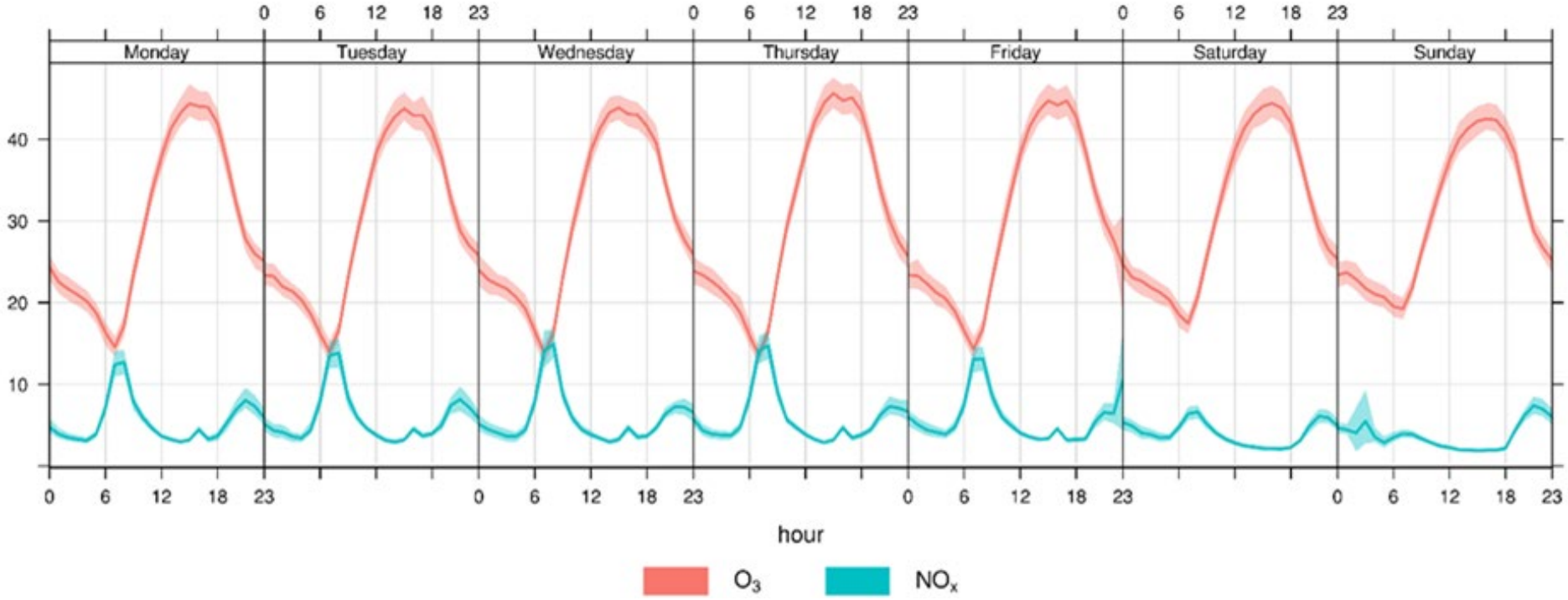
Ozone Chemistry

Camp Bullis VOC/NO_X Ratios June 1, 2016 – October 31, 2016



*Data from TCEQ.

