

Implementation of a new regulation for air monitoring around oil and gas development in Colorado

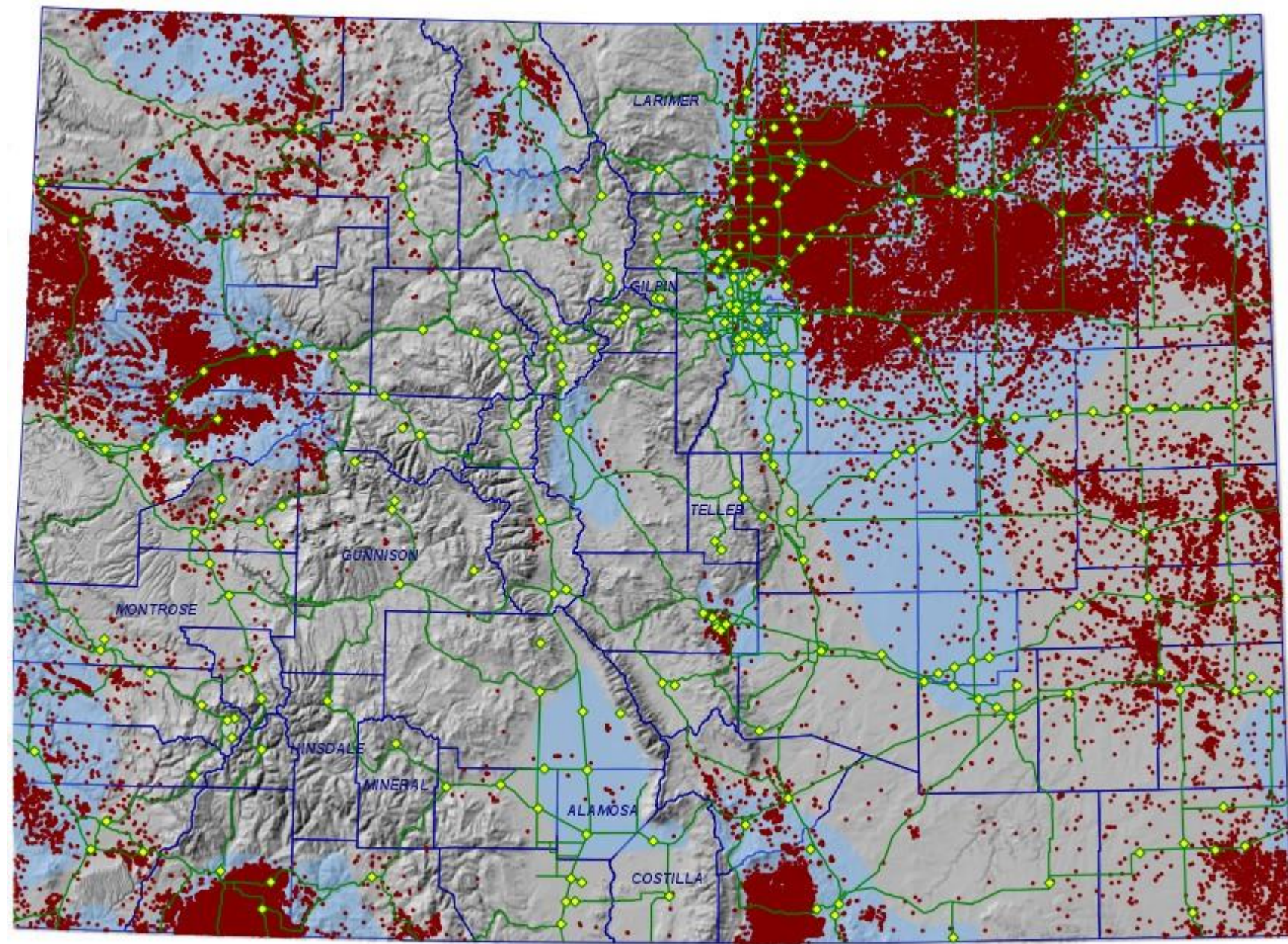
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COLORADO
Air Pollution Control Division
Department of Public Health & Environment

Oil and gas development

- ▶ Over 50,000 wells
- ▶ Over ½ are in the Denver-Julesburg Basin in NE Colorado
- ▶ Near major cities in Colorado
- ▶ Also an ozone non-attainment area



Recent oil and gas monitoring

- ▶ 2015 Governor's Oil and Gas Task Force Report (Recommendation #31b)
 - ▶ Funding for a mobile laboratory that could be dispatched to defined locations to monitor ambient air quality and to help determine potential sources
 - ▶ Colorado Air Monitoring Mobile Lab (CAMML)
- ▶ Sensor deployments
 - ▶ Sensit SPOD
 - ▶ Total VOC PID sensor
 - ▶ Have trigger mechanism so whole air canisters or sorbent tube samples can be taken
 - ▶ Canister samples typically for 1-hour to compare to acute health guideline values



