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2015 Air Quality Report for the Austin-Round Rock Metropolitan Statistical Area

Prepared by the Capital Area Council of Governments

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Acronyms

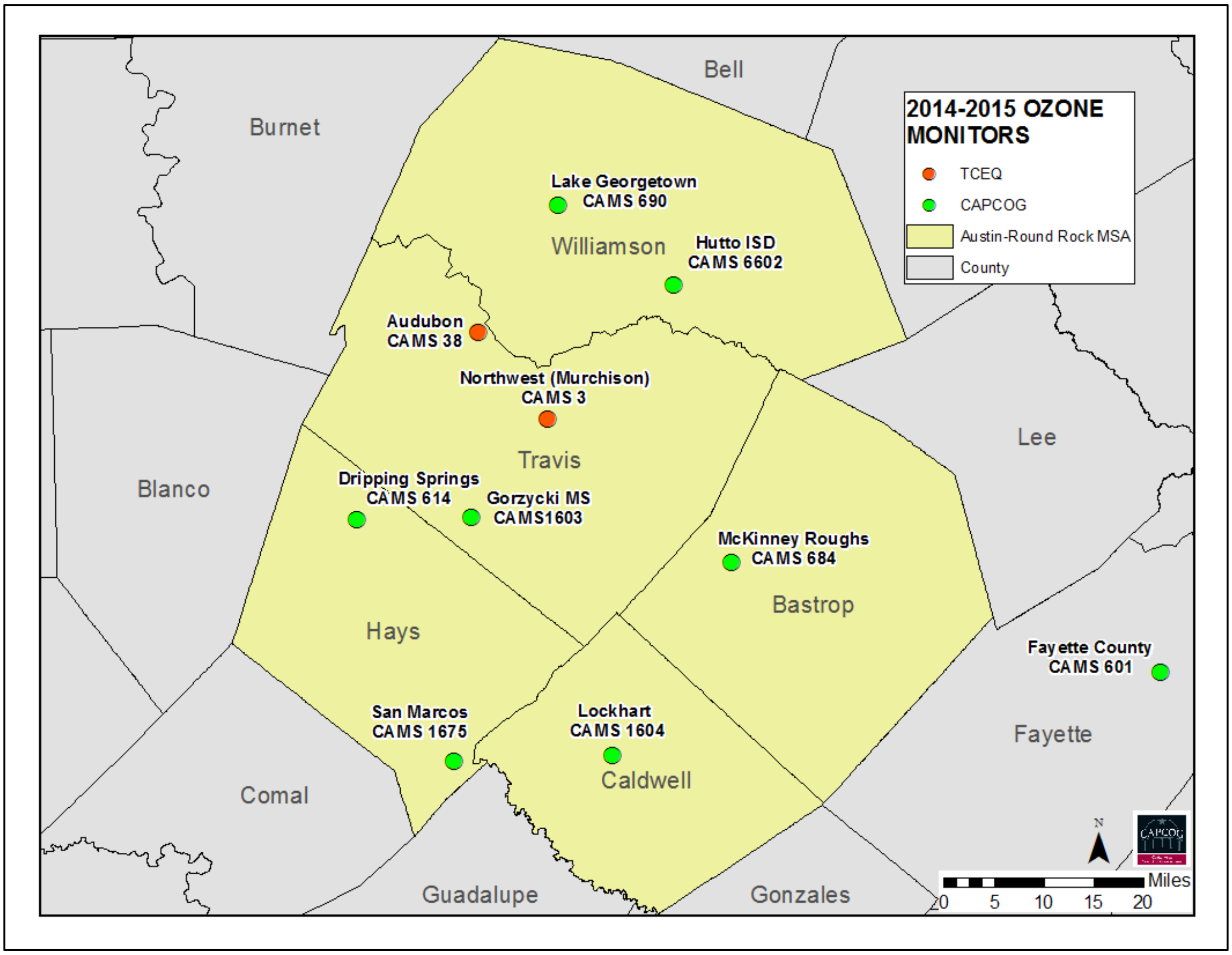
ACT: Air Central Texas
AE: Austin Energy
AFFP: Alternative Fueling Facilities Program
AQI: Air Quality Index
AQS: Air Quality System
bhp-hr: Brake horsepower-hour
B20: 20% Biodiesel/80% Petroleum Diesel Blend
CAF: CLEAN AIR Force
CAMPO: Capital Area Metropolitan Planning Organization
CAMS: Continuous Air Monitoring Station
CAPCOG: Capital Area Council of Governments
CapMetro: Capital Metropolitan Transit Authority
CF: Cubic Feet
CNG: Compressed Natural Gas
CTRMA: Central Texas Regional Mobility Authority
CO: Carbon Monoxide
CO_2: Carbon Dioxide
CTT: Clean Transportation Triangle
DACM: Drive a Clean Machine
DERA: Diesel Emission Reduction Act
DERI: Diesel Emission Reduction Incentive
DQO: Data Quality Objectives
DTIP: Drayage Truck Incentive Program
E85: Ethanol
EGU: Electric Generating Unit
EPA: U.S. Environmental Protection Agency
ERIG: Emission Reduction Incentive Grant
I/M: Inspection and Maintenance
kW: Kilowatt
kWh: Kilowatt-hour
LEADS: Leading Environmental Analysis & Display System
LCRA: Lower Colorado River Authority
LPG: Liquefied Petroleum Gas
$\mu g/m^3$: Micrograms per cubic meter
MDA8: Maximum Daily 8-Hour Average
MGal: Million gallons
MSA: Metropolitan Statistical Area
MW: Megawatt
MW-hr: Megawatt-hour

NAAQS: National Ambient Air Quality Standard
NG: Natural Gas
NO: Nitrogen Oxide
NO_2: Nitrogen Dioxide
NTIG: New Technology Implementation Grant
O_3: Ozone
OSD: Ozone Season Day
PM: Particulate Matter
$PM_{2.5}$: Particulate Matter with a Diameter of 2.5 Microns or Less
PM_{10}: Particulate Matter with a Diameter of 10 Microns or Less
Ppb: Parts per billion
Ppm: Parts per million
QA: Quality-assure
QAPP: Quality Assurance Project Plan
QC: Quality control
SO_2: Sulfur Dioxide
TCFP: Texas Clean Fleet Program
TCEQ: Texas Commission on Environmental Quality
TERP: Texas Emission Reduction Plan
TNGVGP: Texas Natural Gas Vehicle Grant Program
TTI: Texas Transportation Institute
TxDOT: Texas Department of Transportation
TxDOT-Austin: The Austin District of TxDOT
TxDOT-HQ: TxDOT Headquarters
VOC: Volatile Organic Compounds

Executive Summary

This report provides information on air quality and the status of ground-level ozone (O_3) air quality planning efforts in the Austin-Round Rock Metropolitan Statistical Area (MSA) for 2015. It also serves as the annual "check in" summary of the status of measures implemented as part of the region's participation in the U.S. Environmental Protection Agency's (EPA's) O_3 Advance Program (OAP). The Capital Area Council of Governments (CAPCOG) prepared the report on behalf of the Central Texas Clean Air Coalition (CAC). The map below shows the MSA, along with the O_3 monitors that were collecting data in 2015.

Figure 1. Map of Austin-Round Rock MSA and Ozone Monitors



Despite a worse-than-expected O_3 season in 2015, the region's 2013-2015 O_3 level were in attainment of the new 2015 O_3 National Ambient Air Quality Standards (NAAQS), and the region's Action Plan played a significant part in enabling that to happen. As stated in the most recent guidance EPA has issued for the OAP, "The goals of the program are to (1) help attainment areas to take action to keep ozone levels below the level of the O_3 NAAQS to ensured continued health protection for their citizens, (2) better position areas to remain in attainment, and (3) efficiently direct available resources toward actions to address O_3 problems quickly."[1] The region's OAP Action Plan helps achieve all three of these goals through a balanced approach that relies on both large-scale and small-scale measures, and both voluntary actions and regulations. The Action Plan includes large-scale regulatory measures that have been incorporated into the State Implementation Plan (SIP), such as the vehicle emissions inspection and maintenance (I/M) program in Travis and Williamson Counties – the two largest counties in the country with an I/M program not required to have one due to a nonattainment designation. It also incorporates high-impact voluntary measures, such as Texas Lehigh Cement Company's voluntary nitrogen oxides (NO_X) emission reduction efforts on high O_3 days. At the same time, the plan also includes a wide variety of smaller-scale efforts from the 33 organizations that are part of the CAC, and the dozens more that participate indirectly in the regional effort through the Clean Air Partners Program (CAPP), the Commute Solutions Program, and the Lone Star Clean Fuels Alliance (LSCFA). Examples include everything from low-volatile organic compound (VOC) roadway striping material and fueling vehicles after 6 pm to idling restrictions and energy conservation measures.

Section 1 of this report provides an introduction and background on the region, the CAC, and the OAP Action Plan. Section 2 of this report covers the status of the region's air quality as of the end of 2015. While this report is primarily focused on O_3, Section 2 also provides information on the region's air quality more generally, including comparisons of the region's air pollution levels to the NAAQS and the EPA's Air Quality Index (AQI) for multiple pollutants, including carbon monoxide (CO), nitrogen dioxide (NO_2), O_3, particulate matter measuring 2.5 microns or less ($PM_{2.5}$), particulate matter measuring 10 microns or less (PM_{10}), and sulfur dioxide (SO_2). This section also includes information on the region's O_3 levels in terms of peak cumulative seasonal exposure, which is an indication of its impact on vegetation. Finally, Section 2 includes an analysis of the predictability of the region's O_3 and $PM_{2.5}$ air pollution levels by comparing air quality forecasts to actual air pollution levels measured in 2015.

Section 3 of this report provides information on the region's NO_X and volatile organic compound (VOC) emissions, the key direct pollutants that lead to O_3 formation in the region. Based on TCEQ's estimates, the Austin-Round Rock MSA accounted for 30,560 tons per year (tpy) of anthropogenic NO_X emissions in 2014 and 37,169 tpy of anthropogenic VOC emissions. On a typical O_3 season day (OSD) weekday in 2014, this translated into an average of 89 tons per day (tpd) of NO_X and 111 tpd of VOC.[2] Based on a re-analysis of modeling data previously completed for the region that calculated the sensitivity of peak O_3 levels to regional NO_X and VOC emissions, CAPCOG estimates that the MSA's anthropogenic emissions contributed about 8.4 to 8.8 ppb to peak ozone levels for 2013-2015, 98% of which is attributable to NO_X emissions.[3] CAC members operated point sources that accounted for an average of 3,188 tpy of NO_X emissions within the Austin-Round Rock MSA for 2013-2015, and another 5,491 tpy in NO_X emissions

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[1] https://www.epa.gov/sites/production/files/2016-04/documents/guidance_update.final_.april_2016.pdf, Accessed 6/10/2016.

[2] http://www.capcog.org/documents/airquality/reports/2016/Deliverable_2.1.2_CAPCOG_2014_NEI_Review_Interim_Report_final.pdf, Accessed 6/10/2016.

[3] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf, Accessed 6/10/2016.

from other counties in the CAPCOG region. In addition, CAPCOG estimates that CAC members accounted for approximately 998 tpy of NO_X emissions due to employee commuting, electricity consumption, natural gas consumption, water consumption, and engine fuel consumption, based on data collected from CAC members in 2015 for this report.

Section 4 provides information on measures implemented in the region in 2015. These measures included regional measures implemented across more than 1 organization, and hundreds of specific measures implemented by the 32 individual CAC members.

- Vehicle emissions inspection and maintenance (I/M) programs for gasoline-powered vehicles in Travis and Williamson Counties, which accounted for approximately 2.2 – 2.6 tpd of NO_X reductions and about 0.4 to 0.7 ppb in peak O_3 reductions in 2015;
- Texas Emission Reduction Plan (TERP) emission reduction grants, which accounted for about 3 tpd of NO_X reductions in 2015[4] and about 0.3 ppb in O_3 reductions;
- A voluntary NO_X reduction program at Texas Lehigh Cement Company, which accounts for approximately 0.03-0.10 ppb in peak O_3 reductions, with impacts as high as 0.39 to 0.55 ppb at the region's two regulatory O_3 monitors;
- The Drive a Clean Machine (DACM) program in Travis and Williamson Counties, which accounts for approximately 0.01 ton per day of NO_X emission reductions;
- Commute trip reduction measures (73 implemented in 2015);
- Development measures (35 implemented in 2015);
- Energy and resource conservation measures (37 implemented in 2015);
- Fleet and fuel efficiency measures (84 implemented in 2015);
- O_3 Action Day (OAD), Outreach, and Education measures (72 implemented in 2015);
- Regulation and enforcement measures (21 implemented in 2015);
- Sustainable procurement and operations measures (66 measures implemented in 2015); and
- Transportation emission reduction measures (70 measures in various stages of implementation in 2015).

Detailed information on individual CAC measures is provided in an accompanying spreadsheet.

Section 5 provides updated on ongoing planning activities, including stakeholder meetings and air quality research projects. Section 6 provides an outlook for 2016 and beyond. Section 7 provides conclusion and a summary.

[4] https://www.tceq.texas.gov/airquality/terp/leg.html, Accessed 6/10/2016.

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1 Background

The Austin-Round Rock MSA, as defined by the Office of Management and Budget (OMB) in 2013, includes Bastrop, Caldwell, Hays, Travis, and Williamson Counties. The Austin-Round Rock MSA has been participating in the EPA's O_3 Advance Program (OAP) since May 2012, and participated in EPA's three prior voluntary O_3 management programs – the 8-Hour O_3 Flex Program (8-O_3 Flex), the Early Action Compact (EAC), and the 1-Hour O_3 Flex Program (1-O_3 Flex). The region's O_3 management efforts are guided by an OAP Action Plan that was adopted by the Central Texas Clean Air Coalition (CAC) in December 2013 and updated by the CAC in December 2015. The OAP Action Plan includes a combination of state measures that apply to one or more counties in the region, regional measures, and measures implemented by each of the 33 organizations that participate in the CAC. This annual report continues over a decade of periodic reporting by the Capital Area Council of Governments (CAPCOG) on behalf of the CAC as part of the regional effort to remain in attainment of increasingly stringent O_3 NAAQS.

The CAC is a voluntary, unincorporated association of organizations that support the regional effort toward improvement of air quality in the Austin-Round Rock MSA. Each "General Member" of the CAC makes specific commitments to reduce emissions as part of the OAP Action Plan and appoints an elected official to serve as a representative at CAC meetings. Only city and county governments can be General Members of the CAC. The committee is chaired by Travis County Judge Sarah Eckhardt, with Bastrop County Commissioner Willie Piña and Williamson County Commissioner Ron Morrison serving as 1st and 2nd Vice-Chairs.

There are also a number of other organizations that participate in the CAC as "supporting" members. The following table lists all of the organizations considered CAC members as of the end of 2015. All five county governments in the MSA are general members of the CAC, and 15 city governments representing over 1.5 million people are also general members of the CAC. Supporting members include a number of state and regional government agencies, as well the operator of the largest point source of NO_X in the region, several non-profit organizations, and one smaller city government.

Table 1. CAC Members as of December 2015

Organization	Member Type	Organization Type
Bastrop County	General Member	County Government
Caldwell County	General Member	County Government
Hays County	General Member	County Government
Travis County	General Member	County Government
Williamson County	General Member	County Government
City of Austin	General Member	City Government
City of Bastrop	General Member	City Government
City of Bee Cave	General Member	City Government
City of Buda	General Member	City Government
City of Cedar Park	General Member	City Government
City of Elgin	General Member	City Government

Organization	Member Type	Organization Type
City of Georgetown	General Member	City Government
City of Hutto	General Member	City Government
City of Lakeway	General Member	City Government
City of Leander	General Member	City Government
City of Lockhart	General Member	City Government
City of Luling	General Member	City Government
City of Pflugerville	General Member	City Government
City of Round Rock	General Member	City Government
City of San Marcos	General Member	City Government
City of Sunset Valley	Supporting Member	City Government
CAPCOG	Supporting Member	Agency
Capital Area Metropolitan Planning Organization (CAMPO)	Supporting Member	Agency
Central Texas Regional Mobility Authority (CTRMA)	Supporting Member	Agency
Capital Metropolitan Transit Authority (CapMetro)	Supporting Member	Agency
Lower Colorado River Authority (LCRA)	Supporting Member	Agency
Texas Commission on Environmental Quality (TCEQ)	Supporting Member	Agency
Texas Department of Transportation – Austin District (TxDOT-Austin)	Supporting Member	Agency
Texas Department of Transportation – Headquarters (TxDOT-HQ)	Supporting Member	Agency
Texas Lehigh Cement Company, L.P.	Supporting Member	Business
CLEAN AIR Force of Central Texas (CAF)	Supporting Member	Non-Profit
LSCFA	Supporting Member	Non-Profit
Texas Nursery and Landscaping Association	Supporting Member	Non-Profit

CAPCOG is a regional planning commission established under state law covering ten counties in Central Texas: Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Llano, Travis, and Williamson Counties. The CAC has participated in the EPA's O_3 Advance Program (OAP) since 2012, and has also participated in three prior voluntary regional O_3 planning efforts – the 1-Hour O_3 Flex Program in 2002, the Early Action Compact (EAC) State Implementation Plan (SIP) effort between 2002 and 2004, and the 8-Hour Flex Program between 2008 and 2013.

2 Air Quality Status

This section provides an update on the status of air quality in the Austin-Round Rock MSA through the end of 2015. It includes:

- A general overview of air quality in the region;
- Information on the region's compliance with the NAAQS for all criteria pollutants;
- Information on O_3 measurements at all monitoring stations in the region for 2013-2015 generally;
- A comparison of daily NO_2, O_3, and $PM_{2.5}$ air pollution levels in 2015 to EPA's AQI;
- An estimate of peak seasonal O_3 exposure at each monitoring station; and
- An analysis of the predictability of regional air pollution levels based on comparisons of actual air pollution measurements in 2015 to TCEQ's O_3 Action Day (OAD) forecasts and daily air quality forecasts.

2.1 Overview

Air quality data collected in the Austin-Round Rock MSA between 2013 and 2015 shows that the region remains in compliance with all NAAQS, and TCEQ's Toxicological Evaluation of volatile organic compounds (VOC) measurements collected in the region indicates that all concentrations were below the agency's "Air Monitoring Comparison Values." However, there were 12 days when O_3 levels exceeded the 70 ppb level of the new 2015 O_3 NAAQS, and there were 153 days when air pollution levels were considered "Moderate" or worse in the region. So, while the region's air pollution levels are within regulatory limits, and are better than four other large metro areas of the state (Dallas-Fort Worth, Houston, San Antonio, and El Paso), there are still air pollution problems in the region, and the region's O_3 levels remain close to the levels allowed by EPA.

2.2 Compliance with the NAAQS

The Austin-Round Rock's 2015 design values for NO_2, O_3, $PM_{2.5}$, PM_{10}, and SO_2 were all in compliance with the applicable NAAQS. There is no 2015 CO design value for the region because data collection was suspended in November 2014, and there is no lead design value for the region because lead monitoring was not conducted in the region at all during this period.

From 2013-2015, TCEQ operated four Continuous Air Monitoring Stations (CAMS) in the Austin-Round Rock MSA that EPA uses to compare the region's air pollution levels to the NAAQS. These include CAMS 3 at Austin Northwest Elementary School, CAMS 38 at the Austin Audubon Society, CAMS 171 in East Austin on Webberville Road, and CAMS 1068, which is the new near-road monitor located at the northwest corner of the intersection between interstate highway (IH) 35 and U.S. Highway 183 in Austin. The following table summarizes the criteria air pollution data collected at each station. Each site's CAMS number and Air Quality System (AQS) number are listed, along with the dates that the site collected date between January 1, 2013, and December 31, 2015.

Table 2. Federal Reference Method (FRM) Monitors in the Austin-Round Rock MSA, 2013-2015

Pollutant	CAMS 3 (AQS Site Number 484530014)	CAMS 38 (AQS Site Number 484530020)	CAMS 171 (AQS Site Number 484530021)	CAMS 1068 (AQS Site Number 484531068)
CO	2013 – Nov. 2014	n/a	n/a	n/a
NO_2	2013 – 2015	n/a	n/a	Apr. 2014 – 2015
O_3	2013 – 2015	2013 – 2015	n/a	n/a
$PM_{2.5}$	n/a	2013 – 2015	2013 – 2015	n/a
PM_{10}	n/a	2013 – 2015	2013 – 2015	n/a
SO_2	2013-2015	n/a	n/a	n/a

The table below shows a comparison of the region's air pollution levels to each of the applicable NAAQS. The 2014 design values except for PM_{10} are based on data from EPA's design value website at https://www3.epa.gov/airtrends/values.html. CAPCOG calculated the 2015 design values based on data available from TCEQ's website as of May 2016. As the table shows, the region was in compliance with all applicable NAAQS.

Table 3. Austin-Round Rock MSA Criteria Pollutant Design Values Compared to Primary NAAQS

NAAQS Indicator and Form	Conc.	2014 Design Value	2015 Design Value
CO – 1 hr., not to be exceeded more than 1x per year	35 ppm	0.5 ppm	n/a
CO – 8 hr., not to be exceeded more than 1x per year	9 ppm	0.3 ppm	n/a
NO_2 –annual mean	53 ppb	5 ppb	15 ppb[5]
NO_2 – 3-yr. avg. of 98th percentile of max. daily 1-hr. avg.	100 ppb	n/a	32 ppb
O_3 – 3-yr. avg. of fourth-highest maximum daily 8-hr. avg.	0.070 ppm	0.069 ppm	0.068 ppm
$PM_{2.5}$ – 3-yr avg. of 98th percentile of 24-hr. concentrations	12.0 $\mu g/m^3$	9.4 $\mu g/m^3$	9.2 $\mu g/m^3$
$PM_{2.5}$ – 3-yr. avg. of annual mean	35 $\mu g/m^3$	24 $\mu g/m^3$	22 $\mu g/m^3$
PM_{10} – Fourth highest 24-hour avg. over 3 years[6]	150 $\mu g/m^3$	58 $\mu g/m^3$	68 $\mu g/m^3$
SO_2 – 3-yr avg. of 99th percentile of max. daily 1-hr. avg.	75 ppb	n/a	5 ppb

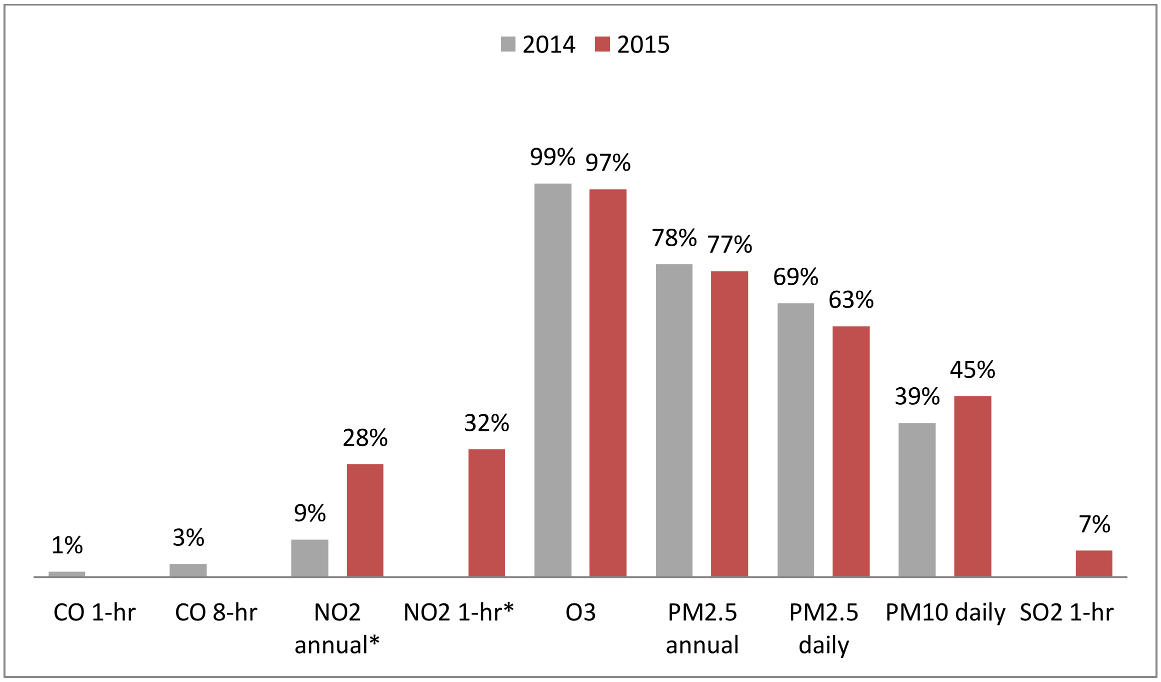
Since each standard has its own unique indicator, concentration, averaging time, and statistical form, a comparison of the region's air quality to the NAAQS requires calculating the ratio of the region's design

[5] The increase in the design value from 2014 to 2015 reflects the fact that 2015 was the year in which data collected at Austin's near-road NO_2 monitor (CAMS 1068) could be used for this design value, since it began collecting data in April 2014 and there must be at least 75% data completeness in each quarter for an annual NO_2 mean to be used for a design value. The annual NO_2 design value at CAMS 3 decreased in 2015 to 4 ppb from 5 ppb in 2014 and 6 ppb in 2013.

[6] The actual form of the standard is based on the number "expected exceedances," which is calculated based on the average number of days that a monitor measured an exceedance of 150 $\mu g/m^3$ per year over a 3-year period. Since the standard limits this average to 1, it means that the fourth highest 24-hour average would need to be at or below 150 $\mu g/m^3$. Expressing the PM_{10} design value in this way allows an easier comparison of the region's air quality as a % of the NAAQS, as show in Figure 2 below.

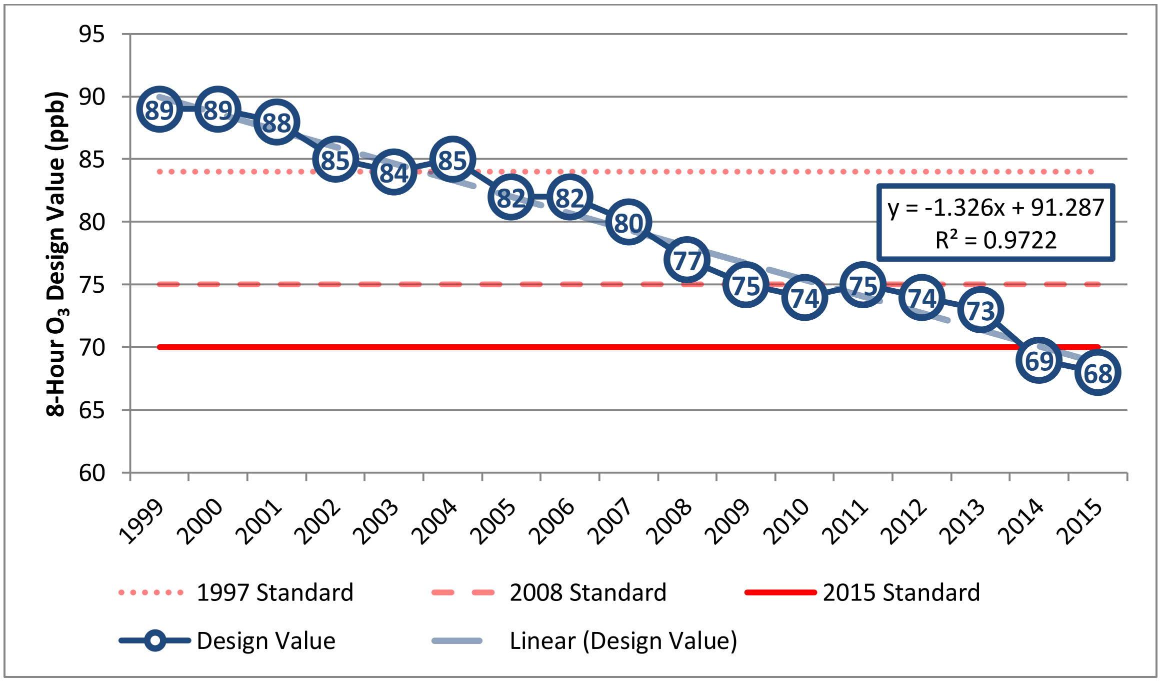
values to the NAAQS for each pollutant. The following figure shows this comparison for each pollutant for 2014 and 2015. As the figure shows, the Austin-Round Rock MSA's O_3 levels are compliant with the O_3 NAAQS, but just barely. After O_3, annual $PM_{2.5}$ levels are the closest to the NAAQS, followed by 24-hour $PM_{2.5}$ levels, both of which are more than 50% of the NAAQS. The region's 1-hour and 8-hour CO levels, 1-hour NO_2 levels, annual NO_2 levels, 24-hour PM_{10} levels, and 1-hour SO_2 levels are all less than 50% of the applicable NAAQS.

Figure 2. Austin-Round Rock MSA Design Values as a Percentage of the NAAQS



While the region's 2013-2015 O_3 design value is close to the level of the 2015 O_3 NAAQS, O_3 design values have been generally declining by over 1 ppb each year since 1999, when the region recorded its highest 8-hour design value at 89 ppb. The figure below shows the trend in the region's design value over this period, along with the levels of the 1997, 2008, and 2015 O_3 NAAQS. On average, the region's O_3 design value has declined by an average of 1.3 ppb per year over this period. Looking forward, trends in ongoing turnover of older on-road and non-road engines and the gradual replacement of older power plants with newer, lower-emitting plants are expected to reduce NO_X emissions in the region and across the country. This, in turn, should continue to drive O_3 levels down within the region. Section 6 of this report includes more information about these emissions trends.

Figure 3. Austin-Round Rock MSA Design Value Trend 1999-2015



2.3 Maximum Daily 8-Hour O_3 Averages in the Region

While compliance with the O_3 NAAQS is based on a three-year average of fourth-highest 8-hour maximum daily averages (MDA8) recorded at "regulatory" Federal Reference Method (FRM) or Federal Equivalent Method (FEM) O_3 samplers, the fourth-highest MDA8 value in any given year in that three-year period can exceed the level of the NAAQS, and there are also a number of non-regulatory O_3 monitoring stations in the region that can be used to understand regional O_3 levels.

In addition to the two regulatory monitors that TCEQ operates, CAPCOG collected O_3 data at eight monitoring stations between 2013 and 2015. These use EPA-approved O_3 sampling methods and data collected during this period followed a Quality Assurance Project Plan (QAPP) approved by TCEQ, but were not operated as FRM or FEM monitors, and these monitors are not included in TCEQ's Annual Monitoring Network Plan that is approved by EPA. As EPA described in its response to TCEQ's 2014 Monitoring Plan, while the O_3 data collected at these stations are not directly comparable to the O_3 NAAQS, each monitoring station "provides indicative data."[7]

The following table summarizes the fourth-highest MDA8 O_3 measurements collected at each monitoring station in the CAPCOG region 2013, 2014, and 2015, as well as the three-year average for each station. CAMS 3 and 38 are the regulatory monitoring stations operated by TCEQ, while CAMS 601, 614, 684, 690, 1603, 1604, 1675, and 6602 are research monitoring stations operated by CAPCOG.

[7] https://www.tceq.texas.gov/assets/public/compliance/monops/air/annual_review/historical/EPA2014AMNP.pdf, Accessed 6/10/2016.

While, O_3 data at CAPCOG's monitoring stations are not strictly comparable to the O_3 NAAQS, a comparison of the fourth highest MDA8 values in the region does an indication of O_3 levels in the region.

