

**2011 REPORT TO THE
WATER QUALITY CONTROL COMMISSION
and
WATER QUALITY CONTROL DIVISION
of
THE COLORADO DEPARTMENT OF
PUBLIC HEALTH AND ENVIRONMENT**

**by
THE COLORADO OIL AND GAS CONSERVATION COMMISSION**



**of
THE DEPARTMENT OF NATURAL RESOURCES**

**IN ACCORDANCE
WITH**

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

FEBRUARY 2012

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1. INTRODUCTION

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

Section 5.1 of the MOA specifies that the COGCC must report annually to the WQCC about how its programs assure compliance with WQCC water quality standards and classifications for the activities, which are subject to the jurisdiction of the COGCC.

This 20th annual report includes a summary of COGCC activities and changes in ground water protection programs that were made during the preceding year. Major issues concerning the implementation of water quality standards and classifications are also reported.

2. COGCC ORGANIZATION AND FUNCTIONS

Public Outreach and Communication

The COGCC employs the following strategies for effective communication with the public and the regulated industry:

- Ten staff reports are prepared annually or submittal to the COGCC Commissioners. Ongoing staff activities such as compliance and enforcement actions, environmental and landowner issues, and other topics relevant to the mission of the COGCC are summarized in these reports. They are distributed widely to interested parties and they are posted on the COGCC website www.cogcc.state.co.us.
- A toll free telephone number (888-235-1101) to the Denver office has been established as a complaint hotline for citizen use.
- The Commission attempts to hold at least three of its 10 hearings outside Denver each year. In 2011, the COGCC held four of its regular hearings outside of Denver; one in Kiowa, Elbert County, one in Broomfield, Adams County, one in Littleton, Adams County, and one in Greeley, Weld County.
- The COGCC continues to solicit participation on all levels from stakeholders including, the oil and gas industry, local government, citizens, other agencies, agriculture, and the environmental community. During 2011, COGCC staff participated in over 70 meetings at the request of municipal, county, and other local governments, EPA, BLM, and trade organizations and in numerous meetings initiated by COGCC.
- The COGCC continues to expand our internet presence. In addition to accessing oil and gas well data, internet users are able to access information regarding pits, spills/releases, complaints, and remediation projects and reports from numerous baseline ground water quality studies and environmental monitoring and investigation projects. The queries by which users access these data continue to be modified and refined to make them more “friendly”. Please visit our website at www.cogcc.state.co.us.

COGCC Commissioners

The Colorado Oil and Gas Conservation Act, as amended by HB 07-1341, requires that the Commission consist of 9 members. HB 07-1341 also includes the following requirements for the members: 7 members appointed by the governor with the consent of the senate and 2 ex officio voting members who are the Executive Directors of the Department of Natural Resources and the Department of Public Health and the Environment. At least 2 members are appointed from west of the continental divide and the other members are appointed taking into account the need for geographical representation of other areas of the state with high levels of oil and gas activity or employment. Of the seven, 3 members are to have substantial experience in the oil and gas industry and at least 2 of these must have college degrees in petroleum geology or petroleum engineering; 1 member must be a local government official; 1 member must have formal training or substantial experience in environmental or wildlife protection; 1 member must have formal training or substantial experience in soil conservation or reclamation; and 1 member must be actively engaged in agricultural production and also be a royalty owner. A chart showing in more detail the makeup of the COGCC Commission is included in Appendix 1.

COGCC Staff

The COGCC has 69 full time employees (FTE) positions, with Information Technology (IT) support provided by 4 employees of the Office of Information Technology. The current organization chart is included in Appendix 2.

The Engineering Unit includes 8 engineers, 1 engineers-in-training (EIT) and 1 engineering/environmental technician. One engineer and the EIT are located in Rifle and 1 engineer is located in Durango. The others are located in the Denver office.

