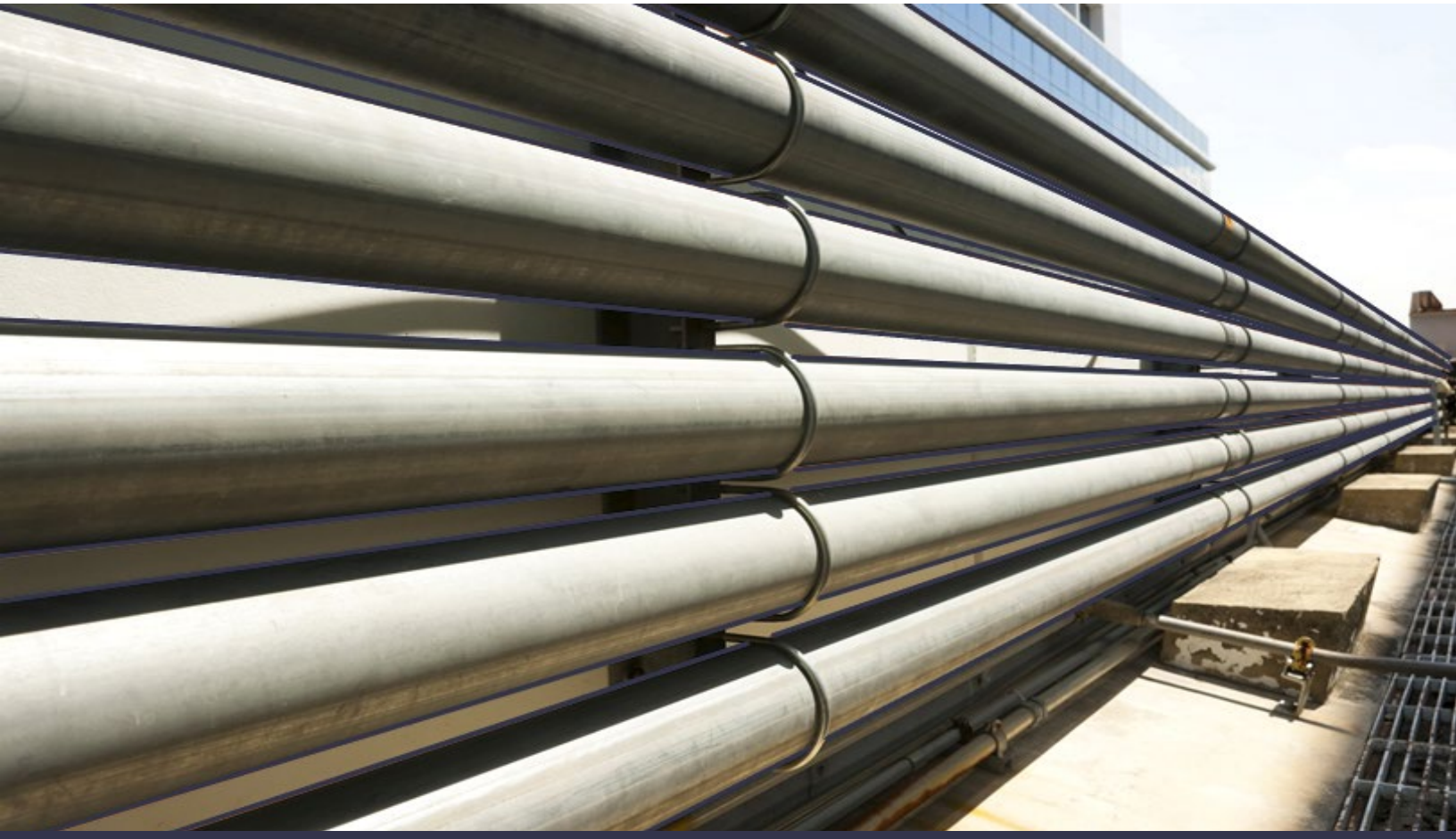
Kiefner

Final No. 24-800001-6000840R

Pipeline Report for the State of Colorado: Considerations for Pipeline Safety and Siting

December 1, 2024



Accommodation statement: The State of Colorado is committed to providing equitable access to our services to all Coloradans. Please contact Sienna Madurski (sienna.madurski@state.co.us or 720-450-0133) for personalized accessibility assistance using this document, which is an 81-page descriptive report assessing pipeline safety and siting in the State of Colorado and includes text, figures, and tables. We will contact you directly within three business days. Visit our accessibility webpage for more information and services, including AIRA, our free service for blind and low-vision users.

The remainder of this page is

Intentionally blank

Final Report

Final No. 24-800001-6000840R

An Administrative Report
to
Colorado ECMC
on
December 1, 2024

Prepared by

Rick Sugden, CP2
Principal Engineer

Approved by

Dyke Hicks
Director of Operations

Kiefner and Associates
14143 Denver West Parkway, Suite 100
Golden, CO 80401

Disclaimer

This document presents findings and recommendations based on engineering services performed by Kiefner and Associates, Inc. employees. The work addressed herein has been performed according to the authors' knowledge, information, and belief per commonly accepted procedures consistent with applicable standards of practice and is not a guarantee or warranty, either expressed or implied.

The analysis and conclusions provided in this report are for the sole use and benefit of the Client. No information or representations contained herein are for the use or benefit of any party other than the party contracting with Kiefner. The scope of use of the information presented herein is limited to the facts presented and examined, as outlined within the body of this document. No additional representations are made regarding matters not explicitly addressed in this report. Any facts or circumstances not described or considered within this report may change the analysis, outcomes, and representations.

Table of Contents

List of Tables

List of Figures

Intentionally blank

SPECIAL THANKS TO CONTRIBUTORS

Special thanks for project contributions, research, coordination, and management:

Ellice Devine (ECMC)

Special thanks to the following individuals for project planning, management, stakeholding, and editing:

Michael Rigby (ECMC), Casey Hensley (PSP), Charles Shikany (PSP)

Special thanks to the following individuals for providing information, feedback, revisions, formatting, and support for this report:

Energy and Carbon Management Commission (ECMC):

Alex Acks, Dave Andrews, Diana Burn, Mike Cross, Greg Deranleau, Jeremy Ferrin, Marie Hoerner, Mike Leonard, Mike Longworth, Joe MacLaren, John Morgan, Julie Murphy, Eric Nickell, Conor Pesicka, Mark Schlagenhauf, Steve Wheeler

Colorado Public Utilities Commission (PUC):

Pam Fischhaber, Rebecca White

Governor's Office:

Mark Silberg

Special thanks to the following groups/organizations who participated in the stakeholder process:

Adams County, Alaska Division of Oil and Gas, American Petroleum Institute (API), Air Quality Control Division (AQCD), Chevron, Citizens for a Healthy Community, City of Aurora, CO811, Colorado Communities for Climate Action (CC4CA), Colorado Department of Transportation (CDOT), Colorado Department of Public Health and Environment (CDPHE), Colorado Oil and Gas Association (COGA), Colorado Parks and Wildlife (CPW), Colorado Produced Water Consortium (CPWC), Colorado School of Mines, Colorado Springs Utilities, Colorado State Land Board, Conservation Colorado, Earthworks, Environmental Defense Fund, Environmental Justice (EJ), Federal Energy Regulatory Commission (FERC), Flowstate Pipeline Leak Detection Solutions, Green Latinos, Hazardous Materials and Waste Management Division (HMWMD), Iowa Utilities Commission, Kinder Morgan CO_2, Methane Emissions Technology Evaluation Center (METEC), National Forest Service, Oxy, Pipeline Association for Public Awareness (PAPA), Pipeline Safety Trust, Pipeline and Hazardous Material Safety Administration (PHMSA), Sierra Club Colorado, Town of Erie, Tristate Gas Transmission Association (TGT), Underground Damage Prevention Safety Commission (UDPSC), Weld County, Williams, and Water Quality Control Division (WQCD).

LIST OF ACRONYMS

API	American Petroleum Institute
AQCD	Air Quality Control Division
AVO	Audio, Visual, and Olfactory
BBLS	Barrels
BLM	Bureau of Land Management
C.F.R.	Code of Federal Regulations
C.R.S.	Colorado Revised Statutes
CCR	Code of Colorado Regulations
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilization, and Storage
CDPHE	Colorado Department of Public Health and Environment
CGA	Common Ground Alliance
CO811	Colorado 811
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife
CPWC	Colorado Produced Water Consortium
CUP	Conditional Use Permit
DI	Disproportionately Impacted
DIRT	Damage Information Reporting Tool
DJ	Denver-Julesburg
DNR	Department of Natural Resources
DOT	Department of Transportation
E&P	Exploration and Production
ECMC	Energy and Carbon Management Commission
EJ	Environmental Justice
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GSOC	Gopher State One Call
H_2	Hydrogen
HB	House Bill
HMWMD	Hazardous Materials and Waste Management Division
LAP	Location Assessment for Pipelines
LEPA	Liquid Energy Pipeline Association
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
MAOP	Maximum Allowable Operating Pressure
MOU	Memorandum of Understanding
NAPSR	National Association of Pipeline Safety Representatives
NARUC	National Association of Regulatory Utility Commissioners
NGA	Natural Gas Act
NOAV	Notices of Alleged Violation
NPMS	National Pipeline Mapping System
OGMP	Oil and Gas Midstream Permit
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration

PHMSA	Pipeline and Hazardous Materials Safety Administration
PSP	Pipeline Safety Program
PUC	Public Utilities Commission
ROW(s)	Right(s)-of-Way
SB	Senate Bill
SBP	Statement of Basis and Purpose
SLB	State Land Board
SMYS	Specified Minimum Yield Strength
U.S. DOT	U.S. Department of Transportation
U.S.C.	United States Code
UDPSC	Underground Damage Prevention Safety Commission
UNCC	Utility Notification Center of Colorado
UNGS	Underground Natural Gas Storage
UNGSF	Underground Natural Gas Storage Facility
WQCD	Water Quality Control Division

ADMINISTRATIVE REPORT

1. EXECUTIVE SUMMARY

Kiefner and Associates, Inc. (Kiefner) prepared this report with input from the Colorado Energy and Carbon Management Commission (ECMC) and Public Utilities Commission (PUC) to address the legislative directive for a pipeline study within Senate Bill 23-285 (SB23-285) and in response to a request for proposal issued by the State of Colorado, Department of Natural Resources (DNR). The study identifies jurisdictional gaps, analyzes existing safety regulations, reviews regulatory strategies, and evaluates resource needs for safe and protective oversight of intrastate pipelines and flowlines.

This report summarizes findings and provides recommendations and considerations for pipelines to the State of Colorado, ECMC, and the Colorado Public Utilities Commission's (PUC) Pipeline Safety Program (PSP). Federal, state, and local regulations related to pipeline safety and siting in Colorado were reviewed, comparing them with "peer" states. As a part of the study, ECMC and PUC consulted with other state agencies, local governments, environmental justice organizations, operators, universities, professional trade organizations, and other relevant stakeholders, resulting in over 40 meetings. Specifically, the study reviewed county regulations and national efforts to manage local pipeline safety and siting oversight. In addition, relevant federal and state agency requirements, legal cases, and Colorado's unique approach to regulating flowlines were evaluated. Note that this study does not explicitly address pipelines located on tribal lands. The resulting recommendations aim to enhance public health and safety, protect environmental and wildlife resources, and offer potential actions for consideration by the Colorado General Assembly, the PSP under the Colorado PUC, and ECMC.

Since the discovery of abundant oil, natural gas, and other fluids, pipelines have been the safest, most efficient means of transporting this energy and other fluids. With the development of cleaner energy sources and carbon management solutions, including carbon capture and storage (CCS), hydrogen fuels, and renewable fuels like sustainable aviation fuel, pipeline transportation and safety will continue to play an important role for the foreseeable future. Carbon dioxide capture is an emerging technology that aims to decrease greenhouse gas emissions, in which the captured carbon dioxide can be sequestered for long-term storage or reused in industrial or other processes. Pipelines will likely be transporting carbon dioxide from the point of capture to the sequestration or reuse location.

Many terms describe pipelines based on their function or position in the industry. Interstate and intrastate pipelines delineate pipelines that do or do not cross state lines. Flowlines, gathering, transmission, and distribution pipelines are functional descriptions of pipelines, while upstream, midstream, and downstream pipelines are based on where the product is in the market chain.

The relevant regulatory agencies that oversee pipeline safety in Colorado include the Pipeline and Hazardous Materials Safety Administration (PHMSA), the Federal Energy Regulatory Commission (FERC), Colorado Pipeline Safety Program (PSP) under Colorado PUC, ECMC (formerly known as the Colorado Oil and Gas Conservation Commission), Colorado Department of Public Health and Environment (CDPHE), and the Environmental Protection Agency (EPA).

These agencies are empowered by law to regulate, inspect, and enforce the requirements for developing, maintaining, and operating pipeline infrastructure.

Colorado contains excellent geology for the long-term development of oil and gas and caverns suitable for hydrogen and carbon dioxide storage. Pipeline infrastructure is necessary to transport these products safely. As of 2023, Colorado has over 15,000 miles of flowlines, over 5,000 miles of regulated gas-gathering pipelines, and over 8,000 miles of reporting-only gas-gathering (Type R) pipelines. Over 7,700 miles of gas transmission pipelines are transporting natural gas, with over 58,000 miles of gas distribution lines sending natural gas to homes and businesses. The state has over 5,000 miles of hazardous liquid pipelines, including over 200 miles of carbon dioxide pipelines. Colorado has 10 underground natural gas facilities and 11 reservoirs with 260 natural gas storage wells.

The siting of a pipeline as it is routed from its origin to its destination often includes passing in or near homes and businesses. With urbanization, residential, or commercial development often encroaching upon already existing pipeline locations or corridors, an operator must manage safety at a higher level while operating pipelines that pre-exist developments. Colorado legislature has recently given local counties authority through SB19-181 to site the pipelines' locations within their jurisdictions' boundaries when not preempted or overruled by an interstate-designated pipeline whose siting is approved by the FERC.

Safety risks in the siting of a pipeline vary significantly depending on the design, construction, operation, and product being transported. Pipeline design, installation, and operation details can be quite technical, and which regulatory agencies oversee which pipelines can be a complex question. These factors lead to public confusion, often exacerbated by both perceived and, in some cases, real lack of transparency. A web of regulatory agencies has varying levels of oversight and covers different types of pipelines depending on their individual jurisdiction.

SB23-285 expanded and changed the Colorado Oil and Gas Conservation Commission (COGCC) regulatory authority, renaming it to ECMC to better describe its new responsibilities. The legislation also authorized this study of the regulatory framework of pipeline siting and safety. Through the lens of safety, this study was directed to seek any potential regulatory gaps and develop recommendations to improve, if necessary, the protection of public health, safety, and welfare, including the protection of the environment and wildlife resources while avoiding adverse impacts on disproportionately impacted (DI) communities and considering the potential cumulative impacts of current and emerging technologies.

The study found that pipeline siting and safety in Colorado involved a complex interplay of federal, state, and local jurisdictions. At the federal level, PHMSA administers safety regulations for interstate hazardous pipelines and all non-exempted hazardous liquid pipelines. On a state level, ECMC and PSP have authority over different aspects of the safety of intrastate pipelines. ECMC administers safety regulations for oil and gas flowlines and produced water flowlines. PSP administers safety regulations for intrastate natural gas gathering, transmission, and distribution pipelines.

FERC regulates the siting and tariffs for interstate natural gas pipelines and preempts local and state jurisdictions. SB19-181 granted authority to local counties in Colorado to regulate the siting of intrastate pipelines. Delegating pipeline siting authority to local counties has resulted in inconsistent and sometimes conflicting regulations. This decentralization poses challenges for pipeline operators and may hinder the development of necessary energy infrastructure. The lack

of a unified siting framework increases the risk of legal disputes and complicates operator compliance.

This study supports the assessment that more cohesive regulation of gathering pipelines within the state would benefit and improve public safety. Colorado can enact stricter requirements on intrastate pipelines than the minimum safety requirements in 49 C.F.R. 192. Colorado has already applied more stringent requirements on flowlines previously unregulated by PHMSA in the wake of the 2017 Firestone Explosion, though data accuracy, transparency, and enforcement, remain areas for improvement. Intrastate pipeline failures have slightly increased in recent years, and additional steps are recommended to reverse this trend.

An analysis of pipeline incident data revealed that Colorado's pipeline safety performance is comparable to that of states with similar pipeline mileage and infrastructure (Colorado's "peer states"). Primary causes of incidents in Colorado include excavation damage, corrosion, and material or equipment failure. The comparison to the "peer" states revealed variability within safety records, levels of regulatory transparency, state-specific safety initiatives, and different balances of resources for pipeline oversight. Currently, Colorado's PSP staffing levels are slightly below average compared to these "peer" states, although efforts are underway to replace retired and departing staff with several open positions.

This study included input from a diverse panel of stakeholders and subject matter experts, and this process identified several regulatory and safety gaps that should be considered for improvement:

- **Data Quality and Transparency**: ECMC and PSP lack robust quality assurance programs, leading to data collection and reporting inaccuracies. A lack of quality assurance and controls hampers effective oversight, public transparency, and trust.
- **Mapping and Locational Data**: Inaccurate or incomplete pipeline mapping increases the risk of excavation damage and impedes emergency response and public awareness efforts.
- **Corrosion Control**: Internal corrosion is a leading cause of gas gathering and flowline system failures. Current regulations do not adequately address corrosion control measures for these pipeline types.
- **Jurisdictional Overlaps and Confusion**: The division of regulatory authority among multiple agencies and local governments creates confusion among the public and industry and potential duplication of efforts within agencies.
- **Resource Constraints**: As federal and/or state rules expand, ECMC and PSP may lack sufficient staffing and resources to oversee pipeline safety and effectively enforce regulations.
- **Damage Prevention**: Excavation damage is the leading cause of pipeline failures in gas distribution pipelines. Studying the root causes of excavation damage to identify what regulatory changes should be implemented to reduce infrastructure damage.
- **Emerging Technologies**: The regulatory framework and statutory language do not fully address the transportation of emerging energy resources and carbon management, such as hydrogen and carbon dioxide sequestration and storage. These are expected to become more prevalent.

1.1 Conclusions and Recommendations

Colorado pipeline safety is average compared to its peers and above average nationwide. However, there is always room for improvement in pipeline safety, including learning from "peer" states. Transparency is paramount for success, and quality assurance is necessary to justify regulation changes and improve public and industry trust. The public deserves to understand and appreciate the resources and efforts to provide the energy they need in a safe and reliable pipeline transportation industry and know that regulators have quality data used to make informed decisions. Improving communication and awareness and enhancing the efficiency of regulatory agencies is a challenging and necessary task. Understanding the root causes of failures when they occur and preventing future occurrences is fundamental to improving the safety and protection of the vital environmental landscape.

The following recommendations are proposed to address these challenges and improve pipeline siting and safety oversight. These recommendations also align with the Carbon Management Roadmap, which outlines the necessary infrastructure, policies, and incentives to support carbon management in the state. Should the state decide to pursue these recommendations, further collaboration and discussion with state agencies are necessary to determine the next steps and consider a legislative proposal in 2026.

1. **Establish a Pipeline Information Office/Group/Program**: Create an office/group to improve coordination across agencies, stakeholders, and the public. Improve data transparency, public education, and communication related to pipeline infrastructure in the state. Consider where in the state government this group should reside and the funding mechanism(s) for program implementation. This program could:
    a. Serve as a central hub for information and educational materials, including pipeline siting, safety, regulatory processes, jurisdictional information, and contact information for relevant agencies, local governments, and first responders.
    b. Encourage statewide communication across agencies and jurisdictions and liaise, as necessary, between federal, state, and local agencies.
    c. Encourage and implement, as appropriate, safety and communication initiatives in collaboration with stakeholders, operators, and pipeline organizations that could include working groups, grants, emergency response efforts, training, or other items or actions related to pipelines across the state. For instance, training resources and coordination related to emergency response for both emerging and existing industries could benefit all involved parties. This could include the state pursuing related federal grants.
    d. Utilize funding and resources for cross-training among state and local agencies and departments to improve coordination, reduce regulatory duplication, and ensure safety across all operations, including emerging industry considerations.
    e. Develop a user-friendly website containing centralized mapping resources, detailed information on local siting requirements, opportunities for training and public input, and educational materials to enhance public understanding of pipelines in Colorado.

f. Include representatives from agencies/organizations across the state (PUC, ECMC, UDPSC, CO811, etc.) to ensure accurate agency information and appropriate incorporation of the interests of existing state agencies into this program's strategies.

2. **Address Damage Prevention:** Consider further data acquisition and study of root causes of excavation damage to identify if and how regulations or strategies should be altered to reduce infrastructure damage. The Underground Damage Prevention Safety Commission (UDPSC) should be consulted in this effort.
3. **Address Corrosion Control**: Perform an in-depth study of Colorado-specific corrosion failures. Understanding the necessary regulations that should be implemented to control corrosion is recommended. Effective corrosion control for flowline and gathering pipelines will reduce environmental releases but must be based on quality data with informed decision-making.
4. **Standardize Pipeline Siting Regulations**: Consider standardizing baseline siting regulations, in consultation with stakeholders, for local county authorities to utilize for pipeline siting. The state could provide a forum for information sharing across jurisdictions and provide information on standards to help inform local jurisdictions on pipeline siting strategies, ensure proper communication, and develop cohesive processes across jurisdictional boundaries. This could help encourage clarity in the pipeline siting process without reducing local autonomy.
5. **Update Revised Statutes:** The General Assembly should consider updating the revised statutes to include definitions and scope for hydrogen, carbon dioxide, and geothermal oversight. This could include clarifying existing PUC/ECMC jurisdictions to ensure all applicable lines are covered, and the agencies have the proper authority to safely and effectively regulate infrastructure related to emerging energy industries. The Colorado hydrogen[1] and carbon dioxide[2] studies also pointed out this gap. The impending geothermal regulatory study will also discuss this issue.
6. **Further Investigation into Pipeline Mapping and Rights-of-Way (ROWs)**: Further investigation may be necessary to establish a statewide mapping strategy to appropriately centralize mapping information, review existing ROWs, and consider corridors for future development in emerging energy industries, such as carbon capture utilization and storage (CCUS), geothermal, and hydrogen.

   Various strategies for location data acquisition and pipeline mapping exist through state and federal agencies. Any strategy must incorporate existing strategies through ECMC/PUC and National Pipeline Mapping System (NPMS) and ensure efficient processes are not overly burdensome for industry or the state.

   Data transparency is important but must be balanced properly with infrastructure security risk, and strategies must be informed by a wide range of stakeholders.

[1] ECMC, Colorado Regulation of Underground Storage and Transportation of Hydrogen. July 2024. https://ecmc.state.co.us/documents/library/GTCCSUNGS/Colorado_Regulation_of_Underground_Storage_and_Transport_of_Hydrogen.pdf

[2] ECMC, Carbon Capture and Storage: Safety and Impact Considerations from Source to Sequestration. February 2024. https://ecmc.state.co.us/documents/library/GTCCSUNGS/CCUS_Safety_Study_Report_Final_20240227.pdf

Development of new industries could leverage existing ROWs, where applicable, to reduce impact, and the state could play a role in compiling data and expediting processes as necessary.

