Proposed Ozone Rule Comments

Doug N. Blewitt
Certified Consulting Meteorologist
Air Quality Resource Management (AQRM)
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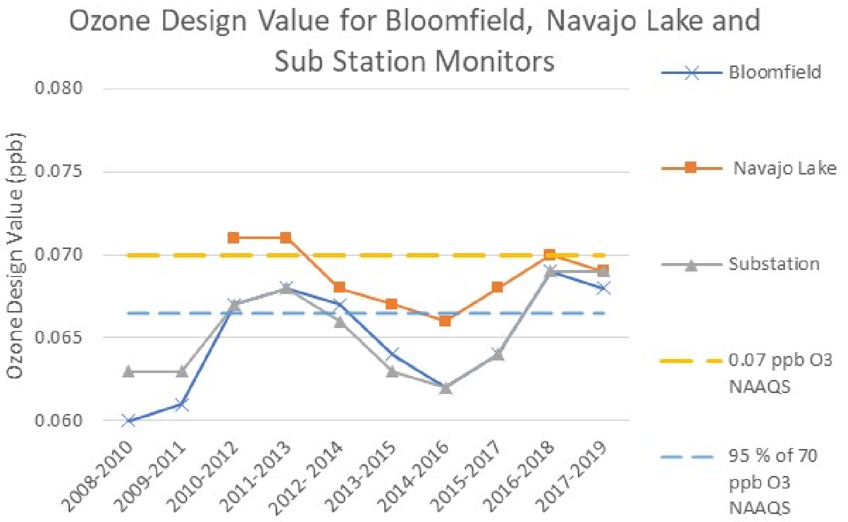
IPANM EXHIBIT 8

Topics of discussion

- Relative source contribution to monitored O3 impacts
- Emission inventory uncertainties
- Proposed emission reductions for Oil and Gas
- Conclusions

Relative Source Contribution to Monitored O3 Impacts



	Ozone Source Contribution to San Juan Monitors (ppb)							
Monitor	Oil pt	Oil non-pt	EGU	Non EGU	On Rd Mobile	Non Rd Mobile	Remain Anthro	Total from NM sources
Najavo Lake	0.8	2.1	1.7	0.1	0.4	0.3	0.2	5.6
Bloomfield	0.7	1.4	1.9	0	0.4	0.2	0.2	4.8
Substation	0.6	1.5	3.1	0.1	0.5	0.3	0.3	6.4

Modeling Assumptions

1) Oil point are mid stream sources
2) Oil non-point are production units
3) O3 contribution is for combined NOx and VOC emissions

Total O3 contribution from NM sources (NOx+VOC) at Navajo Lake 5.6 ppb, Bloomfield 4.8 ppb and Substation 6.4 ppb Remainder of O3 impacts from sources outside NM

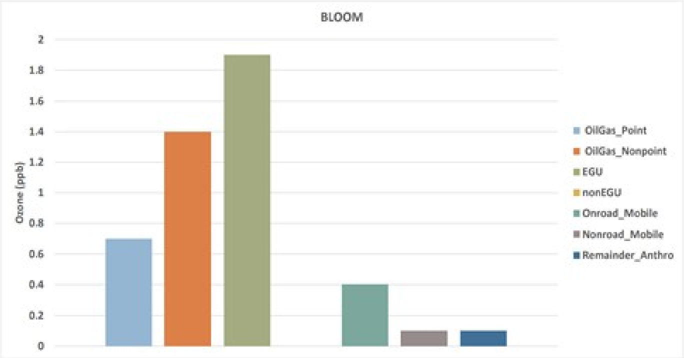


Figure 10-4. Contributions of New Mexico anthropogenic emissions from 7 Source Sectors to projected 2028 ozone DVFs at Bloomfield in San Juan County.

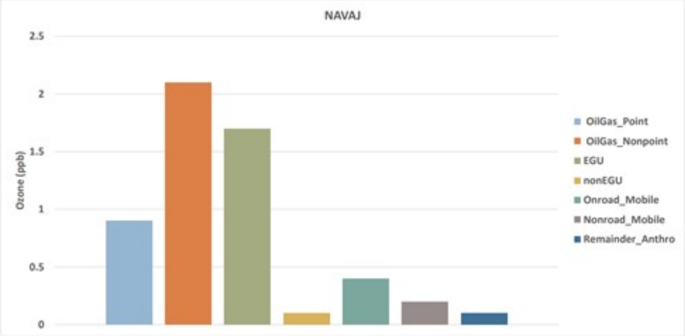


Figure 10-3. Contributions of New Mexico anthropogenic emissions from 7 Source Sectors to projected 2028 ozone DVFs at Navajo Lake in San Juan County.

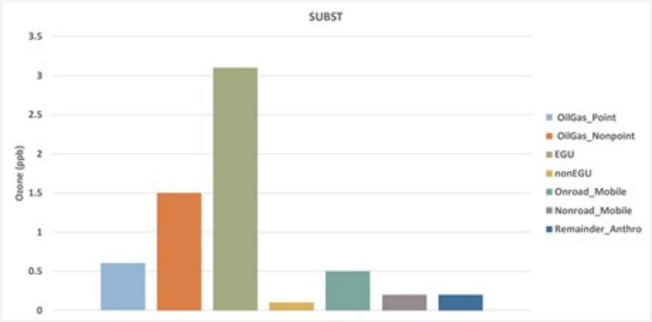
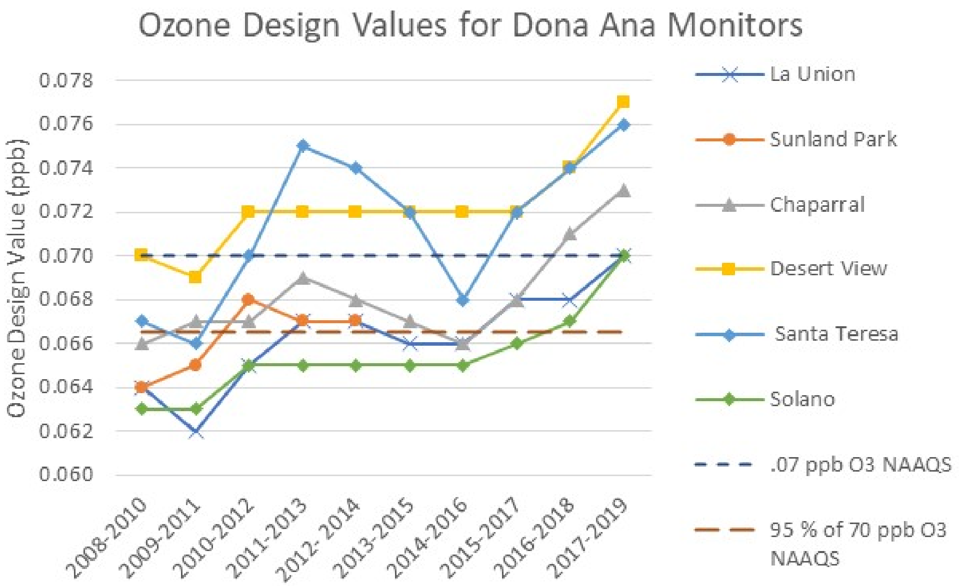


Figure 10-5. Contributions of New Mexico anthropogenic emissions from 7 Source Sectors to projected 2028 ozone DVFs at Substation in San Juan County.