Colorado Air Quality Control Commission Regulation #7

- ▶ “CONTROL OF OZONE VIA OZONE PRECURSORS AND CONTROL OF HYDROCARBONS VIA OIL AND GAS EMISSIONS” (5 CCR 1001-9)
- ▶ Amended September 2020
- ▶ Goal:
 - ▶ To obtain more information regarding potential emissions from pre-production operations (drilling, fracking, millout, flowback, early production)
 - ▶ To determine potential impacts to human health
 - ▶ To obtain more information on innovative monitoring techniques
- ▶ VI.C. Air quality monitoring
 - ▶ Owners or operators of drilling operations that begin on or after May 1, 2021, must monitor air quality at and/or around the pre-production and early production operations
- ▶ 3 objectives listed in the regulation:
 - ▶ Detect, evaluate, and reduce as necessary hazardous air pollutant emissions
 - ▶ Detect, evaluate, and reduce as necessary ozone precursor emissions
 - ▶ Detect, evaluate, and reduce as necessary methane emissions



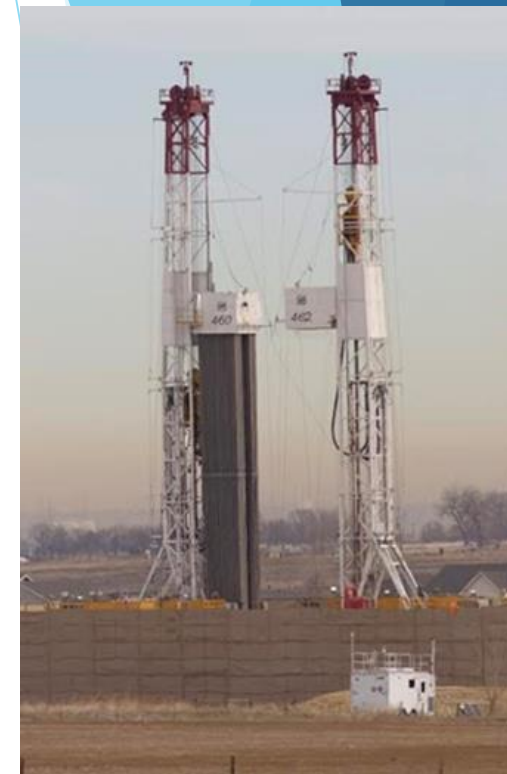
Overview of monitoring requirements

- ▶ Pollutant(s) and other parameters to be monitored must include at least one of the following:
 - ▶ Total VOCs, methane, benzene or BTEX (benzene, toluene, ethyl benzene and xylenes) or other indicator of hydrocarbon emissions
 - ▶ Meteorology
- ▶ Owners or operators must submit an air quality monitoring plan at least sixty (60) days prior to beginning air quality monitoring
 - ▶ Within 14 days of receiving the plan, the Division will consult local governments within 2000' as part of the review process
 - ▶ Owners or operators must receive approval from the Division of the air quality monitoring plan prior to beginning air quality monitoring
- ▶ Owners or operators must keep records for a minimum of three (3) years, unless otherwise specified, and upon request make records available to the Division
- ▶ Owners or operators must submit monthly reports of monitoring conducted to the Division by the last day of the month following the previous month of monitoring



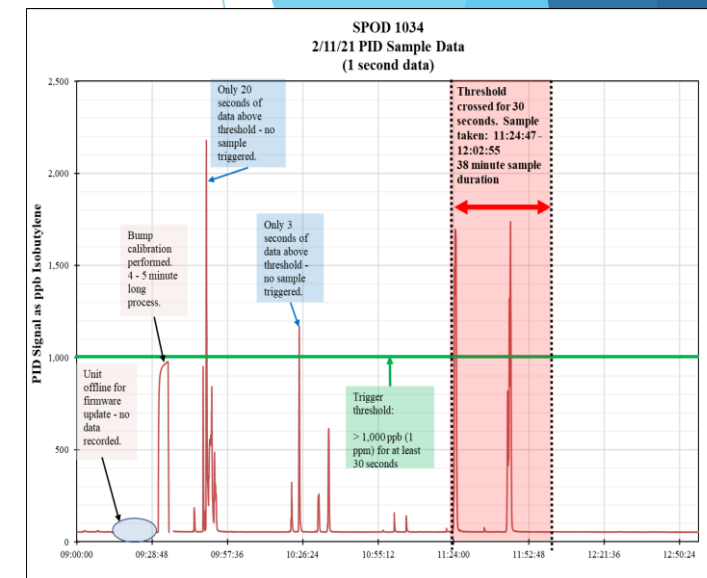
Monitoring plans must include:

- ▶ A description of the monitoring equipment to be deployed
- ▶ A description of the meteorological monitoring equipment to be deployed
- ▶ The number of monitors and/or sensors to be deployed
- ▶ The location and height of the monitoring equipment, including for each phase of operations if location and height of the equipment will change
- ▶ A topographic map and plan of the site
- ▶ A description of how the placement of monitoring equipment minimizes surface disturbances
- ▶ An explanation of how the number and placement of monitoring equipment will be adequate to achieve the desired air quality monitoring objectives
- ▶ The standard operating procedures that will be employed
- ▶ The quality control and quality assurance procedures
- ▶ The data system and operating protocol to be used for data collection
- ▶ The methods for collecting and analyzing speciated or other samples of chemical constituents



Records and reporting must include:

- ▶ Monthly reports and the data necessary to inform the monthly reports
- ▶ The phase of operation
- ▶ Activity logs
- ▶ For a period of one year after the monthly report, the underlying raw data associated with each monitor
- ▶ API number of the well(s)
- ▶ Location of the operations
- ▶ The date, time, and duration of any monitoring equipment downtime
- ▶ The date, time, and duration of operations malfunctions and shut-in periods or other events investigated for influence on monitoring
- ▶ A summary of monitored air quality results, including time series plots as hourly or higher time resolution and a statistical summary
- ▶ A description of responsive action(s) taken as a result of monitoring results
- ▶ Owners or operators must notify the Division and the local government within forty-eight (48) hours of responsive action(s) taken as a result of recorded values in excess of the response level



What has Colorado done to facilitate implementation?

- ▶ Developed a guidance document for the Oil and Gas industry/operators
- ▶ Worked closely with the Oil and Gas industry to develop monitoring Plan template in Excel
 - ▶ Includes 37 worksheets
- ▶ Developed monthly reporting template in Excel
 - ▶ Includes 28 worksheets
- ▶ Most wellpads are 6-12 wells in size, some as few as 1
- ▶ Most wells are horizontal
- ▶ All wells are specifically identified in monitoring plans

Ambient Air Monitoring Guidance For Oil and Gas Locations – Regulation 7 Section VI C



COLORADO
Department of Public
Health & Environment

Technical Services Section

Colorado Air Pollution Control Division

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Operator monitoring plans

- ▶ To-date, 37 monitoring plans have been submitted for review/approval
 - ▶ Some using template, some using own format
- ▶ Most plans are using sensors for total VOC's (TVOC)
- ▶ One is utilizing a rotating FLIR camera
- ▶ Some also include PM2.5
- ▶ Typically 1 meteorological sensor per wellpad
 - ▶ Often associated with a sensor unit
- ▶ Many are adding triggered canisters to get speciated data in plumes
- ▶ Many are adding passive tubes for 2-week exposures
- ▶ Typically 3-6 sensors per wellpad, including predominant wind directions or nearby residences
- ▶ Typically within 150' from edge of pad
 - ▶ Tall soundwalls can create airflow issues



PID-based TVOC sensors

Lunar Outpost
Canary-S



Sensit
SPOD



Earthveiw
Blubird



Aeroqual
AQS-1



Metal oxide-based TVOC sensors and FLIR

WSP - USA
AirWatch



Terra SLS
Air Guardian



CleanConnect
FLIR



Questions that have arisen

- ▶ Does a well that commences pre-production activities prior to the rule effective date need to perform monitoring?
 - ▶ Answer - While it may not be possible to get baseline monitoring, yes, the well should still commence monitoring on or before May 1, 2021
- ▶ How should data be collected where the wellpad is in an area with no cellular or wifi coverage?
 - ▶ Answer - Many systems have onboard memory or SD cards that store the data, which can be downloaded on a routine basis
- ▶ What QA/QC needs to be performed?
 - ▶ Answer - This can vary, but with PID's, a monthly bump-test with isobutylene gas is recommended, as well as periodic/quarterly calibrations



Thoughts and the future

- ▶ A lot of work and collaboration with the oil and gas industry was needed in a short-time to meet the May 1, 2021 required monitoring start date
 - ▶ Monitoring plans need to be submitted for approval at least 60 days prior to commencement of monitoring
 - ▶ Need to perform 10 days of baseline monitoring
- ▶ Some monitoring plans required an expedited review
- ▶ Some operators elected to voluntarily develop plans for approval for operations that commenced or completed prior to the May 1, 2021 required date
- ▶ Monitoring reports are starting to come in and are being reviewed
- ▶ Storage of all the data for future analysis needed
- ▶ Oil and gas development has picked up a lot more quickly than anticipated, so staffing a concern
- ▶ Likely that some revisions to the regulation will be needed in the future based on experiences and data analysis
- ▶ This is an initial step of an anticipated broader oil and gas monitoring program



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- ▶ Regulation #7 can be found at:
 - ▶ <https://cdphe.colorado.gov/aqcc-regulations>