

Air Quality Requirements for Oil and Gas Facilities in Colorado

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Colorado Air Quality

Ozone (2008: 8-hr 0.075 ppm)

- Denver Metro/North Front Range: non attainment (marginal)
- Remainder of state attainment or unclassifiable

PM2.5 (2006: Annual 15 $\mu\text{g}/\text{m}^3$ & 24-hour 35 $\mu\text{g}/\text{m}^3$)

- All areas in attainment or unclassifiable

PM10 (2006: 24-hour 150 $\mu\text{g}/\text{m}^3$)

- All areas in attainment/maintenance or unclassifiable

NO2 (2010: 1-hour 100 ppb)

- All areas in attainment or unclassifiable

SO2 (2010: 1-hour 75 ppb)

- All areas in attainment or unclassifiable

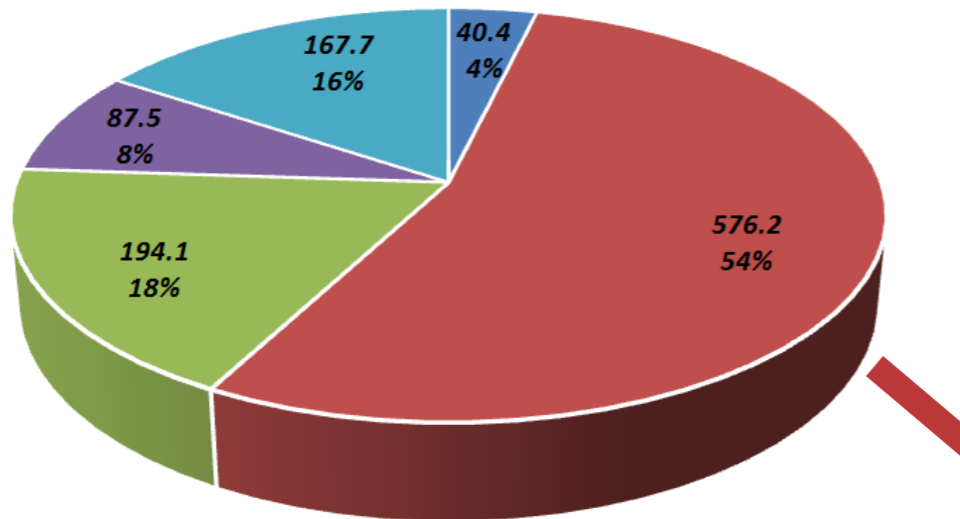
CO (2011: 8-hour 9 ppm & 1-hour 35 ppm)

- All areas in attainment/maintenance or unclassifiable

Pb (2008: Rolling 3 month average of 0.15 $\mu\text{g}/\text{m}^3$)

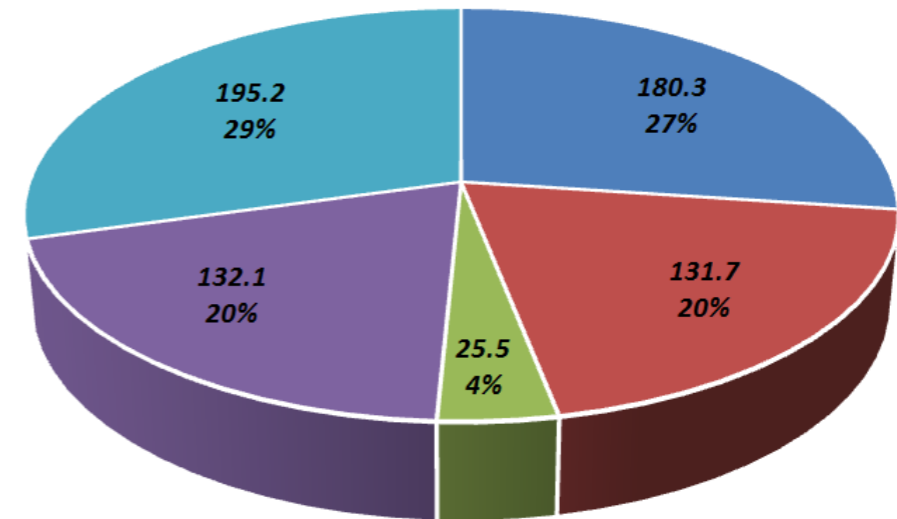
- All areas in attainment or unclassifiable

