ENERGY & CARBON MANAGEMENT COMMISSION (ECMC)

2023 ANNUAL REPORT

to the

WATER QUALITY CONTROL COMMISSION (WQCC)
and
WATER QUALITY CONTROL DIVISION (WQCD)

of
THE COLORADO DEPARTMENT
OF PUBLIC HEALTH AND
ENVIRONMENT (CDPHE)

COLORADO

Energy & Carbon Management Commission

Department of Natural Resources

IN ACCORDANCE

with

THE AUGUST 28, 1990 MEMORANDUM OF AGREEMENT
and
THE IMPLEMENTING PROVISIONS OF SENATE BILL 89-181

February 3, 2024

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1.0 Introduction

The Energy and Carbon Management Commission (ECMC), formerly the Colorado Oil and Gas Conservation Commission (COGCC), is an implementing agency for water quality standards and classifications adopted by the Water Quality Control Commission (WQCC) for groundwater protection. This authority was provided by Senate Bill (SB) 89-181 and is restated and clarified by a Memorandum of Agreement (MOA) that the agencies adopted on August 8, 1990.

Section 5.1 of the MOA specifies that the ECMC must report annually to the WQCC and the Water Quality Control Division (WQCD) about how its programs assure compliance with WQCC water quality standards and classifications for the activities that are subject to the jurisdiction of the ECMC.

This 32nd annual report provides an overview of ECMC functions and a summary of calendar year 2023 activities, focusing on groundwater protection programs. Major issues concerning the implementation of water quality standards and classifications are also reported.

2.0 WQCC/WQCD and ECMC Coordination and Public Outreach

2.1 Inter-agency Coordination

In 2023, the ECMC, WQCC, and WQCD coordinated the implementation of the provisions of SB 89-181 and the MOA. ECMC, the Colorado Department of Public Health and Environment (CDPHE), and the Office of Emergency Preparedness and Response staff communicated frequently through email and telephone calls regarding spills at or near oil and gas facilities. ECMC took the lead for all E&P waste spills.

Key ECMC staff participated in the February 13, 2023, Groundwater Summit with other SB 89-181 implementing agencies. ECMC Director and staff met with WQCD staff (virtually) on November 6th to discuss program implementation and regulatory changes. Other quarterly meetings between the two agencies were canceled due to a lack of agenda items. Typical agenda items include following up on various active investigations, enforcement matters, and E&P waste management practices within the oil and gas industry.

2.2 Public Outreach

The ECMC employed the following strategies for effective communication with the public and the regulated industry.

2.2.1 Commission Hearings

In 2023, the ECMC held weekly or more frequent Commission Hearings depending on Commission business. The 2023 meetings continued to be held virtually, and public participation in the virtual meetings remained high throughout the year. In addition to regular business meetings, the Commission held several evening “listening sessions,” at which minimal business, besides hearing public comment, was conducted. Although previously held monthly, the frequency of these evening listening sessions has been reduced due to a lack of public interest and participation.

2.2.2 Scheduled Meetings

ECMC staff participates in regularly scheduled meetings with the regulated community and other interested stakeholders in parts of the state with active oil and gas operations. ECMC has

continued hosting monthly and more frequent “Operator Meetings” to help the regulated community navigate regulatory requirements and guidance documents.

2.2.3 Stakeholder Participation

ECMC continues to solicit participation in regulating oil and gas exploration and production. Stakeholders, including the oil and gas industry, local governments, citizens, other regulatory agencies, non-governmental organizations, agriculture interests, and the environmental community, provide input into permitting, policy development, rulemaking, and other processes. In 2023, ECMC Staff and Commissioners engaged with stakeholders in various working groups. Due to rulemaking efforts, the Commission required some working groups, such as the Biochar working group and the Produced Water Consortium. Others came about through the ordinary course of business of the Commission, such as the West Slope Task Force.

The Commission is committed to visiting communities statewide and learning about their unique issues and concerns on oil and gas development and production. In 2023, the ECMC Commission traveled to the Raton Basin (Trinidad) and Southwest Colorado (Durango and Cortez). The Commission shared updates on implementing SB 19-181, which changed the mission from “fostering” responsible oil and gas development to regulating in a manner protective of public health, safety, welfare, wildlife, and the environment, and to hear the community’s voice on oil and gas. Also, the Commission explained the transition to ECMC and the new regulatory oversight areas. The Commission met with local governments, community members, environmental groups, disproportionately impacted communities, industry members, and other regulatory agencies.

The Commission conducted stakeholder outreach on cumulative impacts, hosting multiple listening sessions with various stakeholders throughout the year. Additionally, the Commission and Staff held stakeholder meetings throughout the year, including discussions on deep geothermal, meetings with the West Slope operators, and participation in the Colorado Produced Water Consortium.

2.2.4 Local Government Designee Program

ECMC created the Local Governmental Designee (LGD) program via rulemaking in 1992 to provide a conduit of information between local governments and the ECMC. ECMC bolstered the LGD program in 2012 with the addition of Local Government Liaison (LGL) staff to assist

and facilitate participation in the LGD program through training, outreach, and providing information, data, and presentations about specific aspects of oil and gas operations, ECMC rules, use of the ECMC website, and the ECMC's changing regulatory program under SB 19-181. ECMC created the Community Relations Unit in 2018, which includes a Community Relations Liaison working under the supervision of the ECMC Communications Officer.

As of November 2023, LGD participation includes 55 counties (including two combined city-county governments, Denver and Broomfield), 106 municipalities (besides Denver and Broomfield), and ten special districts.

In 2023, staff outreach included the following:

- Adams County Complaint Outreach (January 31, 2023)
- Commissioner Trinidad Area Trip (March 6-9, 2023)
- Commission Listening Session, Glenwood Springs (April 13, 2023)
- Statewide LGD Meeting (April 24, 2023)
- Arapahoe County LGD Outreach (May 15, 2023)
- Coordination Meeting with BLM (June 29, 2023)
- Coordination Meeting with EPA Lowry Team (July 13, 2023)
- Commissioner Durango Area Trip (September 19-22, 2023)
- Fort Collins Spill Coordination Meeting (December 8, 2023)
- ECMC DI Listening Sessions (December 5, 6, 7, and 11, 2023)

The ECMC Staff supported issues of local government concern, including local air monitoring concerns and the development of new local oil and gas regulations. In addition, ECMC staff worked to inform community members and LGDs of other events, such as commission hearings and SB19-181-related training opportunities.

2.2.5 ECMC Website

The ECMC continues to use its website to make announcements and distribute information and data. ECMC information and data systems are described further in Section 3.3. ECMC is working on a refresh to its website format. ECMC is working with its diverse stakeholders to gather input and feedback to help in this effort.

3.0 ECMC Organization

3.1 ECMC Commissioners

The Colorado Oil and Gas Conservation Act (The Act), as amended by SB 19-181, specifies the composition of the full-time professional Commission.

The Act requires seven Commissioners, five of whom are appointed by the Governor with the consent of the Senate, and two ex officio non-voting members who are the Executive Directors of the Department of Natural Resources (DNR) and the CDPHE or their appointed designees.

The five professional members are appointed by considering the need for geographical representation of areas of the state with high levels of current or anticipated oil and gas activity or employment. Of the five, the expertise required is as follows:

1. One appointed member must have substantial experience in the oil and gas industry;
2. One appointed member must have substantial expertise in planning or land use;
3. One appointed member must have formal training or substantial experience in environmental protection, wildlife protection, or reclamation;
4. One appointed member must have professional experience demonstrating an ability to contribute to the commission's body of expertise that will aid the commission in making sound, balanced decisions;
5. One appointed member must have formal training or substantial experience in public health.

Excluding the executive directors, up to three members may be from the same political party. Biographies of the Commissioners are posted on the ECMC website: http://ecmc.state.co.us/about.html#/commissioners.

3.2 ECMC Staff

The ECMC has 151 full-time employee (FTE) positions in the Denver office or throughout the state. The Staff includes engineers, environmental protection specialists (EPS), field compliance specialists, reclamation specialists, permitting specialists, hearings officers, and a variety of other professionals. Table 3-1 summarizes each group and their primary functions. The current organizational chart is included as Appendix 1.

Table 3-1. ECMC Groups and Primary Functions

Group	Number of FTE	Primary Functions
Executive	5	Director, Deputy Directors, and Executive Assistant; community relations and communication
Environmental	29	Spills, remediation projects, pit closures, site closure, complaint investigation and response, environmental projects, interim and final reclamation; environmental database, special projects
Engineering	16	Analyzing and Permitting downhole wellbore plans, underground injection control (UIC) permitting, oil/gas facility oversight, flowline integrity
Orphaned Well Program	13	Plugging orphan wells, orphan site investigation, clean-up, and reclamation
Compliance	39	Inspection of oil/gas wells, facilities, and locations; complaint intake and response, management and resolution; agency contact for responding to emergencies and working with emergency response personnel enforcement.
Planning & Permitting	22	Reviewing and analyzing oil and gas development plans and comprehensive area plan applications, permitting oil and gas wells, evaluating oil and gas Location assessments, cumulative impacts information, & pit permitting
Information & Applied Technology	5	GIS, website and webform development/support, database management/support
Hearings	7	Commission Liaison, Hearings
Financial	10	Budget management, procurement, purchasing, financial assurance, production reporting, and levy collection, Information systems & records, public room
Cumulative Impacts & Regulatory Affairs	7	Hearings, financial assurance planning, cumulative impacts, regulatory affairs
Community Relations Unit	2	Provides communication and information on ECMC to the public and diverse stakeholders

Staff functions that directly relate to water resource protection and compliance with groundwater and surface water standards include the following:

3.2.1 Environmental

The Environmental Unit consists of environmental protection specialists and reclamation specialists that provide oversight during spill and release responses, monitor remediation projects, respond to complaints, and ensure that oil and gas sites are restored to their pre-disturbance conditions following oil and gas exploration and production activities.

Spill/Release Response and Remediation Oversight

Spill response by the environmental staff includes onsite inspections, sample collection, remediation oversight, and review of reports, remediation plans, analytical data, and operating practices to ensure the protection of surface and groundwater following ECMC rules and WQCC standards and classifications. Spills are tracked in ECMC's Master Records Database (MRDB) and can be accessed via the ECMC website. ECMC's oversight of spills, releases, remediation projects, and environmental investigations is discussed in more detail in Section 6 of this report.

Centralized E&P Waste Management Facility Permitting

ECMC environmental staff permits non-commercial centralized E&P waste management (CE&PWM) facilities under Rule 907. Generally, these facilities are larger than a typical tank battery or pit that might handle wastes from only one or a few wells. These larger facilities handle wastes from many wells and often from more than one field or lease operated by a single oil and gas operator. These facilities may include lined pits, land treatment facilities, land application areas, drill cuttings, solidification facilities, or tank batteries. A permit is required for these CE&PWM facilities, and as part of the approval process, staff evaluates the proposed site, operation, financial assurance, potential environmental impacts, and preliminary closure plans. These facilities must have financial assurance equal to the estimated cost for proper closure, abandonment, and reclamation. CE&PWM facilities require local government land use approval, and ECMC staff coordinate with planning, zoning, and other local government staff during the permit review process. During 2023, there were no new CE&PWM facility submissions, two (2) CE&PWM facilities were permitted, and no CE&PWM facilities were closed. There are 53 active centralized CE&PWM facilities in the state.

