

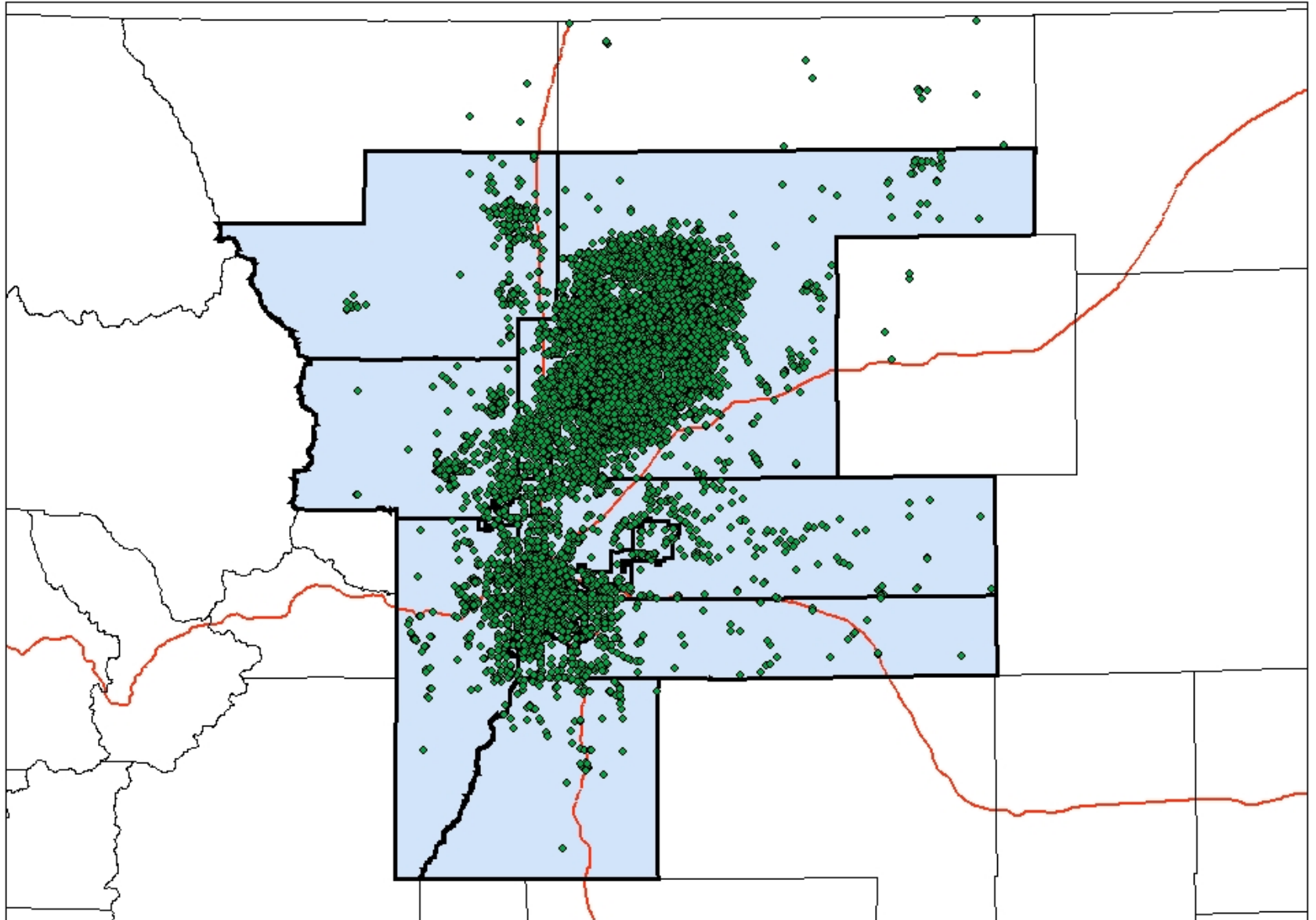
Condensate Tank Emissions

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Discussion Outline

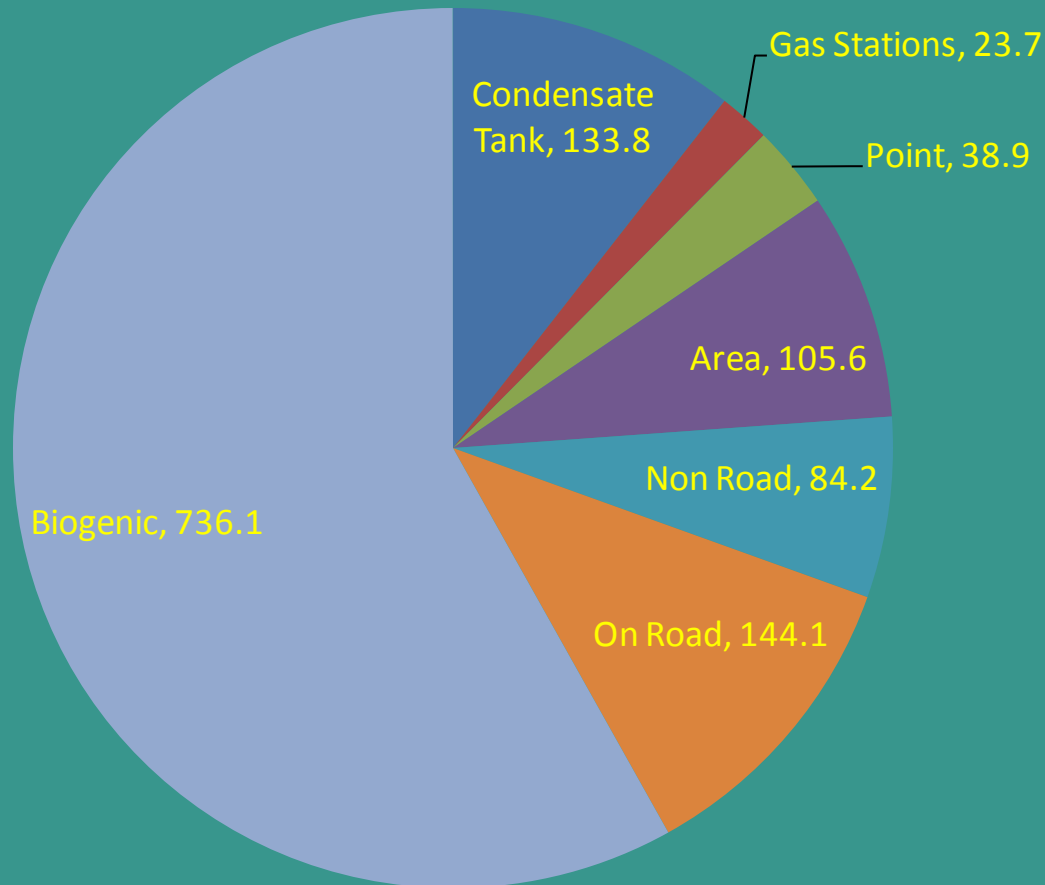
- Area affected.
- Early Action Compact (EAC).
- Condensate Tank Emissions Calculation.
- Adjusting for Leaks and Rule Effectiveness.
- Current Modeling (2008 Base Year).
- Comparison of Modeling Outputs.
- Comparison to EPA ORD Independent Study.
- Conclusions