The following recommendations to ECMC are proposed to address challenges and improve pipeline oversight by ECMC for safety:

1. **Implement Quality Assurance Programs**: Continue to enhance the established quality assurance program for data accuracy and reliability. ECMC has reported an effort is underway to bring this recommendation into its processes. A quality assurance program increases the public and industry's confidence in the agency's recommendations and rulings. A robust quality program will allow ECMC to effectively target the root causes of incidents and the director's enforcement actions. Proposed rulemakings will be defensible based on accurate quality-controlled data to improve jurisdictional pipeline safety and reliability.
2. **Enhance Risk Assessment Models**: Update and refine the risk assessment methodologies to prioritize inspections and regulatory actions. ECMC is currently working with the Colorado School of Mines to develop improved risk methodologies to enhance this process. These efforts should continue until a robust risk assessment process is validated and implemented. ECMC should evaluate whether current data collection practices are sufficient for accurate risk modeling and assess the resources needed to vet information provided by operators. Robust risk assessments improve pipeline safety by effectively using resources to target higher-risk assets for inspection and compliance actions.
3. **Require Root-Cause Investigations**: Update regulations to include reporting root-cause analyses of flowline spills/releases in cases where the immediate cause cannot be determined and enforce preventive measures to mitigate similar future failures. Reduction of incidents involving spills and releases requires proactive measures to address the root causes of failures in the remaining pipe, not solely the current failure location.
4. **Improve Data Transparency**: Update websites to provide operators, regulators, and the public with accessible incident and enforcement data. Transparency of causes, investigations, enforcement, and actions build public trust and raise the bar for industry and agencies to improve safety.
5. **Address Aging Infrastructure**: Consider strategies for addressing aging energy infrastructure while balancing existing energy needs and the transitioning energy landscape. This should include addressing operational resource constraints related to deteriorating infrastructure and should promote public health and safety, and protection of the environment and wildlife resources. This could be accomplished through a study, workgroup, or similar process to fully inform and understand the resources necessary to accomplish these goals in the context of the energy transition.
6. **Clarify Produced Water Regulations**: Engage the Colorado Produced Water Consortium to conduct further research regarding the transport and storage of produced water for reuse, identifying potential scientific, legislative, and regulatory gaps needed to develop standards that are protective of public health, welfare, safety, the environment,

and wildlife resources in Colorado while being conscious of fluid properties and associated risks, and consider strategies and potential pilot studies to inform the development of these standards.

7. **Enhance Mapping Requirements**: Impose conditions of approval for flowline spill/release reports, requiring operators to update locational data using the best horizontal location accuracy available to the operator when flowlines are exposed during activities related to the spill/release. Safety protocols to ensure operator safety during data collection should be considered. Accurate spatial data collection at all available opportunities will improve mapping over time.

The following recommendations to PSP are proposed to address challenges and improve PSP pipeline oversight for safety:

1. **Implement Quality Assurance Programs**: Enhance the existing quality assurance program to enhance data accuracy and reliability. A quality assurance program increases public and industry confidence in the agency's recommendations and rulings. A robust quality program will allow PSP to effectively target the root causes of incidents. Enforcement actions and proposed rulemakings will be more defensible based on accurate quality-controlled data to improve pipeline safety and reliability.
2. **Enhance Risk Assessment Models**: Continue to improve the risk assessment process. Modern risk assessment methodologies prioritize inspections and regulatory actions, enhancing public safety by increasing the agency's effectiveness. To expedite this enhancement to their program, PSP should consider requesting support from a contractor capable of developing a robust risk assessment process.
3. **Improve Data Transparency**: Develop websites that provide operators, regulators, and the public with accessible incident and enforcement data. Transparency of causes, investigations, enforcement, and actions build public trust and raise the bar for industry and agencies to improve safety.
4. **Expand State Oversight**: Pursue 60105 Certification to include intrastate liquid pipelines under state regulatory oversight, similar to approaches in "peer" states. Under current Colorado law, PHMSA regulates intrastate liquid pipelines unless Colorado enters into a state program agreement. Expanding state authority to include these intrastate pipelines would enable more cohesive and locally tailored regulatory practices,[3] improve pipeline safety performance, and enhance oversight of pipeline practices within the state.
5. **Enhance Mapping Requirements**: Update the rules for operators to update locational data using the best horizontal location accuracy available to the operator when jurisdictional pipelines are exposed during any activity. Safety protocols to ensure operator safety during data collection should be considered. Accurate spatial data collection at all available opportunities will improve mapping over time.
6. **Implement Leak Detection Requirements**: Update regulations to include leak detection methods for gas-gathering (Types A, B, C, and R) pipelines to reduce greenhouse gas (GHG) emissions, improve safety, and protect the environment from hydrocarbon contamination from gas-gathering fluids.

[3] Ibid.

7. **Root-Cause Investigations and Preventative Measures**: Update regulations to include root-cause investigations for pipeline failures and enforce preventative measures for gas-gathering pipelines (Types A, B, C, and R).

1.2 Final Remarks

By addressing regulatory gaps, improving data quality, and fostering stakeholder collaboration, the State of Colorado can better protect public health, safety, welfare, and the environment, while supporting the responsible development of energy resources by adopting these recommendations. A unified and proactive approach to pipeline siting and safety will position Colorado as a leader in energy infrastructure management and environmental stewardship. Technical reviews, studies, and support to further enhance and improve these recommendations based on highly qualified data and collaboration with stakeholders and subject matter experts will guide future improvements.

2. BACKGROUND

Energy powers a civilization. Efficient transport of energy sources from where they naturally reside to locations where they can be processed, refined, and distributed to those who consume that energy is vital for a thriving society. Since the discovery of oil and natural gas as abundant energy sources, engineers have found the most efficient transport method is by pipeline. Even today, pipeline transport remains the safest method of moving gas and liquids long distances, reducing traffic and GHG emissions compared to rail and truck. Regardless of the development of new energy sources like hydrogen and green natural gas, the movement to capture carbon dioxide for sequestration, or alternative uses to fight climate change, pipeline infrastructure will continue to be needed to safely and efficiently transport these products.

At a higher level, interstate pipelines transport products across state lines. These are often referred to as "transmission pipelines." Intrastate pipelines do not cross state lines and may be called flowlines, gathering, transmission, or distribution pipelines, depending on their function.

A wellhead is the uppermost point from which oil, produced water, and/or gas flow from a drilled well. As uniquely defined in Colorado, flowlines begin at a wellhead and transfer produced fluids such as oil, gas, and water to a production facility. The gas, oil, and any accumulated produced water are then separated. Gas and oil are metered and prepared for transport. Oil may be trucked to other facilities for storage, while produced water may be trucked for disposal. Gas-gathering pipelines transport gas from a production facility to a transmission line or main. Transmission lines are pipelines or connected series of pipelines that transport gas from a gathering pipeline or storage facility to a distribution center, storage facility, or large volume customer.[4] Distribution pipelines move natural gas to homes and businesses to provide power and heat. Liquid-gathering pipelines transport petroleum from a production facility to a processing facility. Processing facilities and refineries stabilize, separate,

[4] 49 C.F.R. 192.3: (1) Transports gas from a gathering pipeline or storage facility to a distribution center, storage facility, or large volume customer that is not down-stream from a distribution center; (2) Has a maximum allowable operating pressure (MAOP) of 20 percent or more of specified minimum yield strength (SMYS); (3) Transports gas within a storage field; or (4) Is voluntarily designated by the operator as a transmission pipeline.

and process these fluids into usable energy products like gasoline, diesel, jet fuel, natural gas, propane, butane, and other feedstocks used to make plastics and chemicals.

Carbon dioxide is currently used for enhanced oil recovery in production fields and transported via gathering pipelines. It may be used in transmission pipelines to move large volumes for sequestration or alternative uses. Hydrogen has the potential to become a major energy source, potentially on par with oil and natural gas in the future. Hydrogen is best transported by pipeline from its sources as a liquid to distribution pipelines as a gas, which may include blending with natural gas in existing or new pipelines.

The nation, along with Colorado, will continue to demand energy as the population grows. Colorado is uniquely positioned to develop local energy sources close to home markets along the Front Range and beyond. Pipeline infrastructure must expand to provide energy safely, reliably, and efficiently. Pipeline siting thus becomes an important topic. Pipelines can be a divisive issue, often energized by media portrayals of pipeline accidents without considering the industry's overall safety. Pipeline operators expend significant resources in developing, routing, siting, and safety of pipelines' installation, maintenance, and operation. However, operators often struggle to communicate this to their stakeholders and engage them throughout the siting and construction process. Confusion over technical terminology and the web of regulatory agencies and local governments often exacerbates this. The American Petroleum Institute (API) recently published its first edition of *Recommended Practice 1185, Pipeline Public Engagement*, to support operators in improving their processes for engaging stakeholders. This document also contains valuable guidance for agencies and governments to understand what questions to ask and how to interpret the answers.

The siting of a pipeline as it is routed from its origin to its destination often includes passing near homes, businesses, and land development that can occur after the pipeline is constructed and in operation. The Colorado legislature has given local counties authority to site the locations of pipelines within the boundaries of their jurisdictions when not preempted or overruled by an interstate-designated pipeline whose siting is approved by the FERC. Safety risks in the siting of a pipeline vary significantly depending on the design, construction, operation, and product being transported. Regulatory authority also varies depending on the pipeline's location, operation, product, and function.

Operators juggle a myriad of regulations, agencies, and governments to maintain their operations. Despite the safety regulations implemented over the last two decades at various levels of agency oversight, pipeline spills and incidents continue to occur. Although Colorado’s pipeline safety record is very similar to that of its peers, there are actions that Colorado can take to improve pipeline safety and further protect its valuable environment from contamination caused by the accidental release of energy products. This report will provide recommendations to enhance Colorado’s data collection, analysis, quality, and reporting, as well as potential regulatory steps and process changes that should improve the state’s record on pipeline safety and transparency. Transparency is crucial to public engagement, trust in the industry, and those that regulate the industry.

In 2023, SB23-285 was passed by the Colorado General Assembly and signed into law by Governor Polis. This bill changed the name of the Colorado Oil and Gas Conservation Commission to the Energy and Carbon Management Commission (ECMC). This bill developed a new mission to broaden its scope of regulatory authority to include energy and carbon

management areas beyond oil and gas; the development of geothermal energy from wells and reservoirs to fluid management; granted the Commission the authority to exclusively regulate intrastate underground natural gas storage facilities not subject to PHMSA; and, if necessary, submit certification to federal authorities to manage such facilities. Within the legislation was also a mandate to conduct technical studies on geothermal resources, state regulatory structure for those resources, and regulation and permitting of underground hydrogen operations. This study, also mandated by SB23-285, examines the siting and safety regulation of intrastate pipelines.

The scope of this study includes identifying jurisdictional gaps, analyzing safety rules, reviewing jurisdictional strategies, and assessing resource needs for safe and protective regulation of pipelines and flowlines. The study's objectives include contemplating and developing, as necessary, regulatory pathways that enable safe pipeline infrastructure in Colorado and ensure public health, safety, and welfare protection, including environmental and wildlife conservation. The objectives also include considering any potential cumulative impacts stemming from the use and siting of pipelines for current and emerging technologies within the state while preventing adverse impacts on DI communities. The study incorporates the review of many reports and legal cases and the collaborative efforts of ECMC and PSP consultation with various stakeholders identified by ECMC to ensure a comprehensive and inclusive assessment of pipeline safety regulations.

This study provides a holistic look at the state of pipeline safety and siting within Colorado, the agencies that regulate pipelines, what Colorado may consider doing to improve safety and siting, and overall address gaps or processes that impede the safe, transparent, reliable, and efficient energy development and transport within the state for the benefit of all Coloradoans. These recommendations are directed primarily to the State of Colorado, Public Utilities Commission and the Pipeline Safety Program, and the Energy and Carbon Management Commission.

Adopting these recommendations will enhance the safety and efficiency of pipeline infrastructure in Colorado. By addressing regulatory gaps, improving data quality, and fostering collaboration among stakeholders, the state can better protect public health, safety, and the environment while supporting the responsible development of energy resources. A unified and proactive approach to pipeline siting and safety will position Colorado as a leader in energy infrastructure management and environmental stewardship.

3. APPROACH

The study examined pipeline siting and safety from the wellhead to distribution, covering various segments, such as produced and recycled water, crude oil transfer lines, gas gathering, on-site and off-site flowlines, hydrocarbons, carbon dioxide, hydrogen transmission, and natural gas distribution. It also assessed safety regulations and trends within Colorado. The state's pipeline stakeholders represent a wide range of perspectives and viewpoints. ECMC conducted extensive outreach, engaging with many of these stakeholders. Feedback gathered from collaborative discussions has been incorporated into this report.

The study began with a review of the current state of pipeline safety and an analysis of federal pipeline safety incidents using state-level data from PHMSA. Colorado's incident data was then compared to 49 states to evaluate how it ranked regarding incident frequency and pipeline

mileage across various categories. By examining pipeline mileage in each state within regulated categories, the study identified 12 "peer" states for comparison. These states—Alabama, Iowa, Louisiana, Michigan, Minnesota, Missouri, New Jersey, North Carolina, Oklahoma, Tennessee, Wisconsin, and Wyoming—were selected based on their similarities to Colorado. The study also reviewed the certification status of each "peer" state with PHMSA for pipeline oversight.

Each state's specific regulations were investigated once the 12 "peer" states were identified. Federal, state, and local regulations governing pipeline siting and safety were examined, along with their legal foundations. Under the Interstate Commerce Clause, the federal government has authority over all interstate pipeline transportation safety, which PHMSA regulates. Congress has also given PHMSA the authority to specify minimum safety requirements for certain intrastate pipelines. The FERC oversees the siting of interstate natural gas pipelines. In contrast, the siting of interstate hazardous liquid pipelines, intrastate gas, or hazardous liquid pipelines falls under state or local jurisdiction, as discussed in the Assessment of Pipeline Siting Regulations. Various established legal precedents were also reviewed as they apply to siting regulations. The result was that some state regulations are more stringent than federal requirements. This includes but is not limited to Ohio Public Utilities Commission's rules on gas-gathering pipelines, Texas Railroad Commission's corrosion requirements on all pipelines, New Mexico Public Regulation Commission Pipeline Safety Bureau's safety rules, Iowa Utilities Commission's siting requirements, and California's Office of the State Fire Marshal Pipeline Safety Division hazardous liquid rule. In 2019, Colorado passed SB19-181, granting local counties the authority to regulate pipeline siting for intrastate pipelines. As a result of SB19-181, local authorities enacted regulations that vary from county to county. This study also explored the history and legal framework of eminent domain at the federal and state level.

Hazardous liquids[5], as defined by PHMSA and natural gas pipeline safety program management and administration, were reviewed as part of this study to holistically evaluate both natural gas and hazardous liquid pipeline safety within the study's scope.

The study analyzed Colorado's federally reportable incidents[6], state events[7], and enforcement actions by ECMC, PSP, and PHMSA. Pipeline and flowline damage categories and how they affect

[5] 49 C.F.R. 195.2: Hazardous liquid means petroleum, petroleum products, anhydrous ammonia, and ethanol or other non-petroleum fuel, including biofuel, which is flammable, toxic, or would be harmful to the environment if released in significant quantities.

[6] 49 C.F.R. 191.3: Incident means any of the following events: (1) An event that involves a release of gas from a pipeline, gas from an underground natural gas storage facility (UNGSF), liquefied natural gas, liquefied petroleum gas, refrigerant gas, or gas from an LNG facility, and that results in one or more of the following consequences: (i) A death, or personal injury necessitating in-patient hospitalization; (ii) Estimated property damage of $122,000 or more, including loss to the operator and others, or both, but excluding the cost of gas lost. For adjustments for inflation observed in calendar year 2021 onwards, changes to the reporting threshold will be posted on PHMSA's website. These changes will be determined in accordance with the procedures in Appendix A to Part 191; (iii) Unintentional estimated gas loss of three million cubic feet or more. (2) An event that results in an emergency shutdown of an LNG facility or a UNGSF. Activation of an emergency shutdown system for reasons other than an actual emergency within the facility does not constitute an incident. (3) An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraph (1) or (2) of this definition.

[7] 4 CCR § 723-11102(b)(III): (A) An unplanned/emergency event that occurs on the pipeline system that results in the evacuation of 50 or more people from a normally occupied building or property; (B) An unplanned/emergency event that occurs on the pipeline system that results in the closure of all lanes in either direction of a roadway or railroad; (C) An unplanned/emergency event that occurs on the pipeline system that results in the evacuation of four

operations, incident/event rates, and compliance with local, state, and federal regulations were also reviewed. The study also evaluated peer-state staffing levels to establish a baseline comparison with ECMC and PSP, considering factors, such as geographic area, number of operators, and pipeline mileage under oversight.

4. Results of Study

4.1 Evaluation of the Administrative Structure of Pipeline Siting and Safety

4.1.1 Pipeline Safety Program Authority

The State of Colorado's Pipeline Safety Authority has a basis in both Federal and State statutes. The Federal Natural Gas Pipeline Safety Act of 1968 created the fundamental authority for regulating pipeline safety in the United States. This act was formally codified into the United States Code (U.S.C.) in Title 49 [Transportation], Subtitle VIII [Pipelines], Chapter 601 [Safety]. Federal pipeline safety regulatory authority resides within the U.S. Department of Transportation (U.S. DOT) under the Secretary of Transportation.

49 U.S.C. Chapter 601 is the law upon which PHMSA bases its regulations. It is the most important foundational law created by the congressional mandate upon which all subsequent federal pipeline safety regulations are based. 49 U.S.C. § 60102(a) gives "regulatory and enforcement authority" to the Secretary of Transportation and requires the Secretary to "prescribe minimum safety standards for pipeline transportation and for pipeline facilities."

The codification of the 1968 Act and its reauthorizations into 49 U.S.C. 601 remains the most important trigger to developing pipeline safety regulations in the United States. While there have been less than 11 reauthorizations of the original act since 1968, amendments to 49 U.S.C. 601 have been made for 20 years through 2020.

The larger number of amendments versus reauthorizations reflects the continuous efforts of the U.S. DOT administrative agency, PHMSA, to clarify congressional language and intent in the numerous reauthorizations. As of the date of these guidelines, 49 U.S.C. 601 includes 43 sections: 60101 to 60143.

The explicit authority of 49 U.S.C. 601 is critical to understanding Colorado's role in its regulation and enforcement of pipeline safety. Like many health, safety, and environmental laws, 49 U.S.C. Chapter 601 creates a specific structure that supports minimum standards for all states. No state can make state-specific laws that undermine this Federal structure by creating lower standards. A state can only pass laws equal to or greater in regulatory strength.

However, even the state's ability to pass additional laws is explicitly bound by 49 U.S.C. § 60104(c) language. Each state that wishes to "adopt additional or more stringent safety standards for intrastate pipeline facilities and intrastate pipeline transportation" must first submit

---

or more residential structures; (D) An unplanned/emergency event that occurs on the pipeline system that results in a service outage of 100 or more customers; (E) An event that requires active soil vapor extraction for a period exceeding 48 hours as measured from the time the extraction device is turned on at the site until the operator determines soil vapor extraction is no longer necessary; (F) A MAOP-exceedance event that requires the operator, pursuant to its procedures, to implement follow-up actions such as a leak survey; or (G) An event that, in the opinion of the operator, requires courtesy notification to the PSP.

a current "certification" under 49 U.S.C. § 60105(a) and make certain that additional standards are "compatible with the minimum standards (of Chapter 601)" or may receive certification under 49 U.S.C. § 60106(a). Additionally, "a state authority may not adopt or continue to enforce safety standards for interstate pipeline facilities or interstate pipeline transportation." The result of the preemption clause of 49 U.S.C. § 60104(c) is that: 1) All current state pipeline safety programs are fully certified for only intrastate pipelines under 49 U.S.C. § 60105(a) and/or 49 U.S.C. § 60106 certification(s) administered by U.S. DOT PHMSA's Office of Pipeline Safety (OPS); 2) for clarity regarding "compatibility", most states adopt or incorporate-by-reference the most current federal pipeline safety regulations rather than creating unique regulatory language; and 3) state-specific pipeline safety regulations tend to be limited but very focused. The State of Colorado's PSP follows this paradigm closely.

The Colorado statute identifying the PUC as a 49 U.S.C. § 60105 and 49 U.S.C. § 60106 State authority is in Title 40 of the Colorado Revised Statutes (C.R.S.): Utilities. Additionally, Title 40-2-115, C.R.S. and Title 40-7-117, C.R.S. identifies the PUC as the 49 U.S.C. § 60105 and 49 U.S.C. § 60106 State authority, specifically in Title 40-2-115(1)(1.5), C.R.S.:

> "The commission may provide for the exchange of information concerning the enforcement of the economic and safety laws and rules of this state, any other state, and the United States relating to public utilities or to safety of transportation of gas by any person, including a municipality. In particular, the commission may submit a certification to, or enter into an agreement with, the United States Secretary of Transportation under 49 U.S.C. sec. 60105 or 60106, respectively, so that the commission may enforce the rules of the U.S. DOT concerning pipeline safety promulgated under 49 U.S.C. sec. 60101 et seq. The commission shall adopt such rules as are necessary and proper to comply with federal requirements."

As specified in 40-2-115(1)(b), C.R.S., the State of Colorado PSP's jurisdiction currently only covers "gas pipeline safety."

Title 40-7-117, C.R.S. (Gas pipeline safety rules - civil penalty for violations - other remedies.) authorizes PUC to pursue civil penalties for violations of "any rule adopted, or order issued by the commission pursuant to the authority granted in Title 40-2-115(1)(b), C.R.S." The ability to levy civil penalties is an important part of 49 U.S.C. § 60105 Certification, specifically the state's ability to issue civil penalties "substantially the same" as 49 U.S.C. § 60122(a)(1).

PHMSA has regulated all interstate pipelines. However, it has exempted some liquid and gas-gathering pipelines from regulation. As emerging technologies in carbon capture and alternative energy sources are developed, processed, and expanded, Colorado should incorporate these into legislation as appropriate. Carbon dioxide is transported in southwest Colorado as a supercritical fluid, which meets the regulated hazardous liquid transmission definition covered by PHMSA in 49 C.F.R. 195. CCUS is an emerging field that captures carbon dioxide from certain industrial processes and removes it for other industrial uses or long-term storage in wells. Carbon dioxide is often used in the oil and gas industry as a method for enhanced oil recovery operations, in which it is injected as a gas into an oil field. ECMC currently regulates pipelines used for those purposes. ECMC is drafting rules for the Class VI wells used in CCUS, which the EPA currently regulates.