Pit Permitting

Operators may construct pits at oil and gas locations for various purposes, most commonly to contain drill fluids and cuttings, produced water and flow back, and reuse and recycle produced water. ECMC permits pits (Form 15), inspects their operation, and oversees their closure. The OGLA and EPS staff review pit permits for construction and operational details and evaluate the environmental setting to ensure the pit can be used without causing adverse environmental impacts. The Director may apply conditions of approval with additional provisions to protect the waters of the state, public health, or the environment. ECMC Rule 901.a also requires operators of existing pits to submit a Form 15 Pit Report if the records need to be updated. As of December 4, 2023, the ECMC approved 169 Form 15s, most of which were for existing pits.

Complaint Response

A significant part of ECMC's public service and efforts to enhance transparency and public trust is complaint response. As such, ECMC responds to complaints from all parties. Once received through the online intake process or by phone, the complaint specialist first determines if the complaint falls under the jurisdiction of the ECMC regulatory authority. If the complaint is related to another regulatory agency, ECMC will formally refer to the appropriate agency on behalf of the complainant. For complaints under ECMC authority, the complaint specialist will determine the proper group within ECMC to assign the complaint. For example, the Compliance Unit handles many complaints, such as odor, noise, dust, trash, and other operational issues. Regarding groundwater protection, the Environmental Unit responds to complaints alleging oil and gas impacts to domestic water wells. The Environmental Unit also responds to complaints where groundwater or surface water may be threatened by spills/releases or the management of E&P waste and issues related to stormwater management and reclamation.

Complaint investigations generally include a site visit where ECMC staff inspect the location of the complaint. For complaints related to domestic water wells, the environmental unit collects representative groundwater samples. These samples are analyzed at authorized laboratories to determine if oil and gas operations impacted groundwater quality. Regardless of the type of complaint, ECMC staff investigate to determine if there were violations of applicable rules. Where violations are discovered, ECMC issues corrective actions to the operators to mitigate the issue. In cases where complaints result in the discovery of rule violations, enforcement actions are pursued with the operators.

In 2023, ECMC received 231 complaints. The majority (55; 23.8%) were related to noise, with the second largest category (35; 15.2%) related to property damage. The environmental unit was assigned 65 complaints (28.1%) to investigate various allegations related to groundwater and surface water contamination, spills/releases, and other environmental threats.

Of the 65, one complaint (1.5% of the total) was related to concerns about water quality from domestic water wells. During routine testing activities at a wellhead, thermogenic methane was detected at two soil vapor point locations. Samples were collected, and laboratory analysis indicated the presence of thermogenic gas. Trace stray gas was also reported within the domestic water well. The soil vapor investigation continued until no thermogenic methane was observed. The Operator has recently submitted decommissioning documentation for the wellheads in the area.

Oversight of Produced Water Disposal

Over 300 million barrels of water are co-produced with oil and gas production annually. Approximately 70 percent of the produced water is disposed of or used for enhanced recovery by underground injection. Most produced water that is not injected is disposed of in evaporation and percolation pits or discharged under a Colorado Discharge Permit System (CDPS) permit. Disposal facilities may be commercial and subject to oversight by CDPHE or private and subject to oversight by ECMC. To minimize waste and the use of freshwater, many operators are reusing and recycling produced water and other fluids for drilling and well completion activities, including hydraulic fracturing (‘frac’) treatment operations. ECMC staff review UIC permits, pit permits, centralized E&P waste management permits, and other proposals, including water reuse and recycling plans, to ensure that produced water is handled appropriately. In 2023, House Bill (HB) 23-1242 provided statutory direction to the DNR and ECMC to take specific measures to reduce the overall freshwater consumption of the oil and gas industry by increasing the amount of produced water that is recycled or reused. The specifics of this statutory requirement are discussed in detail in Section 4.4.

3.2.2 Engineering Unit

The Engineering Unit includes Flowline and Facility Integrity, Wellbore Integrity, and Class II Underground Injection Control (“UIC”) wells. Flowline Integrity ensures that a flowline is compatible with the fluids being transported, allowing it to withstand anticipated operating conditions and prevent failure. Wellbore Integrity refers to the design and construction

parameters for an oil and gas well that prevent oil, gas, or water from migrating between different geologic formations penetrated by the wellbore. ECMC permits and regulates Class II UIC wells for enhanced oil recovery or to dispose of oil and gas exploration and production waste.

The isolation of all formation fluids, particularly groundwater protection, is routinely addressed and reviewed by ECMC engineering staff over the life stages of all wells.

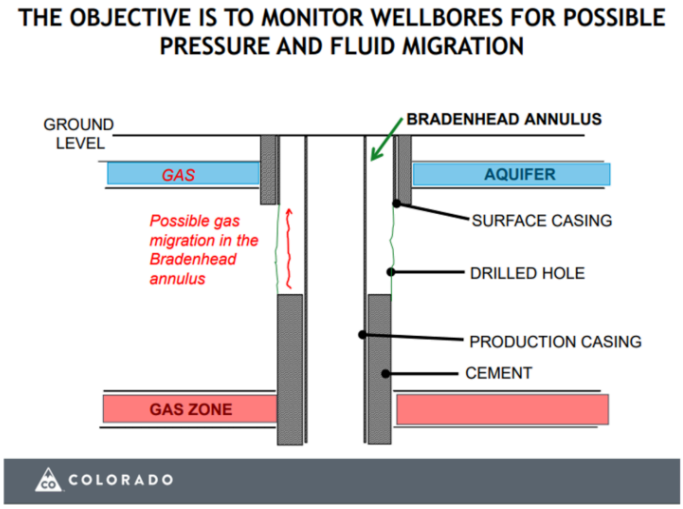
Applications for Permit to Drill (Form 2) for proposed new wells include a casing and cementing plan to demonstrate how formation fluids will be isolated. The operator lists all potential flow (groundwater, hydrocarbon, disposal), confining formations expected to be encountered in the drilling of the well, and the proposed casing and cementing depths. To protect groundwater, ECMC requires a minimum of 500 feet of cement placed above the shallowest-identified hydrocarbon zone, and isolation is 50 feet below the deepest groundwater zone[1].

Additionally, all existing wells within 1500' of the proposed new well are evaluated for adequate formation and groundwater isolation. Suppose an offset well does not meet current isolation standards. In that case, ECMC engineering staff place a condition of approval on the Form 2 requiring the deficiency to be remediated before stimulation of the new well. This ensures that old wells, including previously plugged and abandoned wells, do not create a conduit that allows fluid flow between formations or into groundwater during a nearby hydraulic fracturing operation.

Cement in the annular space between the production casing and the borehole is designed to isolate hydrocarbons and protect groundwater. The ECMC ensures that there isn't a migration pathway from hydrocarbon zones to the surface or groundwater zones by ensuring that there isn't a failure in the annular cement. Monitoring this annular space in the surface casing (a.k.a, bradenhead annulus) has effectively monitored wellbore integrity. Figure 3-0 depicts typical wellbore construction and shows how gas in the production casing annulus can be monitored in the bradenhead at the surface.

[1] Previous rules called out Fox Hills aquifer in DJ basin, where the new rule calls out all groundwater sources with TDS < 10,000 mg/L

Figure 3-0 Bradenhead Pressure Test



Denver-Julesburg Basin Bradenhead Testing Order
Docket No. 181201088 December 2018

Bradenhead pressures are monitored after drilling and before stimulation. Any wells above the pressure threshold require director approval before stimulation[2]. During hydraulic fracturing, casing strings of the wells are stimulated, and all wells within 300' are monitored for evidence of communication. If operators see high pressure or evidence of communication, stimulation is immediately stopped, and ECMC is notified. The operator then performs diagnostic testing to determine the next steps.

Wells in Colorado are subject to monthly bradenhead monitoring and annual testing. Existing wells above the threshold require the operator to perform diagnostic testing and implement a pressure management plan, which may include but is not limited to, cement remediation, fluid displacement, and plugging and abandonment. Operators should be prepared to grab a sample whenever they open the bradenhead valve and must collect a sample if any liquids are present. Samples from the bradenhead annulus and production gas are analyzed for source determination. [3]

During plugging and abandonment, operators and ECMC engineers review wellbore construction (surface casing depths, cement bond logs), bradenhead history (pressure,

[2] Statewide rules call out 0.3psi per vertical foot of surface casing, local orders can lower threshold (1-232 calls out 200 psi in DJ basin)
[3] Gas samples are analyzed for thermogenic or biogenic isotopes

samples), and all groundwater sources to determine the placement of plugs. Wells that demonstrate concern with high bradenhead pressure or thermogenic samples may have additional cementing and wait times prescribed as a condition of approval on the Well Abandonment Report (Form 6).

Underground Injection Control (UIC) Permitting

The US EPA delegated authority to ECMC to review, approve, and monitor the injection of E&P waste into Class II UIC wells. ECMC staff coordinates with the Division of Water Resources (DWR), WQCD, and US EPA staff to ensure that operators of Class II injection wells in Colorado comply with UIC rules and regulations to prevent contamination of Underground Sources of Drinking Water (USDWs). ECMC's staff geologic expert's review UIC permits for site-specific matters, such as the occurrence of faults and the potential for induced seismic activity. Based on this analysis, UIC permits include Conditions of Approval (COAs) pertaining to injection pressures, daily injection rates, and volumes. Commercial and non-commercial injection operations are actively managed by the ECMC in conjunction with the U.S. Geological Survey Earthquake Notification Service through the installation and continuous monitoring of several local seismometers to evaluate if an injection of produced water has some relationship to local seismicity. The ECMC has instituted a "traffic light" monitoring system, which dictates specific mitigation measures and requires injection halted if seismic activity reaches particular levels. Four Class II UIC well permits were approved in 2023.

3.2.3 Orphaned Well Program

ECMC used appropriated funds, the Orphaned Well Mitigation Enterprise Fund, a Federal Infrastructure Investment and Jobs Act "Initial Grant," and claimed financial assurance to perform plugging and abandonment, remediation or reclamation work at 333 orphaned oil and gas sites in 18 counties: Adams, Arapahoe, Archuleta, Boulder, Broomfield, Elbert, Garfield, Jackson, La Plata, Larimer, Logan, Mesa, Moffat, Montezuma, Morgan, Rio Blanco, San Miguel, and Weld. As part of this work, ECMC plugged 61 wells, commenced remediation at nine sites, and commenced reclamation at 37 sites during Fiscal Year 2023. Ongoing reclamation maintenance of stormwater BMPs, weed control, and maintenance seeding were also performed at other locations reclaimed in prior fiscal years. For Fiscal Year 2024 and future fiscal years, due to federal grant funding, the Orphaned Well Program budget has doubled. The

new level of funding will be sufficient to plug up to about 70 wells and remediate or reclaim up to about 150 typical sites each year.

3.2.4 Compliance

The Compliance Unit includes inspectors and enforcement officers, who work closely together to gain operator compliance with ECMC Rules. Gaining compliance can come through outreach training, voluntary compliance after issuing a corrective action or warning letter, or more formal actions related to a Notice of Alleged Violation (NOAV).

