

NEW MEXICO OZONE ATTAINMENT INITIATIVE

2028 Source Sector APCA Ozone Source Apportionment Modeling and Revised Draft Air Quality Technical Support Document

Marco Rodriguez, Pradeepa Vennam, Jung Chien, John Grant, Tejas Shah and Ralph Morris, Ramboll

Tom Moore and Mary Uhl, WESTAR

NM OAI Study Webinar

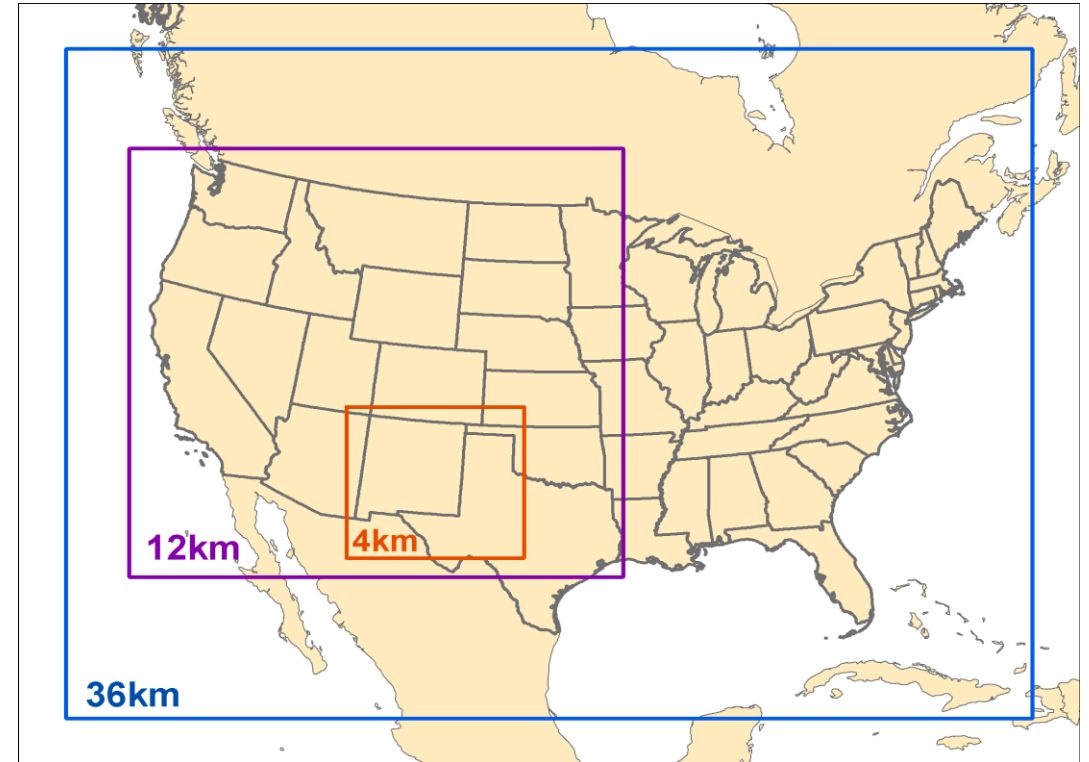
April 2, 2021

2028 SOURCE SECTOR APCA OZONE SOURCE APPORTIONMENT

- 01** Summary of 2028 Ozone Design Value Projections Following EPA Guidance and Sensitivity Analysis to Current Year DVC
- 02** 2028 O&G CS Source Sector APCA Ozone Source Apportionment Modeling Results
- 03** Second Draft Air Quality Technical Support Document (AQTSD)
- 04** Status of 2028 OSAT VOC/NO_x Formation Sensitivity Ozone Source Apportionment Modeling

CAMX 2014 NM OAI STUDY MODEL CONFIGURATION

- Episode: May-August 2014
 - 16-day spin-up before first high ozone day in NM
 - 68 ppb on May 17
- 36/12/4-km Modeling Domains
 - 36/12-km domains same as WRAP Regional Haze
 - New 4-km New Mexico domain
- Boundary Conditions (BC) WRAP 2014 GEOS-Chem
- Four Meteorological Diagnostic Sensitivity tests
 - Selected WRF/NAM with Kv=CMAQ
- WRAP 2014v2 base year emissions
 - EPA NEI2014v2 w/ western state updates
- WRAP 2028OTBa2 for future year w/ 2014 actual fires and new 2028 NM O&G



PROJECTED 2028 OZONE DVFS FOLLOWING EPA GUIDANCE

- Future Year 2028 ozone design value (DVF) projections following EPA guidance using 2012-2016 DVC:
 - $2028 \text{ DVF} = \text{RRF} \times \text{DVC}_{2012-2016}$
- Two sites have current year $\text{DVC}_{2012-2016}$ above the 2015 ozone NAAQS:
 - Desert View = 72.0 ppb
 - Santa Teresa = 71.3 ppb
- Using EPA guidance, all sites have 2028 ozone DVF below NAAQS for both 2028 Base and 2028 O&G Control Strategy:
 - Desert View = 67.0 and 66.8 ppb
 - Santa Teresa = 66.1 and 66.0 ppb

AQS_ID	2012-16	Projected 2028 DVF			Site Name	State
	DVC (ppb)	Base (ppb)	Cntl (ppb)	Cntl - Base		
Northern New Mexico						
350390026	64.0	60.8	60.0	-0.8	Coyote Ranger District	NM
350431001	64.0	58.4	58.1	-0.3	Bernalillo (E Avenida)	NM
350450009	64.3	61.0	60.2	-0.8	Bloomfield	NM
350450018	67.0	64.8	63.3	-1.5	Navajo Lake	NM
350451005	63.7	60.8	59.6	-1.2	Substation	NM
350490021	64.3	60.6	60.4	-0.2	Santa Fe Airport	NM
Bernalillo County						
350010023	66.3	60.9	60.7	-0.2	Del Norte HS	NM
350010024	68.0	62.3	62.0	-0.3	South East Heights	NM
350010029	66.0	61.0	60.5	-0.5	South Valley	NM
350010032	67.0	62.6	62.1	-0.5	Westside	NM
350011012	65.0	59.1	58.8	-0.3	Foothills	NM
Southern New Mexico						
350130008	66.3	60.0	59.8	-0.2	La Union	NM
350130017	67.0	61.9	61.8	-0.1	Sunland Park City Yard	NM
350130020	67.0	62.3	62.2	-0.1	Chaparral	NM
350130021	72.0	67.0	66.8	-0.2	Desert View	NM
350130022	71.3	66.1	66.0	-0.1	Santa Teresa	NM
350130023	65.0	60.3	60.2	-0.1	Solano	NM
350151005	69.0	66.7	66.4	-0.3	Carlsbad	NM
350171003	62.0	59.0	58.9	-0.1	Chino Copper Smelter	NM
350250008	66.0	64.0	63.3	-0.7	Hobbs Jefferson	NM
350290003	66.0	62.7	62.5	-0.2	Deming Airport	NM
350610008	66.3	62.2	62.0	-0.2	Los Lunas (Los Lentos)	NM

INCREASING OZONE AT NEW MEXICO SITES

Ozone Design Values 2010 to 2019

- More recent years have higher ozone DVs at some New Mexico sites:
 - Red > 75 ppb 2008 NAAQS
 - Yellow > 70 ppb 2015 NAAQS
 - Green > 67 ppb (95th percentile)
- Latest 2017-2019 ozone design value (DV₂₀₁₇₋₂₀₁₉) has 6 sites that exceed the 2015 ozone NAAQS
- Conducted sensitivity analysis of 2028 ozone DVF projections to current year DVC
 - DVC₂₀₁₅₋₂₀₁₉
 - DVC₂₀₁₇₋₂₀₁₉

AQS Site ID	Local Site Name	County Name	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
350010023	Del Norte HS	Bernalillo	0.064	0.066	0.068	0.070	0.068	0.066	0.065	0.067	0.070	0.070
350010024	SE Heights	Bernalillo	0.066	0.068	0.070	0.070	0.068					
350010027	Westside	Bernalillo	0.067	0.068	0.071	0.071						
350010029	South Valley	Bernalillo	0.066	0.067	0.069	0.070	0.067	0.066	0.065	0.065	0.066	0.067
350010032	Westside	Bernalillo			0.070	0.070	0.067					
350011012	Foothills	Bernalillo	0.068	0.070	0.074	0.072	0.067	0.064	0.064	0.067	0.069	0.071
350011013	North Valley	Bernalillo	0.067	0.068	0.069	0.069						
350130008	La Union	Dona Ana	0.064	0.062	0.065	0.067	0.067	0.066	0.066	0.068	0.068	0.070
350130017	Sunland Park	Dona Ana	0.064	0.065	0.068	0.067	0.067					
350130020	Chaparral	Dona Ana	0.066	0.067	0.067	0.069	0.068	0.067	0.066	0.068	0.071	0.073
350130021	Desert View	Dona Ana	0.070	0.069	0.072	0.072	0.072	0.072	0.072	0.072	0.074	0.077
350130022	Santa Teresa	Dona Ana	0.067	0.066	0.070	0.075	0.074	0.072	0.068	0.072	0.074	0.076
350130023	Solano	Dona Ana	0.063	0.063	0.065	0.065	0.065	0.065	0.065	0.066	0.067	0.070
350151005	Carlsbad City	Eddy	0.067	0.068	0.071	0.071	0.071	0.069	0.067	0.068	0.074	0.079
350153001	Carlsbad Caverns	Eddy									0.071	
350171003	Chino Copper	Grant	0.063	0.065	0.067	0.063	0.062					
350250008	Hobbs Jefferson	Lea	0.059	0.061	0.061	0.066	0.065	0.067	0.066	0.067	0.070	0.071
350290003	Deming Airport	Luna	0.057	0.058	0.064	0.067	0.066					
350390026	Coyote Ranger District	Rio Arriba							0.064	0.065	0.067	0.067
350431001	Bernalillo Pueblo Of Jemez	Sandoval	0.060	0.061	0.061	0.063	0.063	0.065	0.064	0.065	0.068	0.068
350439004		Sandoval		0.062								
350450009	Bloomfield	San Juan	0.060	0.061	0.067	0.068	0.067	0.064	0.062	0.064	0.069	0.068
350450018	Navajo Lake	San Juan			0.071	0.071	0.068	0.067	0.066	0.068	0.070	0.069
350451005	Substation Santa Fe Airport	San Juan	0.063	0.063	0.067	0.068	0.066	0.063	0.062	0.064	0.069	0.069
350490021		Santa Fe	0.063	0.062	0.065	0.066	0.066	0.064	0.063	0.063	0.066	0.066
350610008	Los Lunas	Valencia			0.067	0.070	0.069	0.066	0.064	0.065	0.067	0.068

2028 OZONE DVF SENSITIVITY TO DVC₂₀₁₅₋₂₀₁₉ AND DVC₂₀₁₇₋₂₀₁₉

AQS_ID	2015-19	Projected 2028 DVF			Site Name	County
	DVC (ppb)	Base (ppb)	Cntl (ppb)	Cntl - Base		
350010023	69.0	63.4	63.1	-0.3	Del Norte HS	Bernalillo
350010029	66.0	61.0	60.5	-0.5	South Valley	Bernalillo
350011012	69.0	62.7	62.4	-0.3	Foothills	Bernalillo
350130008	68.7	62.1	62.0	-0.1	La Union	Dona Ana
350130020	70.7	65.7	65.7	0.0	Chaparral	Dona Ana
350130021	74.3	69.1	68.9	-0.2	Desert View	Dona Ana
350130022	74.0	68.6	68.5	-0.1	Santa Teresa	Dona Ana
350130023	67.7	62.9	62.7	-0.2	Solano	Dona Ana
350151005	73.7	71.2	70.9	-0.3	Carlsbad	Eddy
350153001	71.0	69.3	69.3	0.0	Carlsbad Caverns NP	Eddy
350250008	69.3	67.2	66.5	-0.7	Hobbs Jefferson	Lea
350390026	66.3	63.0	62.2	-0.8	Coyote Ranger Dist	Rio Arriba
350431001	67.0	61.2	60.9	-0.3	Bernalillo (E Avenida)	Sandoval
350450009	67.0	63.6	62.8	-0.8	Bloomfield	San Juan
350450018	69.0	66.7	65.2	-1.5	Navajo Lake	San Juan
350451005	67.3	64.2	62.9	-1.3	Substation	San Juan
350490021	65.0	61.2	61.0	-0.2	Santa Fe Airport	Santa Fe
350610008	66.7	62.6	62.3	-0.3	Los Lunas (Los Lentos)	Valencia

AQS_ID	2017-19	Projected 2028 DVF			Site Name
	DVC (ppb)	Base (ppb)	Cntl (ppb)	Cntl - Base	
350010023	70.0	64.3	64.0	-0.3	Del Norte HS
350010029	67.0	61.9	61.4	-0.5	South Valley
350011012	71.0	64.5	64.2	-0.3	Foothills
350130008	70.0	63.3	63.2	-0.1	La Union
350130020	73.0	67.8	67.8	0.0	Chaparral
350130021	77.0	71.6	71.4	-0.2	Desert View
350130022	76.0	70.5	70.3	-0.2	Santa Teresa
350130023	70.0	65.0	64.8	-0.2	Solano
350151005	79.0	76.4	76.0	-0.4	Carlsbad
350250008	71.0	68.9	68.1	-0.8	Hobbs Jefferson
350390026	67.0	63.6	62.8	-0.8	Coyote Ranger Dist
350431001	68.0	62.1	61.8	-0.3	Bernalillo (E Avenida)
350450009	68.0	64.6	63.7	-0.9	Bloomfield
350450018	69.0	66.7	65.2	-1.5	Navajo Lake
350451005	69.0	65.8	64.5	-1.3	Substation
350490021	66.0	62.2	62.0	-0.2	Santa Fe Airport
350610008	68.0	63.8	63.5	-0.3	Los Lunas (Los Lentos)

CAMX 2028 O&G CS SOURCE SECTOR APCA OZONE SA

• Definition of Source Groups

○ Boundary Conditions (BCs) from WRAP 2014 GEOS-Chem runs:

- BC_{Intl} - International anthropogenic emissions
- BC_{USA} - U.S. anthropogenic emissions
- $BC_{Natural}$ - Natural sources
- BC_{Top} - BC above the top of domain

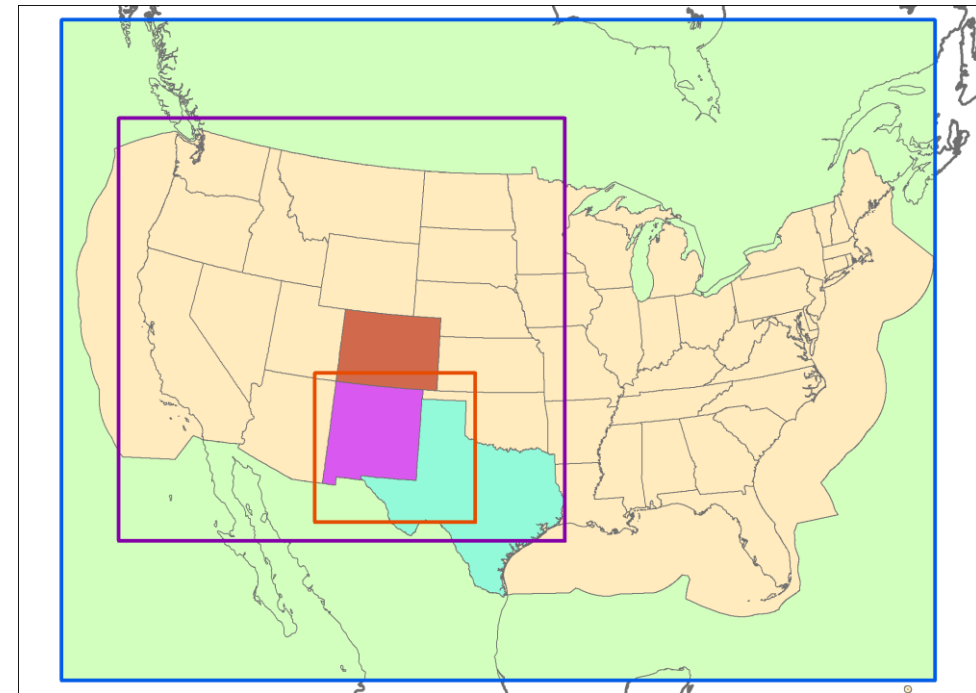
○ Source Categories (9):

1. Natural (biogenic, lightning NO_x, etc.);
2. Fires (WF, Rx, Ag, other);
3. Oil and gas point sources (surrogate for midstream);
4. Oil and gas non-point sources (surrogate for upstream);
5. EGU point;
6. Non-EGU point;
7. On-road mobile;
8. Non-road mobile; and
9. Remainder anthropogenic.