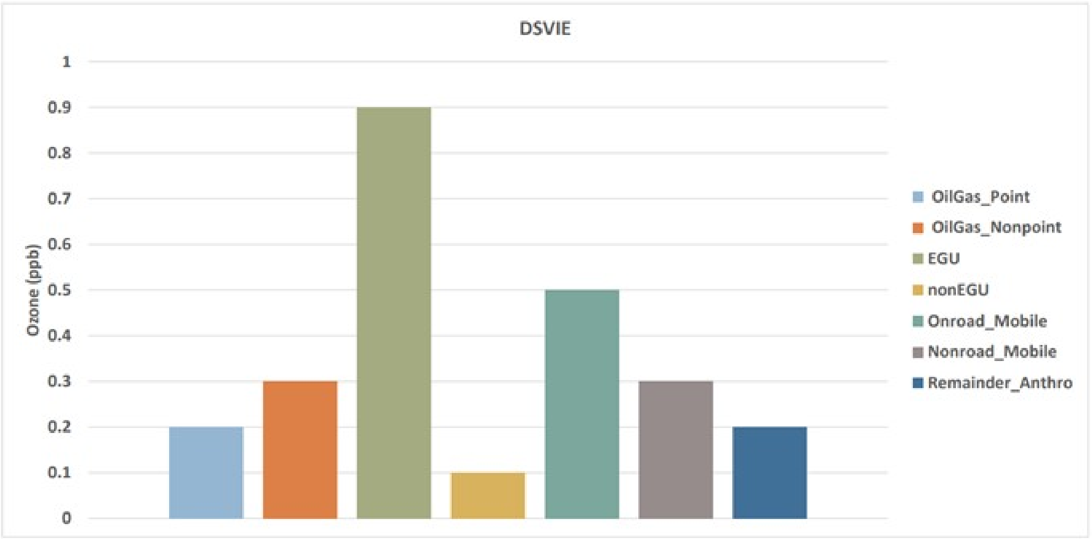
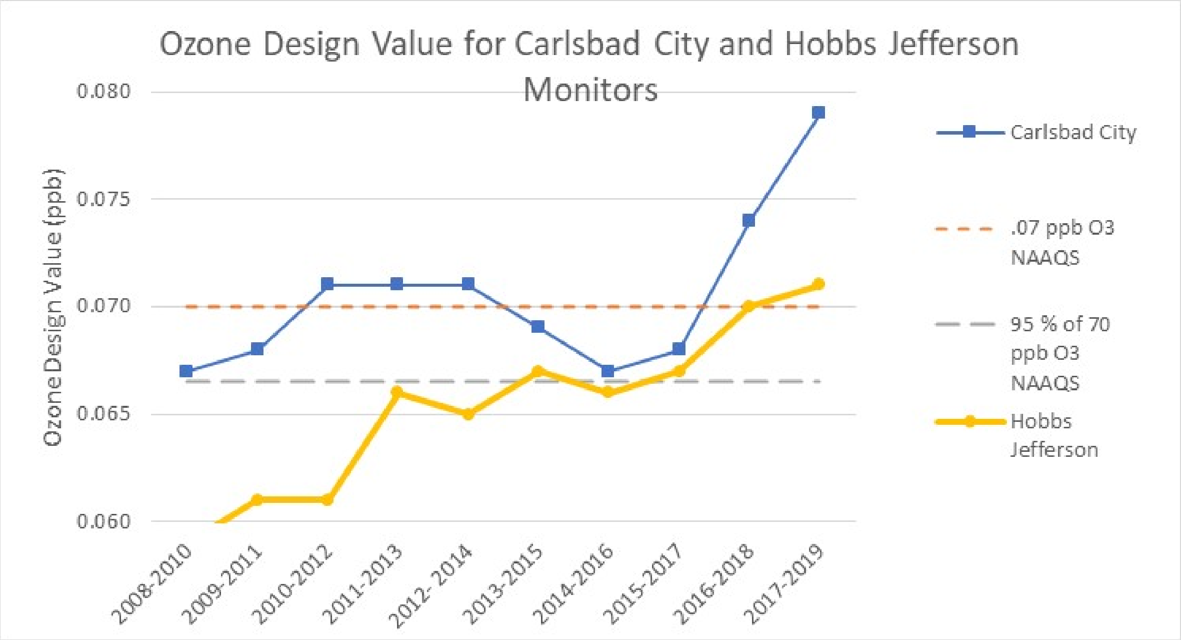


Figure 10-13. Contributions of New Mexico anthropogenic emissions from 7 Source Sectors to projected 2028 ozone DVFs at Desert View in Doña Ana County in southern New Mexico.

	Ozone Source Contribution to Dona Ana Monitors (ppb)							
Monitor	Oil pt	Oil non-pt	EGU	Non EGU	On Rd Mobile	Non Rd Mobile	Remain Anthro	Total from NM sources
Desert View	0.2	0.3	0.9	1	0.5	0.3	0.2	3.4

Modeling Assumptions
1) Oil point are mid stream sources
2) Oil non-point are production units
3) O3 contribution is for combined NOx and VOC emissions

Total O3 contribution from NM sources (NOx+VOC) 3.4 ppb.
Remainder of O3 impacts from sources outside NM



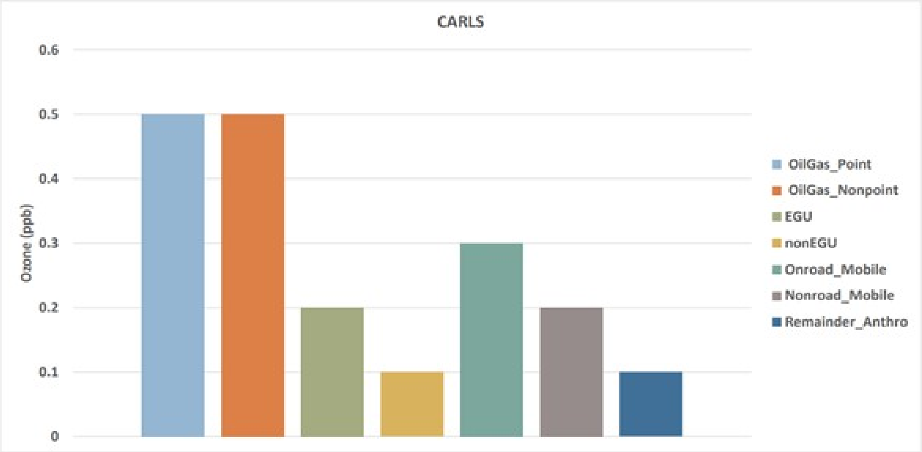


Figure 10-17. Contributions of New Mexico anthropogenic emissions for 7 Source Sectors to projected 2028 ozone DVFs at Carlsbad in Eddy County in southeastern New Mexico.

	Ozone Source Contribution to Carlsbad Monitor (ppb)							
Monitor	Oil pt	Oil non-pt	EGU	Non EGU	On Rd Mobile	Non Rd Mobile	Remain Anthro	Total from NM sources
Carlsbad City	0.5	0.5	0.2	0.1	0.3	0.2	0.1	1.9

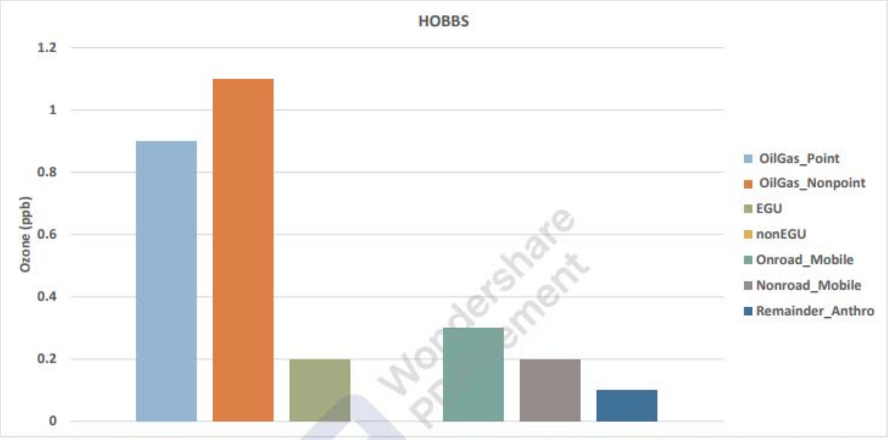


Figure 10-18. Contributions of New Mexico anthropogenic emissions for 7 Source Sectors to projected 2028 ozone DVFs at Hobbs in Lea County in southeastern New Mexico.

Modeling Assumptions

1) Oil point are mid stream sources
2) Oil non-point are production units
3) O3 contribution is for combined NOx and VOC emissions

Total O3 contribution from NM sources (NOx+VOC) 1.9 ppb.
Remainder of O3 impacts from sources outside NM