3.2.5 Permitting and Planning Unit

The Permitting and Planning Unit includes the Location Assessment and the Permit/Completion Groups. It is responsible for surface and subsurface permits, which an operator must obtain from ECMC before drilling a well. The Location Assessment Group primarily addresses the surface-related issues in the Oil and Gas Development Plans (OGDP) or Comprehensive Area Plans (CAP). The Permit/Completion Group addresses any Application for Permit-to-Drill (APD) or the Form 2 required for each proposed well and primarily addresses “down-hole” or subsurface issues.

Applications for Permit to Drill (APD) are reviewed to ensure compliance with all rules related to aquifer protection. Oil and gas wells must be designed, installed, and maintained to prevent the migration of fluids or gas between formations or into aquifers. Permit specialists and engineering staff review drilling permit applications for surface casing and cementing requirements, among other requirements designed to protect aquifers. The ECMC issued 966 APDs in 2023 through December 4th.

Location Assessments

Under the Oil and Gas Development Plan and Form 2A process, Operators must provide site-specific environmental information about surface locations. In some circumstances, consultation by the CDPHE and Colorado Division of Parks and Wildlife (CPW) with the ECMC, the surface owner, and the operator is required. Oil and Gas Location Assessment (OGLA) specialists review and evaluate Oil and Gas Development Plan applications and publicly available information to determine whether the proposed oil and gas operations have the potential to negatively impact water resources, public health, safety, welfare, the environment, or wildlife resources. The ECMC issued 55 Form 2As in 2023 through December 4th.

3.2.6 Hearings Unit

The Hearings Unit is responsible for all matters related to Commission hearings. The Commission holds weekly hearings, taking applications for oil and gas development, adjudicatory matters, and conducting rulemaking as needed. The Hearings Unit reviews and processes all applications for Commission orders, contested matters, rulemaking hearings, and enforcement matters and organizes public comment opportunities.

Enforcement

As of December 1, 2023, the Commission has entered 54 enforcement orders, including 36 Administrative Orders by Consent and 18 Orders Finding Violations. These orders resolved 82 Notices of Alleged Violations and imposed $6,253,273 in gross penalties, of which $1,784,868 was conditionally suspended.

3.3 ECMC Information/Data Systems

ECMC works to improve its data management systems and GIS each year as time and resources allow. Primary data systems improved or developed in 2023 include:

- Electronic Forms - finished implementing a more capable, ‘new eForms’ environment incorporating an electronic payment system. Seven new forms (five related to Financial Assurance and two related to Chemical Disclosure) and two existing forms (for the conservation levy and operator registration) have been deployed to this new environment since late 2022.
- Geographic Information Systems (GIS) - updated map layers associated with Mission Changes rules and introduced automation for receiving and processing GIS data attachments with electronic forms
- Environmental Database improvements
- Data Downloads – new data sets made available
- Online Environmental Reports
- Daily Activity Dashboard (oil and gas activity monitoring tool)

The following sections provide brief descriptions of each system’s changes.

3.3.1 Electronic Forms (Webform & ‘new eForms’)

In 2020-21, ECMC converted its electronic form filing system to utilize an HTML-based web application called “Webforms” that replaced the established Silverlight “eForm” application. Like the original eForms, the new Webforms application allows operators to submit applications and notices electronically, with the system providing automatic email notices to appropriate parties, including the applicant or operator, ECMC staff, and local governments or other regulatory entities. Rule changes from the implementation of SB 19-181 have required extensive revisions of many existing electronic forms, as well as the creation of several new ones over the past couple of years.

In 2022 and 2023, ECMC, in concert with the Governor’s Office of Information Technology (OIT) application development team, created a new, improved electronic form application - currently referred to as 'new eForms' - that includes electronic payment processing. Several Financial Assurance-related forms have already been implemented in this new environment. 'New eForms' is built using a newer web-development framework that allows for more dynamic and responsive forms with user interface enhancements.

Webforms and 'new eForms' allow operators to submit forms and attachments electronically. ECMC staff review and approve the forms digitally before data from the forms are uploaded to the Master Record Database (MRDB). A task-centric workflow enables multiple staff members (e.g., permitting, engineering, etc.) to review and approve aspects of a form relevant to their area of expertise separately.

3.3.2 GIS – Geographic Information Systems

The ECMC GIS Online Interactive Map is an essential tool used by staff, industry, and other agencies to submit and process permits, create reports, and view information related to exploration and development. The ECMC GIS Online Interactive Map is also a go-to resource for the general public and interested stakeholders regarding environmental concerns and citing issues related to current and planned drilling and production activity.

The ECMC GIS Online Interactive Map contains over 170 spatial datasets, including oil and gas well locations, permits, spacing orders, field boundaries, and valuable reference information, such as cities, rivers, roads, sections, land ownership, permitted water wells, etc. Aerial photos, topographic quads, and geologic maps are also included as valuable information resources. The

newest version of the online mapping system allows users to zoom to a specific street address or parcel for much of Colorado, has improved printing functionality, and includes a live connection to ECMC's environmental sampling database. Specifically related to groundwater protection, the ECMC GIS Online Interactive Map includes data showing oil and gas wellbore trajectories (planned, approved, and as-drilled) and water well data from the DWR. These data are used by ECMC Engineers when reviewing permits and conducting offset wellbore evaluations to ensure that the casing and cementing programs for the proposed wells will protect groundwater resources.

To aid operators and other interested parties with their GIS work, the ECMC website provides GIS shapefiles for download, including files with daily updated well information, permit, and pending permit data, and wellbore traces for directional and horizontal wells across Colorado. Recently added are downloads of KMZ files for well locations that can be used on smartphones and tablets in Google Earth. The ECMC GIS Online Interactive Map is regularly recognized as one of the nation's best state-level oil and gas resources.

3.3.3 Environmental Database

The ECMC, in conjunction with the Groundwater Protection Council (GWPC), has developed a publicly available, searchable database of analytical results of groundwater, surface water, and soil sample analysis throughout the state. Referred to as the COENV database, it has been active since September 2012. The COENV database has sampling data dating back as far as 1941. The environmental database currently contains over 24,292 sample locations and 82,000 individual samples (as of December 15, 2023). In 2023, 5,353 total samples were added to the database.

Beginning with the Greater Wattenberg Area (GWA) Rule 318A and Statewide Rules 609 and 615, the ECMC has used an electronic data deliverable (EDD) process to transfer data from the laboratory that performed the analyses to the ECMC. Since Rules 318A and 609 were enacted in May 2013, the ECMC has received 17,758 water samples from 3,520 separate locations from operators in compliance with the groundwater sampling rules through the EDD process.

The data can be easily accessed through the GIS Online Interactive Map. Sample locations with available water and natural gas data appear as green triangles when the "Sites with Lab Data" layer is turned on. The user can double-click on a sample site and access the analytical data for that site.

All of the data collected by ECMC Staff under the following ECMC Rules are available online:

- Rule 411.a.(2).C.ii - Baseline Surface Water Monitoring related to Surface Water Supply Areas;
- Rule 411.b. (4).B - Reporting Groundwater Monitoring Data related to Groundwater Under the Direct Influence of Surface Water and Type III Aquifer Wells;
- Rule 420 - Bradenhead Test Reporting (including gas and liquid samples collected during bradenhead testing);
- Rule 614.b.(3) - Coalbed Methane Coal Outcrop and Coal Mine Monitoring;
- Rule 615 - Groundwater Baseline Sampling and Monitoring;
- Rule 805 - UIC Analytical Requirements for Injection Fluid Analysis;
- Rule 907.b.(9) - Centralized E&P Waste Management Facility Groundwater Monitoring;
- Rule 909.j - Produced Water Quality Analysis; and
- Previous ECMC Rules 317B, 318A.f, 608, and 609 and older samples from ECMC orders and the Colorado Oil and Gas Association (COGA) Voluntary Baseline Sampling Program.

The Form 43 (Analytical Data Submittal) allows operators to upload water quality data to the ECMC COENV database through an electronic data deliverable (EDD). The Form 43 was released in 2018.

The ECMC has completed amending the Form 43 to allow operators to submit analytical data related to the new rules promulgated under SB19-181 that went into effect on January 15, 2021. Analytical data will continue to be submitted via Form 43 to meet the new requirements.

Currently, the ECMC is working with the GWPC to install the GWPC's proprietary WaterStar software to manage analytical data received by the ECMC. The GWPC is partnering with the ECMC on a series of updates to the existing Risk Based Data Management Solutions (RBDMS) Environmental application to upgrade the application to the new RBDMS WaterSTAR structure and User Interface. The ECMC team is focused on improving the user experience and the type and quality of data collected for the application through these updates.

The objectives for developing the CO WaterSTAR Upgrade include:

- Improving the quality and types of data collected for display in the application and for use in agency analysis
- Enhance the user experience through an updated User Interface that makes searching and reviewing data intuitive and easy to navigate
- Strengthen agency analysis capabilities while reducing the time required to complete analysis efforts through updated application modules.

The Waterstar installation project is scheduled to be completed in the second half of 2024.

The data provided to the ECMC is also available to the public through the COGIS data system available on the ECMC website. In April 2014, the COENV database was available for download in an Access database format for those who wish to query large datasets.

3.3.4 Data Downloads

Historically, the ECMC has provided production data, spacing order data, and GIS shapefiles for download from the website. Available GIS data include well-surface locations and directional data (updated daily), pits, oil and gas fields, high-priority wildlife habitat, 100-year floodplain data, and approximate buffers associated with ECMC Rule 411 – Public Water System Protection. This has been updated to reflect the rule change to Rule 411 and the inclusion of Groundwater Under the Direct Influence of Surface Water and Type III Aquifer Wells.

In addition to the GIS data listed above, and to increase transparency, the ECMC aggregates datasets directly from our MRDB and provides them for public use. The MRDB, managed and maintained by ECMC with assistance from the OIT, is a comprehensive repository of Colorado's oil and gas data. Although all the data is available through interactive search tools on the website, these downloads allow the industry, public, and non-governmental organizations or other interested parties to access large amounts of data in searchable formats so that they may run their analyses. These datasets are updated periodically.

The data downloads available are:

- Complaint Data,
- Notice of Alleged Violation (NOAV) Data,
- Flowline Notice to Operators (NTO) Inventory,

- Mechanical Integrity Test (MIT) Data,
- Spill and Release Data,
- Analytical Sample Data,
- Field Inspection Reports,
- Production Data,
- Spacing Orders, and
- GIS Shapefiles.

The ECMC is developing additional data downloads for future releases.

3.3.5 Online Environmental Reports

Written reports for ECMC-managed baseline sampling projects and other special environmental studies are posted on the website under the “Library” tab. They are primarily organized by basin and are available for download in portable document format (PDF) files.

Although not new, the brochure, *How Well Do You Know Your Water Well* continues to be a popular and informative publication for water well owners. The brochure includes

- Information about mitigating methane in water wells.
- Current contact information for various agencies.
- Water well maintenance and recordkeeping.

ECMC provides this helpful brochure to water well owners when water samples are collected from their wells by ECMC, operators, or third-party contractors.