○ Source Regions (5):

- New Mexico
- Texas
- Colorado
- Remainder U.S.
- International (Mex, Can, CMV > 200 nmi)

○ 50 Source Groups ($50 = 5 \times 9 + 5$)



SOURCE SECTOR CONTRIBUTIONS TO 2028 OZONE DVFS

- 1. NEW MEXICO SOURCE SECTOR CONTRIBUTIONS TO 2028 OZONE DVF AT MONITORS**
- 2. SPATIAL DISTRIBUTION OF NEW MEXICO SOURCE SECTOR CONTRIBUTIONS TO 2028 DVFS**
- 3. UNITED STATES SOURCE SECTOR CONTRIBUTIONS TO 2028 OZONE DVF AT MONITORS**

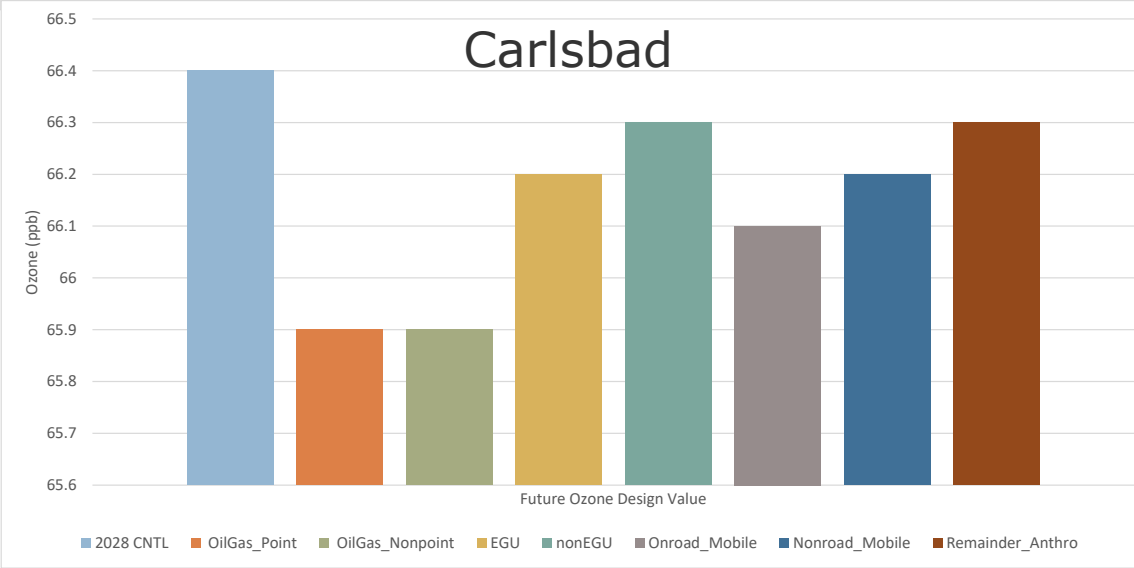
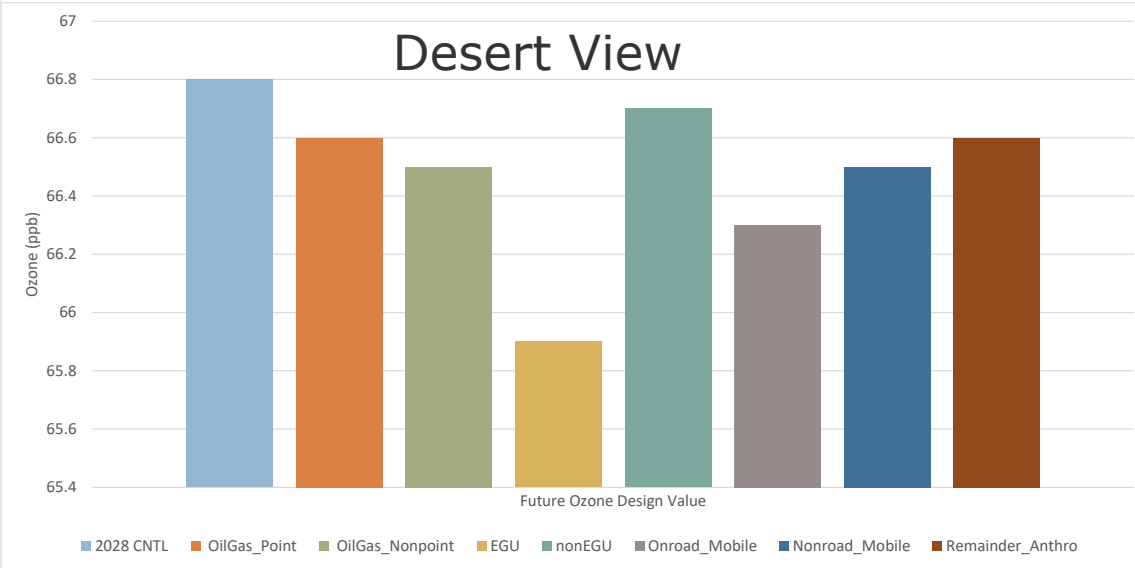
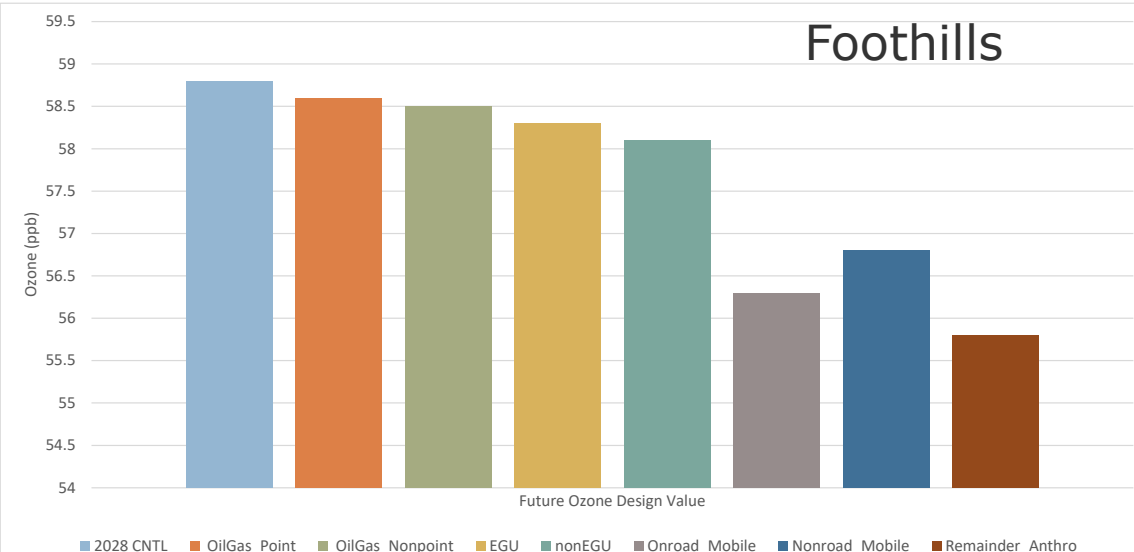
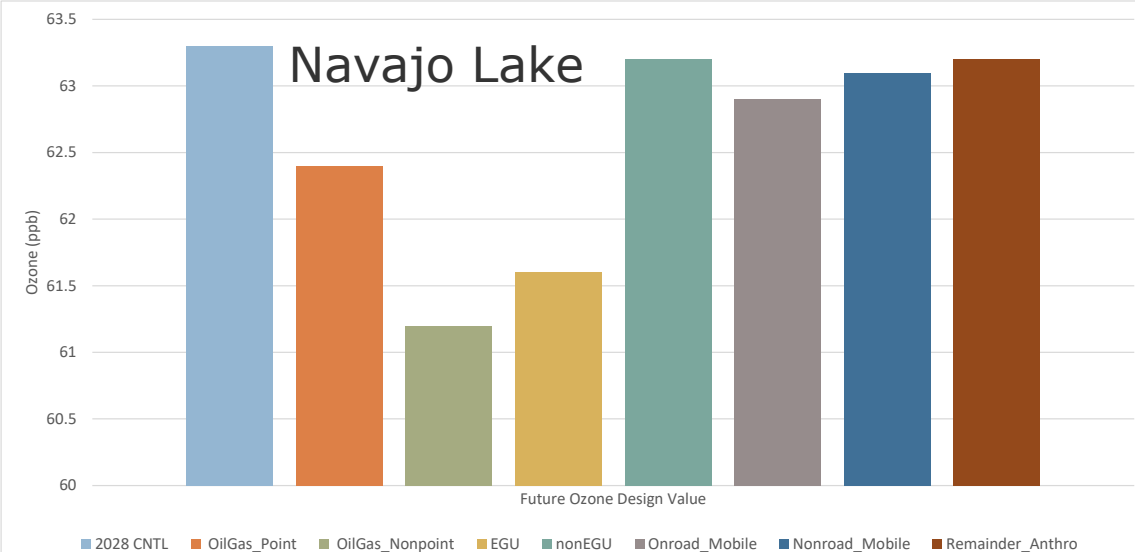
REDUCTIONS 2028 OZONE DVFS NEW MEXICO SOURCE SECTORS

- 2028 ozone DVF Reductions from New Mexico Source Sectors
 - O&G Point: -0.1 to -0.9 ppb
 - O&G Non-Pt: -0.1 to -2.1 ppb
 - EGU Point: 0.0 to -3.1 ppb
 - Non-EGU Pt: 0.0 to -1.1 ppb
 - On-Road: -0.1 to -2.7 ppb
 - Non-Road: -0.1 to -1.9 ppb
 - Other Anthro: 0.0 to -3.6 ppb

AQS_ID	Site_ID	DVC	DVF	O&GPT	O&GNP	EGU	NonEGU	OnRoad	NonRoad	OAnth
350010023	NORTE	66.3	60.7	-0.2	-0.3	-0.5	-1.0	-2.7	-2.0	-3.6
350010024	SEHGS	68.0	62.0	-0.2	-0.3	-0.5	-1.1	-2.5	-1.9	-3.2
350010029	STHVA	66.0	60.5	-0.3	-0.5	-0.5	-1.0	-2.2	-1.7	-2.4
350010032	WSTSD	67.0	62.1	-0.2	-0.4	-0.4	-0.4	-1.6	-1.2	-1.8
350011012	FTHIL	65.0	58.8	-0.2	-0.3	-0.5	-0.7	-2.5	-2.0	-3.0
350130008	UNION	66.3	59.8	-0.2	-0.2	-0.7	0.0	-0.5	-0.3	-0.1
350130017	SPARK	67.0	61.8	-0.2	-0.2	-0.9	0.0	-0.4	-0.2	-0.2
350130020	CHAPA	67.0	62.2	-0.1	-0.1	-0.3	0.0	-0.2	-0.1	-0.1
350130021	DSVIE	72.0	66.8	-0.2	-0.3	-0.9	-0.1	-0.5	-0.3	-0.2
350130022	TERES	71.3	66.0	-0.3	-0.3	-0.7	-0.1	-0.5	-0.3	-0.2
350130023	SOLAN	65.0	60.2	-0.2	-0.2	-0.2	-0.2	-1.2	-0.7	-0.3
350151005	CARLS	69.0	66.4	-0.5	-0.5	-0.2	-0.1	-0.3	-0.2	-0.1
350171003	GRANT	62.0	58.9	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
350250008	HOBBS	66.0	63.3	-0.9	-1.1	-0.2	0.0	-0.3	-0.2	-0.1
350290003	DEAIR	66.0	62.5	-0.2	-0.1	-0.2	0.0	-0.6	-0.4	0.0
350390026	COYOT	64.0	60.0	-0.2	-0.5	-0.5	0.0	-0.2	-0.1	0.0
350431001	BERNA	64.0	58.1	-0.1	-0.2	-0.4	-0.4	-2.1	-1.5	-1.9
350450009	BLOOM	64.3	60.2	-0.7	-1.4	-1.9	0.0	-0.4	-0.1	-0.1
350450018	NAVAJ	67.0	63.3	-0.9	-2.1	-1.7	-0.1	-0.4	-0.2	-0.1
350451005	SUBST	63.7	59.6	-0.6	-1.5	-3.1	-0.1	-0.5	-0.2	-0.2
350490021	SNTFE	64.3	60.4	-0.2	-0.3	-0.2	-0.3	-1.2	-0.7	-0.8
350610008	LUNAS	66.3	62.0	-0.2	-0.3	-0.3	-0.3	-1.1	-1.0	-0.4

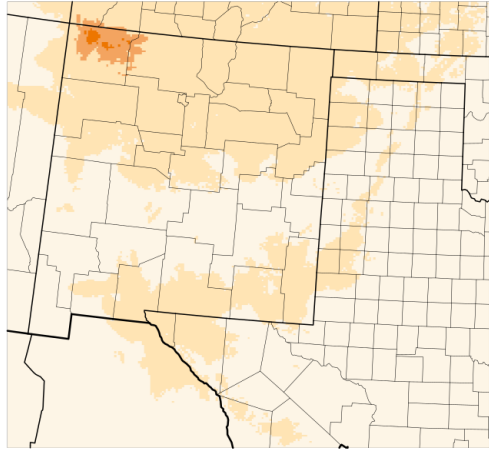
2028 OGCS OZONE DVF & W/ NM SOURCE SECTORS REMOVED

2028 CNTL OilGas_Point OilGas_Nonpoint EGU nonEGU Onroad_Mobile Nonroad_Mobile Remainder_Anthro



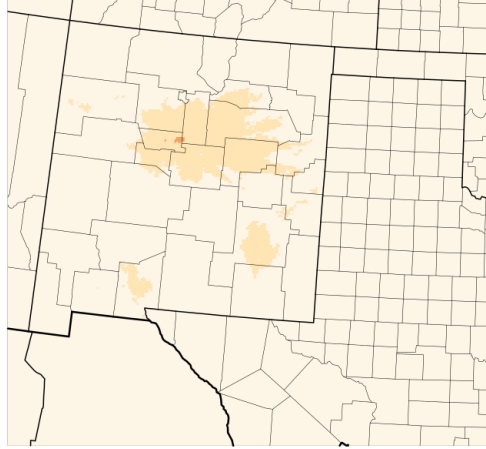
SMAT UAA (DVC₂₀₁₂₋₂₀₁₆) 2028 DVF SOURCE CONTRIBUTIONS

2028 Contributions
EGU point
O3 Design Value UAA



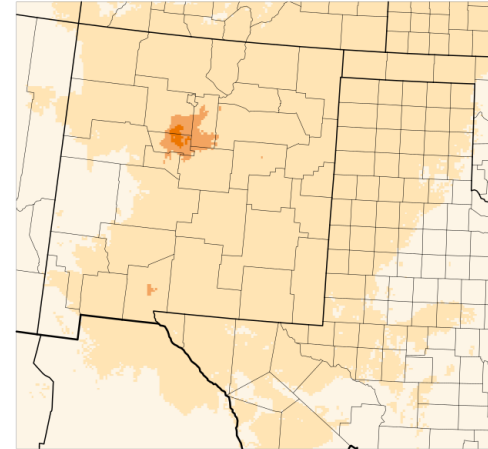
max(44,208) = 3.105 ppb
min(1,215) = 0.006 ppb

2028 Contributions
NonEGU point
O3 Design Value UAA



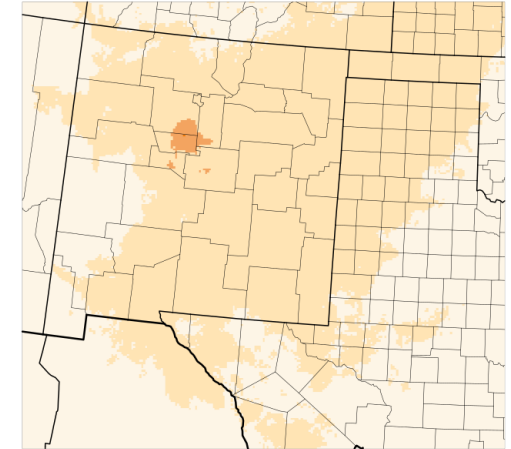
max(86,154) = 1.283 ppb
min(32,1) = 0.000 ppb

2028 Contributions
On-road mobile
O3 Design Value UAA



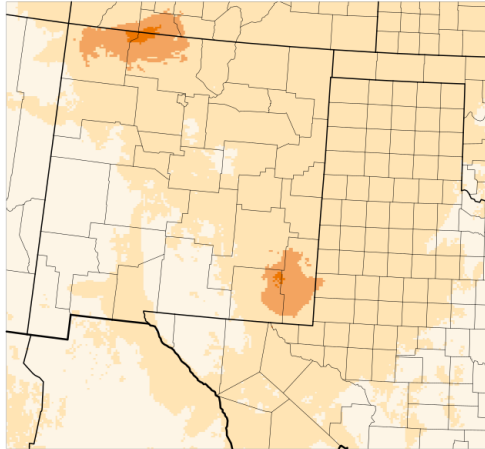
max(82,158) = 2.598 ppb
min(19,189) = 0.006 ppb

2028 Contributions
Non-road mobile
O3 Design Value UAA



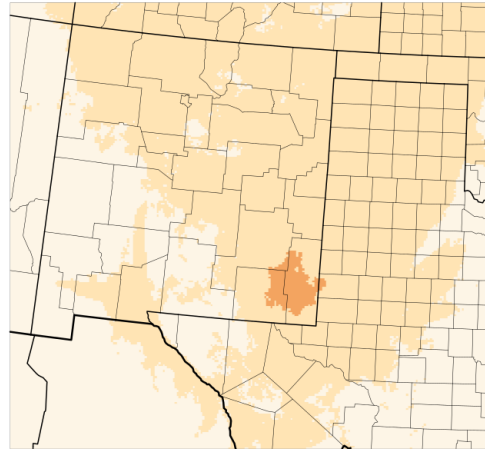
max(82,158) = 2.103 ppb
min(22,200) = 0.006 ppb

2028 Contributions
OilandGas non-point
O3 Design Value UAA



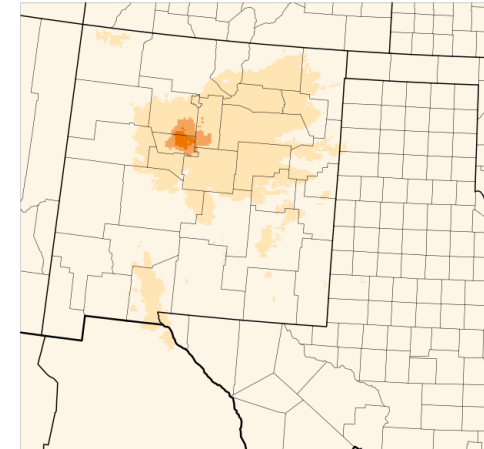
max(67,209) = 2.986 ppb
min(18,192) = 0.006 ppb

2028 Contributions
OilandGas point
O3 Design Value UAA



max(139,86) = 1.889 ppb
min(12,165) = 0.000 ppb

2028 Contributions
Remainder Anthro
O3 Design Value UAA



max(82,156) = 3.094 ppb
min(9,122) = 0.000 ppb

REDUCTIONS 2028 O3 DVFS U.S. ANTHROPOGENIC SOURCE SECTORS

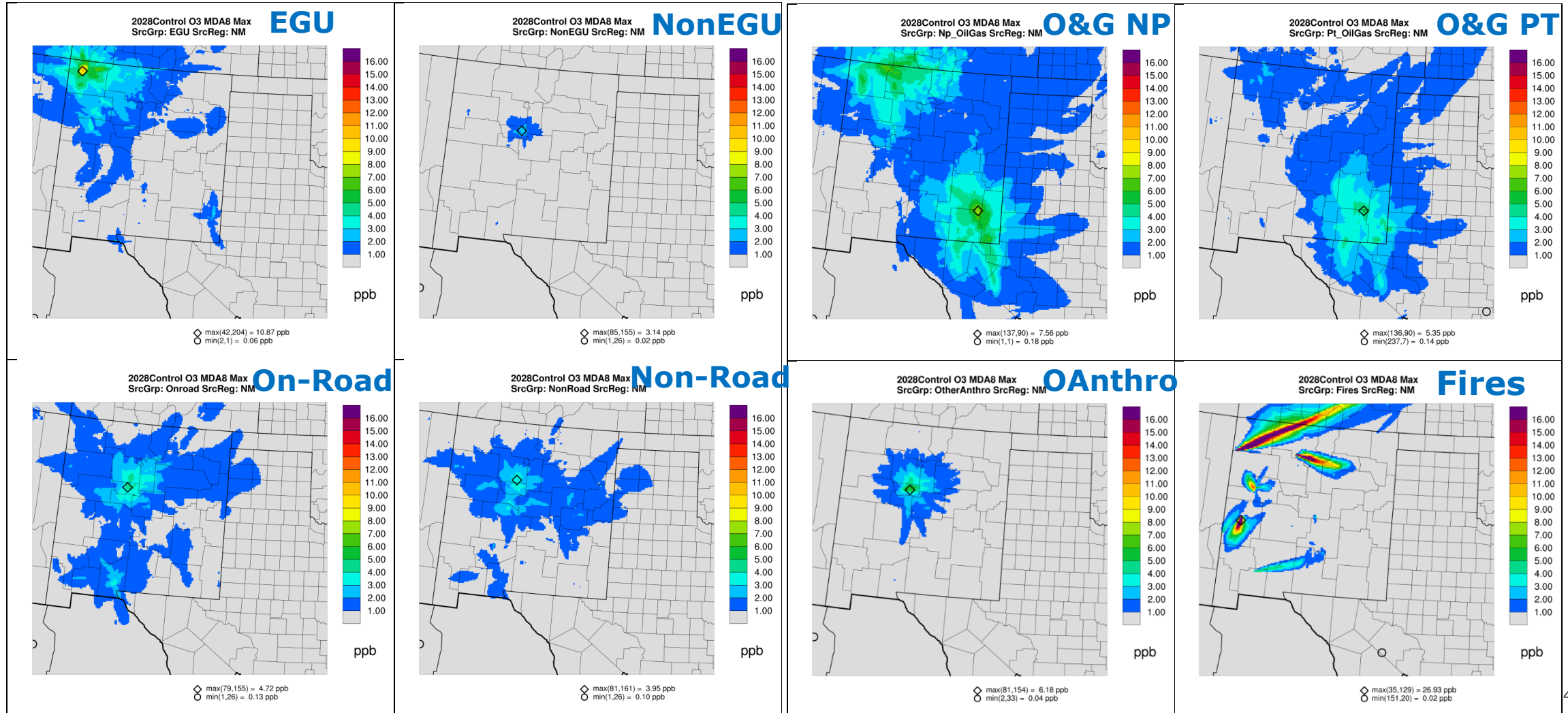
- 2028 ozone DVF Reductions from All U.S. Anthro Source Sectors
 - O&G Point: -0.2 to -1.6 ppb
 - O&G Non-Pt: -0.3 to -2.7 ppb
 - EGU Point: -0.4 to -3.6 ppb
 - Non-EGU Pt: -0.6 to -1.7 ppb
 - On-Road: -1.3 to -3.9 ppb
 - Non-Road: -0.9 to -3.0 ppb
 - Other Anthro: -0.6 to -4.2 ppb