PHMSA has found the most likely and technically feasible carbon dioxide transportation method is in the supercritical or liquid phase. PHMSA is in the process of incorporating updated rules

that will apply to carbon dioxide transported by interstate pipelines, even though carbon dioxide has been safely transported for decades at a much smaller scale. Colorado could be certified as a 60105(a) state, allowing it to incorporate additional safety requirements on intrastate carbon dioxide pipelines. Carbon dioxide pipelines from the capture point to the injection well where carbon dioxide would potentially be sequestered may be regulated by PHMSA but the federal rules are not clear as to their applicability to all potential carbon dioxide pipelines/flowlines between the source and the storage well. ECMC has proactively filled any potential gap and has the authority to regulate carbon dioxide lines that are not under federal pipeline jurisdiction and is clarifying this authority through ongoing rulemaking.[8] PHMSA also regulates interstate gas pipelines carrying hydrogen. PSP has jurisdiction under its 60105(a) agreement to oversee all-natural gas intrastate pipeline safety, including hydrogen transport. Geothermal well operations, which use the natural heat of the Earth for electricity generation and heating, cooling, hot water, and other energy needs, could include pipelines and flowlines[9] between wells, power generation facilities, heat distribution to buildings and homes, and other related uses. ECMC has jurisdiction over upstream geothermal flowlines[10] between permitted wells and power facilities.[11] There is no clear regulatory authority over potential heat distribution lines or for lines outside of ECMC-permitted deep geothermal operations. As this is an emerging technology, consideration is needed to determine the most appropriate regulatory agency to regulate potentially hazardous fluids utilized by geothermal operations for lines not addressed through existing ECMC rules.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

[8] 49 CFR 195.1 (b)
[9] Geothermal Flowline means a flowline which transports a Material Medium from a Deep Geothermal Well to a heat exchanger, a flowline which transports a Material Medium from a Deep Geothermal Well to a geothermal power plant, a flowline which transports a Material Medium from one Location permitted by the Commission to another Location permitted by the Commission, or a flowline which transports a Material Medium to a Geothermal Injection Well.
[10] Rules and Regulations. 100 Series Definitions.
[11] ECMC. Deep Geothermal Rules, 2024. 2 Code Colo. Reg. § 404-1:1301 - 1320.
https://ecmc.state.co.us/hearings.html#/rulemaking/ccs Final Rules and SBP

REGULATORY STRATEGY IDENTIFIED

The Colorado legislature has not authorized the expansion of PSP jurisdiction to cover hazardous liquid transportation in Colorado. It has not explicitly stated that this will include hydrogen, hydrogen blends, or carbon dioxide, whether transported as a liquid, gas, or supercritical fluid.

Multiple legal precedents illustrate the authority that states have to impose regulations that are more stringent than federal minimum safety standards, provided that they do not conflict with federal law.[12, 13, 14]

The Natural Gas Act (NGA) and regulations from PHMSA allow states to regulate intrastate pipeline transportation. Specifically, 49 U.S.C. § 60105 states the Secretary of Transportation cannot enforce safety standards for intrastate pipelines if those standards are regulated by state authorities that submit an annual compliance certification. This allows states to enforce stricter safety regulations unless they conflict with federal statutes.

Additionally, 49 U.S.C. § 60106 permits states to engage in interstate activities with PHMSA for interstate pipelines. However, states cannot preempt federal authority over interstate lines, maintaining a clear boundary between state and federal regulations.

This framework highlights the balance of power between state and federal authorities in regulating pipeline safety and environmental standards, underscoring the importance of understanding both 49 U.S.C. § 60105 and § 60106 in this context.

FERC oversees interstate natural gas pipeline siting and has statutory authority under the NGA to approve or deny interstate gas pipeline certificates.[15] FERC's policy was last updated on December 13, 2021, and two policy statements were approved. The first policy statement established a new analytical framework for evaluating applications. The second policy statement established an interim policy for examining GHG impacts and integrating climate considerations into certification decisions. The certification process includes descriptions of the proposed pipeline, route maps, construction plans, schedules, other statutory and regulatory requirements, environmental reports, route alternatives, and others (such as permits from other agencies). Federal law preempts state or local law that duplicates or obstructs federal law (e.g., siting or zoning) relevant to the projects. The certificate also grants companies the authority to use eminent domain to acquire private property for the public necessity of the project.

REGULATORY STRATEGY IDENTIFIED

Due to 49 U.S.C. § 60104, the Colorado legislature has not authorized the siting of pipelines under the PUC. Instead, it has delegated authority to the local counties, leading to inconsistent regulation of pipeline siting.

4.1.2 ECMC Program Authority

ECMC was granted the authority to regulate the drilling, producing, and plugging of wells and all other operations for the production of oil and gas, protecting and minimizing adverse impacts to

[12] U.S. Const. Amend 10.
[13] City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973)
[14] *Texas Eastern Transmission Corp. v. Wildlife Preservation Trust Int'l*, 621 F.2d 76 (3rd Cir. 1980)
[15] Congressional Research Service, Interstate Natural Gas Pipeline Siting: FERC Policy and Issues for Congress. Updated June 9, 2022. https://www.everycrsreport.com/files/2022-06-09_R45239_34795f983a3a683232947c911b41d5dfd3ac12bd.pdf

public health, safety, and welfare, the environment, wildlife resources, and protecting against adverse environmental effects on any air, water, soil, or biological resource resulting from oil and gas operations.[16] While many states have pipeline regulations, Colorado is unique in its specific rules for oil and gas flowlines. Flowlines are defined as segments of pipe transferring oil, gas, or condensate between a wellhead and processing equipment to the load point or point of delivery to a PHMSA or PUC-regulated gathering line or a segment of pipe transferring produced water or geothermal resources between a wellhead and the point of disposal, discharge, or loading.[17] Flowlines that do not extend beyond the oil and gas location (e.g. lines connecting a well to associated production equipment that is on the same oil and gas location, dump lines connecting separators and storage tanks, process piping between tanks and other on-site equipment) are known as "on-location flowlines." Operators may have larger oil and gas locations that are "controlled" or completely enclosed by a fence restricting land access. All lines contained therein would also be considered "on-location flowlines." On the other hand, lines that extend "off-site" and leave one oil and gas location and arrive at another are considered "off-location" flowlines.

REGULATORY STRATEGY IDENTIFIED

ECMC rules define an "oil and gas location" as an area where an operator has disturbed or intends to disturb the land surface to locate an oil and gas facility. The definition of flowlines positioned within the bounds of this location versus those that leave the location is not as well defined. This has resulted in challenges for operators who interpret the on-location versus off-location requirements differently than intended. Definitions left to interpretation are likely to be interpreted in favor of the lowest cost to the operator and not the intent of the rules. ECMC should update its rules to clarify differences between on-location and off-location flowlines to ensure adherence to the appropriate rules.

In 2017, in Firestone, Colorado, gas flowed through a severed flowline, resulting in a home explosion. In response to the incident, the Governor of Colorado directed the COGCC to amend its rules under the authority given in C.R.S. § 34-60-101 through 34-60-130. In 2018, COGCC amended the 1100-Series Rules on flowlines within Colorado, enhancing flowline definitions and building new integrity management reporting and flowline mapping requirements and programs to enhance oil and gas flowline safety. The flowline rules were updated in 2019 as part of the SB19-181 "Mission Change" rulemaking. COGCC also expanded its existing Orphaned Well Program in 2018, directed by then-Governor Hickenlooper's Executive Order D2018-012, to manage the increasing inventory of oil and gas wells and sites in Colorado with no known responsible parties. As directed by Executive Order D2018-012, COGCC created a working group to assess its existing 700 Series Financial Assurance Rules, which were updated in a rulemaking in 2020. Among other things, the 700 Series includes a bonding requirement for gas gathering and produced water transfer systems to defray the costs of potential health and safety hazards associated with system failures. ECMC manages the release of potentially hazardous Exploration and Production (E&P) Waste under its 900-Series Rules.

[16] § 34-60-106, C.R.S. (Statute for the additional powers of the Commission)
[17] ECMC. Definitions. 2024. 2 Code Colo. Reg. § 404-1:100.
https://ecmc.state.co.us/documents/reg/Rules/LATEST/100%20Series%20-%20Definitions.pdf

In 2023, Colorado SB23-285 renamed COGCC to ECMC. This commission expanded its regulatory authority to regulate the broader energy and carbon management scope beyond oil and gas due to the current interest in hydrogen, CCUS, and geothermal operations.

REGULATORY GAP IDENTIFIED

Some liquid-gathering pipelines are exempt from PHMSA regulations per 49 CFR 195.1, and these pipelines may not meet ECMC definitions of flowlines. ECMC should evaluate these exemptions to ensure that their flowline definitions cover these facilities.

4.1.3 Local Government Authority

Within SB19-181, the Colorado legislature gave authority to local county governments to plan for and regulate the use of land 1) based on the impact of the use on the community or surrounding areas, 2) reasonably address the surface impacts of oil and gas operations as specified in subsection (1)(h), and 3) protect and minimize adverse impacts to public health, safety and welfare, and the environment. Subsection (1)(h) includes the location and siting of oil and gas facilities, oil and gas locations, and their impacts. SB19-181 did not include the authority to regulate the siting of other energy developments, such as geothermal or supercritical carbon dioxide (liquid non-oil product). Hydrogen and gaseous carbon dioxide do not fall under the definition of a gas pipeline as it is related in the C.R.S.

API and LEPA submitted an amicus brief in the U.S. Court of Appeals for the Eighth Circuit in the case of *William Couser and Summit Carbon Solutions, LLC v. Shelby County and Story County, Iowa*.[18] The brief argued that county-level setbacks conflicted with pipeline safety standards and that allowing local jurisdictions to impose such regulations could create a complex legal landscape. The brief notes that with thousands of local jurisdictions in the United States, this regulatory fragmentation could make expanding necessary energy infrastructure, including cleaner energy projects like hydrogen and natural gas/hydrogen blends, CCUS, and other gas and liquid transport, cost-prohibitive. After reviewing this case and others, this study shows that a balance in siting practices is needed, one that promotes energy development while addressing community concerns about pipeline risks, ensuring both safety and progress in national energy and transportation policy. Colorado's approach to delegating siting authority to local county governments may pose similar challenges to those described in the brief. This authorization does not preempt federal authority in creating safety standards as described previously.

REGULATORY STRATEGY IDENTIFIED

Colorado counties have begun and implemented pipeline siting regulations that vastly differ from one county to the next. While county needs may vary, a baseline guidance may be necessary to provide consistency in terminology and oversight.

4.2 Colorado 811

Colorado 811 (CO811) is a nonprofit organization that serves as the communication link between utility/facility owners, excavators, and property owners. While it is not a regulatory agency, it plays a critical role in protecting underground facilities from damage related to excavation by providing notification services to registered public facility owners/operators when

[18] Brief for API and LEPA as Amicus Curiae, *William Couse, et al v. Shelby County, et al*, Nos. 23-3758 and 23-3760 (8th Cir. July 8, 2024).

an excavation is planned. Public utilities include but are not limited to buried gas, sewage, electrical, water, and fiber optic lines owned by public utilities. Private utilities, such as privately owned sprinkler lines or gas lines, are not included in the service. Covered underground facilities include buried flowlines and pipelines regulated by ECMC, PSP, and PHMSA.

CO811 operates the One Call System, a notification system that provides excavators with critical information regarding the location of public underground facilities prior to excavation activities in order to reduce the risk of utility damage or injury to workers. Excavation means any operation in which earth is moved or removed by means of any tools, equipment, or explosives and includes augering, backfilling, boring, etc. This definition does not include certain types of excavation as outlined in Senate Bill 18-167 (SB18-167) Section 9-1.5.102(3), commonly known as the "Dig Law" or "Notification Law."

Colorado's 811 "Dig Law" requires people to "Click or Call Before You Dig" to request that all public underground facilities in the excavation area be located prior to performing excavation activities. Once the locate request has been received, CO811 contacts owners and operators of public underground facilities to arrange for the facilities to be marked. Once the lines have been marked or it has been confirmed that there are no public underground facilities in the proposed area, excavation can begin.

SB18-167 requires that all public underground facility owners be members of CO811. Per ECMC regulations, all operators with underground facilities (e.g. wells, flowlines, and crude oil transfer lines) are required to be Tier 1 members of CO811 and participate in the One Call System. Per PSP regulations, all operators must be members of the Utility Notification Center of Colorado (UNCC)/CO811 if any part of the pipeline system is located in any public or railroad ROW. Prior to January 1, 2021, CO811 had tiered memberships. However, SB18-167 eliminated tiered membership, allowing all members to take advantage of the full benefits of the association. In 2016, COGCC collaborated with CO811 to identify active oil and gas operators who were not yet one-call members and began outreach to operators, resulting in 40 memberships. In 2017, COGCC repeated the audit and issued warning letters to operators who were not in compliance with regulations, resulting in 50 additional memberships.

4.3 Eminent Domain

Eminent domain is the legal mechanism that allows an operator to acquire private property for public use, provided that certain criteria are met including just compensation to any impacted land owner. Although the U.S. Constitution does not explicitly grant eminent domain, it implies this power by setting conditions on its use, leading to significant legal and scholarly discourse.

Property owners can challenge government actions through inverse condemnation proceedings if their property rights are significantly impacted.

At the state level, Colorado law outlines specific provisions for pipeline companies to exercise eminent domain, including the necessity for statutory authorization and public purpose. The Colorado Supreme Court has narrowly interpreted these statutes, creating ambiguity regarding which entities can exercise eminent domain. While eminent domain is a historical and significant tool for public infrastructure, its application often involves complex legal considerations that necessitate court involvement to navigate disputes over property rights.

Any state pipeline siting authority proposal should address eminent domain authority for privately owned entities. For a private entity like a pipeline company to exercise the power of eminent domain, 1) that entity must have statutory authorization to exercise condemnation authority and 2) the exercise of eminent domain must serve a public purpose. Colorado law already includes eminent domain provisions for certain pipeline projects. These include:

- C.R.S. § 7-43-102 allows three or more persons to form a pipeline corporation and specify "the places from and to which it is intended to construct the proposed line…" The corporation will then have a right-of-way over the "line named" and the right to convey gas, water, or oil. If the corporation cannot agree with the landowner(s) to purchase the necessary real estate, "the corporation may acquire such title in the manner provided by law."
- C.R.S. § 38-1-101.5 requires that, when eminent domain is used for pipelines, the lands taken must be "the most direct route practicable," and the pipeline company must "consider existing utility rights-of-way before any new routes are taken." The pipeline company must "post a bond with the court equal to double the amount which the court determines to be the estimated cost of restoring the affected land to the same or as good a condition as it was in prior to the installation of the pipeline."
- C.R.S. § 38-2-101 grants condemnation authority to any corporation formed to construct a pipeline.
- C.R.S. § 38-4-102 allows any foreign or domestic corporation organized or chartered to construct or maintain a pipeline for the transmission of gas for any public purpose to obtain a right-of-way for the construction, operation, and maintenance of such pipeline through any lands without the consent of the owner.

While these statutes grant eminent domain authority to privately owned entities, they do not sufficiently define which pipeline entities or which transported substances qualify. The Colorado Supreme Court narrowly construes statutes "which confer condemnation power upon private entities." The Colorado Supreme Court held that C.R.S. § 38-5-101, C.R.S. § 38-5-102, and C.R.S. § 38-5-105 do not grant condemnation authority to petroleum pipeline companies even though the statutes grant rights-of-way to "[a]ny…pipeline company." Rather, the Court held that the statutes only apply to lines that deliver electric power services.

Therefore, if the General Assembly desires to use eminent domain for carbon dioxide pipeline development, they should specify that eminent domain or condemnation authority applies explicitly to entities that construct, operate, or maintain carbon dioxide pipelines. The General Assembly should also specify that, in this context, carbon dioxide includes any phase in which carbon dioxide could be transported—liquid, gaseous, or supercritical.[19]

REGULATORY STRATEGY IDENTIFIED

The provisions regarding eminent domain for carbon dioxide pipelines are not explicit, and this study recommends that they be clarified.

[19] ECMC, Creating Colorado's Carbon Sequestration Framework: Legislative Proposal, 2024. https://ecmc.state.co.us/documents/library/Special_Projects/CCUS_Framework_Legislative_Proposal.pdf

4.4 Outline of Governmental Authority of Pipelines in Colorado by Pipeline Type

Multiple agencies regulate oil and gas facilities, particularly pipelines. The authorities and jurisdictions are split into multiple designated agencies for very specific and historical reasons, which are beyond the scope of this study. The discussion of each regulatory body below explains the agency's jurisdiction(s), impact(s), and statewide authorities and their relevant roles described under the applicable types. See Appendix A for a chart graphic of this outline and Appendix B for a graphical view of the industry overlaid with jurisdictions. Note that flowlines associated with geothermal resources are not included in the outline. The impending geothermal regulatory study (to be published on Dec. 31, 2024) will further investigate regulatory authority for such flowlines.

I. Natural Gas Pipelines

A. Flowlines

- **Primary Authority:** ECMC, formerly COGCC
    - **Key Role:** Design, construction, installation, inspection, operation, maintenance, and abandonment of flowlines from the wellhead to the point where the line becomes a gathering line (as defined in 49 C.F.R. 192.3[20]). Natural gases can include natural formations of carbon dioxide, hydrogen, and helium.
    - **Safety:** ECMC inspects and enforces Colorado-specific flowline regulations for safety and integrity, which were influenced by incidents like the 2017 Firestone explosion.
    - **Environmental Impacts - Bonding Requirements:** ECMC requires operators to fully investigate and clean up all environmental impacts resulting from a spill or release, regardless of the size and whether or not the spill is reportable. There are no bonding requirements specifically for flowlines.

Federal Jurisdiction: None

Local Government:

- **Role**: SB19-181 gave county commissioners limited siting and permitting authority through land use or zoning regulations. This is subject to state/federal preemption.

[20] Jurisdictional changes are defined by API RP80, which focuses on the function of gathering pipelines rather than specific points or pieces of equipment. The focus has shifted from the specific points or equipment because the use of the point or equipment can be used in multiple capacities. Focus on function clarifies the pipeline jurisdiction and use.

B. Gathering (limits as defined by API RP 80, defined 49 C.F.R. 192.8)

- **Primary Authority**: Colorado PSP
    - **Key Role**: Inspection of intrastate gas pipelines.
    - **Safety**: Inspects and enforces safety standards for Type A, B, and C lines.
    - **Environmental Impacts - Bonding Requirements:** ECMC requires bonding from operators to ensure environmental cleanup costs are covered if the operator abandons the assets.

Federal Jurisdiction:

- **PHMSA**: Limited oversight; primarily sets safety standards for Type A, B, and C lines. Type R lines have data collection requirements but no safety requirements. These have traditionally been referred to as unregulated.
- **FERC**: May assert jurisdiction if the gathering line is connected to interstate transportation.
- **Bureau of Land Management (BLM)**: The BLM Colorado office sets rules for oil and gas operations on federally managed lands in accordance with its mission directives.

Local Government:

- **Role**: SB19-181 gave county commissioners limited siting and permitting authority through land use or zoning regulations. This is subject to state/federal preemption.

C. Interstate Transmission

- **Primary Authority**: PHMSA
    - **Key Role**: PHMSA sets minimum safety standards based on statutory authority through the NGA and preempts all state and local jurisdictions.
    - **Safety**: PHMSA has been granted authority by Congress to inspect and enforce interstate pipeline safety.
    - **Siting and Tariffs/Rates**: Congress designated FERC to regulate the siting and tariffs for interstate pipeline transport, and its certifications grant the operator eminent domain.
    - **Environmental Impacts**: EPA sets air and water quality standards nationally.

D. Intrastate Transmission:

- **Primary Authority**: Colorado PSP
    - **Key Role**: Inspection of intrastate gas pipelines.
    - **Safety**: Inspects and enforces safety standards for natural gas transmission systems.
    - **Siting**: Counties have authority to regulate siting per SB19-181, though this is subject to state preemption.
    - **Environmental Impacts**: The CDPHE and local governments may have regulatory roles.

E. Distribution

- **Primary Authority**: Colorado PSP
    - **Key Role**: Inspection of intrastate gas pipelines.
    - **Safety**: Inspects and enforces safety standards for all distribution systems.
    - **Environmental Impacts**: CDPHE and local governments may have regulatory roles.
- **Federal Jurisdiction**: Under 49 U.S.C. § 60106, PSP can inspect municipally operated systems and refer enforcement actions to PHMSA. Although it cannot levy penalties against municipalities directly due to limitations in the Colorado Constitution, it can refer findings to PHMSA.
- **Local Governments**:
    - **Role**: Limited; may have ordinances related to local infrastructure impacts, such as noise and traffic. Counties have the authority to regulate siting per SB19-181, though this is subject to state preemption.

II. Hazardous Liquid Pipelines

A. Flowlines and Crude Oil Transfer Lines

- **Primary Authority**: ECMC
    - **Key Role:** Oversees the design, construction, installation, operation, maintenance, and abandonment of liquid flowlines from the wellhead to a remote oil and gas location, PHMSA-regulated pipeline, or inlet of oil production facilities with specific rules for a storage capacity greater than 25,000 barrels.
    - **Safety**: ECMC enforces Colorado-specific flowline regulations for safety and integrity.

- **Environmental Impacts**: ECMC requires operators to fully investigate and clean up all environmental impacts resulting from a spill, regardless of the size and whether or not the spill is reportable.

- **Federal Jurisdiction**:
  - **PHMSA**: Sets safety standards for regulated gathering and transmission of hazardous liquid pipelines.
  - **FERC**: There may be rate jurisdiction if the gathering line is connected to an interstate system.
  - **BLM**: The BLM Colorado office sets rules for oil and gas operations on federally managed lands in accordance with its mission directives.
- **Local Government**:
  - **Role**: Counties have the authority to regulate siting per SB19-181, though this is subject to state preemption and potential legal challenges.

B. Interstate Transmission

- **Primary Authority**: PHMSA
  - **Key Role**: Sets the minimum safety requirements authorized by various U.S. Congressional authorizations known as the Congressional Pipeline Safety Acts.[21, 22, 23, 24, 25, 26]
  - **Safety**: PHMSA enforces minimum safety requirements through inspections.
  - **Siting:** FERC reviews siting and routing through its application process.
  - **Tariffs/Rates**: FERC sets and approves rates and tariffs.
  - **Environmental Impacts**: EPA sets relevant standards which the CDPHE enforces.

---

[21] Natural Gas Pipeline Safety Act of 1968. 1968. Public Law 90-481. 82 Stat. 720. https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/Natural%20Gas%20Pipeline%20Safety%20Act%20of%201968.pdf

[22] Hazardous Liquid Pipeline Safety Act of 1979. 1979. 49 U.S.C. § 60101 et seq. https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/Hazardous%20Liquid%20Pipeline%20Safety%20Act%20of%201979.pdf

[23] Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006. 2006. Public Law 109-468. 120 Stat. 3486. https://www.congress.gov/109/plaws/publ468/PLAW-109publ468.pdf

[24] Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011. 2011. Public Law 112-90. 125 Stat. 1904. https://www.gpo.gov/fdsys/pkg/PLAW-112publ90/pdf/PLAW-112publ90.pdf

[25] Protecting our Infrastructure of Pipelines Enhancing Safety (PIPES) Act of 2016. 2016. Public Law 11-183. 130 Stat. 514. https://www.congress.gov/bill/114th-congress/senate-bill/2276/text/pl?overview=closed

[26] Protecting our Infrastructure of Pipelines and Enhancing Safety Act of 2020, Public Law No. 116-260, 134 Stat. 1182. https://www.congress.gov/bill/116th-congress/house-bill/133/text/pl?overview=closed

C. Intrastate Transmission and Gathering:

- **Primary Authority:** PHMSA
    - **Key Role:** Sets the minimum safety requirements authorized by various U.S. Congressional authorizations known as the Congressional Pipeline Safety Acts.[27]
    - **Safety**: PHMSA enforces minimum safety requirements.
    - **Siting**: State and local laws, with counties having some authority under SB19-181 but subject to potential state preemption.
    - **Environmental Impacts**: CDPHE and local governments.

III. Underground Natural Gas Storage (UNGS)

Interstate Facilities

- **Primary Authority**: PHMSA
    - **Key Role:** Responsible for permitting and operations, ensuring public health, safety, and environmental protection.
    - **Safety**: PHMSA sets safety standards for underground natural gas storage facilities and associated pipelines.
    - **Siting**: Local government may have authority over the siting of facilities, while FERC maintains the siting authority of associated interstate transmission pipelines.
    - **Environmental Impacts**: EPA sets air and water quality standards nationally.