Table 4. Fourth-highest MDA8 Measurements at O_3 Monitoring Stations in the CAPCOG Region, 2013-2015 (ppb)

CAMS	AQS Site Number	County	2013	2014	2015	2013-2015 Average
3	484530014	Travis	69	62	73	68.0
38	484530020	Travis	70	63	73	68.7
601	481490601	Fayette	64	69	70	67.7
614	482090614	Hays	67	63	71	67.0
684	480210684	Bastrop	64	53	69	62.0
690	484910690	Williamson	*75	66	75	*72.0
1603	484531603	Travis	*41	57	72	*56.7
1604	480551604	Caldwell	*66	64	67	65.7
1675	482091675	Hays	70	61	70	67.0
6602	484916602	Williamson	69	*39	71	*59.7

In interpreting these data, there are several important caveats, particularly for those numbers marked with an asterisk in the table above:

- In 2013, the instrument used for O_3 sampling at CAMS 690 was an old Dasibi 1008-AH. CAPCOG's contractor conducted calibration checks in June, July, and September that showed O_3 levels reported for the 90 ppb check were 10-12 ppb higher than the reference concentrations. These months are when CAMS 690 recorded its four highest MDA8 levels in 2013. These deviations were within the +/- 15% variation data quality objective (DQO) that CAPCOG's QAPP allowed for this site, but would not meet the DQOs that EPA has set for regulatory O_3 monitoring, which allows for only +/- 7% deviation. If the fourth highest MDA8 values had been recorded perfectly in line with the values from the reference instrument, the fourth highest MDA8 in 2013 would have actually been 67 ppb, rather than 75 ppb, and CAMS 690's three-year average would be 69 ppb rather than 72 ppb.
- For 2014 and 2015, CAPCOG put newer equipment at this site (and other sites), and has set the DQO for O_3 measurements at +/- 7%, consistent with EPA requirements, except for any data collected with a Dasibi analyzer. In 2015, only CAMS 601 used a Dasibi.
- CAMS 1603 was only in operation for approximately 1 month in 2013, so this number should not be considered a reliable indication of the actual fourth-highest MDA8 that would have been measured at this location in 2013. The data was collected manually at this site in 2013, so they are not in TCEQ's LEADS system.
- Like CAMS 1603, CAMS 1604 was operated as a "temporary" monitoring station in 2013, and data was collected manually, rather than reported to LEADS. This monitoring station started collecting O_3 data in May 2013, however, and therefore provides a more complete record of O_3 concentrations during 2013. The four highest O_3 MDA8 measurements at the nearby CAMS 1675 all occurred after CAMS 1604 started collecting data in 2013, so CAPCOG believes that the fourth highest MDA8

recorded at CAMS 1604 is a reliable indication of the actual fourth-highest MDA8 at this location in 2013.

- While CAMS 6602 was located at the same property between 2013-2015, it was actually collecting data at three different physical locations on the property in each of these years. In 2014, CAPCOG believes that the monitoring data collected at CAMS 6602, while accurate, is not representative of ground-level O_3 concentrations in the vicinity of the monitoring station generally due to the siting of the monitor. CAPCOG believes that this is due to the proximity of sampler's inlet to trees, which can titrate O_3. The large difference in measurements from all other monitoring stations in the region in 2014, and the much narrower differences in 2013 and 2015, when the sampling equipment was better sited, indicates that the 2014 data reported at this location is not a reliable representation of actual O_3 concentrations in this area.

These data generally show that the three-year average of the fourth highest MDA8 values in the region ranged from 65 ppb – 69 ppb. However, the fourth highest MDA8 values for 2015 exceeded 70 ppb at all three Travis County O_3 monitors, both of the Williamson County monitors, and one of the two Hays County monitors, with the other Hays County monitor right at 70 ppb. So, while the region's O_3 levels are compliant with the NAAQS, several parts of the region can still experience O_3 levels considered "unhealthy for sensitive groups" multiple times a year. CAPCOG's O_3 monitors also show that there may sometimes exceedance of the level of the 2015 O_3 NAAQS in the region even when TCEQ's two regulatory O_3 monitors do not record an exceedance: from 2013-2015, on 10 of the 23 days between 2013 and 2015 when at least one O_3 monitor in the region recorded an MDA8 over 70 ppb, a CAPCOG monitor measured an exceedance while both of TCEQ's monitors measured MDA8 values at or below 70 ppb, which demonstrates the geographic variability of O_3 concentrations in the region.

2013-2015 O_3 data in the region also suggest that there is a high degree of year-to-year variability in O_3. There was a 10-11 ppb difference between the fourth highest MDA8 values at CAMS 3 and 38 in 2014 and 2015, and a difference of 16 ppb at one of CAPCOG's non-regulatory monitoring stations. If not for the lower-than-average O_3 levels in 2014, both of the regulatory monitors would actually have 2013-2015 "design values" (the average of the 2013 and 2015 fourth highest MDA8 values) of 71 ppb, and the three-year average at CAMS 690 would be 72 ppb, but all other parts of the region would still have three-year averages at or below 70 ppb.

As a result of the data recorded in 2014 and 2015, the region's fourth-highest MDA8 values at CAMS 3 and CAMS 38 in 2016 would need to reach 78 ppb or 77 ppb, respectively, in order for the region's 2014-2016 design value to exceed 70 ppb. This is very unlikely to occur, considering the long-run declines in O_3 concentrations in the region and the fact that fourth-highest MDA8 values that high have not been recorded at these monitoring stations since 2006. Statistically, the probability of a fourth highest MDA8 value of 78 ppb or 77 ppb at CAMS 3 or CAMS 38, respectively, would only be 4% and 5%.[8] Based on the monitoring data collected between 2013 and 2015, CAPCOG's conclusion is that O_3

[8] CAMS 3 avg. = 68 ppb for 2013-2015, standard deviation = 5.6 ppb. CAMS 38 avg. = 68.7 ppb for 2013, 2014, and 2015; standard deviation = 5.1 ppb. Probability that CAMS 3 has a fourth high > 77.9 ppb = 4.09% and probability that CAMS 38 has fourth high > 76.9 ppb = 5.37%. Calculated using

levels in all areas of the Austin-Round Rock MSA are compliant with the 2015 O_3 NAAQS, and are very likely to remain compliant with this NAAQS through the end of 2016. Added

2.4 Daily Pollution Levels Compared to EPA's AQI

While regulatory compliance is an important indicator of a region's air quality, it is possible for an area to experience numerous exceedances of an air pollution level that exceed the level of the NAAQS multiple times in a given year and still have a compliant design value. A design value also does not directly indicate how frequently a region experienced high pollution levels. Another indicator that can be used to characterize a region's air quality is the number of days a region experiences air pollution levels that are considered "Good," "Moderate," "Unhealthy for Sensitive Groups," or worse compared to the EPA's AQI. The following table shows the concentrations of NO_2, O_3, and $PM_{2.5}$ that correspond to each AQI level, taking the 2015 O_3 NAAQS into account.

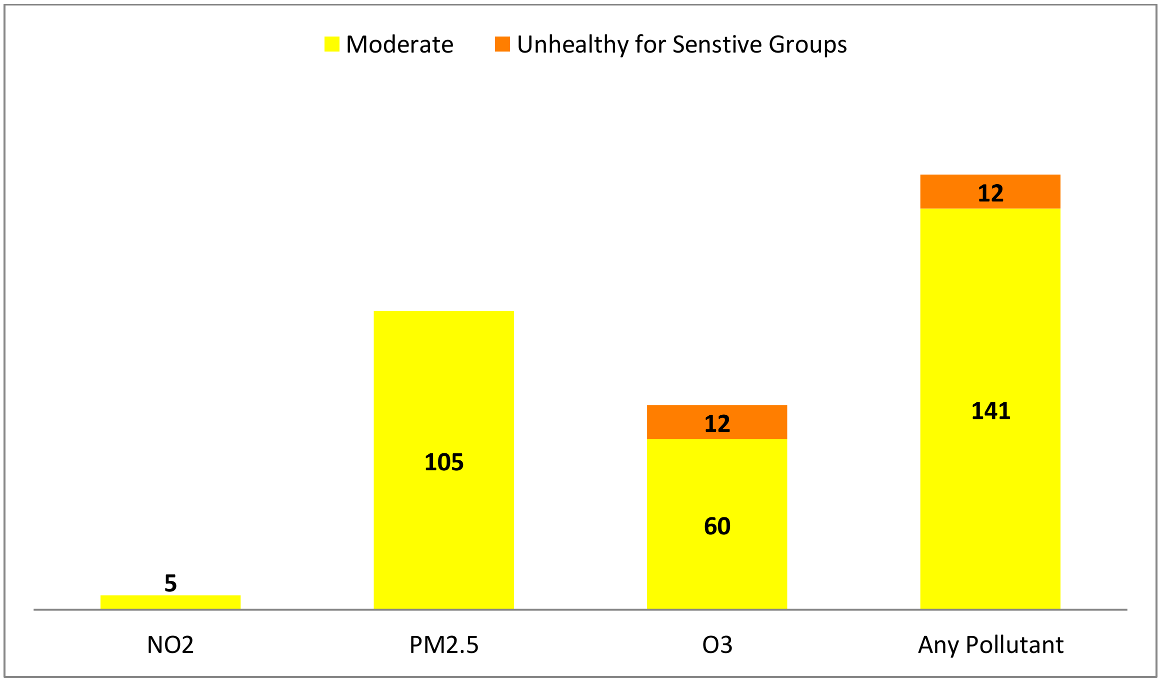
Table 5. Summary of AQI for NO_2, O_3, and $PM_{2.5}$

AQI Level	AQI Number	NO_2 (1-Hr., ppb)	O_3 (8-Hr., ppb)	$PM_{2.5}$ (24 hr., $\mu g/m^3$)
Good	0-50	0-53	0-54	0.0-12.0
Moderate	51-100	54-100	55-70	12.1-35.4
Unhealthy for Sensitive Groups	101-150	101-360	71-85	35.5-55.4
Unhealthy	151-200	361-649	86-105	55.5-150.4
Very Unhealthy	201-300	650-1,249	106-200	150.5-250.4
Hazardous	301-500	1,250-2,049	201-600	250.5-500

The following figures show the number of days in 2015 when NO_2, $PM_{2.5}$, or O_3 concentrations measured in the CAPCOG region were high enough to be considered Moderate or Unhealthy for Sensitive Groups.

http://www.mathportal.org/calculators/statistics-calculator/normal-distribution-calculator.php, Accessed 6/10/2016.

Figure 4. Number of "Moderate" or Worse Air Pollution Days in the CAPCOG Region in 2015 by Pollutant

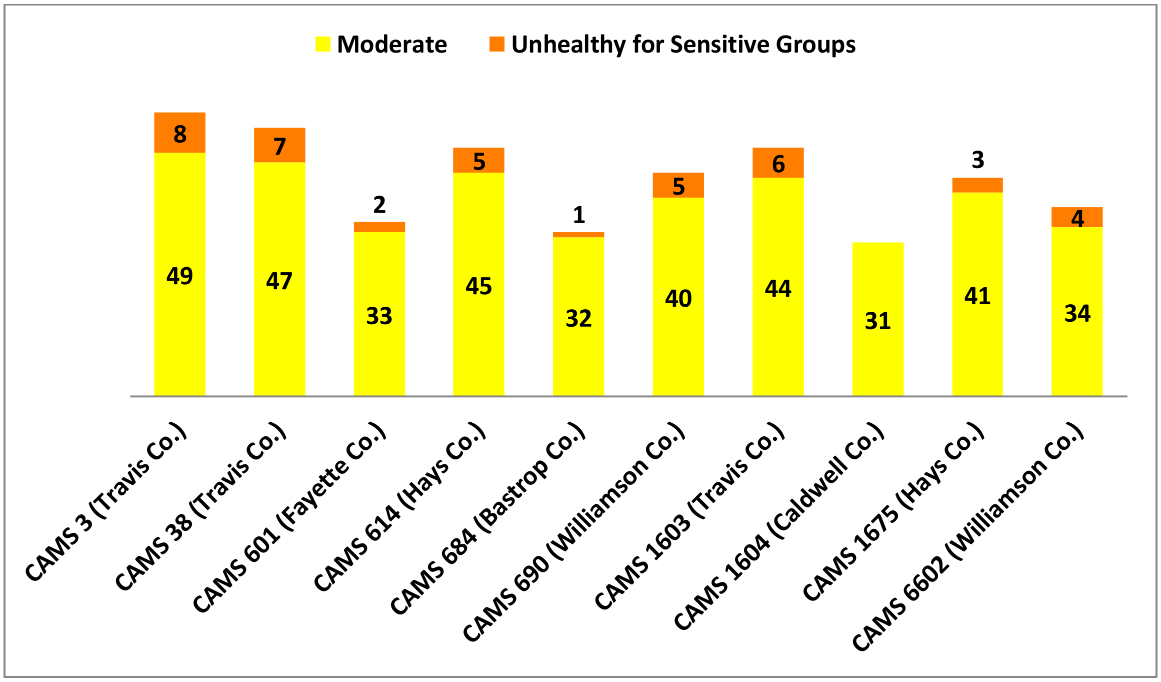


While the region's 2013-2015 design value was in compliance with the 2015 O_3 NAAQS, there were still 12 days when at least one monitoring station in the region measured O_3 concentrations considered unhealthy for sensitive groups. While the region only reached levels considered unhealthy for sensitive groups for O_3, over half of the days when air pollution reached levels considered moderate or worse were due to elevated NO_2 or $PM_{2.5}$ concentrations. Finally, while the region's air pollution levels were considered good on a majority of the days in 2015, they were moderate or worse on 42% of the days in 2015, which means that at least some particularly sensitive groups could potentially have experienced health issues related to air pollution exposure on about 2 out of every 5 days in 2015.

2.4.1 High O_3 AQI Days

The following figures show the number of days when O_3 levels were considered moderate or unhealthy for sensitive groups at each monitoring station in the region in 2015. CAMS 3 in Travis County measured the highest number of MDA8 values over 70 ppb (eight), while CAMS 1604 measured no MDA8 values over 70 ppb. Aside from CAMS 1604, all other O_3 monitoring stations recorded at least one MDA8 measurement over 70 ppb.

Figure 5. Number of Days when O_3 Pollution was "Moderate" or worse by Monitoring Station and County, 2015

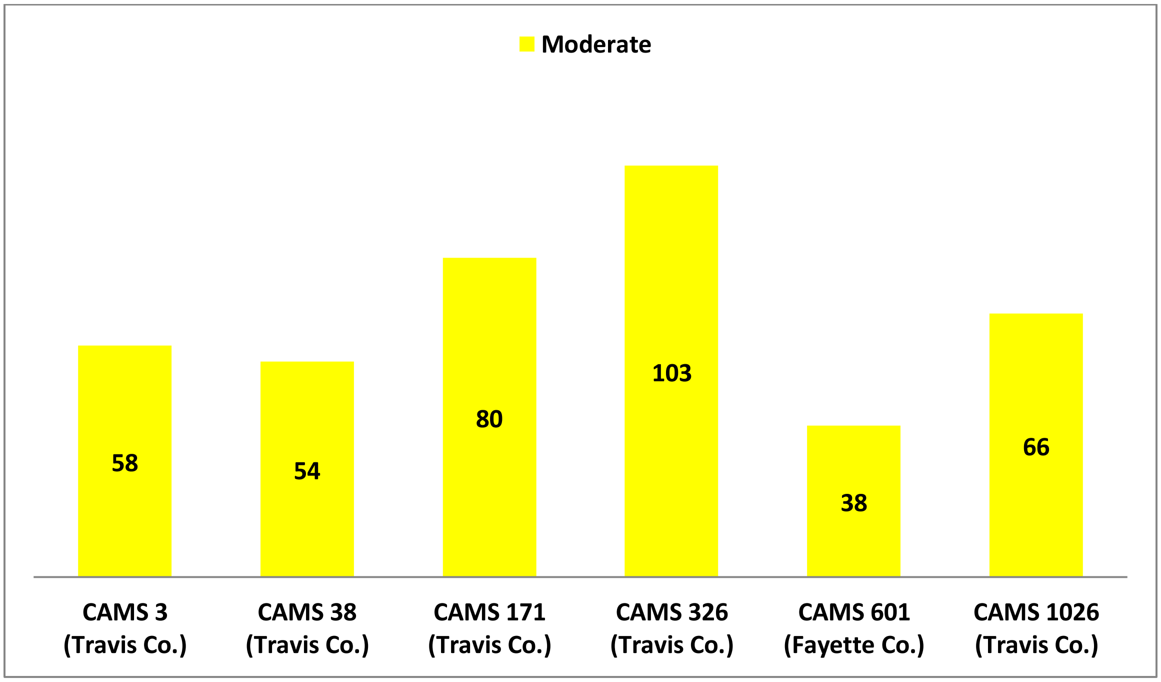


The highest MDA8 value recorded in 2015 was 85 ppb at CAMS 3 on August 28. This is the highest value within the Unhealthy for Sensitive Group AQI index range (71-85 ppb), and which is high enough that it would have been considered an exceedance of the old 1997 O_3 NAAQS. The highest value recorded at CAMS 1604 was 69 ppb.

2.4.2 High $PM_{2.5}$ AQI Days

The figure below shows the number of days when $PM_{2.5}$ levels were considered Moderate at each monitoring station. The location with the highest number of Moderate days $PM_{2.5}$ was CAMS 326, which is located at Zavala Elementary School in Austin. The highest 24-hour $PM_{2.5}$ average in 2015 was recorded on July 8, 2015, when CAMS 171 had a 24-hour average of 30.0 $\mu g/m^3$ (86% of the level of the 24-hour $PM_{2.5}$ NAAQS).

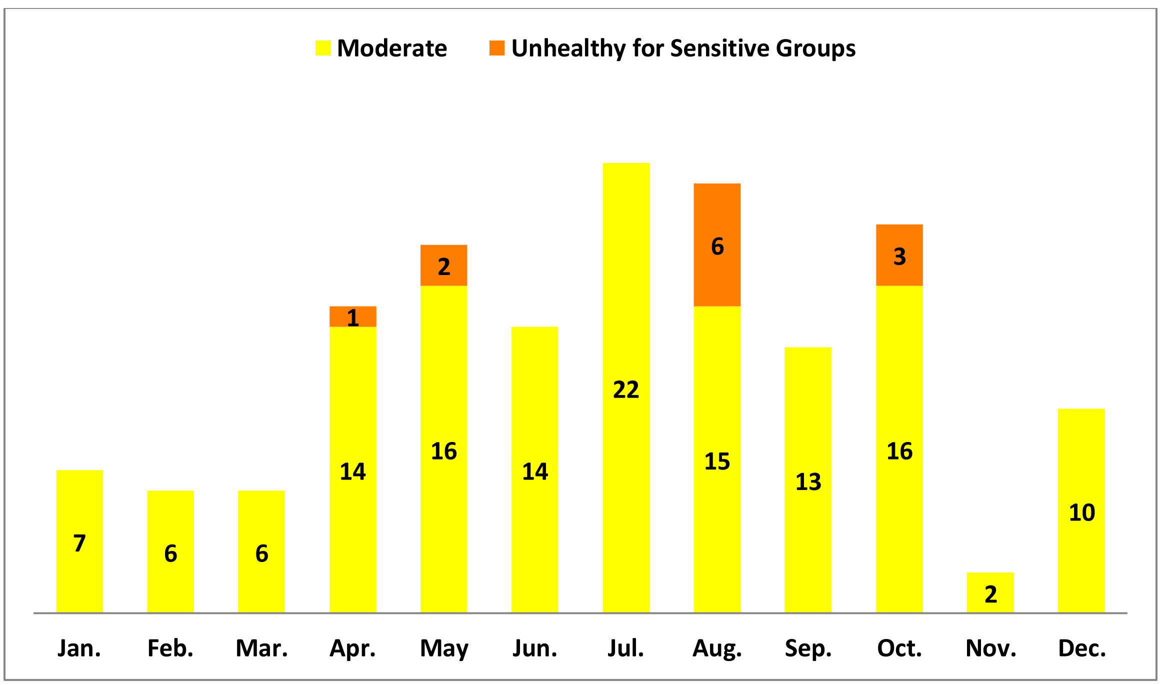
Figure 6. Number of Days when $PM_{2.5}$ Pollution was "Moderate" or Worse by Monitoring Station and County, 2015



2.4.3 Distribution of Moderate or Worse AQI Days by Month

Air pollution levels vary significantly by season in the CAPCOG region. In 2015, air pollution levels were considered Moderate or worse on as many as 71% of the days in July, and as low as 7% in November.

Figure 7. Number of Days when Air Pollution was "Moderate" or Worse in the CAPCOG Region by Month, 2015

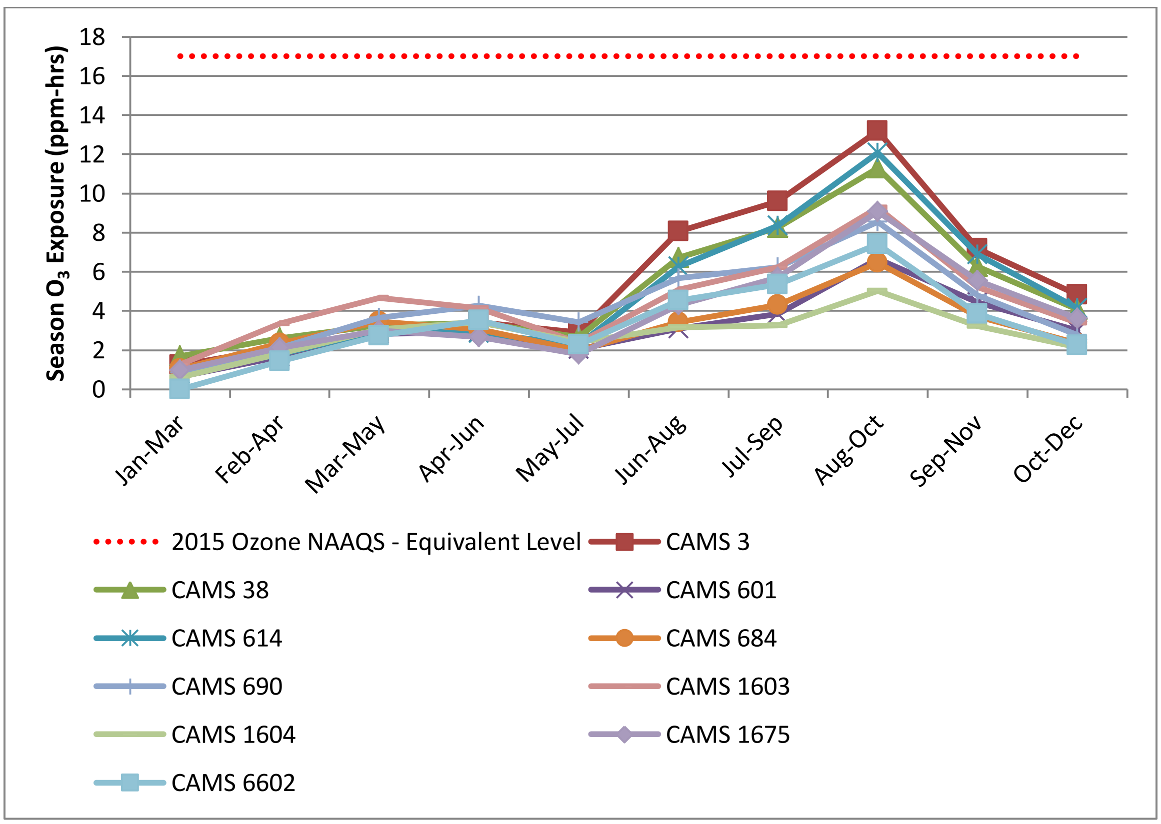


Half of the days when air pollution levels were considered Unhealthy for Sensitive Groups occurred in August, and three-quarters occurred between August and October. The first day when O_3 levels exceeded 70 ppb was April 30, and the last day was October 17.

2.5 Seasonal O_3 Exposure

While EPA set the 2015 secondary O_3 standard identical to the 2015 primary O_3 standard, the preamble to the rulemaking states that, "the requisite protection will be provided by a standard that generally limits cumulative seasonal exposure to 17 ppm-hours (ppm-hrs) or lower, in terms of a 3-year W126 index."[9] EPA did not set a separate secondary standard because, "such control of cumulative seasonal exposure will be achieved with a standard set at a level of 0.070 ppm, and the same indicator, averaging time, and form as the current standard." The region's peak seasonal O_3 exposure levels were 22-70% below the 17 ppm-hr levels EPA referenced in the final 2015 O_3 NAAQS rulemaking. The figure below shows the 3-month seasonal exposure levels at each monitoring station by month (the month on the x-axis corresponds with the final month in the 3-month sum).

Figure 8. Weighted Seasonal O_3 Exposure by Monitoring Station, 2015 (W126 ppm-hrs)



[9] 80 FR 65299, https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf

2.6 Predictability of Regional Air Pollution

One of the factors that influences the risks associated with air pollution is the extent to which air pollution can be accurately and successfully predicted. For the Austin-Round Rock MSA, there are two types of forecasting tools that can be used to help reduce the exposure of sensitive populations to high air pollution levels – TCEQ's O_3 Action Days (OADs) and daily Air Quality Forecasts. This section reviews the extent to which regional air pollution levels could be accurately forecast (i.e., a high percentage of predictions are accurate) and successful (i.e., a high percentage of high air pollution days are accurately predicted).

2.6.1 O_3 Action Days

TCEQ issues OADs the afternoon before a day when it believes that O_3 levels may exceed the level of the NAAQS. As mentioned above, there are two ways to measure the performance of OAD forecasting – "accuracy," and "success." The following two formulas explain each of these terms in the context of this analysis.

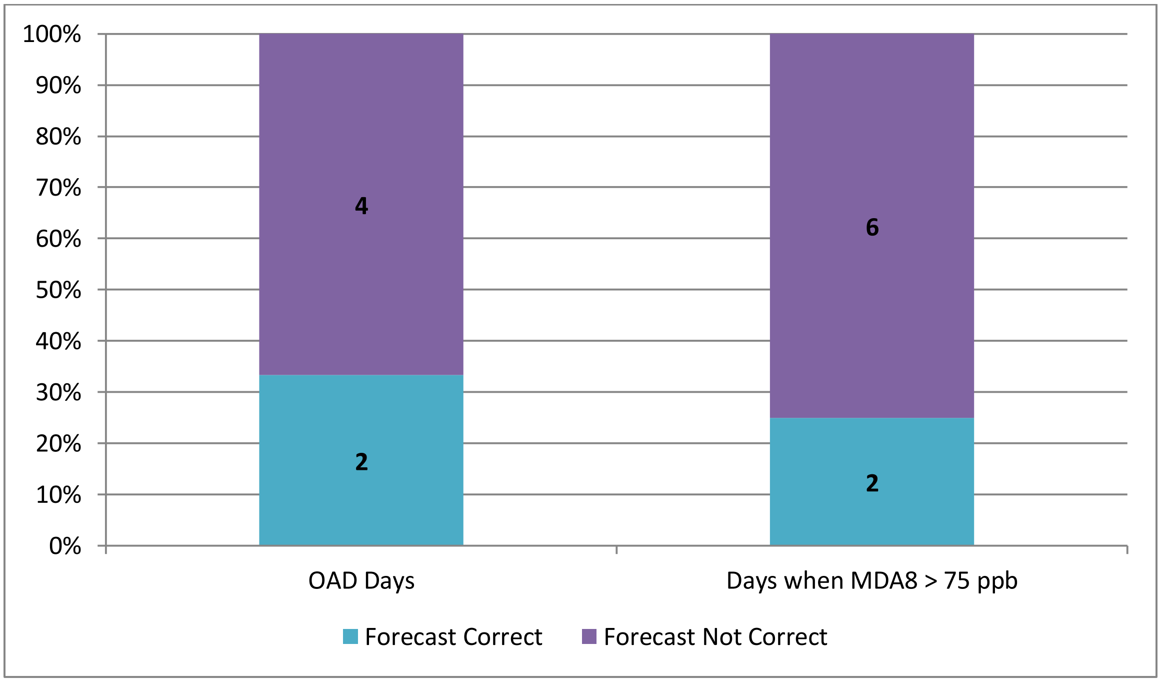
$$OAD\ Accuracy\ Rate = \frac{Days\ OAD\ Declared\ When\ Actual\ MDA8 > 75\ ppb}{Days\ OAD\ Declared}$$

$$OAD\ Success\ Rate = \frac{Days\ OAD\ Declared\ When\ Actual\ MDA8 > 75\ ppb}{Days\ When\ Actual\ MDA8 > 75\ ppb}$$

In 2015, there was only one OAD. This forecast correctly predicted that O_3 levels would exceed 75 ppb on August 27, 2015. CAMS 3, 38, and 690 all recorded MDA8 values of over 75 ppb on this day, with the highest MDA8 at 82 ppb. However, there were also four other days when MDA8 levels exceeded 75 ppb when an OAD was not forecast. This means that TCEQ's OAD forecasts for the region in 2015 were 100% accurate (all forecasts for an exceedance of 75 ppb were correct), but missed 75% of the days when O_3 levels were actually over 75 ppb.

From 2013-2015, TCEQ issued a total of six OAD alerts – four in 2013, one in 2014, and one in 2015. Two of these forecasts correctly predicted O_3 MDA8 levels over 75 ppb in the region on the following day – a 33% accuracy rate. Likewise, there were a total of eight days from 2013-2015 when O_3 MDA8 levels exceeded 75 ppb, two of which were forecast as OADs – a 25% success rate.

Figure 9. O_3 Action Day Forecast Accuracy and Success, 2013-2015



2.6.2 Daily Air Quality Forecasts

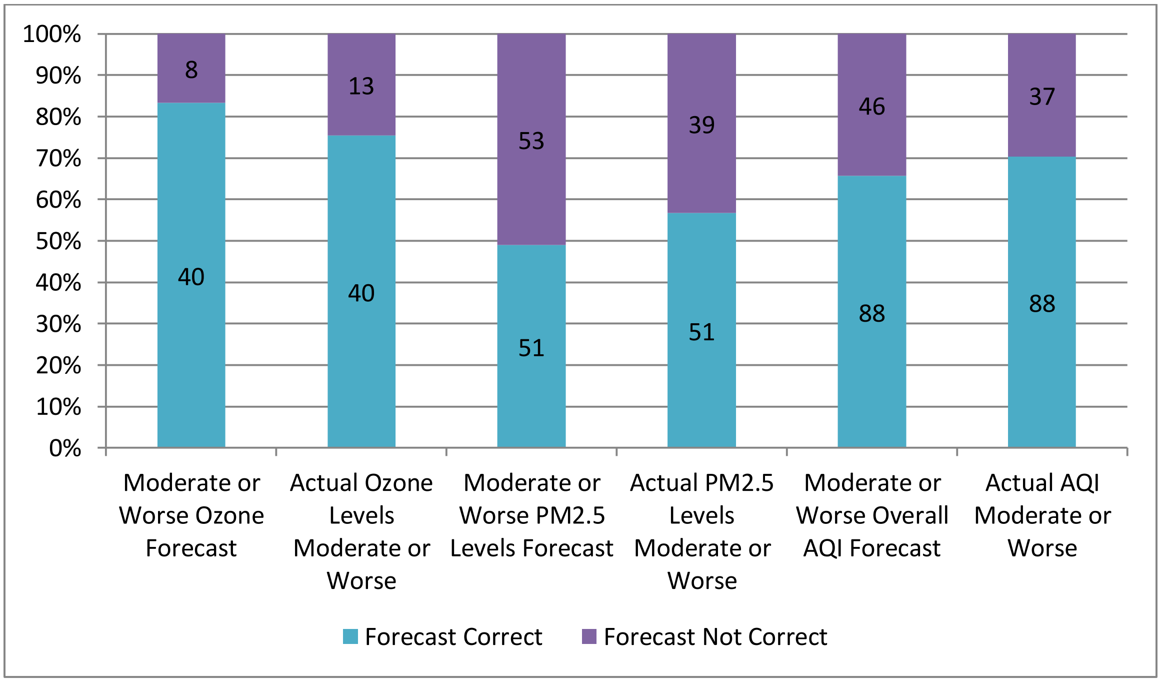
Unlike OADs, which are only issued for days when TCEQ believes O_3 will reach levels considered unhealthy for sensitive groups, daily air quality forecasts include forecasts for “good” and “moderate” air pollution levels as well, and include forecasts for pollutants other than O_3. The performance of these forecasts can also be measured using the same type of metrics used above for OADs – accuracy and success. In this case, CAPCOG evaluated the accuracy and success rate in terms of the number of days when air quality was forecast to be moderate or worse. The equations below explain these terms in terms of the daily AQI forecast.

$$AQI\ Forecast\ Accuracy\ Rate = \frac{Days\ When\ AQI\ Forecast\ to\ be\ Moderate\ or\ Worse\ and\ was\ Actually\ Moderate\ or\ Worse}{Days\ Forecast\ to\ be\ Moderate\ or\ Worse}$$

$$AQI\ Forecast\ Success\ Rate = \frac{Days\ When\ AQI\ Forecast\ to\ be\ Moderate\ or\ Worse\ and\ was\ Actually\ Moderate\ or\ Worse}{Days\ When\ Actual\ AQI\ Was\ Moderate\ or\ Worse}$$

Since the daily AQI forecasts for the region included forecasts for both O_3 and $PM_{2.5}$, it is possible to analyze these accuracy and success rates by pollutant, as well as for the overall AQI. The figure below shows the results of this analysis for 2015.