Ozone Nonattainment Area



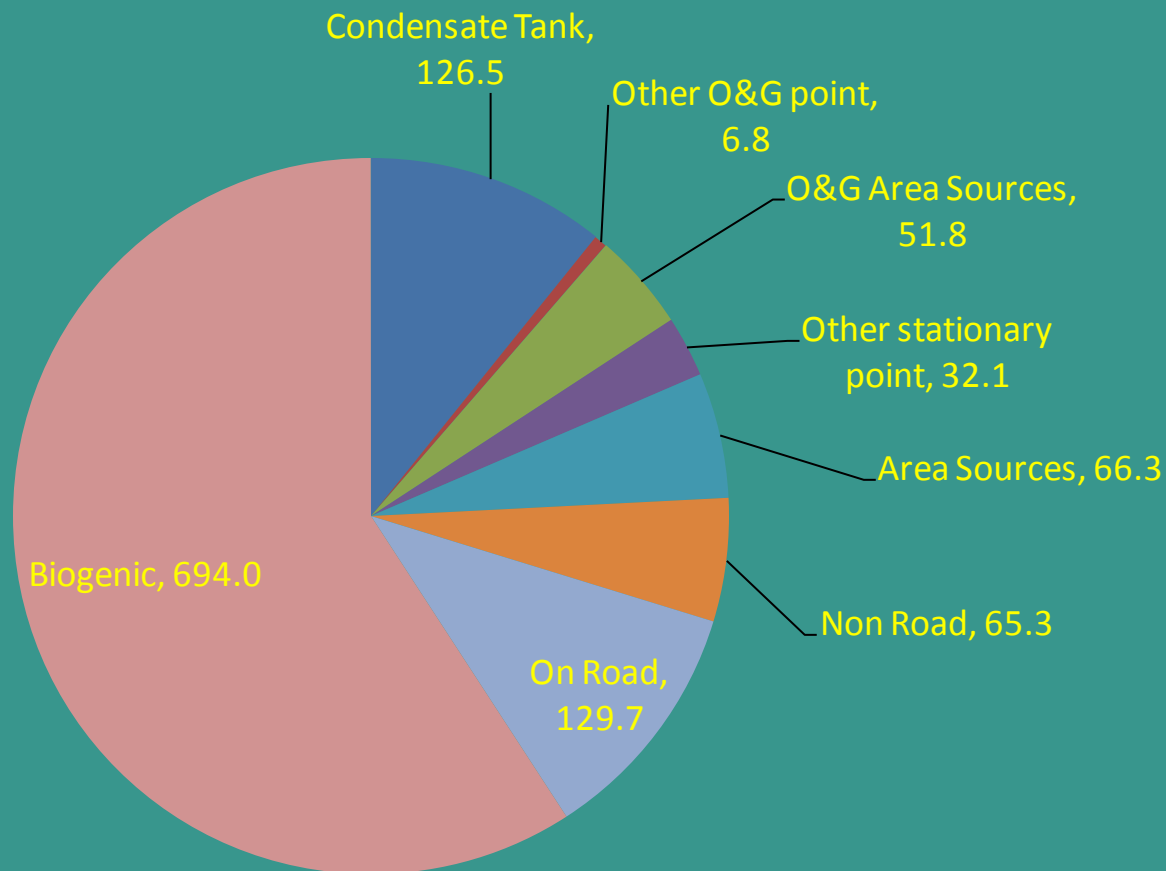
EAC Base Year Inventory (2002)

EAC Base Year VOC Inventory (2002)
(1,266 tons/day)



2008 SIP Base Year Inventory (2006)

2006 VOC (1,172.5 tons/day)



Condensate Tank Controls

Requirements for oil and gas condensate tanks are provided in Colorado Regulation Number 7, Section XII, which is available at:
<http://www.cdphe.state.co.us/regulations/airregs/>.

Within the Nonattainment Area

Reporting required in emissions greater than two tons per year.

2008 Ozone Season (May 1–September 30) VOC emissions must be reduced by 75% from uncontrolled actual.

2011 and 2012 Ozone Season (May 1–September 30) VOC emissions must be reduced by 90% from uncontrolled actual.

Accounting for Leaks

Uncontrolled emissions:

default emission factor = 13.7 pounds of VOC per barrel of condensate

The calculation of emissions that escape control devices can be presented as follows:

Controlled Emissions = Uncontrolled Emissions x (1 - Control Device Efficiency x Rule Effectiveness x Rule Penetration x Capture Efficiency)

- The control device in this equation is a flare with an efficiency of 95%.
- Rule Penetration (in this case the percentage of tanks requiring control) is not used since we have actual emissions estimates reported by source operators.
- Rule Effectiveness is a measure of how well the regulation is enforced and we are using 83% from the 2008 SIP.
- Capture Efficiency is the fraction of emissions going to the control device (assumed to be 75%).