Intrastate Facilities

- **Primary Authority**: Presently PHMSA. However, in 2023, the Legislature clarified that ECMC has the authority to pursue a full certification and agreement with PHMSA to become the regulatory authority for all intrastate UNGS facilities and their associated wells, downhole components, and wellhead and wellhead piping. All intrastate pipelines associated with these facilities are considered intrastate transmission or gathering lines, which Colorado PSP regulates.
    - **Key Role**: Responsible for permitting, inspections, and enforcement.
    - **Safety**: PHMSA sets safety standards for underground natural gas storage facilities. ECMC enforces 49 C.F.R. 192 and states specific rules. The Colorado PUC sets and enforces safety standards for intrastate transmission pipelines in accordance with federal

[27] Ibid.

minimums set in 49 C.F.R. 192 and Colorado-specific state standards as they pertain to UNGS.

- **Siting:** Local governments may have authority over the siting of facilities and associated pipelines.
- **Environmental Impacts**: CDPHE and local governments.

IV. Produced Water Pipelines

- **Primary Authority**: ECMC
  - **Key Role**: Regulates the handling, transportation, and disposal of produced water from oil and gas operations.
  - **Environmental Impacts - Bonding Requirements**: Colorado requires financial assurance for produced water transfer systems to cover potential cleanup costs.
- **Local Government**:
  - **Role**: Local governments may have limited authority over siting, subject to state preemption.

Other Notable Organizations (State and Non-governmental)

- **CDPHE:**
  - The Water Quality Control Division (WQCD) ensures oil operations protect water resources. WQCD may get involved when spills from any oil and gas operations[28] impact surface waters, per the memorandum of understanding (MOU) between ECMC and WQCD.[29]
  - The Air Quality Control Division (AQCD) ensures oil and gas operations protect the population from emitted pollutants. AQCD may become involved in air monitoring when the public makes complaints.
  - The Hazardous Materials and Waste Management Division (HMWMD) oversees the removal and disposal of hazardous waste from oil and gas production waste.

[28] Oil and Gas operations include "exploration for oil and gas, including the conduct of seismic operations and drilling of test bores; the siting, drilling, deepening, recompletion, reworking, or abandonment of an oil and gas well, underground injection well, or gas storage well; production operations related to any such well including the installation of flowlines and gathering systems; the generation, transportation, storage, treatment, or disposal of exploration and production wastes; and any construction, site preparation, or reclamation activities associated with such operations."

[29] WQCD, COGCC. Memorandum Of Agreement Between the Water Quality Control Division and the Oil and Gas Conservation Commission - Response to Spills/Releases to Surface Water.
https://ecmc.state.co.us/documents/gov/state/wqcdmoa.htm

- **Colorado Parks Wildlife (CPW):**
    - CPW provides input and guidance on impacts on wildlife from the development of energy infrastructure to all Colorado agencies.
- **Colorado State Land Board (SLB):**
    - The Colorado SLB is responsible for managing state land leases and provides input on using and managing those assets.
- **Colorado 811 (CO811)**
    - CO811 is a non-governmental organization that manages the one-call system to ensure that communications are relayed between excavators and public utility owners in order to protect underground facilities from excavation damage.
- **Underground Damage Prevention Safety Commission** (**UDPSC)**
    - The UDPSC, established by SB18-167, within Colorado Department of Labor and Employment, is charged with making recommendations regarding best practices and training, policies to enhance public safety, and policies to improve efficiency and cost savings to the 811 program. It also reviews complaints of alleged violations and orders appropriate remedial action/penalties.
- **Colorado Produced Water Consortium**
    - The Colorado Produced Water Consortium, established by House Bill 23-1242 in DNR, consists of individuals with expertise in produced water related to oil and gas operations, environmental impacts, environmental justice concerns, and community perspectives. The Consortium's primary goal is to reduce the use of fresh water and increase the recycling of produced water in oil and gas operations.

Statewide Federal Agencies:

- **BLM**
    - Colorado permits drilling and extraction of oil and gas and oversees inspections and reporting of assets and leases on federal lands in Colorado. ECMC coordinates with and assists the BLM in overseeing assets on federal lands.
- **National Forest Service**
    - The National Forest Service may also be involved in the permitting processes and can reject permits if plans do not align with their management objectives.

4.5 Assessment of Pipeline Siting Regulations

In Colorado, there is currently no state-level pipeline siting authority, and pipelines are sited parcel by parcel through collaboration with private landowners, SLB, BLM, local governments,

and counties. The Local Government Land Use Control Enabling Act of 1974 (§ 29-20-104, C.R.S.) authorized local governments to regulate the surface impacts of oil and gas operations in a reasonable manner to protect and minimize adverse impacts to public health, safety, and welfare and the environment within its jurisdiction. It also authorizes local governments to adopt regulations for surface impacts of oil and gas operations. The Colorado Oil and Gas Conservation Act (§ 34-60-131, C.R.S.) grants local governments the authority to adopt regulations that are more stringent than state requirements. Counties and other jurisdictions have the authority to regulate the siting of oil and natural gas facilities as it relates to land use; however, they do not have the authority to supersede jurisdiction on pipeline safety regulated by PHMSA, ECMC, or PSP.

Depending on the jurisdiction, counties and local governments may have different siting requirements and processes for pipelines. Colorado has 273 active municipalities comprising 198 towns, 73 cities, 2 consolidated city and county governments, and 64 county governments. Counties vary in size, population, and land use strategies and goals. Cities and towns may have priorities that differ from the one or more counties in which they reside. This diversity leads to siting considerations that vary with the unique priorities of each local government. These potentially conflicting regulations support the position that API and LEPA, in their amicus brief filed in the case of *William Couser and Summit Carbon Solutions*, *LLC v. Shelby County and Story County*, *Iowa,*[30] that if county ordinances are left to stand, it would have far-reaching ramifications and unintended consequences, noting that "common sense dictates that if each of these governmental authorities were permitted to issue regulations of the sort at issue in these cases, the nation's energy and transportation policy would be crippled simply by virtue of competing or conflicting regulations between each other, to say nothing of regulations that could directly conflict with federal legislation and PHMSA's exclusive jurisdiction to address interstate pipeline safety."

While local autonomy is encouraged, differences in permitting practices across the state have led to confusion for operators and the general public. Further, a National Association of Regulatory Utility Commissioners (NARUC) study observes that several states, including Colorado, lack specific laws or regulations governing carbon dioxide pipelines in particular. This absence of state-level guidance leaves local governments as the primary authority over pipeline sections within their jurisdictions, often with limited guidance. This can lead to inconsistent rules for the same pipeline as it crosses multiple counties, which poses a challenge for effective and uniform oversight of energy infrastructure development.

A full exploration of local pipeline siting regulation is beyond the scope of this study, but the regulations from two counties and one city have been summarized below to provide an example of local regulatory variability.

[30] API and LEPA Amicus Brief No. 23-3758 and 23-3760, July 8, 2024.

City of Aurora

City of Aurora resides in Adams, Arapahoe, and Douglas County. An Oil and Gas Midstream Permit (OGMP) is required for oil and gas midstream facilities, including central gathering facilities, compressor stations, intrastate gas gathering lines, and off-location produced water flowlines. OGMP requirements do not apply to PHMSA-regulated lines, as City of Aurora does not preempt PHMSA authority. OGMPs include project and site plans, descriptions of the pipelines and fluid being transported, pipeline routes, construction and mitigation plans, commissioning schedules, potential hazards, decommissioning plans, and more.[31] Prior to submitting the permit application, operators meet with the Office of Development Assistance to discuss the project, determine the necessary application materials, and receive feedback from city staff. While the OGMP is in review, operators may be required to host neighborhood meetings to inform the public of their application, notifying surface owners, tenants, and registered homeowners within 350 feet of the gathering line or off-location produced water flowline. Operators address comments and questions gathered during the review process and neighborhood meetings, while fulfilling all applicable requirements specified in Chapter 135 of the Aurora City Code. OGMPs can be approved with or without conditions. Permits may be denied if operators fail to meet the code's specifications.

Weld County

Weld County requires a Location Assessment for Pipelines (LAP) for pipelines with a diameter of 12 inches or greater that carry natural gas or petroleum derivatives in all zone districts. An LAP requires additional consideration to ensure the pipeline is developed in a manner that complies with various standards set forth in Chapter 21, Article VI of the Weld County Code. If a LAP permit is not required due to not meeting the size threshold, additional permits, such as ROW or access, may still be required. LAP permits do not include pipelines used for the sole purpose of transporting produced water or for oil and gas support and service uses, such as compressor stations, natural gas processing facilities, company offices, storage yards for oil and gas equipment, and trucking companies. LAP applications include summary requirements regarding pipeline details and the proposed route, methods for minimizing adverse impacts, construction details and schedules, public meetings, potential health and safety hazards, a decommissioning plan, and other required information.[32] The application is reviewed by the oil and gas department to ensure that it follows sound land use planning. It is then referred to any relevant agencies and landowners potentially impacted by the proposed pipeline route. Surface and property owners within 150 feet of either side of the proposed easement are also notified. The permit is then conditionally approved if development standards are met.

Adams County

Adams County uses conditional use permitting and development agreement processes to regulate intrastate pipelines not under federal jurisdiction that transport crude oil, natural gas, and produced water, requiring more stringent review to increase safety and reduce environmental impact. A conditional use permit (CUP) application addresses pipeline operation

[31] City of Aurora. Aurora City Code. 2024. Section 135. https://aurora.municipal.codes/Code/135
[32] Weld County. Weld County Charter and County Code. 2024. Section 21-6-220. https://library.municode.com/co/weld_county/codes/charter_and_county_code?nodeId=CH21ARACSTIN_ARTVIRELOASPIETPRUNARWECO

and includes a detailed description of the pipeline use and timeline, purpose, proposed improvements, and other pertinent details such as construction requirements, fluid type details, potential impacts, and mitigation measures, etc. A development agreement addresses pipeline construction and installation and includes details related to worker and environmental safety. Applications are processed through a public hearing by the Adams County Planning Commission. The Planning Commission forwards an application for the permit to the Board of County Commissioners for review. Following a public hearing, the Board of County Commissioners then approves the permit (sometimes with conditions) or denies it based on consideration of the staff report, the Planning Commission's recommendation and findings, the evidence from the public hearings, and the conditional use permit's compliance with the criteria for approval.[33]

4.6 Assessment of Pipeline Safety Incidents, Events, Spills, and Releases in Colorado

Pipelines are a necessary infrastructure to transport energy, and while they are not without risk, effective regulations can mitigate those risks by appropriately managing the threats of pipeline failure. Pipeline safety is often evaluated by the number and severity of incidents where a threat has not been managed and the product is released, impacting people and the environment. This study researched PHMSA's reportable incident data, PSP's reportable event data, and ECMC's reportable spill/release data and reportable safety event data to define pipeline safety trends in Colorado. The study was able to further compare the federally available data to the "peer" states to understand the context of Colorado's safety trends. The study considered PHMSA data from 2004 to 2023. However, to align with ECMC data collection, only data collected from 2015 to 2023 will be utilized. PUC data for 2021-2024 were available and used for comparison. By reviewing PHMSA-reported incidents over the last nine years for hazardous liquid pipeline incidents, as shown in Figure 1, it is notable that the hazardous liquid incident rate has not significantly changed, averaging four to five incidents per year. Hazardous liquid mileage, tanks, and operators have increased in Colorado over the last nine years. Colorado has approximately 1900 miles of intrastate pipelines and over 4100 miles of interstate pipelines. Colorado could regulate approximately 30% of pipeline mileage under the PSP. Although the study could not determine from public information which reported failures were intrastate versus interstate based on knowledge of the operators and location of the failures, it is presumed that over 50% of these reported failures occurred on intrastate pipelines or facilities in the last 5 years.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

[33] Adams County. Adams County Development Standards and Regulations. 2023. Section 2-02-08-06 https://adcogov.org/sites/default/files/2023-08/dsr-chapter-02.pdf

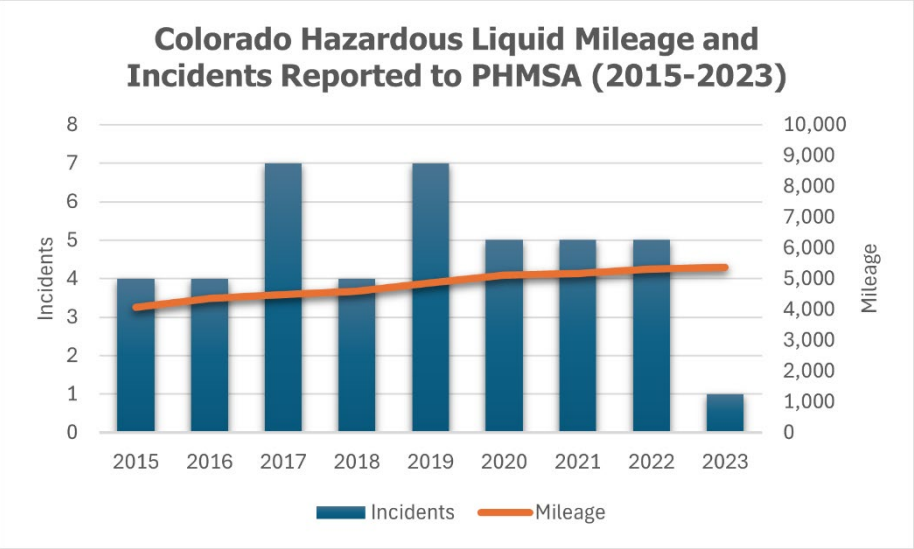


Figure 1. Colorado Hazardous Liquid Mileage and Incidents Reported to PHMSA (2015-2023)

Similarly, gas transmission incidents in Colorado have remained relatively flat over the last nine years, while mileage has remained steady as shown in Figure 2.

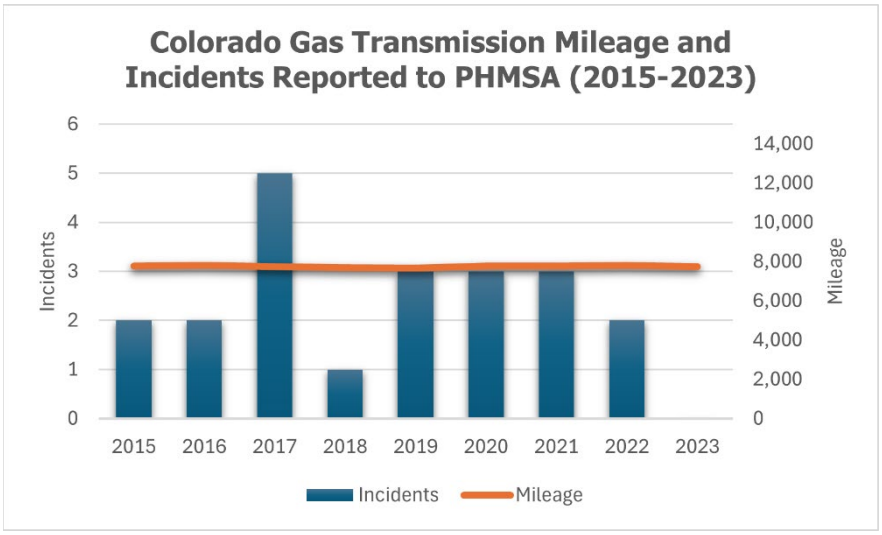


Figure 2. Colorado Gas Transmission Mileage and Incidents Reported to PHMSA (2015-2023)

In contrast, gas distribution incidents have slightly decreased over the last nine years while mileage has remained relatively steady as shown in Figure 3.

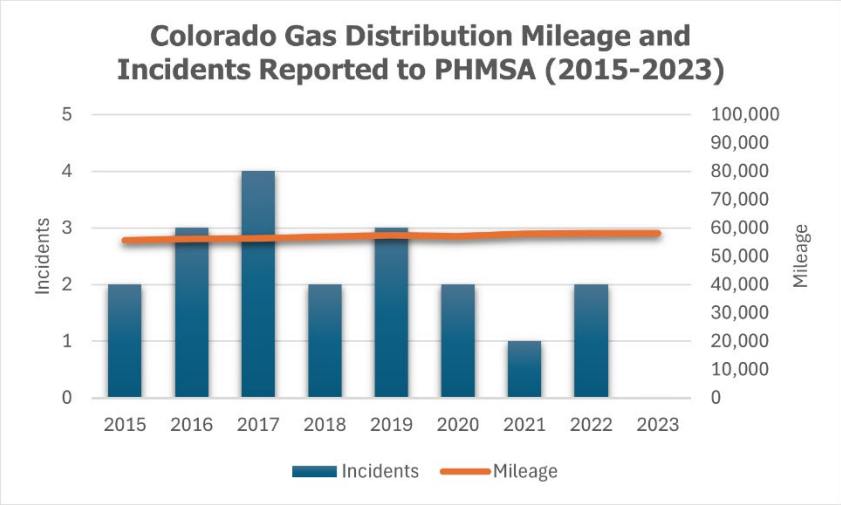


Figure 3. Colorado Gas Distribution Mileage and Incidents Reported to PHMSA (2015-2023)

PSP oversees intrastate gas transmission and distribution under PUC.

Interviews were conducted with individuals responsible for overseeing state jurisdictional areas. The analysis revealed distinct trends for different types of pipelines:

1. Federally managed pipelines:
   - Despite federal regulatory oversight, Colorado's interstate liquid pipeline accident[34] rates have remained relatively consistent over the past 20 years.
   - Interstate gas pipeline incident rates have also shown a slightly better general reduction during this time frame.
2. State-managed pipelines and flowlines:
   - Intrastate gas pipeline incidents have shown a steady downward trend.
   - Recent intrastate liquid flowline spills have slightly increased since 2018.
   - Intrastate safety events reported to ECMC have increased, but this is attributed to changes in reporting requirements.

[34] An accident report is required for each failure in a pipeline system subject to this part in which there is a release of the hazardous liquid or carbon dioxide transported resulting in any of the following:
(a) Explosion or fire not intentionally set by the operator;
(b) Release of 5 gallons (19 liters) or more of hazardous liquid or carbon dioxide, except that no report is required for a release of less than 5 barrels (0.8 cubic meters) resulting from a pipeline maintenance activity;
(c) Death of any person;
(d) Personal injury necessitating hospitalization; and/or
(e) Estimated property damage, including cost of clean-up and recovery, value of lost product, and damage to the property of the operator or others, or both, exceeding $50,000.

It is important to note that gathering lines,[35] which are regulated by both PHMSA (Type R[36]) and the State of Colorado (Types A, B, and C[37]), and distribution pipeline incidents appear to be increasing slightly across all categories. This trend warrants further investigation and targeted safety measures.

Although titles, organizational structure, and program complexity varied significantly across states, the study determined Colorado currently has slightly below-average staffing levels compared to its "peers" when considering factors, such as the number of operators and pipeline mileage under oversight. Increasing staff may support more frequent inspections, especially if the Colorado legislature increases the scope of PSP or ECMC to include intrastate hazardous liquid pipelines, expands regulation to include Type R gas gathering pipelines, or oversees carbon dioxide, geothermal, and hydrogen transportation and the storage of underground natural gas, hydrogen, or carbon dioxide.

4.6.1 Colorado ECMC Incident History

Spills and Releases

Spill and release data reported to ECMC must also be examined to understand the entire picture of pipeline safety in Colorado. ECMC defines a spill as any unauthorized sudden discharge of E&P waste to the environment. A release is defined as any unauthorized discharge of E&P waste to the environment over time. Operators are required to report any spill or release that does any of the following[38]:

- Impacts or threatens to impact the waters of the State;
- One or more barrels of E&P Waste or produced fluids are spilled or released outside of berms or other secondary containment;
- Five or more barrels of E&P Waste or produced fluids are spilled or released regardless of containment;
- A Grade 1 Gas Leak occurs from a flowline, which is a gas leak that ignites or represents an existing or probable hazard to persons or property and requires immediate repair or continuous action until the conditions are no longer hazardous;
- Ten cubic yards or more of impacted material resulting from a current or historic spill or release are discovered;
- Impacted waters of the State, including groundwater, are discovered;
- The volume of the spill or release cannot immediately be determined;
- Any volume of the spill or release daylights from the subsurface;

[35] 49 C.F.R. 192.3: A gathering line is a pipeline that transports gas from a current production facility to a transmission line or main.
[36] 49 C.F.R. 192.8 (3): Type R Gathering Lines are subject to reporting requirements under 49 C.F.R. 191 but are not regulated onshore gathering lines under 49 C.F.R. 192
[37] Types A, B, & C onshore gathering lines are defined in 49 C.F.R. 192.8 (c) based on pipeline features, area classifications, and other metrics.
[38] ECMC. Environmental Impact Prevention. 2024. 2 Code Colo. Reg § 404-1:900-915 https://ecmc.state.co.us/documents/reg/Rules/LATEST/900%20Series%20-%20Environmental%20Impact%20Prevention.pdf

- Vaporized hydrocarbon mists leave the oil and gas location or off-location flowline right-of-way from an oil and gas location and impact or threaten to impact off-location property;
- Results in the accumulation of soil gas or gas seeps; or
- Natural gas enters groundwater.

Spills/releases are categorized as recent or historical. Recent spills/releases are categorized as recent or ongoing at the time of discovery. Historical spills/releases are categorized as occurring at an unknown time or were discovered during other operations, such as facility abandonment, reclamation, or other field activities. When an initial report is submitted, operators may be unaware that the spill is flowline-related. ECMC reviews all spill/release reports to determine which are related to flowlines.

This study examined the latest data and the root causes of recent flowline releases and spills.

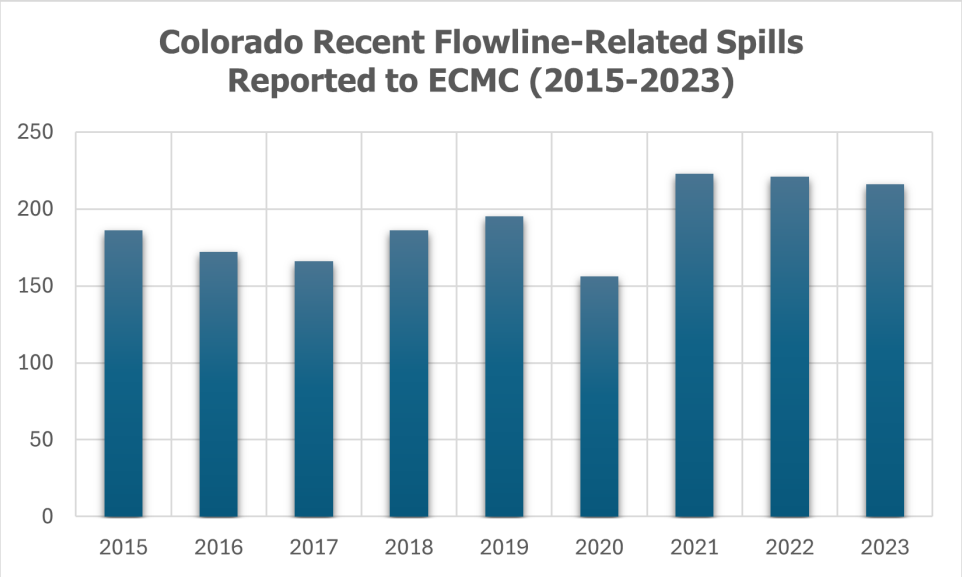


Figure 4. Colorado Recent Flowline-related Spills Per Year (2015-2023)

ECMC rule changes on flowline integrity were announced in 2018. Since then, there has been an increase in flowline-related spills through 2023 as shown in Figure 4. despite integrity assessment requirements to pressure test these lines. This is largely attributed to aging and improperly protected infrastructure. More than half of oil and gas wells in Colorado are greater than 15 years old. Many of the associated flowlines are likely of the same age. However, without corrosion control, the remaining life of these aging assets may be at or exceeding the pressure-containing capacity of the remaining pipe wall thickness, which could warrant further investigation.