AQS_ID	Site_ID	DVC	DVF	O&GPT	O&GNP	EGU	NonEGU	OnRoad	NonRoad	OAnth
350010023	NORTE	66.3	60.7	-0.5	-0.7	-1.1	-1.7	-3.9	-3.0	-4.2
350010024	SEHGS	68.0	62.0	-0.5	-0.7	-1.0	-1.7	-3.6	-2.8	-3.7
350010029	STHVA	66.0	60.5	-0.6	-0.9	-1.0	-1.6	-3.3	-2.5	-2.9
350010032	WSTSD	67.0	62.1	-0.4	-0.7	-0.9	-1.0	-2.7	-2.0	-2.4
350011012	FTHIL	65.0	58.8	-0.5	-0.7	-1.1	-1.4	-3.8	-3.0	-3.7
350130008	UNION	66.3	59.8	-0.8	-0.9	-1.6	-1.5	-3.2	-2.3	-1.5
350130017	SPARK	67.0	61.8	-0.7	-1.0	-1.8	-1.5	-3.0	-2.1	-1.7
350130020	CHAPA	67.0	62.2	-0.6	-0.8	-1.3	-1.4	-2.3	-1.7	-1.3
350130021	DSVIE	72.0	66.8	-0.8	-1.1	-1.8	-1.6	-3.1	-2.2	-1.8
350130022	TERES	71.3	66.0	-0.8	-1.1	-1.6	-1.5	-2.9	-2.1	-1.5
350130023	SOLAN	65.0	60.2	-0.7	-1.0	-0.9	-1.1	-2.7	-1.8	-1.1
350151005	CARLS	69.0	66.4	-0.8	-1.1	-0.5	-0.8	-1.3	-0.9	-0.7
350171003	GRANT	62.0	58.9	-0.2	-0.3	-0.4	-0.7	-1.3	-1.0	-0.7
350250008	HOBBS	66.0	63.3	-1.6	-2.2	-0.7	-0.6	-1.4	-1.0	-0.7
350290003	DEAIR	66.0	62.5	-0.4	-0.5	-0.6	-0.7	-1.7	-1.2	-0.7
350390026	COYOT	64.0	60.0	-0.5	-0.9	-0.8	-0.7	-1.5	-1.0	-0.7
350431001	BERNA	64.0	58.1	-0.4	-0.6	-0.8	-1.1	-3.4	-2.5	-2.6
350450009	BLOOM	64.3	60.2	-1.1	-2.1	-2.3	-0.7	-1.7	-1.1	-0.6
350450018	NAVAJ	67.0	63.3	-1.3	-2.7	-2.0	-0.8	-1.7	-1.2	-0.8
350451005	SUBST	63.7	59.6	-1.1	-2.5	-3.6	-0.8	-1.7	-1.2	-0.7
350490021	SNTFE	64.3	60.4	-0.5	-0.7	-0.7	-0.7	-2.0	-1.4	-1.3

SOURCE SECTOR CONTRIBUTIONS TO MODELED 2028 OZONE

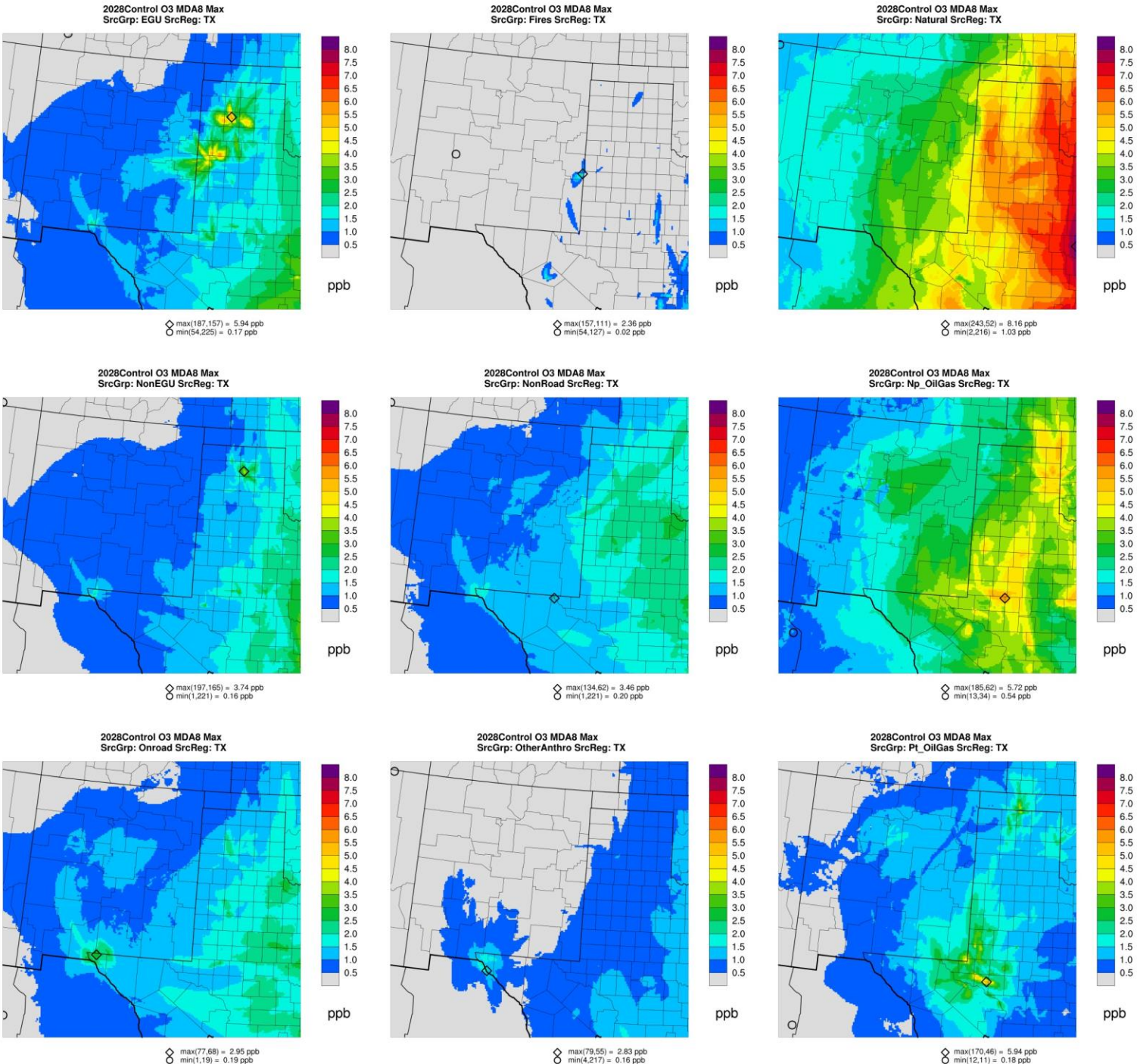
- 1. HIGHEST NEW MEXICO SOURCE SECTOR CONTRIBUTIONS TO DAILY MDA8 OZONE DURING EPISODE**
- 2. DETAILS OF SOURCE SECTOR CONTRIBUTIONS TO MODELED 2028 MDA8 OZONE ON 10 SMAT DAYS USED TO MAKE 2028 OZONE DVF PROJECTIONS**
- 3. SPATIAL DISTRIBUTION OF NEW MEXICO AND ALL UNITED STATES SOURCE SECTOR CONTRIBUTIONS ON SIX EXAMPLE DAYS**

HIGHEST NEW MEXICO SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE



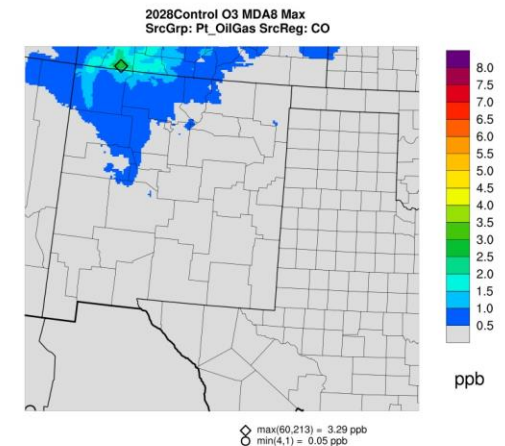
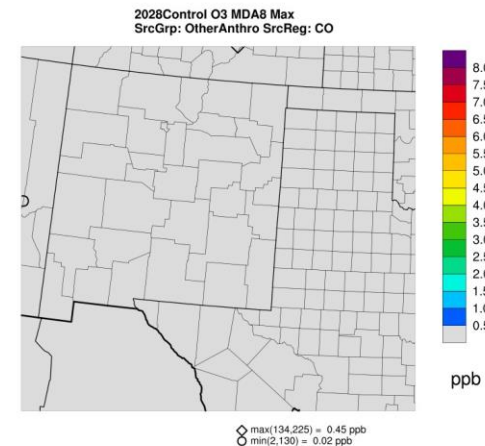
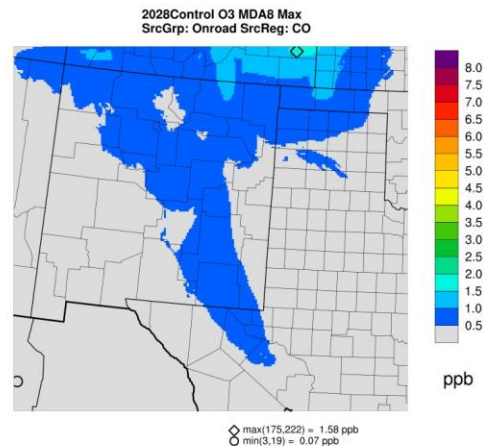
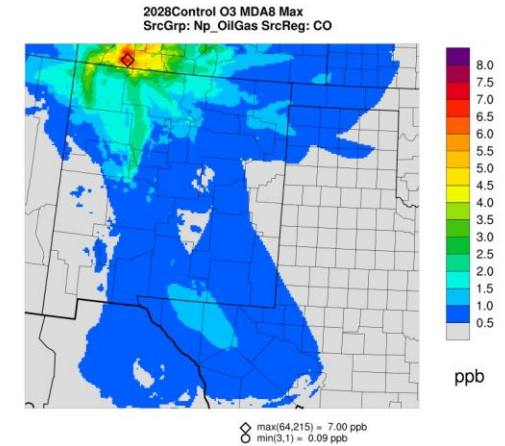
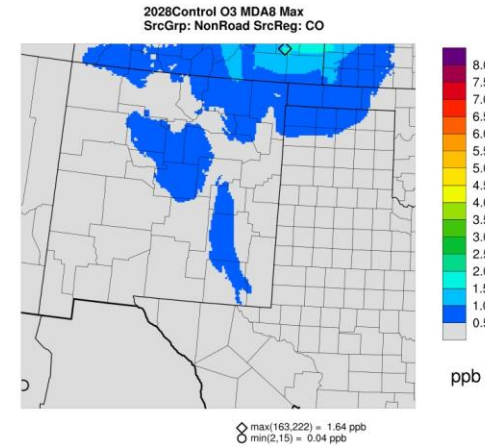
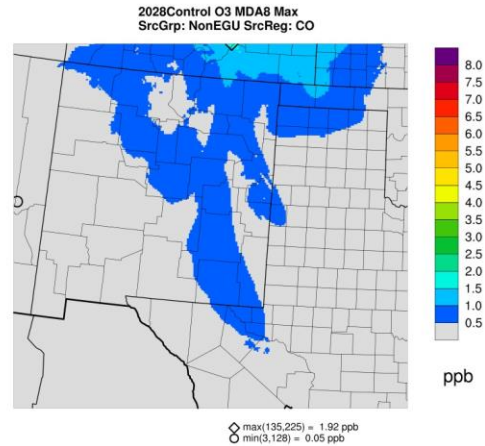
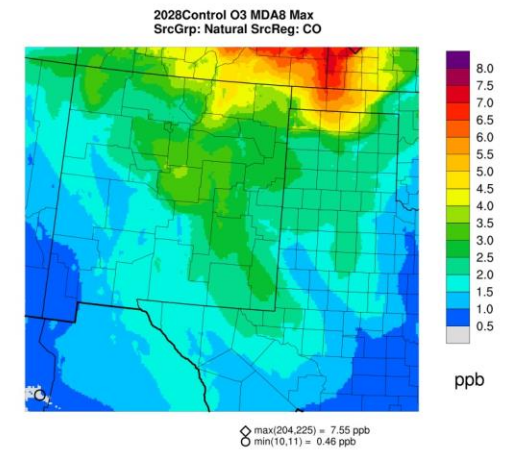
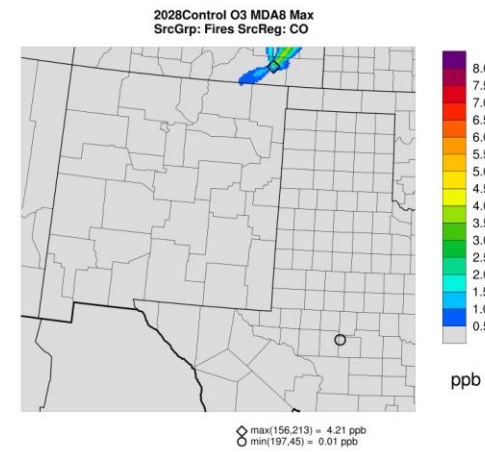
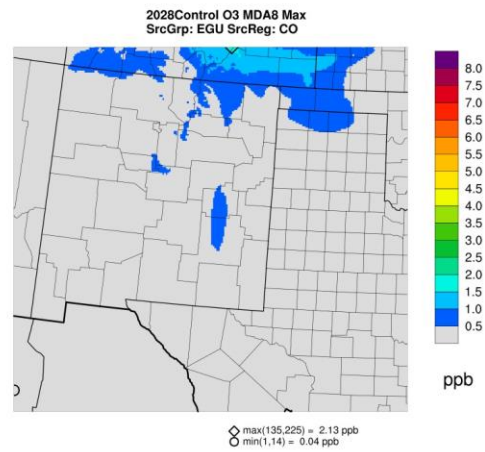
HIGHEST TEXAS SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT



HIGHEST COLORADO SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE

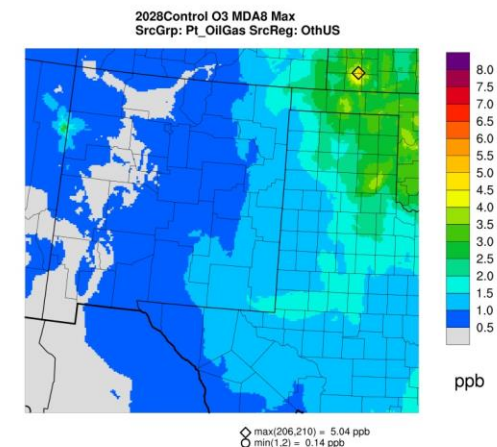
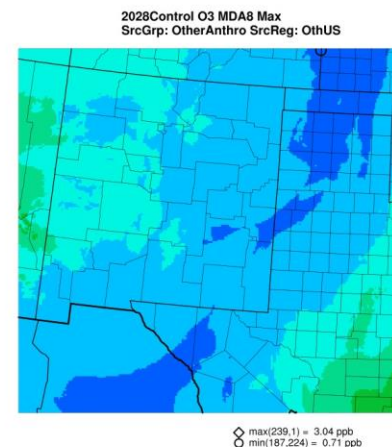
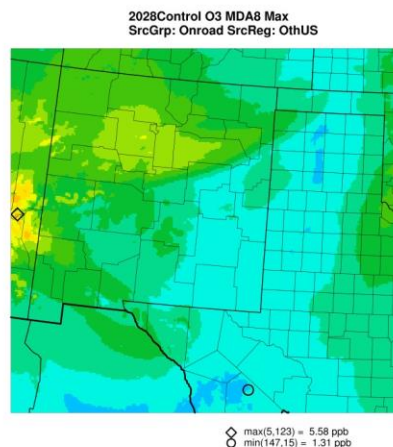
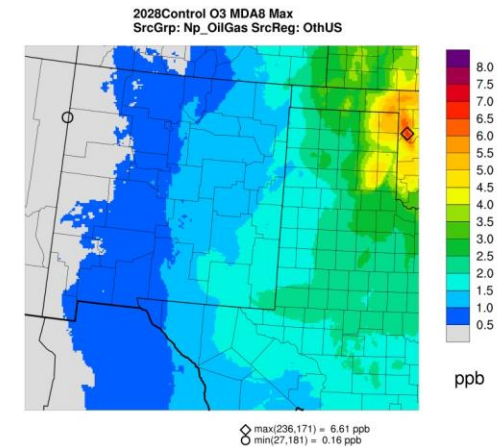
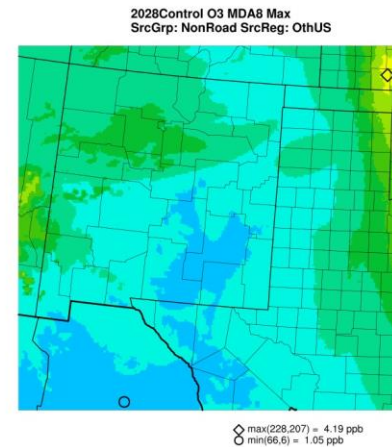
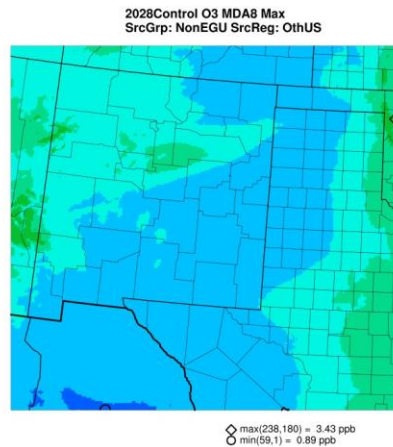
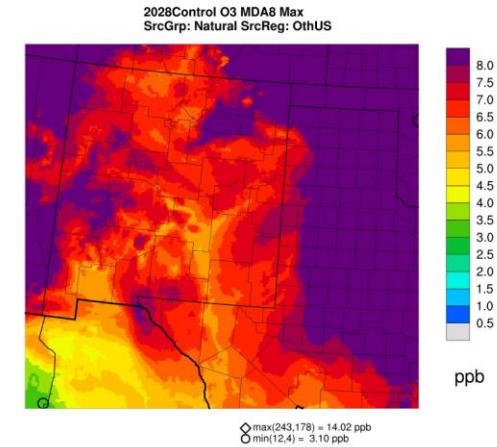
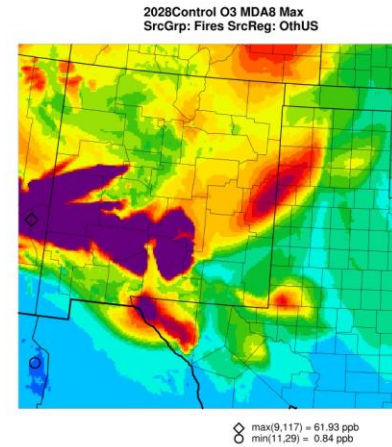
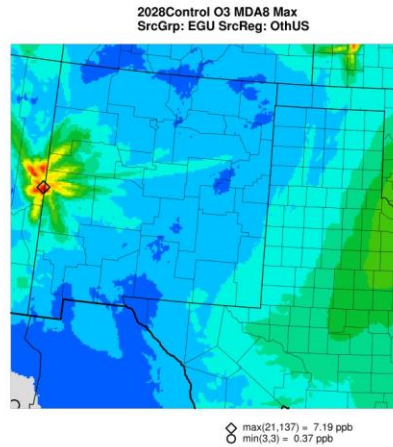
EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT



HIGHEST REMAINING U.S. SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE (EXCLUDES NM, TX AND CO)

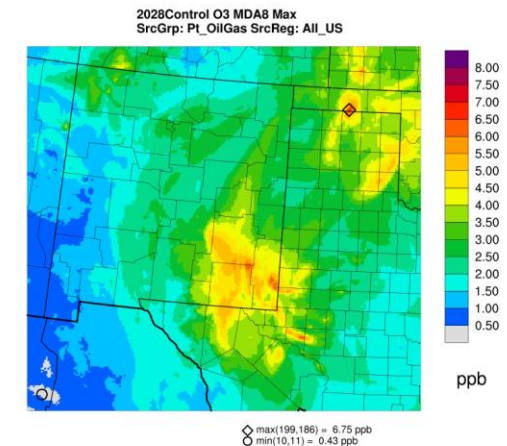
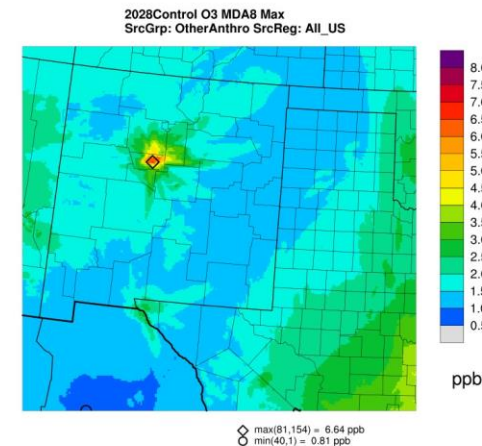
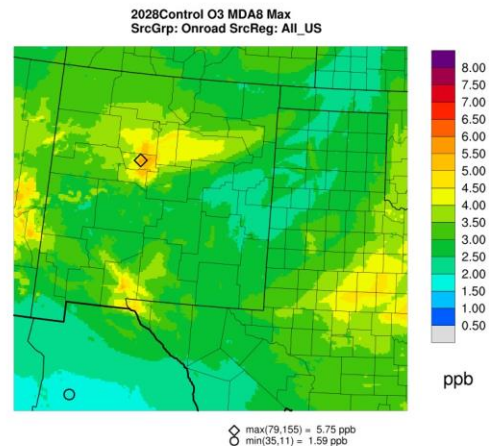
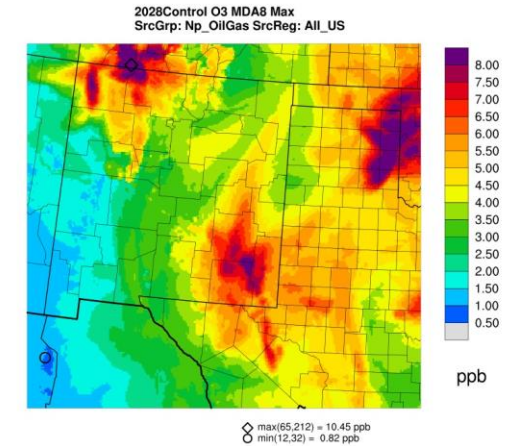
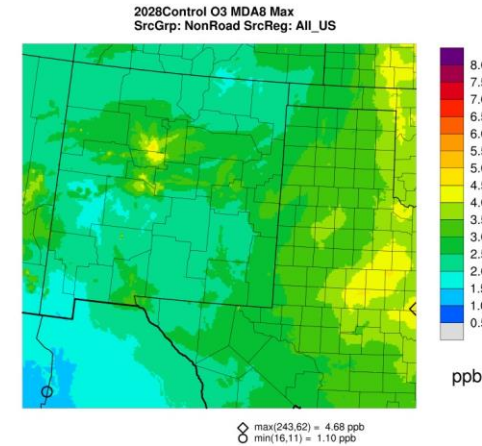
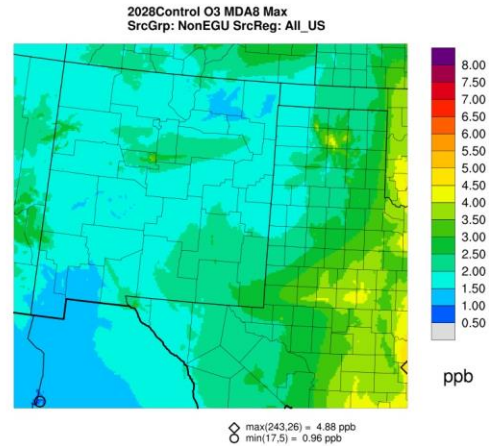
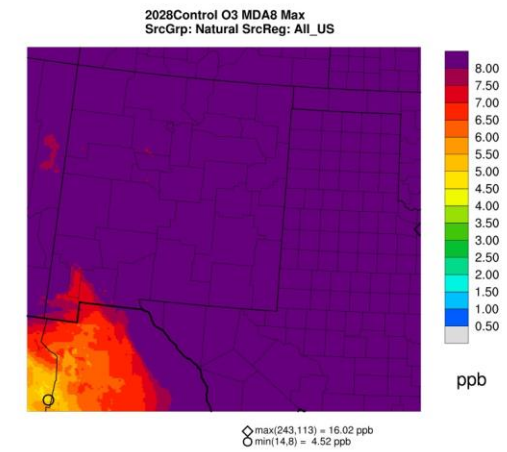
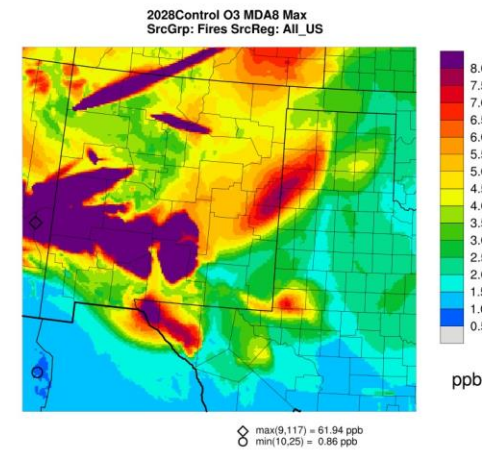
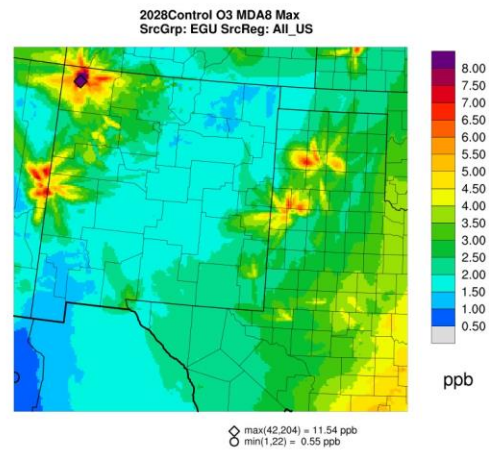
EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

RAMBOLL



HIGHEST ALL U.S. SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE

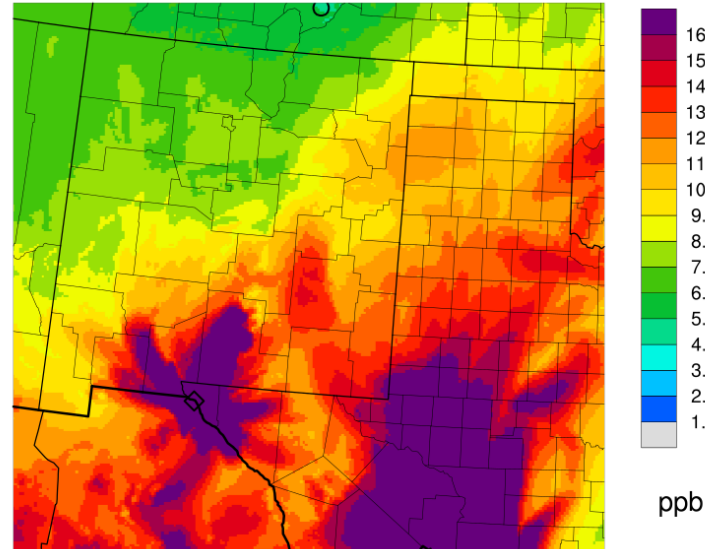
EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT



HIGHEST OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE

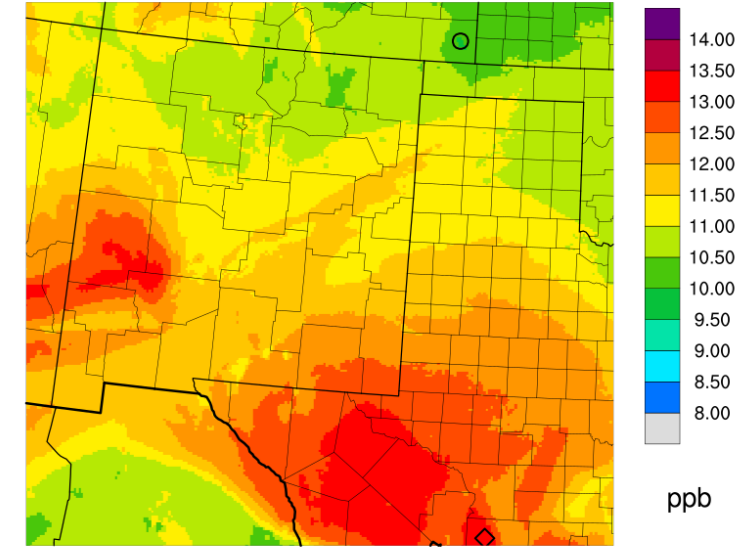
- In-Domain International Anthropogenic Emissions (top left)
- Boundary Conditions from International Anthropogenic Emissions (top right)
- Boundary Conditions from Natural Sources (bottom left)
- Boundary Conditions from U.S. Anthropogenic Emissions (bottom right)

2028Control O3 MDA8 Max
SrcGrp: OtherAnthro SrcReg: Intl



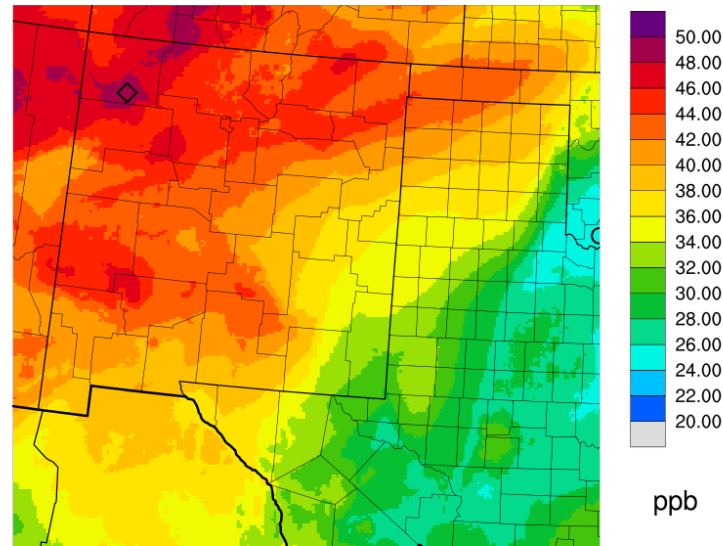
◇ max(75,62) = 25.93 ppb
○ min(127,223) = 4.80 ppb

2028Control O3 MDA8 Max
SrcGrp: BCIntl



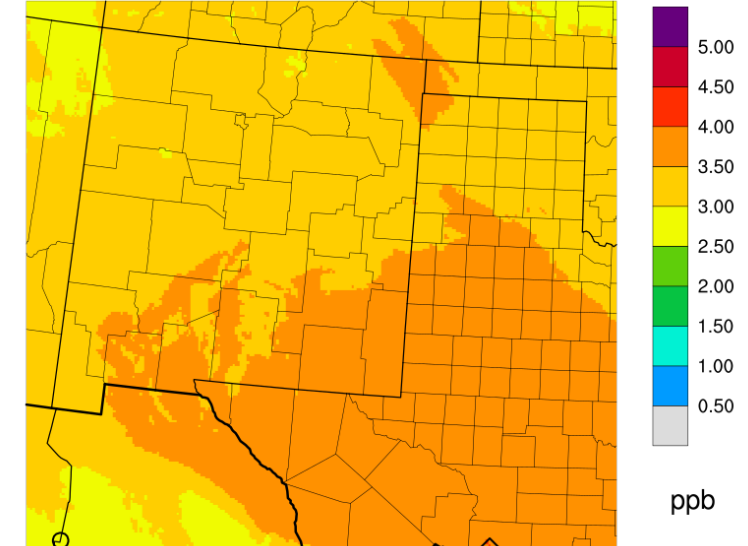
◇ max(190,4) = 13.46 ppb
○ min(180,209) = 9.94 ppb

2028Control O3 MDA8 Max
SrcGrp: BCNat



◇ max(48,189) = 49.12 ppb
○ min(243,130) = 24.31 ppb

2028Control O3 MDA8 Max
SrcGrp: BCUS



◇ max(191,1) = 4.01 ppb
○ min(15,4) = 2.69 ppb

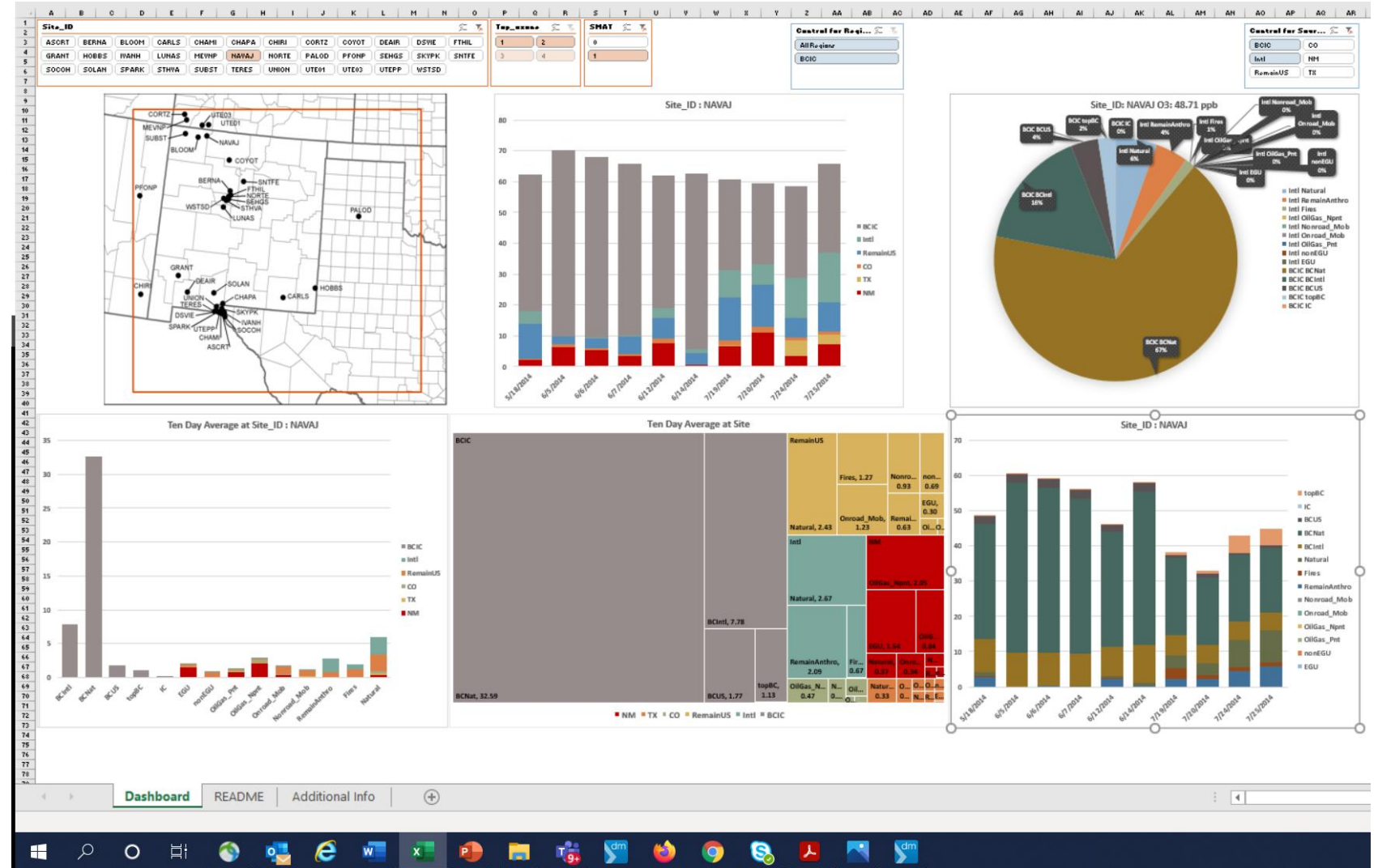
EXCEL DASHBOARD TO DISPLAY 2028 SOURCE SECTOR APCA OZONE SOURCE APPORTIONMENT MDA8 OZONE RESULTS

- User selects:

- Monitoring Site
 - Which 10 days to display
 - SMAT days, 1-10, etc.
- Dashboard Displays:
 - Stacked Bar Chart of MDA8 ozone contributions for 10 days
 - Stacked Bar Chart of Source Sector contributions averaged across 10 days
 - Tree Chart of contributions averaged across 10 days

- Also control source contributions by Source Region:

- BC, Intl, NM, TX, CO and RemainUS
- Dashboard generates stacked Bar Chart for 10 days and Pie Chart averaged across 10 days