Accounting for Leaks (continued)

Controlled Emissions = Uncontrolled Emissions x
(1 - Control Device Efficiency x Rule Effectiveness x Rule
Penetration x Capture Efficiency)

Controlled Emissions = Uncontrolled Emissions x
(1- 0.95 x 0.83 x 0.75)

Controlled Emissions = Uncontrolled Emissions x 0.41

The calculation without adjustment for Capture Efficiency and Rule Effectiveness is:

Controlled Emissions = Uncontrolled Emissions x (1- 0.95)

Controlled Emissions = Uncontrolled Emissions x .05)

The Affect of Adjustment is Large

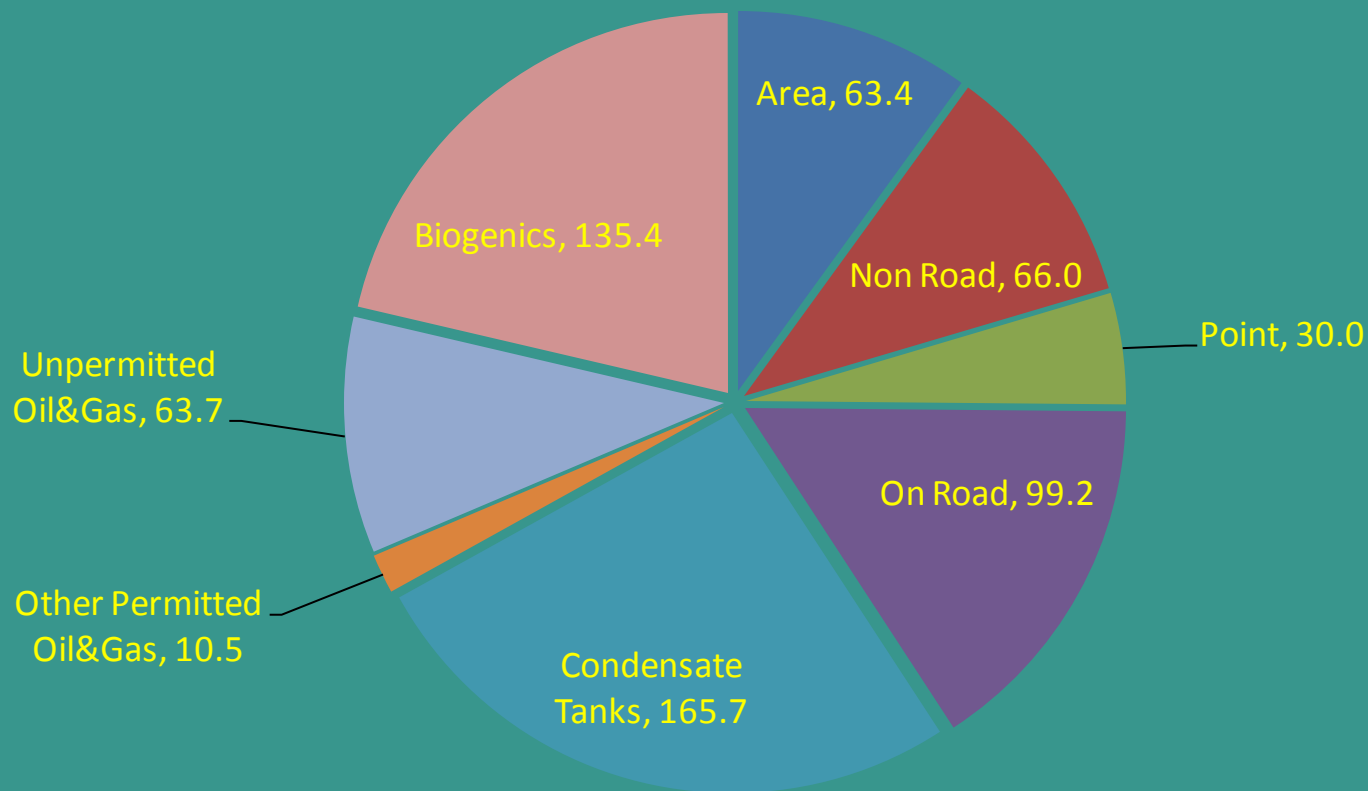
Dividing adjusted Controlled Emissions (Uncontrolled x 0.41) by Controlled Emissions without adjustment (Uncontrolled Emissions x 0.05) yields:

An increase by a factor of about 8 ($0.41/0.05$)

Because all condensate tanks are not controlled, overall emissions increase by a factor of about three.