**Colorado (Statewide)
2011 - Anthropogenic VOC Emissions
1066 tons/day**



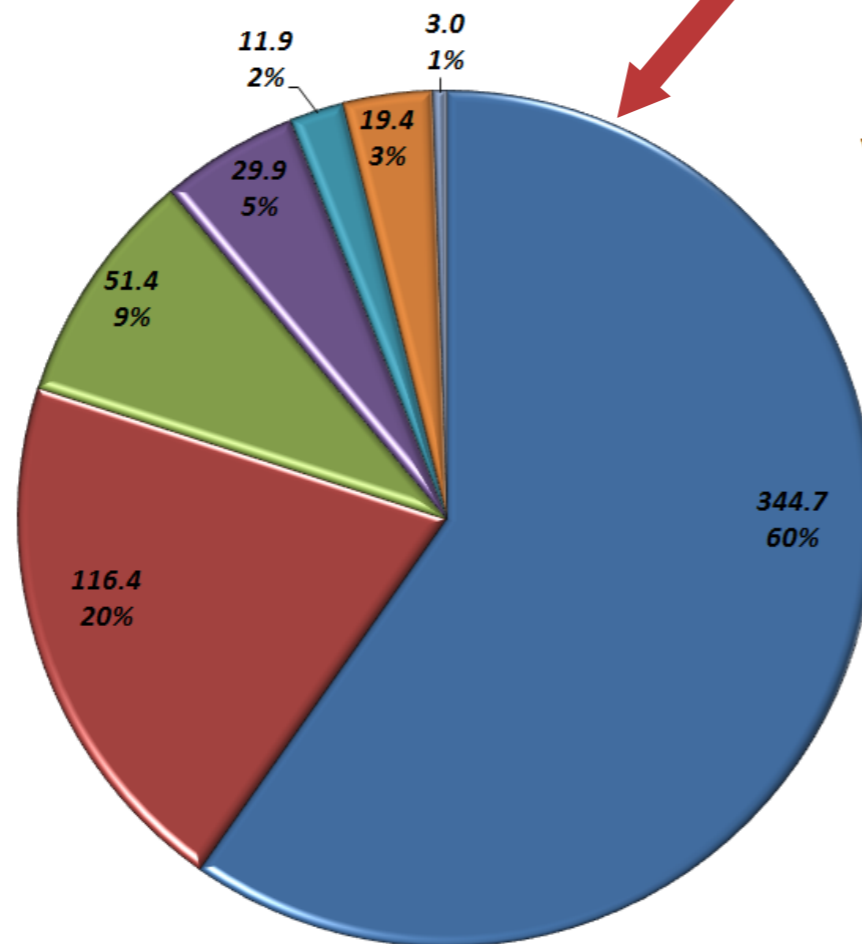
- Point
- Area
- On-Road Mobile
- O&G (permitted & unpermitted)
- Non-Road Mobile

**Colorado (Statewide)
2011 - Anthropogenic NOx Emissions
665 tons/day**



- Point
- Area
- On-Road Mobile
- O&G (permitted & unpermitted)
- Non-Road Mobile