3.3.6 Daily Activity Dashboard

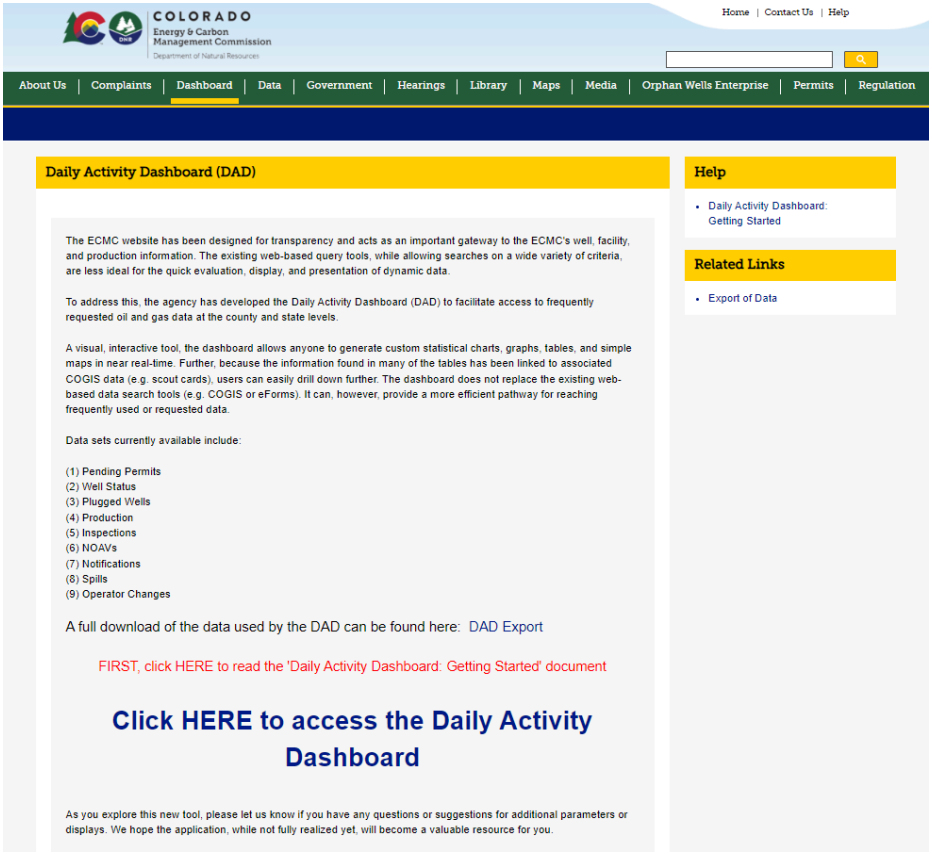
The Daily Activity Dashboard is a web-based tool designed to give local governments, the public, and other stakeholders a more efficient way to access, sort, and display the most commonly used data related to oil and gas operations. The Dashboard is a visual interactive tool that allows a user to generate custom statistical charts, graphs, tables, reports, and simple maps based on data that are updated daily.

The Dashboard does not offer the public new types of oil and gas data or replace existing ways of searching for online oil and gas data in the Colorado Oil and Gas Information System. Instead, it provides a convenient way to access information on the following nine subject areas:

(1) Pending Permits,
(2) Well Status,
(3) Plugged Wells,
(4) Production,
(5) Inspections,
(6) NOAVs,
(7) Notifications,
(8) Spills, and
(9) Operator Changes

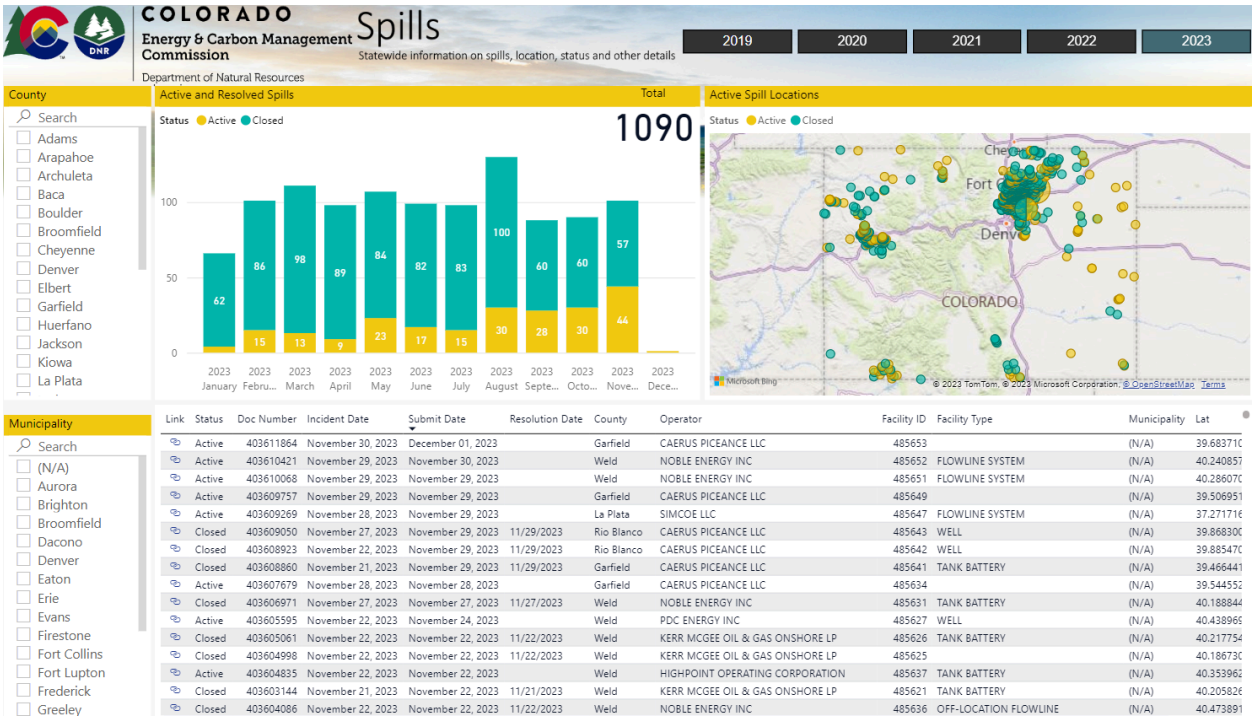
This tool can be accessed by clicking “Dashboard” in the main menu of the ECMC homepage and continues to be a popular page on the website.

Figure 3-1 Daily Activity Dashboard



Anybody interested in tracking spills related to oil and gas in Colorado can use the Daily Activity Dashboard. It provides spill data back to 2019 and the current numbers of spills reported by year with the functionality to search spills by county or municipality. It also provides a map with spill locations and links to the spill reports. For a more in-depth dive into spill and remediation information, ECMC developed a tutorial on the website under the Environmental section on the Help page. This tutorial helps explain the Daily Activity Dashboard search methods and ECMC database tools available to the public on the website.

Figure 3-2. Daily Activity Dashboard Screenshot (Spills)



3.4 ECMC Environmental Program and Project Funding

The General Assembly annually appropriates a line item within ECMC's budget for the environmental staff to respond to, investigate, prevent, monitor, or mitigate conditions that threaten or cause adverse impacts to air, water, soil, public health, safety, and welfare, or wildlife resources. This work includes but is not limited to, the collection of water and soil samples,

laboratory analyses of the samples, and review and analysis of laboratory results and other environmental data. For Fiscal Year 2023-2024, the appropriation for this line item remained at $312,033.

In addition, the General Assembly annually appropriates a line item to fund special environmental protection and mitigation studies including, but not limited to, gas seepage mitigation studies, outcrop monitoring studies, soil gas surveys in the vicinity of plugged orphaned wells, and baseline water quality and subsequent follow-up studies. The intent was to provide readily available funds for special projects as needed. In its annual budget request, the ECMC reports all expenditures made from this line item in the previous year to the General Assembly. The total appropriation for this line item in Fiscal Year 2023-2024 remained at $325,000.

In addition to the preceding, ECMC receives an annual appropriation to respond to oil and gas operation emergencies that threaten or cause significant adverse impacts to public health, safety, welfare, or the environment. For FY 2023-24, this appropriation is $150,000, consistent with prior year appropriations. The ECMC also receives an annual appropriation to plug wells, abandon flowlines, decommission production equipment, perform environmental sampling and remediation, and reclaim the surface. The FY 2023-24 appropriation for the budget line item is $9.5 million.

4.0 Regulatory and Legislative Updates

4.1 Senate Bill (SB) 19-181

On April 3, 2019, the Senate passed SB 19-181, which the Governor signed into law on April 16, 2019. This legislation amended the Oil and Gas Conservation Act and required several changes to the overall regulatory framework of the ECMC. Changes included the appointment of a professional commission by the Governor, increased local government control over the siting of oil and gas locations, an overhaul of the Oil and Gas Location Assessment review process, and changing of the ECMC mission to "regulate the development and production of the natural resources of oil and gas in the state of Colorado in a manner that protects public health, safety, welfare, the environment, and wildlife resources." As a result of this Mission Change, the Commission undertook required rulemakings for Wellbore Integrity, Flowlines, Practice and Procedure, Alternative Location Analysis, Cumulative Impacts, "Mission Change" generally, and Financial Assurance. The remaining rulemakings prescribed by SB 19-181 include cumulative impacts and worker certification rules.

The ECMC has engaged stakeholders statewide and has released draft cumulative impact rules that reflect the significant feedback and public comment received. The cumulative impacts rulemaking must be completed by April 28, 2024.

The entire ECMC Mission Change rulemaking efforts record can be found on our website on the "Hearings" page under the "Rulemaking" link.

4.2 Emerging Energy Technologies (SB 23-285)

On May 22, 2023, Governor Polis signed SB 23-285, "Energy & Carbon Management In Colorado," into law. The bill renamed the Colorado Oil and Gas Conservation Commission (COGCC) to the Energy and Carbon Management Commission (ECMC). It expanded the agency's regulatory authority over several emerging energy technologies, such as deep geothermal, underground natural gas storage, and carbon capture and storage. Before this legislation, there was regulatory uncertainty due to a lack of oversight of these new and emerging energy technologies. ECMC's resources and expertise in subsurface technologies, rulemaking, and working with communities made the former COGCC the trusted division to undertake this important role.

The following subsections describe several emerging technologies that ECMC identified in early 2023 as appropriate for consideration for ECMC oversight and describe the current status.

4.2.1 UIC Class VI Program

The USEPA regulates Class VI underground injection control (UIC) wells used for geologic carbon dioxide gas (CO_2) sequestration in deep rock formations. The USEPA UIC Class VI program is frequently referred to as “carbon capture and storage” (CCS) and is part of the federal efforts to reduce CO_2 emissions to the atmosphere and a tool to mitigate climate change. The USEPA can delegate the primacy of its Class VI program to states with established and approved regulatory programs.

In 2021, the State Legislature passed Senate Bill SB 21-264, that tasked the ECMC with compiling a report to evaluate the resources needed for the State of Colorado to implement a safe and effective UIC Class VI program. The ECMC published its report in November 2021. Based on discussions with the USEPA, Wyoming, and North Dakota (currently the only states with Class VI UIC programs), the ECMC estimates that completing a successful primacy application and gaining EPA’s approval is around 2 to 5 years following legislative approval. In 2023, the State Legislature passed SB 23-016, which directed the ECMC to seek primacy for Class VI injection wells upon a determination by both the Governor and the Commission that the State has adequate resources to regulate Class VI wells.