Figure 10. Accuracy and Success of AQI Forecasts for 2015



Overall, TCEQ's forecasts for O_3 levels to be moderate or worse were 83% accurate (actual O_3 levels were good 17% of the time TCEQ made a forecast for O_3 to be moderate or worse) and 75% successful (25% of days when actual O_3 levels were moderate or worse has been forecast to have good O_3 levels). The accuracy and success rates for $PM_{2.5}$ forecasting were lower – 49% and 57%, respectively. Overall, the AQI forecasts were 66% accurate and 70% successful.

3 NO_X and VOC Emissions

Since O_3 is a secondary pollutant, meaning it is formed in the atmosphere due to reactions between other gases that are directly emitted, regional O_3 planning efforts must be based on a solid understanding of the relationship between regional NO_X and VOC emissions and regional O_3 levels. Previous modeling conducted by the University of Texas at Austin (UT) and analysis of monitoring data in the region suggests that MDA8 levels in the region would be approximately 60 ppb if not for the anthropogenic emissions generated in the Austin-Round Rock MSA.[10] Regional O_3 levels respond much more to a ton per day of NO_X reductions than to a ton per day of VOC reductions. Reducing NO_X emissions by 1 tpd would be expected to yield a reduction of 0.093-0.96 ppb in peak O_3 levels, whereas reducing VOC emissions by 1 tpd would be expected to yield a reduction of only about 0.0013-0.0017 ppb, 50-70 times less than the same reduction in NO_X emissions.[11] Due to the relative importance of NO_X emissions compared to VOC emissions, most of the focus in this report is on NO_X emissions and NO_X reduction strategies.

3.1 Regional Emissions Estimates

The TCEQ recently submitted 2014 emissions data to EPA as part of the Air Emissions Reporting Rule (AERR) that will be used as part of the 2014 National Emissions Inventory (NEI). The following table summarizes the 2014 annual and average O_3 season day (OSD) NO_X and VOC emissions by county.

Table 6. 2014 NO_X and VOC Emissions by County

County	NO_X (tpy)	NO_X (OSD tpd)	VOC (tpy)	VOC (OSD tpd)
Bastrop	2,632	7.66	2,075	5.98
Caldwell	1,991	7.54	5,213	14.45
Hays	5,399	15.31	3,466	10.33
Travis	14,911	42.03	18,938	57.50
Williamson	5,628	16.40	7,477	22.88
TOTAL	**30,560**	**88.94**	**37,169**	**111.14**

Based on the NO_X/O_3 and VOC/O_3 ratios described above, the Austin-Round Rock MSA's NO_X and VOC emissions contribute approximately 8-9 ppb, which is consistent with a 59-60 ppb "background" level for the region and the region's current 68 ppb design value. The following equations show how this estimate was calculated:

[10] http://www.capcog.org/documents/airquality/reports/2015/O3_Conceptual_Model_Final_-_10-1-15.pdf
[11] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf

$$88.94\ tpd\ NO_X in\ MSA \times 0.096\ \frac{ppb\ O_3\ at\ CAMS\ 3}{tpd\ NO_X\ in\ MSA} = 8.5\ ppb\ O_3\ at\ CAMS\ 3\ from\ MSA\ NO_X$$

$$111.14\ tpd\ VOC\ in\ MSA \times 0.0017\ \frac{ppb\ O_3\ at\ CAMS\ 3}{tpd\ VOC\ in\ MSA} = 0.2\ ppb\ O_3\ at\ CAMS\ 3\ from\ MSA\ VOC$$

$$8.5\ ppb\ O_3\ at\ CAMS\ 3\ from\ MSA\ NO_X + 0.2\ ppb\ O_3\ at\ CAMS\ 3\ from\ MSA\ VOC = 8.7\ ppb\ O_3$$

$$88.94\ tpd\ NO_X in\ MSA \times 0.093\ \frac{ppb\ O_3\ at\ CAMS\ 38}{tpd\ NO_X\ in\ MSA} = 8.3\ ppb\ O_3\ at\ CAMS\ 38$$

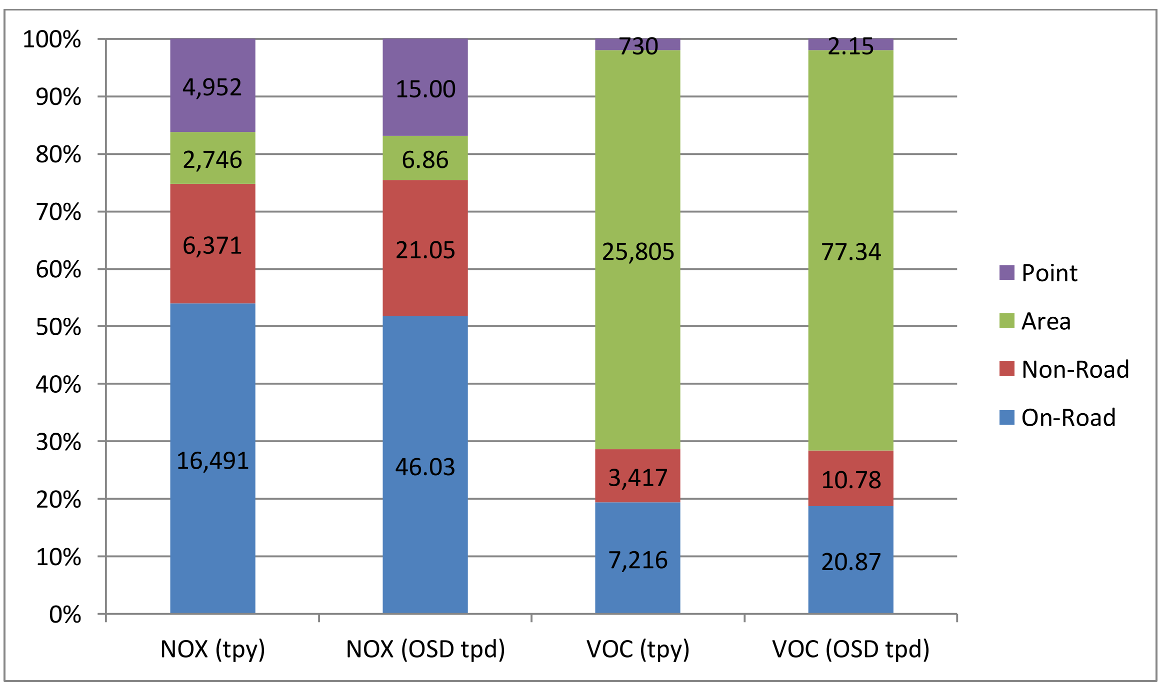
$$111.14\ tpd\ VOC\ in\ MSA \times 0.0013\ \frac{ppb\ O_3\ at\ CAMS\ 3}{tpd\ VOC\ in\ MSA} = 0.1\ ppb\ O_3\ at\ CAMS\ 38$$

$$8.3\ ppb\ O_3\ at\ CAMS\ 3\ from\ MSA\ NO_X + 0.1\ ppb\ O_3\ at\ CAMS\ from\ MSA\ VOC = 8.4\ ppb\ O_3$$

An estimated 60 ppb background level using this analysis matches the average MDA8 value at the monitoring station with the lowest MDA8 value on days when at least one monitor in the region exceeded 70 ppb in 2015.

Within the region, as the figure below shows, mobile sources make up a large majority of both annual and OSD NO_X emissions.

Figure 11. Austin-Round Rock MSA NO_X and VOC Emissions by Source Type, 2014



3.2 Point Sources Operated by CAC Members

Three CAC members own and operate point sources in the region: the City of Austin, the Lower Colorado River Authority (LCRA), and Texas Lehigh Cement Company. City of Austin operates two power plants located in Travis County: Decker Creek and Sand Hill. LCRA owns and operates five power plants: Sim Gideon and Lost Pines 1 in Bastrop County; T.C. Ferguson in Llano County; and, Winchester Power Park and the Fayette Power Project (Sam Seymour) in Fayette County (the largest point source of NO_X in the CAPCOG region). Texas Lehigh Cement Company owns and operates a cement manufacturing facility in Hays County. This facility is the 2nd-largest point source of NO_X in the CAPCOG region and the largest point sources of NO_X in the Austin-Round Rock MSA.

Collectively, these point sources owned and operated by CAC members reported emitting a total of 3,080 tons of NO_X emissions in the Austin-Round Rock MSA in 2014, accounting for 62% of all point source NO_X emissions in the MSA that year. Within the CAPCOG region, these sources emitted a total of 8,393 tons of NO_X in 2014, accounting for 76% of all point source NO_X emissions for the region. The 2013, 2014, and 2015 NO_X emissions, and three-year averages, are reported for each facility below.[12]

[12] 2013 and 2014 estimates are based on each facility's annual Emissions Inventory Questionnaire (EIQ) for those years. 2015 estimates are based on data reported by Texas Lehigh to CAPCOG for this report and from EPA's Air Market Program Data. The NO_X emissions for Decker Creek's turbines for 2015 were adjusted to reflect the facility's 2014 emissions rates for those units since the data reported in CAMD is based on a "worse case scenario" emissions rate and does not reflect actual stack test data for those units.

Table 7. 2013-2015 NO_X Emissions from Point Sources Operated by CAC Members

Facility	Owner	County	2013 NO_X (tpy)	2014 NO_X (tpy)	2015 NO_X (tpy)	2013-2015 Avg. NO_X (tpy)
Sim Gideon Power Plant	LCRA	Bastrop	257	154	264	225
Lost Pines 1 Power Plant	LCRA[13]	Bastrop	213	218	191	207
Fayette Power Project	LCRA[14]	Fayette	5,941	5,273	5,050	5,421
Winchester Power Park	LCRA	Fayette	2	5	2	3
Texas Lehigh Cement Co.	Texas Lehigh Cement Co. LP	Hays	2,364	2,388	2,301	2,351
TC Ferguson Power Plant	LCRA	Llano	94	35	72	67
Decker Creek Power Plant	Austin Energy	Travis	330	248	384	321
Sand Hill Energy Center	Austin Energy	Travis	83	72	97	84
SUBTOTAL-MSA COUNTIES	***n/a***	***Bastrop, Hays, & Travis***	***3,247***	***3,080***	***3,237***	***3,188***
SUBTOTAL-FAYETTE AND LLANO COUNTIES	***n/a***	***Fayette & Llano***	***6,037***	***5,313***	***5,124***	***5,491***
TOTAL	***n/a***	***n/a***	***9,284***	***8,393***	***8,361***	***8,679***

3.3 NO_X Emissions Footprints of CAC Member Operations

For the first time, CAPCOG is including assessments of the emissions impacts of the operations of CAC members. While not comprehensive, this assessment covers some of the key areas that the Austin-Round Rock MSA's OAP Action Plan seeks to reduce emissions, including vehicle and equipment fuel usage, natural gas combustion, electricity usage, water usage, and employee commuting. Detailed explanations of the key assumptions are included in the accompanying spreadsheet.

The intent of this analysis is to provide CAC members, the TCEQ, and the EPA with a general idea of the overall emissions impact of the operations for the organizations participating in this plan, as well as to help improve the understanding of the relative importance of different types of activities in determining an organization's ground-level O_3 "footprint." This, in turn, should improve the ability of each organization to develop and implement strategies to reduce their contribution to peak O_3 levels in the region. CAPCOG's analysis is based on data reported by CAC members as of May 31, 2016.

To the extent possible, CAPCOG relied on data that was directly reported from CAC members, although not all CAC members reported on all of the key operational data. For organizations that did not report data for 2015, CAPCOG either used data from 2013 or 2014, or used an organization's 2015 employment and the data from similar types of organizations. For example, CAPCOG calculated the average electricity consumption per employee for city governments that reported for 2015 and multiplied that ratio to the

[13] Facility is technically operated and ½ owned by "GenTex," which is a wholly owned subsidiary of LCRA. LCRA directly owns the other ½ of the facility, and it appoints half of GenTex's board.
[14] Austin Energy owns ½ of two of the three units at FPP.

employee totals for each city government that did not report 2015 electricity consumption or previously report electricity consumption in 2013 or 2014. Since not all cities reported employment for 2015, CAPCOG estimated employment for some cities based on total population estimated for 2014. For other organizations, that did not report total employment for 2015, CAPCOG used a prior year's employment total from 2013 or 2014. These assessments only cover organizations that are directly participating in the OAP Action Plan as full CAC members. They do not, therefore, include any other organization that participate in CAF's CAPP, which also includes similar types of emissions assessments based on operational data reported by partners.

These estimates are intended to be broadly consistent with the emissions data in the 2014 National Emissions Inventory (NEI). While the public release of the 2014 NEI is not scheduled until August 2016, CAPCOG used the data that TCEQ submitted to EPA, along with a number of other data sources, in order to develop activity and emissions factors that were used in these assessments. CAPCOG intends to use these activity and emissions factors in future projects scheduled for 2016 and 2017 in order to quantify the emission reduction benefits of some of the specific types of efforts that CAC members have undertaken in recent years. CAPCOG also plans to work with CAF to incorporate these updated emissions factors into the CAPP reporting tool.

This assessment focuses on NO_X emissions due to their importance to regional O_3 formation relative to VOC emissions. However, VOC emissions factors could also easily be added to this set of emissions factors in the future if desired by CAC members, the TCEQ, or the EPA. CAPCOG grouped CAC members into four organization types for this analysis: 1) Cities; 2) Counties, 3) Agencies, and 4) Businesses. This analysis does not include the three non-profits that are CAC members. In the case of CAF and LSCFA, they each only have a single staff member, and the TNLA's participation in the effort is centered on providing information on emissions and air quality to their statewide membership.

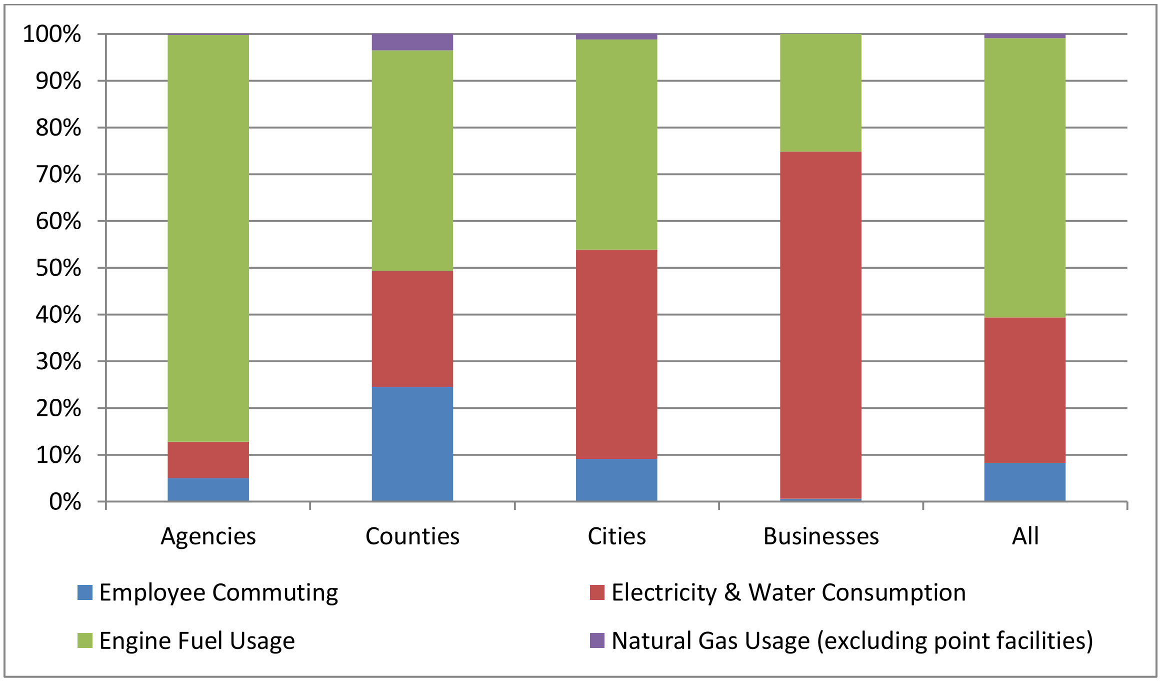
Table 8. Emissions Assessment Summary, Excluding Point Source Emissions

Statistic	Agencies	Counties	Cities	Businesses	Total
Organizations	8	5	16	1	30
Employee Commuting NO_X (tpy)	18.53	21.49	42.31	0.37	82.68
Natural Gas Consumption NO_X (tpy)	0.83	3.10	5.63	0.01	9.57
Electricity Consumption NO_X (tpy)	29.38	21.75	204.75	48.92	304.80
Water Consumption NO_X (tpy)	0.11	0.18	5.05	0.07	5.41
Diesel Consumption NO_X (tpy)	314.69	26.14	125.11	16.53	482.48
B20 Consumption NO_X (tpy)	0.00	0.00	23.29	0.00	23.29
Gasoline Consumption NO_X (tpy)	10.56	14.91	35.82	0.08	61.37
E85 Consumption NO_X (tpy)	1.22	0.00	10.84	0.00	12.06
LPG Consumption NO_X (tpy)	0.10	0.45	4.22	0.00	4.78
CNG Consumption NO_X (tpy)	0.00	0.00	11.12	0.00	11.12
TOTAL	**375.40**	**88.03**	**468.14**	**65.99**	**997.56**

This is 997 tpy of NO_X roughly equivalent to 3% of the Austin-Round Rock MSA's 2014 NO_X emissions.

The following chart illustrates the % of each type of organization's emissions impact attributed to employee commuting, electricity and water consumption, fuel usage, and natural gas usage.

Figure 12. Relative Contribution of Different Activities to Each Organization Type's Operations Emissions Impact



One challenge in interpreting this chart is that the NO_X emissions attributable to electricity are not likely to be all occurring within the Austin-Round Rock MSA, or even all within the CAPCOG region. Due to the distributed nature of electricity generation, transmission, and distribution, it is not possible to attribute emissions from any plant or any group of plants to any particular community's electricity usage on the grid. For example, energy efficiencies and solar panel installations on the U.T. campus would reduce the demand for electricity from the Hal Weaver Power Plant, which is not connected to the electrical grid. If these same efficiencies and solar panel installations were implemented elsewhere in the City of Austin, the effect on the grid and the dispatch of local power plants would be far less certain. At a state-level perspective, this might not matter as much as it might at the regional and local level. If the air quality benefit associated with an energy efficiency or renewable energy initiative cannot be geographically associated with the area where the energy efficiency improvement or renewable energy project is located, it may be more difficult to make the case to support such projects from a regional air quality perspective.

Two alternative approaches exist to assigning the statewide NO_X emissions to the region's electricity usage: 1) reduce the NO_X emissions rate by the fraction of electric generating unit (EGU) NO_X emissions from outside of the area in the state of Texas (97% of all EGU NO_X emissions in the state are outside of the Austin-Round Rock MSA), or 2) use the average NO_X emissions rate for only local plants, based on the general assumption that it's more likely that electricity demand will be met by facilities physically closest to that demand in order to minimize transmission/distribution loss. Either of these would lower the electricity and water consumption share of these emissions estimates considerably.

3.4 Other Emissions-Related Operational Data Reported by CAC Members for 2015

In addition to obtaining 194 individual pieces of "high-priority" operational data from CAC members used to calculate the NO_X emissions footprints presented above, CAC members also submitted 42 pieces of "medium-priority" data from 7 cities related to municipally-owned water, wastewater, and electric utilities, as well as 338 pieces of "low-priority" data reported by 14 CAC members on areas ranging from the percentage of commuters who use alternative work schedules to the number and usage of backup generators.

3.4.1 Water and Wastewater Utility Data

CAPCOG used the "medium-priority data" to estimate the average electricity consumption per million gallons of water supplied, as well as to understand the extent to which a city's electricity consumption is attributable to its water and wastewater utilities. All of the cities participating in the CAC other than Bee Cave and Sunset Valley have their own municipally-owned water and wastewater utility. Electricity consumption is reported below in kilowatt-hours (kWh), while water consumption is reported in millions of gallons (MGal).

Table 9. Water & Wastewater Utility Data Reported

City	Total Electricity Consumed (kWh) by City	Electricity Consumed for Water Utility (kWh)	Electricity Consumed for Wastewater Utility (kWh)	% Consumed for Water & Wastewater Utilities	Electricity Consumed per Million Gallons of Water Consumed (kWh/MGal)
Cedar Park	24,602,329	12,475,907	5,073,452	71%	5,808.97
Georgetown	31,301,307	710,000	775,000	5%	385.68
Lockhart	1,616,227	4,360	130,000	8%	267.65
Pflugerville	16,277,863	5,368,785	5,966,179	70%	6,150.91
Round Rock	53,871,010	12,884,372	15,030,174	52%	4,587.91
Combined	**127,668,736**	**31,443,424**	**26,974,805**	**46%**	**3,443.36**

Due to the large discrepancy between the data reported for the cities of Cedar Park, Pflugerville, and Round Rock on the one hand, and the data reported for the cities of Georgetown and Lockhart on the other hand, and literature review conducted by CAPCOG on this topic, CAPCOG believes that the data for Georgetown and Lockhart likely significantly under-represent the electricity usage for the water and wastewater utility. This may be due to challenges in obtaining electricity consumption data for specific departments/divisions within the city as opposed to organization-wide data that tends to be more readily available. A Congressional Research Service (CRS) report from 2014 suggested that the national average is about 3,300 – 3,600 kwh/million gallons delivered and treated, with the Austin area having a somewhat higher average of about 5,000 kWh per million gallons.[15] CAPCOG used the sub-totals for Cedar Park, Pflugerville, and Round Rock in order to obtain an average estimate of 5,188 kWh per million gallons, which is very close to the number cited in the CRS report. CAPCOG then used this ratio in combination with the water consumption reported by each organization in order to estimate the emissions related to water consumption. For cities with water utilities, this electricity was subtracted from the city's total electricity consumption before calculating the emissions assessments in order to avoid double-counting. More broadly, this also suggests that approximately 60% of the over 200 tpy of NO_X emissions attributable to electricity consumed by CAC cities can be attributed to water and wastewater utility energy consumption in their communities.

3.4.2 Electricity Utility Data

Based on CAPCOG's review, six of the cities that participate own and operate their own municipal electric utilities. These cities include:

- City of Austin;
- City of Bastrop;
- City of Georgetown;
- City of Lockhart;
- City of Luling; and
- City of San Marcos.

Four of these cities have publicly available data reported for 2014 on the Energy Information Administration's (EIA's) *Electric power sales, revenue, and energy efficiency Form* EIA-861.[16] The table below summarizes the electricity consumption totals; the EIA's data also includes the revenue generated and the number of customers in the residential, commercial, industrial, and transportation sectors (no electricity consumption reported for any of the four utilities in the region). Data is reported in megawatt-hours (MW-hrs)

Table 10. 2014 Electric Utility Data for Austin, Georgetown, Lockhart, and San Marcos from EIA Form 861

City	Residential (MW-hrs)	Commercial (MW-hrs)	Industrial (MW-hrs)	Total (MW-hrs)
Austin	4,267,484	5,453,445	2,781,583	12,502,512
Georgetown	242,051	247,382	77,436	566,869
Lockhart	57,703	29,301	12,360	99,364
San Marcos	226,462	359,747	2,124	588,333
TOTAL	**4,793,700**	**6,089,875**	**2,873,503**	**13,757,078**

CAPCOG estimated the NO_X emissions attributable to the electricity sold by these utilities by using the emissions factor CAPCOG calculated for electricity consumption based on 2014 statewide NO_X emissions from power plants and statewide retail electricity sales. The following table summarizes the results.

[15] https://www.fas.org/sgp/crs/misc/R43200.pdf
[16] http://www.eia.gov/electricity/data/eia861/index.html

Table 11. 2014 Electric Utility Sales NO_X Estimates for Austin, Georgetown, Lockhart, and San Marcos (tpy)

City	Residential	Commercial	Industrial	Total
Austin	1,313.49	1,678.52	856.14	3,848.15
Georgetown	74.50	76.14	23.83	174.48
Lockhart	17.76	9.02	3.80	30.58
San Marcos	69.70	110.73	0.65	181.08
TOTAL	**1,475.45**	**1,874.40**	**884.44**	**4,234.29**

CAPCOG only received electric utility data for 2015 from Georgetown and Lockhart:

- Georgetown reported 614,709 MW-hrs of electricity sold in 2015 to 23,189 customers
  - 26,509 kWh per customer, a 16% increase from 2014;
  - Overall electricity sold increased by 8% from 2014;
- Lockhart reported 101,680 MW-hrs of electricity sold in 2015 to 4,985 customers
  - 20,397 kWh per customer, a 5% increase from 2015;
  - Overall electricity sold increased by 2% from 2014.

Austin Energy maintains a wide range of data on the reductions in grid electricity consumption due to its energy efficiency and renewable energy efforts. A 2012 report estimates that the city's demand-side management energy efficiency measures saved 106,055,975 kWh of electricity consumption in 2012 and reduced 48.9 tons of NO_X emissions. This translates into a 0.000923 lbs/kWh ratio for 2012, which is 50% higher than the emissions rate CAPCOG used in its assessments, based on 2014 emissions and retail electricity sales. This may reflect the fact that the marginal change in emissions due to reduced electricity consumption is different from the average emissions per kWh over the course of a year.

Other reports include detailed listings of solar installations and programs as of 2012, which included 38,484 kilowatts (kW) of solar capacity, including:

- 30,000 kW of utility-scale solar panels at Austin Energy's Webberville solar facility;
- 6,417 kW of residential solar installations;
- 1,511 kW of commercial solar installations;
- 441 of municipal solar installations; and
- 114 kW of school solar power installations.

Assuming a 20% capacity factor, these installations should have reduced about 21 tpy of NO_X emissions from EGUs.

3.4.3 Overview of Other Data Reported

As part of their 2015 reports, CAC members had the option of reporting highly detailed operational data that could be used to refine the estimated emissions impact from the operations. Due to the quantity of data points reported and the somewhat spotty coverage of some of the individual data elements, it is difficult to draw broad conclusions from the data that were reported. However, CAPCOG does intend to use the data for improving the quantification of emissions impacts and emission reduction efforts as part of its 2016-2017 work plan.

Data reported included:

- Detailed employee commuting & parking data:
  - Avg. commute distance;
  - Percentage of employees who commute by driving alone;
  - Percentages of employees who commute by alternative modes;
  - Percentages of employees who work a traditional 8 am – 5 pm M-F schedule;
  - Percentages of employees who work flex schedules or compressed work week schedules;
  - Data on subsidized transit passes;
  - Data on parking spaces - Number shaded, number reserved for electric vehicles, number reserved for carpool/vanpool, etc.
- Detailed fuel consumption data:
  - Percentages of fuels used in on-road vehicles;
  - Percentages of fuels used in non-road equipment;
  - Percentages of fuels used in stationary equipment;
  - Quantities of fuels dispensed;
  - Use of vapor recovery on pumps;
- Detailed data on backup generators & other electricity data::
  - Number of generators owned/operated;
  - Total number of hours generators operated;
  - Time & day of the week generators are tested;
  - Quantity of solar-power electricity generated;
  - Quantity of renewable energy purchased;
- Detailed fleet data:
  - Number of vehicles and pieces of non-road purchased;
  - Number of alternative-fueled vehicles and non-road equipment purchased;
  - Number of low-emission vehicles purchased;
- Data on landscaping and construction contracts & operations:
  - Acres landscaped through contracts;
  - Data on road construction projects underway in 2015;
  - Quantity of asphalt consumed;
  - Quantity of road striping material consumed;
  - Lane-miles of unpaved roads that were paved in 2015;
- Other data:
  - Number of visitors per day;
  - Number of delivery trucks per day;
  - Number of trees planted; and
  - Number of trees maintained.

The data that were reported are included in the supplemental spreadsheet that accompanies this report.

3.5 Summary of Regional Emissions Data & Contribution from CAC Members

This report is one of the first efforts in the past 10 years to develop actual estimates of the CAC members' own contribution to regional or statewide NO_X emissions. With the exception of the point source emissions estimates, the NO_X emissions impacts estimates for CAC operations and CAC-owned utilities should be considered generally indicative of the relative importance of different types of activities on each organization's impact on O_3 formation, but should not be considered precise estimates at this stage. For example, the estimated emissions impact from employee commuting for each organization is based on region-wide averages for commuting distance and the percentage of employees who commute by driving alone and by carpool/vanpool, but do not incorporate any of the more detailed, member-specific data reported under the "low-priority data" section due time and resource constraints.

There are also some challenges with interpreting the emissions impacts associated with electricity consumption. The nature of electricity generation, transmission, and distribution, makes it impossible to assign emissions from a particular power plant or set of power plants to a specific community's electricity consumption with any degree of confidence. Therefore, the NO_X emissions impacts estimated reflect the total NO_X emissions from power plants across the state attributable to electricity consumption within the Austin-Round Rock MSA, but it is not possible to say exactly how much of those NO_X emissions were accounted for by local power plants. This also creates challenges with double-counting – the City of Austin owns fossil-fuel power plants, sells electricity it purchases from the grid to customers within its service area, and consumes electricity in its own right. Each of these aspects of the City's operations contributes to NO_X emissions and O_3 formation in the region, but it is not easy to discern with any precision how to avoid double-counting the emissions impacts among these activities.

Similarly, interpreting the emissions impact due to water consumption poses a challenge in terms of double-counting emissions impacts. Cities with municipal water and wastewater utilities are simultaneously (1) consuming electricity for their water/wastewater utilities, (2) consuming electricity for other purposes, (3) supplying other CAC members with water and wastewater services, and (4) consuming water and generating wastewater in their own right. CAPCOG attempted to avoid double-counting to some extent by subtracting the estimated electricity usage attributable to each city's water consumption from that city's electricity consumption total if it had a water/wastewater utility. However, CAPCOG's estimates of the emissions attributable to, say, Travis County's water consumption or Williamson County's water consumption do somewhat overlap with the estimate of the emissions attributable to the electricity consumption reported by cities in Travis County and Williamson County insofar as they are supplying buildings owned by Travis County and Williamson County with water and wastewater services. However, this slight double-counting does not significantly affect the overall picture that this analysis paints.

It is also important to note that the NO_X impact does not translate directly into an O_3 impact – NO_X emissions from point sources in Fayette and Llano Counties may be higher, but their combined O_3 impact on monitors in the Austin area are much lower than point sources within the MSA that have lower NO_X emissions. The table below identifies whether the emissions impact is direct or indirect and identifies the geographic area of the estimated impact. An impact is considered "direct" if the emissions are being generated from equipment directly under the control of a CAC member, such as Austin Energy and LCRA power plants, or vehicles owned by TxDOT. An impact is considered "indirect" if the emissions associated with that activity are not necessarily directly under the control of the CAC member, such as emissions attributable to electricity or water consumption, or employee commuting.

Table 12. Review of NO_X Emissions Impacts from CAC Member Activities

Activity	NO_X Impact, 2015 (tpy)	Direct or Indirect Impact	Geographic Area of NO_X Impact
Operation of Point Sources in Bastrop, Hays, and Travis Counties by CAC Members	3,237	Direct	Austin-Round Rock MSA
Engine Fuel Consumption in Vehicles and Equipment Owned by CAC Members	595	Direct	Austin-Round Rock MSA
CAC Member Employee Commuting	83	Indirect	Austin-Round Rock MSA
CAC Member Natural Gas Fuel Combustion	10	Direct	Austin-Round Rock MSA
Operation of Point Sources in Llano and Fayette Counties by CAC Members	5,124	Direct	Adjacent Counties
Retail Electricity Sales by CAC Municipally-Owned Utilities	4,234	Indirect	Statewide
Electricity and Water Consumption by CAC Members	310	Indirect	Statewide

This analysis suggests that CAC members have a direct or indirect influence impact on at least 13% of the locally generated NO_X emissions associated with the activities described above, which translates into a contribution of approximately 1 ppb to local peak O_3 levels.