2008 Modeling Inventory

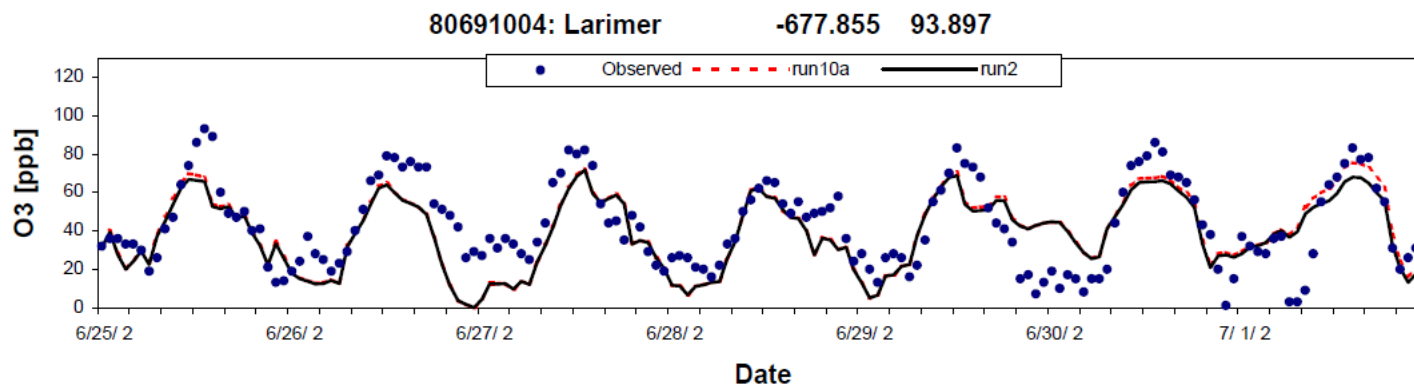
2008 VOC (633.8 tons/day)