4.2.2 Geothermal Energy

Geothermal energy production involves using wells or loops that cycle fluids to transfer subterranean heat to the surface for use in direct heating applications or energy production. Shallow geothermal wells used for direct heating have been in use for decades and have been administered by the Division of Water Resources, which, until 2023, had jurisdiction over all geothermal wells in Colorado.

Deep geothermal wells have the potential to generate significant amounts of energy by using either new or existing vertical or horizontal wells drilled with technologies similar to those used in oil and gas development. Deep Geothermal Resources have been defined by Statute as being non-tributary to water rights in nature and deeper than 2,500 ft.

The ECMC was given regulatory authority over Deep Geothermal Resources in Colorado in 2023 by SB 23-285 and is currently engaged in stakeholding with relevant parties for Rulemaking to create a regulatory process for permitting and oversight of Deep Geothermal Operations.

4.2.3 Natural Gas Storage

Oil and gas midstream and distribution companies temporarily store natural gas in subsurface geologic formations to provide dispatchable gas to generate power as market demand dictates. The ECMC currently has state jurisdiction over the gas storage well permitting and construction but does not regulate the operations of the wells or gas storage fields since those facilities are regulated by the Pipeline and Hazardous Materials Safety Administration (PHMSA). The ECMC seeks an agreement with PHMSA to regulate the intrastate gas storage facilities in Colorado and to regulate facilities used to inject and store non-hydrocarbon gasses. Centralizing regulation of gas storage activities may provide a more protective regulatory environment supporting innovation and economic investment. ECMC was directed to create draft rules around natural gas storage as one step towards gaining primacy.

4.2.4 Direct Air Capture

Direct air capture is part of the CCS industry and includes facilities that reduce legacy climate change causing pollutants emissions by capturing CO_2 and other pollutants at the source and directly from the atmosphere and transporting them to sequestration facilities. The ECMC is poised to fold this emerging technology into its existing regulatory programs for well permitting, construction, and wellbore integrity. Although direct air capture was not included in SB 23-186, DNR is requesting it be included in legislation during the current session.

4.2.5 Hydrogen

The hydrogen industry involves the production, transport, storage, and distribution of hydrogen gas; it includes subsurface operations such as wells, underground storage facilities, and pipelines and surface operations such as tank storage, truck transport, and distribution facilities. Production, transportation, and storage are crucial considerations for the success of the hydrogen industry. Consolidating the regulatory program of those components will increase operational certainty, and provide a consistent approach to protective permitting and oversight of the burgeoning industry. Developing the regulatory structure for the hydrogen industry is

consistent with the Colorado Energy Office Roadmap for Low-Carbon Hydrogen in Colorado and the State's Greenhouse Gas Roadmap. The ECMC is also well positioned to work with our surrounding states to develop the Western Inter-State Hydrogen Hub, which will compete for Federal dollars allocated in the 2021 Infrastructure Investment and Jobs Act. ECMC was directed to conduct a study and make recommendations about permitting and management of hydrogen infrastructure and operations. ECMC has developed a request for a proposal for the study.

4.3 Oversight of Chemicals Used in Oil & Gas (HB 22-1348)

In the 2022 Legislative Session, ECMC (then COGCC) was tasked with creating a new process for chemical disclosure for chemicals used downhole during oil and gas operations. Since 2013, oil and gas operators have been required to report their chemical usage to FracFocus, an independent third-party data repository created in partnership with the Groundwater Protection Council (GWPC). However, environmental groups had concerns that reporting to FracFocus was significantly curtailed--at least from the perspective of data transparency--due to the industry's reliance upon trade secret protection in reporting; stakeholders also had concerns that reporting to FracFocus did not put information directly into the hands of the public nearby to active oil and gas activities.

In response to those concerns, the Colorado Assembly passed HB 22-1348, "Oversight of Chemicals Used in Oil & Gas." The act established a regulatory scheme requiring the disclosure of certain chemical information for products used in downhole oil and gas operations (chemical disclosure information). The ECMC is required to utilize or develop a chemical disclosure website to collect and share certain chemical disclosure information with the public (chemical disclosure website).

On and after July 31, 2023, operators, service providers, and direct vendors that provide chemical products directly to an operator or service provider at a well site (disclosure) for use in underground oil and gas operations (downhole operations) in the state must disclose to the commission:

- The trade name of the chemical product; and
- A list of the names of each chemical used in the chemical product.

The discloser must also provide the commission with a declaration that the chemical product contains no intentionally added perfluoroalkyl or polyfluoroalkyl chemicals.

ECMC is working closely with OIT to implement the requirements of the 2022 legislation.

4.4 Water Conservation in Oil and Gas Operations (HB 23-1242)

The act requires operators, every month, with respect to wells, and quarterly, with respect to oil and gas locations, to report information to ECMC regarding the operator's use of freshwater, recycling, and reuse of produced water, and disposal of produced water. The overarching goal of the legislation is a statewide reduction in the usage of fresh water and a corresponding increase in the use of recycled or reused water in oil and gas operations, and the act requires the ECMC to adopt rules by December 31, 2024, to that end.

The act created the Colorado Produced Water Consortium in the DNR, which has been meeting since September 2023. The Consortium will make recommendations to state agencies and the general assembly regarding the recycling and reuse of produced water, develop guidance documents to promote best practices for in-field recycling and reuse of produced water and analyze and report on:

- Existing produced water infrastructure, storage, and treatment facilities;
- The volume of produced water in different oil and gas basins available for recycling and reuse; and
- Additional infrastructure, storage, and technology needed to achieve different levels of recycling and reuse of produced water throughout the state.

ECMC is working with OIT to develop the forms and processes necessary to collect the monthly and quarterly data, as required, and has been receiving manual submittal of data since September. As of December 31, 2023, 32 operators have provided over 130,000 unique rows of water data for July, August, September, and October operating months. ECMC is working on accepting the data into their master relational database for processing, review, and analysis. HB 23-1242 authorized two new FTEs in the Environmental Data Group in the Environmental Unit, one of which has been hired and is in active recruitment; two other new FTE positions directing and supporting the research of the Consortium were established at DNR.

4.5 Oil And Gas Commission Study Methane Seepage Raton Basin (SB 23-186)

The act requires the Colorado Oil and Gas Conservation Commission (Commission) and the Water Quality Control Division (Division) in the Department of Public Health and Environment, in consultation with local governments, to perform a study that:

- Identifies best management practices for capturing methane seepage in the Raton basin;
- Evaluates the quality of water resulting from such methane capture operations; and
- Evaluates the potential to preserve and make beneficial use of such water.

The primary objectives of the study are to:

- Proactively and systematically locate and survey methane gas seepage in the Raton basin;
- Document previous areas of seepage;
- Calculate any differences in seepage amounts; and
- Assess the potential for methane to create hazardous conditions.

ECMC has worked with APCD to implement aerial surveys of the Raton Basin based on the availability of APCD's aerial survey technology. ECMC has developed a scope of work for the study and has solicited contractors to perform the study through a Request for Proposal (RFP) process. ECMC will award the contract to begin in 2024.

4.6 Studies

As mentioned in several of the subsections above, ECMC has been directed by the legislature to undertake several studies in 2024. These studies are summarized in the table below.

Table 4-1. ECMC 2024 Studies

Study	Bill	Due Date	Description
Class VI	SB 23-285	Feb. 1, 2024	Evaluate safety of Class VI injection wells, including potential releases from wells, pipelines, or sequestration facility; evaluation of safety measures, environmental impacts, and potential regulations
Geothermal Regulatory	SB 23 - 285	Dec. 31, 2024	Evaluate existing State regulatory structure and whether changes to law or regulations are necessary
Geothermal Technical	SB 23-285	July 1, 2024	Evaluation of geothermal resources in Colorado, use of existing infrastructure, emerging technologies, potential impacts and mitigation measures, and economic analysis
Biochar *with CSU	HB 23-1069	June 1, 2024	Colorado State University and working group to evaluate use of biochar in plugging of oil and gas wells to determine whether use of biochar will provide net removal of atmospheric carbon and whether use would require changes to state law or regulations
Hydrogen	SB 23-285	July 1, 2024	Study and develop recommendations concerning regulation and permitting of underground storage, pipeline transportation and other hydrogen operations under the Commission's authority
UIC	SB 23 -016	Dec. 1, 2024	Evaluation of whether Colorado should seek primacy for all classes of underground injection wells, including recommendations for regulatory structure and jurisdictional concerns

Pipeline	SB 23-285	Dec. 1, 2024	Evaluate administrative structure for siting and regulating intrastate pipelines, including potential jurisdictional gaps and safety concerns
Raton Basin	SB 23-186	June 30, 2025	Identify potential dangers of methane seepage and best management practices for capture in Raton Basin, and evaluate water quality and potentially beneficial use of water from CBM wells.

5.0 Oil and Gas Exploration and Production Activity

The following sections describe statewide oil and gas activity. Data presented are current through December 2023 unless otherwise noted. Additionally, monthly oil and gas production reporting must be submitted 45 days following the end of the month; ECMC staff then process the production reports, resulting in a delay of 60 to 90 days before production is finalized. Therefore, annual production data provided in this report are estimates, with final annual production typically available on the ECMC website by April of the following year.

5.1 Drilling Permits and Rig Activity

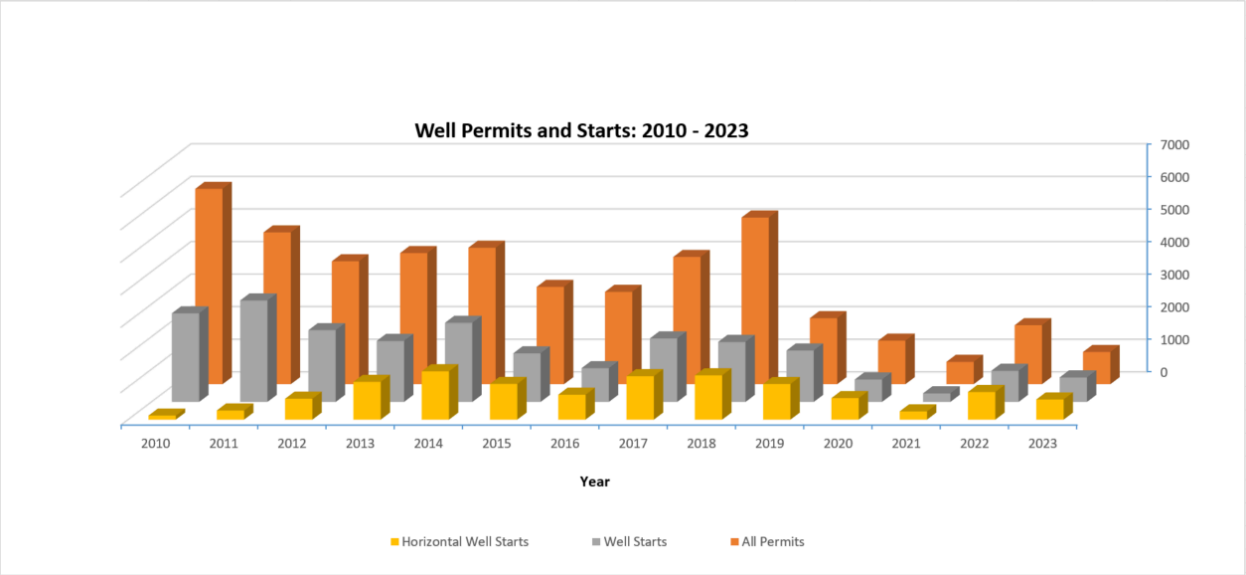
The ECMC approved 1000 APDs in 2023 through December 18th. Sixty-seven percent of the approved well permits were located in Weld County, followed by Rio Blanco County (6%).