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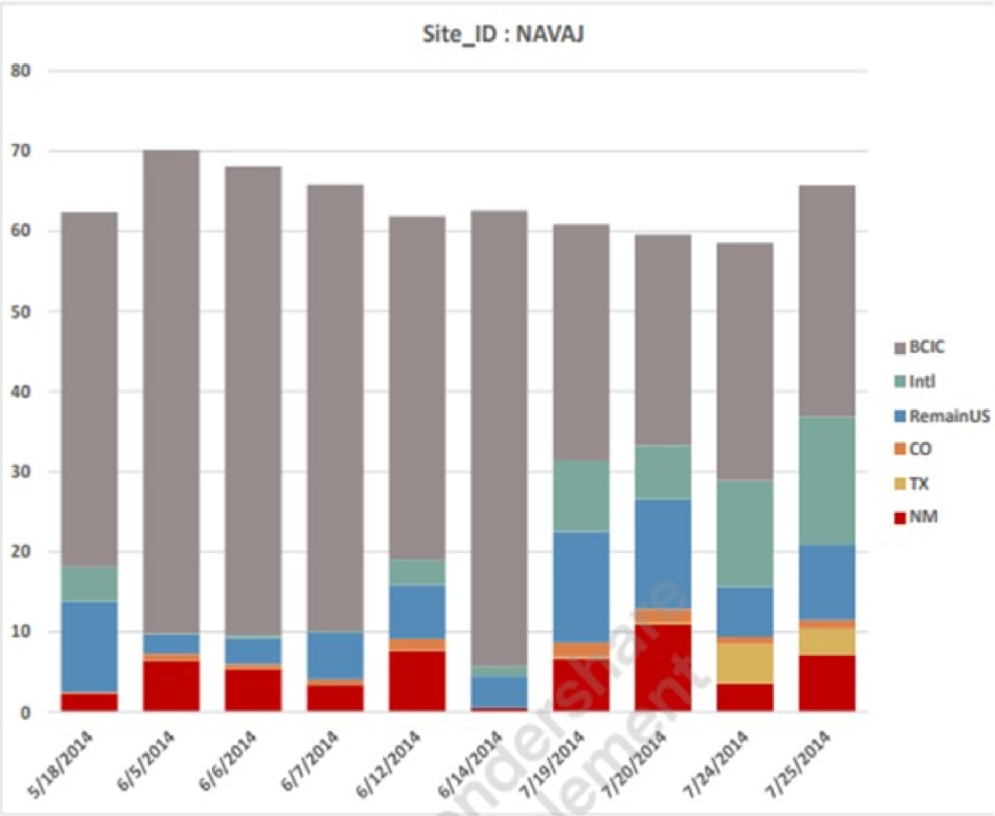
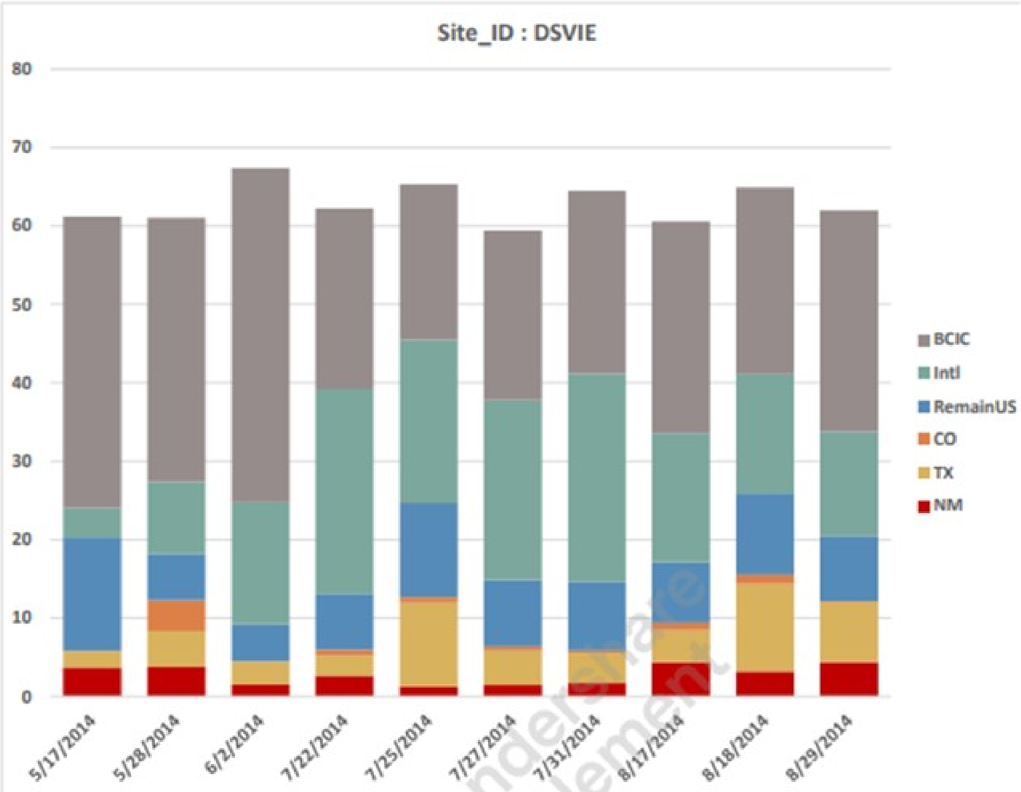
O3 contributions from sources beyond New Mexico

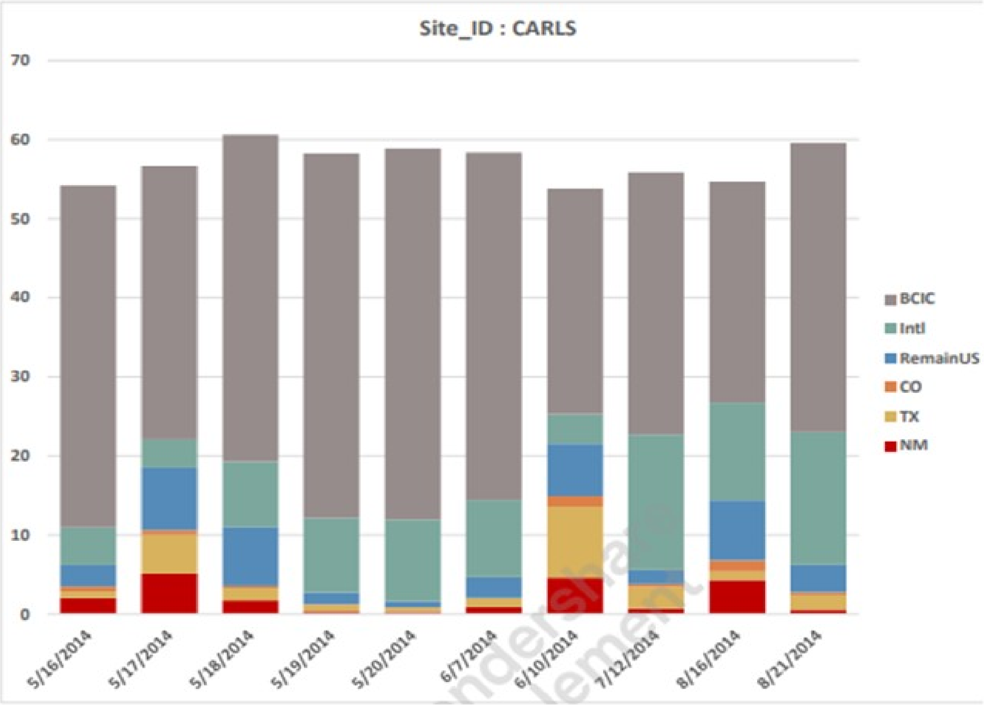
Navajo Lake Monitor



Desert View Monitor



O3 contributions from sources beyond New Mexico



- Majority of O3 is transported from outside of New Mexico
- New Mexico has no regulatory authority for requiring reductions beyond its borders
- Other states have similar O3 compliance issues with the NAAQS and as control strategies for those areas are developed, O3 transport into New Mexico will be reduced

Note: 1) O3 contributions at the Hobbs Jefferson O3 monitor from sources beyond New Mexico are not provided in the TSD
2) The Hobbs Jefferson monitor, located on the New Mexico and Texas border, is likely influenced by Texas sources