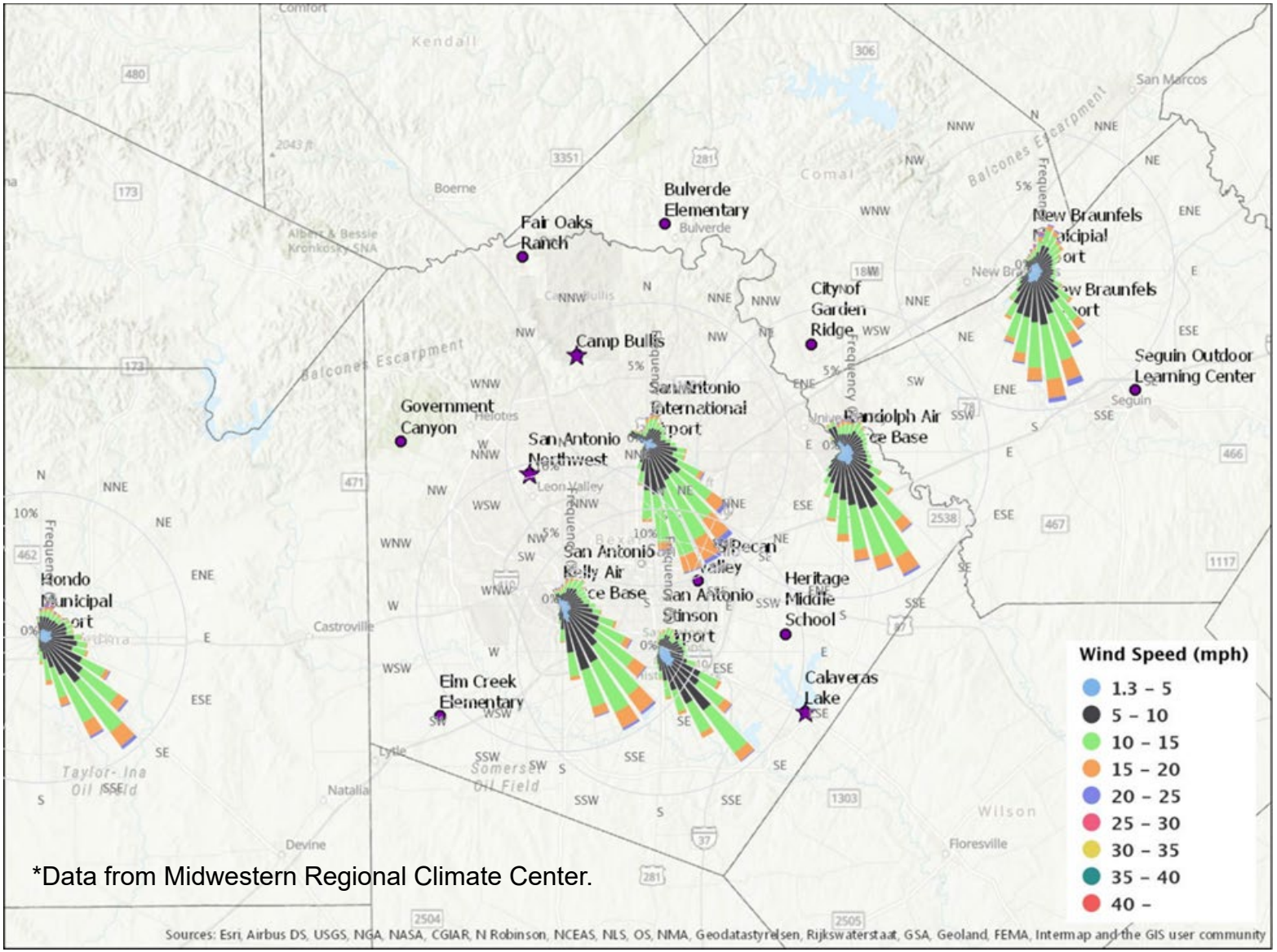
San Antonio Northwest One-Hour Ozone and NO_X Weekdays vs Weekends 2013 – 2018



*Data from TCEQ.