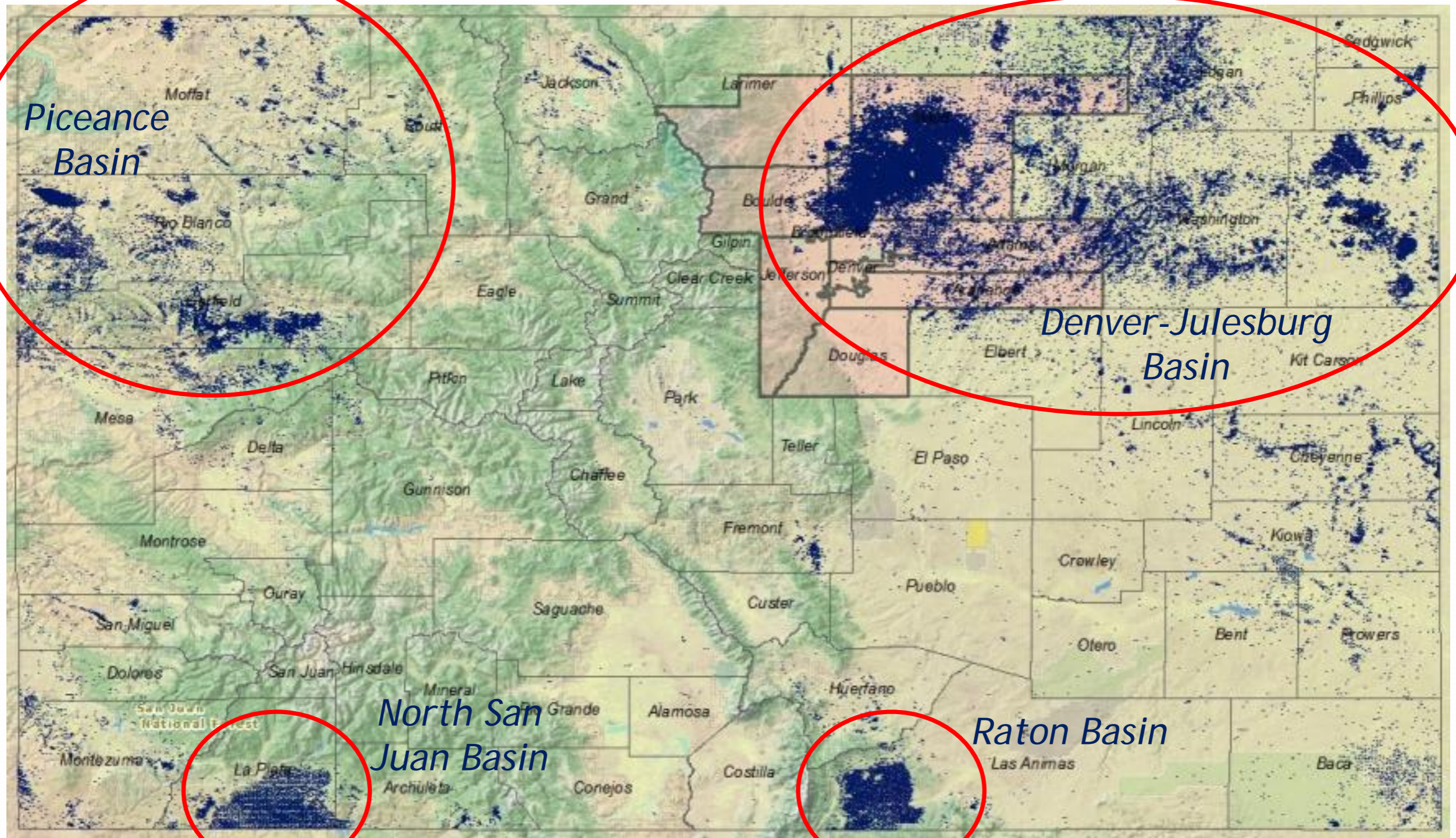
**Colorado (Statewide)
2011 O&G Sources
VOC Emissions - 576 tons/day**