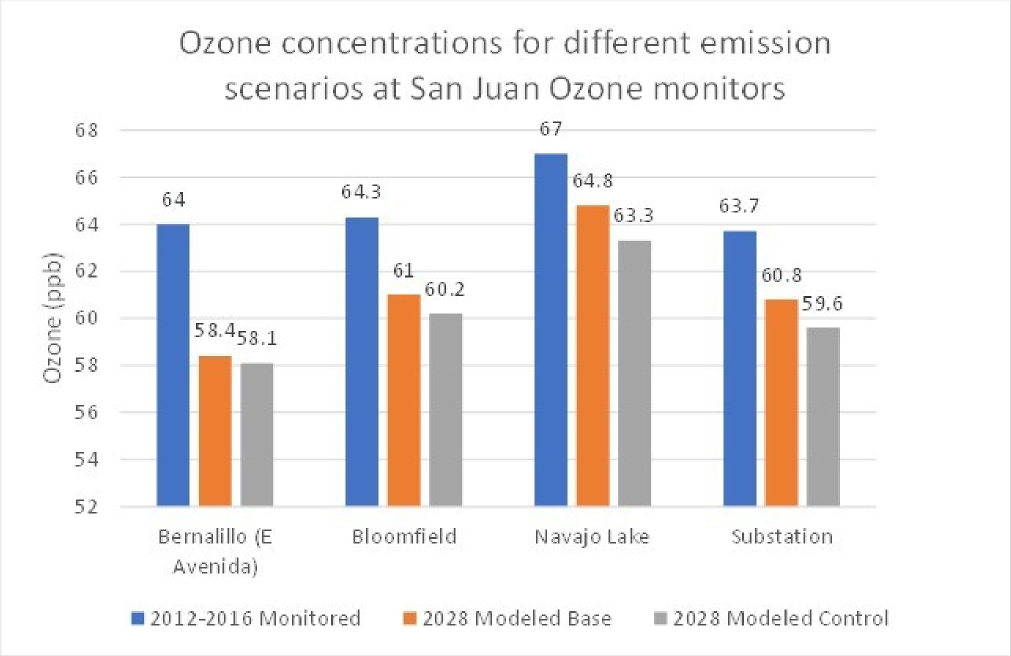
Source culpability findings

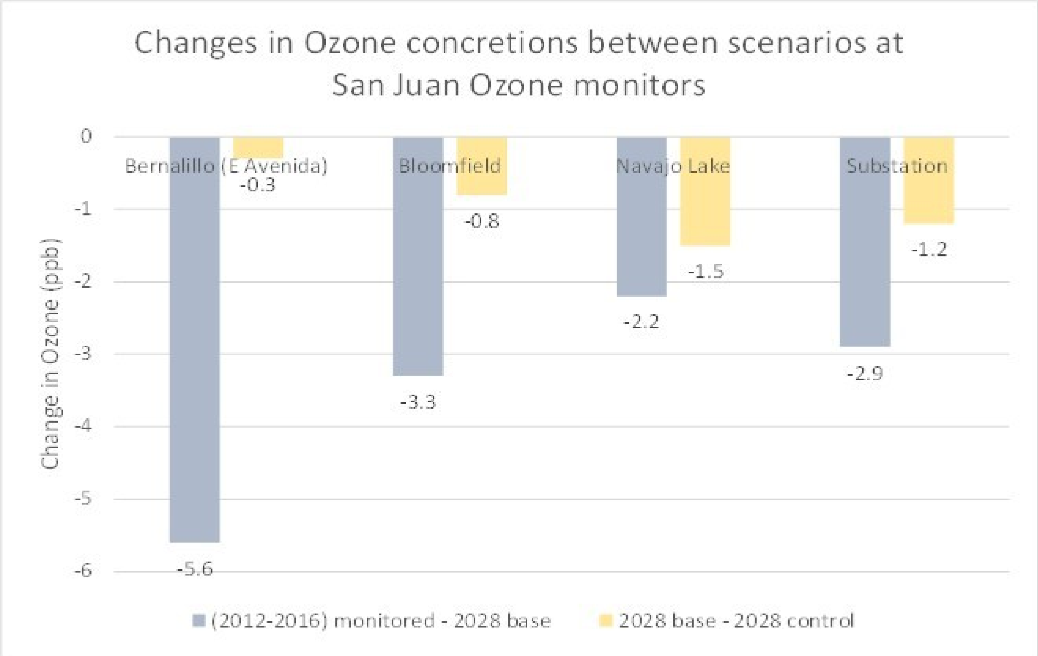
- For all monitors, New Mexico source impacts are a small fraction of total O3
- Sources beyond New Mexico are responsible for the majority of O3
- The Desert View monitor reported the largest measured O3 design value
  - The largest predicted source category O3 impacts (0.9 ppb) are from EGU emissions
  - The combined predicted total Oil and Gas O3 impacts are only 0.5 ppb
- Reported Oil and Gas O3 contributions are from combined NOx and VOC emissions
- Because of O3 formation non-linear chemistry, Oil and Gas O3 impacts and O3 impacts from NOx emissions must be separated from VOC impacts

Current O3 design values and projected O3 concentrations for future cases

- Monitored O3 design values for the period 2012 – 2016 (period used in TSD) were compared to design values in the 2028 year case
- The 2028 year base considered growth in emissions and future controls
- A controlled 2028 case was developed with additional controls applied on Oil and Gas sources for both NOx and VOC emissions
- The controlled 2028 case results indicate the design value as well as the change in monitored and predicted O3
- Predicted Oil and Gas results combine monitoring and modeling
    - This combination is appropriate considering the analyses conducted

Changes in O3 concentrations for alternate scenarios (San Juan monitors)





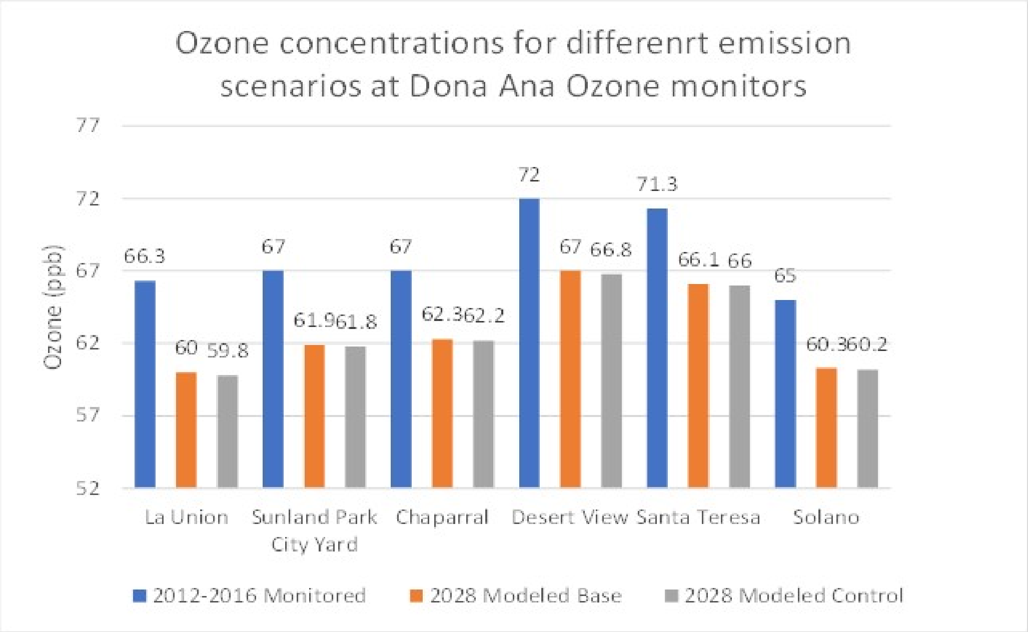
Notes:

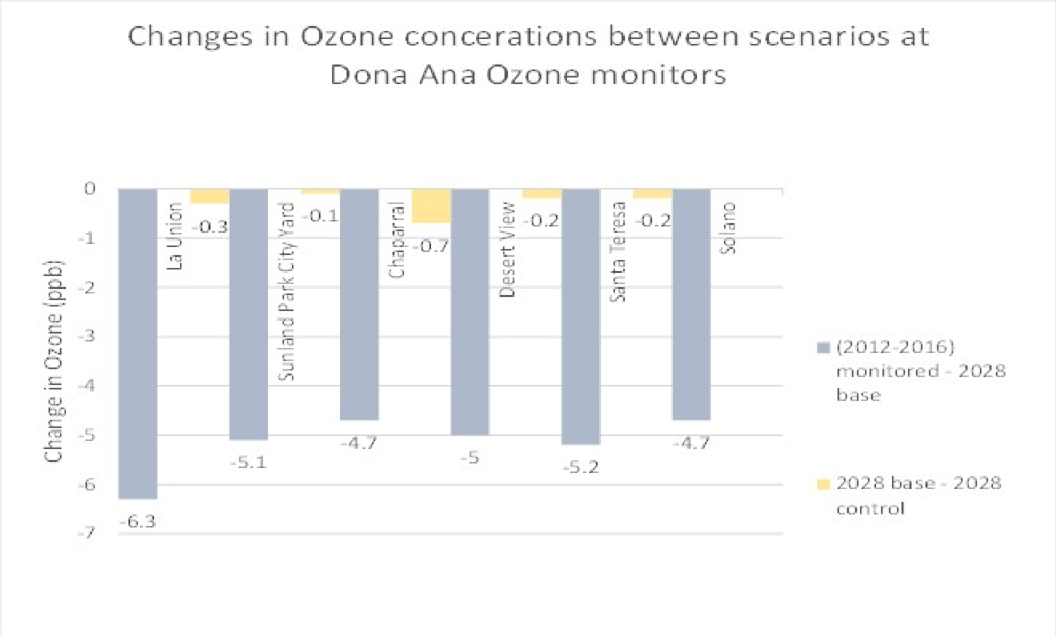
- NOx and VOC emission changes are combined
- 2012-2016 impacts are monitored not modeled

Conclusions

- **At the Navajo Lake monitor (dv=67 ppb) the 2028 future year base case predicted impacts are 64.8 ppb, a reduction of 2.2 ppb (no additional controls on Oil and Gas)**
- **If additional Oil and Gas controls are implemented, the 2028 design value is reduced to 63.3 ppb (a decrease of 1.5 ppb)**
- **Results indicate future case compliance with the 70 ppb NAAQS and the 66.5 ppb safety factor threshold**
- **Compliance is therefore demonstrated without the implementation of additional Oil and Gas controls**

Changes in O3 concentrations for alternate scenarios (southern NM monitors)





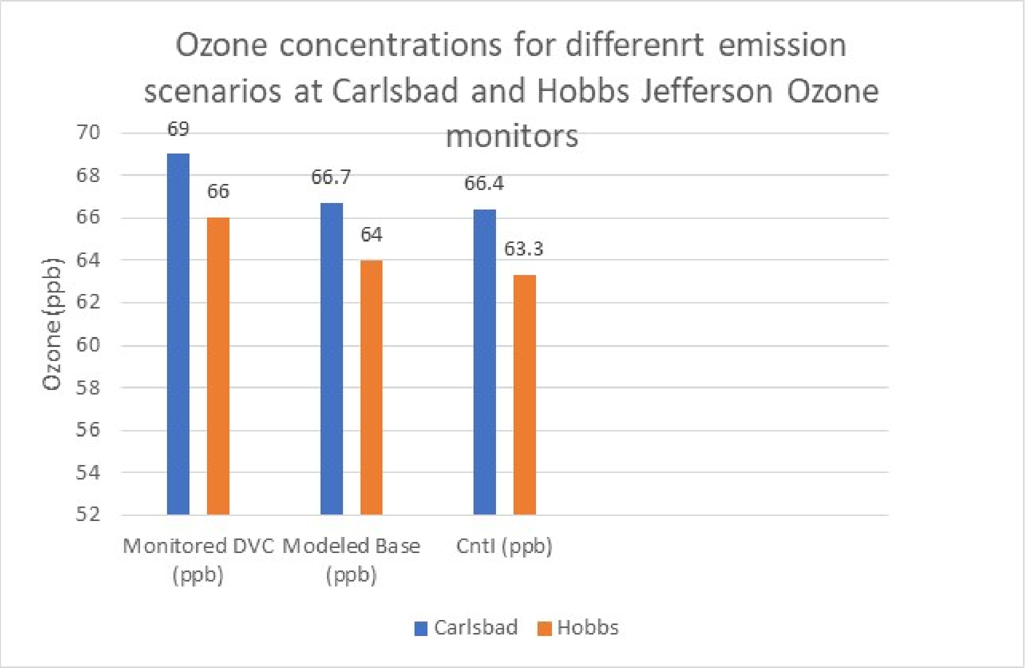
Notes:

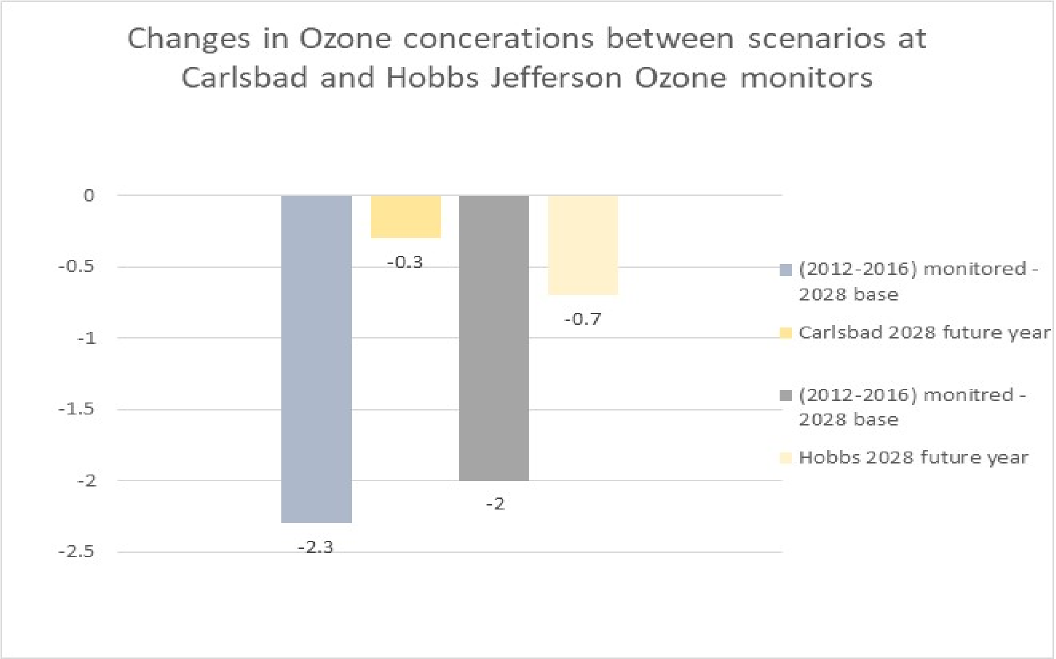
- NOx and VOC emission changes are combined
- 2012-2016 impacts are monitored not modeled

Conclusions

- **The Desert View monitor has dv of 72 ppb and the 2028 future year base case predicted impacts are 67 ppb, a reduction of 5 ppb (no additional controls on Oil and Gas)**
- **If additional Oil and Gas controls are implemented, the 2028 design value is reduced to 66.7 ppb (a decrease of 0.3 ppb)**
- **These results demonstrate future case compliance with the 70 ppb NAAQS**
- **The Desert View 2028 base case has a 67 ppb design value (0.5 ppb above the 95 % threshold)**
- **The Oil and Gas 2028 control strategy reduces the 2028 case to 66.8 ppb (reduction of 0.2 ppb) which is above the 66.5 ppb threshold**
- **Oil and Gas controls provide insignificant additional benefits for reducing O3 impacts at this monitor**

Changes in O3 concentrations for alternate scenarios Carlsbad and Hobbs Jefferson O3 monitors





Notes:
- NOx and VOC emission changes are combined
- 2012-2016 impacts are monitored not modeled

Conclusions
- **The Carlsbad monitor has a dv 69 ppb and the 2028 future year base case predicted impacts are 66.7 ppb, a reduction of 2.3 ppb (no additional controls on Oil and Gas)**
- **If additional Oil and Gas controls are implemented, the 2028 design value is reduced to 66.4 ppb (a decrease of 0.3 ppb)**
- **Implementing the Oil and Gas control strategy results in an insignificant improvement in O3**
- **The Hobbs Jefferson monitor dv is below the 66.5 ppb threshold**

Summary of changes in O3 from the 2028 future year base case using 2012 – 2016 data (time period follows EPA guidance)

Table 8-1. Observed ozone $DVC_{2012-2016}$ and projected 2028 ozone DVFs for the 2028 Base Case and 2028 O&G Control strategy and differences in the 2028 ozone DVFs (DVF_{Cntl} – DVF_{Base}).

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

Legend: Red highlight 2012-2016 design value is above O3 NAAQS of 70 ppb
Yellow highlight 2012-2016 design value is above 95% of O3 NAAQS or 66.5 ppb

Conclusions

1) For the 2012-2016 time frame the only monitors that have a design value above the NAAQS are Desert View and Santa Teresa 72.0 and 71.3 ppb respectively

2) The Navajo Lake, Carlsbad, South East Heights, Westside, Sunland Park City Yard, and Carlsbad monitors have design values for the 2012-2016 base case above 66.5 (95 % of the 70 ppb NAAQS)

3) For the 2028 base case all modeled design values are below 66.5 ppb except at Desert View and Carlsbad monitors

4) At Desert View the 2028 base case design value 67 ppb and is 0.5 ppb above the threshold value

5) Additional Oil and Gas controls reduce impacts for the Desert View monitor 0.2 ppb (total O3 66.8 ppb which is still above the 66.5 ppb threshold)

6) At the Carlsbad monitor the 2028 base case is 66.7 ppb (0.2 ppb above the 66.5 ppb threshold) and Oil and Gas controls reduce the design value by an additional 0.3 ppb (66.4 ppb)

6) Combined Oil and Gas controls are a very ineffective way to reduce impacts below 66.5 ppb

7) If different years are used for the dv, slightly different conclusions are found. According to the TSD the use of the 2012-2016 baseline follows EPA guidance

Summary of changes in O3 2028 future year base case using 2015 – 2019 data (Sensitivity Case)

Table 9-1. Projected 2028 ozone DVFs for the 2015-2019 current year design value DVC2015-2019 sensitivity analysis.

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	Doña Ana
350130020	70.7	65.7	65.7	0.0	Chaparral	Doña Ana
350130021	74.3	69.1	68.9	-0.2	Desert View	Doña Ana
350130022	74.0	68.6	68.5	-0.1	Santa Teresa	Doña Ana
350130023	67.7	62.9	62.7	-0.2	Solano	Doña 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 Lentes)	Valencia

<u>Legend</u>: Red highlight 2012-2016 design value is above O3 NAAQS of 70 ppb
Yellow highlight 2012-2016 design value is above 95% of O3 NAAQS or 66.5 ppb

Conclusions

1) For the 2015-2019 time frame, the Chaparral, Desert View, Santa Teresa, Carlsbad and Carlsbad Cavern monitors have a design value above the 70 ppb NAAQS
2) For the 2015 -2019 time frame, the Del Norte HS, Foot Hills, La Union, Solano, and Navajo Lake monitors have a design value in excess of 66.5 ppb (95 % of the 70 ppb NAAQS) threshold
3) For the 2028 base case, all monitors are below the 70 ppb O3 NAAQS except Carlsbad
   - The 2028 control base case reduces the design value from 73.7 ppb to 71.2 ppb (reduction of 2.5 ppb)
   - The implementation of the Oil and Gas control strategy (NOx and VOC combined) reduces the design value to 70.9 ppb (a reduction of 0.3 ppb) but still above the 70 ppb NAAQS
4) For the 2028 base case only the Chaparral, Desert View, Santa Teresa, Hobbs Jefferson and Carlsbad monitors have concentrations above 66.5 ppb (90% of the 70 ppb NAAQS)
5) The dv at the Hobbs Jefferson monitor using the 2015-2019 data is larger than the 2012 -2016 data
   - The dv at the Hobbs Jefferson monitor (69.3 ppb) is below the NAAQS but above the 66.5 ppb threshold
   - For the Hobbs Jefferson monitor the implementation of the Oil and Gas control strategy (NOx and VOC combined) reduces the design value by a maximum of 0.7 ppb and reduces the dv to 66.5
   - The implementation of Oil and Gas controls reduces the dv equal to the threshold, but is not an efficient method of achieving O3 reductions
   - The modeling does not provide analyses to separate NOx and VOC impacts by source region and therefore it is impossible to evaluate the efficiency of controls
   - If the 2015 - 2019 data is used to evaluate controls, then the emission inventory should be updated to be consistent with the monitoring data
6) For the Carlsbad monitor the implementation of the Oil and Gas control strategy (NOx and VOC combined) reduces the design value by a maximum of 0.3 ppb