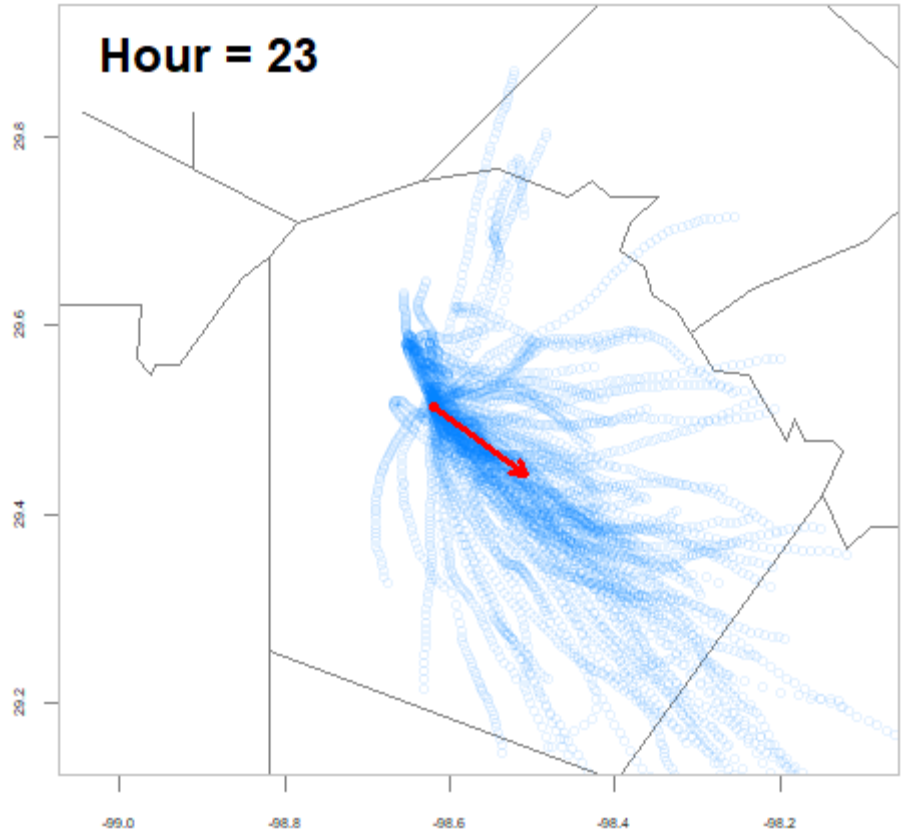
Meteorology and its Affect on Ozone

Ozone Season Prevailing Winds



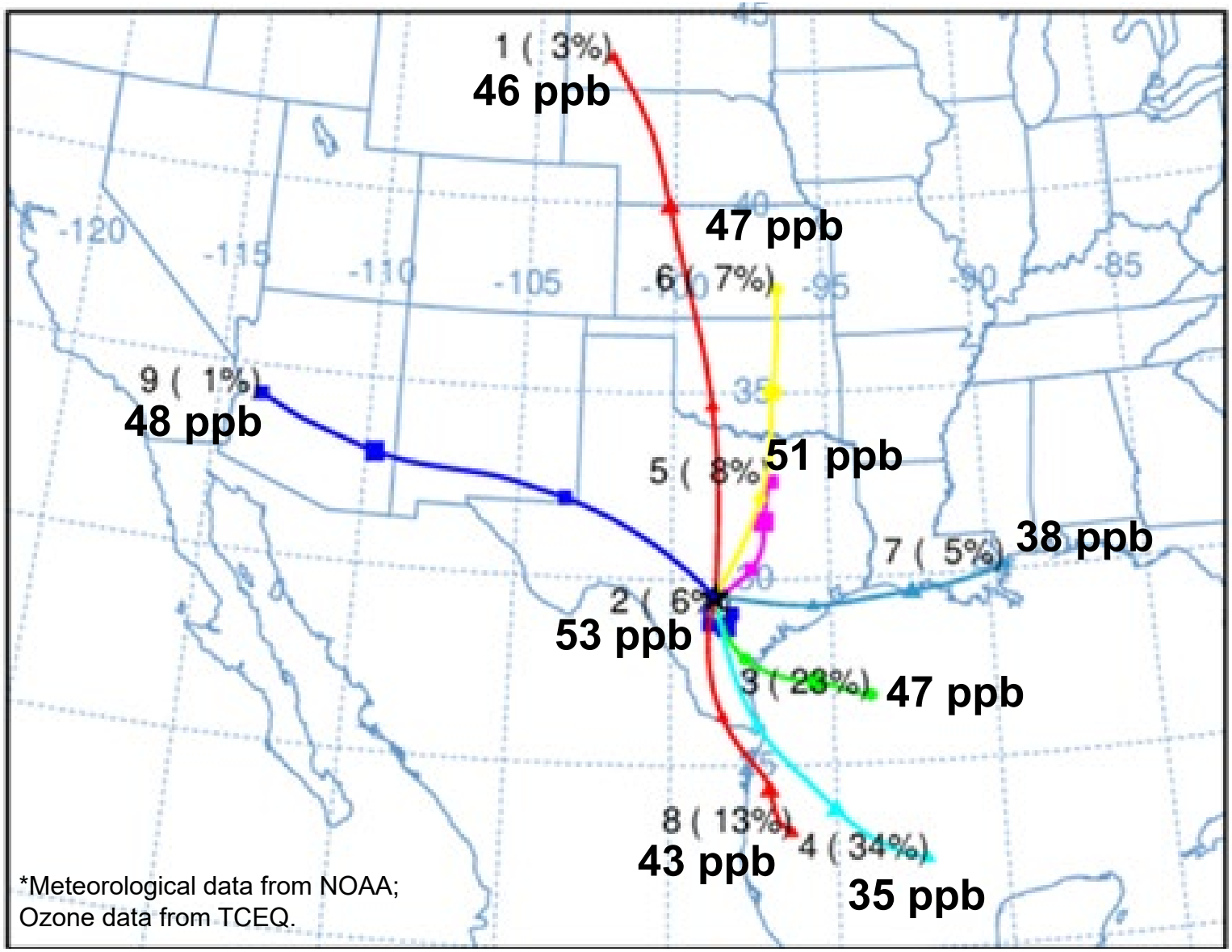
*Data from Midwestern Regional Climate Center.