The Environmental Unit includes 14 environmental protection specialists. Six of the environmental protection specialists (EPS II) are located in field offices in Brighton, Durango, Rifle, and Trinidad, which helps to minimize their complaint response time and maximize their ability to identify and address other potential environmental issues related to oil and gas development. The others are located in the Denver Office. The Oil and Gas Location Assessment (OGLA) group, which is part of the Environmental Unit, conducts a thorough review of the potential environmental impacts from the surface disturbance associated with oil and gas operations, including waste management. The OGLA staff can apply site specific conditions of approval to the Form 2As that address additional precautions that need to be taken to protect public health, safety, welfare, and wildlife. They also facilitate consultation with CDPHE and CDPW.

The Field Inspection Unit has 15 FTE including three environmental protection specialists who bring additional expertise related to reclamation and other environmental issues. Three inspection supervisors, 9 field inspectors, and the two environmental protection specialists are located in Arvada, Broomfield, Cheyenne Wells, Durango, Fort Lupton, Grand Junction, Louisville, Parachute, Pueblo West, Rifle, Steamboat Springs, Trinidad, and Whitewater, which helps to maximize their time for field inspections and helps to minimize their response time for complaints and incidents.

COGCC Environmental Unit

The COGCC environmental staff all have professional experience and expertise in environmental issues associated with oil and gas operations, hydrogeology, geology, and geochemistry. We continue to handle questions, concerns, problems, programs, and issues relating to the oil and gas industry's impact on the environment, including wildlife, and public health safety and welfare. In addition, 1 of the environmental protection specialists implements

the COGCC's Onsite Inspection Policy, which is discussed in more detail in Part G. The environmental staff works closely with the COGCC engineering staff and the field inspectors. Incidents resulting in environmental impacts are typically referred to the environmental staff for investigation and enforcement. The primary responsibilities of the environmental staff are discussed below.

Spill/Release Response

Operators are required to report spills and releases that occur as a result of oil and gas operations, in accordance with COGCC Rule 906. Produced oil, gas, and water are the substances most commonly spilled or released. These substances fall under the exploration and production (E&P) waste exemption to regulation as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA); therefore, they are subject to COGCC jurisdiction. Generally, impacts from these events are limited to soils and are relatively small.

Spill response by the environmental staff includes onsite inspections, sample collection, remediation oversight, and review of reports, remediation plans, analytical data, and operating practices, to ensure protection of surface and ground water, in accordance with COGCC rules and WQCC standards and classifications. Spills are tracked in COGCC's Master Records Database (MRDB) and can be accessed via the COGCC website (www.cogcc.co.us, select Database, then Inspection/Incident, then Spill/Release). In 2011 approximately 516 spills and releases were reported and have been remediated or are in the process of being remediated.

Complaint Response

The COGCC responds diligently to complaints, which are received from individuals and other agencies. Complaints are tracked in the COGCC's MRDB and can be accessed via the COGCC website. In 2011 approximately 249 complaints were received. Often complaints are from landowners, alleging damage to their land or water wells. The environmental staff follows up where appropriate, collecting samples for laboratory analysis when necessary. Operators are required to perform additional investigation, remediation, and mitigation, as needed, to bring sites into compliance with soil and ground water standards.

Remediation Projects

Operators are required to remediate significant adverse environmental impacts that occur as a result of oil and gas activities. Situations requiring remediation often result from spills and releases of produced water and hydrocarbons discovered at the time of occurrence, during due diligence investigations, during the upgrading of production facilities and replacement of older equipment, during the plugging of wells and abandonment of locations, or during pit closures. The environmental staff manages remediation projects by reviewing and approving plans, evaluating analytical data and the progress of the remediation, and by ensuring that cleanup standards and other requirements for operators are met through verification by sampling.

Remediation projects are tracked in the COGCC's MRDB database and can be accessed on the COGCC website. During 2011, approximately 70 operators submitted approximately 722 new remediation plans for approval and approximately 538 remediation projects were closed. The environmental staff managed a total of approximately 1,000 new and ongoing remediation projects during 2011.