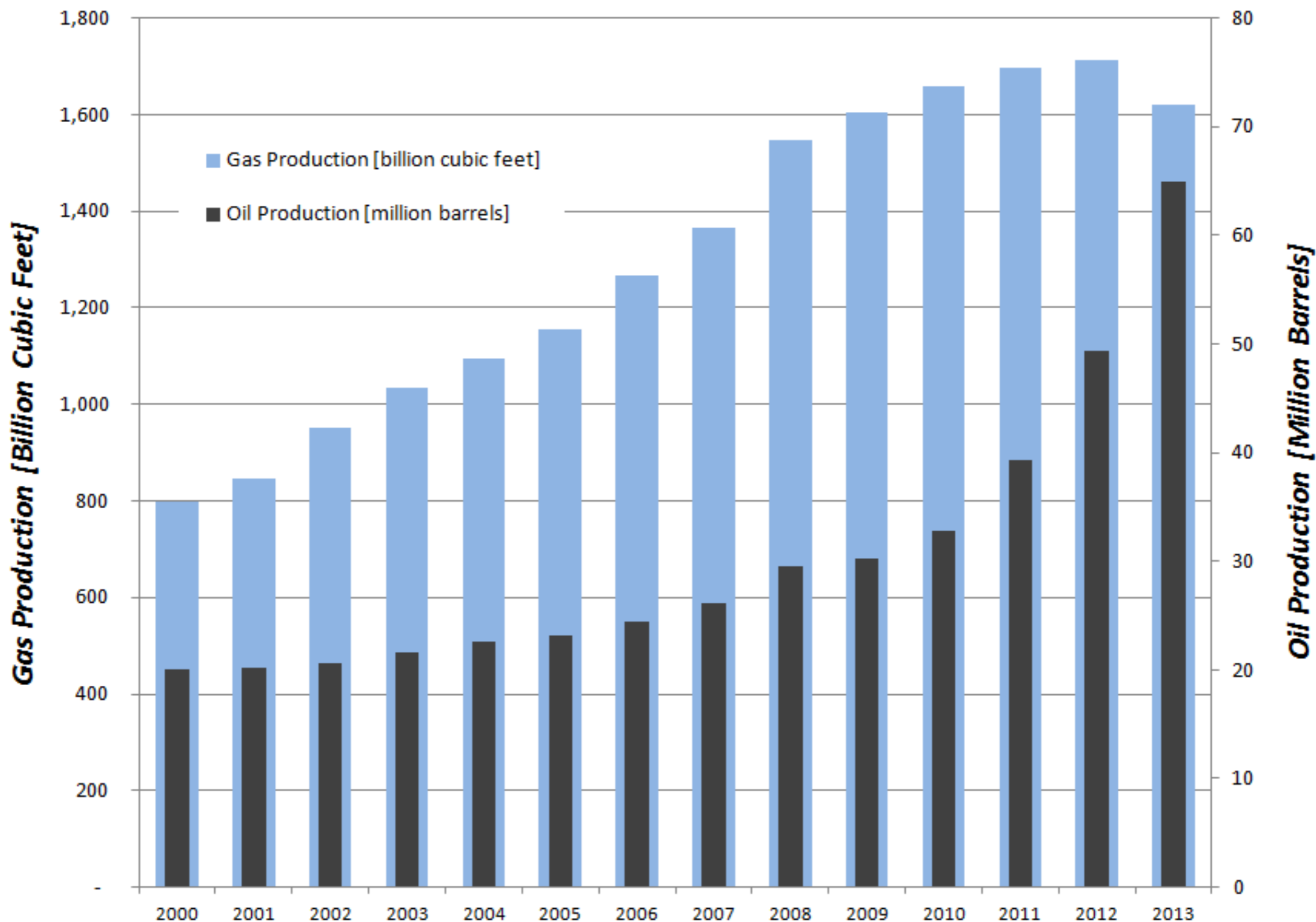
- O&G - Tanks
- O&G Area - Venting/Fugitives
- O&G Area - Pneumatics/Pumps
- O&G Point - Industrial Processes
- O&G Point - Evaporation
- O&G Point - Engines
- O&G Area - Engines/Rigs