This analysis also suggests that the largest opportunities for CAC members to reduce their impact on local O_3 levels may be through electricity conservation, water conservation, and fleet management practices, rather than efforts to shift commuting behavior.

4 Implementation of O_3 Advance Program Action Plan Measures

This section includes information on the implementation of measures designed to support the OAP Action Plan's goals in 2015. These measures can be categorized as following:

- **Measures that reduce the emission rates for emissions-generating activities**:
    - Ex 1: The vehicle emissions inspection and maintenance (I/M) program in Travis and Williamson Counties reduces the NO_X, VOC, and CO emissions rates (grams per mile or per brake horsepower-hour (bhp-hr)) of gasoline-powered on-road vehicles by ensuring that pollution control systems are properly maintained;
    - Ex 2: The Diesel Emission Reduction Incentive (DERI) grant program administered by TCEQ reduces the NO_X emissions rates from diesel-powered vehicles and equipment by replacing or repowering older, dirtier engines with newer, cleaner engines; and
    - Ex 3: Traffic flow improvements can reduce NO_X, VOC, and CO emissions rates from on-road sources by reducing idling time and ensuring that vehicles operate closer to their optimal speed.
- **Measures that reduce the underlying emissions-generating activities**:
    - Ex 1: Telecommuting once a week reduces commute-related activity by 20%;
    - Ex 2: Planning measures designed to promote walking/biking reduces vehicle miles traveled (VMT) for commuting and other activities;
    - Ex 3: Energy conservation and renewable energy efforts reduce the need to generate electricity from fossil fuel power plants and therefore avoid the emissions they would produce; and
    - Ex 4: Water conservation reduces the demand for electricity, which in turn reduces emissions from power plants.
- **Measures that change the timing of emissions**:
    - Ex 1: Rescheduling backup generator testing when an O_3 Action Day is declared;
    - Ex 2: "Load-shifting" to avoid the need to generate electricity at peak hours;
    - Ex 3: Waiting until after 6 pm to mow the lawn;
- **Measures that help sensitive populations avoid high O3 levels when they occur**:
    - Ex 1: Education the public and employees about the health hazards of O_3 exposure for sensitive populations;
    - Ex 2: Work with schools, health professionals, and senior care-takers to ensure that they are receiving air quality forecasts and know what actions to take to protect sensitive populations when O_3 levels are forecast to be high.

This section provides details about measures that were implemented within the Austin-Round Rock MSA that required some degree of participation/action on the part of CAC members and people within the community. For instance, the I/M program is administered by the state, but it requires local residents to bring their vehicles in to be tested and pay for repairs, so the success of the program is dependent to some degree on local participation and compliance. Likewise, while the TERP grant programs are also administered by the state, local businesses need to actually apply for and be awarded grants in order for the region to realize emission reduction benefits from the program.

In contrast, emissions reductions achieved through other state or federal rules or programs may not require much in the way of active compliance or participation from individuals or organizations within the region. For example, the state's Texas Low-Emission Diesel (TxLED) program, which achieves a 5-6% reduction in NO_X emissions in the eastern part of the state from diesel-powered vehicles and equipment through fuel content standards, is not a program that requires active participation from the local community in order for the emission reductions to occur. Similarly, any emission reductions from the EPA's mobile source engine standards or new source performance standards would only be considered a "local" or "regional" action if organizations or individuals in the region accelerated the turnover/replacement of older equipment with newer equipment in order to reduce emissions faster than they would otherwise occur.

In short, since this is a report on the region's OAP *Action* Plan, it is mainly concerned with *actions* taken specifically in this region to support the plan's goals.

While many of the measures implemented in the region have not been quantified for their emission reduction impact, the more significant ones have been, and two of the more significant measures have actually been directly modeled in order to understand their specific O_3 reduction impact. **CAPCOG estimates that combined emission reductions from the several of the programs that were quantified (I/M, DACM, TERP, Texas Lehigh's NO_X reduction efforts) were able to reduce peak 8-hour O3 levels in 2015 by about 0.8 – 1.4 ppb**. This accounts for a large share of the 2.7 ppb difference between the current O_3 levels in the region, which are attaining the 2015 O_3 NAAQS, and a 71 ppb design value for 2013-2015, which would be considered in violation of the O_3 NAAQS. While it is not known exactly how much the remaining measures that are being implemented in the region are contributing to this difference, it is safe to say that the region's O_3 reduction efforts had a "significant" impact on regional O_3 levels, based on EPA's threshold for an air quality impact to be considered "significant" for interstate air quality transport analysis (1% of the NAAQS).

4.1 Regional Measures & State Programs

A number of measures that are implemented on a regional basis or are implemented or managed by the state are a key part of the region's success in achieving O_3 levels that are in attainment of the new 2015 O_3 NAAQS. These measures include:

- Texas Emission Reduction Plan (TERP) Grants
- The Vehicle Emissions Inspection and Maintenance (I/M) Program in Travis and Williamson Counties;
- The Drive a Clean Machine (DACM) Program in Travis and Williamson Counties;
- The Commute Solutions Program managed by CAMPO;
- The CAPP, managed by CAF;
- The local Clean Cities Program managed by the LCSFA; and
- Regional Air Quality Outreach and Education efforts coordinated by CAPCOG.

This section provides details on each of these measures & programs.

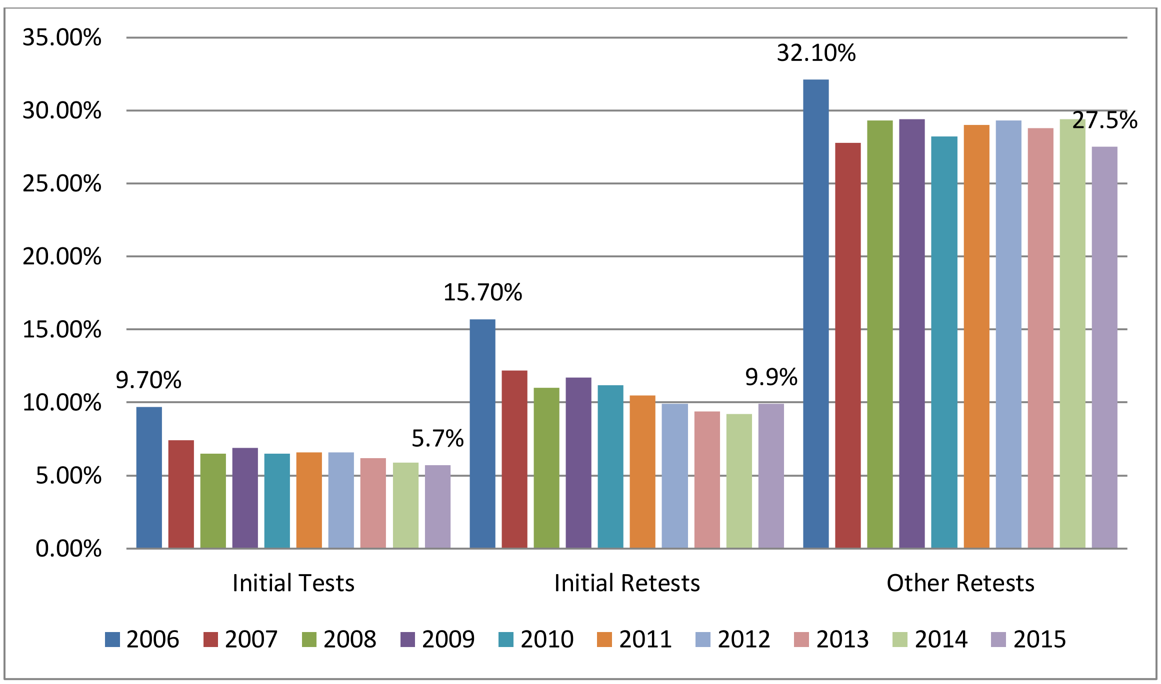
4.1.1 Vehicle Emissions Inspection and Maintenance Program

Travis and Williamson Counties are the largest and 2nd largest counties in the country that have a vehicle emissions inspection and maintenance that have not been designated nonattainment.[17]

Under the program, all gasoline-powered vehicles, other than motorcycles, in Travis and Williamson Counties that are 2 or more years old and less than 25 years old are required to pass annual vehicle emissions inspection in addition to the annual safety inspection. Model year 1995 and older vehicles must pass a two-speed idle (TSI) test, and model year 1996 and newer vehicles must pass an on-board diagnostic (OBD) test. If the vehicle does not pass the initial test, the owner must make repairs and get the vehicle re-tested until it passes.

In 2015, there were a total of 903,772 vehicle emissions tests performed in Travis and Williamson Counties, including 880,085 OBD tests and 23,687 TSI tests. The following figure shows the failure rates from 2006-2015 by test type. As the figure shows, failure rates have declined significantly over this period. The 9.7% initial failure rate in 2006 largely reflected the fact that 2006 was the first year of the program – the 5.7% initial failure rate in 2015 is 41% lower. Similar trends are apparent in the decline in the failure rates for subsequent re-tests.

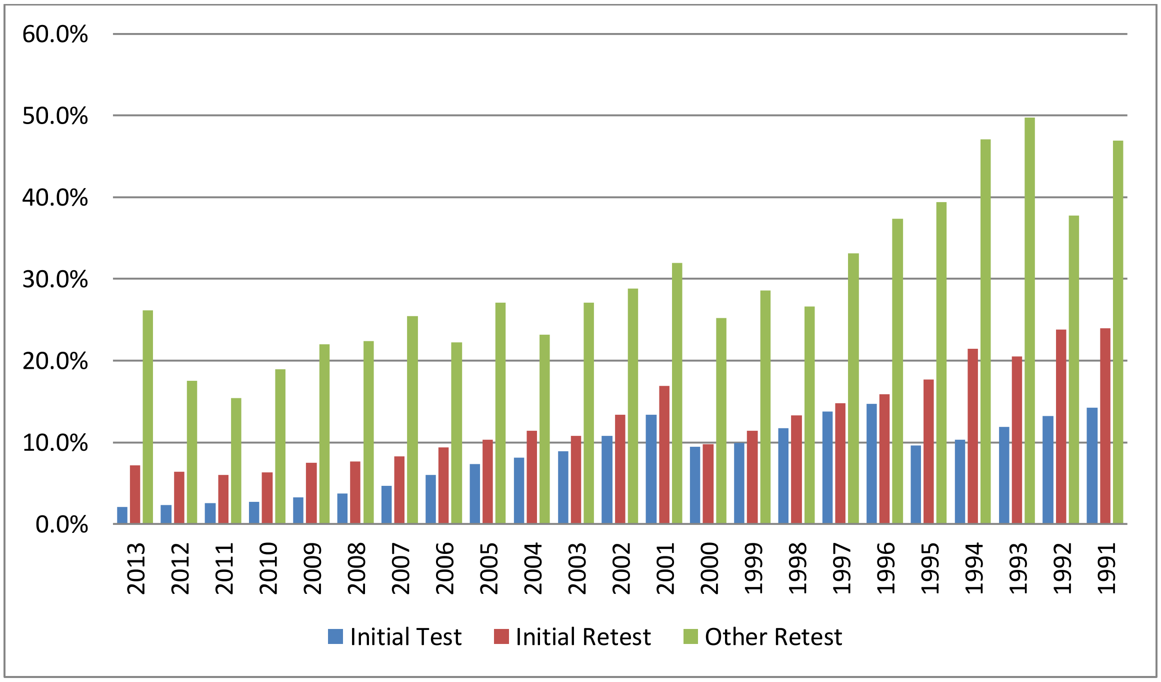
Figure 13. Test Failure Rates by Year



[17] Based on whether a state submitted I-M information for the county in the 2011 NEI and 2015 county population data from the U.S. Census. There are a total of 397 counties that had I-M program data in the 2011 NEI, only 36 of which had not previously been designated nonattainment for any criteria pollutant, based on CAPCOG's review of EPA's "Greenbook" for nonattainment areas. The next-largest county in terms of population was Cumberland County in North Carolina with 323,838 people.

The following figure shows the failure rate by model year for all tests completed in 2015. As the figure shows, vehicles are significantly more likely to fail a test the older they are. The highest initial failure rate for any model year was 14.7% for model year 1996 vehicles.

Figure 14. Failure Rate by Test Type and Model Year

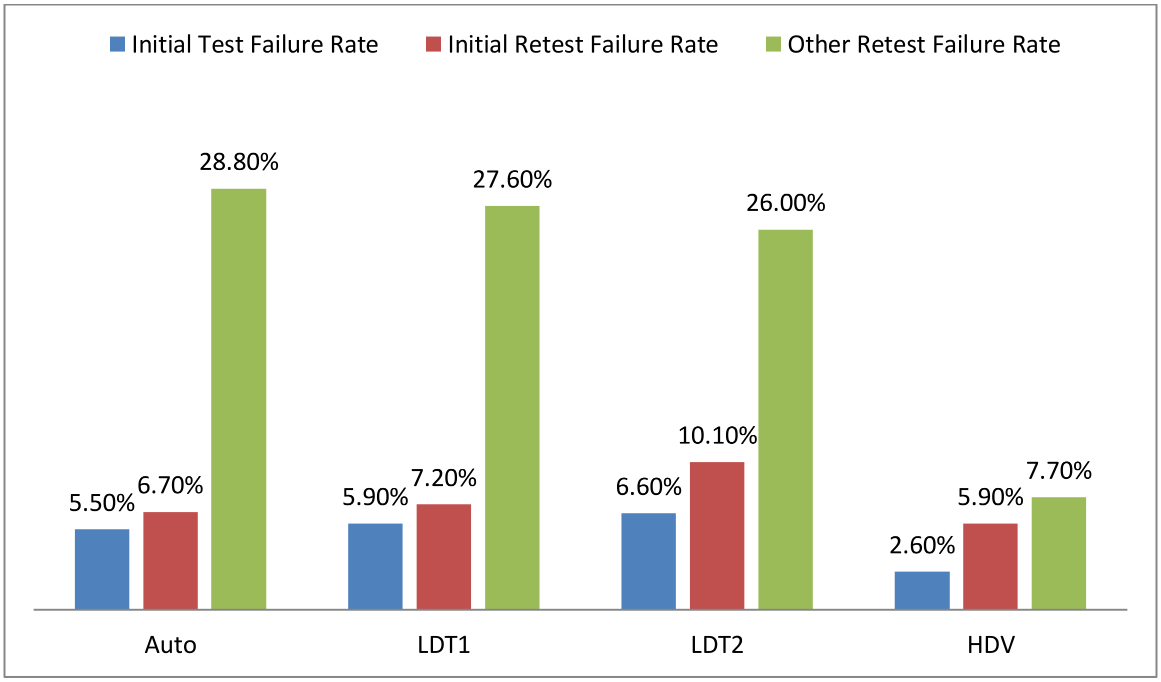


The total number of initial tests breaks down by vehicle type as follows:

- Passenger Cars: 419,332 initial tests
- Light Duty Trucks 1 (<6,000 lbs GVWR): 226,493 initial tests
- Light Duty Trucks 2 (6,001 – 10,000 lbs GVWR): 182,858 initial tests
- Heavy Duty Trucks (>10,000 lbs GVWR): 21,002 initial tests

The following figure shows the initial failure rate by vehicle type for all four categories of vehicles. Heavy-duty vehicles had the lowest failure rates of any of the vehicle classes.

Figure 15. Initial Test Failure Rate by Vehicle Type



Motorists are eligible for waivers under certain circumstances, such as:

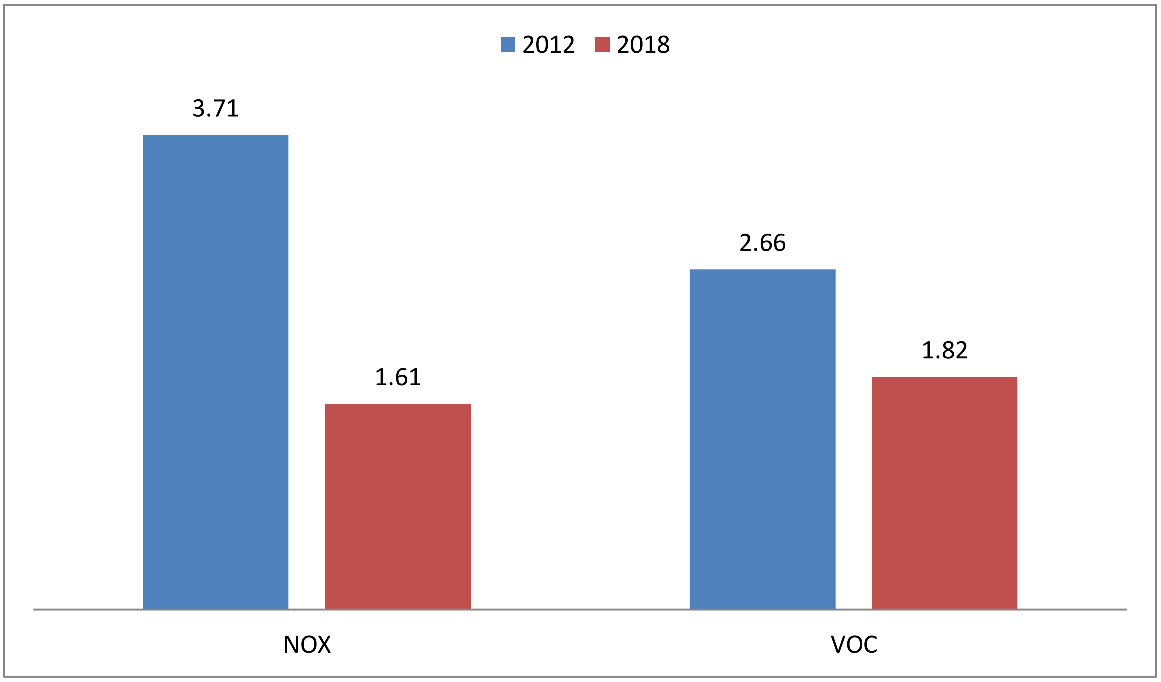
1. An "individual vehicle waiver" if the motorist has spent at least $600 to make repairs;
2. A "low mileage waiver" if a vehicle is driven less than 5,000 miles and the motorist has spent at least $100 on repairs;
3. A "low income time extension" provides a 1-year extension if the motorist has income below the federal poverty line; and
4. A "parts availability time extension."

Waivers are rarely used in Travis and Williamson Counties. In 2015, out of 47,756 vehicles that failed an emissions test, only 19 received any type of waiver, making the waiver rate only 0.04%.

In a research project last year, ERG estimates that the program achieved about an 11-12% reduction in NO_X emissions, a 11-13% reduction in VOC emissions, and a 13-14% reduction in CO emissions from gasoline-powered light-duty vehicles. Based on an interpolation of ERG's estimates, the program achieved about 2.2-2.6 tpd of NO_X reductions, and about 2.0 – 2.4 tpd of VOC reductions in 2015.[18]

[18] http://www.capcog.org/documents/airquality/reports/2015/Austin_Area_I-M_Benefit_Analysis_2015_revised_2015_12_16.pdf

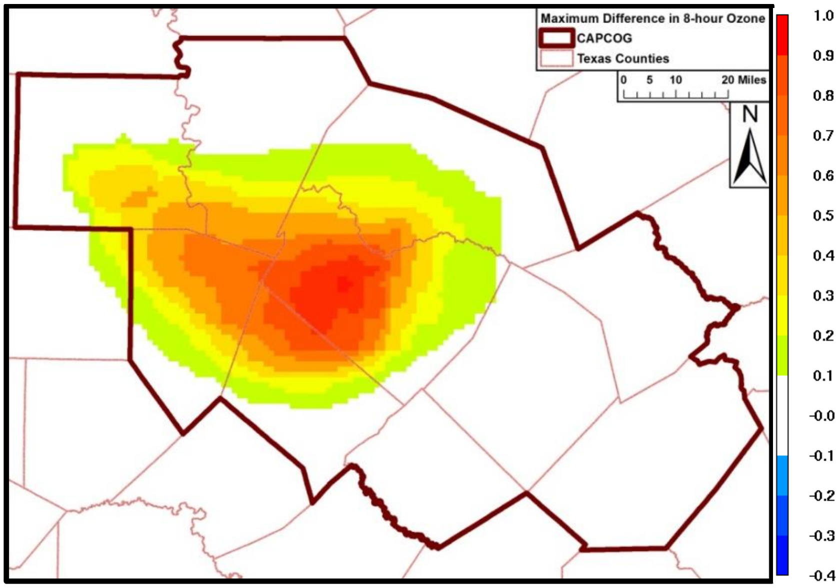
Figure 16. Estimated OSD NO_X and VOC emission reductions from I/M program in 2012 and 2018 (tpd)



In 2015, CAPCOG contracted with the Alamo Area Council of Governments (AACOG) to model the O_3 reduction benefit associated with the program's 2012 emission reductions.[19] Since the I/M program was already in effect in 2012, it was necessary to model the increase in O_3 that would have occurred if the I/M program hadn't been in place. The figure below shows a map of the impact on peak 8-hour O_3 on one of the days modeled.

[19] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf

Figure 17. Example of Modeled Change in 8-Hour O_3 Concentrations when I/M Program Removed, 2012 (June 8)



The following table shows the average O_3 reduction benefits modeled at each of TCEQ's and CAPCOG's current O_3 monitoring locations within the MSA for different subsets of days analyzed.

Table 13. Average modeled peak 8-hour O3 change and NO_X sensitivities for I-M program

Monitor	Avg. O_3 Change All Days (ppb)	Avg. Change Top 4 Days (ppb)	Max Change (ppb)	Min Change (ppb)	Sensitivity All Days (ppb/tpd NO_X)	Sensitivity Top 4 Days (ppb/tpd NO_X)
C3	0.50	0.86	1.11	0.11	0.16	0.27
C38	0.55	0.63	0.85	0.26	0.17	0.19
C614	0.38	0.87	1.17	0.00	0.12	0.27
C684	0.06	0.16	0.44	-0.01	0.02	0.05
C690	0.39	0.58	0.70	0.01	0.12	0.18
C1603	0.47	0.91	1.17	-0.01	0.15	0.28
C1604	0.03	0.00	0.39	-0.01	0.01	0.00
C1675	0.13	0.36	0.80	-0.01	0.04	0.11
C6602	0.32	0.39	0.74	0.00	0.10	0.13

The analysis shows that the program achieves a higher degree of O_3 reduction per tpd of NO_X reduced than a broad, across-the-board reduction in NO_X would achieve. At CAMS 3, for instance, the ratio for the I/M program was 0.27 ppb/tpd NO_X on the four highest days modeled, whereas it was 0.10 ppb/tpd NO_X for an across-the-board cut in emissions across the MSA. Based on this ratio and the estimated emission reductions in 2015, **the I/M program likely reduced peak 8-hour O_3 concentrations at the two regulatory monitors by about 0.4 – 0.7 ppb**.

4.1.2 Texas Emission Reduction Plan Grants

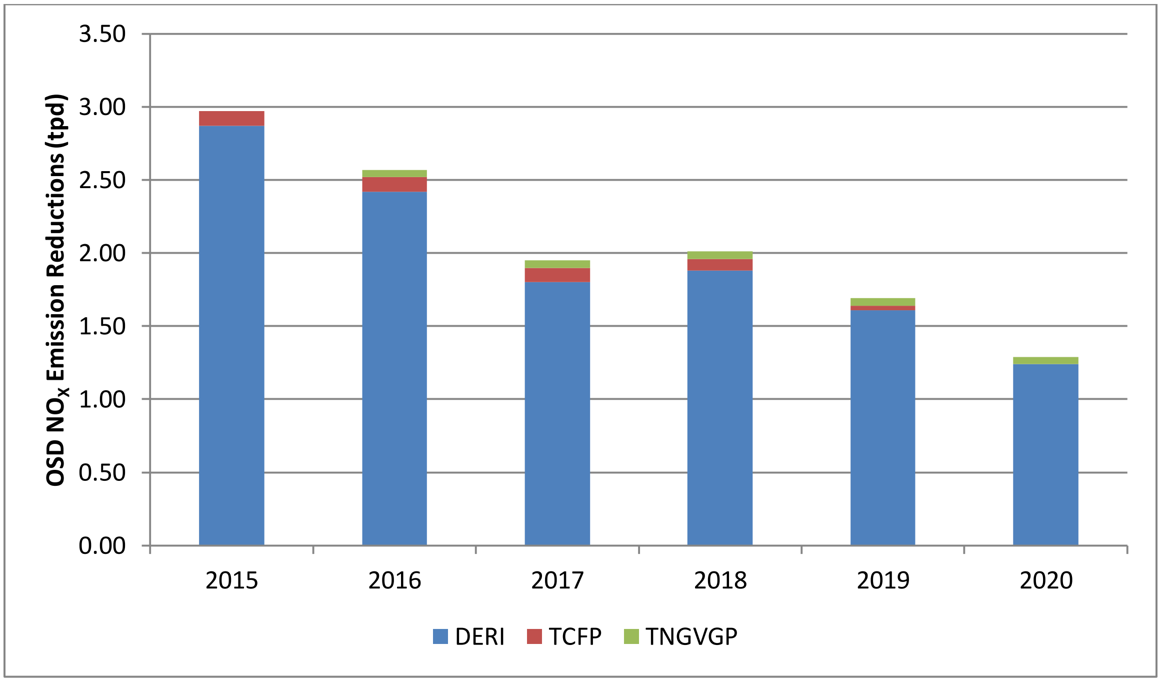
Texas Emission Reduction Plan (TERP) grants provide incentives to reduce NO_X emissions, primarily through the replacement of older diesel-powered vehicles and equipment with newer vehicles and equipment that meet more stringent NO_X emissions standards. In 2015, TERP grants available to the Austin-Round Rock MSA included:

- Diesel Emission Reduction Incentive (DERI) grants, which include the competitive Emission Reduction Incentive Grant (ERIG) program and rebate grants;
- The Texas Clean Fleet Program (TCFP);
- The Texas Natural Gas Vehicle Grant Program (TNGVGP);
- The Clean Transportation Triangle (CTT) grant program;
- New Technology Implementation Grant (NTIG) program;
- The Texas Clean School bus Program; and
- The Light-Duty Motor Vehicle Purchase or Lease Incentive (LDPLI) program.

TCEQ's TERP reports provide estimates of the NO_X emission reductions that the DERI, TCFP, and TNGVGP programs are achieving in each area of the state.[20] The total estimated O_3 season weekday NO_X reductions from active projects as of August 31, 2015, from the DERI, TCFP, and TNGVGP programs was 2.97 tpd, making TERP grants the largest source of NO_X emission reductions in the Austin-Round Rock MSA's OAP Action Plan. The following chart shows the average O_3 season day (OSD) NO_X emissions reductions that TCEQ estimates the projects that were active as of August 31, 2015, achieved in 2015 in the Austin-Round Rock MSA, and each year out to 2020.

[20] https://www.tceq.texas.gov/airquality/terp/leg.html

Figure 18. NO_X Emission Reductions from DERI, TCFP, and TNGVGP Projects Active in the Austin-Round Rock MSA as of August 31, 2015

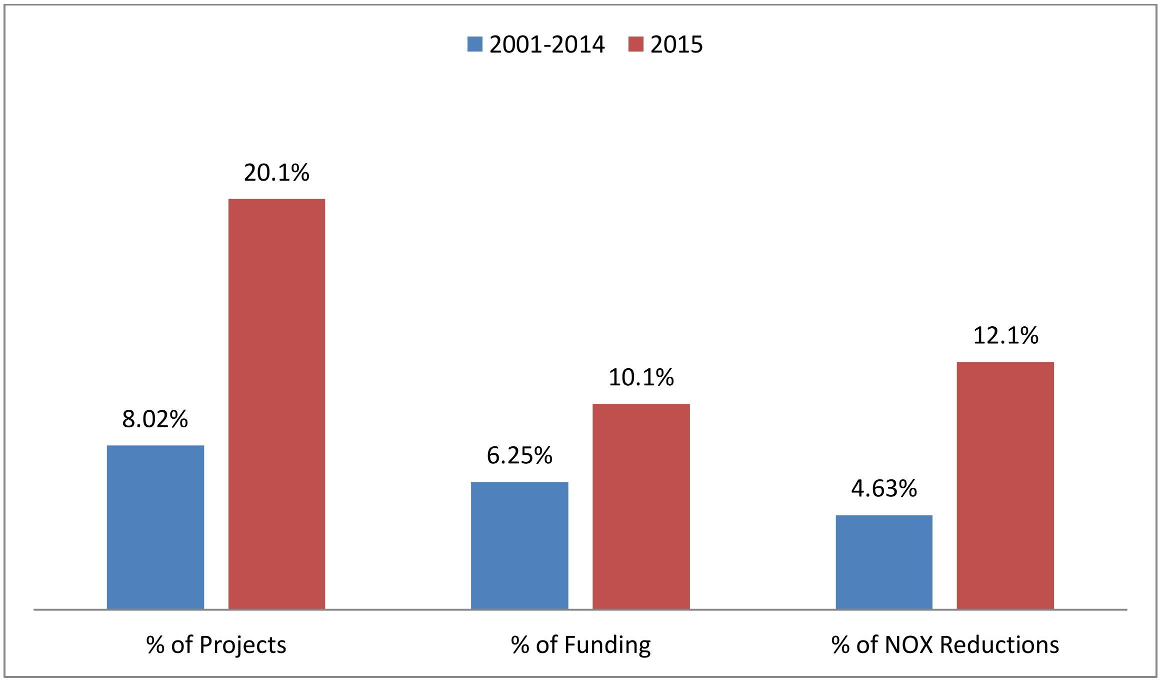


Based on a modeling analysis conducted by CAPCOG in 2015, the general ratio of NO_X emission reductions in the Austin-Round Rock MSA to reductions in peak 8-hour O_3 concentrations at CAMS 3 and 38 are 0.10 ppb/tpd NO_X and 0.09 ppb/tpd NO_X, respectively.[21] This means that **the 2.97 tpd of NO_X reductions from TERP grants in 2015 translates into about a 0.3 ppb reduction in peak 8-hour O_3 concentrations**.

In 2015, 79 projects (20% of the total) that TCEQ awarded funding to under the Emission Reduction Incentive Grant (ERIG) program were based primarily in the Austin-Round Rock MSA for a total of $7,700,029 in funding (12.1% of all funding awarded) to reduce 860.33 tons of NO_X emissions (10.1% of total NO_X reductions funded). This was a large jump in both the absolute funding for this grant program since the prior grant round during the 2012-2013 biennium, but it was also a big jump in the Austin-Round Rock area's share of funding and emission reductions. The figure below shows a comparison of the region's share of projects, funding, and NO_X reductions through August 2014 compared to the funding awarded in 2015.

[21] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf

Figure 19. Comparison of Austin-Round Rock MSA Share of TERP ERIG Projects, 2001-2014 to 2015



Between May 2014 and April 2015, there was also a total of $795,625 awarded under the LDPLI program for 349 projects to fund the purchase of light-duty vehicles powered by CNG, LPG, or electricity, with the Austin-Round Rock MSA as the primary area of use. This represented about 17% of all funds awarded statewide through this program. Although TCEQ did not calculate the emission reductions from these grants, CAPCOG estimated the emission reductions by looking up each new vehicles emissions certification level at www.fueleconomy.gov, comparing it to the NO_X standard for a Tier 2, bin 5 vehicle (0.07 grams of NO_X per mile traveled), and multiplying that difference by 120,000 miles, which EPA considers the useful life of a vehicle for regulatory purposes. CAPCOG estimates that these projects will yield approximately 2.71 tons of NO_X emission reductions over their lives compared to the NO_X emissions from a Tier 2, bin 5 vehicle over that same period of time. This translates into approximately $293,000 per ton of NO_X reduced, almost 30 times higher than the cost per ton reduced from the latest round of ERIG grants. Since the LDPLI program was not renewed by the Texas Legislature in the 84th Legislative Session in 2015, it expired on August 31, 2015.

No new projects were funded in the Austin-Round Rock MSA in 2015 under the CTT program, which funds CNG and LNG fueling infrastructure. Two stations in the region previously received a total of $800,000 in funding in 2014 – one in Hays County, one in Travis County.