Where ground water has been impacted, operators are required to: mitigate any continued release; investigate the extent of contamination; remove the source of contamination (such as the

impacted soils in contact with ground water or free hydrocarbon product); remediate; establish points of compliance; and monitor contaminant levels.

Pit Program

Industry operators employ pits at oil and gas locations for a variety of purposes, most commonly for drilling, production, or reuse and recycling. The COGCC is responsible for permitting pits (Form 15), inspecting their operation to ensure compliance, and overseeing their closure. COGCC Staff review pit permits for construction and operational details and to evaluate the environmental setting to ensure that the pit can be used without causing adverse environmental impacts. The Director may apply conditions of approval with additional provisions to protect waters of the state, public health or the environment (Rule 903.e.). In 2011, COGCC staff approved permits for approximately 191 new pits and approved the closure of approximately 204 pits.

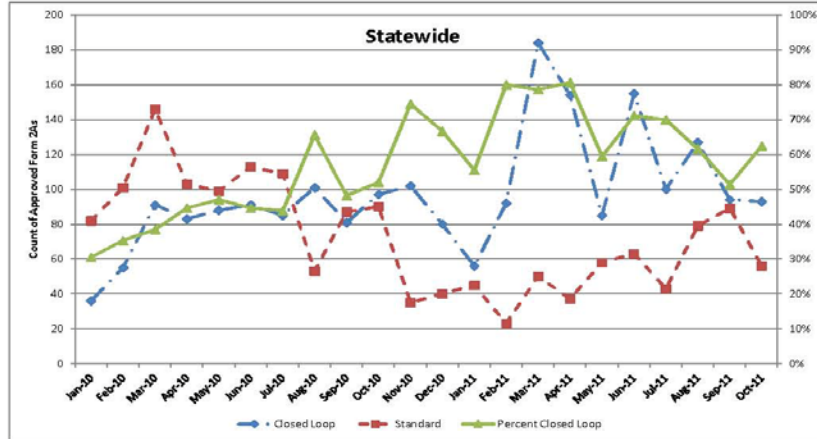
In 2011, COGCC staff worked to develop an eForm 15 which will be rolled out to industry in the first quarter of 2012. The eForm will improve consistency among applicants and increase the efficiency with which the COGCC can review and process pit permit applications.

As an alternative to using drilling pits, many operators are implementing “closed loop” drilling systems, where fluids are contained and circulated in a series of tanks and reserve pits are not used. During 2011 the use of closed loop drilling systems has increased statewide. This increase has been most significant in Weld County, where most of the new wells have been drilled using closed loop systems. The Form 2A permitting process allows operators to specify whether closed loop systems will be used for wells on a location; however, COGCC staff may also require the use of closed loop systems in areas where site specific conditions, such as shallow groundwater, warranted additional precautions.

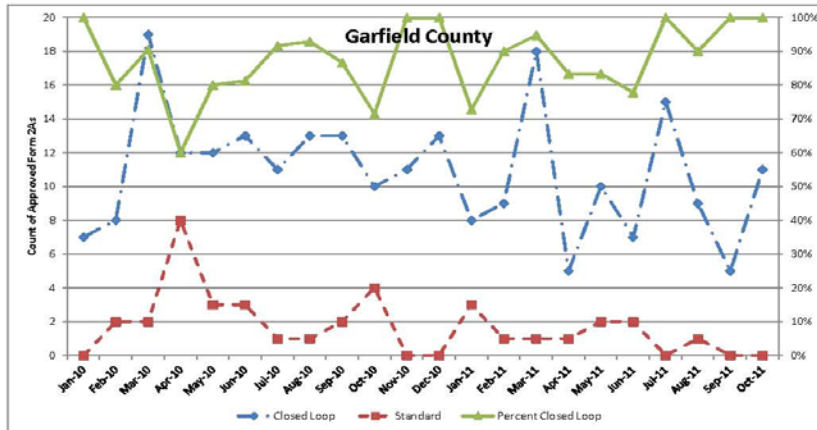
The following tables and charts show monthly summary data of the approved use of closed loop drilling systems.