O&G Storage tanks are the largest source of VOC emissions in the State

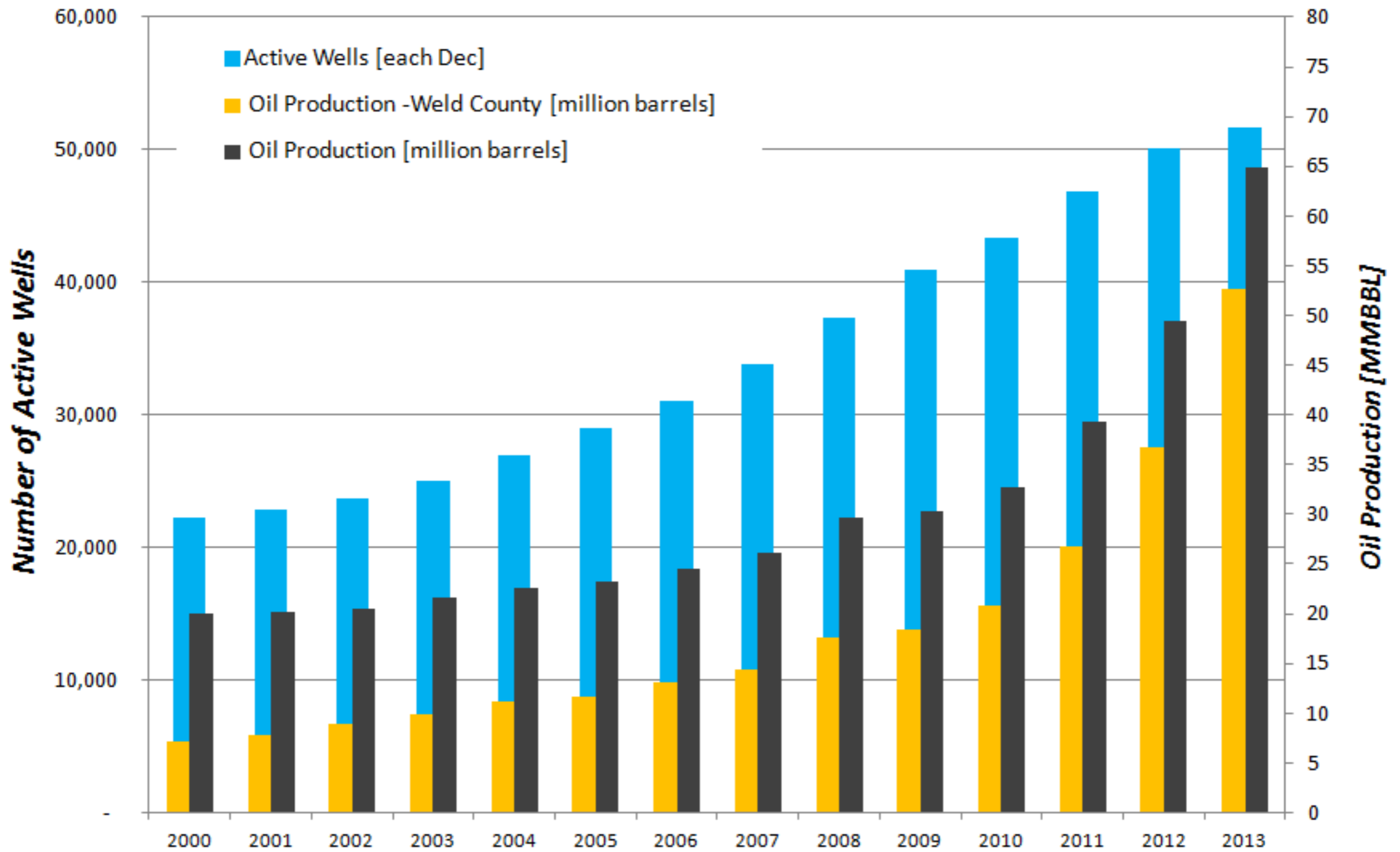
Colorado has over 52,500 active O&G wells



Colorado Annual Oil and Gas Production



Colorado Annual Oil Production and Number of Active Wells



O&G Regulatory Background

- 2004 Early Action Compact (EAC) Rulemaking
 - Reduced VOC and NOx emissions from Oil and Gas Sector in the Denver Metro/North Front Range (DMA/NFR)
- 2006 EAC Rulemaking
 - Update to 2004 rules and adoption of new rules with statewide applicability
- 2008 Ozone Action Plan (OAP) Rulemaking
 - Address non-compliance with 1997 Ozone NAAQS in DMA/NFR
 - Increase system-wide controls on condensate tanks in DMA/NFR NAA
 - Statewide VOC controls on condensate tanks over 20 tpy and NOx controls on natural gas fired engines