Another metric to gauge activity level is the number of wells drilled; ECMC tracks all well starts including conventional and horizontal well starts. As of December 19, 2023, there were 777 well starts statewide, compared to 954 in 2022, 263 in 2021, 688 in 2020, and 1,578 in 2019. In 2023, 653 well starts were for horizontal wells, or approximately 84% of the total well starts for the state. As in recent years, horizontal drilling associated with the Niobrara and Codell Formations in the Denver-Julesburg (DJ) Basin continues to dominate the drilling activity in the State. Over the past decade, wells drilled in Colorado have shifted from a dominance of vertical wells to horizontal wells, as shown in Table 5-1 and Figure 5-1 below.

Table 5-1. Annual Permit and Well Start Activity 2010 – 2023

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
All Permits	5159	5996	4659	3773	4025	4190	2987	2835	3906	5116	2026	1336	686	1810	1000
Well Starts	2071	2719	3114	2202	1872	2428	1492	1036	1950	1842	1578	688	263	956	777
Horizontal Well Starts	31	123	280	641	1160	1484	1096	764	1334	1360	1094	661	252	848	653
Percent Horizontal	1%	5%	9%	29%	62%	61%	73%	74%	68%	74%	69%	96%	96%	89%	84%

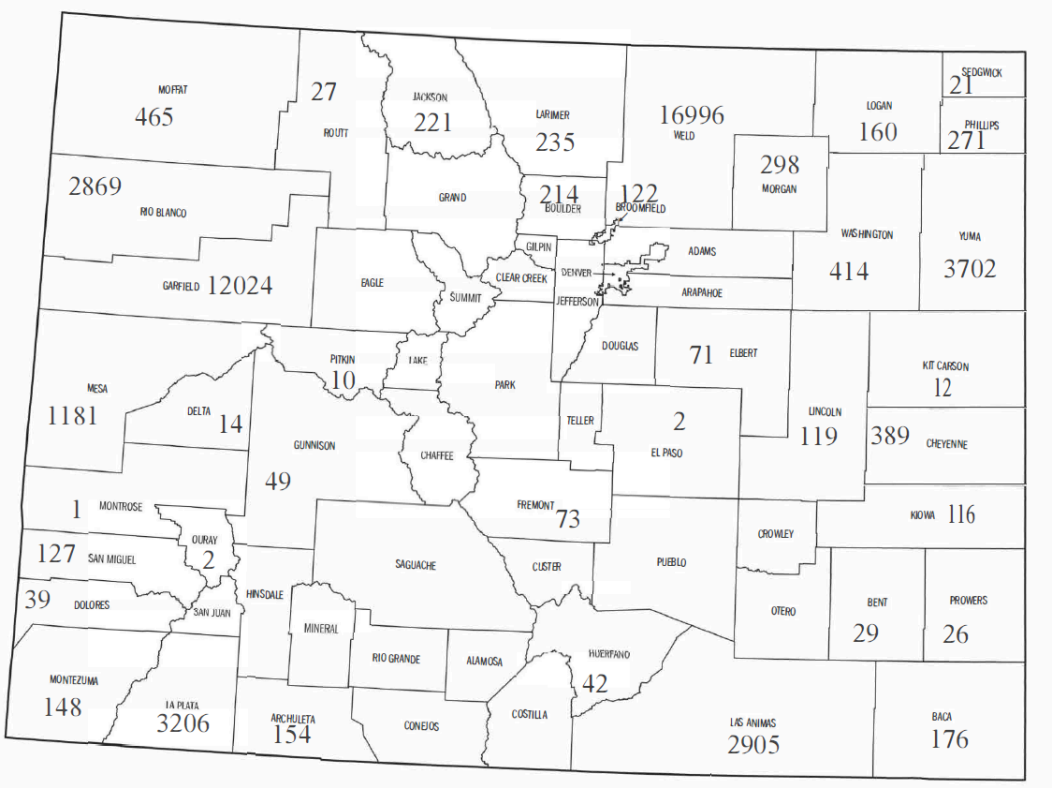
Figure 5-1. Annual Permit and Well Start Activity 2010 – 2023



The 2023 average weekly active rig count for Colorado stood at 17 through the second week of November. By comparison, the average weekly active rig count in Colorado was 18 rigs in 2022, 10 rigs in 2020 and 2021, down from 30 rigs in 2019. Assuming prices remain stable, the expectation is for rig activity to remain flat in 2024.

As of December 2023 (12/7), there were 48,234 active wells in the state. Figure 5-2 shows the number of active wells by county. Weld and Garfield counties have the most active wells, with 17,021 and 12,020 wells (as of December 7th), respectively, followed by Yuma County with 3,704 and La Plata County with 3,205 wells.

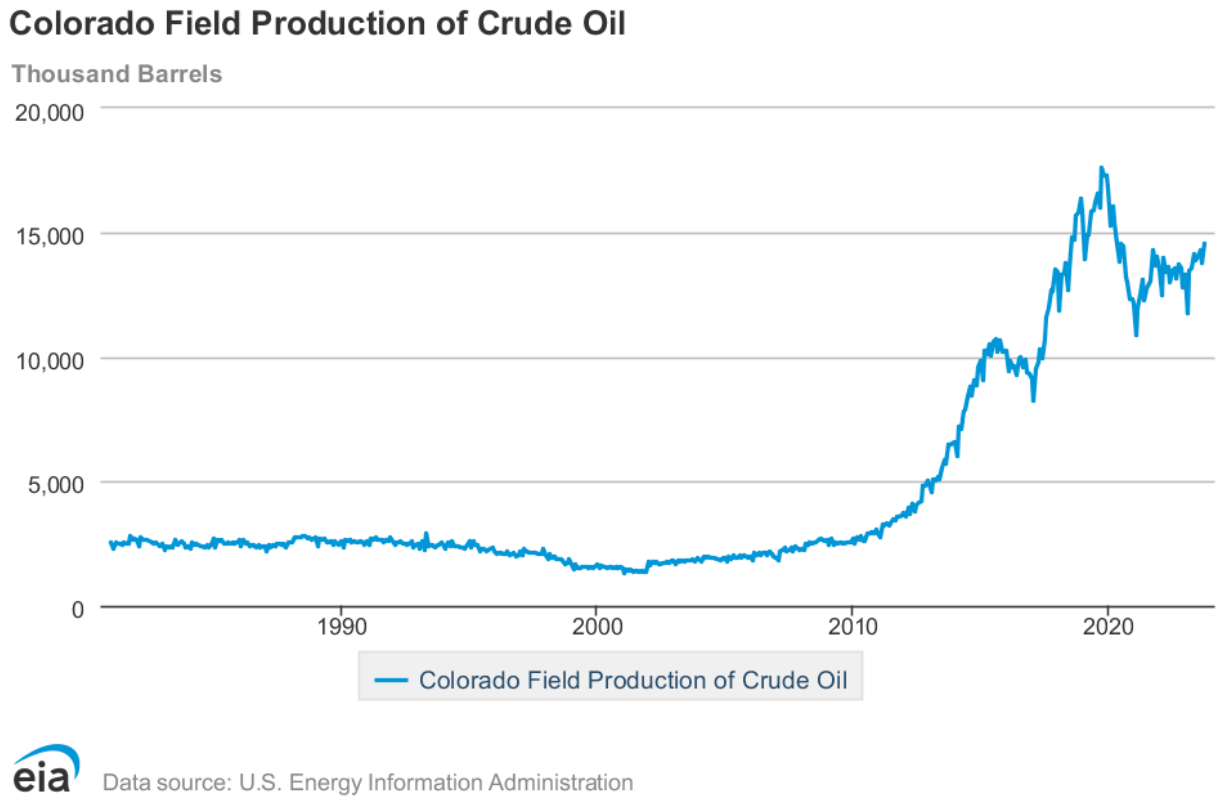
Figure 5-2. Number of Active Wells by County



5.2 Oil Production

ECMC estimates that statewide oil production for 2023 was approximately 163.5 million barrels (MMbbls) of oil produced. As shown in Figure 5-3, the production high (all-time) was in 2019 of nearly 193 MMbbls. According to the U. S. Energy Information Administration (EIA), Colorado accounts for approximately 3.5% of the total crude oil produced in the United States. It ranks 4th among states in production as of August 2023.

Figure 5-3. Colorado Field Production of Crude Oil



While the rapid growth in production rates reflects the increase in horizontal well development, these horizontal wells experience rapid production decline rates (estimated to be from 30% to greater than 50%) in the first year of production. From 2011 through 2019, production decline rates were offset by new drilling; however, the decrease in new well drilling starting in 2020 and continuing through 2022 is reflected in the drop in cumulative production after 2019. In the longer term, estimates indicate the Niobrara Formation may contain as much as 2 billion barrels of oil, with the Denver-Julesberg (DJ) Basin being the 5th largest liquid resource in the U.S. based on proven reserves.

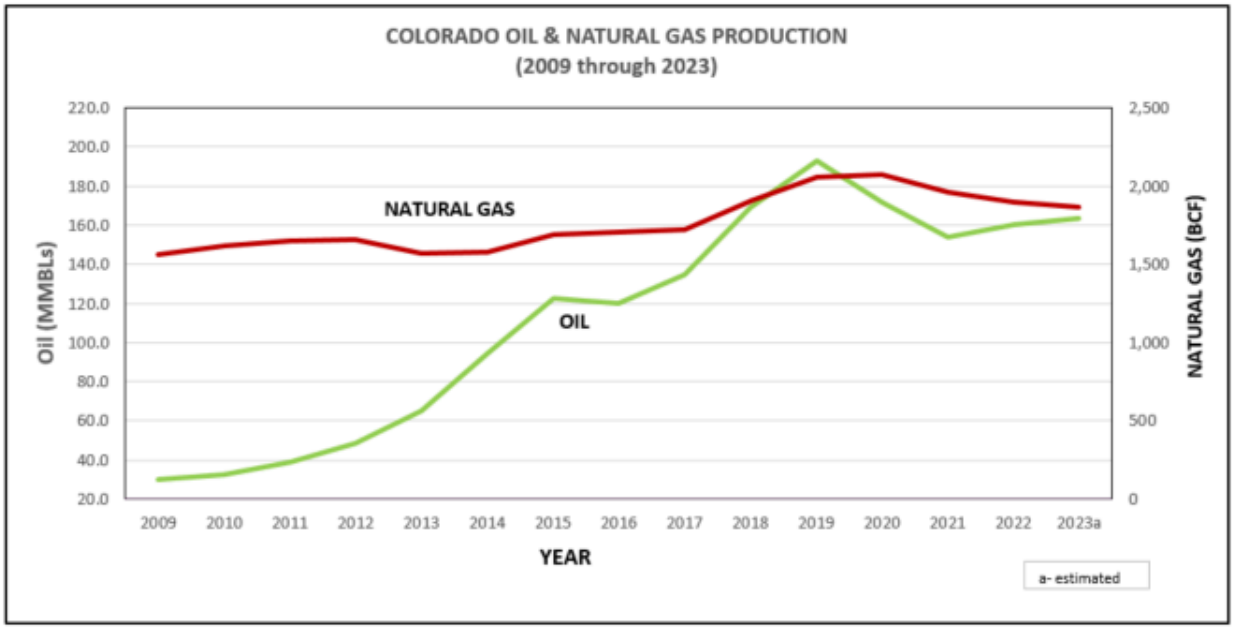
5.3 Natural Gas Production

In 2022 and 2023, Colorado was ranked eighth in the nation for marketed natural gas production. The EIA estimates that conventional and unconventional output from Colorado basins accounts for 4.2% of the total annual U.S. natural gas production. The state contains 11 of the largest natural gas fields in the country, leads the nation in gross withdrawals from coalbed methane (CBM) wells, and contains almost a quarter of the economically recoverable coalbed methane in the country.