ECMC crude oil transfer line rules do not apply to lines transferring fluids to crude oil storage facilities with less than 25,000 barrels (bbls) of capacity. However, ECMC does regulate flowlines that transfer crude oil, crude oil emulsion, or condensate from multiple well sites or production

facilities to storage facilities with permanent storage capacity below 25,000 bbls. These lines are not subject to more stringent requirements for crude oil transfer lines, such as registration prior to construction or implementing leak protection and monitoring plans.

In reviewing current incident data from ECMC, the study could not determine if a significant number of spills originated from flowlines transporting fluids to storage facilities with less than 25,000 bbls of capacity. It is recommended that ECMC collect data on the sources of spilled crude to assess whether the current exemption for facilities of this size is appropriate or if it should be revised or removed.

Next, the study examined the root causes of spills (as reported by the operator), shown in Figure 5.

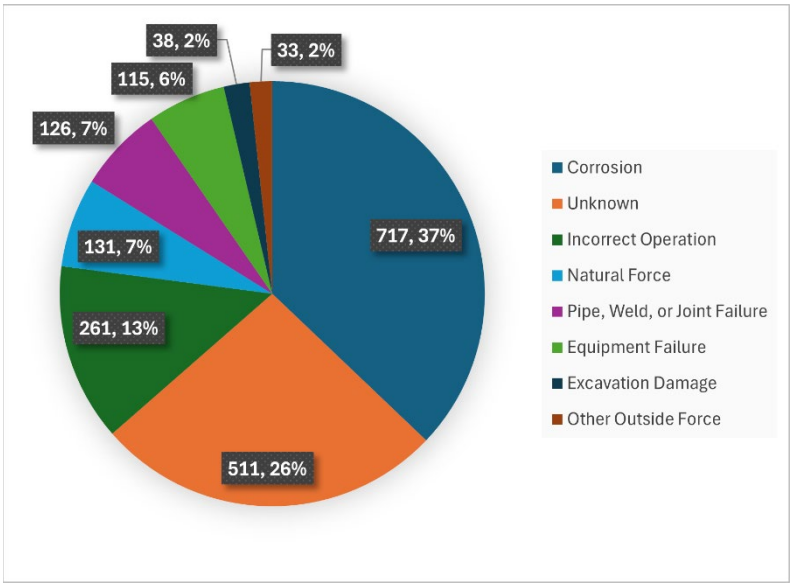


Figure 5. Colorado Recent Flowline-related Spills by Root Cause (2015-2023)

Corrosion remains the leading cause of spills, with events categorized as "unknown" being a close second. Recent reported spills/releases with unknown causes are often the result of missing or unclear root cause descriptions provided by operators. The "unknown" categorization is used when the root cause of a spill/release cannot be determined, an exercise that is particularly difficult when an event is discovered long after the initial spill/release occurred. Operators must determine and document the cause of spills/releases and Grade 1 Gas Leaks and implement measures to prevent recurrence due to similar causes.[39] While there is currently no explicit state or federal requirement to report the exact cause of every release, root cause details are requested on every spill/release report. Per Rule 206.a., operators are required to submit information requested by the director. It is essential to note that operators are also required to report spills/releases upon the discovery of historical impacts, which are often discovered during the decommissioning of oil and gas facilities and are not included in Figure 5. This has contributed to a rise in spill reporting, for which determining the root cause is often challenging due to the passage of time and incomplete historical records.

[39] ECMC Rule 912.d.(1)

Additionally, there have been concerns about errors and incomplete information in the data sets collected due to the lack of a formal quality assurance program. Data verification through a robust quality assurance program can improve efforts to understand the full scope and causes of spills, ultimately leading to the development of effective preventative measures. In 2024, the environmental and integrity groups began conducting a more detailed review of flowline-related spill/release forms for data accuracy, completeness, and the quality of root cause descriptions. Staff confer with operators for clarification when needed. ECMC should continue to review spill data to see if there is an improvement in the quality of root cause details and a decrease in reportable spills with the increase in quality control measures.

ECMC is responsible for overseeing flowlines associated with orphaned assets through the Orphaned Well Program. A significant challenge arises from the time gap between when an operator abandons its assets and when the Orphaned Well Program assumes ownership. During this period, the assets may be left unmonitored and unmaintained, leading to increased risks, such as corrosion and potential releases. This problem is further exacerbated when defunct operators terminate their membership in the 811 Program, which may lead to inaccurate mapping of utilities in the area. In some cases, CO811 is not notified when an operator becomes defunct. As a result, these abandoned assets might be unable to be marked or located for excavation, and locate requests may go unanswered, increasing the likelihood of third-party damage. To mitigate these risks, Colorado should explore ways to maintain, purge, locate, or otherwise ensure safety and environmental protection from assets during the transition from defunct operators to the Orphaned Well Program to mitigate risks.

Since corrosion appears to be the primary cause of failure, ECMC rules should be updated to address this root cause of failures. Current assessment rules only address defects that have or are about to fail. They do not address corrosion growth at other locations on the flowline that will fail in the future. Without requiring robust corrosion control of these flowlines, operators will continue to spill their products, contaminating the Colorado environment and leading to potential safety issues.

To enhance the understanding of spill/release causes and reduce future occurrences, it is recommended that ECMC consistently require root cause analyses for all recent flowline-related reportable spills/releases in cases where the immediate cause cannot be determined. This would provide clearer insights into common failure mechanisms and allow for targeted, preventive actions, improving overall safety and environmental protection. Implementing such a policy would also contribute to the long-term reduction of spills and enhance the accuracy and reliability of data used in regulatory decision-making.

ECMC Safety Events

Reportable safety events are events that include any of the following:

- Any accidental fire, explosion, detonation, uncontrolled release of pressure, loss of Well control, vandalism or terrorist activity, or any accidental or natural event that damages equipment or otherwise alters an oil and gas facility to create a significant spill or release, fire hazard, unintentional public access, or any other condition that threatens public safety;

- Any accident or natural event at an oil and gas facility that results in a reportable injury as defined by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA);
- Any spill or release of hazardous chemicals reportable to another state or federal agency, or a Grade 1 Gas Leak; and/or
- Any accident or natural event at an oil and gas facility that results in:
    - An injury to a member of the general public that requires medical treatment or
    - Damage to lands, structures, or property on or off the oil and gas location.

Figure 6 shows reportable safety event data related to flowlines. As a result of SB19-181, COGCC modified the rules, adding several additional safety issues that must be reported, including loss of well control, vandalism and terrorism, natural events that cause safety hazards, and any incident that damages land, structures, or property outside the oil and gas location. This change has resulted in an increase of reported safety events over time. When a reportable safety event occurs, the ECMC Director has the authority to request a more detailed submission, which includes identifying the root cause, information on repairs, and other relevant data. It is difficult to identify trends at this time due to the amount of reported events. However, establishing a facility classification system and systematically identifying root causes for all reportable events can inform better preventative measures and rulemaking.

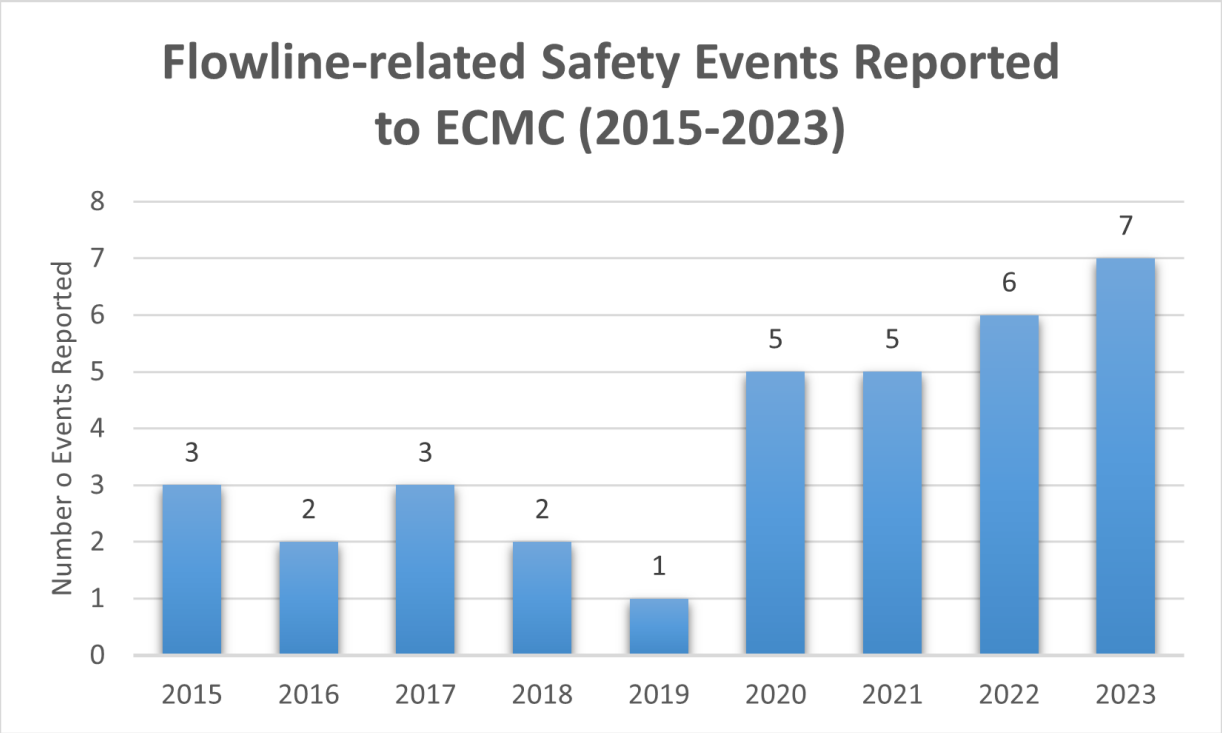


Figure 6. Colorado Flowline-related Safety Events (2015-2023)

4.6.2 Colorado PSP Incident and Event History

This study also reviewed Colorado PSP's root cause data from its event reporting. Note that Colorado PSP data collection is only available starting in 2021, so it is difficult to establish trends for such a short period of time. The State of Colorado has state-defined events that require operators to report to the state, in addition to the federal definition of incidents.

As per 49 C.F.R. 191.3, a federally defined incident is:

1. An event that involves a release of gas from a pipeline, gas from an underground natural gas storage facility (UNGSF), liquefied natural gas, liquefied petroleum gas, refrigerant gas, or gas from a liquified natural gas (LNG) facility, and that results in one or more of the following consequences:
    a. A death or personal injury necessitating in-patient hospitalization;
    b. Estimated property damage of $145,400 or more, including loss to the operator and others, or both, but excluding the cost of gas lost. For adjustments for inflation observed in calendar year 2021 onwards, changes to the reporting threshold will be posted on PHMSA's website. These changes will be determined in accordance with the procedures in Appendix A to Part 191; and/or
    c. Unintentional estimated gas loss of three million cubic feet or more.
2. An event that results in an emergency shutdown of an LNG facility or a UNGSF. Activation of an emergency shutdown system for reasons other than an actual emergency within the facility does not constitute an incident.
3. An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraph (1) or (2) of this definition.

As per 4 CCR 723-11102(b)(III)(A), a Colorado pipeline event is defined as:

1. An unplanned/emergency event that occurs on the pipeline system that results in the evacuation of 50 or more people from a normally occupied building or property;
2. An unplanned/emergency event that occurs on the pipeline system that results in the closure of all lanes in either direction of a roadway or railroad;
3. An unplanned/emergency event that occurs on the pipeline system that results in the evacuation of four or more residential structures;
4. An unplanned/emergency event that occurs on the pipeline system that results in a service outage of 100 or more customers;
5. An event that requires active soil vapor extraction for a period exceeding 48 hours as measured from the time the extraction device is turned on at the site until the operator determines soil vapor extraction is no longer necessary;
6. A maximum allowable operating pressure (MAOP) exceedance event that requires the operator, pursuant to its procedures, to implement follow-up actions, such as a leak survey; or
7. An event that, in the opinion of the operator, requires courtesy notification to the PSP.

Operators are required to report incidents and events to PSP, including a cause for the report. There are frequent instances when the initial and final reporting causes differ. The differences are due to various reasons, including the operator learning more about a particular event or PSP performing an investigation and determining the root cause. In the raw data, a significant number of reports were labeled "To Be Determined" and were removed from the data set shown in Figure 7 because it is related to the changes in reporting standardization over the last few years since data collection began and is expected to decline as quality assurance programs mature. Removing this from reported data allows this study to demonstrate known and proven root causes to be demonstrated in proper proportions.

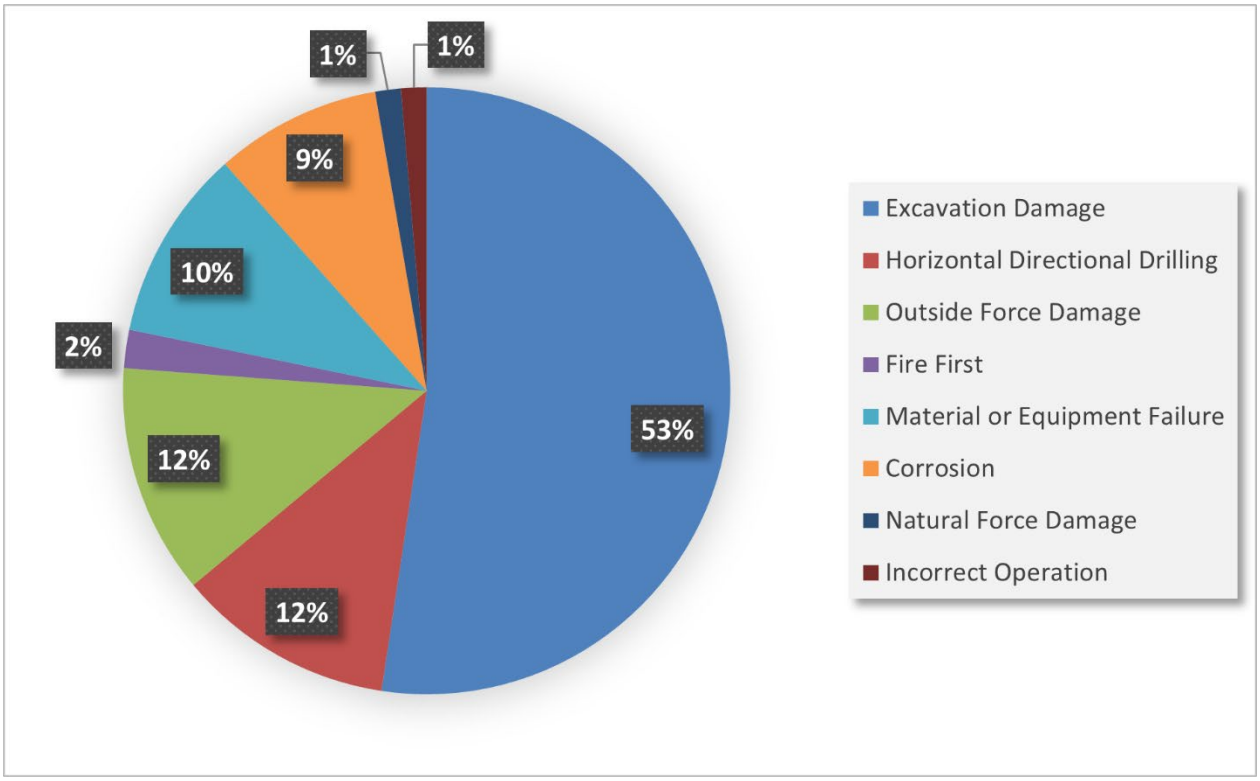


Figure 7. Colorado Pipeline Events Reported to PSP by Final Reported Cause (2021-2024)

Excavation damage is the primary cause of incidents that were not unknown or to-be-determined causes and removed from Figure 7 (out of 522 reported incidents). Most other incidents were caused by outside force damage (not related to excavation), horizontal directional drilling, material or equipment failure, or corrosion. Nearly all causes show a slight increase in events from 2021 to 2024. However, the short time interval makes it difficult to identify if this is a long-term trend. As a final note, recent national data indicate that internal corrosion primarily drives gas-gathering failures. This study reviewed the first two years of national data submitted to PHMSA and identified that internal corrosion is responsible for over 50% of gas-gathering pipeline failures nationally. This is further supported by the fact that internal and external corrosion is known to be responsible for the majority of pipeline and flowline failures monitored by ECMC. The study supports additional regulations that require root

cause investigation of failures in certain cases, internal and external corrosion control and reporting, leak detection, public awareness, and emergency response measures that will reduce the consequences of failure from corrosion.

Third-party damage is a secondary cause of gathering and flowline pipeline failures. Additional regulation and enforcement of excavator practices and locator training will improve awareness and reduce the causal factors of second- and third-party damage, improving overall pipeline safety and reliability in Colorado.

Third-party damage is the leading cause of gas distribution pipeline failures for assets under PSP jurisdiction. The Colorado UDPSC is responsible for providing recommendations to the Colorado legislature to promote pipeline damage prevention, including strengthening the state's facility location and notification (one-call) law. While UDPSC does have enforcement authority and can issue fines for violations, it only acts based on complaints and does not independently inspect or investigate incidents. CGA's Best Practices are cited in its Electronically Locatable Best Practice and Locating & Marking Standard and referenced on the UDPSC's website.

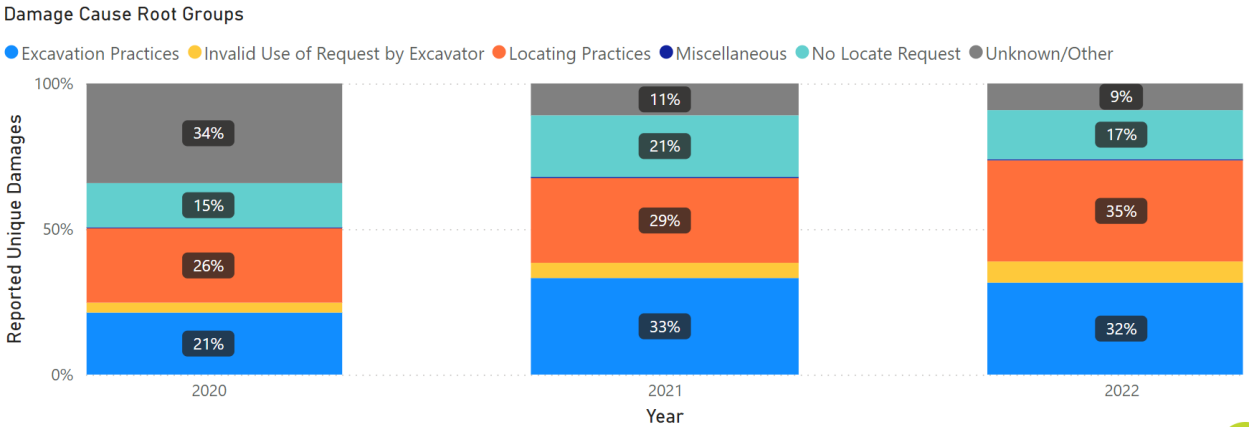


Figure 8. Root Cause of Excavation Damage

According to the Common Ground Alliance (CGA) Damage Information Reporting Tool (DIRT) report[40] for Colorado in 2021 and 2022, over 50% of the root causes of excavation damage were due to incorrect excavation and locating practices, as shown in Figure 8. CGA member surveys showed that geographic information system (GIS) mapping applications and enhanced marking and locating are top priorities for reducing damages.[41] Furthermore, the majority of the complaints received by the UDPSC are related to location accuracy and line locate completion issues. Minnesota Gopher State One Call (GSOC) performed a pilot program leveraging location to improve facility maps. It published a paper on the results, which showed that telecom

[40] DIRT data is voluntarily submitted and may not represent all actual incidents.
[41] CGA, Natural Gas: Leading the Damage Prevention Industry. September 2022 https://commongroundalliance.com/Portals/0/CGA_Natural%20Gas_White%20Paper_final2.pdf?ver=2022-10-25-175001-653

response was reduced by 50% and that the utility locator could produce more accurate facility maps while performing locates.[42]

Additionally, CO811 is expanding its current training/certification portfolio for excavators and locators to standardize education across utilities in Colorado, incorporating how the "Dig Law" can be applied. CGA also surveyed its members and found that over 50% stated excavator education and training was the primary strategy to reduce damage to natural gas facilities. Over 40% stated that more comprehensive enforcement of current regulations was needed. Improved communication between stakeholders was also over 40%.[43] Colorado is also working towards implementing statewide access to high-speed internet, primarily achieved by installing fiber-optic underground infrastructure. This massive undertaking has resulted in higher below-ground infrastructure damage as these projects commence. Training and certification programs for line-locating personnel should be considered, as should requiring location data acquisition during line maintenance and ensuring pipelines can be located.

CGA's Next Practices Initiative and commitment to reduce underground damage by 50% in five years has the following three recommendations:

1. **Effective and consistent use of 811:** Despite DIRT data and market research, which indicate that 811 awareness is very high – particularly among professional excavators – 60% of damages to underground utilities are caused specifically by professional contractors not contacting 811 prior to digging. CGA is unveiling a refreshed 811 tagline and animated logo this spring, which will join a new video series and other outreach tools that damage prevention advocates can use to *implement behavior change campaigns around 811 usage.*
2. **Key excavator practices (potholing, maintaining clearance, etc.):** Potholing (test holing) to confirm the location of buried utilities and then maintaining the required clearance around those utilities, along with miscellaneous improper excavation practices, are key steps for protecting the integrity of underground infrastructure. *Targeted and consistent excavator outreach* around these two CGA Best Practices (5.19 and 5.20) could dramatically reduce damages to buried infrastructure. CGA's Next Practices Initiative also highlights damage reductions achieved by *operators who contractually compensate excavators for potholing*.
3. **Accurate, timely utility locating:** CGA's Locator White Paper and the work of the Next Practices Initiative reveal that *improving the accuracy of facility maps* and *implementing electronic white-lining* would help locators complete their work more quickly and accurately. Efforts like a Minnesota coalition's pilot program to make 811 ticket-level facility map visualizations available to locators and other 811 system end users have the potential to increase locating efficiency, among other systemic benefits. *Decreasing over-notification practices utilized by both contractors and facility*

[42] CGA, Next Practices Initiative - Case Study - Gopher State One Call's GPS-Enabled Locator Program. 2024. https://commongroundalliance.com/Portals/0/Library/Next-Practices/case%20studies/NEXT%20Practices%20GSOC%20locator%20GPS%20case%20study-FINAL.pdf

[43] CGA, CGA Natural Gas: Leading the Damage Prevention Industry. September 2022 https://commongroundalliance.com/Portals/0/CGA_Natural%20Gas_White%20Paper_final2.pdf?ver=2022-10-25-175001-653

owner/operators themselves would also help decrease overall 811 request volume so locators' workloads are more manageable.