O&G Regulatory Background (cont)

- 2012 partial adoption of NSPS 0000
 - Partial adoption reflected concerns about permitting burdens that would occur with full adoption
- 2014 full adoption of NSPS 0000
 - Colorado Regulation Number 3
 - Regulation revisions to reporting and permitting
 - Colorado Regulation Number 6, Part A
 - NSPS 0000 full adoption
 - Colorado Regulation Number 7
 - Oil and gas emission reduction strategies

2014 Regulatory Process

- 2013 Stakeholder Process
 - Division conducted 5 stakeholder meetings from January through May
 - Numerous technical workgroup meetings held over summer and fall
- Collaboration effort between one environmental group and several of the largest oil and producers in the state with the support of the Governor
- Air Quality Control Commission Public Hearing process took 5 days, completed on February 23, 2014

Changes to Reg. Number 3 & Number 6

- Remove NSPS, NESHAP, MACT “catchall” provisions
 - Reduce minor source permit workload
 - Percent of statewide emissions from eliminated permits
 - VOC=0.005%, NO_x=0.07%, SO₂=0.0002%, CO=0.05%, PM=0.0004%
- Remove the crude oil storage tank permitting exemptions
- Partial adoption of NSPS 0000 on October 18, 2012
- Full adoption of NSPS 0000 on February 20, 2014
 - Removed emission threshold exclusion to include all affected facilities regardless of size
 - Add well completion requirements

Regulation Number 7

- Expand control requirements for storage tanks
- Expand auto-igniter requirements on flare control devices statewide
- Expand control requirements for glycol dehydrators
- Establish requirements to minimize emissions during well maintenance
- Require capture or control of the gas stream at well production facilities
- Expand pneumatic controller requirements statewide
- Improve capture of emissions at controlled storage tanks
- Establish LDAR requirements for compressor stations and well production facilities

Regulation Number 7

<i>Leak Inspection Tiers</i>		
Facility Type	Uncontrolled Actual VOC Emissions	Inspection Frequency
Compressor Station (based on component fugitive leaks)	≤ 12 tpy	Annually
	>12 tpy to ≤ 50 tpy	Quarterly
	> 50 tpy	Monthly
Well Production Facilities (based on tank battery emissions)	< 6 tpy	One Time + Monthly AVO
	≥ 6 tpy to ≤ 12 tpy	Annually
	>12 tpy to ≤ 50 tpy	Quarterly
	> 50 tpy	Monthly

Summary of Key Points

- The 2014 O&G regulations expand Colorado's existing program and establishes innovative new strategies on the most significant emission sources
- Maintains Colorado's leadership role in regulating air emissions from oil and gas production
- Establishes a rigorous set of requirements to ensure responsible development of Colorado's oil and gas resources
- Wide range of regulatory requirements aimed at reducing volatile organic compound (VOC) and methane emissions from the oil and gas production sector
- Collaborative effort involving the Division, industry, environmental groups and local government stakeholders
- Significant emission reductions from the Oil and Gas sector
 - Over 93,000 tons per year of VOC reduced
 - About 64,000 tons per year of methane and ethane reduced
- Cost-effective requirements
 - Calculated VOC reduced cost per ton ranges from \$176 to \$1,259 per ton
 - Overall cost effectiveness is about \$450 per ton of VOC reduced

Colorado SIP Challenges

- Significant O&G development in Ozone NAA
 - Emission Inventory Issues
 - O&G sector technology changes rapidly
 - Drilling methods
 - Typical site design
 - 3-Phase Separator Design
 - Single stage/multi stage
 - Emission profile very different
 - Modeling
 - O&G sources difficult to characterize
 - Leaks are poorly understood
 - Some sources not included (pipeline leaks)