The ECMC estimates that approximately 1.87 trillion cubic feet (tcf) of natural gas were produced in Colorado in 2023. This volume is on track to be slightly less than the production in 2022, down from the all-time highest production record of 2,070 tcf in 2020.

Since 2010, while Colorado's oil production has dramatically increased from 30 million bbl to the current levels, natural gas production has remained relatively flat (Figure 5-4).

Figure 5-4. Colorado Oil and Gas Production 2009 - 2023



5.4 Economic Value

The ECMC estimates the total dollar value for combined oil and natural gas produced in Colorado in 2023 to be approximately $16 billion – 37.5% lower than in 2022. In this estimate, ECMC used $66.9 per bbl for oil and $2.60 MMCF for natural gas. This decrease in production value results from the lower oil and natural gas prices in 2023 despite an increase in oil production and a decrease in natural gas production[4] (Leeds School of Business, 2023). The combined production value was $25.6 billion in 2022, $15.7 billion in 2021, $9.4 billion in 2020, $15.3 billion in 2019, $16.3 billion in 2018 and $11.4 billion in 2017.

5.5 Total State Well Count vs Well Plugging and Abandonment

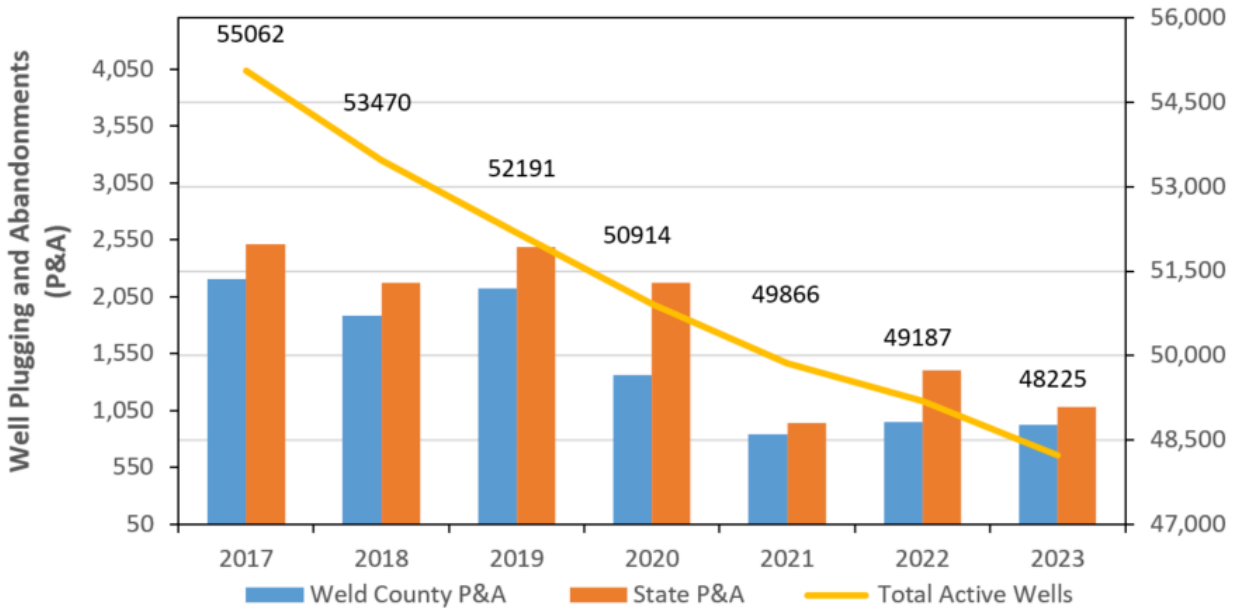
A total of approximately 1,072 wells were plugged and abandoned (P&A) statewide in 2023, bringing the state active well count down to 48,224; a significant decrease from the all-time high active well count of 55,062 in 2017. Since 2017, approximately 12,750 wells have been P&A'd state-wide.

Weld County continues to lead the state in well P&A activities, with approximately 916 wells plugged in 2023, slightly below the 950 wells plugged in 2022. The ongoing horizontal development in the GWA Field (primarily in Weld County) has resulted in many older conventional wells being plugged.

Figure 5-5 shows the overall decline in total active well count each year since 2017, with bars representing the number of wells plugged annually statewide and in Weld County.

[4] Leeds School of Business, 2023, Fifty-Ninth Annual Colorado Business Economic Outlook 2023: Leeds School of Business, University of Colorado Boulder, 167 pgs.

Figure 5-5. Well Plugging and Abandonment and Total Active Wells 2017 – 2023



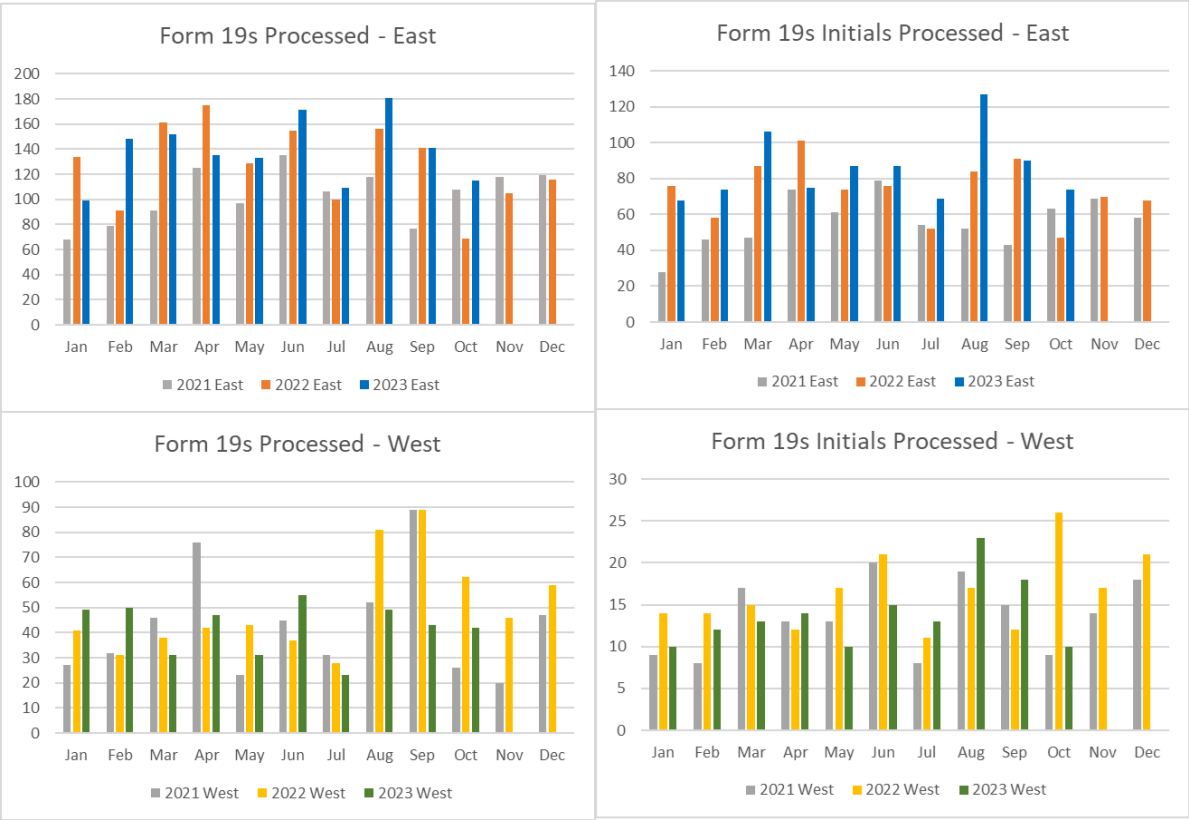
6.0 Statewide Spills/Releases, Remediation Projects, and Environmental Investigations

Operators are required to report spills and releases of E&P waste and produced fluids that occur as a result of oil and gas operations in accordance with ECMC Rule 912 using a Form 19 – Spill/Release Report. Reporting is required for all types of produced fluids and E&P waste, although oil, condensate, and produced water are the most commonly spilled or released substances. These substances fall under the E&P waste exemption to regulation as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA); therefore, they are subject to ECMC jurisdiction. ECMC defines spills as "any unauthorized sudden discharge of E&P waste to the environment" and releases as "any unauthorized discharge of E&P waste to the environment over time." From a practical standpoint, spills are incidents found while or shortly after they occur, and releases are found long after they occur and include historical impacts associated with past oil and gas operations that may be found during facility decommissioning.

Through December 31, 2023, a total of 1,189 spills/releases were discovered and reported to the ECMC for the calendar year. In comparison, there were 1,050 spills in 2022, 851 spills in 2021, 476 spills in 2020, 639 spills in 2019, and 578 spills reported in 2018. There are two primary reasons for the significant increase in reported spills observed in 2021 and 2022. First, the Mission Change Rules (as required by SB 19-181) went into effect on January 15, 2021; as updated, Rule 912 included several new reporting thresholds for spills. Second, as amended, Rule 911 required Operators to submit Form 27 remediation plans to document the closure of all facilities when wells are plugged, and related production facilities (including flowlines) are decommissioned. In the past, there was no formal requirement for closure documentation except for pits and partially buried vessels. During these closure events, operators are now documenting historical releases through Form 19 and then closing them through their site investigation and remediation process.

The number of Initial Form 19s (new spills or releases) has risen sharply in the eastern half of the state where most plugging and abandonment activity is occurring. A direct result of better environmental oversight during P&A and facility decommissioning activities is an increase in reported spills and releases. Figure 6-1 shows the number of all Form 19s processed in the past three years.

Figure 6-1. 2020-2023 Spill Reporting



Per the MOA for Response to Spills/Releases to Surface Water, the ECMC notifies the WQCD of spills or releases impacting surface waters. Additionally, Rule 912.b.(9) requires operators to report a spill or release of any size that impacts or threatens to impact surface water to the CDPHE spill reporting hotline. As of October 2023, five spills or releases to surface waters were reported to WQCD staff. ECMC and WQCD staff coordinate the follow-up and oversight of these spill cleanups, including enforcement for any rule violations that led to or resulted from the spill or release.

As of December 2023, 47 spills or releases were reported that either impacted or threatened to impact groundwater. Of those 47 spills or releases, 33 were historical releases (32 located in the eastern portion of the state and 1 in the western portion), and 14 spills were recent spills (11 of those recent spills were in the east and 3 in the west).