Use of Closed Loop Drilling Systems
 As Reported or Conditioned on the Oil and Gas Location Assessment, Form 2A
 January 2010 through October, 2011

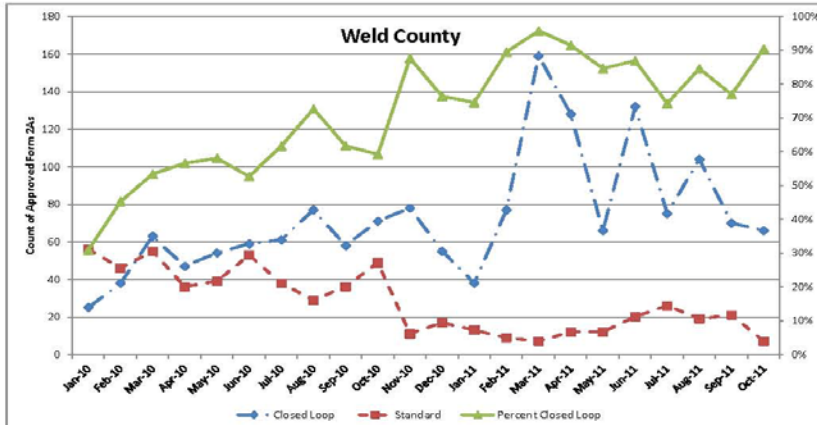
Statewide			
Date	Closed Loop	Standard	Percent Closed Loop
Jan-10	36	82	31%
Feb-10	55	101	35%
Mar-10	91	146	38%
Apr-10	83	103	45%
May-10	88	99	47%
Jun-10	91	113	45%
Jul-10	85	109	44%
Aug-10	101	53	66%
Sep-10	81	87	48%
Oct-10	97	90	52%
Nov-10	102	35	74%
Dec-10	80	40	67%
Jan-11	56	45	55%
Feb-11	92	23	80%
Mar-11	184	50	79%
Apr-11	154	37	81%
May-11	85	58	59%
Jun-11	155	63	71%
Jul-11	100	43	70%
Aug-11	127	79	62%
Sep-11	94	89	51%
Oct-11	93	56	62%



Garfield			
Date	Closed Loop	Standard	Percent Closed Loop
Jan-10	7	0	100%
Feb-10	8	2	80%
Mar-10	19	2	90%
Apr-10	12	8	60%
May-10	12	3	80%
Jun-10	13	3	81%
Jul-10	11	1	92%
Aug-10	13	1	93%
Sep-10	13	2	87%
Oct-10	10	4	71%
Nov-10	11	0	100%
Dec-10	13	0	100%
Jan-11	8	3	73%
Feb-11	9	1	90%
Mar-11	18	1	95%
Apr-11	5	1	83%
May-11	10	2	83%
Jun-11	7	2	78%
Jul-11	15	0	100%
Aug-11	9	1	90%
Sep-11	5	0	100%
Oct-11	11	0	100%



Weld			
Date	Closed Loop	Standard	Percent Closed Loop
Jan-10	25	56	31%
Feb-10	38	46	45%
Mar-10	63	55	53%
Apr-10	47	36	57%
May-10	54	39	58%
Jun-10	59	53	53%
Jul-10	61	38	62%
Aug-10	77	29	73%
Sep-10	58	36	62%
Oct-10	71	49	59%
Nov-10	78	11	88%
Dec-10	55	17	76%
Jan-11	38	13	75%
Feb-11	77	9	90%
Mar-11	159	7	96%
Apr-11	128	12	91%
May-11	66	12	85%
Jun-11	132	20	87%
Jul-11	75	26	74%
Aug-11	104	19	85%
Sep-11	70	21	77%
Oct-11	66	7	90%



As shown, the statewide trend has been moving toward a higher percentage of closed loop systems since January 2010, increasing from 31% of all permits to 59% through October, 2011. In January 2010 closed loop systems comprised 31% of the total permitted locations in Weld County, but increased to 96% of all permitted locations by March 2011. Since then closed loop systems have been permitted at no less than 74% of locations approved in a given month. Interestingly, in Garfield County, the relative percentage of locations approved using closed loop systems has always been relatively high, never dropping below 60% during the same time period. The increased use of closed loop systems represents an improvement in the overall protection of the environment by the oil and gas industry in the State of Colorado.