Emission Inventory Uncertainties

Issues with emission inventories used in the modeling

- The Technical Support Documentation does not contain data regarding the derivation of the base case
- The 2028 future year base case provides no documentation for emission calculations, emission growth (by source category) as well as assumptions regarding emission reductions that will be implemented as a result of new control requirements that are required by promulgated regulation
- Growth assumptions for Oil and Gas sources are critical because growth for many sources is contingent on production levels as well as rate of drilling for new wells
- A review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement identified numerous issues with the Mancos modeling inventories
    - The Mancos analysis is directly related to the New Mexico O3 Attainment Initiative Photochemical Modeling Study

Power Plant Emissions

- Electric Generating Units (EGU) are a very large emission source in New Mexico and large EGU sources exist beyond NM borders that impact New Mexico O3 levels
- The TSD developed provides limited documentation on EGU sources included in the inventory as well as information supporting the 2028 emission reductions
- The Technical Support Document presents the following NOx emission data for EGUs
  - EGU 2014 base case NOx emissions 43,071 t/yr
  - EGU 2028 future year case NOx emissions 13,389 t/yr
  - Difference -29,682 t/yr
  - EGU 2014 EIA NOx emissions are listed as 60,158 t/yr
  - Difference between NOx modeling and EIA inventories is approximately 17,000 t/yr
  - No documentation is provided regarding how the 2014 EGU modeling inventory was developed and why it is so different than the 2014 EIA inventory
  - Several EGU facilities have announced closure of coal fired plants and the only statement made in the TSD is that Units 4 and 5 will continue to operate at the Four Corners Power Plant in 2028

Oil and Gas emission inventories

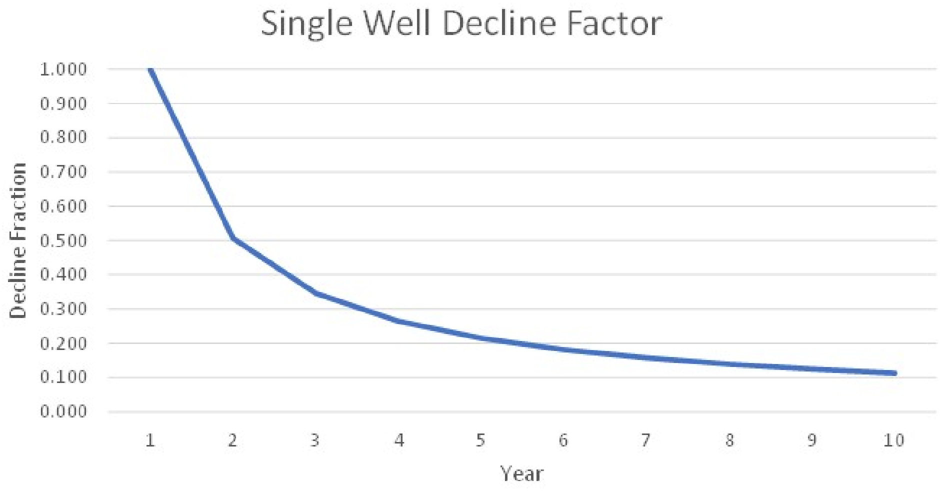
New Mexico NOx and VOC Oil and Gas emissions for 2014 base case, 2028 growth case and 2028 control case												
	NOx Emissions (t/yr)						VOCx Emissions (t/yr)					
Case	2014 Base	2028 growth	Difference 2014 base and 2028 growth	Difference 2014 base and 2028 growth (%)	2028 Control		2014 Base	2028 Growth	Difference 2014 base and 2028 growth	Difference 2014 base and 2028 growth (%)	2028 Control	
Non-Point	45,476	61,245	15,769	35	33,144		321,608	181,252	-140,356	-77	85,564	
Point	31,125	41,066	9,941	32	22,872		40,744	30,340	-10,404	-26	19,608	
Total	76,601	102,311	25,710	34	56,016		362,352	211,592	-150,760	-42	105,172	

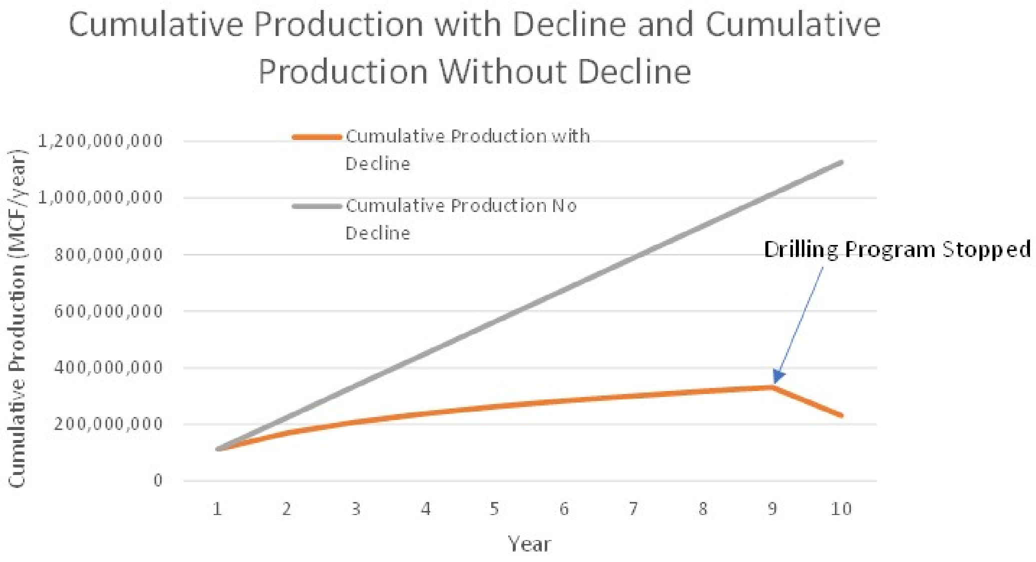
- Documentation is lacking on the underlying assumptions used to formulate Oil and Gas emissions for the 2014 base, 2028 growth and 2028 Oil and Gas control cases
- For NOx emissions there is approximately a 34 % increase in emissions between the 2014 base case and the 2028 growth case, while for VOCs the difference between the 2014 base case and the 2028 growth base case indicates a 42 % decrease
- It does not seem reasonable that there is substantial growth in NOx sources while there is a simultaneous reduction in VOC emissions from the same sources
- **Assumptions used in developing the NOx and VOC inventories do not appear to be consistent**

Production decline will result in emission reductions for some NOx and VOC emissions

- All production from Oil and Gas wells will exponentially decrease over time
- Production decline is offset by drilling new wells which slows the rate of overall decline
- As well production declines, some Oil and Gas emissions from selected sources will be reduced (e.g., compressors (NOx), dehys (NOx and VOCs) and tanks (VOCs)
- The reduction in emissions from decline occurs for both NOx and VOCs
- In most Oil and Gas inventories for existing wells decline is not accounted for
- Typically, in future year inventories new well emissions at initial production are added to existing wells at initial production and result in substantially overstating actual emissions
- The lack of documentation regarding Oil and Gas inventories prevents confirmation of values used in the modeling

Example of production decline





- New wells are drilled in a basin to replace declining production in existing wells
- Emissions from sources which are dependent on production rate will be reduced as production declines (compressors, dehys, tank emissions, liquid unloading etc.)

ɔurce: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft ɛsource Management Plan Amendment and Environmental Impact Statement

Example of changes over time in well head equipment and emissions

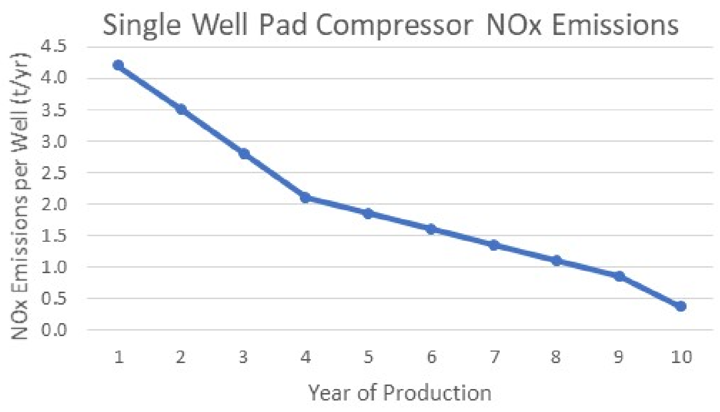
Table 2-8. Summary of Compression Equipment and Associated Emissions Mancos Oil Well Using Gas Lift Technology