Ozone Exceedance Day Surface-Level Five-Hour Back Trajectories 2009 – 2018

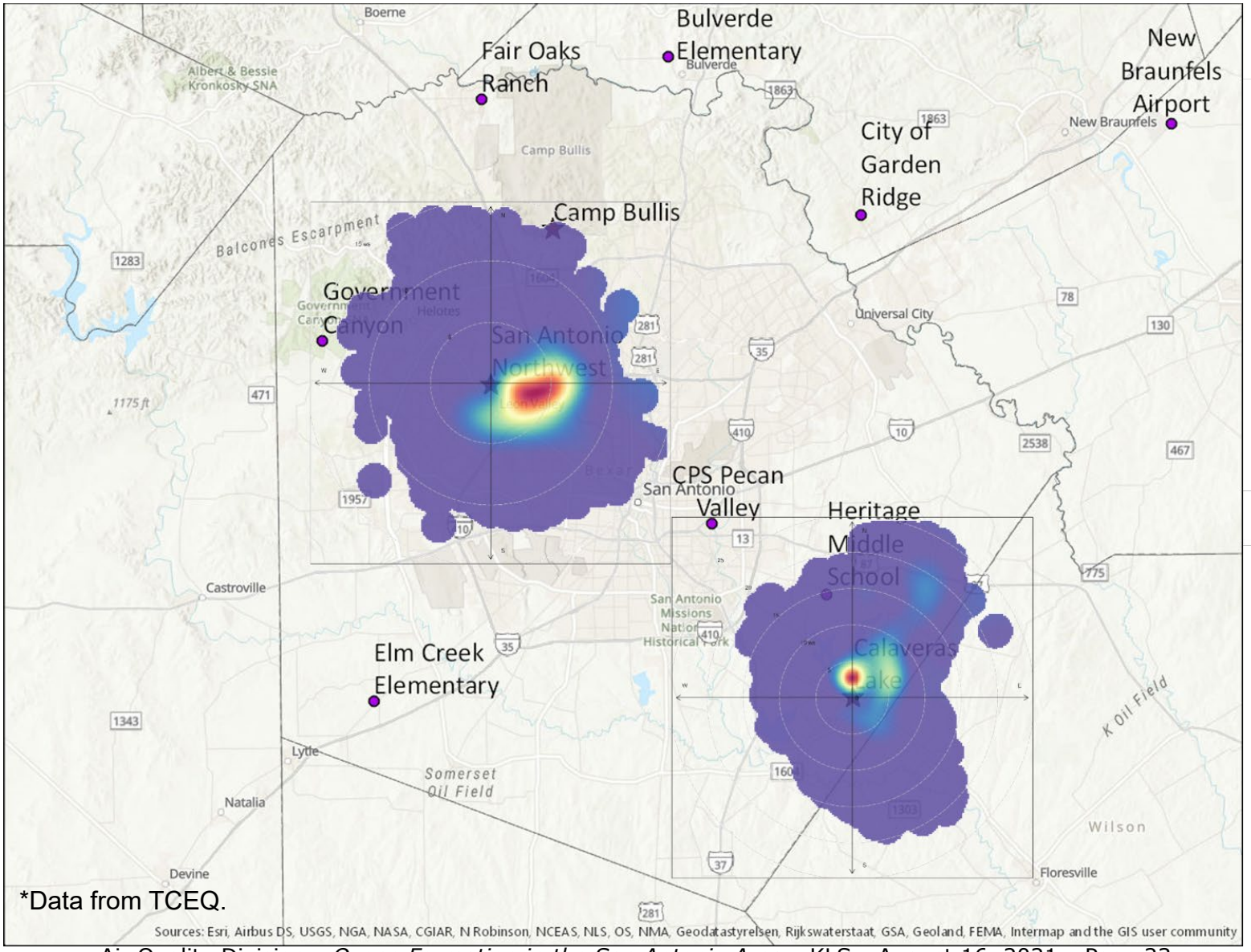


*Data from TCEQ.

Average Daily-Maximum Eight-Hour Ozone and 500 Meter 56-Hour Back Trajectory Clusters for Ozone Season, 2009 – 2018



San Antonio Northwest and Calaveras Lake One-Hour Ozone by Wind Speed and Direction



*Data from TCEQ.

San Antonio Area Ozone Formation

- Eight-hour ozone design value trends have been flat over the last ten years.
- Ozone formation peaks from April through June and then again from August through October, with a "mid-summer minimum" occurring in July.
- High ozone typically occurs on hot sunny days with dry conditions and slow winds out of the southeast.
- Emissions located south and southeast of the area combine with urban mobile emissions to create ozone and slow winds transport it to the monitors located in the northwest.

San Antonio Area Ozone Formation

- Ozone accumulation is further exacerbated by recirculating wind directions throughout the day.
- These conditions also create high levels of regional background ozone, which combines with the local ozone and emissions to produce high ozone levels.
- The air mass appears to be NO_X limited to transitional.
- The dominant VOC are either naturally occurring or have low ozone formation potential, meaning NO_X controls may be more effective in reducing ozone compared to VOC.

Questions?

Kasey Savanich

kasey.savanich@tceq.texas.gov

Link to full Conceptual Model for the San Antonio area:

https://www.tceq.texas.gov/assets/public/implementation/air/sip/sipdocs/2020_Bexar179B/179B_SIP_Appendix_E_ado.pdf