Permitted Centralized Waste Management Facilities

Non-commercial centralized exploration and production (E&P) waste management facilities are permitted by COGCC under Rule 908. Generally these facilities are larger than a typical tank battery that might handle wastes from only one or a few wells. These larger facilities handle wastes from many wells and wastes that may be from more than one field or lease and may include lined pits, landfarms, drill cuttings solidification facilities, or tank batteries. Rule 908 requires that operators apply for a permit and, as part of the approval process, staff evaluates the proposed site, operation, financial assurance, and preliminary closure plans. These facilities are currently required to have financial assurance in an amount equal to the estimated cost for proper closure, abandonment, and reclamation. During 2011 the COGCC permitted 3 new centralized E&P waste management facility, and permits for 4 new centralized E&P waste management facilities are currently being reviewed by staff. There are 29 active permitted centralized E&P waste management facilities in the state.

Disposal and Reuse of Produced Water

Approximately 46% of the water co-produced with oil and gas is disposed of or used for enhanced recovery by underground injection. Most produced water that is not injected is disposed in evaporation and percolation pits or discharged under Colorado Discharge Permit System (CDPS) permit, and a small amount of produced water is used for dust suppression on oil and gas lease roads. In addition, to minimize waste and the use of fresh water, more operators are reusing and recycling produced water and other fluids for drilling and well completion activities including hydraulic fracture treatment (“fracing”).

Onsite Inspections

In January 2005, COGCC adopted a policy to conduct onsite inspections where oil and gas wells are proposed on lands where the surface owner did not execute a lease or is not party to a surface use agreement. Under COGCC Rule 306, an operator is required to use its best efforts to consult in good faith with the affected surface owner with regard to locations of proposed wells and surface facilities, access roads, and final reclamation and abandonment. If the COGCC Rule 306 good faith consultation between the operator and the surface owner does not resolve operational issues related to the proposed well, the surface owner may request that the COGCC conduct an onsite inspection under the policy.

During the onsite inspection, the surface owner, operator, and COGCC staff meet at the location and discuss issues related to the proposed well and associated surface facilities. The local government designee may also attend if requested by the surface owner. Following the inspection, the COGCC may apply appropriate site specific drilling permit conditions, if necessary to avoid potential unreasonable crop loss or land damage, or to prevent or mitigate health, safety and welfare concerns, including potential significant adverse environmental impacts. Any such conditions of approval must be consistent with applicable Commission spacing orders and well location rules, and must take into account cost-effectiveness, technical feasibility, protection of correlative rights, and prevention of waste. The COGCC cannot require an operator to use an exception location, directional drilling techniques, or otherwise compromise its reasonable geologic and petroleum engineering considerations.

Since January 2005, the COGCC has received a total of 146 requests for onsite inspections to date under the Policy For Onsite Inspections On Lands Where The Surface Owner Is Not A Party To A Surface Use Agreement Policy, effective for Applications for Permits-to-Drill (APDs) submitted after February 15, 2005. Thirty-two onsite inspections have been

conducted, while 97 requests for inspections have been withdrawn. Sixteen onsite inspections are pending and will be scheduled, if necessary, after the Application for Permit to Drill (APD) is received, or after issues related to local government designee consultation, location change, or surface use agreements are resolved.