NAVAJO LAKE: 10 SMAT DAYS

Contributions from All Sources

Average MDA8 O3

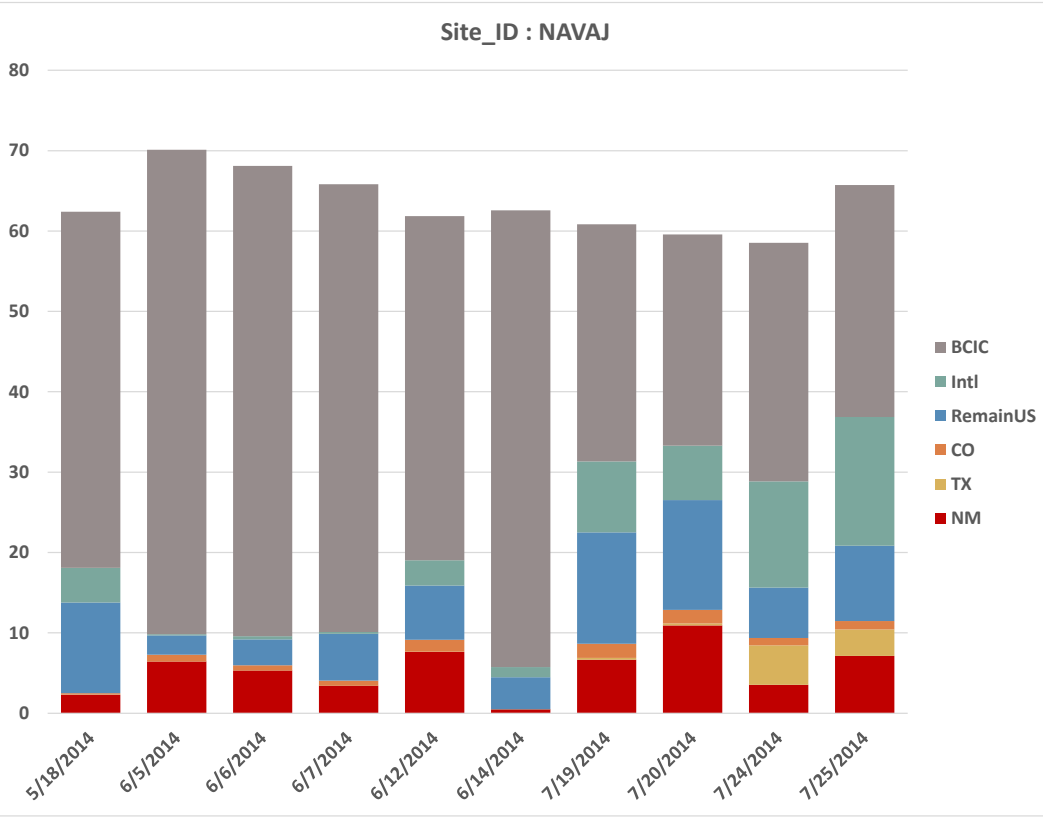
Ozone = 63.6 ppb

BC = 43.3 ppb (68%)

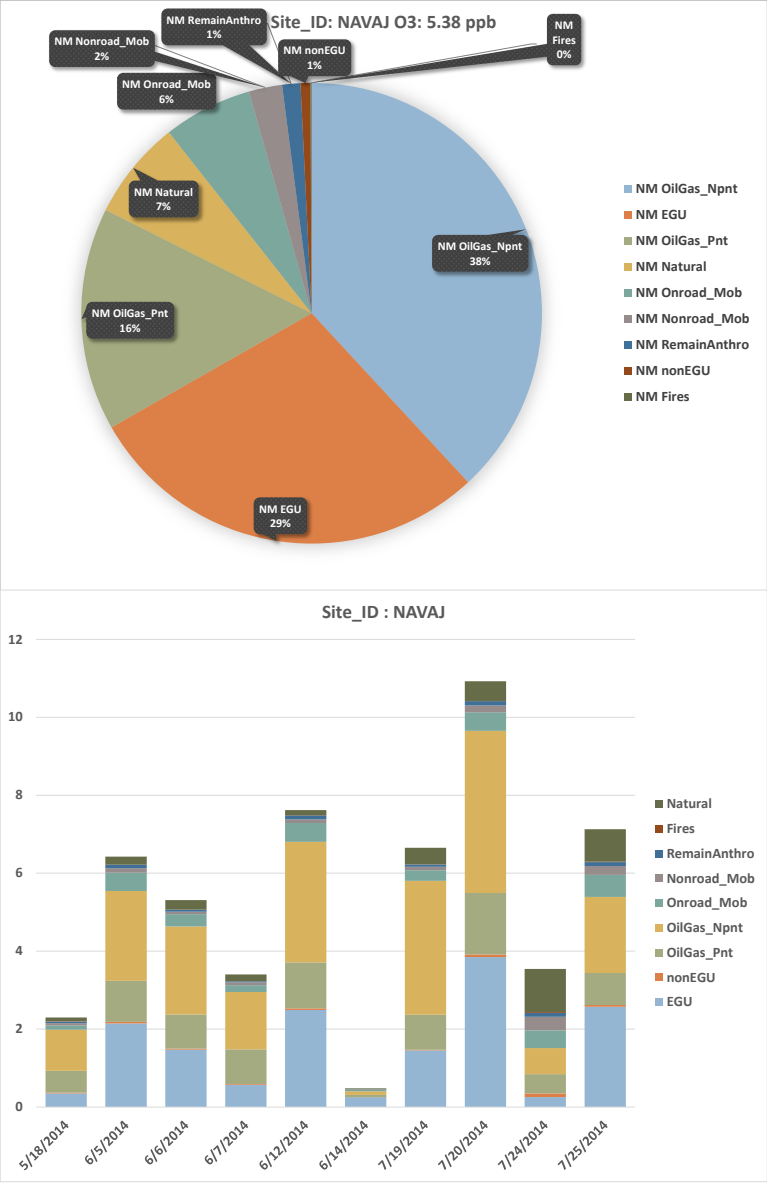
US = 14.8 ppb (23%)

NM = 5.4 ppb (8%)

Intl Ant = 9.9 ppb (16%)



Contributions from New Mexico Sources



FOOTHILLS: 10 SMAT DAYS

Contributions from All Sources

Average MDA8 O3

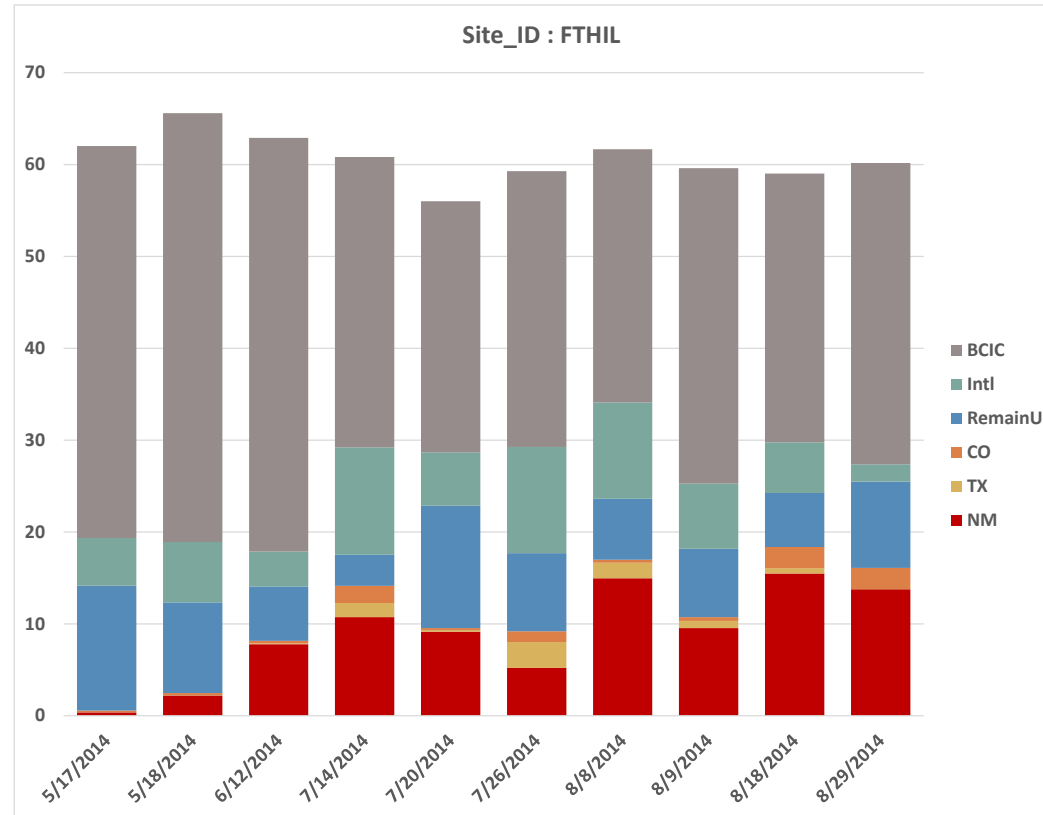
Ozone = 60.7 ppb

BC = 34.7 ppb (57%)

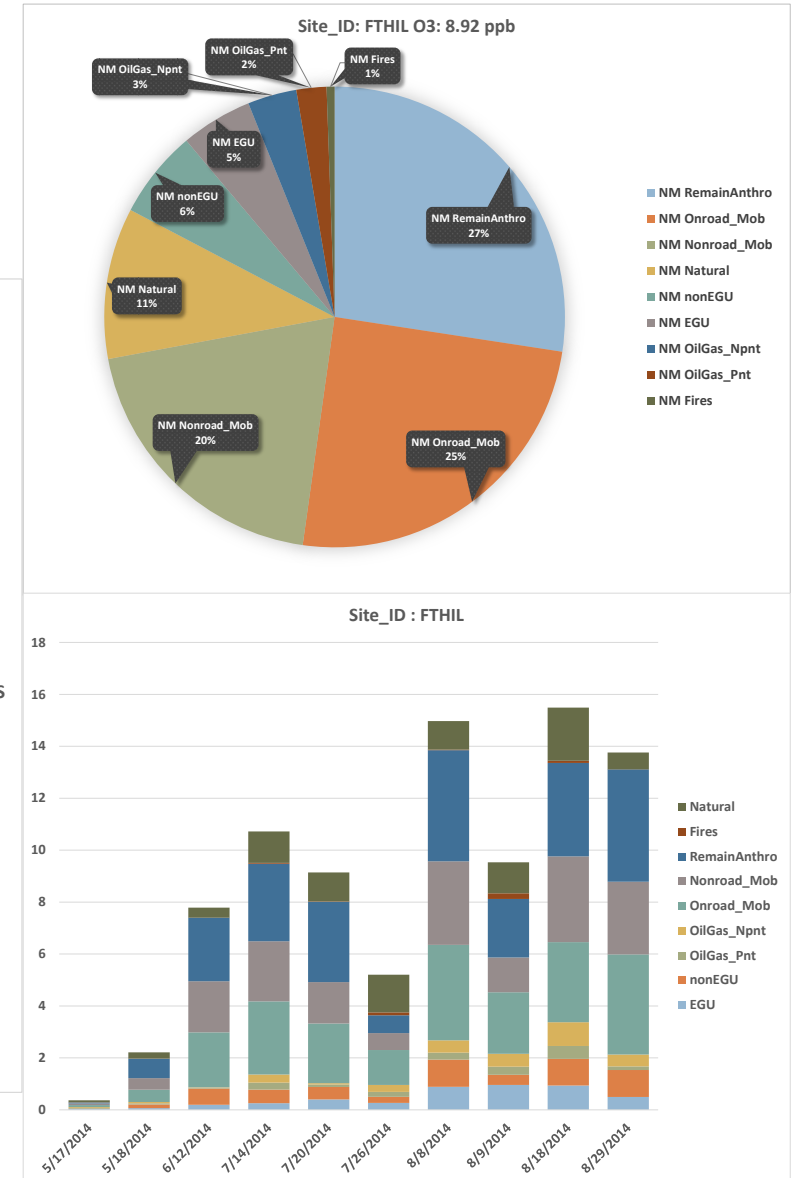
US = 19.0 ppb (31%)

NM = 8.9 ppb (15%)

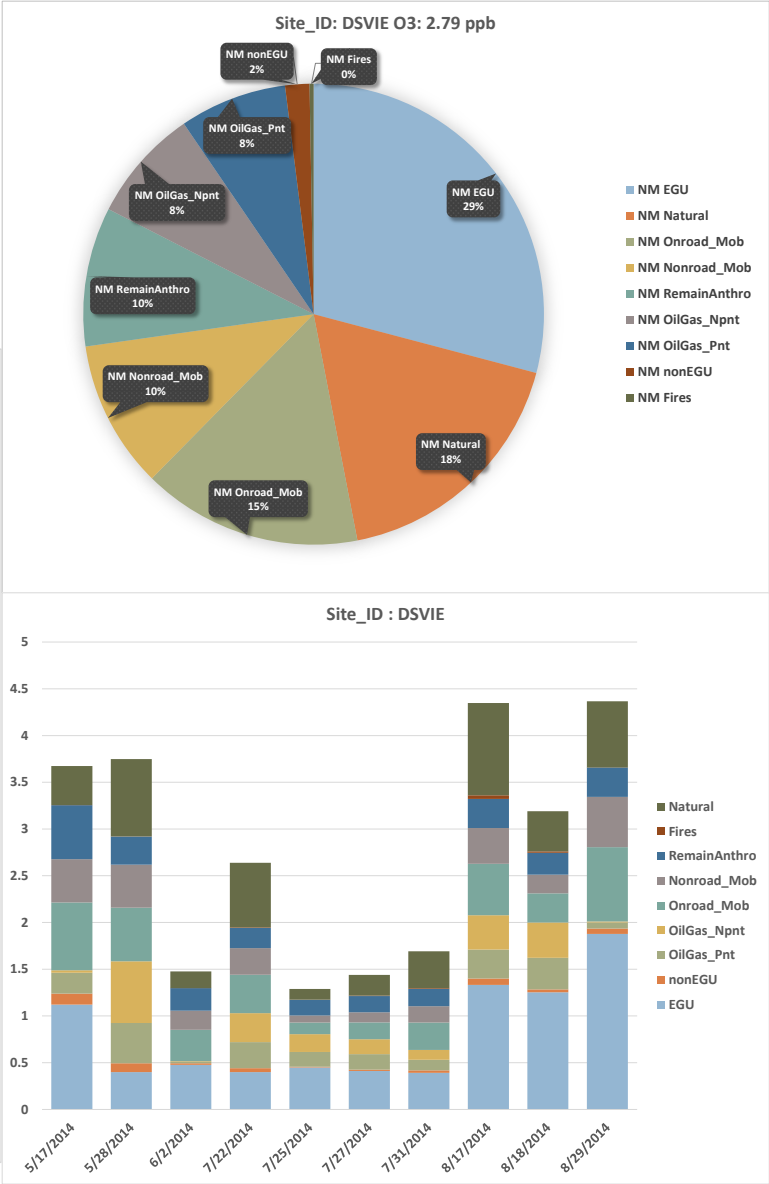
Intl Ant = 10.2 ppb (17%)



Contributions from New Mexico Sources



Contributions from New Mexico Sources



DESERT VIEW: 10 SMAT DAYS

Contributions from All Sources

Average MDA8 O3

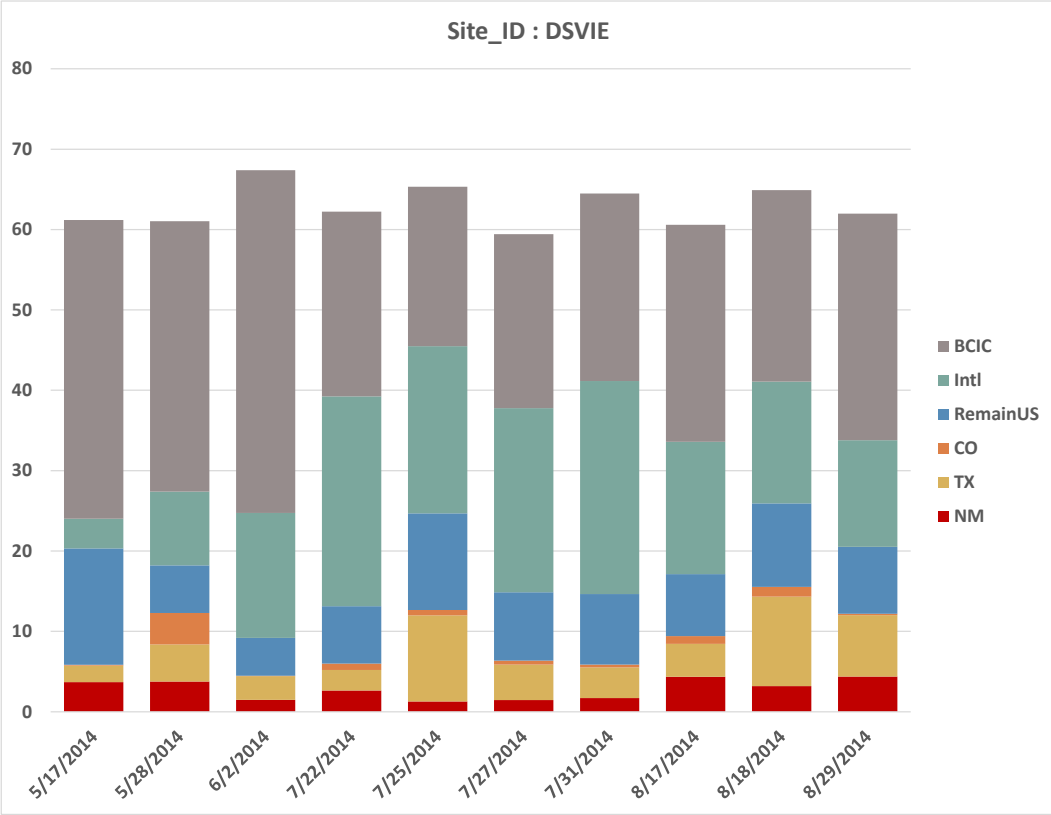
Ozone = 62.9 ppb

BC = 28.0 ppb (45%)

US = 17.9 ppb (28%)

NM = 2.8 ppb (4%)

Intl Ant = 18.8 ppb (30%)



CARLSBAD: 10 SMAT DAYS

Contributions from All Sources

Average MDA8 O3

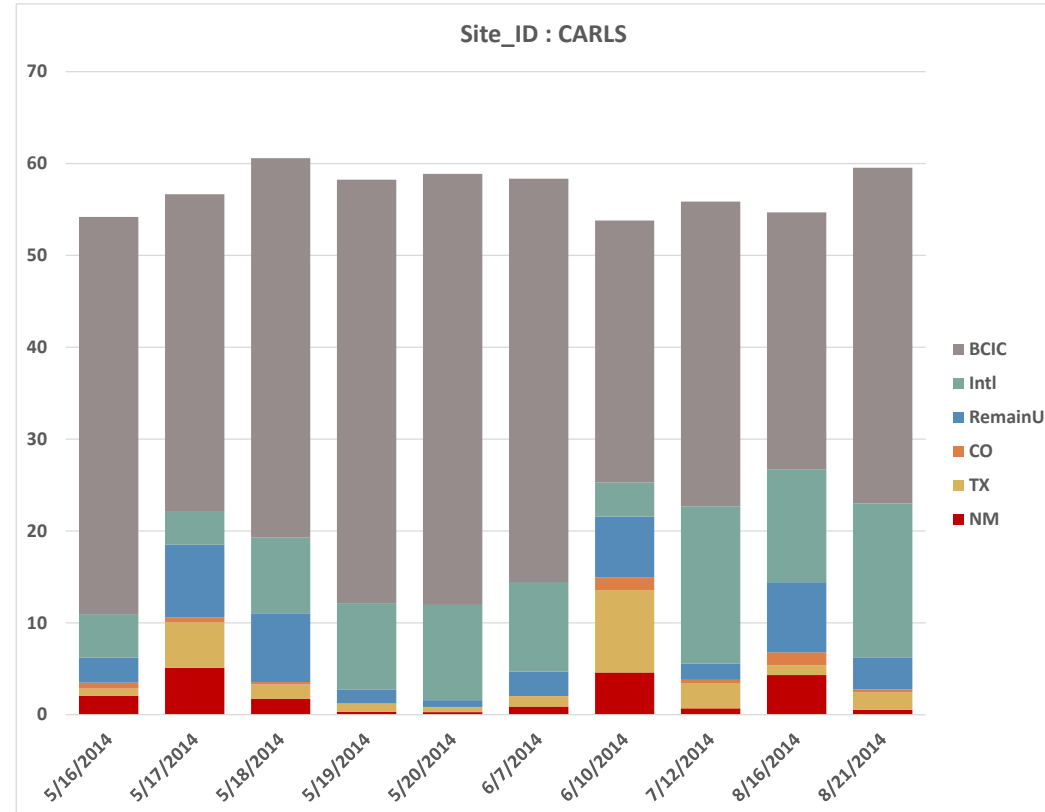
Ozone = 57.1 ppb

BC = 38.2 ppb (67%)