There was one NTIG project funded in the Austin-Round Rock MSA in 2015: a $1 million grant to Austin Energy for electricity storage related to solar photovoltaic power.[22] This project involved six lithium-ion battery modules providing 1.5 MW of electric output and storing up to 3 MW-hrs of electricity from

[22] https://www.tceq.texas.gov/airquality/terp/ntig-fiscal-2014-15-applicants

solar photovoltaic power. Based on the highest hourly NO_X emissions rates from the Decker Creek Power Plant's two boilers in 2015 (3.6 lbs of NO_X per MW-hr of electricity generated, based on EPA's Air Markets Data Program for 2015), this project has the potential to reduce as much as 11 pounds of NO_X per day (0.005 tpd) from peaker plants in the region.

4.1.3 Drive a Clean Machine Program

The Drive a Clean Machine (DACM) program reduces O_3 -forming emissions from gasoline-powered personal vehicles by:

1. Replacing vehicles 10+ years old with newer vehicles (up to three years old) that meet more stringent emissions standards (up to $3,500 available);
2. Replacing vehicles that have failed an emissions test with a new vehicle (up to three years old) with a lower emissions rate that is less likely to fail an emissions test (up to $3,500 available); and
3. Repairing vehicles that have failed an emissions test (up to $600 in financial assistance available).

The program is only eligible in counties that have I/M programs that opt into the program, including both Travis and Williamson Counties, and the program is financed through a $2 add-on fee to emissions tests. The following table summarizes the total number of replacement and repair vouchers redeemed in each county in 2015.

Table 14. Drive a Clean Machine Statistics for 2015

Statistic	Travis	Williamson	Total
Repair Vouchers Redeemed	264	47	311
Replacement Vouchers Redeemed	131	46	177
Total Vouchers Redeemed	395	93	488
Value of Repair Vouchers	$158,833	$20,428	$179,261
Value of Replacement Vouchers	$394,500	$141,500	$536,000
Total Value of Vouchers Redeemed	$553,333	$161,928	$715,261

4.1.4 Commute Solutions Program

Commuting is one of the largest sources of NO_X emissions in the region. On an average O_3 season weekday, commuting accounts for about 10 tpd of NO_X emissions, about 11% of the region's total.

One of the Regional Measures in the OAP Action Plan is the "Commute Solutions" Program administered by CAMPO. The program offers information and resources on alternative commuting options such as carpools, vanpools, transit, bicycling, and walking, as well as work schedule alternatives such as flex schedules, compressed work weeks, and teleworking. The Commute Solutions website (www.CommuteSolutions.com) serves as a "one-stop shop" for regional commute resources.

One of the key components of the Commute Solutions program is its regional trip-planning and ridesharing system *MyCommuteSolutions* (www.mycommutesolutions.com). The system supports both ridesharing and trip-planning, in addition to enabling users to find a carpool match, it can also be used by carpoolers, vanpoolers, bicyclists, walkers, teleworkers, and transit users to log and track their commutes. MyCommuteSolutions offers organizations the opportunity to set up custom sub-sites specific to their organizations within the MyCommuteSolutions.com website. Each employer can use the existing framework to set up their own in-house ridesharing and trip planning sub-sites branded with the look and feel of their company. They can manage incentives, collect data, and promote the program to suit their needs.

In 2015, CAPCOG, in collaboration with other CAC members, created a CAC-specific custom subsite that included any organization participating in the CAC. As of May 23, 2016, there were 720 users registered on CAC's custom sub-site, making up 25% of the site's 2,936 registered users as of this date. This site incorporated the custom sub-sites previously administered by the City of Austin and Travis County, so the vast majority of users are from those two organizations. While it was made available to other CAC members and promoted by CAPCOG, there are only a handful of users from other organizations, as the table below shows. Overall, about 2.27% of employees among all CAC members are registered on the site.

Table 15. Active MyCommuteSolutions Users Among CAC Members

Organization	MyCommuteSolutions.Com CAC Custom Subsite Users, May 23, 2016	Number of Employees, 2015	% of Employees Registered
Bastrop County	2	446	0.45%
CAPCOG	8	63	12.70%
City of Austin	475	11,957	3.97%
City of Bastrop	1	120	0.83%
City of Georgetown	1	661	0.15%
Hays County	1	781	0.13%
Travis County	231	5,100	4.53%
Williamson County	1	1,700	0.06%
Other CAC Members	0	10,947	0.00%
TOTAL	**720**	**31,775**	**2.27%**

In 2015, CAC member employees who logged their commutes on the MyCommuteSolutions.com website reported 155,849 vehicle commuting miles saved in 2015, translating into 164.89 pounds of NO_X reduced.

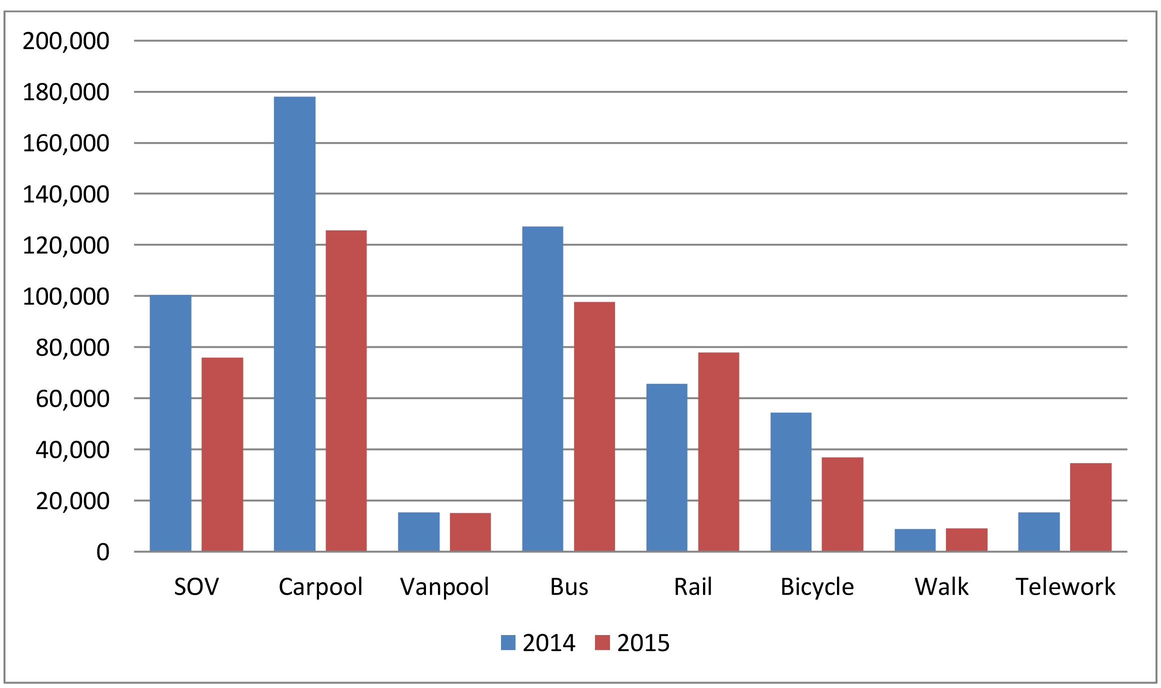
Table 16. CAC Member MyCommuteSolutions Commuting Data, 2015

Mode/Activity	Commute Distance Miles	Avg. Vehicles / Employee / Day for Commuting Mode	Passenger Car and Truck Commute VMT	VMT Difference	NO_X Difference (lbs)
Carpool Driver	17,384	0.46	7,997	-9,387	-9.93
Carpool Passenger	11,652	0.46	5,360	-6,292	-6.66
Vanpool Driver	3,504	0.17	596	-2,908	-3.08
Vanpool Passenger	5,916	0.17	1,006	-4,910	-5.20
Bus	49,181	0.00	0	-49,181	-52.03
Rail	45,708	0.00	0	-45,708	-48.36
Bicycle	19,049	0.00	0	-19,049	-20.15
Walk	3,361	0.00	0	-3,631	-3.84
Telework	14,782	0.00	0	-14,782	-15.64
Total	**170,807**	**0.81**	**46,284**	**-155,849**	**-164.89**

The CAC users of MyCommuteSolutions accounted for 51% of the passenger car and truck VMT reduced among all users, and about 46% of the NO_X emission reductions associated with the alternative commutes logged on MyCommuteSolutions.com.

There was actually a 16% decrease in the total VMT logged on the site between 2014 and 2015, and a 14% decrease in alternative commutes

Figure 20. MyCommuteSolutions.com Commute VMT Logged, 2014-2015



Overall, the U.S. Census Bureau's 2010-2014 American Community Survey (ACS) data show that the Austin-Round Rock MSA has the lowest percentage of workers who primarily commute by driving alone of any metro area in the state. The following table summarizes how the Austin-Round Rock's data compare to the other 24 MSAs in the state.

Table 17. ACS 2010-2014 Data on Commuting by Mode in Texas Metro Areas

Mode	Austin-Round Rock MSA	Austin-Round Rock MSA Rank	Texas Metro Min.	Texas Metro Avg.	Texas Metro Max.
Drove Alone	76.02%	25/25	76.02%	80.03%	85.91%
Carpool/Vanpool	10.54%	18/25	8.26%	10.78%	14.80%
Worked at Home	6.90%	1/25	1.86%	4.11%	6.90%
Public Transportation	2.41%	2/25	0.20%	1.72%	2.54%
Walked	1.85%	11/25	0.80%	1.56%	5.71%
Bicycle	0.81%	2/25	0.03%	0.28%	1.59%
Motorcycle	0.37%	2/25	0.05%	0.22%	0.42%
Taxicab	0.05%	11/25	0.00%	0.05%	0.14%
Other Means	1.06%	11/25	0.23%	1.25%	4.05%

As the table shows, the Austin-Round Rock MSA has the state's highest percentage of workers who work from home, and the 2nd-highest percentages of workers who commute by public transportation, by bike, and by motorcycle. While the percentage of workers who walk to work in the Austin-Round Rock MSA is higher than the percentage of all workers in Texas MSAs, the MSA ranks 11th among metro areas in this metric, and it actually has slightly lower-than-average percentages of workers who commute by vanpool/carpool and by other means. So, while carpooling/vanpooling is the mode of transportation most likely to be used in the Austin-Round Rock MSA and every other MSA in the state, the Austin-Round Rock MSA's lower percentage of driving alone than the rest of the state is driven by the modes of transportation in which the region clearly leads on – working from home, public transit, biking, and motorcycling.

4.1.5 Clean Air Partners Program

The CAPP is a nationally recognized, voluntary program of CAF that encourages businesses and organizations to voluntarily reduce their O_3 -forming emissions in Central Texas by at least 10% over a three-year period. In 2015, the CAPP was awarded EPA's Clean Air Excellence Award for Community Action.

With 32 partners participating, the program aims to reduce at least 10,000 commuters from Central Texas roads through efforts such as carpooling/vanpooling, transit, teleworking, flexible schedules, and car sharing. Partners are able to customize additional strategies to achieve O_3 reductions, such as the use of green power sources, water and energy conservation, low-emission landscaping methods, clean fleet and fuel strategies, and other proactive measures that lead to cleaner air. The program includes the participation of over 100,000 employees in Central Texas.

While there are some organizations that are also CAC members, most organizations in the CAPP are not. The following table lists the current members of the program and indicates whether they are currently CAC members or not.

Table 18. Clean Air Partners

Organization Name	Type of Organization	CAC Member?
3M	Business	No
Applied Materials, Inc.	Business	No
Chemical Logic, Inc.	Business	No
Emerson Process Management	Business	No
EnviroMedia Social Marketing	Business	No
Farmer's Insurance	Business	No
Freescale Semiconductor	Business	No
HNTB Corporation	Business	No
Hospira, Inc.	Business	No
Metropia	Business	No
Oracle	Business	No
R&R Limousine & Bus	Business	No
Samsung	Business	No
St. David's Healthcare Partnership	Business	No
TECO-Westinghouse	Business	No
Tokyo Electron (TEL)	Business	No
Zephyr Environmental Corporation	Business	No
American Lung Association	Non-Profit	No
Austin Chamber of Commerce	Non-Profit	No
Environmental Defense Fund	Non-Profit	No
LSCFA	Non-Profit	Yes
Austin Community College District	Education	No
Austin Independent School District	Education	No
The University of Texas at Austin	Education	No
CAPCOG	Government	Yes
CAMPO	Government	Yes
CapMetro	Government	Yes
CTRMA	Government	Yes
City of Austin	Government	Yes
LCRA	Government	Yes
TxDOT-Austin District	Government	Yes
TxDOT-HQ	Government	Yes
Travis County	Government	Yes
Williamson County	Government	Yes

Clean Air Partners report their business activities each year via a user-friendly online tool that calculates their emission reductions. The 2014 Partner data reported in 2015 amounted to the reduction of 93,000 pounds of O_3 -forming emissions reduced by Partners. As a whole, the average emissions per employee across all partners was reduced by 4.05%, and the average reduction overall was 2.91%. Partners were publicly thanked by CAF and the community for their clean air efforts in a ½ page color ad in the Austin American-Statesman on October 4.

In addition to winning a Clean Air Excellence Award in 2015, the Program was also recognized by the Austin Chamber Greater Austin Business Award as a finalist in the Environmental Responsibility and Sustainability category.

On June 12, 2015, partners took a field trip to Austin-Bergstrom International Airport to learn about their sustainability efforts, and on November 12 the CAPP held their annual Partner Networking Event at the Park on South Lamar, providing partners an opportunity to meet and share ideas for reducing emissions.

In 2015, the CAPP published two newsletters, one in the spring and one in the fall, providing communication and educating Partners on topics such as: the Drive A Clean Machine Program, available TERP grants, and reminding them of low-emission landscaping practices.

More information about the program can be found on the program website at www.cleanairpartnerstx.org.

4.1.6 Clean Cities Programs

LSCFA is a non-profit organization that coordinates the regional Clean Cities programs in the Austin-Round Rock MSA, as well as in the Fort Hood and Temple areas. Here are some highlights from its 2015 report:

- LSCFA has 85 stakeholders, including 12 in the private sector;
- LSCFA's stakeholders reduced 2,380,348 gallons of gasoline equivalent:
    - 88% (2,333,006 gallons of gas equivalent) through alternative-fueled vehicles;
        - CNG: 37%
        - Propane: 35%
        - E85: 19%
        - Biodiesel: 4.7%
        - Hybrid (conventional): 3.4%
        - Plug-in Hybrid: 0.1%
        - Electric: 0.07%
    - 6.4% through off-road vehicles;
    - 3.3% from hybrid vehicles;
    - 1.4% from idle reduction;
    - 0.6% from VMT reductions; and
    - 0.1% from electric and plug-in vehicles.

According to its 2015 report, LSCFA had 85 stakeholders, including 12 private sector stakeholders.

In 2015, 1 new public CNG station and 10 new private propane stations opened in the region.

Additional information is available from LCFSA's annual report.

4.1.7 Outreach and Education Measures

CAPCOG again coordinated regional air quality outreach and education efforts in 2016, in large part thanks to funding provided by the City of Austin and Travis County to support these efforts. Highlights of the efforts from 2015 include:

- $89,715 spent on radio advertising encouraging residents to consider carpooling/vanpooling and to apply for Drive a Clean Machine (DACM) funding if they had an older vehicle;
    - A total of 744 spots were purchased on 11 stations;
    - The spots achieved an estimated 4.8 million gross impressions (GIs) within the region;
- $14,479 in one-on-one fleet outreach efforts designed to increase the amount of emission reductions by CAC members through fleet management practices and policies;
- $8,223 in expenses for other in-person outreach;
    - A number of presentations were made to CAC members, school district personnel, etc.
    - Staffing & supplying 15 outreach events that reached an estimated 3,992 persons;
- $4,050 for graphic services work;
    - Design of a new “Air Central Texas” (ACT) logo and branding;
    - Design of a school outreach flier; and
- $1,918 in incentives for logging alternative commutes on the MyCommuteSolutions.com website;
    - Two contests were run in the fall, both of which boosted participation.

A full report on these activities is available at CAPCOG’s website at http://www.capcog.org/divisions/regional-services/aq-reports.

One unique event in 2015 was a “Lunch and Learn” for local meteorologists and media on July 22 hosted by CAF and City of Austin. This event brought together all of the local meteorologists from the local TV affiliates to learn about air quality. Following the event, the meteorologists began incorporating TCEQ’s air quality forecasts into their regular weather forecasts far more frequently, and CAPCOG’s 2015 regional survey showed about a 10% increase in O_3 Action Day awareness compared to 2014 that was explainable by the increase in the number of survey respondents indicating that they knew about O_3 action days due to TV coverage.

2015 marked the 8th year of the High School Public Service Announcement (PSA) Air Quality Contest aimed at educating and engaging the youth of Central Texas in air quality related issues. Time Warner Cable was the presenting sponsor for the 2015-2016 PSA Contest and the CAF, in partnership with Samsung Austin Semiconductor, held the contest with students from all high schools in the five-county region. High School students were asked to create a 30-second PSA incorporating air quality information and tips on simple ways citizens can reduce ground-level O_3 and air pollution.

For the 2014-2015 Contest, the CAF received 15 entries and the winning first place entry went to a student at Vista Ridge High School, in the Leander Independent School District, and the second place winner was awarded to a student at Manor New Tech High School, in the Manor Independent School

District. The winners were recognized at a proclamation by the Mayor of Cedar Park and the winning PSA was aired on Time Warner Cable News in the spring.

The winning first place winner also received a 32GB Samsung Galaxy Tab and the second place winner received a 16GB Samsung Galaxy Tab, courtesy of Samsung Austin Semiconductor. The winning PSAs were posted on the CAF website and CAF You Tube channel. CAF will continue the Contest in 2016 with Time Warner Cable and Samsung Austin Semiconductor.

4.2 Organization-Specific Measures Implemented in 2015

In addition to regional measures implemented in 2015, there were a number of organization-specific measures that were implemented by CAC members. These are grouped into the following categories:

- **Commute Trip Reduction Measures**, which are measures designed to reduce emissions attributable to single-occupancy vehicle (SOV) commuting, particularly among an organization's own employees, and can be implemented by any organization;
- **Development Measures**, which are measures implemented by local governments and agencies designed to steer development in ways that reduces or minimizes poor air quality and emissions that contribute to it;
- **Energy and Resource Conservation Measures**, which are designed to reduce emissions associated with energy and resource consumption, and which can be implemented by any organization;
- **Fleet and Fuel Efficiency Measures**, which are designed to reduce the direct emissions from an organization's fleet of on-road vehicles and non-road equipment;
- **O_3 Action Day, Outreach, and Education Measures**, which are measures designed to reduce emissions during days and times that are most likely to lead to an exceedance of the O_3 NAAQS in the region, and measures designed to improve awareness among employees and the general public about O_3 and what can be done to help keep the air clean;
- **Regulation and Enforcement Measures**, which are measures designed to reduce emissions during days and times that are most likely to lead to an exceedance of the O_3 NAAQS in the region, and measures designed to improve awareness among employees and the general public about O_3 and what can be done to help keep the air clean;
- **Transportation Emission Reduction Measures (TERMs)**, which are measures designed to reduce on-road emissions through changes to the design of transportation systems, such as traffic flow improvements, bike/pedestrian projects, transit projects, and other transportation projects that can reduce emissions.

The following tables summarize each organization's reporting for 2015. The first table summarizes the information by organization, while the second table summarizes the information by measure. The tables do not include TERMs, which are reported differently. The table also includes a summary of the other high-priority operational data (# employees and quantities of electricity, natural gas, water, diesel, B20, gasoline, E85, LPG, and CNG consumed). These summaries are based on data reported by May 31, 2016.

Table 19. Annual Report Status by Organization

Organization	Report Submitted	Commitments	Commitments Reported On	Commitments Implemented	Other Measures Reported Implemented	Total Measures Implemented	High-Priority Data Reported
CAPCOG	YES	7	7	7	1	8	1
CAMPO	YES	11	11	10	7	17	1
CapMetro	NO	35	0	0	0	0	0
CTRMA	YES	14	14	14	0	14	1
CAF	YES	8	8	8	0	8	0
LCRA	YES	8	8	8	0	8	3
LSCFA	YES	1	1	1	0	0	0
TCEQ	YES	14	14	14	0	14	10
TxDOT-Austin	YES	13	13	12	21	33	10
TxDOT-HQ	YES	11	11	10	0	10	1
Texas Lehigh	YES	1	1	1	0	1	10
TNLA	YES	2	2	2	0	2	0
Bastrop County	YES	15	15	13	2	15	1
Caldwell County	YES	9	9	9	2	11	7
Hays County	YES	19	19	19	0	19	6
Travis County	YES	20	20	20	11	31	10
Williamson County	YES	16	16	0	0	0	10
City of Austin	YES	34	34	34	0	34	9
City of Bastrop	YES	26	26	0	0	0	9
City of Bee Cave	YES	14	14	12	0	12	0
City of Buda	YES	18	18	17	0	17	0
City of Cedar Park	YES	23	23	23	0	23	10
City of Elgin	YES	13	13	7	1	8	9
City of Georgetown	YES	12	12	12	4	16	9
City of Hutto	YES	6	6	4	3	7	0
City of Lakeway	YES	14	14	4	3	7	9
City of Leander	YES	15	15	7	2	9	10
City of Lockhart	YES	16	16	16	0	16	10
City of Luling	NO	6	0	0	0	0	0
City of Pflugerville	YES	6	6	3	2	5	10
City of Round Rock	YES	28	28	27	0	27	10
City of San Marcos	YES	17	17	15	1	16	9
City of Sunset Valley	NO	17	0	0	0	0	0
TOTAL	**30/33**	**469**	**411**	**329**	**60**	**388**	**175**

The following table summarizes these by the type of measure implemented.

Table 20. Summary of Status of Measures Implemented in 2015 by Measure Type

Measure Type	Commitments	Commitments Reported On	Commitments Reported Implemented	Other Measures Reported Implemented	Total Measures Implemented
Commute Trip Reduction Measures	79	68	56	17	73
Development Measures	49	43	28	7	35
Energy and Resource Conservation	42	37	30	7	37
Fleet and Fuel Efficiency Measures	106	92	74	10	84
Outreach and Awareness	88	81	68	5	72
Regulation and Enforcement	29	25	19	2	21
Sustainable Procurement and Operations	76	65	54	12	66
TOTAL	**469**	**411**	**329**	**60**	**388**

The tables above exclude TERMs, due to the discrete nature of these projects. A fuller explanation/summary of the status of TERMs is provided in a subsection below.

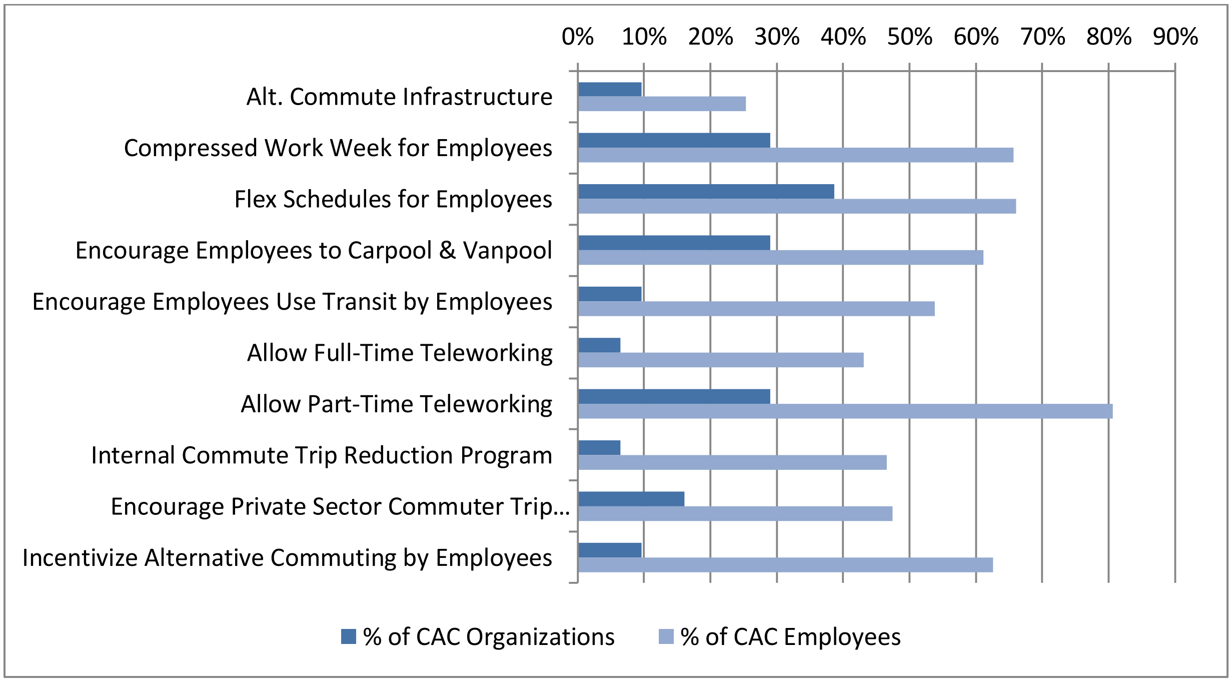
4.2.1 Commute Trip Reduction Measures

Under the OAP Action Plan, there are a number of measures designed to reduce emissions attributable to employee commuting. These measures include:

- Providing alternative commute infrastructure;
- Allowing employees to work compressed work weeks;
- Allowing employees to work flexible schedules;
- Encourage employees to carpool/vanpool;
- Encourage employees to use transit to commute;
- Allow employees to telecommute (part-time or full-time);
- Implement an internal employee commute trip reduction program; and
- Encourage private-sector commuter trip reduction programs.

The following figure summarizes the % of CAC members and the % of employees among the CAC members working at organizations that implemented these measures.

Figure 21. Summary of Commute Trip Reduction Measures Implemented by CAC Members in 2015



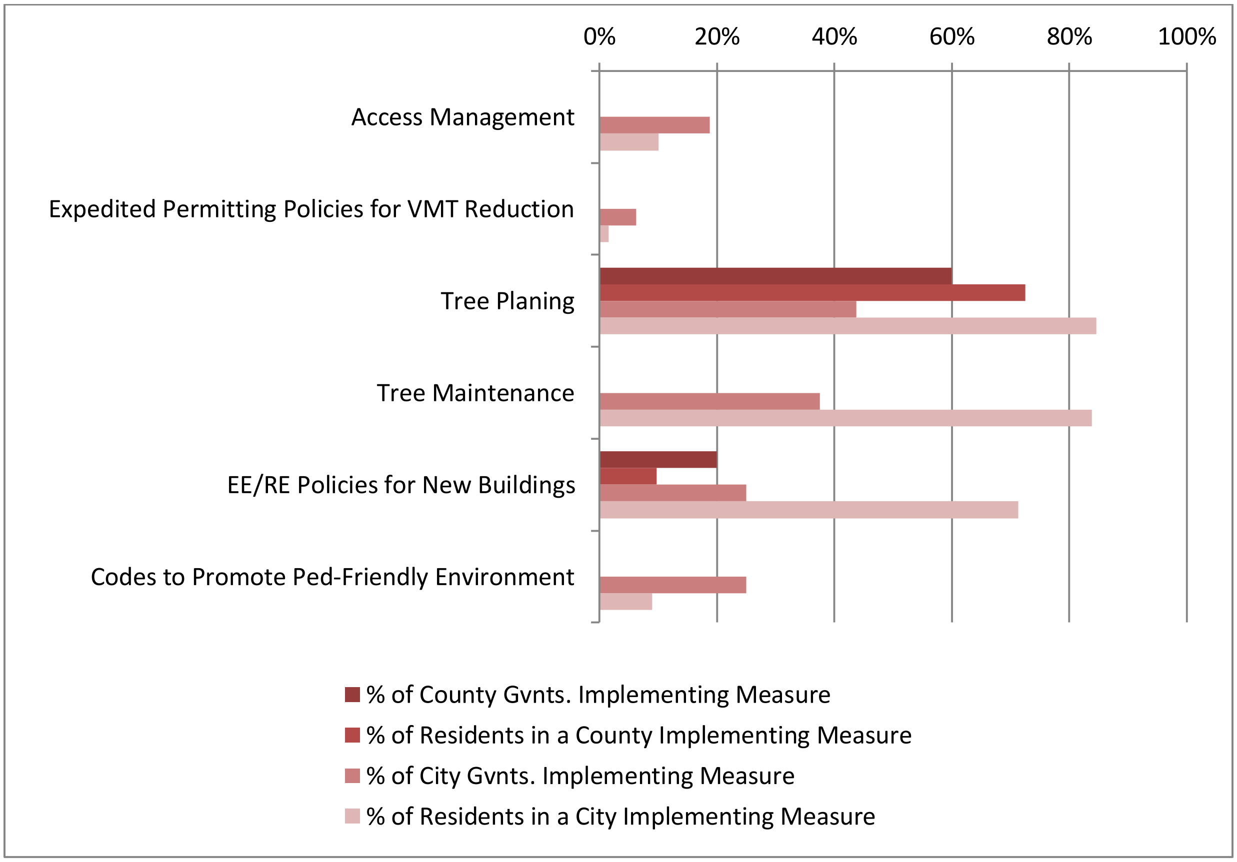
4.2.2 Development Measures

CAC members implemented a number of measures designed to reduce emissions or O_3 formation through planning and development policies. These measures included:

- Access management (improving the traffic flow between developed land and streets);
- Expedited permitting for mixed-use, transit-oriented, or in-fill development, which can help reduce VMT;
- Tree planting and tree maintenance programs, which can reduce the urban heat island effect and reduce electricity demand;
- Development policies to improve energy and resource efficiency in new buildings; and
- Codes and ordinances that require a more pedestrian-friendly environment.

The following figure summarizes the % of CAC members and the % of employees among the CAC members working at organizations that implemented these measures.

Figure 22. Summary of Development Measures Implemented by CAC City and County Governments in 2015



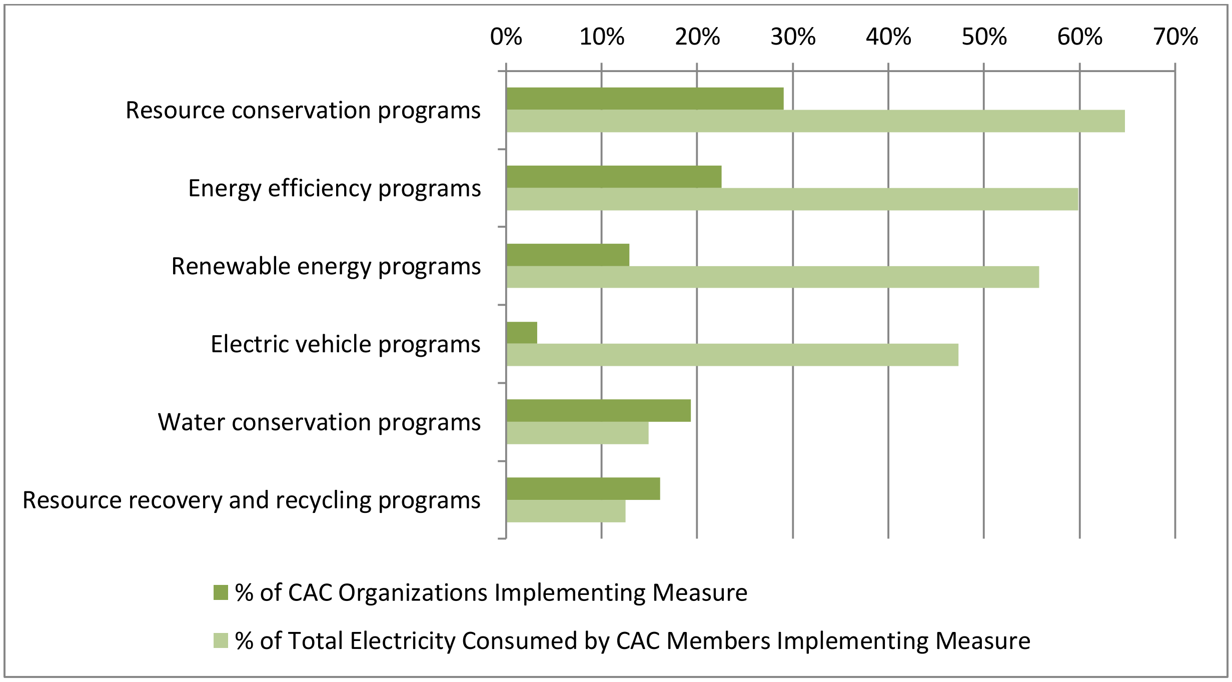
In addition to the City and County governments that implemented development measures, CTRMA and LCRA both implemented a tree maintenance program, and CTRMA implemented access management measures.