Of the 146 requests for onsite inspection, 80 were for locations in Weld County, 26 in Las Animas County, 9 in Adams County, 7 in La Plata County, 5 in Garfield County, 3 each in Archuleta, Boulder, Logan, and Yuma Counties, 2 in Morgan County, and 1 each in Baca, Cheyenne, Kiowa, Larimer, and Washington Counties.

COGCC staff have attended on-site meetings to facilitate communication between the parties and to minimize impacts to the surface owner through voluntary measures implemented by the operator in instances where surface owners have requested Onsite Inspections beyond the 10 business-day window provided for in the Policy, and where there is a dispute between parties regarding the date of the Rule 306 consultation.

In addition to the Onsite Inspection Policy, onsite inspections are being conducted in the San Juan Basin under Cause 112, Order Nos. 156 and 157. These are cases where an onsite inspection was required because an APD was submitted without a surface use agreement.

Oil & Gas Location Assessment (OGLA)

Operators are required to submit an Oil and Gas Location Assessment (OGLA) Form 2A for any “new oil and gas location”. Most operators are taking advantage of the COGCC’s “eForm” process and more than 90% of the Form 2As are submitted, reviewed, modified, and approved electronically.

The Form 2A requires environmental information about surface locations and provides for consultations by the Colorado Department of Public Health and Environment (CDPHE) and Colorado Division of Parks and Wildlife (CPW, formerly CDOW) with the surface owner. The Form 2A provides site specific environmental information that the OGLA specialists review and evaluate to determine whether the proposed oil and gas operations have the potential to negatively impact public health, safety and welfare, including the environment and wildlife resources. The OGLA specialists review the information provided, as well as published information, and apply site-specific conditions of approval to prevent or mitigate potential impacts.

One critical part of the evaluation is the sensitive area determination and the evaluation of water resources. OGLA specialists consider proximity to surface and ground water, terrain, topography, local geology and soil types to determine whether the proposed location is situated in a sensitive area. Once the sensitive area determination is made, appropriate protective measures are considered and applied. The Form 2A process allows the COGCC to work cooperatively with operators to protect water resources by advanced planning and proactive operational measures.

The OGLA group facilitates the consultation process with CDPHE and CPW. In 2011 COGCC staff consulted with CDPHE on 5 proposed oil and gas location - Form 2As. In addition the COGCC consulted with CPW on approximately 290 proposed Form 2As.

Oil and Gas Conservation and Environmental Response Fund (Fund 170)

The COGCC receives an annual appropriation of \$312,033 that is used primarily by the

environmental staff to respond to and investigate complaints alleging impacts from oil and gas operations, and an appropriation of \$325,000 that can be used to conduct special environmental projects such as baseline ground water testing, gas seep investigations, regional investigations of potential impacts from oil and gas operations, and to verify COGCC information. Because of the COGCC's need to respond to emergency situations related to oil and gas operations, the COGCC has been appropriated \$1,500,000 for emergency response activities. In addition, the COGCC continues to receive an appropriation of \$220,000 for plugging, abandoning, and reclaiming orphaned wells.

In 2011 the COGCC used the \$312,033 appropriation to respond to and investigate complaints and spills/releases, and to ensure compliance with COGCC rules. In addition Special Environmental Projects conducted by the COGCC environmental staff included: ongoing monitoring of methane impacts to ground water from an orphaned gas well in Bondad; oversight of required environmental monitoring for gas wells drilled in the vicinity of the Project Rulison and Project Rio Blanco nuclear test sites; third party review of engineering, ground water, and geologic data related to concerns in Garfield County regarding potential impacts from oil and gas activity; ongoing investigation of ground water and surface water impacts from leaking pits in Garfield County; ongoing investigations of gas seeps associated with orphaned oil and gas wells in Fremont County; and ongoing monitoring, investigation, and remediation oversight related to ground water and water well impacts from gas development in Huerfano County.