REGULATORY STRATEGY IDENTIFIED

Understanding the causes of excavation damage and what rules or regulations are required to improve the trend in excavation damage can be drawn on by CGA White Papers and studies. Consider a study on Colorado-specific excavation damage causes and provide recommendations for Colorado to improve infrastructure damage prevention regulations, if necessary.

4.6.3 Additional Considerations

Mapping Requirements

Stakeholders lamented that flowline and pipeline databases are not linked, and pipeline data is often in several places. They noted that these databases are not updated in real-time, leading to out-of-date information. Additionally, challenges existed in the form of pipelines that were not in any database, and considerations should be made for a centralized state mapping database with efforts to identify or gather information on flowlines and pipelines that are currently unknown or have inaccurate line location information based on old records.

The study recommends the development of a statewide mapping database and the UDPSC's recommendation for updates to the 811 Program or other changes to improve locator and excavator training. ECMC and PSP have implemented rules requiring mapping but should consider more stringent locational accuracy requirements. It is recommended that rules be updated to collect this data using stringent quality control processes to ensure the accuracy of the data. A final note is that locating non-metallic pipes is challenging, and technology development should be investigated to locate these types of pipes. Public education on the importance of 811 requirements and the potential hazards of defunct assets is also essential to ensure that communities understand the risks and the steps to mitigate them.

ECMC rules distinguish between flowlines based on their installation date. For flowlines existing before May 1, 2018, the rules require a minimum horizontal positional accuracy of ± 25 feet for GIS data. However, for lines installed after this date, Rule 216 mandates using global positioning system (GPS) instruments capable of 1-meter horizontal positional accuracy. Despite these requirements, there are currently no processes to verify the accuracy of submitted data or collect data whenever a pipe is exposed. For older assets where such accuracy might be challenging to achieve without causing surface disturbances, ECMC encourages operators to provide the highest locational accuracy possible. The study noted that PSP's new mapping rule lacks specific accuracy requirements for the submitted GIS data, only specifying the scale at which it should be submitted, consistent with ECMC's mapping requirements.

To improve mapping accuracy over time, it is recommended that both agencies require operators to collect and submit updated GPS data using the best horizontal accuracy available to the operator whenever lines are exposed for reasons related to maintenance, crossings, or flowline and pipeline releases. This approach would gradually enhance the overall accuracy of pipeline mapping without necessitating immediate widespread excavation.

Quality Assurance

The data above suggest that current damage prevention laws are not reducing incidents. However, with no quality assurance program and little data available, making recommendations

to improve these metrics is challenging. This study's recommendations should improve the metrics and transparency, allowing the agencies to make better-informed rulemaking to improve pipeline safety in Colorado.

REGULATORY STRATEGY IDENTIFIED

Improve and clarify the existing quality assurance program to identify and resolve incidents better. The data collected will better inform rulemaking, and the findings can be used to enforce improved measures to prevent similar failures from reoccurring. Future rulemaking can consider further preventative measures and enforcement mechanisms to address the root causes of pipeline failures.

Corrosion

The primary driver of incidents on assets under ECMC jurisdiction is corrosion. Corrosion is one of the leading categories of pipeline failures nationwide, causing billions of dollars in damage. Interviews revealed that corrosion impacts flowlines and gathering systems due to a lack of funding and investment in repairing or rehabilitating aging gas and liquid systems by operators that manage these systems on very slim profit margins. Gas-gathering pipeline failures under PSP jurisdiction are also primarily driven by corrosion. There are no current requirements under federal or state rules to control the corrosion of gas or liquid-gathering pipelines by any regulatory agency. Type R gas gathering pipelines also have no emergency response, public awareness, or damage prevention requirements. These topics are identified as areas for potential regulatory action by the State to improve safety and protect the environment in Colorado.

Although a much smaller subset, PSP also reports an increase in corrosion-related failures. This will likely increase as new federal requirements on Type C and Type R pipelines are reported in the next few years.

REGULATORY STRATEGY IDENTIFIED

Understanding the causes of corrosion failures and what rules or regulations are required to improve trends in corrosion related failures necessitates a further in-depth study beyond the scope of this report.

Leak Protection

ECMC rules require crude oil transfer line operators to prepare and file a leak protection and monitoring plan with their registration. However, this requirement does not extend to off-location flowlines. It's important to note that operators are allowed to use various detection methods, including pressure tests, audio, visual, and olfactory (AVO) inspections, annual instrument monitoring, smart pigging, or continuous pressure monitoring depending on the type of flowline. Effective leak detection programs are crucial to reduce spills, response times, and environmental impacts. SB19-181 Flowline Rule Making Statement of Basis and Purpose (SBP) recommended that ECMC staff review emerging leak detection technologies and consider amending its leak detection standards as appropriate.

Concerns about the absence of leak detection requirements for Colorado's Type R gas-gathering pipelines have been identified. These unregulated gas gathering lines present unique challenges for leak detection due to their typically low or intermittent flow and pressure. Unlike regulated

transmission pipelines with specific patrolling requirements, these gathering lines have no regulatory requirements.

Type R gathering leaks are often detected through casual observation by pipeline operators or the general public rather than through systematic monitoring. While EPA and PHMSA's GHG emissions rules may indirectly increase operator scrutiny of natural gas leaks, they do not specifically address leak detection for these types of gathering lines.

Given these gaps, implementing minimum requirements for leak detection on Type R gathering lines could reduce the number of releases, decrease response times to leaks, and reduce the environmental impact of releases, particularly in areas where these lines do not follow established ROWs. This could include regular visual inspections of the pipeline route, where accessible, or adopting more advanced leak detection technologies as they become feasible for these lines.

REGULATORY GAP IDENTIFIED

Regulations do not address leak detection for gathering lines, which results in large spills or leaks that further contaminate the environment. Consideration should be given to expanding leak detection requirements.

4.6.4 State Inspection, Enforcement Activity, and Transparency

Program Improvements

In a performance audit report[44] published on May 31, 2023, the Colorado Office of the State Auditor reviewed the Colorado Gas Pipeline Safety Program administered by PUC. The audit highlighted several areas for improvement, including the need for more consistent inspections, better documentation, and enhanced enforcement practices. This supports the study's recommendation for a continued improvement on the quality assurance program that improves documentation, performance, and internal assessment of the program.

From 2019 to 2021, ECMC conducted enforcement activities through its Flowline Integrity Program, issuing 63 notices of alleged violation (NOAVs). Of these, 41 were related to failures to report GIS flowline data sets, which became a new regulatory requirement in 2019. ECMC has generally ensured operator compliance with Colorado's regulations.

PSP's enforcement activities are accessible through its electronic case management website, however its user interface could be improved. A more intuitive and transparent system could improve public access to information and provide greater clarity on operator compliance actions.

Both PSP and ECMC would benefit from redesigning their enforcement websites to improve the communication of inspection and enforcement outcomes. Clear and accessible information would benefit both the public and pipeline operators, allowing for greater transparency around non-compliance issues and fostering improved public confidence in the safety and reliability of the state's energy infrastructure. Enhancing quality assurance practices and improving both agency websites will improve data quality, data access, and transparency. Both ECMC and PSP would benefit from a quality assurance program to ensure the accuracy of information and the

[44] Colorado Office of the State Auditor, Gas Pipeline Safety Program-Performance Audit. May 2023. https://leg.colorado.gov/sites/default/files/documents/audits/2256p_gas_pipeline_safety_program.pdf

quality of processes and procedures. A quality assurance program with adequate quality controls will improve confidence in data assurance in the department's programs.

Tap Regulation

In addition to flowlines, ECMC regulates domestic taps. All domestic taps must be registered with ECMC. Although ECMC regulates domestic taps, when a farm (non-domestic) or service tap is installed, the PSP has jurisdiction over the downstream flow to non-utility distribution under 49 CFR 192.740 or Subpart P. In these cases, the tap should be registered with both agencies, but it is often not. This study recommends that all systems be consistently registered with both agencies. This supports both agencies' collaboration and quality assurance to ensure that both organizations regulate taps.

REGULATORY GAP

The agencies should collaborate and define taps under each jurisdiction and rulemaking to reduce overlap and stakeholder confusion.

Interagency Collaboration, Transparency, and Security

As noted by stakeholders, internally, improved communication techniques are recommended to assist the organizations with understanding each other's roles and responsibilities and overall cross-training. It is also recommended that ECMC and PSP consider inter-agency coordination and collaboration to improve state-level inspection and pipeline safety beyond their quarterly meetings with PHMSA and CO811. Topics could include pipeline safety opportunities, knowledge sharing, and discussions on novel techniques to improve compliance and safety.

Stakeholders noted that there seems to be insufficient data related to pipelines shared across the industry, regulators, and local governments. Information is difficult to find for developers, state and local agencies, and the public. Additionally, infrastructure is being damaged during excavation because the excavator was unaware of the line despite it being known in at least one pipeline mapping database or GIS. This can be a result of outdated or missing information in the One Call database. Note that pipeline mapping databases, while they offer general information, are under no circumstances a substitute for line location services provided by CO811.

Stakeholders are considering strategies to bring the appropriate level of detail to the people who need it and when they need it to avoid incidents, help inform the development planning process, and balance data transparency with the need for safety and security.

Jurisdictional and Regulatory Clarity

Stakeholders noted a need for clearer delineation between regulatory authority and oversight and requested a diagram of how different agencies are involved. Appendix A contains flowcharts of the jurisdictions of flowlines and pipelines based on safety, environmental, and siting concerns. Appendix B contains a more general flow diagram of the safety regulation of intrastate pipelines in Colorado.

Stakeholders requested that duplicative regulatory efforts be eliminated while maintaining safety across all pipelines. They alleged that crude oil transfer lines, in particular, are confusing, and regulatory efforts seemed duplicative between ECMC and PHMSA. Stakeholders commented that it can be challenging to know who regulates what line and who to contact, even for state and local government agencies, the public, or impacted communities. Better interagency

collaboration is needed in development planning and safety regulation. Additionally, as previously mentioned, a more user-friendly database will allow better communication across industry communities and governments. Within ECMC, some inconsistencies among groups and rules were noted, leading to confusion and delays in form approvals. Understanding regulatory agencies' roles and responsibilities is critical to addressing these concerns.

Information Coordination

Creating an office or group responsible for educating the public and agencies on the structure and process of pipeline regulation can help improve transparency and remove duplicative regulatory efforts.

Additionally, it is recommended that a Pipeline Information Office or group be created to provide an initial point of contact for all inquiries. API RP 1185—*Pipeline Public Engagement* states that stakeholder engagement is one of the core elements of a pipeline safety management system, as set forth in API RP 1173—*Pipeline Safety Management Systems*.[45] API RP 1185 also provides provisions for stakeholders to consider in engagement. Colorado could be a leader in engaging operators, the public, local authorities, and agencies by learning from this recommended practice and applying it to a role that would provide the necessary contacts and information for the public, operators, and regulatory agencies. Cross-training among internal departments and inter-agency training is recommended to improve communication and understanding of agency roles and responsibilities. It could also improve agency training and coordinate regional state collaboration and education.

Stakeholders noted a lack of clear, accessible, and comprehensive educational resources for the public regarding pipeline ownership, operation, status, incident response, and contact information without clearly defined roles and responsibilities, including access to information in multiple languages in a centralized resource for easy access.

This study recommends creating a Pipeline Information Office or group to coordinate information dissemination, improve training and access to information, and make recommendations to enhance public awareness and education.

Additional Considerations

Other items flagged by stakeholders included:

- More emphasis on DI communities and environmental justice (EJ) organizations.
- Considerations for a more scientific approach to siting processes, holistic approaches to project development and permitting, considering the pipeline's purpose, more information on incidents and causes, and enforcement resources to ensure compliance and accountability.
- Improvements to processes and forms and increased efficiency in information and transparency to reduce lag and pending frustration, confusion, and misunderstandings.
- Adequate resources must be a primary consideration for compliance or enforcement strategies from operators to municipalities and state agencies. Additionally, the

[45] API, Recommended Practice 1185 1st Edition Pipeline Public Engagement. March 2024. https://www.api.org/products-and-services/standards/important-standards-announcements/rp1185

differences between produced water and recycled water must be understood to regulate them effectively.

Many of these items can be greatly improved through a Pipeline Information Office or group that can direct and assist in the flow of information. Colorado should consider incorporating and disseminating API RP 1162 and API RP 1185 as appropriate resources to improve public awareness and engagement processes in its overall engagement with the public on these topics.

4.6.5 ECMC and PSP Risk Assessment Process

By law, ECMC is mandated by SB2013-202 to use a risk-based strategy to inspect oil and gas facilities, including flowlines. Currently, ECMC uses a qualitative approach that calculates flowline inspection priority based on the following factors:

- Population density,
- Environmental risks,
- Number of spills on the associated oil and gas location (within the last five years),
- Years of service,
- Number of integrity-related corrective actions, and
- Time since the last inspection.

The 2014 report "Risk Based Inspections Strategies to Address Environmental Risk Associated with Oil and Gas Operations" breaks down equipment failures by type. According to the report, about 50% of spills were due to process piping and pipelines.[46]

ECMC uses qualitative risk assessment processes to understand where inspections should occur. Due to their flexibility and simplicity, qualitative models are widespread for flowlines. Qualitative models have the inherent weakness of being subjective, based on perceived experience outcomes, and not rigorous statistical analysis.[47]

ECMC is pursuing studies with the Colorado School of Mines to improve its risk assessment process and reach a semi- or fully quantitative analysis. They seek to apply machine learning, using known data to improve risk assessments.

PSP uses a risk assessment that is primarily qualitative with limited quantitative metrics; additional improvements would benefit PSP's current risk assessment process. Contractor support to expedite this process and improve the model is recommended. An improved risk process will allow Colorado authorities to prioritize their inspection work and quantify risks.

The study recommends continuous improvement in risk models to identify assets that may need additional monitoring and resources to improve operator compliance, safety, and environmental protection.

---

[46] ECMC, Risk Based Inspections Strategies to address Environmental Risk Associated with Oil and Gas Operations. February 2014, pg. 25.
https://ecmc.state.co.us/documents/library/Technical/Risk_Based_Inspections/DNR%20-%20OGCC%20Risk%20Based%20Inspection%20Strategy%20FINAL.pdf

[47] Colorado School of Mines, Flowline Risk Review. 2018.
https://ecmc.state.co.us/documents/library/Special_Projects/Flowline_IMM_Workgroup/CSM_Flowline_Risk_Review_October_2018.pdf

4.6.6 Carbon Dioxide Pipeline Transport

Pipeline transportation of carbon dioxide is likely to increase nationally, and in Colorado, with the increasing interest in CCUS. The most efficient mode of transporting carbon dioxide is in the supercritical or liquid phase. PHMSA considers it a hazardous liquid in this phase and regulates the interstate pipeline transporting under 49 C.F.R. 195. Under current Colorado law, PHMSA would also regulate intrastate liquid pipelines unless Colorado enters into a 60105 Certification with PHMSA.[48] With the 2020 Satartia, Mississippi carbon dioxide pipeline rupture[49] and the growing industry interest in transporting more carbon dioxide through pipelines, PHMSA is updating its regulations on carbon dioxide transportation. Notably, carbon dioxide pipelines generally have fewer safety risks than natural gas and oil pipelines.[50] The threats associated with newly constructed carbon dioxide pipelines are similar to those of other new pipelines. The primary concern is the control of moisture in the pipeline, as this accelerates internal corrosion. Preventative practices include controls to reduce the risk of water infiltration and increase the rate of pipeline inspections. The main hazard of a liquid carbon dioxide release from a pipeline is vapor cloud formation. Carbon dioxide vapor is an asphyxiant. Operators must perform high-consequence area analysis as part of the integrity management plan for a hazardous liquid pipeline. This should include a vapor dispersion model to assess the risk to the public. Well-developed programs would then identify locations for additional public awareness activities in compliance with API RP 1162—*Pipeline Awareness Programs for Pipeline Operators* to inform the public and emergency response personnel of carbon dioxide pipelines in their areas.

4.6.7 Hydrogen Pipeline Transport

Hydrogen will likely play an expanded role in the United States' energy economy in the future. PHMSA already regulates the transportation of gaseous hydrogen under 49 C.F.R. 192.

Approximately 2000 miles of pipelines in the United States are dedicated to pure hydrogen transportation as of 2019. Most were constructed after 1980 and purposely built to transport hydrogen. PHMSA oversees the safety of interstate hydrogen pipelines under 49 C.F.R. 192. As codes and standards are updated, Colorado must recertify its programs to meet the federal minimum safety standards per its 60105 and 60106 agreements. Consistent with the current 60105 Certification, any intrastate pipelines would fall under the jurisdiction of PSP, and any interstate pipelines would fall under the jurisdiction of PHMSA. Current plans for primary hydrogen hubs are outside of Colorado. Therefore, it is not expected that either entity will regulate significant mileage of hydrogen pipelines in the near term.

Significant industry efforts are ongoing nationally and internationally to understand the potential threats created by hydrogen blending and the conversion of non-hydrogen pipelines to transport hydrogen. The primary threats associated with hydrogen pipelines that are repurposed include

---

[48] ECMC, Carbon Capture and Storage: Safety and Impact Considerations from Source to Sequestration. February 2024. https://ecmc.state.co.us/documents/library/GTCCSUNGS/CCUS_Safety_Study_Report_Final_20240227.pdf

[49] U.S. DOT, PHMSA, Office of Pipeline Safety-Accident Investigation Division. Failure Investigation Report – Denbury Gulf Coast Pipelines, LLC – Pipeline Rupture/Natural Force Damage. https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-05/Failure%20Investigation%20Report%20-%20Denbury%20Gulf%20Coast%20Pipeline.pdf

[50] ECMC, Creating Colorado's Carbon Sequestration Framework: A Legislative Proposal. January 2023, pg. 43. https://ecmc.state.co.us/documents/library/special_projects/CCUS_Framework_Legislative_Proposal.pdf

the interaction of elemental hydrogen with existing defects that can result in embrittlement. Operators will seek to mitigate these threats using inspection technologies and assessment techniques. Purpose-built hydrogen pipelines have operated in the United States for many years and have been safely operated using these principles.

The risks associated with the release of hydrogen are not much different than that of natural gas. However, hydrogen fires are not visible to the naked eye. Similar to carbon dioxide pipelines, operators should utilize API RP 1162 to inform the public, emergency responders, and government agencies of the presence and emergency response to hydrogen pipeline releases. However, hydrogen is unlike carbon dioxide in that it does not create an asphyxiation risk.

4.6.8 Produced Water Transportation

Produced water is not regulated as a hazardous liquid in federal regulations. Often, pipelines are utilized to transport produced water between operations. Produced water contains wastes from oil and gas operations that can contaminate fresh water and soils with hydrocarbons, chemicals, and bacteria. Produced water can also corrode pipeline steels, releasing contaminants into the environment. ECMC has jurisdiction over produced water pipelines and works with the CDPHE and WQCD to monitor and enforce environmental standards regarding produced water. Colorado HB23-1242 established the Colorado Produced Water Consortium (CPWC) to primarily reduce the use of fresh water and increase the recycling of produced water in Colorado's oil and gas operations. To date, the CPWC has focused on identifying issues regarding produced water reuse and recycling across the state. It examined the current infrastructure of produced water flowlines, finding that the Denver-Julesburg (DJ) Basin has the least connected produced water flowline network. At the same time, water usage for hydraulic fracturing is greater than the volume of water produced. More flowline infrastructure may be needed to "develop connectivity in the Wattenberg area of the DJ Basin where most of the opportunities to increase reuse and recycling of produced water exist."[51] The CPWC should conduct further research regarding the transport and storage of produced water for reuse, identifying potential scientific, legislative, and regulatory gaps needed to develop standards that are protective of public health, welfare, safety, environment, and wildlife resources in Colorado while being mindful of fluid properties and associated risks, and consider strategies and potential pilot studies to inform the development of these standards.

The Produced Water Consortium should be directed to provide recommendations to ECMC to clarify rules on produced vs. recycled water based on sound science and risk management.

4.6.9 Gathering Pipelines

Recent PHMSA reporting on Gas Gathering for 2022 and 2023 under the new Type R reporting requirements demonstrates that internal corrosion causes most gas-gathering pipeline failures. In 2022, internal corrosion caused 45% of failures, and in 2023, over 57% of failures. Incident reporting for Type C and R gas gathering has only been required since 2022. Based on this limited information, early indications and field experience are that internal corrosion is the primary cause of gas-gathering pipeline failures for Types A, B, C, and R. There are limited corrosion control requirements associated with the different types of gathering lines. There are

[51] Colorado Produced Water Consortium, Initial Report on Infrastructure, Storage, and Treatment Facilities Necessary to Achieve Different Levels of Recycling & Reuse of Produced Water, September 1, 2024.
https://drive.google.com/file/d/1azjjaU5QkUI5_5HHemJE6onWLzru6Rt8/view

no corrosion control requirements associated with Type R pipelines and the requirements for Type A, B, and C are easily bypassed by operators. Figure 9 shows that corrosion is the second most common failure type on hazardous liquid gathering lines regulated by PHMSA.

REGULATORY STRATEGY IDENTIFIED

Internal and external corrosion control for gathering lines is not required. It is demonstrated that failures continue to occur because corrosion is not controlled or prevented.