4.2.3 Energy and Resource Conservation

CAC members implemented a number of energy and resource conservation measures in 2015. These are categorized as follows:

- Resource conservation;
- Energy efficiency programs;
- Renewable energy programs;
- Water conservation programs; and
- Resource recovery and recycling programs.

Figure 23. Summary of Energy and Resource Conservation Measures Implemented by CAC Members in 2015

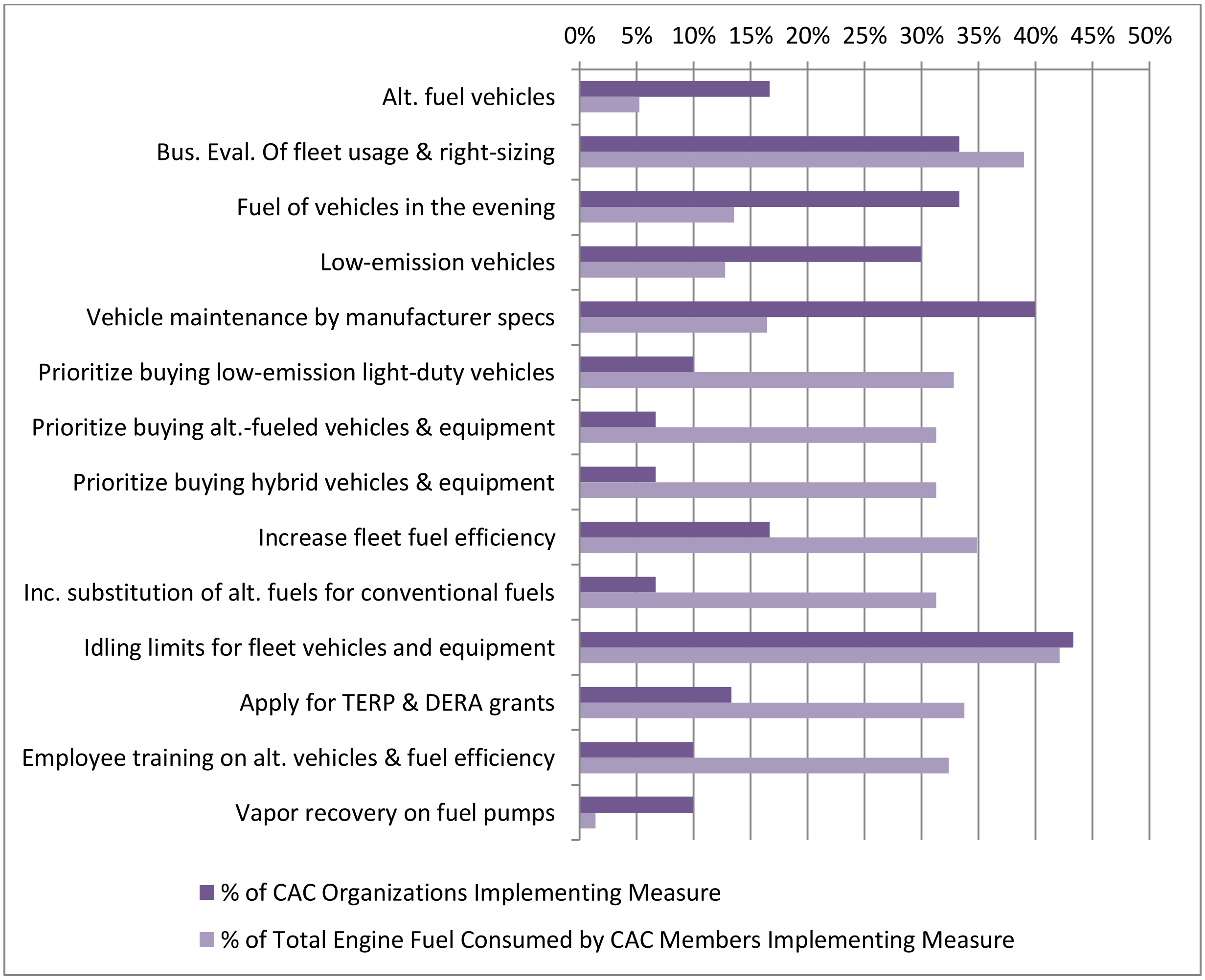


4.2.4 Fleet and Fuel Efficiency Measures

CAC members implemented a wide variety of measures to reduce emissions attributable to vehicles and non-road engines directly owned and operated by each organization. Measures included:

- Use of alt. fuel vehicles;
- Business evaluation of fleet & right-sizing;
- Fuel vehicles in the evening;
- Use of low-emission vehicles;
- Vehicle maintenance in accordance with manufacturer specifications;
- Prioritize purchasing low-emission light duty vehicles;
- Prioritize purchasing hybrid vehicles and equipment;
- Increase fleet fuel efficiency;
- Increase substitution of alt. fuels for conventional fuels;
- Idling limits for fleet vehicles and equipment;
- Replace/repower/retrofit vehicles and equipment through TERP/DERA grant funding;
- Employee training on alt. fuels and fuel efficiency;
- Vapor recovery on fuel pumps.

Figure 24. Summary of Fleet and Fuel Efficiency Measures Implemented by CAC Members in 2015



The following figure summarizes these data in terms of the % of organizations implementing each measure and the % of total engine fuel consumption (in terms of energy content) from organizations implementing each measure.

4.2.5 O_3 Action Day, Outreach, and Education Efforts

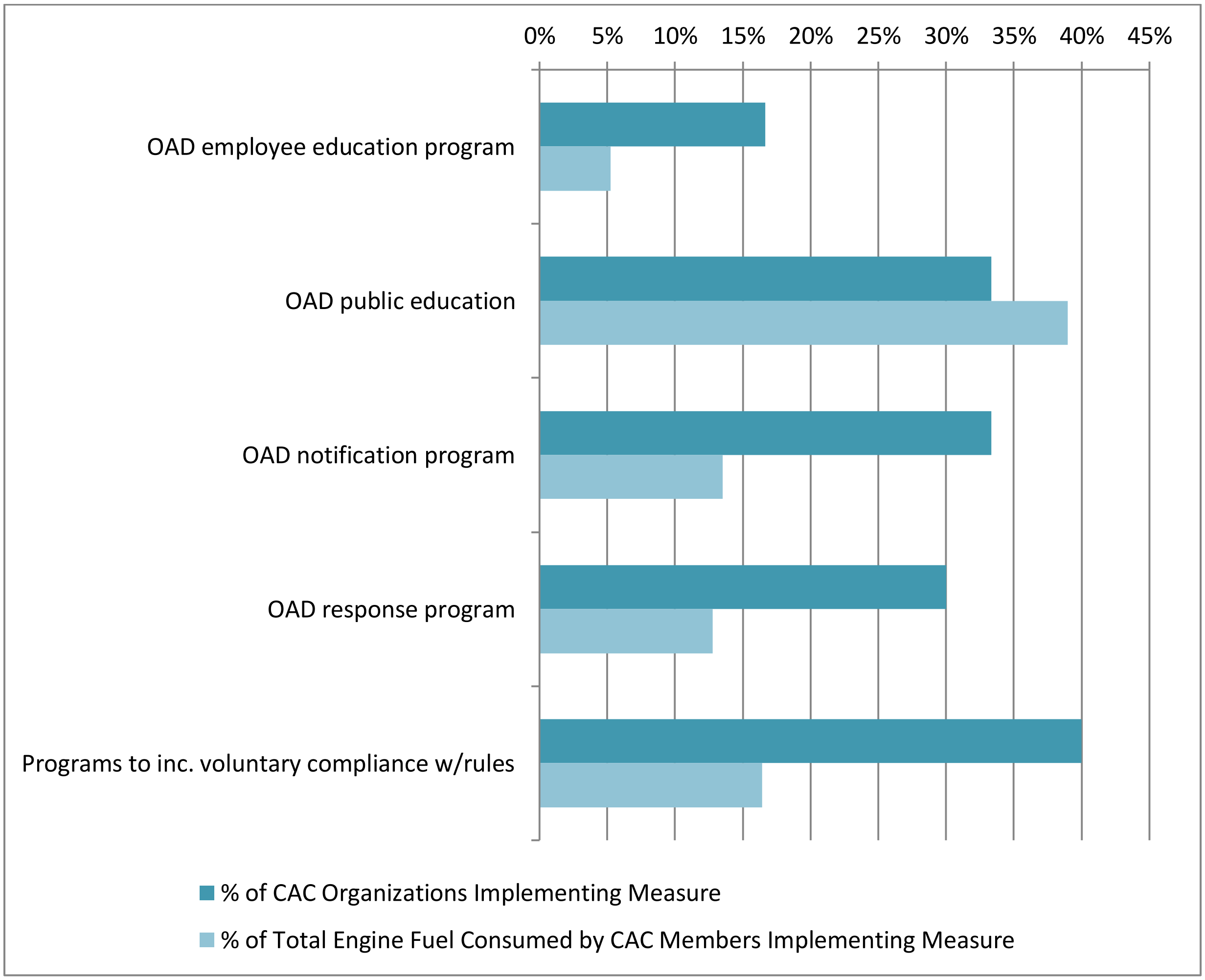
Efforts geared around O_3 action days can help decrease emissions when O_3 is expected to be at its highest, while other outreach and education efforts can increase the willingness of businesses and the general public to take action to reduce emissions. These efforts are categorized in the OAP Action Plan as follows:

- OAD Employee Education Programs;
- OAD Public Education Programs;
- OAD Notification Programs;

- OAD Response Programs; and
- Programs to Improve Awareness of and Compliance with Air Quality Rules.

The following figure summarizes the percentage of organizations who implement such measures and the percentage of total employees among CAC members who work at organizations that implement such measures.

Figure 25. Summary of O_3 Action Day & Outreach and Education Measures Implemented by CAC Members in 2015



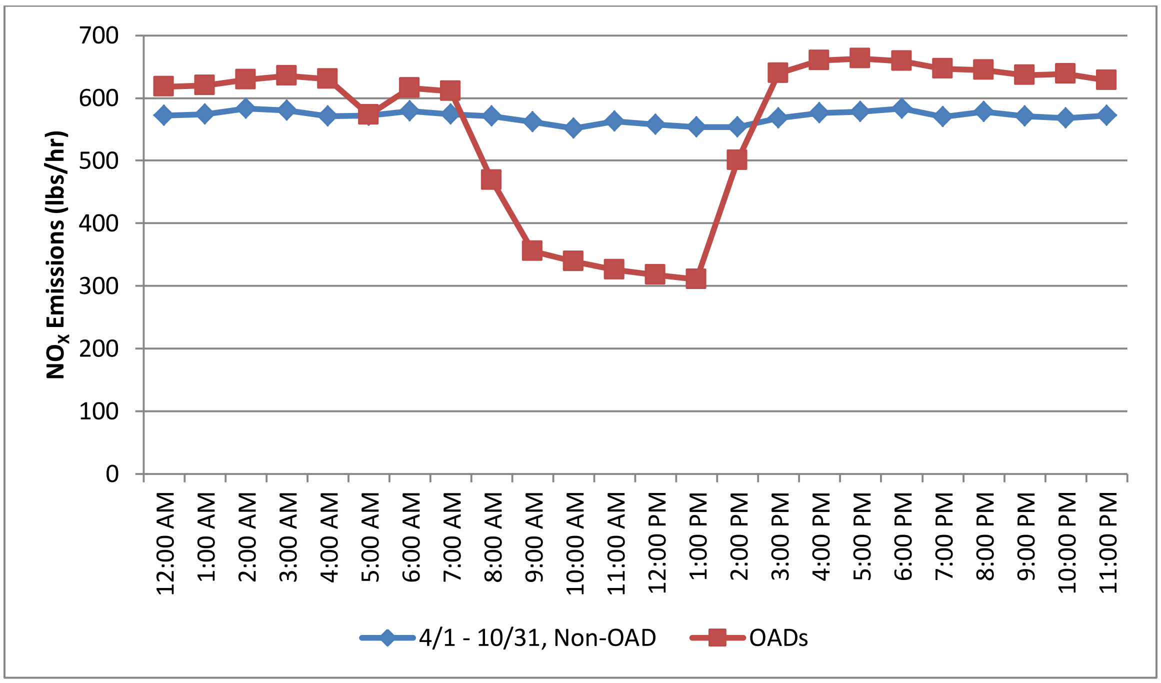
4.2.6 Texas Lehigh Cement Company's O_3 Action Day Response Program

Texas Lehigh is the largest point source of NO_X emissions in the Austin-Round Rock MSA, and participates in the OAP Action Plan through an innovative O_3 Action Day NO_X reduction effort. In 2014, Texas Lehigh accounted for approximately 8% of all anthropogenic emissions in the MSA, 48% of all point source emissions in the MSA, and 44% of all NO_X emissions from Hays County, where it is located. Texas Lehigh reported emitting 2,300 tons of NO_X in 2015, slightly lower than the 2,388 tons of NO_X reported for 2014.

For Texas Lehigh's efforts, an "O_3 Action Day" includes many more days than just the TCEQ's formally announced OADs. In the past few years since 2013, they have included most days when TCEQ forecasts O_3 in the region to reach "moderate" levels or higher if the wind was forecast to cause the plant's plume to go over the core urban area in central Travis County.

On such days, Texas Lehigh increases the NO_X reduction efficiency of its Selective Non-Catalytic Reduction (SNCR) between 9 am – 3 pm. On other days, Texas Lehigh operates the SNCR as needed to stay within the plant's 30-day NO_X limits. In 2015, this resulted in an average reduction of 0.596 tons of NO_X emissions over these six hours compared to the average for these hours on days when Texas Lehigh did not implement this measure. The following chart shows a comparison of the average hourly NO_X emissions for each day type between April 1, 2015, and October 31, 2015.

Figure 26. Comparison of Avg. Hourly NO_X Emissions by Hour for Texas Lehigh in 2015



Texas Lehigh implemented this measure on a total of 36 days in 2015. The following table summarizes the data for each day. There are three days on this list when Texas Lehigh did not implement the measure, either due to wind direction, plant issues, or operator error, as noted.

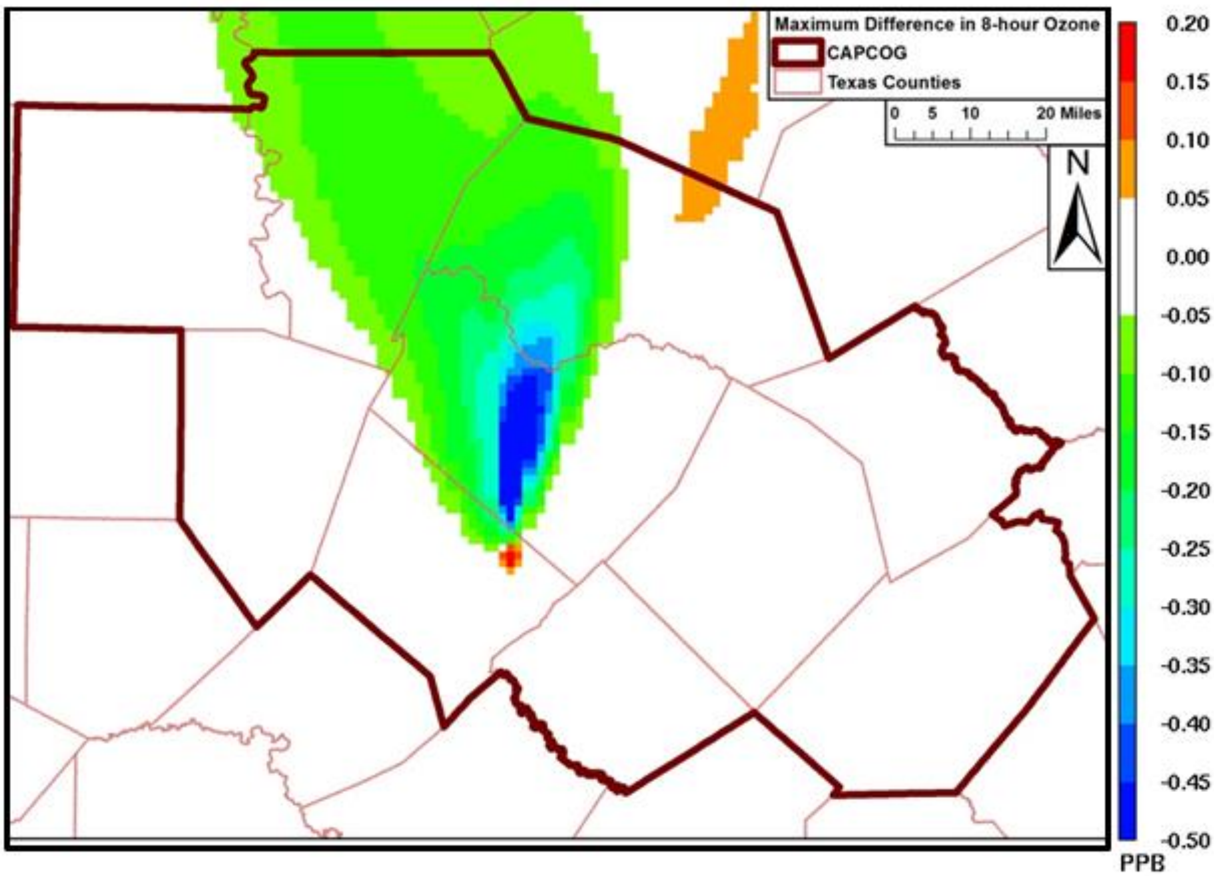
Table 21. Dates for Texas Lehigh Voluntary NO_X Reductions in 2015 and Notes

Date	Forecast	Peak MDA8 (ppb)	Avg. NO_X 12 - 9am (lbs/hr)	Avg. NO_X 9am - 3pm (lbs/hr)	Avg. NO_X 3pm – 12 (lbs/hr)	Operator Notes
6/1/2015	60-70 ppb	64	546	349	846	got started a bit late
6/2/2015	60-70 ppb	66	772	311	778	
6/4/2015	60-70 ppb	59	652	327	629	
6/5/2015	60-70 ppb	52	613	291	535	
6/6/2015	60-70 ppb	58	457	292	525	
7/30/2015	60-70 ppb	61	521	334	406	process issue in 20:00 hr
7/31/2015	60-70 ppb	61	626	303	651	
8/1/2015	60-70 ppb	64	672	308	671	
8/2/2015	60-70 ppb	70	638	311	649	
8/3/2015	60-70 ppb	73	668	384	619	started a tad late, had plant air pressure issues shutting down SNCR and had small leak in SNCR lance so had to make repairs
8/11/2015	60-70 ppb	64	548	315	628	
8/12/2015	60-70 ppb	66	503	347	620	process issue from 10:00 to 13:00 hrs
8/13/2015	60-70 ppb	76	614	329	600	
8/14/2015	60-70 ppb	66	635	319	641	
8/15/2015	60-70 ppb	72	666	331	622	
8/16/2015	60-70 ppb	65	673	307	667	
8/17/2015	60-70 ppb	60	635	307	621	
8/25/2015	60-70 ppb	57	604	327	710	
8/26/2015	60-70 ppb	63	672	322	648	
8/27/2015	76-95 ppb	82	619	344	639	
8/28/2015	60-70 ppb	85	586	305	673	
8/29/2015	60-70 ppb	83	688	303	662	
9/13/2015	60-70 ppb	57	624	376	636	operator stopped too early
9/14/2015	60-70 ppb	61	519	321	601	

Date	Forecast	Peak MDA8 (ppb)	Avg. NO_X 12 - 9am (lbs/hr)	Avg. NO_X 9am - 3pm (lbs/hr)	Avg. NO_X 3pm – 12 (lbs/hr)	Operator Notes
9/20/2015	60-70 ppb	51	622	349	603	
9/21/2015	60-70 ppb	57	535	200	423	late notification and start, process problems
9/22/2015	60-70 ppb	61	418	295	641	
9/23/2015	60-70 ppb	67	623	302	682	
9/24/2015	60-70 ppb	69	665	312	669	
10/4/2015	60-70 ppb	59	660	681	642	operator forgot to participate
10/5/2015	60-70 ppb	52	581	12	14	plant down
10/7/2015	60-70 ppb	69	709	339	719	
10/8/2015	60-70 ppb	53	626	377	734	late notification and start
10/9/2015	60-70 ppb	62	717	310	620	
10/11/2015	60-70 ppb	71	714	324	620	
10/12/2015	60-70 ppb	61	600	412	698	late notification and start
10/14/2015	60-70 ppb	73	682	307	681	
10/15/2015	60-70 ppb	61	601	601	600	didn't participate
10/16/2015	60-70 ppb	67	602	451	744	forgot to start on-time

In 2015, CAPCOG modeled the O_3 impact of these emission reductions using emissions data from 2014.[23] The following figure provides an illustration of O_3 benefit from these emission reductions in Travis County on a day when winds are coming out of the south and carrying the Texas Lehigh plume over Travis County.[24]

Figure 27. Example Map of Change in MDA8 O_3 from Texas Lehigh Voluntary NO_X Reduction Measure



Since the modeled O_3 impact from this measure at any given location is highly influenced by wind direction, it is useful to look at the range of impacts on MDA8 at each monitoring location that is currently in operation in the region, as well as the range of impacts in areas where there aren't monitoring stations within the CAPCOG region.[25]

[23] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf

[24] This map shows the change in MDA8 O_3 for June 6 in the episode. The difference at CAMS 38, which is right in the middle of the dark blue part of this map, was -0.58 ppb.

[25] In this case, CAPCOG analyzed the array of grid cells that encompasses all of the 3x3 cell arrays around each O_3 monitoring station in the CAPCOG region, for the sake of simplicity. All of the numbers in this table are based on a re-analysis of AACOG's 2015 data, so they will not match the numbers in the 2015 report.

Table 22. Modeled Impacts on MDA8 Values in CAPCOG Region from 2015 Study (ppb)

Station/Area	Maximum Benefit	Maximum Disbenefit	Avg. Impact
C3	-0.3905	+0.0336	-0.0381
C38	-0.5520	+0.0424	-0.1027
C601	-0.0076	+0.0134	-0.0001
C614	-0.2072	+0.0530	-0.0439
C684	-0.0020	+0.0587	+0.0031
C690	-0.2694	+0.0281	-0.0175
C1603	-0.5111	+0.0554	-0.1346
C1604	-0.0236	+0.0688	+0.0019
C1605	-0.8816	+0.0715	-0.0608
C1675	-0.3600	+0.1199	-0.0183
C6602	-0.0396	+0.0261	-0.0001
CAPCOG Region – Maximum Benefit	-1.1433	-0.2815	-0.6469
CAPCOG Region – Maximum Disbenefit	+0.0952	+0.4756	+0.2164

As the table above shows, the implementation of this measure can have significant O_3 reduction benefits in the region, including at the regulatory monitoring stations that are used to evaluate the region's compliance with the O_3 NAAQS. The average impact at CAMS 38 is particularly noteworthy, since an impact of 0.1 ppb is enough to make a change in a monitoring station's design value. Apart from the impact at actual O_3 monitoring stations, the fact that this measure can achieve reductions in MDA8 levels of more than 1 ppb in parts of the region at times is particularly remarkable, and illustrates just how effective this voluntary measure can be at controlling peak O_3 levels in the region at times.

There were some O_3 dis-benefits modeled, both in the immediate vicinity of the plant (i.e., the same 4 km x 4 km grid cell) due to the reduced effects of NO_X titration, but there were also some small dis-benefits modeled elsewhere within the region in some situations. CAPCOG believes that this is likely due to the impact of higher-than-average emissions that were modeled for 12 am – 9 am and 3 pm – 12 am carrying over from one day to the next in the model, particularly in situations in which the wind changes direction during the day. CAPCOG is considering performing some additional modeling in 2016/2017 in order to further investigate this phenomenon and work with Texas Lehigh in order to achieve optimal results from this innovative measure. The company has expressed a willingness to make adjustments to this effort if it would provide additional benefits based on the new modeling CAPCOG is planning to undertake.

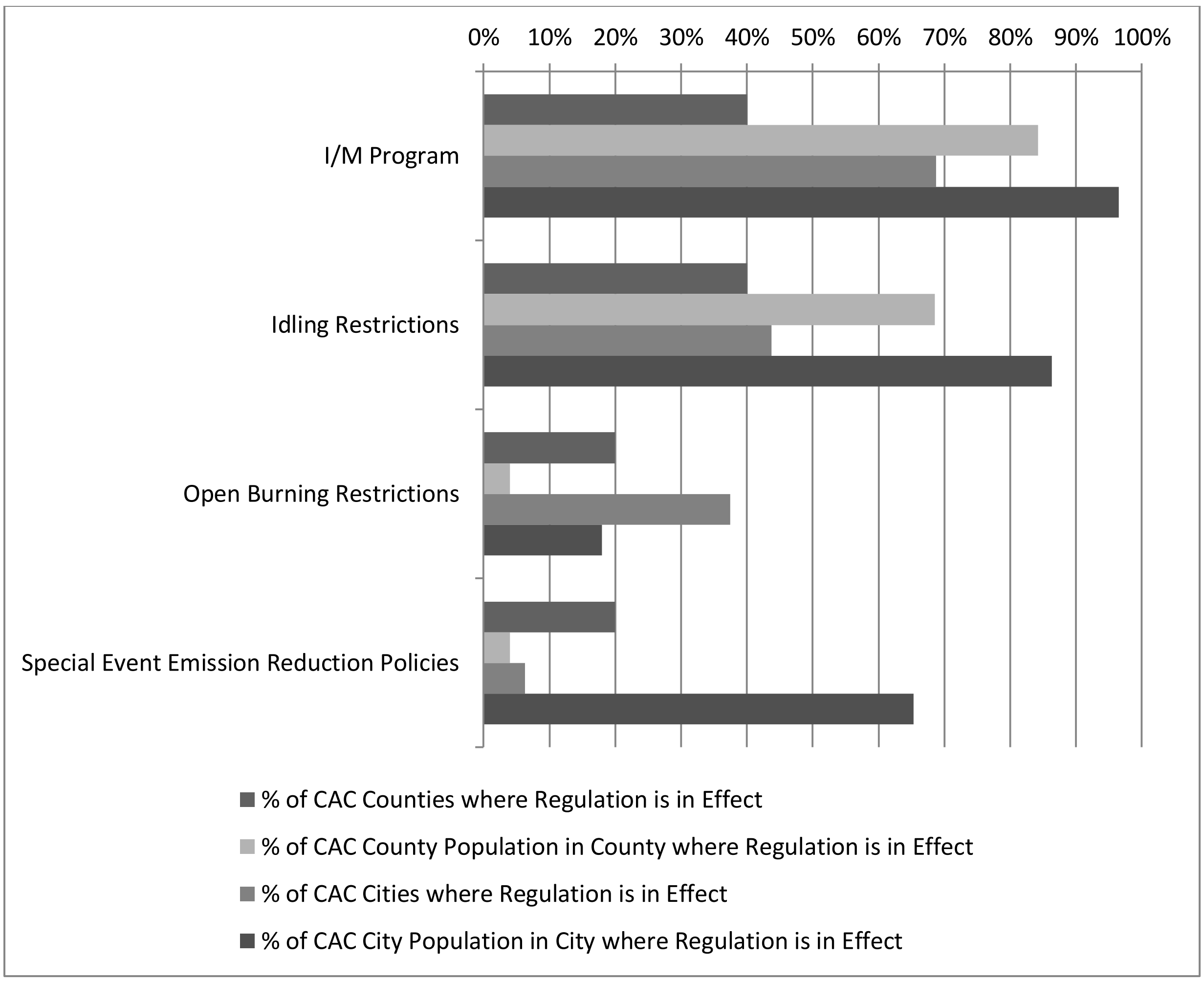
4.2.7 Regulation and Enforcement Measures

While in general, the OAP Action Plan is referred to as a "voluntary" program, there are still some regulatory aspects to the Action Plan. The "voluntary" terminology primarily refers to the concept that the organizations participating in the OAP Action Plan are adopting measures on their own terms, rather than the EPA or TCEQ imposing rules & regulations on these organizations. To the extent that a city or county voluntarily adopts or requests an air quality regulation for its jurisdiction, those measures are still considered voluntary vis-à-vis EPA and Clean Air Act requirements, although they wouldn't be considered "voluntary" to the people or organizations subject to the regulation. The four primary regulatory/enforcement measures included in the OAP Action Plan are:

- The I/M program;
- Idling restrictions;
- Open burning restrictions; and
- Special event emission reduction policies.

The following figure summarizes the % of county and city governments where these regulations are in effect, and the % of the populations living in the CAC member counties and cities that are subject to these regulations.

Figure 28. Summary of O_3 Action Day & Outreach and Education Measures Implemented by CAC Members in 2015



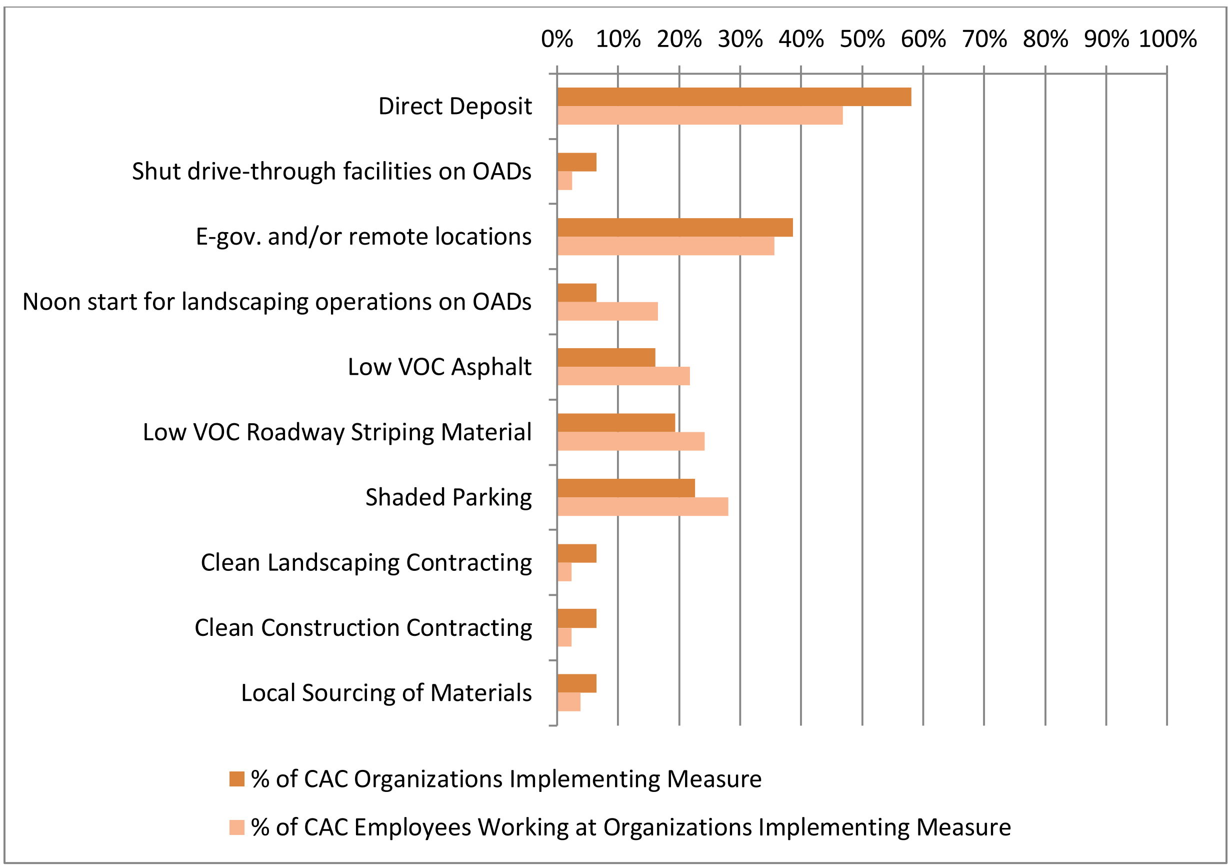
4.2.8 Sustainable Procurement and Operations Measures

There are a variety of other measures related to procurement and operations that CAC members implemented in 2015, including:

- Direct deposit, which reduces the need to make trips to the bank;
- Shutting drive-through facilities on OADs;
- E-government services and/or remote locations to help avoid unnecessary VMT required to access government services;
- Noon start for landscaping operations on OADs;
- Low-VOC asphalt;
- Low-VOC road striping material;
- Shaded parking;
- Clean landscape contracting;
- Clean construction contracting; and
- Local sourcing of materials, which reduced on-road VMT.