Potential Technical Improvements

- Definition of storage vessel
 - Individual tank vs manifolded group of tanks
- Storage vessel modification
 - Consider well refracturing and recompletion activities as a modification at on-site storage tanks
- Well completions
 - Require green completions for all wells - oil and natural gas
- Storage tank emission control threshold
 - Actual controlled emissions vs actual uncontrolled emissions

Questions

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- Colorado Regulations:

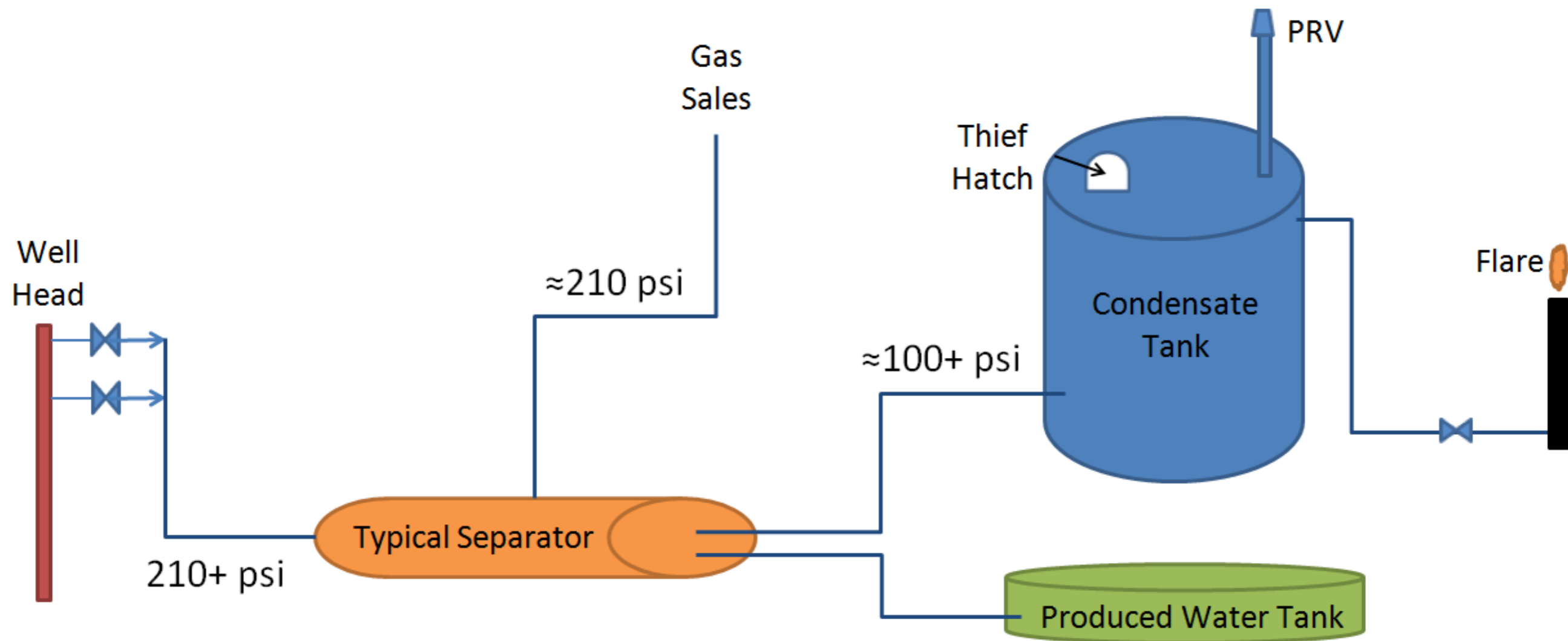
<https://www.colorado.gov/pacific/cdphe/aqcc-regs>

- 2014 O&G Regulation Cost/Benefit Analysis:

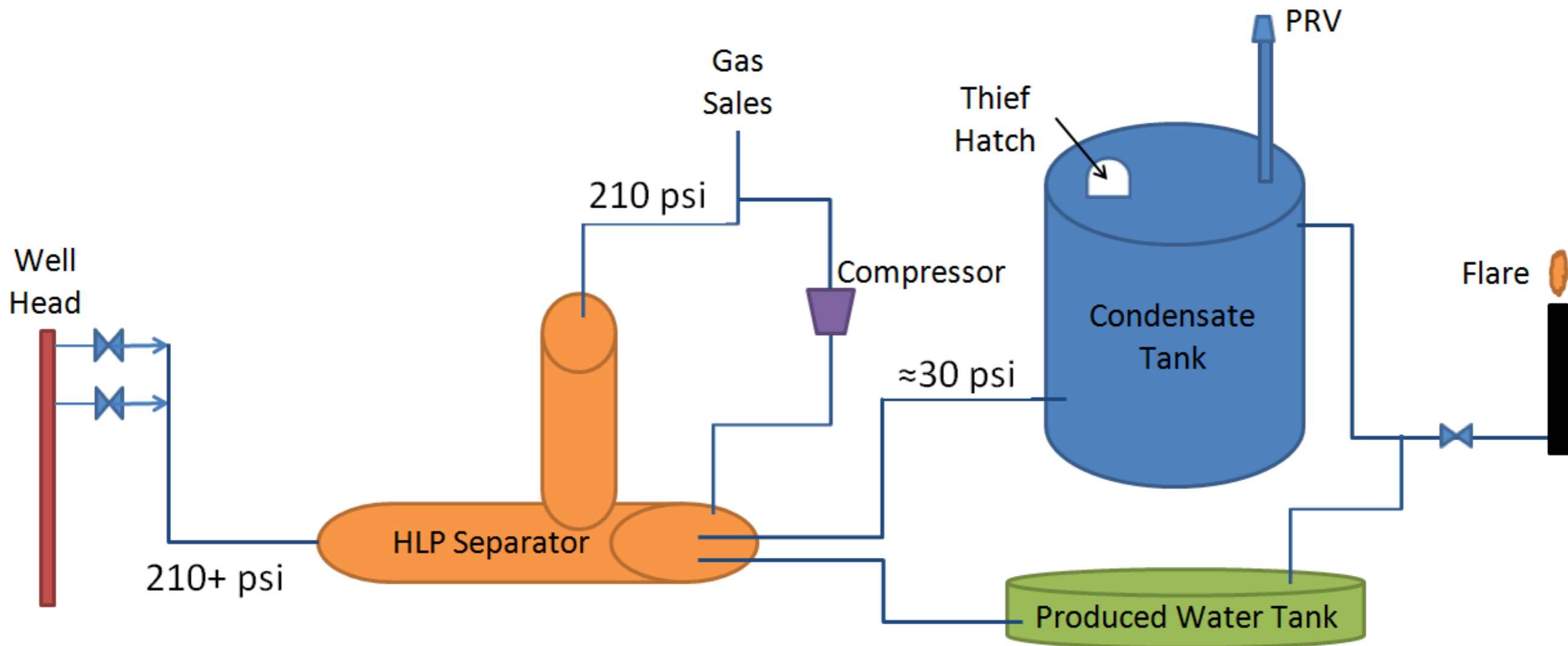
ftp://ft.dphe.state.co.us/apc/aqcc/COST%20BENEFIT%20ANALYSIS%20%26%20EXHIBITS/CDPHE%20Cost-Benefit%20Analysis_Final.pdf

Extra Slides

Typical DJ Basin Gas Well Configuration



Improved DJ Basin Gas Well Configuration



Regulation Number 3 APEN and Permit Reporting Thresholds

Pollutant	APEN		Air Permit	
	Attainment [tpy]	Non- Attainment [tpy]	Attainment [tpy]	NAA Non- Attainment [tpy]
VOC	2	1	5	2
NO _x	2	1	10	5
PM ₁₀ /PM _{2.5}	2	1	5	1
CO	2	1	10	5
SO ₂	2	1	10	5