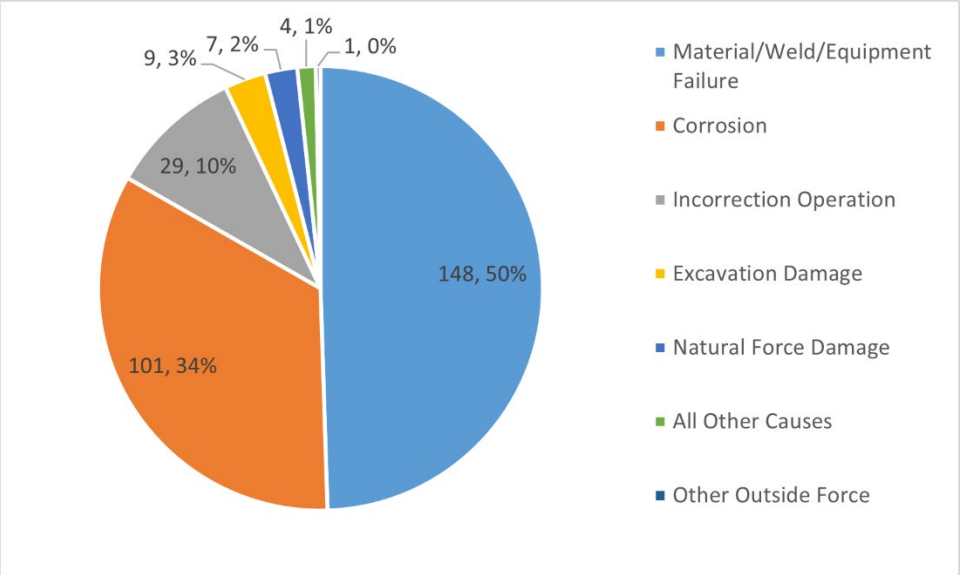


Figure 9. Hazardous Liquid Gathering Line Reported Incidents to PHMSA by Type (2021 to 2023)

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

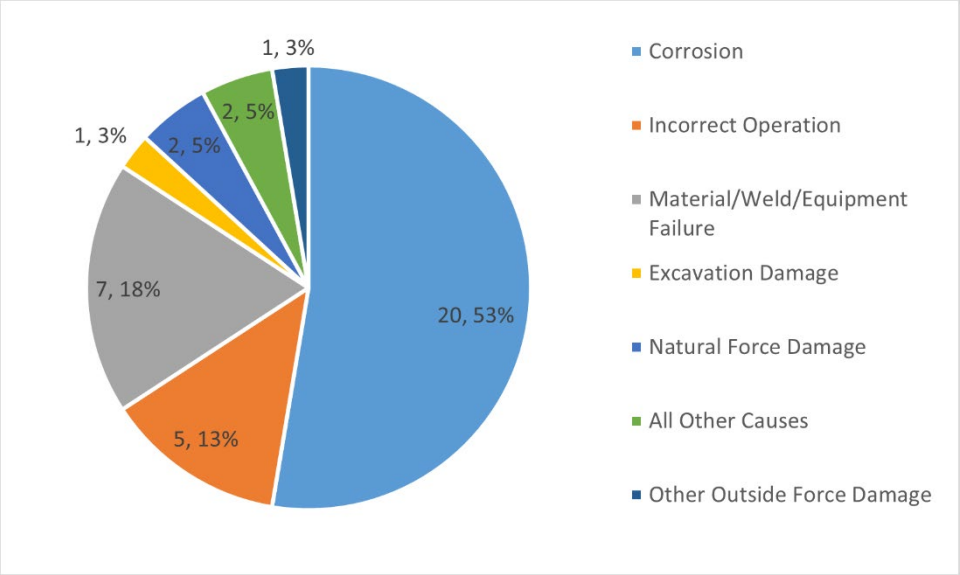


Figure 10. Natural Gas Type-R Gathering Line Reported Incidents to PHMSA by Type (2022 to 2023)

Nationally, gas-gathering incidents have increased over the last ten years, driven primarily by corrosion. Since Type R gas gathering reporting began in 2022, six incidents in Colorado were reported in 2023, all of which were internal corrosion. Figure 10 shows that nationally, corrosion is causing over 53% of Type R gathering pipeline failures.

4.7 Evaluation of Peer State Approaches to Permitting, Siting, and Safety Regulation

Most states in the United States adopt stricter pipeline safety regulations than the corresponding federal regulations (1477 occurrences)[52] to meet specific local safety needs, according to a 2022 report by the National Association of Pipeline Safety Representatives (NAPSR). To identify states that are similar enough to Colorado to allow for an analysis of approaches to permitting, siting, and safety, the study reviewed all 50 states that reported pipeline mileage.

"Peer" states to Colorado were identified by the study using the following criteria:

- Total pipeline mileage or total gas pipeline mileage within 10% of Colorado's mileage and
- Three or more subcategories of pipeline mileage within 20% of Colorado's mileage.

The study identified 12 "peer" states to Colorado based on pipeline mileage. These states are Alabama, Iowa, Louisiana, Michigan, Minnesota, Missouri, New Jersey, North Carolina,

[52] National Association of Pipeline Safety Representatives, Compendium of State Pipeline Safety Requirements and Initiatives Providing Increased Public Safety Levels compared to the Code of Federal Regulations, 3rd Edition. 2022. https://nebula.wsimg.com/77f8f2a14d467fbe1e56cbafaf9e8a8b?AccessKeyId=8C483A6DA79FB79FC7FA&disposition=0&alloworigin=1

Oklahoma, Tennessee, Wisconsin, and Wyoming. The basis of the peer evaluation was total pipeline mileage or gas mileage within 10% of Colorado's 2023 reported mileage. Four additional states were included within 20% of the same mileage as Colorado, with more than three sub-types of reported mileage. Table 1 contains the mileage data with the highlighted mileage meeting the criteria above:

Table 1. Colorado and peer state pipeline mileage (2023)

Peer States with Oil and Gas Rules	Total Pipeline Mileage	Gas Mileage	Gas Trans Mileage	HL Mileage	Gas Dist. Main Mileage	Gas Dist. Service Mileage	Gas Gathering Mileage	Crude Mileage	HVL Mileage	Refined Mileage
Alabama	67,285	65,568	6,591	1,717	33,439	25,253	285	335	272	1,110
Colorado	**76,160**	**70,848**	**7,743**	**5,312**	**38,707**	**19,413**	**4,984**	**1,711**	**2,103**	**1,255**
Iowa	48,803	44,355	8,114	4,448	19,583	16,639	0	673	1,901	1,874
Louisiana	88,448	74,826	24,180	13,622	28,594	15,570	6,483	4,108	7,488	1,709
Michigan	135,888	132,425	8,720	3,463	62,187	60,934	585	1,472	569	1,421
Minnesota	72,480	67,232	5,423	5,248	34,721	27,088	0	2,907	520	1,821
*Missouri	59,511	54,381	4,510	5,130	28,841	21,030	0	1,846	1,375	1,909
New Jersey	72,527	71,959	1,595	568	36,041	34,321	1	0	24	544
North Carolina	69,074	67,919	3,745	1,155	35,318	28856	0	0	89	1,066
*Oklahoma	79,344	64,234	11,628	15,110	27,834	9,052	15,719	7,087	5,474	2,212
Tennessee	77,454	76,176	4,874	1,278	42,679	28,605	19	395	12	870
Wisconsin	80,659	78,140	4,621	2,519	42,316	31,200	4	1,181	238	1,100
Wyoming	29,205	20,648	6,933	8,557	5,851	2,812	5,052	4,624	1,866	1,406

*MO and OK were removed from the peer states in further analysis due to the lack of publicly available information, which made effective analysis impossible.

The study then analyzed PHMSA-reported incident data to understand where Colorado ranked nationally in pipeline safety based on incidents per mile and injuries per mile of transmission pipelines. To normalize the reporting, a heat map was generated for these "peer" states and their incidents per mile. The results are displayed in Table 2. The green formatting indicates a lower incidence per mile relative to the other peer states, while the red formatting indicates a higher incidence. Colorado has trended in the middle of the pack regarding pipeline incidents and injuries per mile. It has above-average fatalities per mile of pipeline.

Table 2. Colorado and peer state PMHSA incidents, fatalities, and injuries (2015 to 2023)

Peer States with Oil and Gas Rules	Incidents	Fatalities	Injuries	Incidents Per Mile	Fatalities Per Mile	Injuries Per Mile
Alabama	62	3	9	9.22E-04	4.46E-05	1.34E-04
Colorado	**92**	**2**	**7**	**1.20E-03**	**2.61E-05**	**9.15E-05**
Iowa	58	0	1	1.19E-03	0.00E+00	2.05E-05
Louisiana	359	8	11	4.06E-03	9.05E-05	1.24E-04
Michigan	158	6	22	1.16E-03	4.42E-05	1.62E-04
Minnesota	76	2	3	1.05E-03	2.76E-05	4.14E-05
*Missouri	74	0	3	1.24E-03	0.00E+00	5.04E-05
New Jersey	110	0	8	1.52E-03	0.00E+00	1.10E-04
North Carolina	64	2	7	9.27E-04	2.90E-05	1.01E-04
*Oklahoma	341	1	12	4.30E-03	1.26E-05	1.51E-04
Tennessee	46	1	8	5.94E-04	1.29E-05	1.03E-04
Wisconsin	33	1	1	4.09E-04	1.24E-05	1.24E-04
Wyoming	136	0	0	4.66E-03	0.00E+00	0.00E+00

*MO and OK were removed from the "peer" states in further analysis due to the lack of publicly available information, which made effective analysis impossible.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

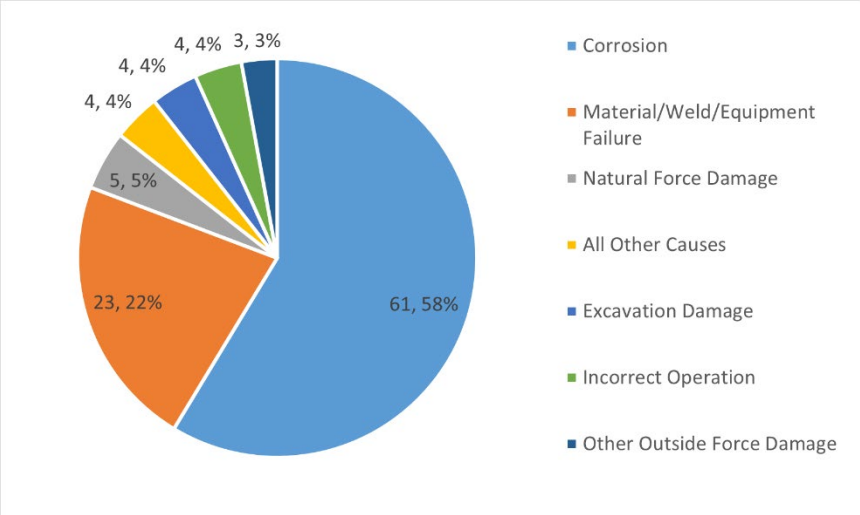


Figure 11. Ten-Year National Incidents by Type (2014-2023)

Colorado has ten state-specific safety initiatives as of 2022, including four enhanced reporting requirements, four direct oversight requirements, one specific requirement for Type A, B, and C gathering pipelines, and one for more frequent inspections, contacts, and detailed audits. These enhanced reporting requirements allow the state regulators to be informed sooner when an incident occurs. Additionally, operators must take appropriate actions when PHMSA issues advisory bulletins and amend procedures after an incident, safety-related condition, or abnormal operating condition occurs. The "peer" state average state-specific regulations is 38, more than three times as many as Colorado.

There are additional factors to consider. For example, the eastern United States tends to have more cast iron pipes than the western states. Additionally, moist soil can cause faster corrosion than the drier, more arid soil in Colorado. While the number of types of safety initiatives cannot be directly correlated, it is worth noting that Colorado tends to have fewer safety regulations than "peer" states. Figure 11 shows that corrosion remains a major cause of incidents nationally over the last 10 years.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

Table 3. Pipeline safety peer state comparison (2015-2023)

Peer States	Number of State Safety Initiatives	Colorado mirror initiatives	State performs better than Colorado in PHMSA Injuries per mile	Siting Regulated by the State	60105(a) Certification
Alabama	17	3	-	-	Gas/Liquid
Iowa	13	4	Yes	Yes	Gas
Louisiana	8	1	-	Yes	Gas/Liquid
Michigan	71	5	-	Yes	Gas
Minnesota	30	4	Yes	Yes	Gas/Liquid
New Jersey	85	6	-	Yes	Gas
North Carolina	17	3	-	-	Gas
Tennessee	11	5	-	-	Gas
Wisconsin	75	2	Yes	Yes	Gas
Wyoming	12	4	Yes	Yes	Gas

Permitting and siting are regulated in various ways in various states in the United States. Some states, such as Louisiana and Minnesota, regulate at the state level. The Iowa Utilities Commission is well known for its current involvement at the state level in permitting the siting of carbon dioxide pipelines. Other states, like Colorado, have deferred regulations to counties, leading to varying regulations. Seven of the "peer" states have pipeline siting permitted at the state level as shown in Table 3.

The safety of intrastate pipelines may be managed at the state level by certifying with PHMSA under 49 U.S.C. §§ 60105-60106. The District of Columbia, Puerto Rico, and all states except Alaska and Hawaii participate in this program. States may also certify to act as PHMSA agents for interstate pipeline inspections. Three peer states—Michigan, Minnesota, and Iowa—are certified to represent PHSMA in interstate pipeline inspections. Iowa and Minnesota have better safety metrics and a more comprehensive safety program than Colorado based on PHMSA statistics and safety initiatives, as shown in Table 3. Both have more state initiatives with permitting and siting at the state level. Due to Minnesota's oversight of all gas and liquid pipelines and stricter requirements, which include 26 rules that go above the federal regulations, Minnesota experienced 13% fewer federally defined incidents per mile than Colorado from 2015 to 2023.

PSP should consider a program similar to the gas program to regulate intrastate liquid pipelines through the 49 U.S.C. § 60105 Certification.

The study then attempted to evaluate peer state programs by size and publicly available resources to review whether Colorado has sufficient staff resources. It found that the titles, roles, and responsibilities varied significantly across the states, as shown in Table 4.

Table 4. Known resources used by "peer" states relative to Colorado (2023)

"Peer" States	Program Size			Summary of State Operations	Comments
Colorado PSP	**1 Deputy Director 1 Program Manager 3 Unit Managers (also inspect)**	**7 Inspectors (3 open positions)**	**1 GIS Analyst**	**15 GD* operators, 38 GT** Operators, 66k miles gas,**	**14 FT personnel**
Colorado ECMC	1 Engineering Manager 1 Integrity Supervisor	2 Engineers (1 open position) 2 Inspectors	1 GIS Supervisor 1 GIS Analyst	1472 operators 15k miles flowlines	5 FT flowline regulation personnel
Alabama	1 Director 2 Supervisors	5 Investigators 2 Engineers	1 Admin Support Asst.	74 GD operators 27 GT operators 6 HL*** operators 61k gas pipeline miles 129 HL pipeline miles	11 FT personnel, similar mileage, and operators
Iowa	1 Manager 1 Attorney	2 Engineers 5 Inspectors 1 One Call Investigator	1 Admin	63 GD operators, 40 GT operators 12 HL operators 38k gas pipeline miles	11 FT personnel, fewer total miles, similar GT, GD, and HVL mileage
Louisiana (Pipeline Division)	1 Director 1 Manager 1 Petroleum Scientist 2 Division Managers 6 Conservation Managers	14 Enforcement Specialists 2 Petroleum Scientist Managers 1 Petroleum Scientist Supervisor 1 Engineer Tech Dcl	1 Admin Asst.	104 GD operators 71 GT operators 58 HL operators 55k gas pipeline miles 5k HL pipeline miles	Large divisions, also manages offshore pipelines

Michigan	1 Director, 3 Managers	15 Engineers 1 Specialist (Ungs)		12 GD operators 28 GT operators 129k gas pipeline miles	Similar performance, more mileage, GT, crude, and RF similar mileage
Minnesota	1 Pipeline Safety Director 1 Deputy Director	16 Engineers	1 GIS Manager 3 Office Admin	52 GD operators 26 GT operators 2 HL operators 62k gas pipeline miles 27 HL miles	>20 personnel similar geographic area > operators and similar mileage
New Jersey	1 Asst Bureau Chief	3 Engineers 1 Engineer Trainee		4 GD operators, 7 GT operators 71k gas pipeline miles	Small geographic area
North Carolina	1 Pipeline Safety Manager	5 Engineers		13 GD operators 9 GT operators 67k gas pipeline miles	Smaller geographic area, very few gas operators (13), only 3 liquid operators
Tennessee	1 Director 1 Deputy Director	6 Inspectors	1 Admin	98 GD operators 15 GT operators 72k gas pipeline miles	9 FT personnel
Wisconsin	1 Director	1 Engineering Supervisor 7 Engineers		12 GD operators 16 GT operators 74k gas pipeline miles	9 FT personnel, fewer operators, more miles
Wyoming	1 Supervisor	3 Engineers 1 Inspector		8 GD operators 18 GT operators 15k gas pipeline miles	Fewer miles, similar operators, limited population

* GD (Gas Distribution)
** GT (Gas Transmission)
*** HL (Hazardous Liquid)

Next, the study aligned the number of inspectors/engineers with the ratio of operators and mileage to ascertain if resources may be considered for pipeline safety performance. The following Table 5 shows the results, with "peer" states performing with fewer incidents or injuries than Colorado and those with higher numbers of incidents or injuries ranking lower.

Table 5. Ratio of operators and miles to inspectors organized by descending PHMSA serious incidents or injuries (2023)

State	Operators/Inspector	Pipeline miles per inspector
Wyoming	6.5	3,750
Wisconsin	3.5	9,250
Iowa	14.3	4,750
Minnesota	5.0	8,000
Colorado	**5.3**	**6,600**
North Carolina	4.4	13,400
Tennessee	17.2	12,000
New Jersey	2.75	17,750
Louisiana	12.9	3,333
Alabama	15.3	8,700
Michigan	2.5	8,000

Based on Table 5, "peer" states with a lower operator-to-inspector ratio or fewer miles per inspector tend to perform better than those with higher ratios or more miles. The study cannot definitively state performance is related to these ratios but does note that there may be a correlation here. Minnesota is closest in terms of operators per inspector, with a slightly higher mileage. Two out of three states with lower operator inspector ratios have significantly higher mileage per inspector. Michigan is the only exception, with an incident rate close to Colorado's. Louisiana has a lower mileage per inspector but significantly higher operators per inspector. This observation indicates that there may be a causal link primarily between fewer operators to inspector ratios, with a secondary effect of lower mileage per inspector.

Colorado's pipeline safety program is not currently fully staffed, with three open positions. Considering its geographic area, number of operators and mileage, types of regulated entities, and safety performance relative to its peers, it is recommended that Colorado increase its staffing to support a minimum of 13-16 full-time inspectors at all times to account for paid time off and turnover. This would increase the average mileage and decrease the average operator per inspector. The average mileage per inspector for a state above Colorado is approximately 4,000 miles/inspector and 4.3 operators per inspector.

ECMC inspects and enforces over 1400 operators, with approximately 15,000 miles of registered flowlines and a staff of five integrity inspectors/engineers. This is a ratio of 280 operators per inspector across the large geographical area of Colorado. This issue should be addressed to

reduce the operator-to-inspector ratios to a more manageable level. It should be noted that while Colorado has a lot of registered oil and gas operators, the vast majority of the flowline mileage belongs to fewer than 30 operators, which is still a ratio of six operators per inspector, which is again higher than optimum.

4.8 Disproportionately Impacted Communities, Environmental Justice, and Community Engagement

4.8.1 DI Communities

Colorado law (§ 24-4-109, C.R.S.) defines a DI Community for state purposes, recognizing communities that face greater environmental and socioeconomic challenges. According to the law, a DI Community is defined as:

1. A community in a census block group where:
    - More than 40% of households are classified as low-income (earning less than or equal to 200% of the federal poverty guideline),
    - More than 40% of households identify as minority, or
    - More than 40% of households are housing cost-burdened (spending more than 30% of income on housing).
2. Or any other community identified or approved by a state agency if:
    - The community has a history of environmental racism perpetuated through practices, such as redlining or laws that disproportionately impacted Indigenous, immigrant, Hispanic, or Black populations, or
    - Multiple factors—including socioeconomic stressors, disproportionate environmental burdens, vulnerability to environmental degradation, and limited public participation—act cumulatively to affect health and contribute to persistent disparities in the community.

4.8.2 Environmental Justice and Community Engagement

The goal of state engagement with DI Communities, as outlined in Colorado law, is to:

1. Build trust and transparency between communities and regulatory bodies;
2. Provide meaningful opportunities for communities to influence public policy; and
3. Modify proposed state actions in response to public input to reduce environmental burdens or increase environmental benefits for DI Communities.

To achieve these goals, state agencies are required to:

1. Develop new ways to gather input from communities across the state, using multiple languages and communication formats;
2. Share information transparently about potential adverse environmental effects from proposed state actions;
3. Schedule public input opportunities at varying times, including mornings, evenings, and weekends;

4. Provide at least 30 days' notice before any public input opportunity or the start of any public comment period;
5. Use diverse methods of outreach, such as schools, clinics, social media, local governments, tribal governments, and community organizations;
6. Offer multiple methods for public input, including in-person meetings, virtual sessions, and online comment portals;
7. Consider a variety of locations for public input, including urban centers, predominantly minority neighborhoods, and rural areas; and
8. Create outreach materials in layperson's terms, translating them into the community's top two languages.

4.8.3 Recommendations

In line with these legal requirements and in response to the challenges faced by DI Communities, this report recommends:

1. **Creating a Pipeline Information Office**: This role would facilitate the engagement processes required by law and ensure continuous dialogue between communities, regulatory bodies, and industry.
2. **Developing a Comprehensive Engagement Strategy**: This strategy should meet or exceed the legal requirements for community outreach and input, ensuring diverse and equitable participation.
3. **Implementing Regular Environmental Justice Training**: Both regulatory staff and pipeline operators should receive training to ensure they understand environmental justice requirements and the unique needs of DI Communities.

4.8.4 Cumulative Impacts

The law recognizes the importance of addressing the cumulative impacts of energy development on DI Communities. The recommendations in this report aim to reduce these impacts by:

1. Reducing spills, leaks, and other adverse events in pipeline infrastructure;
2. Enhancing transparency and access to information regarding environmental risks and benefits;
3. Promoting active community participation in decision-making processes; and
4. Supporting the transition to cleaner, more sustainable energy sources can increase the resilience of Colorado's energy infrastructure while reducing environmental impacts on vulnerable communities.

These efforts align with the Colorado Environmental Justice Act, which recognizes the right of all people to clean air and water, equitable participation in environmental decision-making, and protection from environmental hazards.

4.8.5 Moving Forward

By adhering to the legal requirements and implementing the recommendations outlined in this report, Colorado can work towards a more equitable, safe, and sustainable energy infrastructure. This approach balances the need for reliable energy development while protecting public health, safety, welfare, environment, and wildlife, ensuring that environmental justice principles guide the state's energy future.

While acknowledging the potential negative impacts of energy development, it is important to recognize the benefits of reliable and affordable energy, including improved quality of life and longevity for Coloradans. The transition to cleaner, more sustainable energy sources can increase the resilience of Colorado's energy infrastructure while potentially reducing environmental impacts on DI communities.

With an emphasis on transparency, community engagement, and equitable policy development, Colorado can build a more inclusive energy infrastructure that benefits all its residents. By integrating these recommendations with broader improvements to pipeline safety and siting processes, the state can work towards an energy future that is not only technologically advanced and economically viable but also socially just and environmentally sustainable.

5. STUDY RECOMMENDATIONS

The study recommends the following to the state of Colorado to improve safety and siting:

1. **Establish a Pipeline Information Office/Group/Program**: Create an office/group to improve coordination across agencies, stakeholders, and the public. Improve data transparency, public education, and communication related to pipeline infrastructure in the state. Consider where in the state government this group should reside and the funding mechanisms(s) for program implementation. This program could:
    a. Serve as a central hub for information and educational materials, including pipeline siting, safety, regulatory processes, jurisdictional information, and contact information for relevant agencies, local governments, and first responders.
    b. Encourage statewide communication across agencies and jurisdictions and liaise, as necessary, between federal, state, and local agencies.
    c. Encourage and implement, as appropriate, safety and communication initiatives in collaboration with stakeholders, operators, and pipeline organizations that could include working groups, grants, emergency response efforts, training, or other items or actions related to pipelines across the state. For instance, training resources and coordination related to emergency response for both emerging and existing industries could benefit all involved parties. This could include the state pursuing related federal grants.
    d. Utilize funding and resources for cross-training among state and local agencies and departments to improve coordination, reduce regulatory duplication, and ensure safety across all operations, including emerging industry considerations.

e. Develop a user-friendly website containing centralized mapping resources, detailed information on local siting requirements, opportunities for training and public input, and educational materials to enhance public understanding of pipelines in Colorado.

f. Include representatives from agencies/organizations across the state (PUC, ECMC, UDPSC, CO811, etc.) to ensure accurate agency information and appropriate incorporation of the interests of existing state agencies into this program's strategies.

2. **Address Damage Prevention:** Consider further data acquisition and study of root causes of excavation damage to identify if and how regulations or strategies should be altered to reduce infrastructure damage. UDPSC should be consulted in this effort.