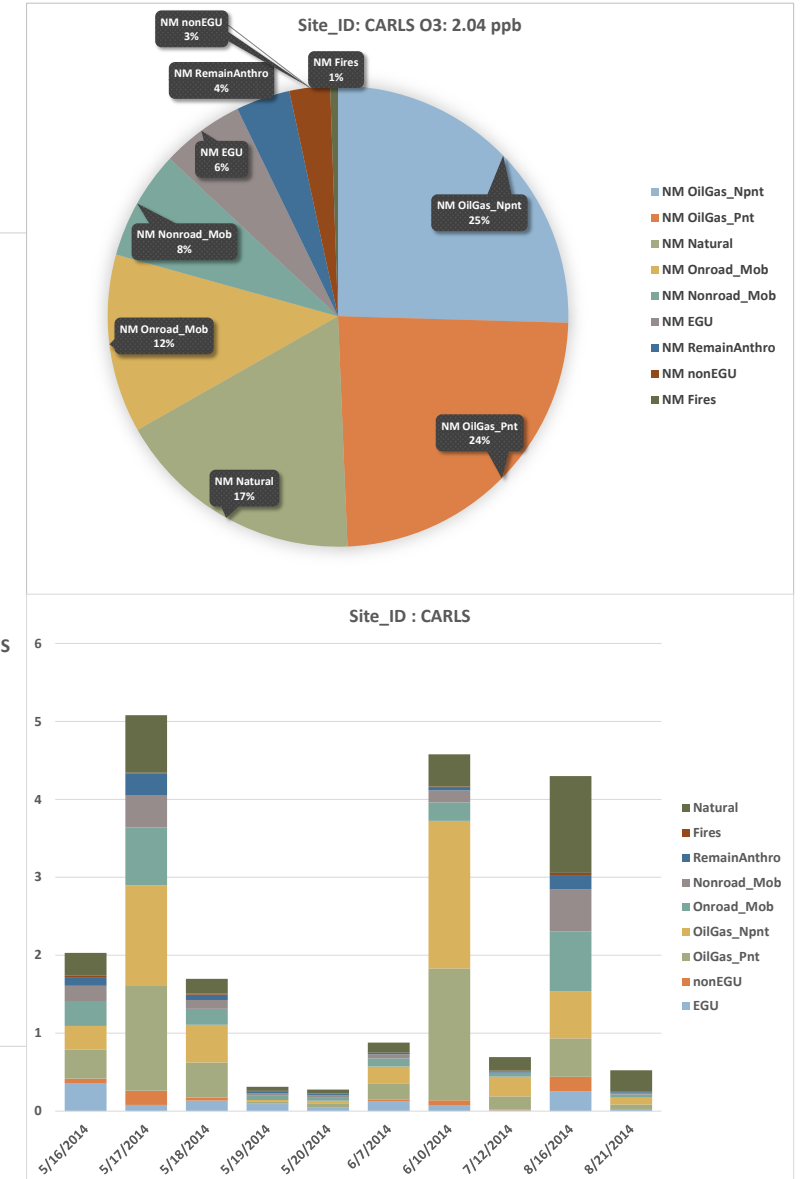
US = 9.3 ppb (16%)

NM = 2.0 ppb (3%)

Intl Ant = 13.4 ppb (23%)



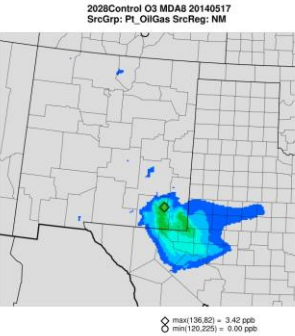
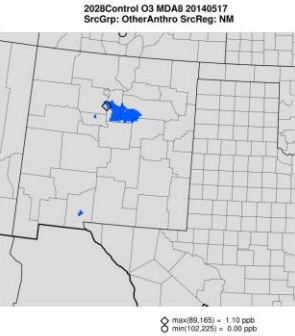
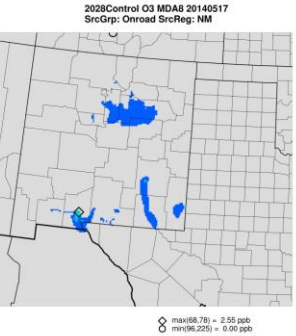
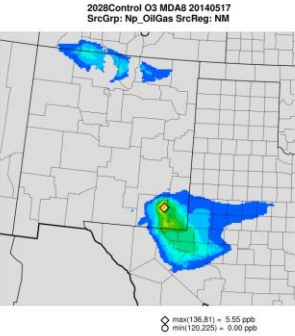
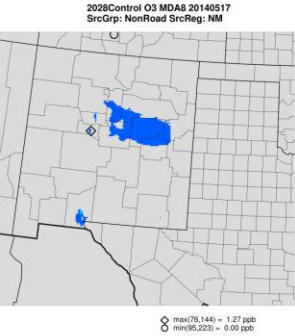
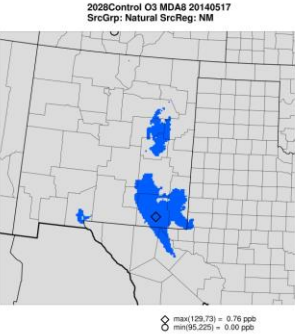
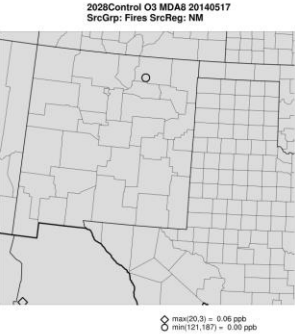
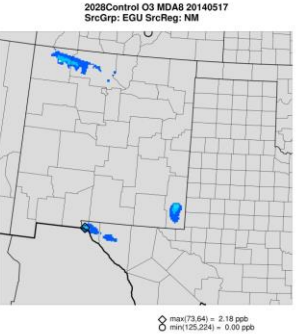
Contributions from New Mexico Sources



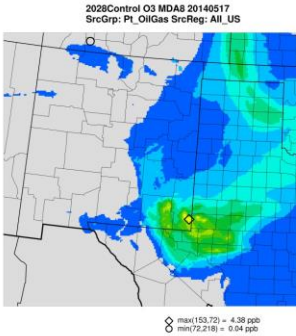
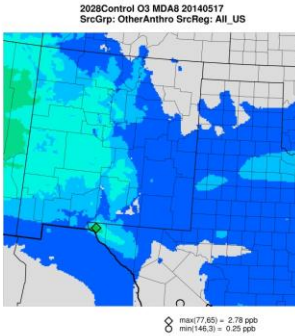
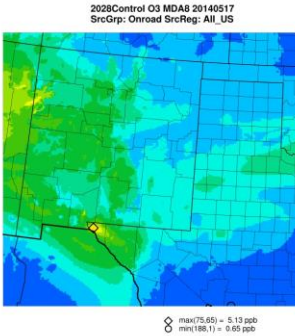
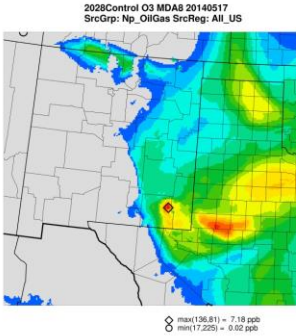
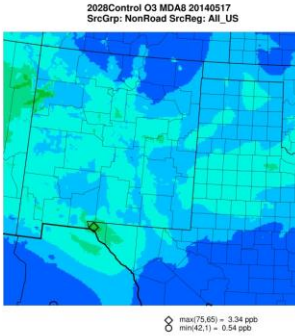
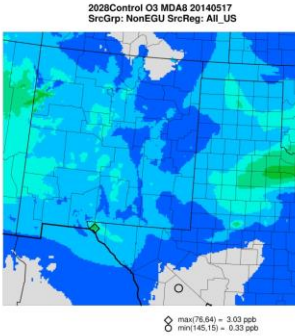
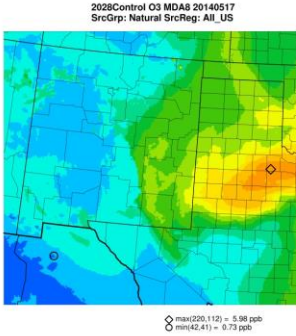
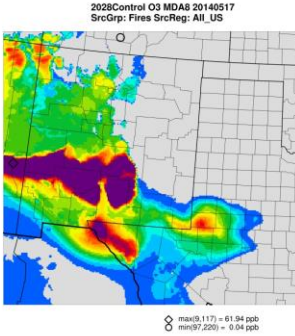
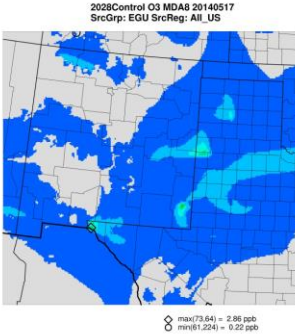
2028 SOURCE SECTOR -- MAY 17, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico



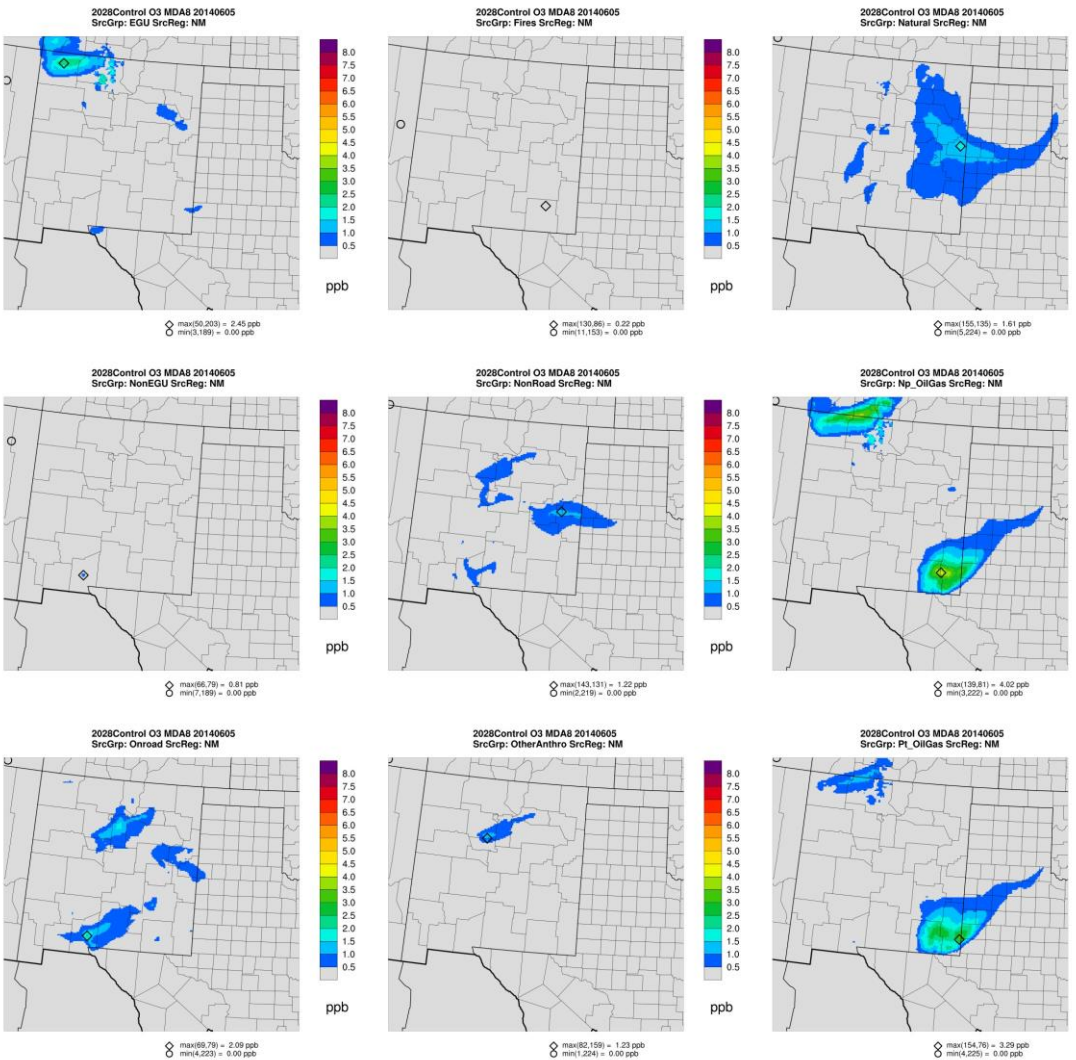
All United States



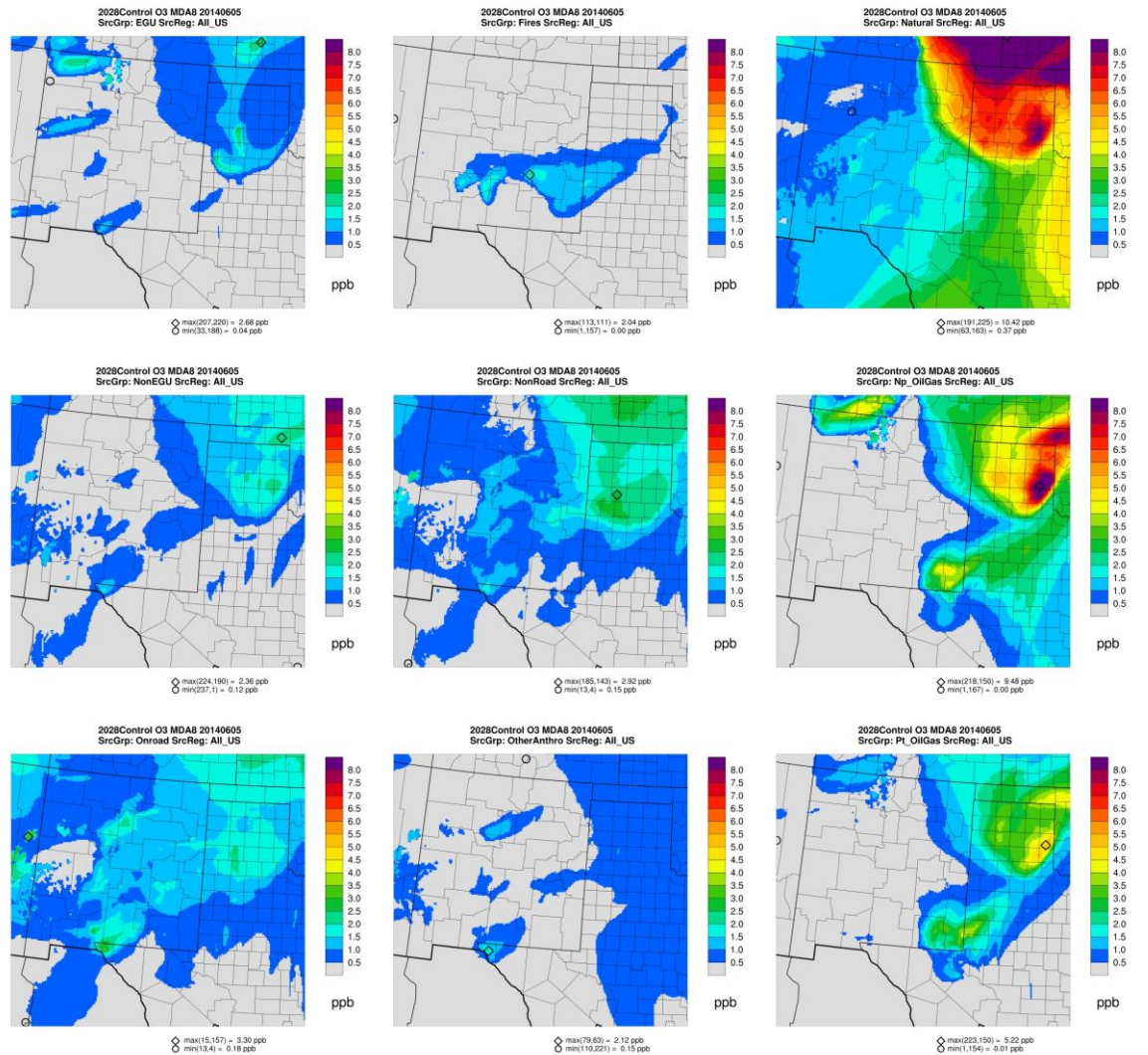
2028 SOURCE SECTOR – JUNE 5, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico



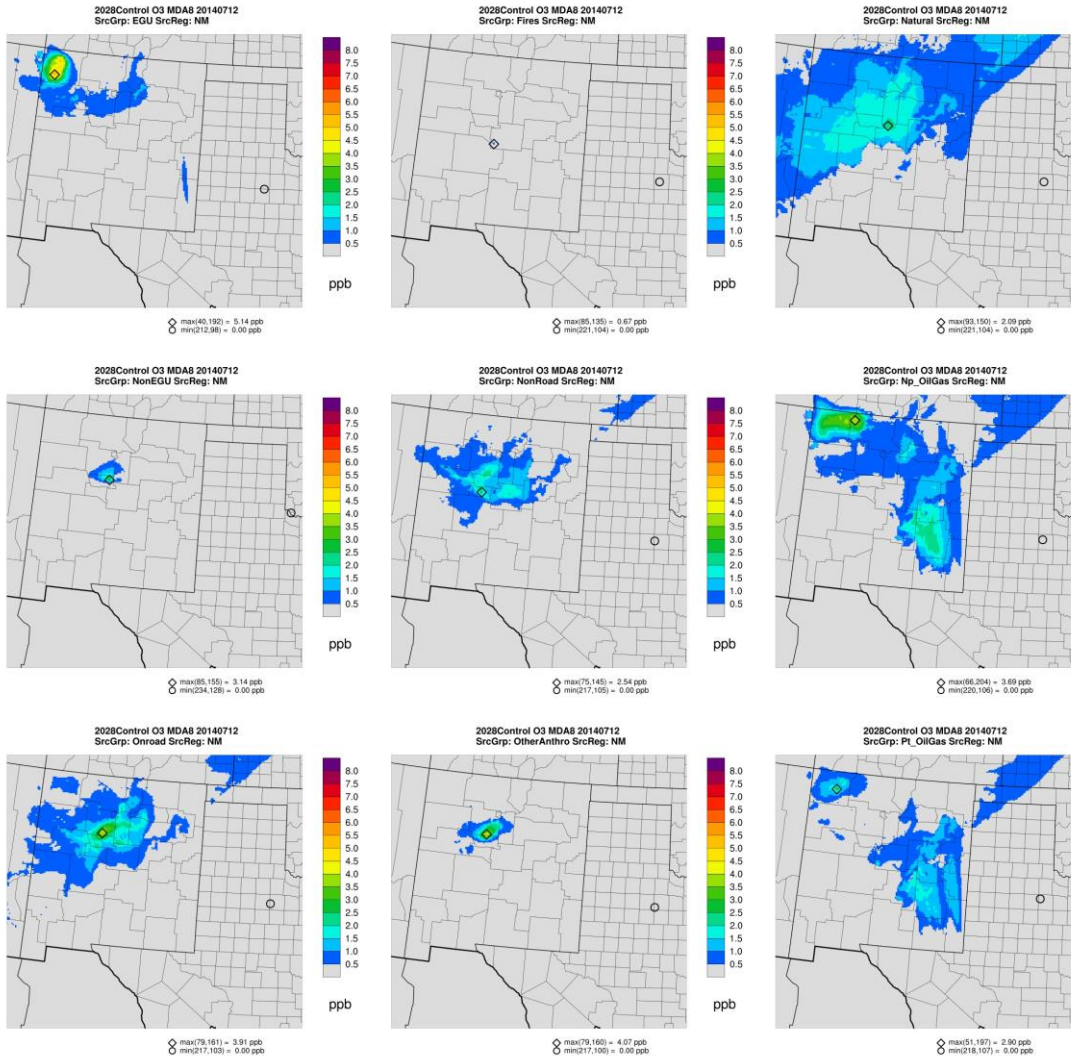
All United States



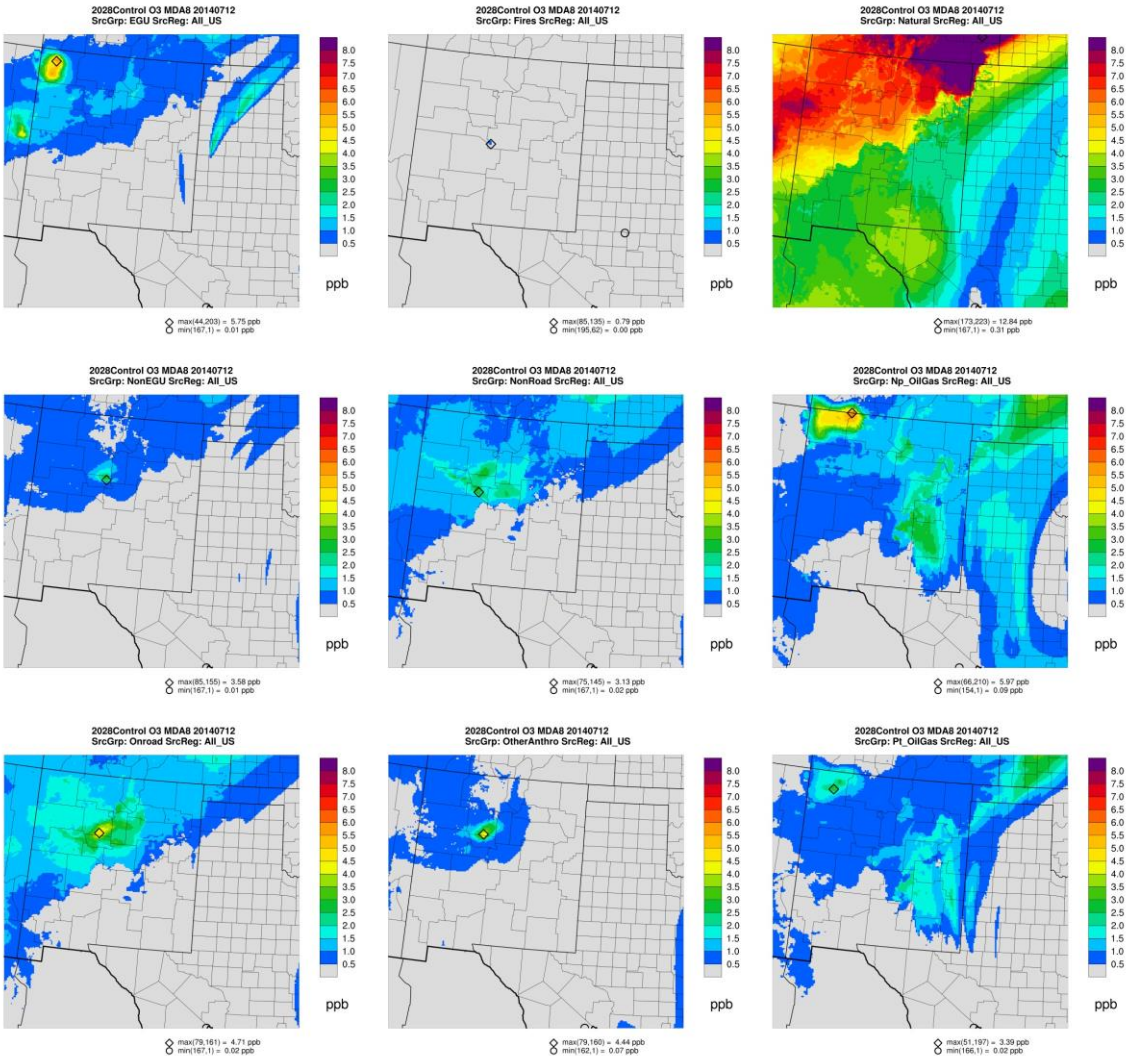
2028 SOURCE SECTOR – JULY 12, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico



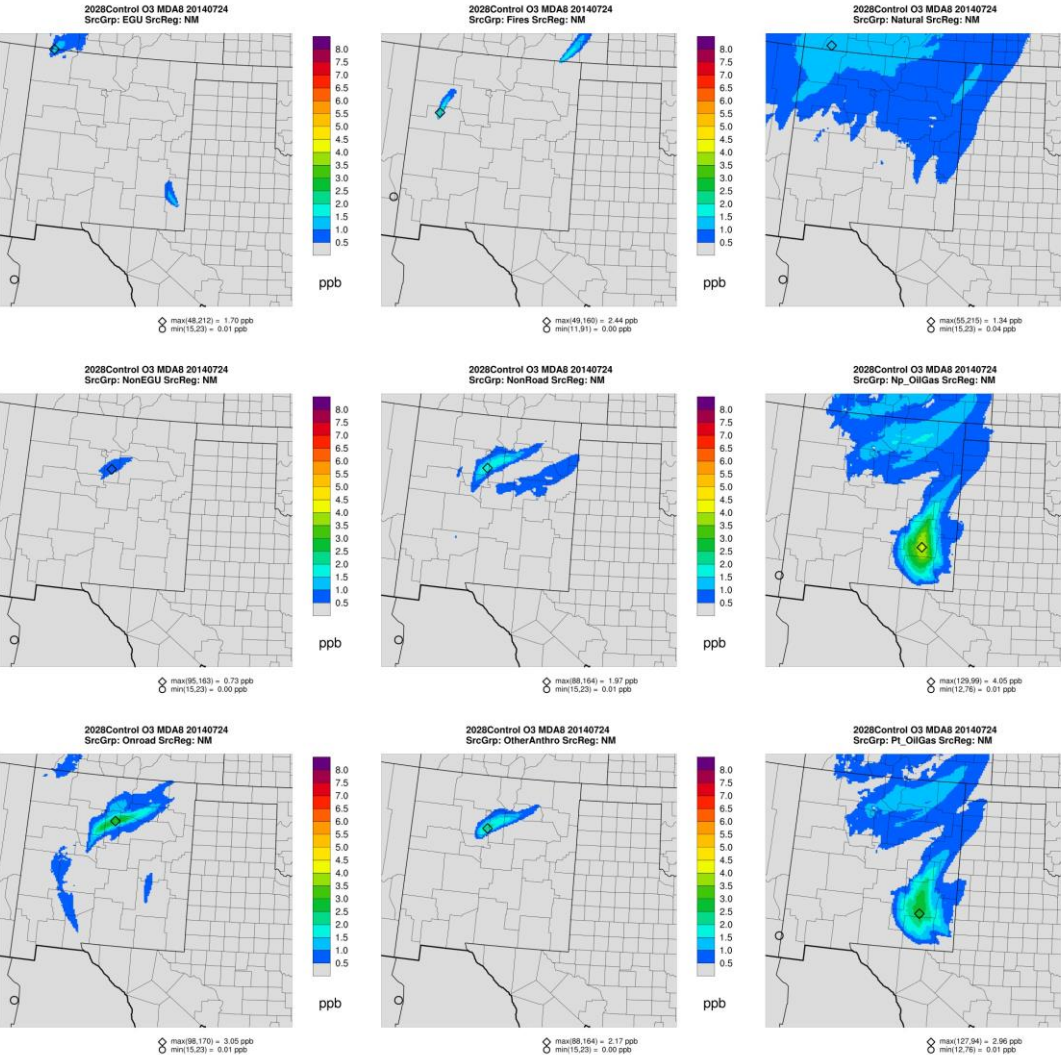
All United States



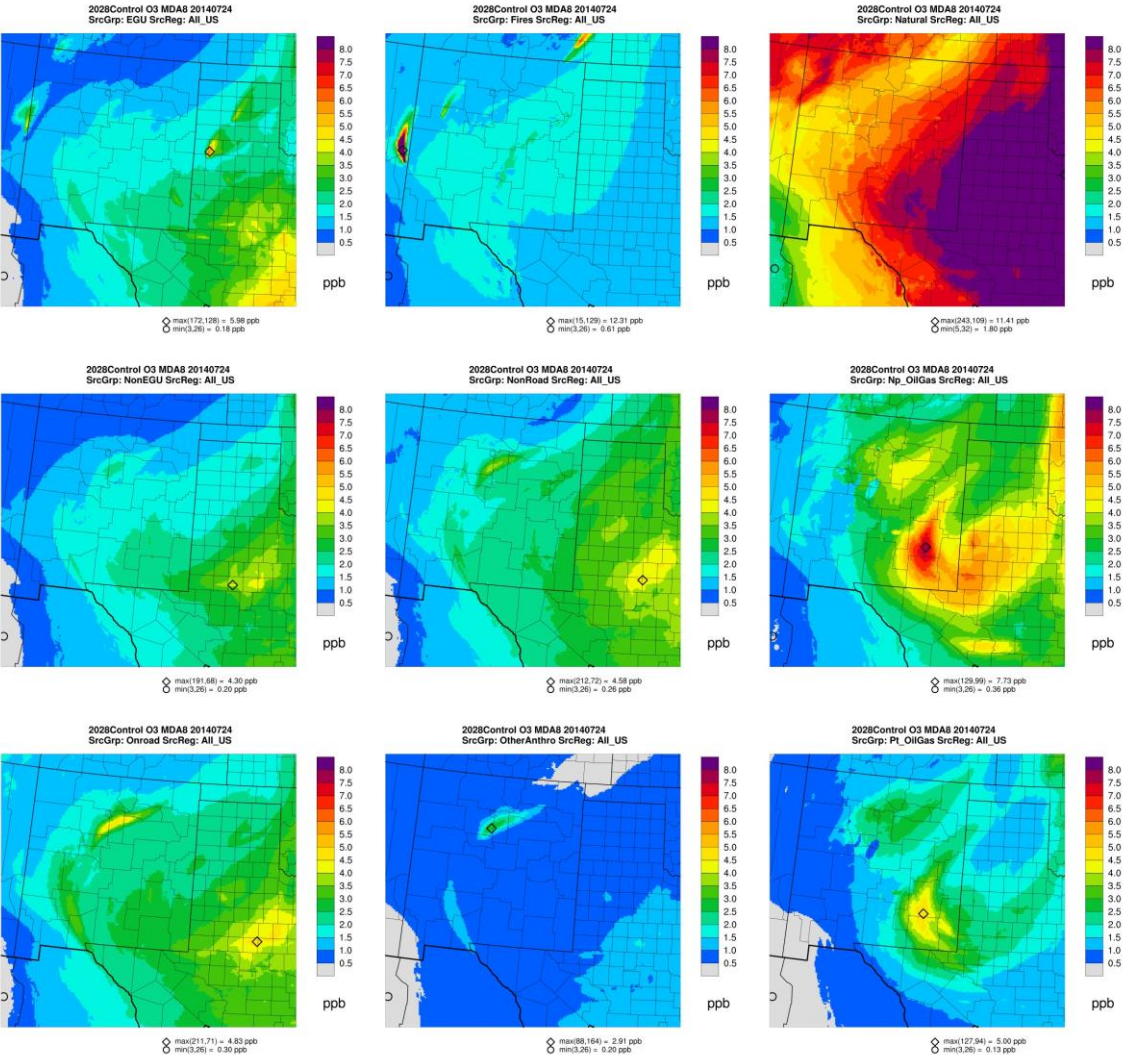
2028 SOURCE SECTOR – JULY 24, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico



All United States

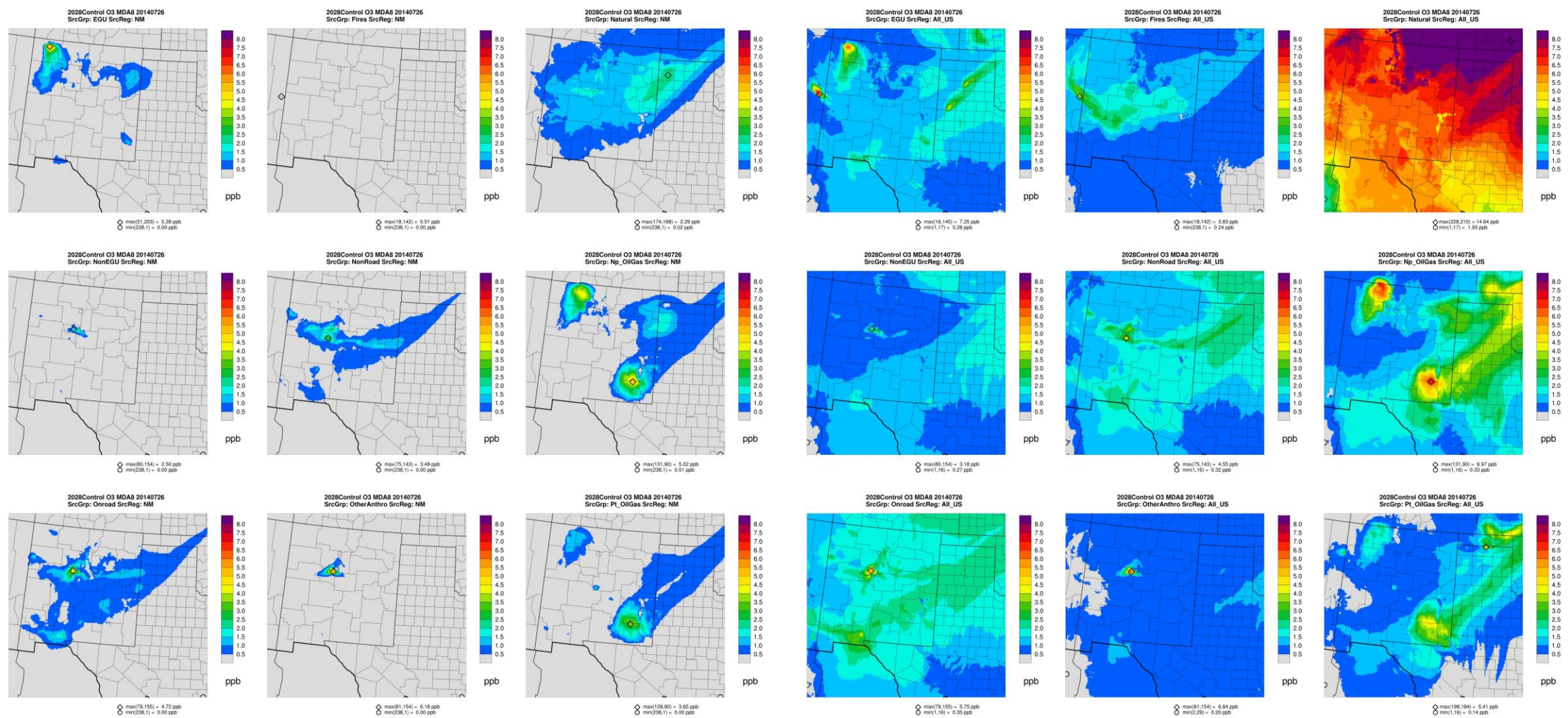


2028 SOURCE SECTOR – JULY 26, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico

All United States

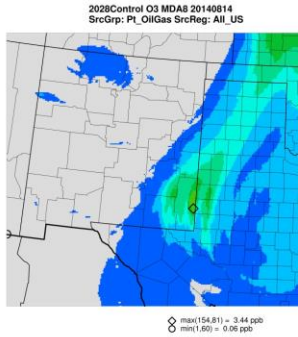
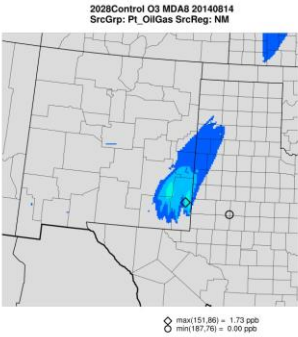
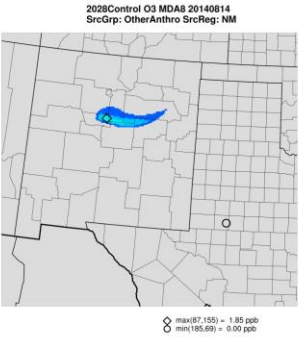
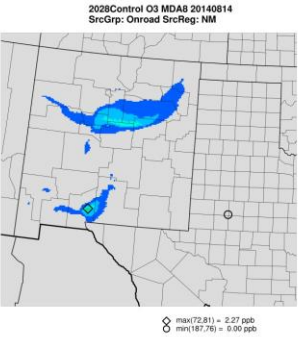
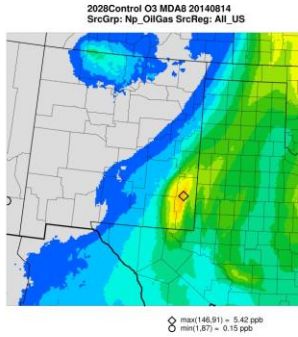
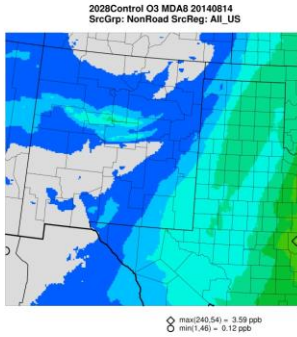
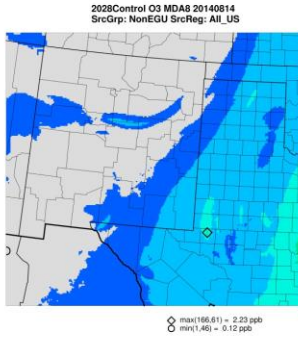
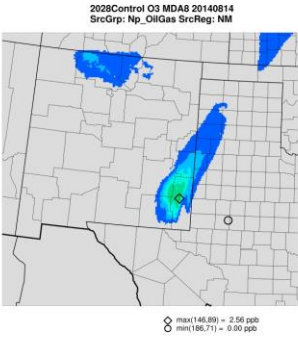
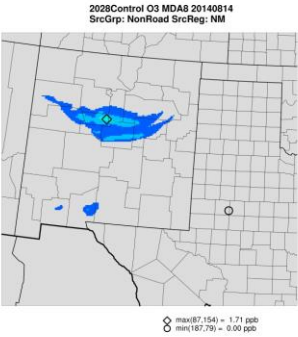
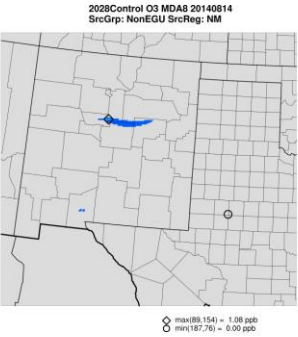
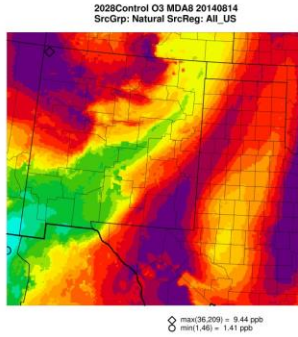
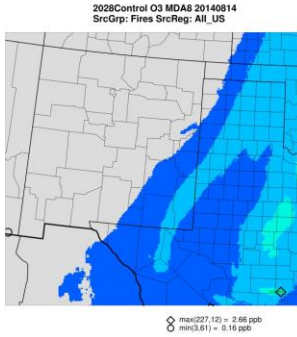
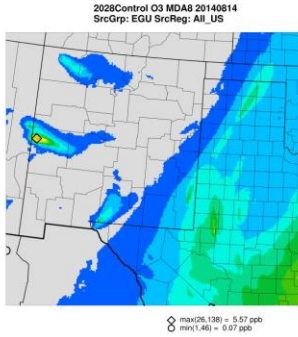
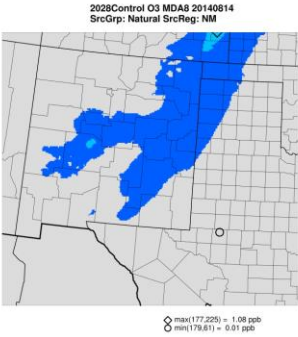
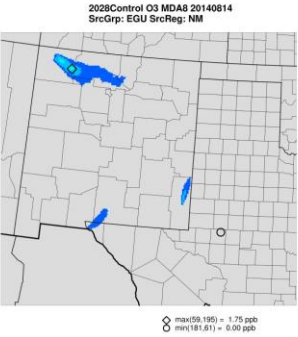