Year	Gas Lift Engines	Capacity Engine 1 and 2 (hp)	Well Pad Compressor NOx Emissions (t/yr)	VRU Engines	NOx Emissions Other Sources	Total NOx Emissions per 3 Well Pad	NOx Emissions per Well (t/yr)
1	2 Engines Max Capacity	1093	4.2	2 Engines Max Capacity	0.9	5.1	1.7
2	Interpolate Emissions		3.5	2 Engines Max Capacity	0.9	4.4	1.47
3	Interpolate Emissions		2.8	1 Engine Max Capacity	0.6	3.4	1.13
4	Reduce Capacity to 1 Engine	546	2.10	1 Engine Max Capacity	0.6	2.7	0.90
5	Interpolate Emissions		1.85	1 Engine Max Capacity	0.3	2.1	0.70
6	Interpolate Emissions		1.60	Remove VRU	0.3	1.9	0.62
7	Interpolate Emissions		1.35		0.3	1.6	0.54
8	Interpolate Emissions		1.11		0.3	1.4	0.46
9	Interpolate Emissions		0.86		0.3	1.1	0.37
10	Reduce Engine Size	100*	0.36		0.3	0.6	0.21

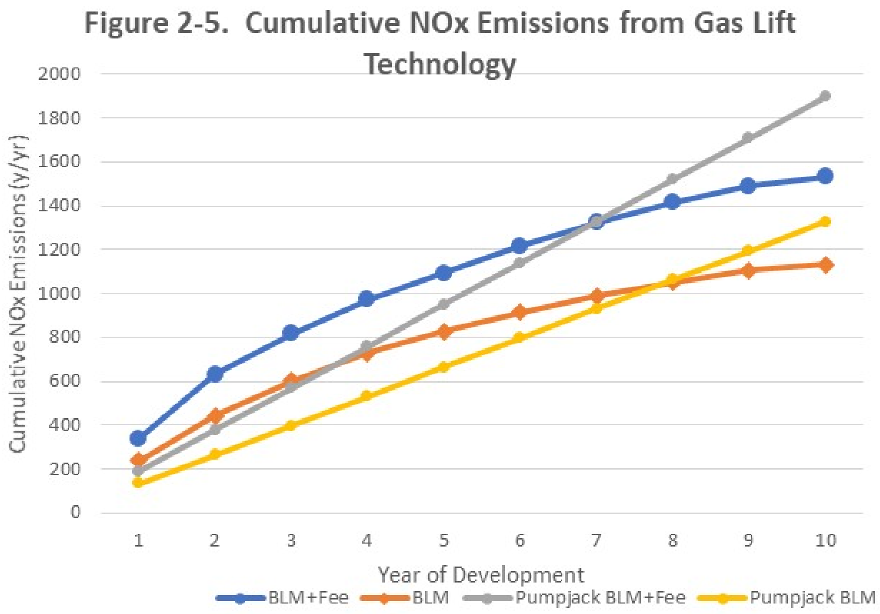
*Dependent upon pipeline pressures. Actual pressure could vary by site.

Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

Importance of decline in wellhead compressor emissions



- Example is based on the high rate of development case from Mancos RMP over a 10-year drilling program
- Example indicates a 500 t/yr reduction in projected emissions over a 10-yr period



Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

Changes in NOx emissions for Mancos maximum development case

Table 2-4a. Total (BLM+Fee) Well Revisions Based on Revised Engineering Data to NOx Emissions for Maximum Oil Development Case

						Original[1]		Revised		
Key	Year	Tab Name	Source Description	General Source	Source Type	NOx	% of Total	Revised NOx (t/yr)	% of Total	Chan Emiss (t/yr)
1	2025	Cn_HEq_Exh	Drilling Equip	Drilling Equip	dsl eqt exh	291.6	9.4	268.1	10.3	-23
3	2025	Cn_HEq_Exh	Completion Equip	Completion Equip	dsl eqt exh	325.1	10.4	325.1	12.5	0.
5	2025	Cn_HEq_Exh	Const Equip - Well Pad	Const Equip	dsl eqt exh	2.8	0.1	2.8	0.1	0.
6	2025	Cn_HEq_Exh	Const Equip - Well Pad Access Road	Const Equip	dsl eqt exh	2.4	0.1	2.4	0.1	0.
7	2025	Cn_HEq_Exh	Const Equip - Pipeline	Const Equip	dsl eqt exh	1.1	0.0	1.1	0.0	0.
8	2025	Cn_CV_Exh	Drilling Traffic	Drilling Traffic	dsl veh exh	11.5	0.4	11.5	0.4	0.
11	2025	Cn_CV_Exh	Well Completion & Testing	Completion Traffic	dsl veh exh	2.7	0.1	2.7	0.1	0.
27	2025	Ops_Well WO	Workover Equip	Workover Equip	dsl eqt exh	118.6	3.8	118.6	4.6	0.
40	2025	Misc_Engines_Exh	Misc. Engines	Misc. Engines	dsl eqt exh	1,898.0	60.9	0.0	0.0	-18
41	2025	Condensate Tanks & Traffic	Produced Condensate Hauling Traffic - Exhaust	Production Traffic	dsl veh exh	101.5	3.3	101.5	3.9	0.
45	2025	Condensate Tanks & Traffic	Produced Water Hauling Traffic - Exhaust	Production Traffic	dsl veh exh	35.6	1.1	35.6	1.4	0.
47	2025	Ops_Road Maint	Road Maintenance Traffic - Exhaust	Production Traffic	dsl veh exh	1.7	0.1	1.7	0.1	0.
57	2025	Heaters and Flaring	Flaring	Completion Flaring	flaring	2.1	0.1	2.1	0.1	0.
58	2025	Heaters and Flaring	Heaters	Heaters	ng ext comb	321.2	10.3	174.9	6.7	-14
64	2025	Well pad compression					0.0	1,549.0	59.6	154
					Total	3,117	100	2,598.5	100.0	-5

[1] From Draft EIS spreadsheets

Table 2-5a. Total Source (BLM+Fee) Revisions Based on Revised Engineering Data to NOx Emissions for the Maxi Development Case

						Original[1]		Revised		
Key	Year	Tab Name	Source Description	General Source	Source Type	NOx	% of Total	Revised NOx (t/yr)	% of Total	Ch Em (t/
1	2025	Cn_HEq_Exh	Drilling Equipment	Drilling Equipment	dsl eqt exh	1,271.8	66.5	197.1	23.5	-
2	2025	Cn_HEq_Exh	Completion Equipment	Completion Equipment	dsl eqt exh	59.7	3.1	59.7	7.1	
8	2025	Cn_CV_Exh	Drilling Traffic	Drilling Traffic	dsl veh exh	9.8	0.5	9.8	1.2	
11	2025	Cn_CV_Exh	Well Completion & Testing	Completion Traffic	dsl veh exh	24.1	1.3	24.1	2.9	
12	2025	Cn_CV_Exh	Well Pad and Access Road Construction Traffic	Construction Traffic	dsl veh exh	1.4	0.1	1.4	0.2	
27	2025	Ops_Well WO	Workover Equipment	Workover Equipment	dsl eqt exh	39.7	2.1	39.7	4.7	
49	2025	Compressor_Engines	Wellhead Compressor Engines	Wellhead and Lateral Compressor Engines	ngrb eng exh	369.9	19.3	369.9	44.2	
55	2025	Others Traffic	Fuel Haul Truck Traffic - Exhaust	Production Traffic	dsl veh exh	114.5	6.0	114.5	13.7	
58	2025	Heaters and Flaring	Heaters	Heaters	ng ext comb	17.0	0.9	17.0	2.0	
						1,912	**100**	**838**	**100**	-

[1] From Draft EIS spreadsheets

Total reduction in NOx over non decline case
Gas 1,075 t/yr
Oil 1,447 t/ty
Total 2,522

Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

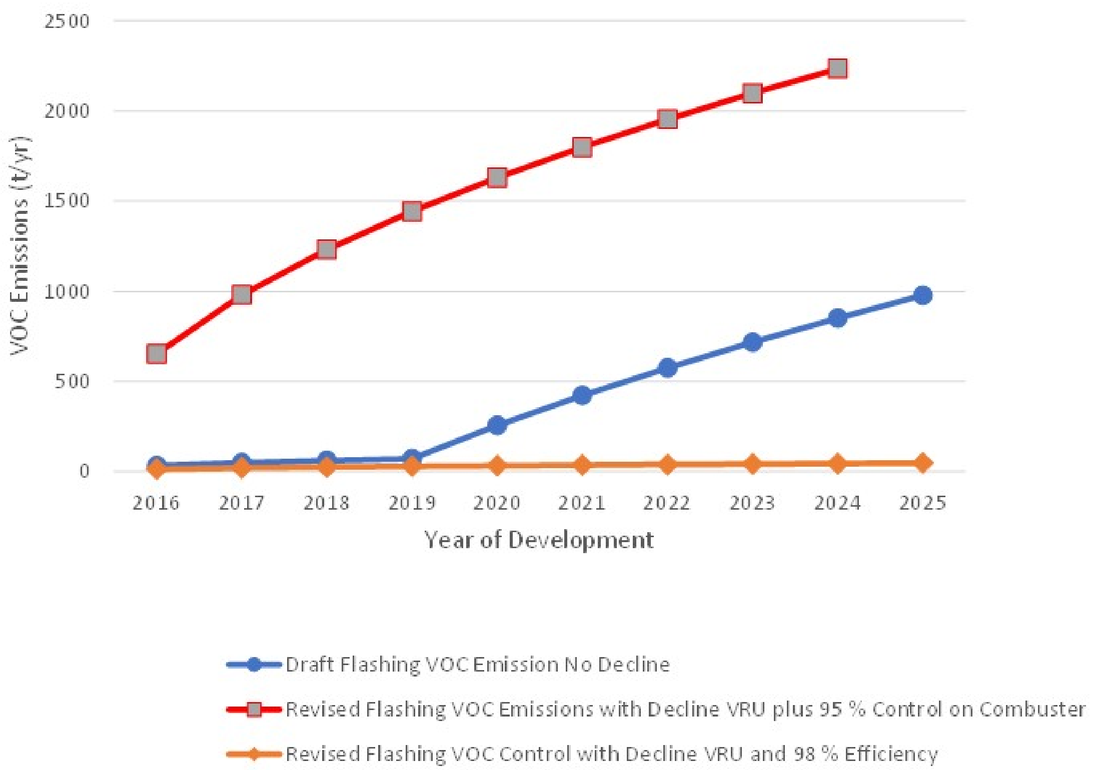
Changes in Mancos VOC emissions for Maximum Development Case by incorporating decline