3. **Address Corrosion Control**: Perform an in-depth study of Colorado-specific corrosion failures. Understanding the necessary regulations that should be implemented to control corrosion is recommended. Effective corrosion control for flowline and gathering pipelines will reduce environmental releases but must be based on quality data with informed decision-making.

4. **Standardize Pipeline Siting Regulations**: Consider standardizing baseline siting regulations, in consultation with stakeholders, for local county authorities to utilize for pipeline siting. The state could provide a forum for information sharing across jurisdictions and provide information on standards to help inform local jurisdictions on pipeline siting strategies, ensure proper communication, and develop cohesive processes across jurisdictional boundaries. This could help encourage clarity in the pipeline siting process without reducing local autonomy.

5. **Update Revised Statutes:** The General Assembly should consider updating the revised statutes to include definitions and scope for hydrogen, carbon dioxide, and geothermal oversight. This could include clarifying existing PUC/ECMC jurisdictions to ensure all applicable lines are covered, and the agencies have the proper authority to safely and effectively regulate infrastructure related to emerging energy industries. The Colorado hydrogen[53] and carbon dioxide[54] studies also pointed out this gap. The impending geothermal regulatory study will also discuss this issue.

6. **Further Investigation into Pipeline Mapping and ROWs**: Further investigation may be necessary to establish a statewide mapping strategy to appropriately centralize mapping information, review existing ROWs, and consider corridors for future development in emerging energy industries, such as CCUS, geothermal, and hydrogen.

   Various strategies for location data acquisition and pipeline mapping exist through state and federal agencies. Any strategy must incorporate existing strategies through ECMC/PUC and NPMS and ensure efficient processes that are not overly burdensome for industry or the state.

---

[53] ECMC, Colorado Regulation of Underground Storage and Transportation of Hydrogen. July 2024. https://ecmc.state.co.us/documents/library/GTCCSUNGS/Colorado_Regulation_of_Underground_Storage_and_Transport_of_Hydrogen.pdf

[54] ECMC, Carbon Capture and Storage: Safety and Impact Considerations from Source to Sequestration. February 2024. https://ecmc.state.co.us/documents/library/GTCCSUNGS/CCUS_Safety_Study_Report_Final_20240227.pdf

Data transparency is important but must be balanced properly with infrastructure security risk, and strategies must be informed by a wide range of stakeholders

Development of new industries could leverage existing ROWs, where applicable, to reduce impact, and the state could play a role in compiling data and expediting processes as necessary.

The following recommendations are for ECMC. These recommendations are proposed to address challenges and improve pipeline oversight by ECMC for safety:

1. **Implement Quality Assurance Programs**: Continue to enhance the established quality assurance program for data accuracy and reliability. ECMC has reported an effort is underway to bring this recommendation into its processes. A quality assurance program increases the public and industry's confidence in the agency's recommendations and rulings. A robust quality program will allow ECMC to effectively target the root causes of incidents and the director's enforcement actions, and proposed rulemakings will be defensible based on accurate quality-controlled data to improve jurisdictional pipeline safety and reliability.
2. **Enhance Risk Assessment Models**: Update and refine the risk assessment methodologies to prioritize inspections and regulatory actions. ECMC is currently working with the Colorado School of Mines to develop improved risk methodologies to enhance this process. These efforts should continue until a robust risk assessment process is validated and implemented. ECMC should evaluate whether current data collection practices are sufficient for accurate risk modeling and assess the resources needed to vet information provided by operators. Robust risk assessments improve pipeline safety by effectively using resources to target higher-risk assets for inspection and compliance actions.
3. **Require Root-Cause Investigations**: Update regulations to include reporting root-cause analyses of pipeline spills/releases in cases where the immediate cause cannot be determined and enforce preventive measures to mitigate similar future failures. Reduction of incidents involving spills and releases requires proactive measures to address the root causes of failures in the remaining pipe, not solely the current failure location.
4. **Improve Data Transparency**: Update websites to provide operators, regulators, and the public with accessible incident and enforcement data. Transparency of causes, investigations, enforcement, and actions build public trust and raise the bar for industry and agencies to improve safety.
5. **Addressing Aging Infrastructure**: Consider strategies for addressing aging energy infrastructure while balancing existing energy needs and the transitioning energy landscape. This should include addressing operational resource constraints related to deteriorating infrastructure and should promote public health and safety, and protection of the environment and wildlife resources. This could be accomplished through a study, workgroup, or similar process to fully inform and understand the resources necessary to accomplish these goals in the context of the energy transition.
6. **Clarify Produced Water Regulations**: Engage CPWC to conduct further research regarding the transport and storage of produced water for reuse, identifying potential

scientific, legislative, and regulatory gaps needed to develop standards that are protective of public health, welfare, safety, the environment, and wildlife resources in Colorado while being conscious of fluid properties and associated risks, and consider strategies and potential pilot studies to inform the development of these standards.

7. **Enhance Mapping Requirements**: Impose conditions of approval for flowline spill/release reports, requiring operators to update locational data using the best horizontal location accuracy available to the operator when flowlines are exposed during activities related to the spill/release. Safety protocols to ensure operator safety during data collection should be considered. Accurate spatial data collection at all available opportunities will improve mapping over time.

The following recommendations to PSP are proposed to address challenges and improve PSP pipeline oversight for safety:

1. **Implement Quality Assurance Programs**: Enhance the existing quality assurance program to enhance data accuracy and reliability. A quality assurance program increases public and industry confidence in the agency's recommendations and rulings. A robust quality program will allow PSP to effectively target the root causes of incidents. Enforcement actions and proposed rulemakings will be more defensible based on accurate quality-controlled data to improve pipeline safety and reliability.
2. **Enhance Risk Assessment Models**: Continue to improve the risk assessment process. Modern risk assessment methodologies prioritize inspections and regulatory actions, enhancing public safety by increasing the agency's effectiveness. To expedite this enhancement to their program, PSP should consider requesting support from a contractor capable of developing a robust risk assessment process.
3. **Improve Data Transparency**: Develop websites that provide operators, regulators, and the public with accessible incident and enforcement data. Transparency of causes, investigations, enforcement, and actions build public trust and raise the bar for industry and agencies to improve safety.
4. **Expand State Oversight**: Pursue 60105 Certification to include intrastate liquid pipelines under state regulatory oversight, similar to approaches in "peer" states. Under current Colorado law, PHMSA regulates intrastate liquid pipelines unless Colorado enters into a state program agreement. Expanding state authority to include these intrastate pipelines would enable more cohesive and locally tailored regulatory practices,[55] improve pipeline safety performance, and enhance oversight of pipeline practices within the state.
5. **Enhance Mapping Requirements**: Update the rules for operators to update locational data using the best horizontal location accuracy available to the operator when jurisdictional pipelines are exposed during any activity. Safety protocols to ensure operator safety during data collection should be considered. Accurate spatial data collection at all available opportunities will improve mapping over time.
6. **Implement Leak Detection Requirements**: Update regulations to include leak detection methods for gas-gathering (Types A, B, C, and R) pipelines to reduce GHG emissions, improve safety, and protect the environment from hydrocarbon contamination from gas-gathering fluids.

[55] Ibid.

7. **Root-Cause Investigations and Preventative Measures**: Update regulations to include root-cause investigations for pipeline failures and enforce preventative measures for gas-gathering pipelines (Types A, B, C, and R).

THE REMAINDER OF THIS PAGE IS INTENTIONALLY BLANK

6. APPENDIX A

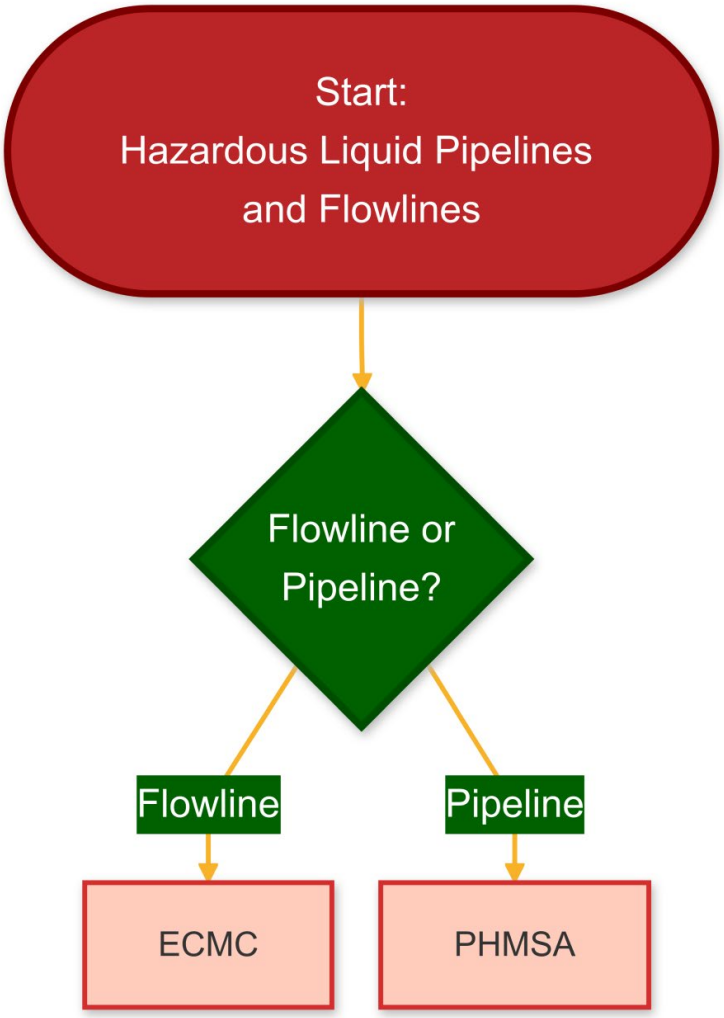
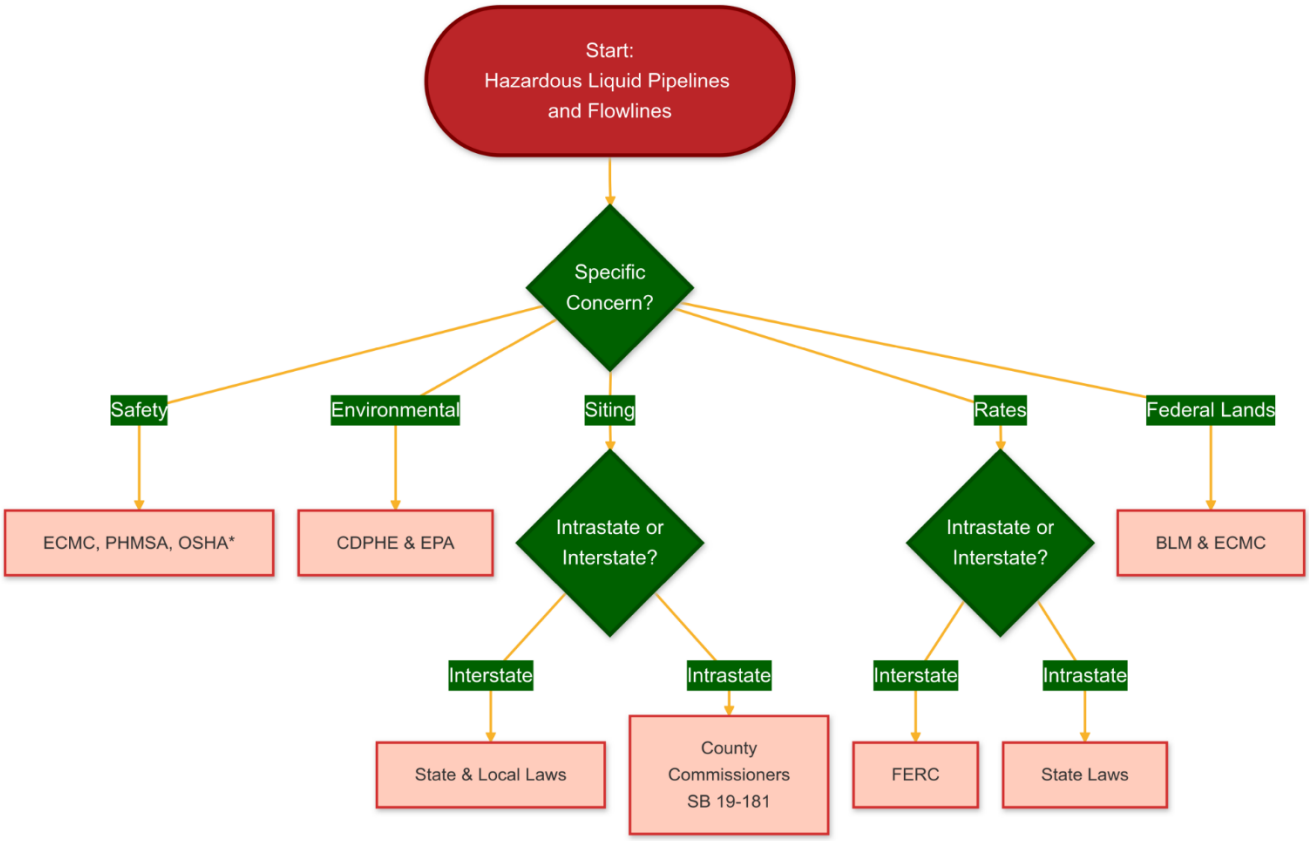


Figure A-1. Flowchart – Safety Jurisdictions of Hazardous Liquid Pipelines in CO Flowchart



*OSHA regulates the working conditions of oil pipelines in cases where federal and state agencies have not exercised statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health (29 U.S.C. 653(b)(1)).

Figure A-2. Flowchart – Specific Jurisdictions of Hazardous Liquid Pipelines in CO

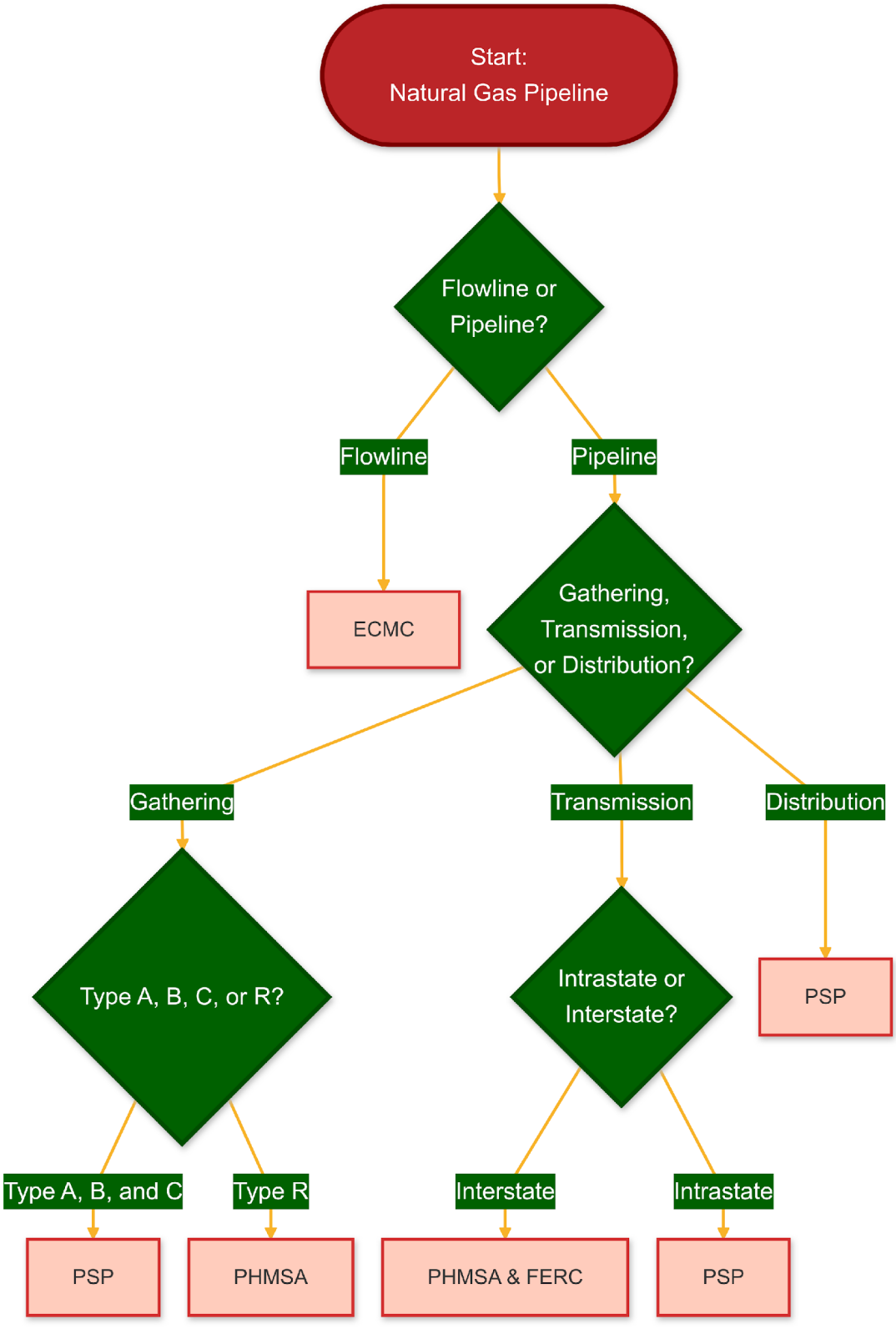


Figure A-3. Flowchart – Safety Jurisdictions of Natural Gas Pipelines in CO

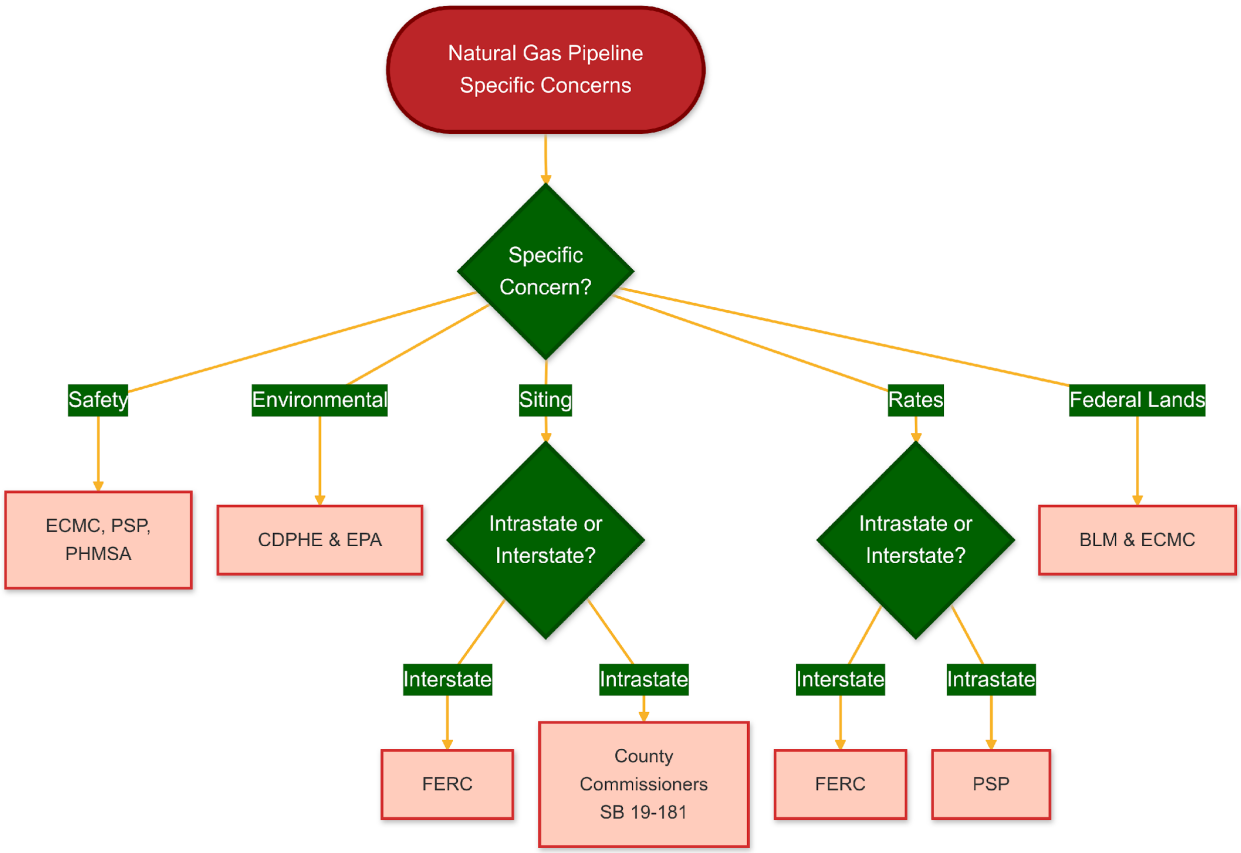


Figure A-4. Flowchart – Specific Jurisdictions of Natural Gas Pipelines in CO

7. APPENDIX B

Figure B-1. Jurisdictional Diagram

Safety Regulation of Intrastate Energy Pipelines in Colorado

This schematic is intended to provide general information regarding energy pipeline systems in Colorado. Please note the following:

***Certain aspects may be regulated differently than shown.**

***Geothermal flowlines and pipelines on tribal lands are not included in this schematic.**

***Regulatory authority of the associated facilities shown here is not depicted.**

Gas Storage Facility

Liquid Petroleum Gas Customer

Electric Power Generation Station

Large Industrial Customer

Smaller Manufacturer

Commercial Customer

Residential Customer

Natural Gas Powered Vehicle Stations

Gas Transmission Lines

Gas Gathering Lines

Gas Processing and Treatment Plant

Compressor Station

City Gate

Natural Gas Distribution Lines

Pipeline operators use API RP 80 - Guidelines for the Definition of Onshore Gas Gathering Lines to make the gas gathering line determination.

Jurisdictional changes are based on the function of the line rather than on a particular piece of equipment.

Jurisdictional Change

Crude Oil Transfer Lines

Oil, Gas, or Multiphase Wells

Production Facility

Underground Natural Gas Storage Facility (Intrastate)

Permanent Oil Storage Facility

Discharge Point like a Pit or a Loading Point

Class II Wells

Class VI Wells

Jurisdictional Change

Point Sources for Carbon Capture

Crude Oil Gathering Lines

Crude oil gathering lines are 8.625 inches (nominal diameter) or less that transport petroleum from production facilities and include:
- Pipelines in non-rural areas
- Regulated rural gathering lines as described in 49 CFR 195.11

Jurisdictional Change

Pump Station

Hazardous Liquid Transmission Lines

Refinery or Chemical Plant

Manufacturers

Hazardous Liquid Transmission Lines

Bulk Product Storage Facility (Tank Farm)

Storage Facility (Tank Farm) for direct-served users such as airports

Pump Station

Bulk Storage Facility (Tank Farm); Distribution Terminal

Storage for Home Heating Oil

Storage for Local Gasoline Delivery

LEGEND

Line Type

- Flowlines
- Pipelines

Fluid Type

- Liquid, Gas, or Multiphase Mixture
- Gas
- Petroleum Liquids (such as Crude Oil)
- Produced Water
- Supercritical CO2

Regulatory Authority

- Energy and Carbon Management Commission
- Colorado Public Utilities Commission (Pipeline Safety Program)
- Pipeline and Hazardous Material Safety Administration

COLORADO
Energy & Carbon Management Commission
Department of Natural Resources