The COGCC engineering staff used appropriated funds and claimed financial assurance to plug and abandon and to reclaim orphaned oil and gas sites in Cheyenne, Fremont, La Plata, Mesa, and Morgan Counties. In FY 2011-2012 the engineering staff plans on plugging, abandoning and reclaiming orphaned oil and gas wells in Fremont, Garfield, Logan, Mesa, Mesa, Moffat, Ouray, and Rio Grande Counties.

Data Management and Geographical Information Systems (GIS)

In response to the implementation of the new rules in April of 2009, changes were made to the applications that support the data systems to accommodate tracking and the overall processing of permits. Major modifications were made to the following systems along with their associated databases:

- Permit processing – eForm was implemented;
- COGIS Database – Many new tables and queries to support eForm and other applications;
- Imaging System – Migration from Content Manager to LaserFiche
- GIS- Addition of several new map layers.

A brief description of the changes for each system is provided below:

Permit Processing -eForm

The eForm application allows Operators to submit Applications for Permit to Drill, (Form 2) and Oil and Gas Location Assessment, (Form 2A) electronically. The COGCC staff then reviews the forms along with the electronically submitted attachments. Each staff member involved in the process then passes their portion of the form (i.e. spacing, engineering, etc.) online. Paper files are not generated for these new permits. Each form is assigned a number of tasks that must be passed before the form is approved. All of the tasks are listed and the status of each task is visible on the public interface. As the form is working its way through the COGCC review process, the public is able to track the status of the form through the use of the

public user interface. The IT staff is currently converting additional COGCC Forms to the electronic format.

Database

The database that supports the agency underwent numerous modifications in 2011. One new major entity added to the database is the "Location". A Location exists independent of the oil and gas facilities that may be on it. It is best described as a geographic area where oil and gas activities take place. This definition is consistent with the Oil and Gas Location Assessment Regulatory review process. A Location is related to all of the wells that are on it, along with all of the associated equipment and facilities. This information can be obtained from the online database "Scout Card" by clicking on the "Related" link. Data improvement and cleanup activities are an ongoing process.

A project to migrate the environmental data from Access to the SQL-server database was initiated in 2011. The project is tasked with identifying new processes to allow for electronic submission of analytical data that are required by a variety of rules and orders and in support of investigations, spill/release responses, remediation activities, and operators voluntary water well sampling. The COGCC and the Groundwater Protection Council (GWPC) are working cooperatively on this project and are currently in the process of migrating the existing Access database to the SQL-server database. COGCC and the GWPC anticipate having a standardized electronic data deliverable available to facilitate electronic data submission by the end of February 2012. The interface for entering field data, location data, and facility information will be similar to the e-Form applications.

Document Imaging

LaserFiche allows for improving functionality with respect to uploading and indexing images. The system provides users with tools to sort and query the image repository in ways that were not previously possible.

GIS

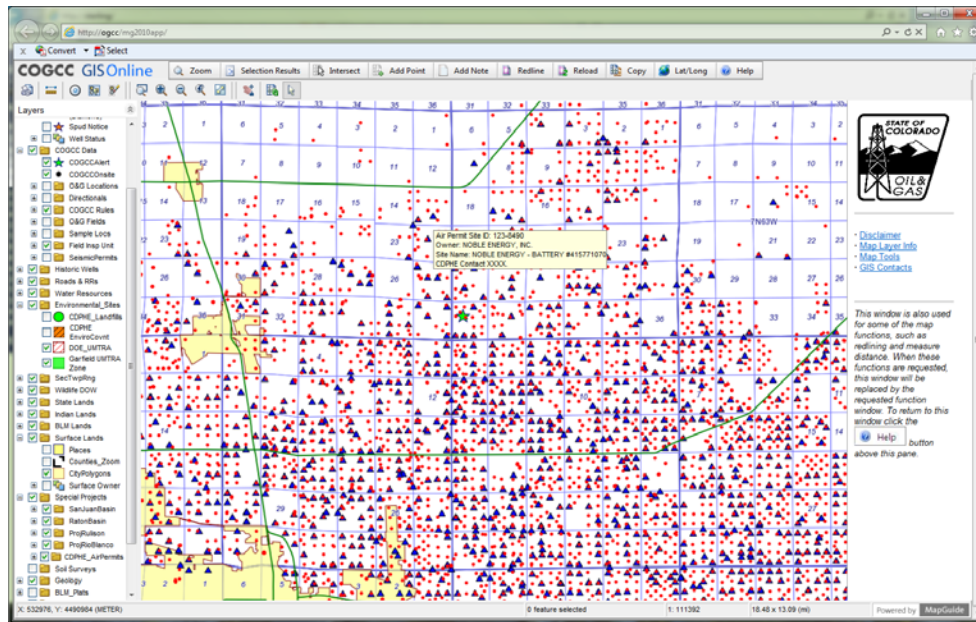
The GIS Online map continues to be a critical application that staff, industry, other agencies, and the general public depend on to process permits, create reports and to view information that can assist in exploration programs, or address environmental concerns. Additionally, certain rules require industry to view the online map to determine if a proposed location falls within a CDPHE 317B Buffer Zone, a Sensitive Wildlife Habitat (SWH), and/or a Wildlife Restricted Occupancy (RSO) Area.