The following figure summarizes the % of organizations implementing each measure and the % of employees in CAC organizations who work at organizations that implement the measure.

Figure 29. Summary of Sustainable Procurement & Operations Measures Implemented by CAC Members in 2015



4.2.9 Transportation Emission Reduction Measures

TERMS are not reported in the same way, since each TERM is a discrete activity, usually with a beginning and end date. The following tables summarize the status of TERMs listed in the 2014 report and new TERMs identified by CAC members.

Table 23. TERMS with Activity Reported in 2015

Reporting Organization	Bicycle / Pedestrian	Operational Improvements	Transit	Other	Total
Bastrop County	0	1	0	0	1
Travis County	2	0	0	0	2
City of Austin	10	2	0	0	12
City of Buda	7	5	0	0	12
City of Cedar Park	0	4	0	0	4
City of Elgin	1	0	0	0	1
City of Round Rock	7	7	0	0	14
CapMetro	0	0	0	0	0
CTRMA	0	2	0	0	2
TxDOT	8	16	0	0	24
TOTAL	**35**	**37**	**0**	**0**	**72**

5 Ongoing Planning Activities

This section reviews planning activities completed in 2015, including public and stakeholder involvement, an update to the Action Plan, and air quality research projects.

5.1 Public and Stakeholder Involvement

Public and stakeholder involvement is an important part of the OAP Action Plan, and is accomplished primarily through three avenues:

- The CAC;
- The Clean Air Coalition Advisory Committee (CACAC); and
- The CAF.

5.1.1 CAC

The CAC held five meetings in 2015. The following list highlights some of the more notable actions taken at each meeting.

- March 21, 2015;
    - Elected newly sworn-in Travis County Judge Sarah Eckhardt as Chair;
    - Approved comment letter to EPA on proposal for 2015 O_3 NAAQS;
- June 10, 2015;
    - Approved adding City of Buda as a Regular Member of the CAC;
- August 12, 2015;
    - Accepted Annual Report;
- October 21, 2015;
    - Approved adding Cities of Bee Cave and Leander as Regular Members of the CAC;
    - Approved resolution supporting federal legislation enabling Early Action Compacts;
- December 9, 2015;
    - Approved adding Lakeway as Regular Member of the CAC;
    - Approved Update to O_3 Advance Program Action Plan;
    - Provided direction to CAPCOG that it was interested in investigating participating in PM Advance as well.

The four new CAC members that were added in 2015 – the cities of Bee Cave, Buda, Lakeway, and Leander – accounted for a population of 72,103. This is 4.7% of the total population living in incorporated cities and villages in the Austin-Round Rock MSA and 14.4% of the combined growth in all of the cities in the region. Two of these cities – Buda and Leander were among the four cities in the region with the largest growth rates between 2014 and 2015, with Buda growing by 20% and Leander growing by 11%.

With the addition of these cities, there are now a total of 20 cities that are members of the CAC. Combined, CAC member cities account for 93.1% of the population that lives in incorporated cities in the MSA.

Table 24. City Populations in the Austin-Round Rock MSA

City	County	2014 Est.	2015 Est.	Change	% Change	CAC Member ?
City of Austin	Travis	912,713	931,830	19,117	2%	Yes
City of Round Rock	Williamson	112,784	115,997	3,213	3%	Yes
City of Cedar Park	Williamson	63,627	65,945	2,318	4%	Yes
City of Georgetown	Williamson	59,105	63,716	4,611	8%	Yes
City of San Marcos	Hays	59,231	60,684	1,453	2%	Yes
City of Pflugerville	Travis	54,672	57,122	2,450	4%	Yes
City of Leander	Williamson	34,187	37,889	3,702	11%	Yes
City of Kyle	Hays	32,870	35,733	2,863	9%	No
City of Hutto	Williamson	21,180	22,722	1,542	7%	Yes
City of Taylor	Williamson	16,497	16,702	205	1%	No
City of Lakeway	Travis	13,711	14,217	506	4%	Yes
City of Buda	Caldwell	11,442	13,705	2,263	20%	Yes
City of Lockhart	Hays	13,231	13,446	215	2%	Yes
City of Elgin	Bastrop	8,634	9,039	405	5%	Yes
City of Bastrop	Bastrop	7,875	8,231	356	5%	Yes
City of Manor	Travis	6,921	7,587	666	10%	No
City of Lago Vista	Travis	6,478	6,550	72	1%	No
City of Bee Cave	Travis	5,961	6,292	331	6%	Yes
City of Luling	Caldwell	5,724	5,764	40	1%	Yes
City of Sunset Valley	Travis	697	698	1	0%	Yes
Remaining 27 Cities	All	37,572	38,639	1,067	3%	No
All Cities	**All**	**1,485,112**	**1,532,508**	**47,396**	**3%**	**n/a**

5.1.2 CACAC

The CACAC, which is made up of staff members from CAC member organizations, with participation from other stakeholders, met on the following dates:

- January 15, 2015;
- February 5, 2015;
- March 5, 2015;
- June 4, 2015;
- July 2, 2015;
- September 3, 2015;
- October 1, 2015;
- November 12, 2015; and
- December 11, 2015.

The CACAC was co-chaired by Pharr Andrews and Andrew Hoekzema. Pharr Andrews is the City of Austin Air Quality Program Manager, and Andrew Hoekzema is CAPCOG's Air Quality Program Manager. Minutes from these meetings are available from CAPCOG.

5.1.3 CLEAN AIR Force

Founded in 1993, the CAF is a 501(c)(3) organization of business, government, environmental, and community leaders united in the common goal of finding workable solutions for improving air quality in Central Texas. CAF conducts and coordinates public awareness and education campaigns and implements voluntary programs to reduce O_3 -forming emissions. CAF's initiatives in 2015 included:

- Administering the CAPP program
- Co-hosting a "Lunch & Learn" for local TV meteorologists and media with the City of Austin on July 22, 2015;
- Providing supplementary O_3 Action Day alerts (One on August 26, 2015);
- Hosting an O_3 Season Kickoff event (March 30, 2015);
- Running a High School Air Quality Public Service Announcement (PSA) contest;
- Working with Doss Elementary School in Austin Independent School District to implement a no-idling policy;
- Convened workgroups to assist in developing CAPCOG's Nonattainment Impact study;

The CAF Board of Directors consists of 13 members united in the common goal of finding workable solutions for improving air quality in Central Texas. The CAF Board represents environmental, governmental, corporate and community interests in air quality in the Austin-Round Rock MSA. The Board was led by Tim Jones of Samsung Austin Semiconductor (Chair), Rick Perkins of Chemical Logic (Vice Chair), and Brett Davis of Zephyr Environmental Corp. (Secretary/Treasurer) and met to discuss air quality issues and policies. The Board held three general meetings in 2015, and eight Executive Committee meetings in 2015.

- General Board Meetings:
  - February 18, 2015;
  - May 13, 2015;
  - August 5, 2015;
- Executive Committee Meetings:
  - February 18, 2015;
  - March 4, 2015;
  - April 2, 2015;
  - May 13, 2015;
  - July 9, 2015;
  - August 5, 2015;
  - September 2, 2015; and
  - October 7, 2015.

5.2 2015 Plan Update

The CAC approved an update to the OAP Action Plan at the end of 2015 that reflected a change in the plan's goals to account for the 2015 O_3 NAAQS, changes in CAC membership, and additional explanations about the DACM program and TERP grants, among other things. A copy of the updated plan can be found at http://www.capcog.org/divisions/regional-services/O3 -advance/.

5.3 Regional Air Quality Technical Research Activities

CAPCOG completed a number of air quality research projects in 2015, including:

- Air Quality Monitoring:
  - CAPCOG continued collecting O_3 and meteorological measurements at eight Continuous Air Monitoring Stations (CAMS) in the region to supplement the two Federal Reference Method O_3 monitors operated by TCEQ;
- Emissions Research:
  - CAPCOG contracted with ERG to develop new, link-based on-road emissions inventories for 2012 and 2018 using MOVES2014 and the latest Travel Demand Model (TDM) data from CAMPO's 2010 TDM for Bastrop, Caldwell, Hays, Travis, and Williamson Counties;
  - CAPCOG developed new 2012 and 2018 OSD non-road agricultural equipment emissions inventories using the 2012 Census of Agriculture, equipment sales data, a regional survey of farmers, and TexN v. 1.7.1. for all counties in the CAPCOG region and Milam County (the tractor portion of this analysis was documented in a conference paper at the EPA's 2015 Emissions Inventory Conference);
  - CAPCOG updated the short-term and extended idling emissions inventories for 2012 and 2018 for all counties in the CAPCOG region and Milam County (this project was documented in a conference paper for the EPA's 2015 Emissions Inventory Conference);
  - CAPCOG contracted with ERG in order to estimate the emission reduction benefits associated with the I/M program in Travis and Williamson Counties;
  - CAPCOG completed a project involving refinements/research into the emissions estimates for several large point sources in the region, including the Decker Creek Power Plant, Texas Lehigh, Austin White Lime, and the Hal Weaver Power Plant;
  - CAPCOG completed an "investigative emissions inventory" research project designed to guide future research efforts;
- Data Analysis & Modeling:
  - CAPCOG developed a new O_3 conceptual model based on 2006-2014 O_3 data;
  - CAPCOG contracted with AACOG to perform photochemical modeling of the impacts of the I/M program and Texas Lehigh's voluntary NO_X reduction efforts;
  - CAPCOG performed a thorough secondary analysis of photochemical modeling data relevant to the region dating back to the Early Action Compact attainment modeling;
- Regulatory and Economic Analysis:
  - CAPCOG developed an analysis of the potential costs of an O_3 nonattainment designation to the Austin-Round Rock MSA, finding that if EPA had set the 2015 O_3 NAAQS, the region could experience economic losses of $24 - $42 billion over about 25 years; and

- CAPCOG developed a detailed technical support document that the CAC used for its comments to EPA on the proposal for the 2015 O_3 NAAQS.

6 Planning for the Future

The CAC remains committed to continuing to advance the goals of the OAP Action Plan:

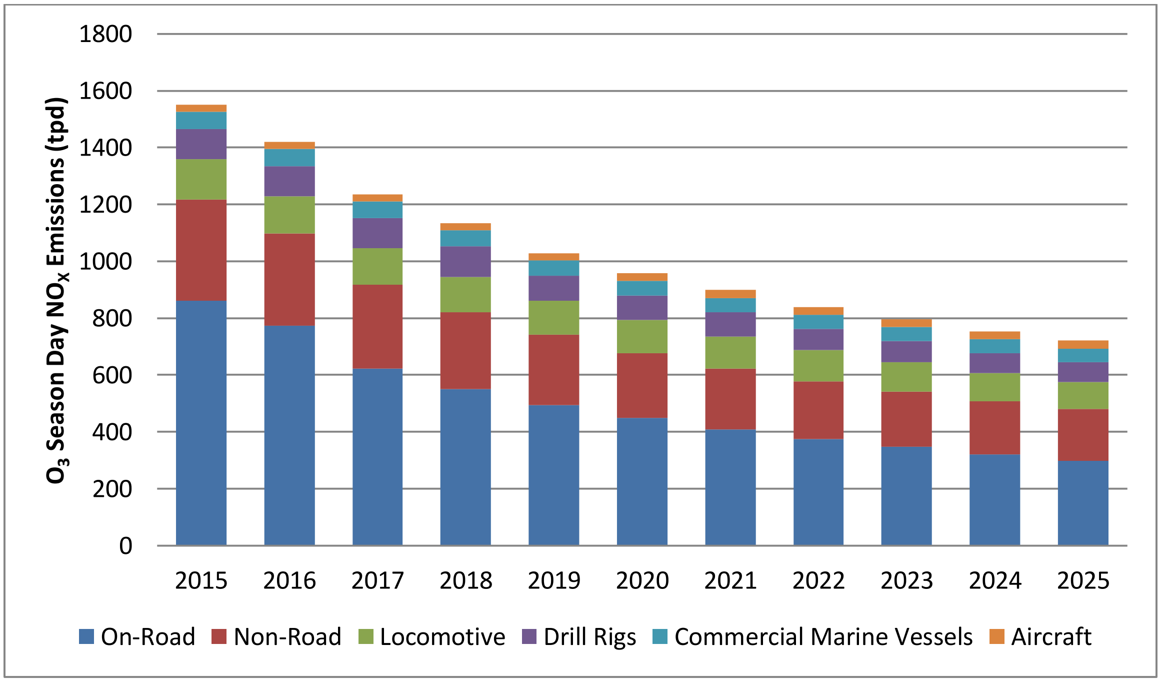
1. Remain in attainment of the 2015 eight-hour O_3 standard of 70 ppb;
2. Continue reducing the region's 8-hour O_3 design value to avoid being designated nonattainment for a new O_3 NAAQS;
3. Put the region in the best possible position to bring into attainment of an O_3 standard expeditiously if it does violate an O_3 standard or gets designated nonattainment;
4. Reduce the exposure of vulnerable populations to air pollution when the region experiences high O_3 levels; and
5. Minimize the costs to the region of any potential future nonattainment designation.

6.1 Projected Mobile Source Reductions in NO_X Emissions Nationwide and Statewide

Continued reductions in mobile source NO_X emissions from on-road sources and non-road sources are expected to continue to drive O_3 levels down nationwide. Statewide, NO_X emissions from all mobile sources are expected to decline by 27% from 2015 levels by 2018 and by 53% by 2025, as the following figure shows.[26]

[26] Based on reports produced by TTI and ERG for TCEQ in 2015 that can be found here: http://www.tceq.state.tx.us/airquality/airmod/project/pj_report_ei.html and here: http://www.tceq.state.tx.us/airquality/airmod/project/pj_report_mob.html.

Figure 30. Statewide Mobile Source NO_X Emissions, 2015-2025



One of the consequences of this trend is that, while mobile sources currently make up a large majority of NO_X emissions within the Austin-Round Rock MSA, strategies designed to reduce emissions-generating activity will have less and less of an O_3 reduction impact moving forward, while programs like TERP that are designed to accelerate fleet turnover will have higher and higher cost-per-ton of NO_X reduced ratios as the fleet gets cleaner and cleaner. Another consequence is that the relative importance of mobile sources compared to stationary sources will shift, such that by 2025, CAPCOG expects stationary sources to make up a majority of the NO_X emissions in the region without further controls.

6.2 Emissions Reductions from the EGU Sector

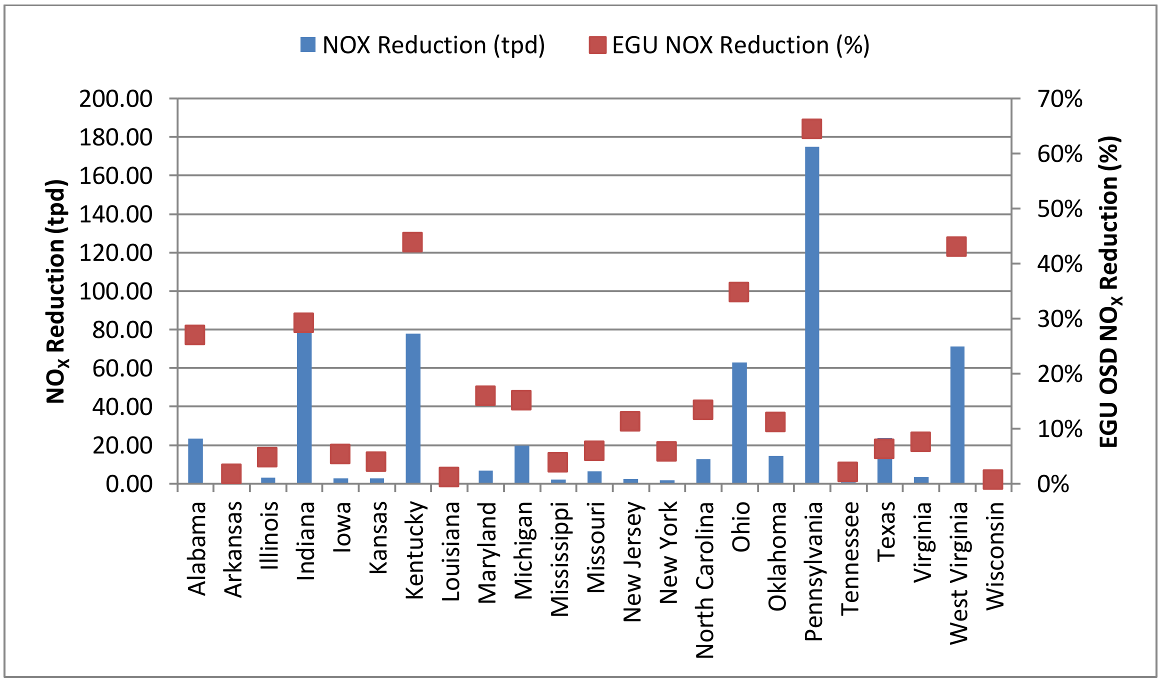
There are several federal and local developments that are likely to result in decreases in local O_3 levels as a result of reductions in NO_X emissions from the EGU sector. These include:

- NO_X reductions from EGUs starting in May 2017 due to the 2008 O_3 NAAQS Update to the Cross-State Air Pollution Rule;
- Anticipated retirement of the two steam boilers with a combined 735 MW capacity at Austin Energy's Decker Creek Power Plant with 500 MW of combined-cycle turbines; and
- EPA's Clean Power Plan, which is expected to result in shifts in power generation from older coal-fired power plants with high NO_X emissions rates to newer gas-fired power plants with lower NO_X emission rates.

6.2.1 CSAPR Update

EPA's proposed 2008 O_3 NAAQS update to the Cross-State Air Pollution Rule (CSAPR) is expected to reduce the projected 2017 O_3 -season NO_X emissions from EGUs in 23 states by about 23%, from an estimated 2,570 tpd in the "base case" down to 1,976 tpd in the $1,300 per ton of NO_X reduced scenario EPA proposed. The following figure shows the extent of the emissions reductions from power plants expected in each state.

Figure 31. NO_X Reductions from the Proposed 2008 O_3 NAAQS Update to CSAPR

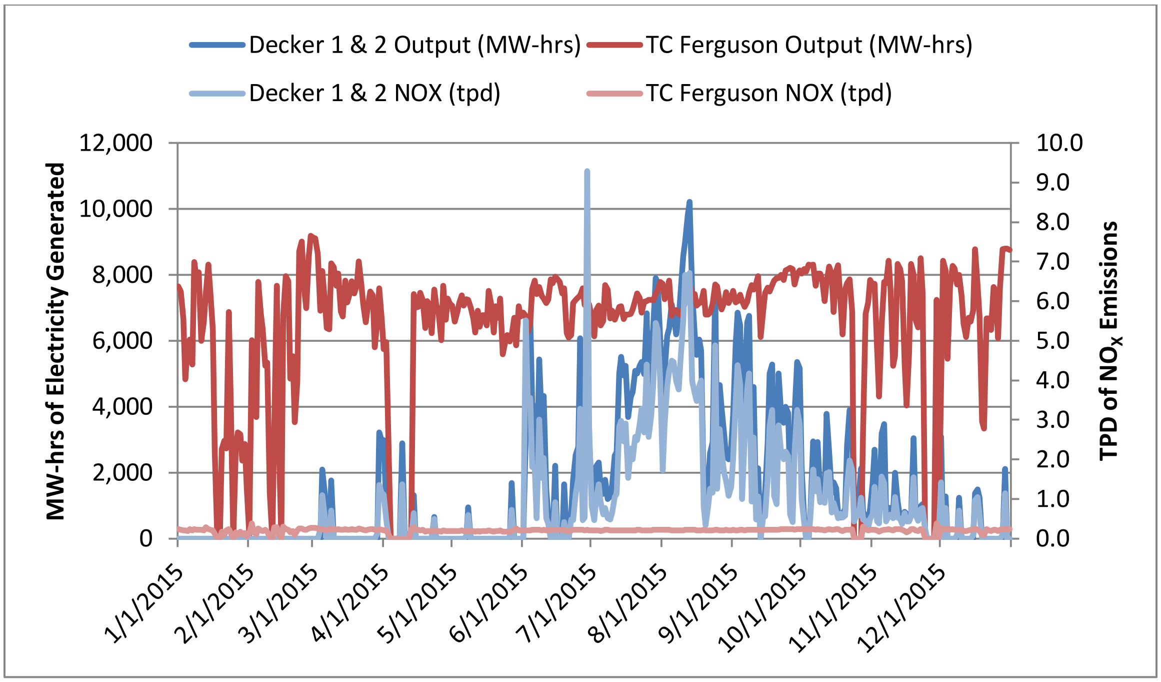


Source apportionment modeling conducted by TCEQ for the Dallas-Fort Worth area's attainment demonstration SIP revision for the 2008 O_3 NAAQS included analysis of the impacts of various source types and regions on the Austin area. Point source EGU emissions accounted for about 6.5 ppb of O_3 on high O_3 days, 4.3 ppb of which is attributable to EGUs in Texas and 2.2 ppb of which is attributable to EGUs in other states. Using these figures and the estimated NO_X reductions EPA presented, this translates into about a 0.26 ppb reduction in peak O_3 levels due to NO_X reductions at Texas EGUs and another 0.57 ppb in peak O_3 reductions due to NO_X reductions at plants in other states, for a combined total of 0.83 ppb in O_3 reductions.

6.2.2 Status of Decker Creek Power Plant

Austin Energy's 2014 Update to its Generation Plan stated, "Subject to ERCOT processes, and needed transmission upgrades, this Plan establishes the expected retirement date for the 735 MW of steam units at Decker by the end of 2018…This Plan would add 500 MW of additional gas units by the beginning of 2018 at Sand Hill Energy Center or Decker."[27] While Decker is not used often, it has a high NO_X emissions rate, making it one of the key contributors to peak O_3 formation in the region on days when it is used. Replacement of this capacity with 500 MW of new gas units at either Sand Hill or Decker would be expected to decrease NO_X emissions and O_3 formation in the region due to the stringent NO_X emissions rates that new units would need to meet in order to comply with permitting requirements. For example, the new T.C. Ferguson power plant in Llano County, which came online in 2014, is rated at 566 MW, and never exceeded 0.39 tpd of NO_X emissions in 2015, while producing as much as 9,189 MW-hrs of electricity on its peak day. Decker's two steam units, on the other hand, generated a maximum output of 10,222 MW-hrs on a single day in 2015 – 11% higher, but produced 9.30 tpd of NO_X on its highest day – 24 times higher than T.C. Ferguson. The figure below shows a comparison of the daily electricity generation and NO_X emissions from Decker's two steam units to T.C. Ferguson's two combined cycle units.

Figure 32. Comparison of Decker & T.C. Ferguson Daily Electricity Output and NO_X Emissions, 2015



Based on CAPCOG's analysis of prior modeling data, a change in emissions of this scale would likely reduce peak O_3 concentrations at CAMS 3 and 38 by an average about 0.2 ppb across the O_3 season, with reductions as high as 1.5-1.6 ppb (using the 2015 peak NO_X emissions as a reference point).[28]

In May 2016, Austin Energy announced that, due to low natural gas prices, it was putting its plans for replacement of the facility on hold and that this replacement was not being included in the utility's five-

[27] http://www.austinenergy.com/wps/wcm/connect/461827d4-e46e-4ba8-acf5-e8b0716261de/aeResourceGenerationClimateProtectionPlan2025.pdf?MOD=AJPERES
[28] http://www.capcog.org/documents/airquality/reports/2015/Photochemical_Modeling_Analysis_Report_2015-09-04_Final_Combined.pdf

year financial plan. It is not clear if or when Austin Energy might proceed with this replacement, and CAPCOG now expects that Decker will remain operational at least through the end of 2021.

6.2.3 Clean Power Plan NO_X Emission Reduction Co-Benefits

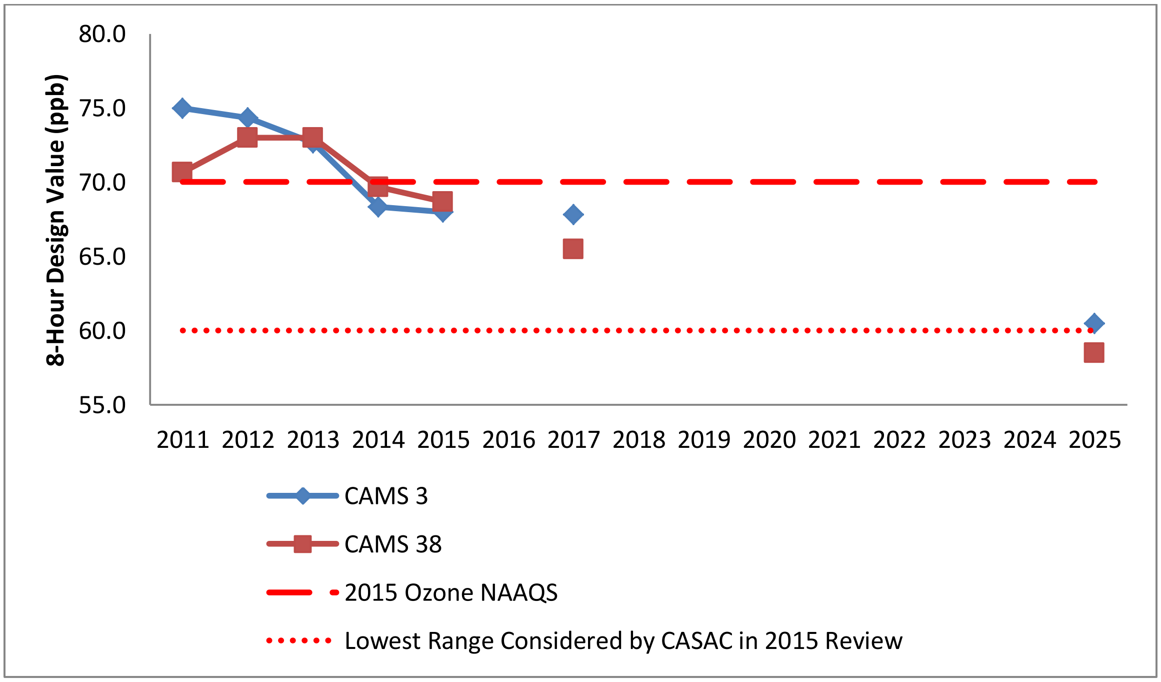
EPA's modeling for the proposal for the 2015 O_3 NAAQS indicated that the NO_X reductions from the Clean Power Plan (CPP) would be expected to reduce peak 8-hour O_3 concentrations in Travis County by 0.7-0.9 ppb. Since the status of the CPP is unclear due to litigation, it is not clear that these reductions can be counted on in the next few years. The U.S. Court of Appeals for the D.C. Circuit should be issuing a ruling on the rule in the near future.

6.3 Projected Reductions in Travis County's 8-Hour O_3 Design Value

These projected trends in emissions are reflected in modeled O_3 projects for the region showing the region's O_3 design value declining to approximately 67 ppb in 2017 based on EPA's 2008 O_3 NAAQS transport modeling[29] and as low as 60 ppb by 2025, based on EPA's 2015 O_3 NAAQS Regulatory Impact Analysis.[30] These trends strongly suggest that the region's O_3 levels will likely remain in compliance with the 2015 O_3 NAAQS for the foreseeable future, although the region may continue to experience exceedances of the NAAQS periodically in a given year, as the region experienced in 2015. If EPA further tightens the O_3 NAAQS in their next review to a level of 60 ppb, the region would be unlikely to reach that level without further emission reductions in time to avoid a nonattainment designation, assuming EPA completes the next review by the end of 2020 as required under the Clean Air Act, although it may manage to narrowly avoid a nonattainment designation for a standard set as low as 65 ppb.

[29] http://www.epa.gov/airtransport/pdfs/O3 %20Design%20Values_Transport%20NODA.xlsx
[30] http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0169-0057

Figure 33. 8-Hour O_3 Design Value Trends for Travis County, 2011 - 2025



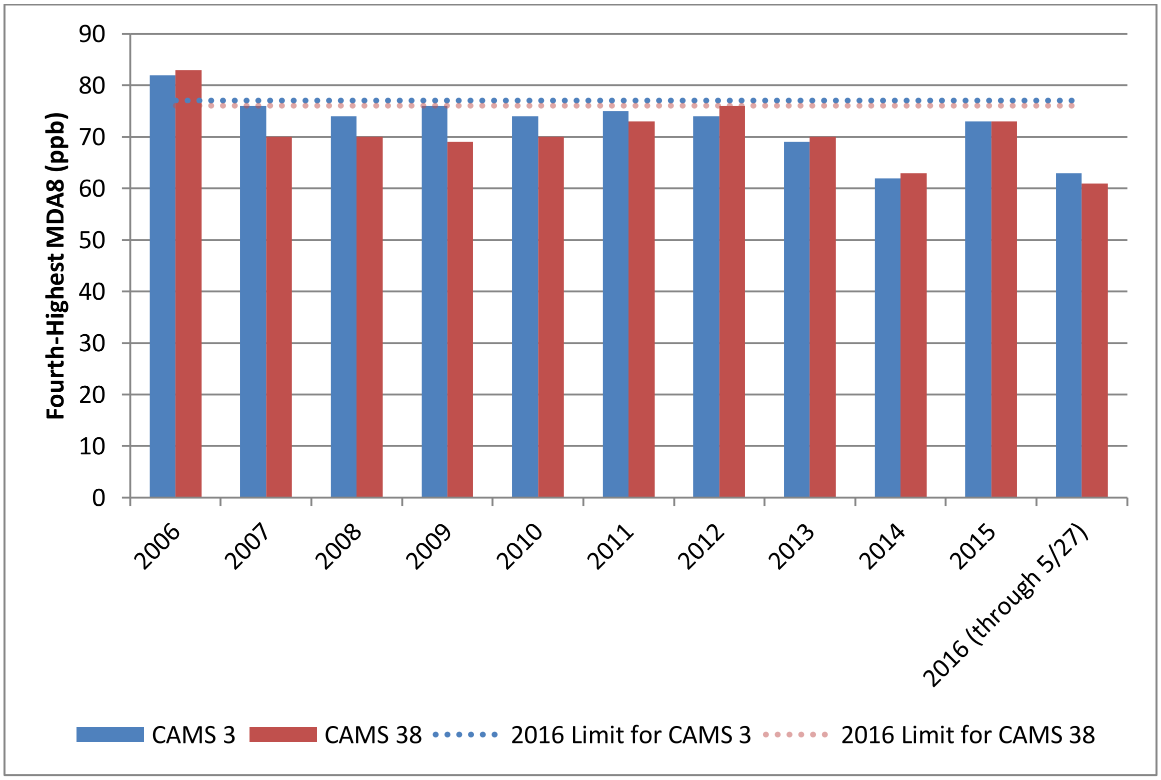
6.4 Outlook for Area Designations for the 2015 O_3 NAAQS

While the long-term projections for O_3 levels in the region indicate that the region's design value is likely to remain in compliance with the 2015 O_3 NAAQS in 2017 and 2025, a more immediate concern is ensuring that the region's 2016 O_3 design value remains in compliance with the 2015 O_3 NAAQS to ensure that the monitoring data that EPA has indicated that it plans to use as the basis for the initial area designations for the 2015 O_3 NAAQS show that the region's O_3 levels are attaining the standard. While the region's 2013-2015 design value is attaining the standard, the fourth-highest MDA8 values at CAMS 3 and 38 in 2015 were both over 70 ppb due to an unusually bad O_3 season. This raised concerns among some stakeholders about the possibility of the region's 2014-2016 design value exceeding the 2015 O_3 NAAQS by the end of the 2016 O3 season.