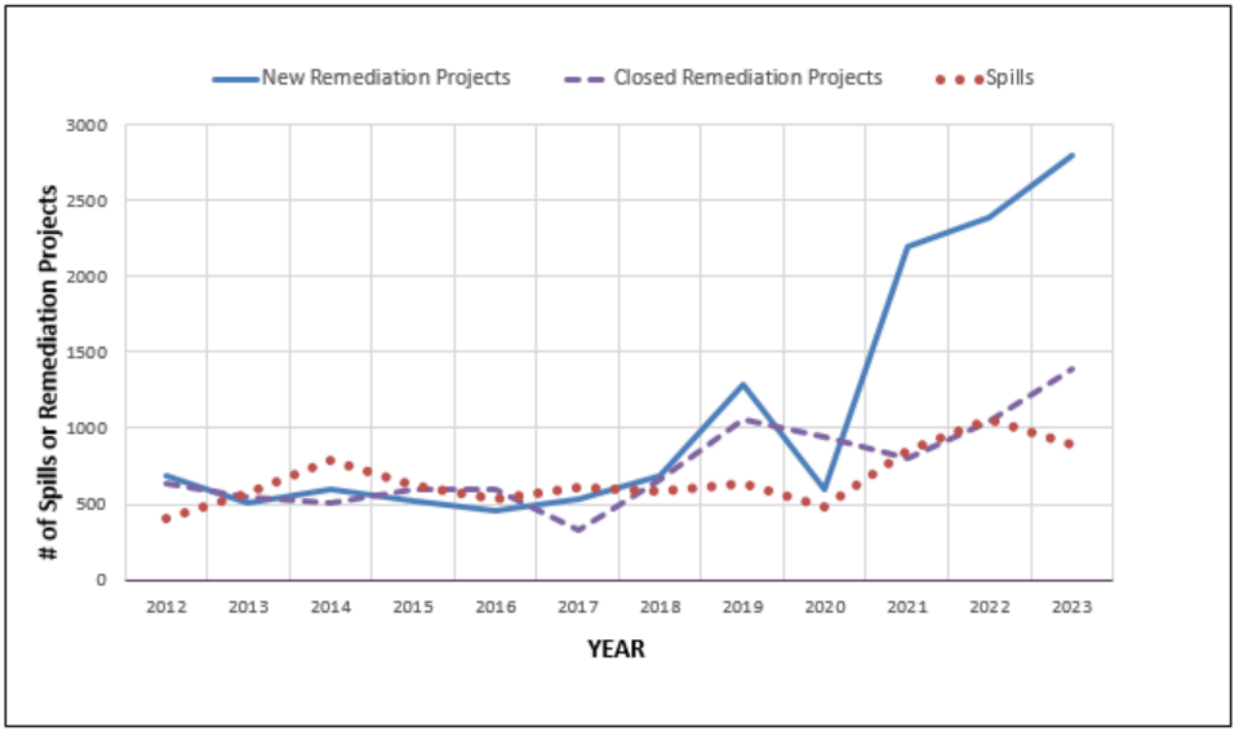
Where groundwater has been threatened or impacted, operators are required to:

- Immediately eliminate any ongoing spill,
- Investigate the extent of contamination,

- Remove the source of contamination (such as impacted soils in contact with groundwater or liquid phase hydrocarbon product),
- Establish points of compliance,
- Remediate to the extent practicable, and
- Monitor any remaining contaminant levels until contaminants of concern comply with Table 915-1 Standards and Regulation 41 Groundwater Quality Standards.

In 2023, 888 spills and releases were closed. Spills and releases are considered “closed” when soils and groundwater have been demonstrated to meet the cleanup criteria of Table 915-1 or when the operator requests to continue their site investigation and remediation under an approved work plan. Spills and releases that impact groundwater are closed through the latter process due to the duration of the remediation projects, and as required by rule. Figure 6-2 shows the number of spills and remediation projects from 2012 through 2023. A significant increase in new remediation projects was observed after Senate Bill 19-181 took effect on January 15, 2021. Due to this rule change, operators are required to submit Site Investigation and Remediation Workplans (Form 27s) for decommissioning oil and gas facilities. Operators must demonstrate that each site complies with analytes listed in Table 915-1.

Figure 6-2. Spills and Remediation Projects (2012 through 2023)



Remediation projects are tracked in the ECMC's database and can be accessed on the ECMC website. Through October 2023, the ECMC received 2,796 new remediation plans and closed 1,388 remediation projects. Figures 6-3 and 6-4 show the number of active remediation projects in the east and west halves of the state, respectively. These charts show a dramatic increase in active remediation projects in the eastern half of the state, reflecting the significant P&A activity--including facility decommissioning--in the DJ Basin and a more minor but still significant increase in active remediation projects on the western slope. In addition to the growing number of active remediation projects, ECMC is also monitoring hundreds of ongoing cleanup projects statewide, reflected in the relatively flat lines of "Update/Monitoring Report Due" in each graph. In all, ECMC staff processed over 8,970 Form 27s in 2023.

Figure 6-3. Eastern Colorado Remediation Projects

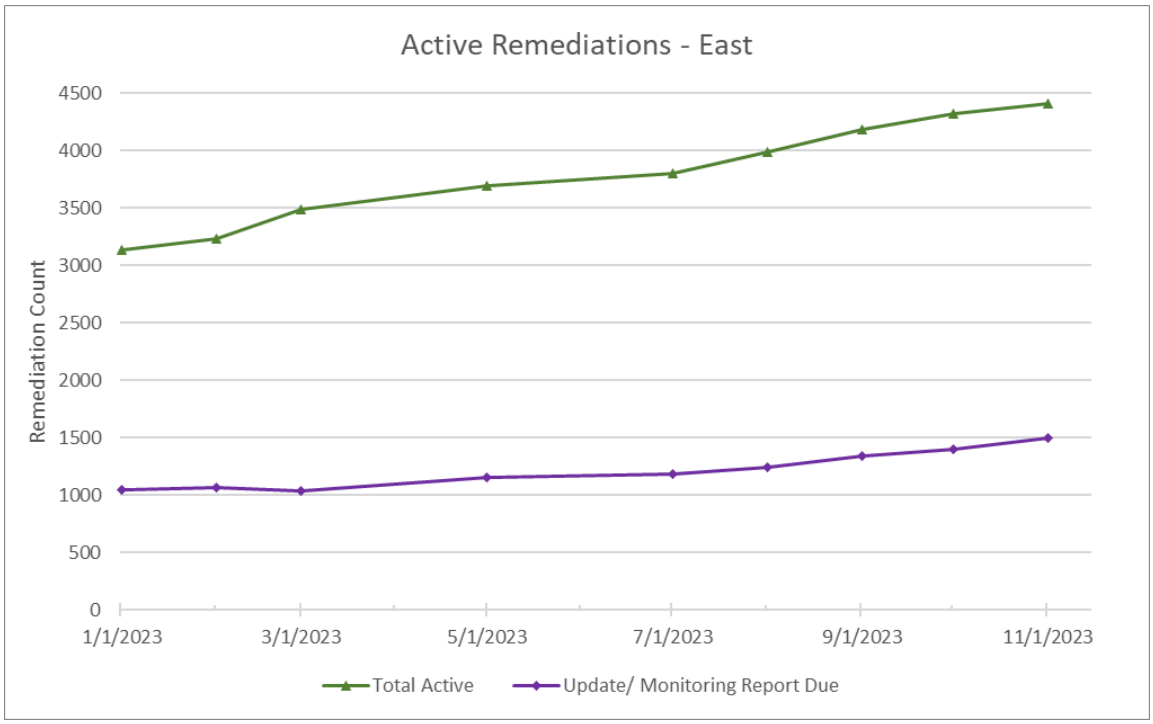
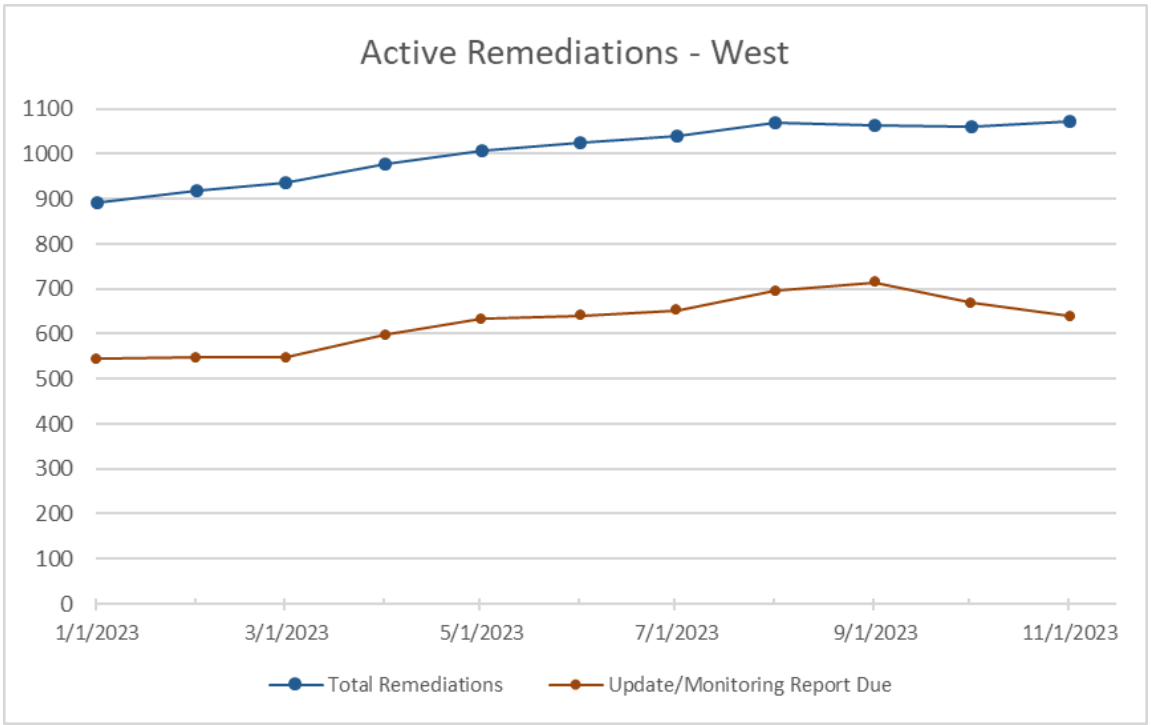


Figure 6-4. Western Colorado Remediation Projects



As previously stated, the new spill reporting thresholds and facility closure requirements have resulted in a substantial increase in the number of spills reported on Form 19s and the number of investigation and remediation projects established and reported on Form 27s. The significance of this increase indicates a measurable way to better protect the environment and groundwater resources at the end of the life of an oil and gas development project and a decreased risk of residual contamination being left in place for a surface owner or developer to discover later. Because of the required site assessments performed to document facility closure, more spills/releases were found and reported. As of October 2023, Colorado had 345 active spills (230 in the East and 115 in the West) and 637 historic spills (614 in the East and 23 in the West).

Through October 2023, 216 spills or releases were discovered and reported at wellheads during plugging and abandonment compared to the 204 spills or releases reported in 2022. Before 2021, these historic releases might not have been discovered or reported because there was no closure assessment required directly at the wellhead; the documentation of cleanup of these spills or releases is a net positive for the environment and groundwater protection, despite the numeric increase in spills reported.

APPENDIX 1

ECMC Organizational Chart