Modeling Results

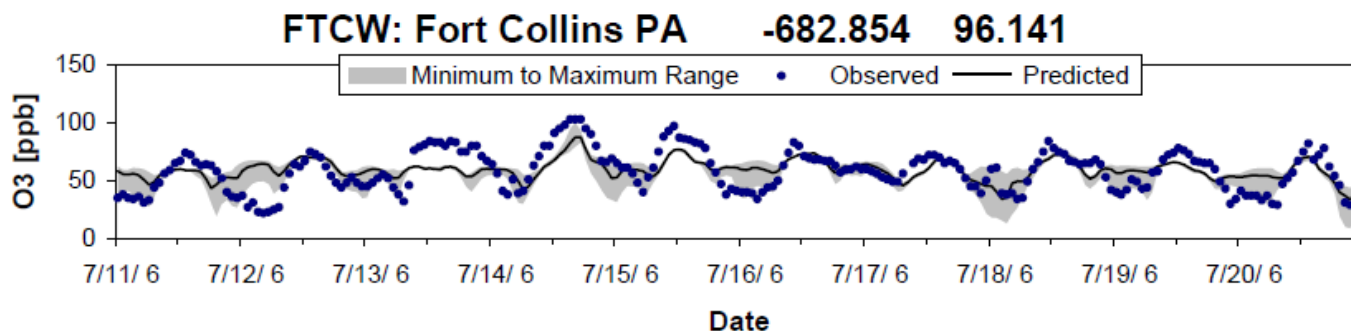
EAC 2002 Base Case

Denver Base Case run2 and run10a 1hr Ozone 04km



SIP 2006 Base Case

Denver 2006 1hr O3. run1.1204



Modeling Results

2008 Base Case With Leak Adjustment

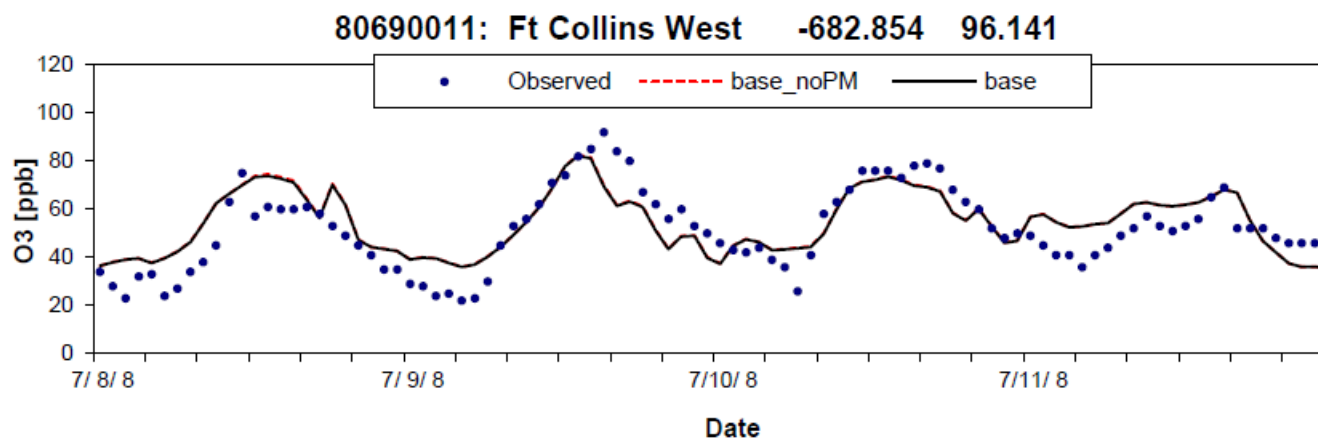


Figure 6-3. Time series of predicted and observed hourly ozone concentrations (ppb) for the initial base case and no PM chemistry sensitivity test and July 9-11, 2008.

EPA Office of Research and Development (ORD) Study

In a study conducted last year, EPA used a vehicle fitted with measuring devices to remotely measure and calculate emissions in grams per second from 52 condensate tanks in Weld County oil and gas fields.

Colorado provided estimates of uncontrolled emissions, emission reported by operators, and emission estimates adjusted for Capture Efficiency and Rule Effectiveness for those tanks within 500 meters of the EPA measurement locations.

Off-site assessment with *GMAP-REQ*

(*Geospatial Measurement of Air Pollution – Remote Emissions Quantification*)

wind direction



- Position vehicle in the plume
- Acquire CH₄ and wind data for 20 minutes
- Pull a 30 second canister sample for VOC information