2028 SOURCE SECTOR – AUGUST 14, 2014

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

New Mexico

All United States



INTERNATIONAL ANTHROPOGENIC EMISSIONS CONTRIBUTIONS

1. CONTRIBUTIONS OF INTERNATIONAL ANTHROPOGENIC EMISSIONS TO PROJECTED 2028 OZONE DVFS AT MONITORING SITES USING THREE DEFINITIONS OF CURRENT YEAR DESIGN VALUES: $DVC_{2012-2016}$, $DVC_{2015-2019}$ AND $DVC_{2017-2019}$
2. CONTRIBUTIONS OF INTERNATIONAL ANTHROPOGENIC EMISSIONS TO SMAT UNMONITORED AREA ANALYSIS PROJECTED 2028 OZONE DVFS ACROSS 4-KM NEW MEXICO DOMAIN USING THREE DEFINITIONS OF CURRENT YEAR DESIGN VALUES: $DVC_{2012-2016}$, $DVC_{2015-2019}$ AND $DVC_{2017-2019}$

2028 OZONE DVF NO INTERNATIONAL ANTHRO EMISSIONS

- 2028 ozone DVF projections using $DVC_{2012-2016}$, $DVC_{2015-2019}$ and $DVC_{2017-2019}$
- Elimination of international anthropogenic emissions reduces 2028 ozone DVF by 13 to 25 ppb
- 2028 ozone DVF w/ no international anthropogenic emissions range from 38 to 53 ppb

2012-14 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
66.3	60.7	47.2	-13.5	Del Norte HS
68.0	62.0	48.5	-13.5	South East Heights
66.0	60.5	47.1	-13.4	South Valley
67.0	62.1	48.5	-13.6	Westside
65.0	58.8	45.7	-13.1	Foothills
66.3	59.8	39.9	-19.9	La Union
67.0	61.8	38.4	-23.4	Sunland Park
67.0	62.2	39.6	-22.6	Chaparral
72.0	66.8	42.6	-24.2	Desert View
71.3	66.0	42.2	-23.8	Santa Teresa
65.0	60.2	41.5	-18.7	Solano
69.0	66.4	46.1	-20.3	Carlsbad
62.0	58.9	43.0	-15.9	Chino Copper Smelt
66.0	63.3	44.9	-18.4	Hobbs Jefferson
66.0	62.5	43.3	-19.2	Deming Airport
64.0	60.0	47.4	-12.6	Coyote Ranger Dist
64.0	58.1	44.4	-13.7	Bernalillo (E Avenida)
64.3	60.2	46.4	-13.8	Bloomfield
67.0	63.3	50.2	-13.1	Navajo Lake
63.7	59.6	48.5	-11.1	Substation
64.3	60.4	47.9	-12.5	Santa Fe Airport
66.3	62.0	47.5	-14.5	Los Lunas (Los Lentos)

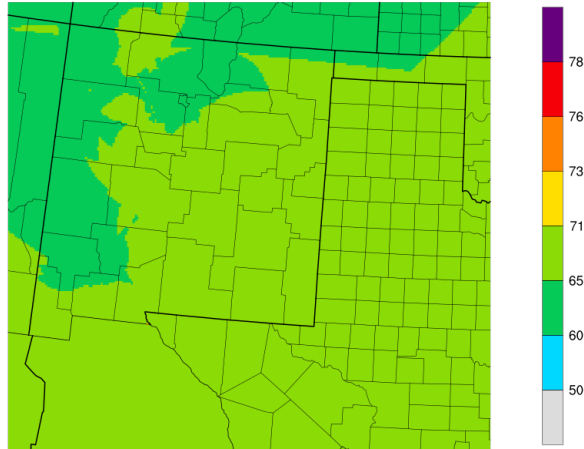
2015-19 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
69.0	63.1	49.2	-13.9	Del Norte HS
66.0	60.5	47.1	-13.4	South Valley
69.0	62.4	48.5	-13.9	Foothills
68.7	62.0	41.3	-20.7	La Union
70.7	65.7	41.8	-23.9	Chaparral
74.3	68.9	43.9	-25.0	Desert View
74.0	68.5	43.8	-24.7	Santa Teresa
67.7	62.7	43.3	-19.4	Solano
73.7	70.9	49.2	-21.7	Carlsbad
71.0	69.3	44.1	-25.2	Carlsbad NP
69.3	66.5	47.1	-19.4	Hobbs Jefferson
66.3	62.2	49.1	-13.1	Coyote Ranger Dist
67.0	60.9	46.5	-14.4	Bernalillo (E Avenida)
67.0	62.8	48.3	-14.5	Bloomfield
69.0	65.2	51.7	-13.5	Navajo Lake
67.3	62.9	51.2	-11.7	Substation
65.0	61.0	48.4	-12.6	Santa Fe Airport
66.7	62.3	47.8	-14.5	Los Lunas (Los Lentos)

2017-19 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
70.0	64.0	49.9	-14.1	Del Norte HS
67.0	61.4	47.8	-13.6	South Valley
71.0	64.2	49.9	-14.3	Foothills
70.0	63.2	42.1	-21.1	La Union
73.0	67.8	43.1	-24.7	Chaparral
77.0	71.4	45.5	-25.9	Desert View
76.0	70.3	45.0	-25.3	Santa Teresa
70.0	64.8	44.7	-20.1	Solano
79.0	76.0	52.8	-23.2	Carlsbad
71.0	68.1	48.3	-19.8	Hobbs Jefferson
67.0	62.8	49.6	-13.2	Coyote Ranger Dist
68.0	61.8	47.2	-14.6	Bernalillo (E Avenida)
68.0	63.7	49.1	-14.6	Bloomfield
69.0	65.2	51.7	-13.5	Navajo Lake
69.0	64.5	52.5	-12.0	Substation
66.0	62.0	49.1	-12.9	Santa Fe Airport
68.0	63.5	48.7	-14.8	Los Lunas (Los Lentos)

SMAT UAA -- DVC (TOP) AND 2028 O&G CONTROL DVF (BOTTOM)

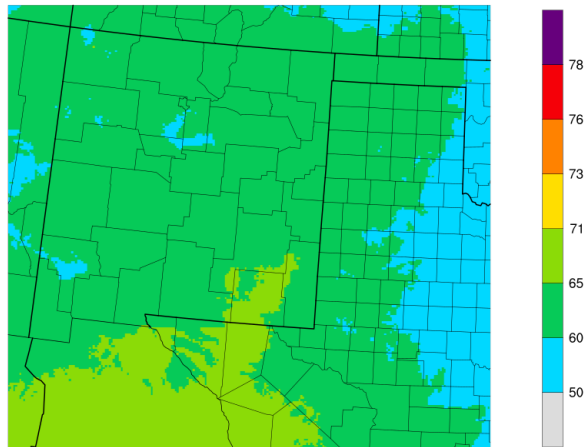
DVC₂₀₁₂₋₂₀₁₆

2014 Basecase
DVC 2012_2016
O3 Design Value UAA



max(71,64) = 71.0 ppb
min(38,93) = 62.1 ppb

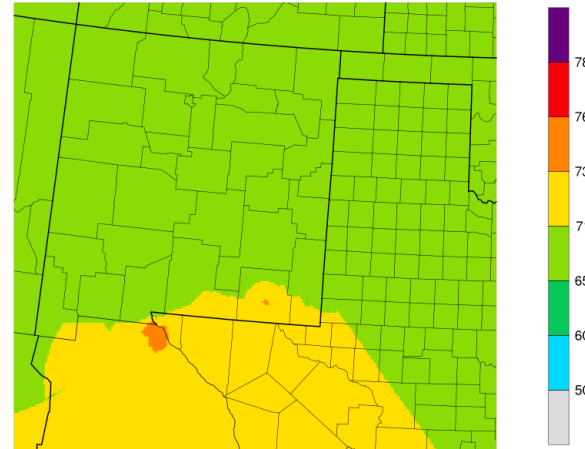
2028 Oil and Gas Control
DVC 2012_2016
O3 Design Value UAA



max(79,59) = 67.2 ppb
min(243,116) = 54.7 ppb

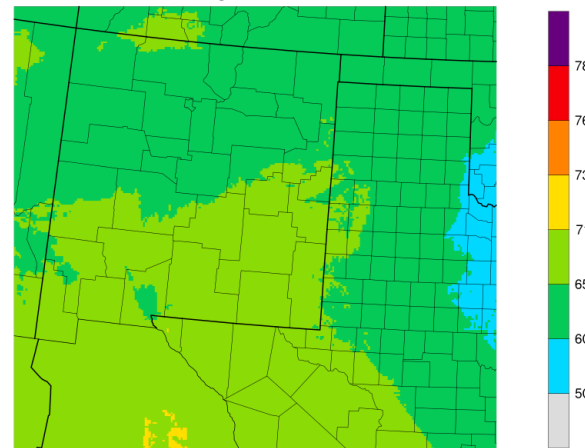
DVC₂₀₁₅₋₂₀₁₉

2014 Basecase
DVC 2015_2019
O3 Design Value UAA



max(71,64) = 74.2 ppb
min(93,169) = 65.1 ppb

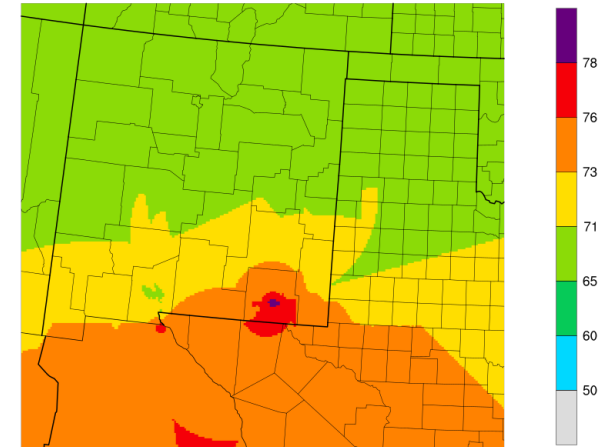
2028 Oil and Gas Control
DVC 2015_2019
O3 Design Value UAA



max(78,62) = 71.5 ppb
min(243,116) = 57.3 ppb

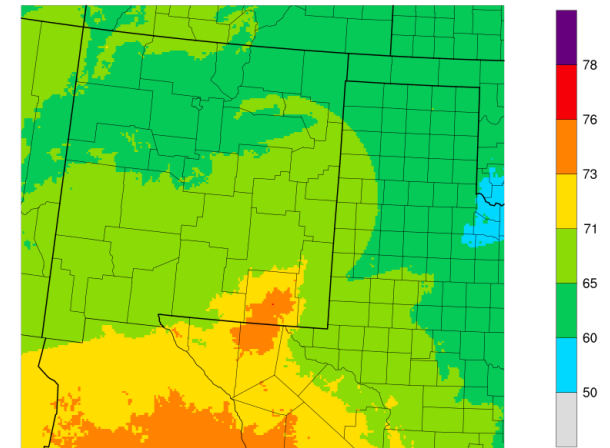
DVC₂₀₁₇₋₂₀₁₉

2014 Basecase
DVC 2017_2019
O3 Design Value UAA



max(127,75) = 78.9 ppb
min(93,169) = 66.1 ppb

2028 Oil and Gas Control
DVC 2017_2019
O3 Design Value UAA

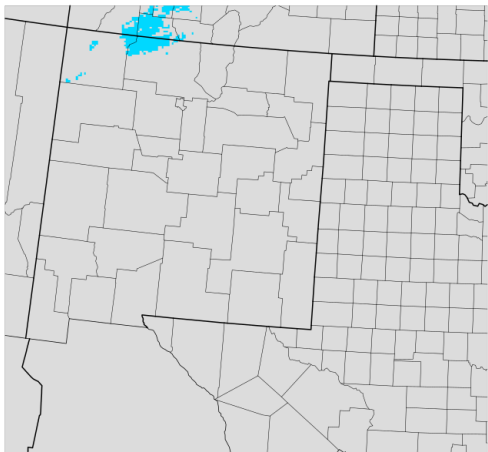


max(127,75) = 76.1 ppb
min(243,116) = 57.5 ppb

SMAT UAA – 2028 DVF NO INTL (TOP) AND DIFFERENCE (BOTTOM)

DVC₂₀₁₂₋₂₀₁₆

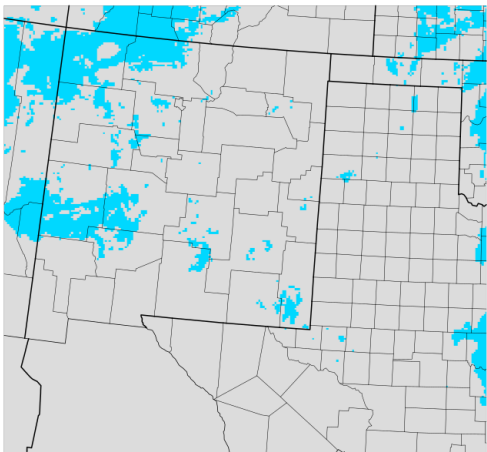
2028 No International
DVC 2012_2016
O3 Design Value UAA



max(44,204) = 52.5 ppb
min(176,2) = 33.8 ppb

DVC₂₀₁₅₋₂₀₁₉

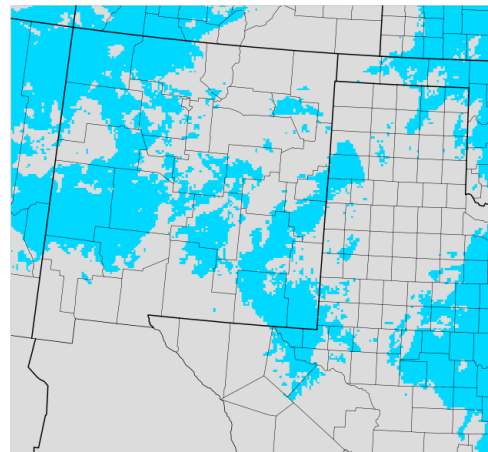
2028 No International
DVC 2015_2019
O3 Design Value UAA



max(44,204) = 55.2 ppb
min(176,2) = 35.6 ppb

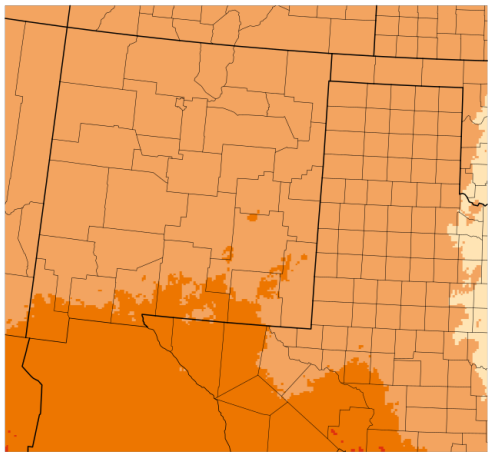
DVC₂₀₁₇₋₂₀₁₉

2028 No International
DVC 2017_2019
O3 Design Value UAA



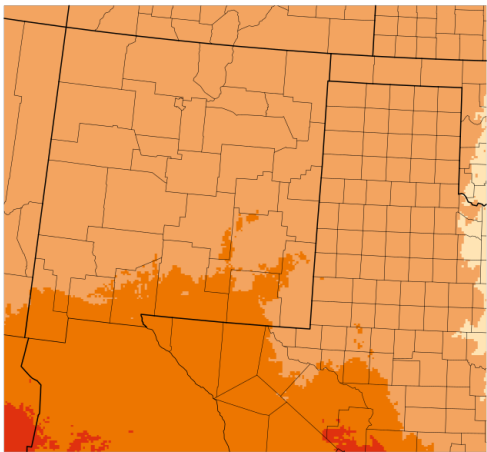
max(44,204) = 56.4 ppb
min(176,2) = 37.4 ppb

2028 OilandGas control - 2028 No_International
DVC 2012_2016
O3 Design Value UAA



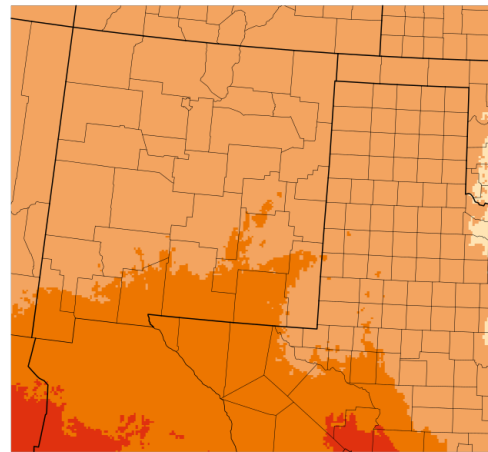
max(176,2) = 30.748 ppb
min(241,59) = 7.247 ppb

2028 OilandGas control - 2028 No_International
DVC 2015_2019
O3 Design Value UAA



max(2,2) = 32.562 ppb
min(241,59) = 7.636 ppb

2028 OilandGas control - 2028 No_International
DVC 2017_2019
O3 Design Value UAA



max(176,2) = 34.092 ppb
min(241,59) = 7.932 ppb

SECOND DRAFT AQTSD (DUE APRIL 4, 2021)

1. Introduction
 2. 2014 WRF Meteorological Modeling
 3. Boundary Condition Inputs
 4. 2014 Emission Inputs
 5. Diagnostic Sensitivity Tests
 6. 2014 Base Case Modeling and Model Performance Evaluation
 7. 2028 Base Case Modeling and Ozone Design Value Projections
 8. 2028 Oil and Gas Control Strategy Modeling and Ozone Design Value Projections
 9. Sensitivity of 2028 Ozone Design Value Projections to Current Year Design Values
 10. APCA Source Sector Ozone Source Apportionment Modeling
 11. Summary and Conclusions
 12. References
- To Come:
11. OSAT VOC/NO_x Sensitivity Ozone Source Apportionment Modeling

CAMX 2028 O&G CS OSAT OZONE SOURCE APPORTIONMENT

- Use the OSAT version of CAMx ozone source apportionment tool
 - OSAT O3V and O3N tracers give indication of amount of VOC-limited and NOx-limited ozone formation
- Definition of Source Groups
 - Source Regions (5):
 - Use same 5 Source Regions as APCA SA run
 - Source Categories (3):
 - Anthropogenic Emissions
 - Natural (Biogenic, lightning NOx, WBD, oceanic)
 - Fires (WF, Rx, Ag and other)
 - 17 Source Groups (5 x 3 + 2 [IC,BC])
 - Will run faster than CAMx APCA SA Run (50 Source Groups)
- Post-Processing
 - Amount of VOC-limited vs. NOx-limited ozone across 4-km domain from New Mexico sources alone, and all sources