Table 2-10. Changes to VOC Emissions from BLM Wells and Total Wells

Scaler	Type of Emission	VOC (t/yr)	(% Contribution)	Revised Emissions based on More Accurate Engineering VOC (t/yr)	(% Contribution)	Reduction (t/yr)	% Reductic
Annual condensate production	Flashing	2297.2	36.6	814	27	-1483	-65
Active well counts	Water tanks	2017.4	32.2	360	12	-1658	-82
Active well counts	Venting	831.8	13.3	832	27	0	0
Annual condensate production	Working/ breathing	734.0	11.7	734	24	0	0
Active well counts	Dsl eqt exh	206.6	3.3	207	7	0	0
Active well counts	Venting	107.1	1.7	107	4	0	0
	Total	**6,271**		**3,054**		**-3141**	

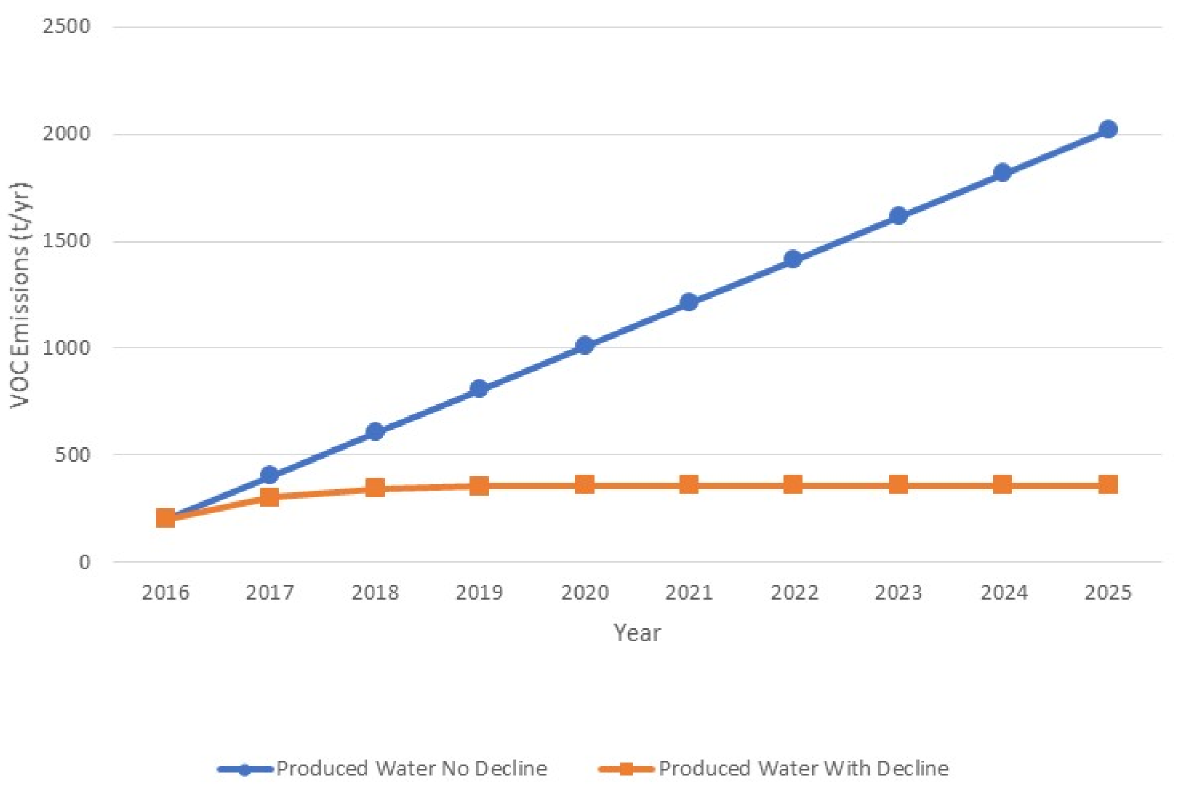
Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

Figure 2-8. Comparison of VOC Flashing Emissions from Draft and Actual Well Design Being Implemented in the Mancos For BLM Wells



Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

Figure 2-9. Produced Water VOC Emissions from BLM Wells With and Without Production Decline



Source: 2020, D.N. Blewitt, Technical Review of the Farmington Mancos-Gallup Draft Resource Management Plan Amendment and Environmental Impact Statement

Proposed Emission Reductions for Oil and Gas

Procedure for Heaters

- The San Juan basin application of the proposed rule to existing sources for heaters would affect 5 sources and reduce NOx emissions by 19 t/yr.
    - Retrofitting heaters for NOx controls in the San Juan basin will have an insignificant effect on local O3
- The installation of low NOx burners for a 10 MMBtu/hr heater will result in the following
    - Assume 50% control
    - 30ppm emission standard based on CARB BACT
    - For new 10 MMBtu/hr heaters, the proposed regulation using low NOx burners at 100% load would reduce emissions from 4.4 t/yr to 2.2 t/yr

Summary of emission reductions and control cost effectiveness for a new 10 MMBtu/hr heater under proposed regulation

Cost to control

	Emission reductions and cost effectiveness for low NOx burners on 10 MMBtu/hr heater						
Percent load	Low NOx burner controlled emissions assume 50% control (t/yr)	Control cost 1991 ($)	Control cost 2019 ($)	Control cost 2021 ($)		Cost to control 2019 ($/ton)	Cost to control 2021 ($/ton)
100	2.19	9,250	15,553	18,104		7,102	8,267
90	1.97	9,250	15,553	18,104		7,891	9,185
75	1.64	9,250	15,553	18,104		9,469	11,022
50	1.10	9,250	15,553	18,104		14,204	16,533
25	0.55	9,250	15,553	18,104		28,407	33,067

Heater conclusions

- The application of NOx controls for heaters with a threshold of 10 MMBtu/hr is not cost effective (90 % load control costs are estimated to be $9,185/ton)
- Actual load may be closer to 50% and control costs are approaching $16,533/ton
- Emission standard of 30 ppm is based on CA BACT analysis (equivalent to LAER in the rest of US)
- It is recommended that NMED consider a capacity threshold of 50 MMBtu/hr
- Cost effective control based on CARB BACT (LAER other portions of US) $2,200/ton

Comparison of O3 reduction from NOx vs VOC controls

- Controls for NOx and VOCs do not have the same effect on reducing O3 concentrations
- Typically, a reduction in NOx emissions will be more effective than a reduction in VOC emissions (most areas are NOx limited)
- The O3 analysis combines NOx and VOC emission reductions for Oil and Gas, consequently it is not possible to determine the effectiveness of VOC control in a NOx limited region
- The NOx and VOC source impacts must be separated to evaluate the effectiveness of NOx versus VOC controls

Modeling indicates that O3 formation is dominated by NOx emissions (NOx limited)

Summary of NOx vs VOC contribution from anthropogenic sources						
Monitor	County	Total O3 (ppb)	Boundary Conditions (%)	In domain emissions Pie (ppb)	O3 NOx (%)	O3 VOC (%)
Sub Station	San Juan	63.7	67	4.7	87	13
Southeast Heights	Bernalillo	60.7	58	4.7	92	8
Desert View	Doña Ana	63.1	44	2	95	5
Carlsbad	Eddy	57.3	67	1.6	96	4
				Maximum	96	13
				Average	92.5	7.5
				Standard Deviation	4.0	4.0
				Minimum	87	4

This means that NOx controls are more efficient in controlling O3 than VOC controls

Conclusions

- Monitoring and modeling analyses presented in the TSD do not support the need for additional controls on Oil and Gas sources
- The emission inventories used in the modeling lack documentation for verification
- The emission inventories for Oil and Gas do not include decline and likely overstate actual emissions (this will affect cost effective control evaluations)
- The modeling strongly indicates that ozone formation is NOx limited, however, the modeling cannot separate the effectiveness of NOx versus VOC controls
- The information presented in the TSD does not provide sufficient data to develop an O3 control strategy
- Modeling should be conducted so that source apportionment results are provided by region (Oil and Gas impacts should be parsed by basin) and pollutant