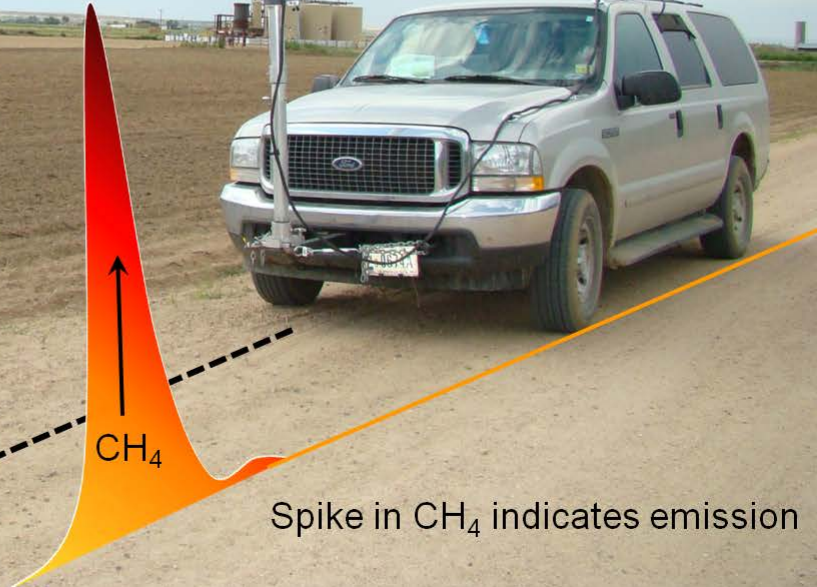
driving path



CH₄



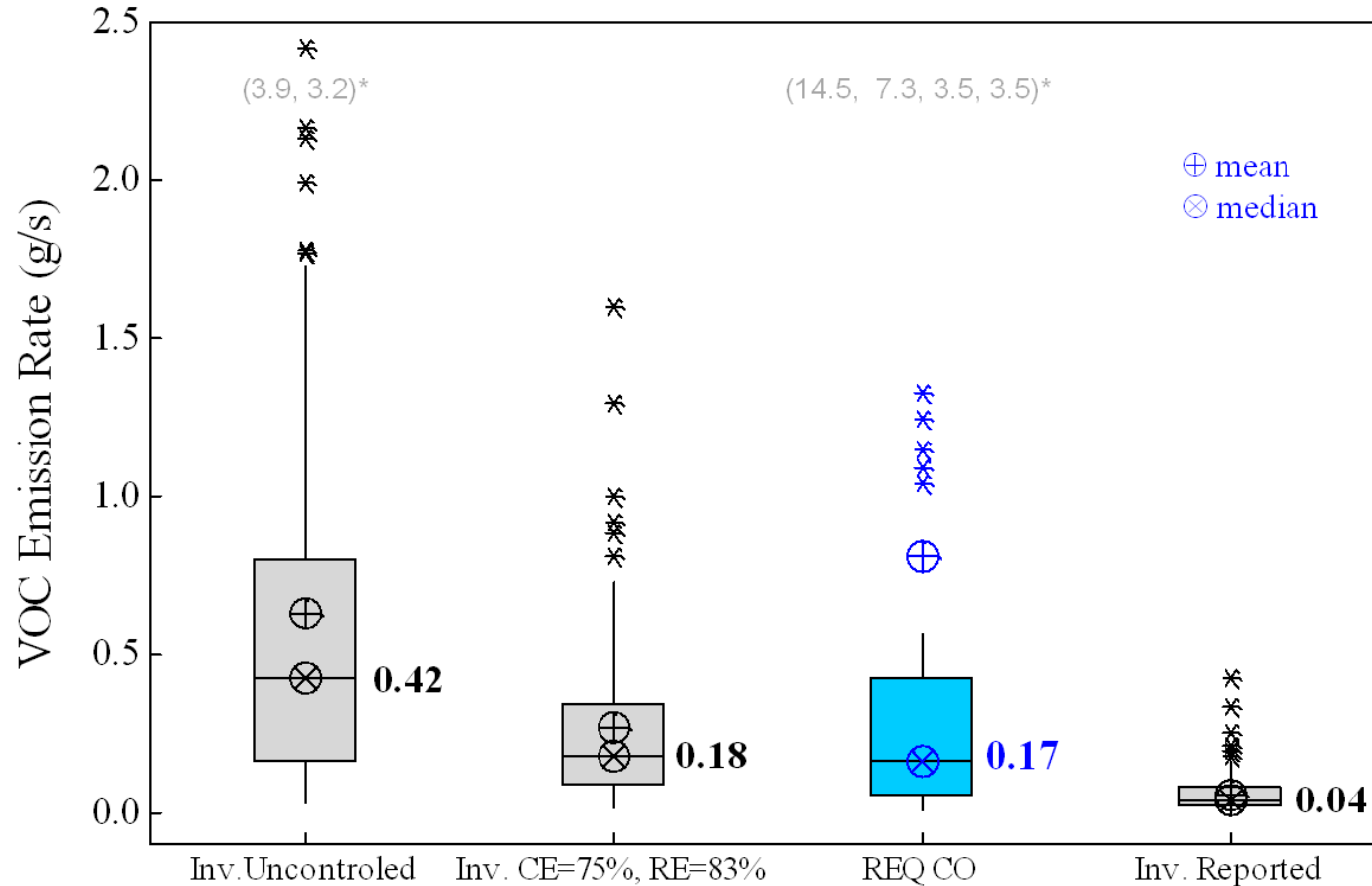
Spike in CH₄ indicates emission



GMAP REQ “VOC snapshot measurements” compared to CO condensate tank emissions inventory expressed in g/s.

(tanks within 500 m of GMAP measurement, Inv. data provided by Dale Wells, Colorado DPHE)

In Greeley Colorado, condensate tank emissions are controlled by flares



Inv. Uncontrolled: modeled inventory assuming 0% control Capture Efficiency (CE),

Inv. CE=75%, RE=83%: State of CO estimate of 75% control CE and 83% Rule Effectiveness (RE), 95% control effectiveness

Inv. Reported: Reported inventory assuming 100 % CE, 100% RE and 95% control effectiveness

*off scale

Conclusions

The modeling results indicate that mode; performance is better with the correction for leaks and rule effectiveness.

The leak and rule effectiveness correction is independently verified by the EPA study.