The region's O_3 levels that would need to be reached in 2016 would need to exceed the O_3 levels measured in each of the prior 10 years in order have a 2014-2016 design value of71 ppb or higher. While this is technically possible, it is statistically very unlikely – only about a 4-5% probability, given the O_3 levels measured between 2013 and 2015.[31]

[31] Mean of 2013-2015 fourth highest MDA8 for CAMS 3 = 68 ppb, S.D = 5.6 ppb; probability that fourth high MDA8 in 2016 > 77.9 ppb = 4%. Mean for CAMS 38 = 68.7 ppb, S.D. = 5.1 ppb; probability that fourth high MDa8 in 2016 > 76.9 ppb = 5%.

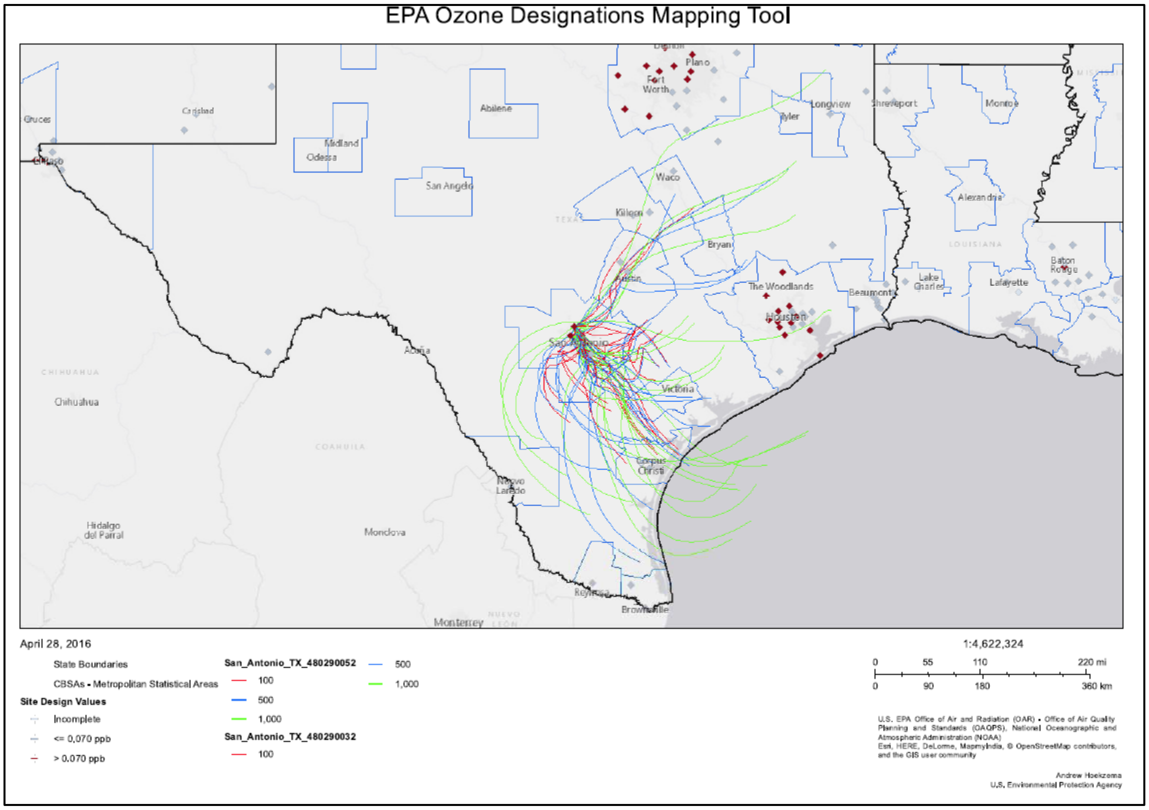
Figure 34. Fourth-Highest O_3 MDA8 Values at CAMS 3 and 38 for 2006-2015 and Outlook for 2016



While the probability is very low that the Austin-Round Rock MSA's 2014-2016 design value would violate the 2015 O_3 NAAQS, there is also a risk that one or more of the counties could be added to a nonattainment area associated with violations of the NAAQS in San Antonio. Two monitors in San Antonio already have preliminary 2014-2016 design values that violate the 2015 O_3 NAAQS, and it is possible that Bastrop, Caldwell, Hays, Travis, or Williamson Counties could be designated as "nonattainment" for the 2015 O_3 NAAQS despite having O_3 levels that are attaining the NAAQS if EPA determines that any of these "contribute to the violation" of the O_3 NAAQS in San Antonio."[32] EPA's guidance does not include a threshold for determining whether a county's emissions would be considered "contributing" to a violation, but EPA has indicated that it plans on using HYSPLIT back-trajectories included in its designation mapping tool to screen areas for inclusion or exclusion of a nonattainment area. The following map shows the 24-hour back-trajectories from the monitors in San Antonio that on days when MDA8 levels exceeded 70 ppb at elevations of 100, 500, and 1,000 meters.

[32] https://www.epa.gov/sites/production/files/2016-02/documents/ozone-designations-guidance-2015.pdf

Figure 35. HYSPLIT Back-Trajectories from San Antonio CAMS 23 and 58 on Days >70 ppb: 2013 & 2014



As the figure shows, the vast majority of back-trajectories on these high O_3 days in 2013 and 2014 came from the south-east, and therefore do not cross over the Austin-Round Rock MSA. However, there are a small number of back-trajectories that trace back up the I-35 corridor, crossing Hays, Travis, and Williamson Counties, with two back-trajectories at the 500 meter elevation tracing back across Bastrop County as well. **Since EPA Region 6 staff have stated that they plan to use this mapping tool in their proposed area designations due in June 2017, and since at least some of these back-trajectories pass over the Austin-Round Rock MSA, CAPCOG and the CAC will continue to closely monitor this issue as EPA proceeds with its initial area designation process for the 2015 O_3 NAAQS**.

6.5 Regional Air Quality Collaboration and Coordination with the San Antonio Area

On April 29, 2016, the CAC had its first-ever joint meeting with AACOG's Air Improvement Resources (AIR) Executive Committee, which includes elected officials from city and county governments in the San Antonio-New Braunfels MSA. This meeting was the first of what will now be semi-annual joint meetings between the two committees in order to improve collaboration and coordination on air quality issues. The CAPCOG and AACOG air quality programs have long collaborated on technical projects, but now the two organization's air quality committees will be collaborating and coordinating on a much wider range of air quality topics.

As regions that host the two largest cities in the U.S. that are not currently designated nonattainment for any NAAQS, which have both long participated in EPA's voluntary O_3 management programs, and which have similar types of emissions sources, industries, and demographic trends, the Austin-Round Rock MSA and San Antonio-MSA have much in common as it relates to air quality planning, and this collaborative effort between the two areas should help both areas better be able to improve air quality. Already, the meeting has prompted officials in San Antonio to begin investigating the possibility of adopting an I/M program, and has encouraged officials in the Austin-Round Rock MSA to find ways to effectively reduce emissions from the implementation of local idling restrictions.

The next joint meeting between the CAC and the AIR Executive Committee is scheduled for Friday, November 4, 2016, in San Marcos, Texas, and will be hosted by AACOG.

CAPCOG and AACOG are also collaborating on several research projects in 2016, including a "cost of nonattainment" analysis for the San Antonio area similar to the analysis CAPCOG completed in 2015 for the Austin-Round MSA, as well as a source apportionment modeling project designed to compare the impact on O_3 levels in the Austin-Round Rock MSA of emissions from individual counties in the CAPCOG, AACOG, and CTCOG regions, as well as from regions in other parts of Texas and the rest of the country.

6.6 Outlook for TERP Grant Programs

As the single largest source of NO_X reductions in the region's OAP Action Plan, TERP Grants and the outlook for these grants are an important part of the region's air quality planning efforts.

On May 6, 2016, TCEQ announced the grant recipients for the latest round of ERIG grants. Of the 559 projects selected for funding, 76 were primarily located in the Austin-Round Rock MSA, accounting for $7,852,426.04 in funding, and 843.56 tons of NO_X reduced over the lifetime of these projects. This translates into 120.51 in annual NO_X reductions, and 0.46 tpd of NO_X reductions for typical O_3 season weekdays. This will bring the total NO_X reductions from the DERI, TCFP, and TNGVGP to 3.03 tpd in 2016 compared to the 2.57 tpd that would have been occurring based on the projects active as of August 31, 2015. These latest grants have an average cost-effectiveness of $9,308.70 in the Austin area, and 9,922.74 overall. Cost-effectiveness ratios for projects primarily in the Austin-Round Rock MSA ranged from $6,853 per ton of NO_X reduced to $12,001 per ton of NO_X reduced.

As a group, the projects in Austin were about 7% more cost-effective at reducing NO_X than the projects funded in other parts of the state. One CAC members received an FY 2016 ERIG grant: CapMetro received a $672,000 to replace 28 transit buses for a total of 65.50 tons of NO_X reductions over the next 7 years. For the 2^{nd} year in a row, the Austin-Round Rock MSA's share of total funding and NO_X reductions exceeded the shares of all other metro areas other than the Dallas-Fort Worth and Houston-Galveston-Brazoria areas. CAPCOG received 15% of total funding awarded and 16% of the emission reductions from the FY 16 grants, up from the 7% of funding and 5% of NO_X reductions from 2001 through August 31, 2015.

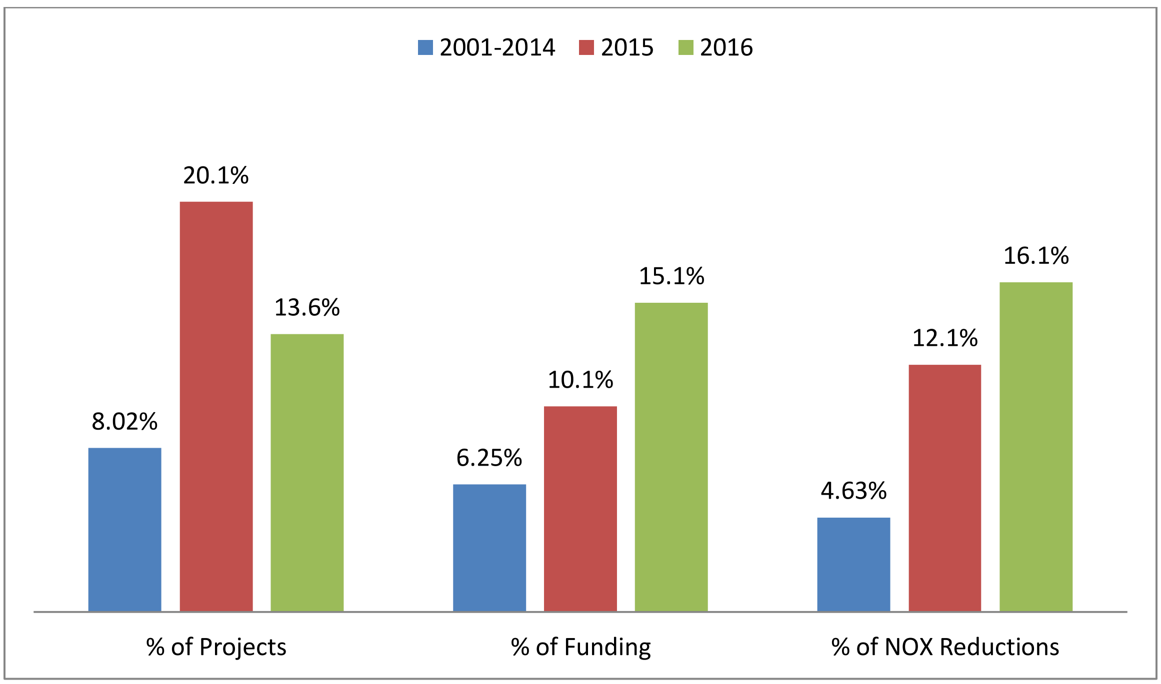
Table 25. FY 16 ERIG Grant Summary by Area

AREA	Projects	Funding	NO_X Reductions-Lifetime tons

AREA	Projects	Funding	NO_X Reductions-Lifetime tons
Dallas/Fort Worth	198	$15,659,941.45	1,591.39
Houston/Galveston/Brazoria	181	$19,533,740.69	1,889.87
Corpus Christi	9	$720,668.19	76.27
San Antonio	42	$4,503,618.39	488.92
Austin	76	$7,852,426.04	843.56
Victoria	31	$2,523,626.63	233.02
Beaumont/Port Arthur	20	$1,032,475.10	100.01
El Paso	2	$87,003.00	8.74
TOTAL	559	$51,913,499.49	5,231.77
Austin Area Share	14%	15%	16%

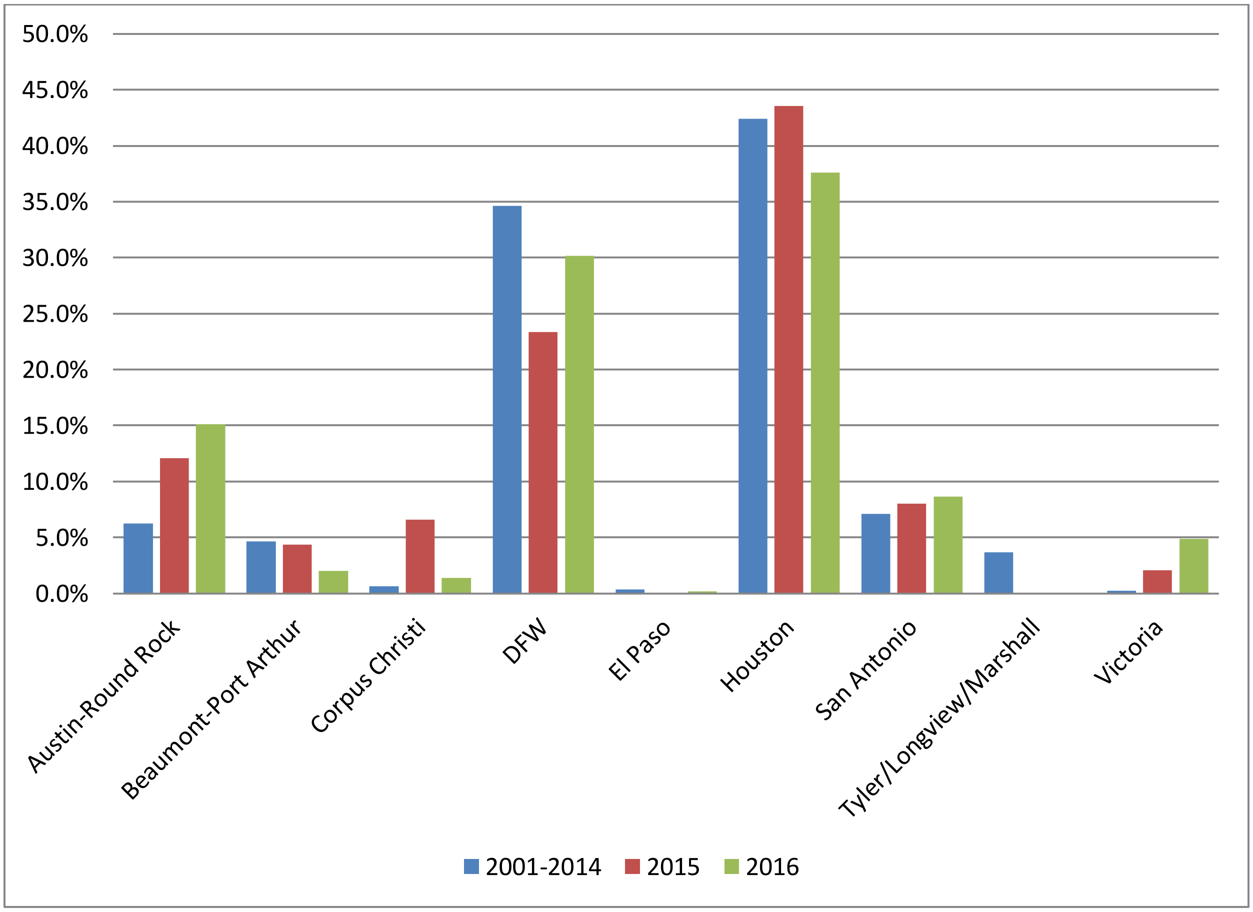
The following figure shows a comparison of the share of projects, funding, and NO_X reductions the Austin-Round Rock MSA has received from the ERIG grants since 2001.

Figure 36. Comparison of Austin-Round Rock MSA Share of TERP ERIG Projects, 2001-2014, 2015, and 2016



The increases in Austin Area's share suggests that outreach efforts in the Austin area have been more successful, and grant applicants have been able to have more competitive applications than other areas. The following figure shows a comparison of the share of funding each area has received over these periods.

Figure 37. Allocation of TERP ERIG Funding by Area, 2001-2014, 2015, and 2016



Looking ahead to the state's 2017 Legislative Session, the statutory authority for several of the grant programs that specifically encourage the use of alternative fuels as a way to reduce NO_X emissions is set to expire if the Texas Legislature does not extend these programs. If these programs are not renewed, the funding that was dedicated to these programs would not necessarily go away; instead, the funding would simply be made available to the DERI program, which is significantly more cost-effective than these other programs at reducing NO_X. The table below summarizes the annual funding, average cost-effectiveness, and expiration date for each program.

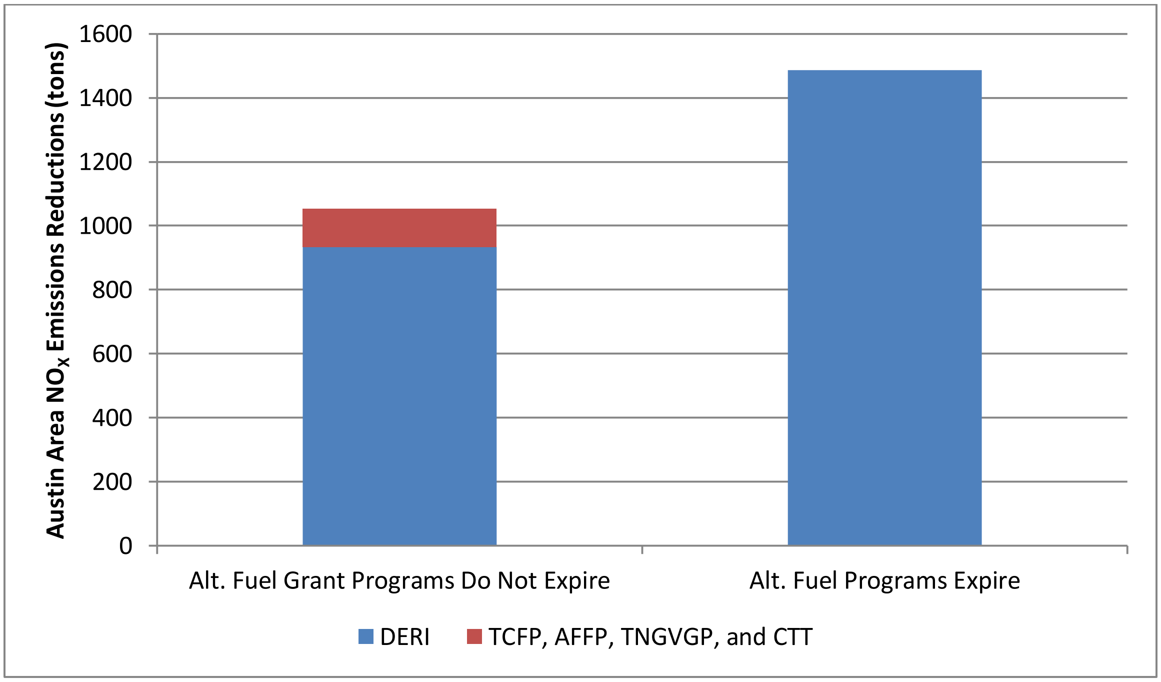
Table 26. Outlook for TERP Grant Programs

Program	Statutory Citation	FY 2017 Budget	Cost Effectiveness ($/ton NO_X reduced)	Expiration Date
Diesel Emission Reduction Incentive Grants	Health and Safety Code, Chapter 386, Subchapter C	$61,741,371	$9,923	August 31, 2019
Drayage Truck Incentive Program	Health and Safety Code, Chapter 386, Subchapter D-1	$2,362,763	$16,983	August 31, 2019
Clean School Bus Program	Health and Safety Code, Chapter 390	$4,725,527	Not available	August 31, 2019
New Technology Implementation Grants	Health and Safety Code, Chapter 391	$3,544,145	Not available	August 31, 2019
Clean Fleet Program	Health and Safety Code, Chapter 392	$5,906,908	$78,391	August 31, 2017
Alternative Fueling Facilities Program (AFFP)	Health and Safety Code, Chapter 393	$5,906,908	Not applicable	August 31, 2018
Natural Gas Vehicle Grant Program & Clean Transportation Triangle Program	Health and Safety Code, Chapter 394	$24,809,014	$34,067[33]	August 31, 2018

If the programs that are set to expire at the end of FY 2017 and 2018 do, in fact, expire, and these funds become available for the DERI grant program, it would significantly increase the amount of NO_X emission reductions that could be achieved. The following figure shows the estimated NO_X reductions that could be achieved in the Austin area in FY 2019 if these programs were extended compared to a scenario in which they expired, assuming that the Austin area received 15% of the funding from these programs as has occurred in recent years. This would represent a 41% increase in the total NO_X emission reductions that can be achieved with the funding available to the DERI, TCFP, AFFP, TNGVGP, and CTT programs if the latter programs expire as scheduled. This would raise the average O_3 season day NO_X reductions added with new projects in the Austin area from 0.58 tpd to 0.82 tpd in FY 2019.

[33] Reflects the total amount spent on both the CTT and TNGVGP divided by the total NO_X emission reductions estimated from the TNGVGP.

Figure 38. Austin Area NO_X Emission Reduction Potential from TERP Grants Depending on Program Expiration



6.7 Outlook for the I/M Program

March 1, 2016, marks the full transition to a one-sticker inspection & registration system in Texas. This change in the I/M program is likely to increase the program's compliance levels, assuming a deterrent effect of the prospect of failing to receive a vehicle registration sticker if a motorist cannot pass a vehicle emissions inspection. In the short-term, though, the transition actually enabled a certain subset of motorists to avoid getting tested, depending on the timing of when they would have been required to get their vehicles tested. As these vehicles cycle through the program between March 1, 2016, and February 28, 2017, this problem should go away, however.

While the I/M program remains one of the highest-impact measures that the region is taking, enjoys high levels of public support, its cost-effectiveness is near the level that would be considered "break even" for a cost/benefit ratio compared to the quantified health benefits associated with NO_X reductions described in the 2015 O_3 NAAQS Regulatory Impact Analysis, which is approximately $26,000 per ton of health benefits per ton of NO_X reduced. As the fleet gets cleaner due to fleet turnover and more stringent engine and fuel standards and the population continues to grow, the costs will grow while the benefits will shrink. This will be particularly true starting in 2017 with the new tier 3 fuel and light-duty vehicle standards.

In 2015, CAPCOG estimated that the financial cost of the I/M program to motorists in Travis County and Williamson was $15.6 – 36.8 million annually. Compared to a cost/benefit ratio of $26,000 per ton of NO_X reduced in the 2015 O_3 NAAQS RIA, this would mean that the I/M program would need to achieve 600 - 1,415 tons of NO_X reductions annually in order to "break even" compared to the financial cost of the program. Current estimates for the emission reductions the program did reduce NO_X emissions in the lower end of this range: at about 2.5 tpd NO_X, reductions, it would be expected to achieve about 750 tpy of NO_X reductions annually.

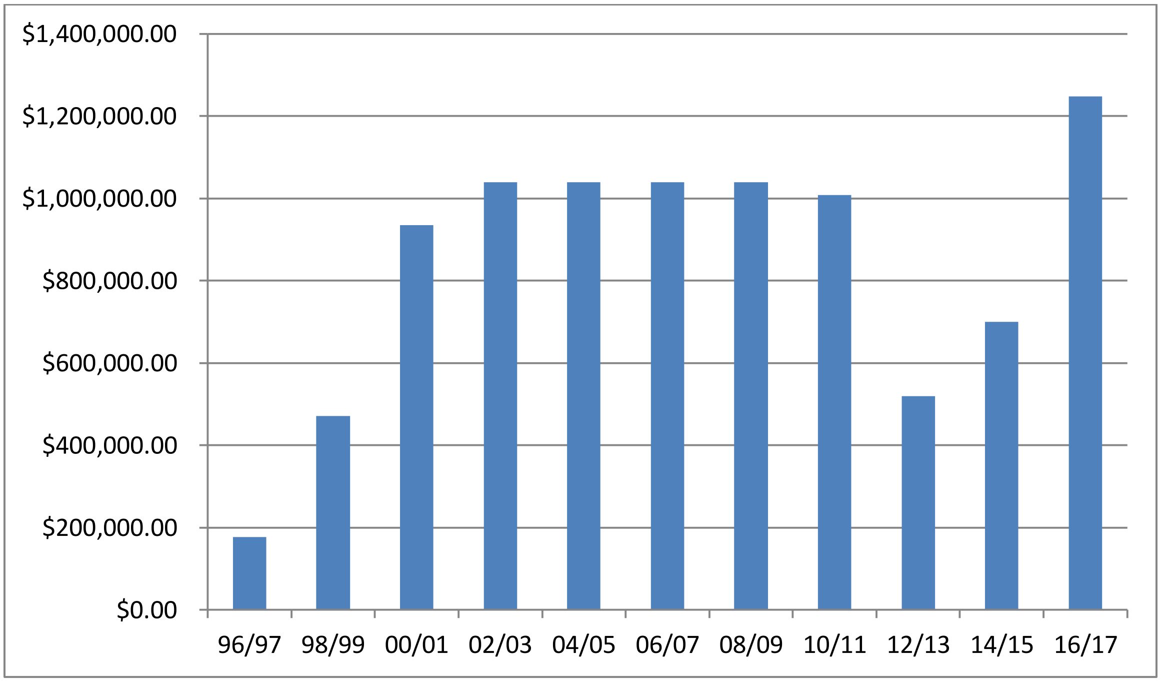
This analysis, however, does not consider how financial costs translate into impacts on the overall economy. CAPCOG estimated that the impact of the I/M program ranged from an $8 million/year cost to the economy to a $1.8 million benefit to the economy, depending on the assumptions used. If the $15.6 - $36.8 million that is currently spent on the I/M program annually was spent elsewhere in the economy at large, CAPCOG estimates that it would generate an extra $1.8 - $8 million in gross regional product (GRP), while the comparison to other sectors (retail, arts/entertainment/recreation, and accommodations/food services) shows a more mixed picture, with some scenarios showing higher growth with the I/M program and some scenarios showing higher growth without it.

Regardless, the issue that the I/M program faces is increasing costs due to population growth while simultaneously having decreasing benefits due to cleaner vehicles throughout the fleet. There are benefits for the I/M program that don't compare directly to this cost-benefit ratio, such as the benefits of avoiding a nonattainment designation. However, once the EPA's initial designations are made, policy-makers in the region and at the TCEQ will need to consider the future of the program, and decide whether adjustments are warranted to reduce the program's costs or increase its benefits. One idea that has been discussed is to limit the applicability of the I/M program to only model years up through 2016, which would gradually phase the program out over time. Other ideas that have been discussed include switching to biennial testing or adding a few years to the exemption coverage. Since the program is part of the SIP, any changes in the program will need to be approved by EPA in any case, and the state would need to demonstrate that any such change did not interfere with attainment or maintenance of the NAAQS.

6.8 CAPCOG 2016-2017 Near-Nonattainment Area Work Plan

CAPCOG's near-nonattainment grant got a large boost in funding as a result of legislative changes to the program in the 2015 Texas Legislative Session. Under Rider 7 to TCEQ's appropriations, funding for the program increased by $1 million from the 2014-2015 biennium, from $5,000,500 to $6,000,500, while 1 area was added (Killeen-Temple), bringing the total number of "near-nonattainment" areas to 10. The legislature also added a provision specifying how funding would be determined, using a formula based on each area receiving a minimum amount of funding, and the remainder of the funding being based on population. As a result of these changes, the Austin-area funding increased from just under $700,000 for the 2014-2015 biennium to over $1.2 million for the 2016-2017 biennium.

Figure 39. Austin Area Near-Nonattainment Grant Funding, 1996-2017



An outline of CAPCOG's work plan for 2016-2017 is shown below. Several tasks/deliverables have already been completed.

1. Planning and Implementation Activities:
    1.1. Prepare Annual Air Quality Reports;
    1.2. Prepare Annual Air Quality Updates;
    1.3. Regional Air Quality Surveys;
    1.4. Local and Voluntary Emission Reduction Quantification;
    1.5. Cost-Benefit Analysis of Regional Air Quality Planning Efforts;
    1.6. Air Quality Plan Implementation Assistance;
    1.7. Air Quality Outreach and Education Activities;
    1.8. Staff Support for the CAC;
2. Emissions Inventory Projects:
    2.1. Analysis of 2014 National Emissions Inventory Data;
    2.2. Emissions Inventory Projections;
    2.3. Emissions Inventory Spatial Allocation Surrogates;
3. Conceptual Model Update and 2016 Data Analysis;
4. Program Administration and Management Activities:
    4.1. General Program Administration and Management Activities;
    4.2. Development of a Proposal for Grant Activities for the 2018-2019 Biennium;
5. Monitoring Projects:
    5.1. Continuous Monitoring in the 2016 and 2017 O_3 Seasons;
    5.2. CAPCOG O_3 Monitoring Network Review;
    5.3. Additional O_3 Monitoring Projects;
6. Photochemical Modeling Projects:

   6.1. Source Apportionment Modeling;
   6.2. 2012 Modeling Platform Performance Evaluation;
   6.3. Sensitivity and Control Strategy Modeling;
   6.4. Secondary Analysis of Photochemical Modeling Data;
7. Regional Air Quality Grants:
   7.1. NO_X Reduction Grants; and
   7.2. CAPCOG Regional Air Quality Grants.

6.9 Incorporating Other Pollutants into Regional Air Quality Planning Efforts

At the December 2015 CAC meeting, the CAC members expressed interest in the CAC starting to incorporate $PM_{2.5}$ into the region's air quality planning efforts, if only in a public notification/outreach and education capacity. Several factors were discussed at the meeting as to the potential benefits of taking such an approach:

- co-pollutant benefits from reductions in $PM_{2.5}$ concentrations account for about 80% of the public health benefits that EPA estimates will be associated with the NO_X reductions needed to ensure compliance with the 2015 O_3 NAAQS,
- the Austin-Round Rock MSA experiences more days when PM levels are not considered "good" than it experienced days when O_3 levels are not considered "good;"
- there are often local scale/micro-scale PM issues that come up from time to time in communities in the region (wildfires, dust issues, etc.) that may benefit from involvement by regional air quality experts.

CAPCOG and the CAC will continue to explore opportunities to address regional air quality issues more broadly. TCEQ's planned installation of a new, near-road $PM_{2.5}$ monitor at CAMS 1068, which sits at the intersection of IH-35 and U.S. 183, by January 1, 2017, should provide new insights into these issues and the extent to which these particular parts of our community may be exposed to $PM_{2.5}$ beyond what is captured at other monitors further from major roadways. To the extent that the region's O_3 planning efforts can help reduce $PM_{2.5}$ concentrations or vice-versa, the regional effort stands to benefit.

7 Conclusion

The Austin-Round Rock MSA's air quality meets all federal standards, although the region periodically measures O_3 levels considered "unhealthy for sensitive groups" and more commonly measures O_3, $PM_{2.5}$, and NO_2 concentrations that are considered "moderate." While the region's own O_3 levels are likely to remain in compliance with the 2015 O_3 NAAQS for the foreseeable future, the region's proximity to the San Antonio area, which is currently exceeding the 2015 O_3 NAAQS, creates a risk that some of the counties in the Austin-Round Rock MSA could yet face regulatory issues related the new standard.

As this report thoroughly documents, however, the region has taken on the responsibility of addressing the 8-9 ppb of O_3 that it contributes to peak O_3 concentrations within the area, and these efforts have "spillover" effects in adjacent areas, providing the San Antonio are with air quality benefits due to emission reductions in the Austin-Round Rock MSA. CAPCOG estimates that emission reductions that the region is actively implementing under this Action Plan are reducing the region's contribution to peak O_3 levels by approximately 1 ppb, or about 13%. The CAC remains committed to clean air, and will continue improving air quality for the residents of Central Texas.