The GIS Online map contains over 150 map layers including oil and gas wells, permits, spacing orders, field boundaries, along with a number of base layers such as cities, rivers, roads, sections, land ownership, etc. Aerial photos, topographic quads, and geologic maps are displayed as images in the map. The well points, permits, and a few other layers are produced dynamically by a direct connection to the MRDB, so that if a new well is permitted it appears immediately on the map.

A new build of the mapping application (GISOnline 2010) was deployed in October 2011. The new version does not require a viewer plug-in and works in most browsers. Two versions are maintained - an internal version, and an external, public version.

Several new layers were added to the internal map during 2011 including: Spud Notice Dates, Pending Directional Well Paths, Hearing Applications, GWA Water Sample Sections,

CDPHE Landfills, CDPHE Environmental Covenants, DOE UMTRA Sites, CDPHE Air Permits, EPA CERCLA Sites, and Seismic Permit Areas/Lines. A screen shot of the map is shown below. The Hearing Applications, GWA Water Sample Sections, and Seismic Permits layers have also been added to the public map.



Online Access to Baseline and Special Studies Reports

The written reports for COGCC managed baseline sampling projects and other special environmental studies, such as the Water Well Booklet and Water Quality Trend and Data Analysis for the San Juan Basin are posted on the website under the “Library” tab where they are primarily organized by basin. Many of these reports are in PDF format and can be downloaded.

Industry Services

The COGCC continues to promote its mission to foster the responsible development of Colorado’s oil and gas natural resources by providing information and assistance in complying with the COGCC rules and requirements. Our expanded website and GIS capabilities support this mission.

Industry Compliance/Violations/Penalties

In 2011, the COGCC continued to pursue a backlog of enforcement matters.. The COGCC Commission assessed penalties against 22 operators for violations of rules and orders. The total amount of penalties assessed was approximately \$3,000,000, of which \$408,350 was associated with enforcement for violations that resulted in actual or potential impacts to public health, safety, welfare, and water resources.

Underground Injection Control (UIC)

COGCC staff continues to work with WQCD and EPA staff to ensure that operators of Class II injection wells in Colorado are in compliance with ground water standards and classifications, and that points of compliance are established. In addition, the Colorado Geologic Survey is consulted on site specific matters, such as the occurrence of faults and potential seismic

issues. COGCC approved 17 Class II UIC well permits during 2011. One permit was denied because the depth of the proposed well was such that staff concluded that protection of the overlying underground sources of drinking water (USDW) could not be assured. The applicant is appealing staff's denial.

Water Sources and Demand for Hydraulic Fracturing – Estimates & Projections

Questions continue to be raised about the quantity of water that will be needed for hydraulic fracturing of oil and gas wells in Colorado. The Division of Water Resources (DWR) and the COGCC have prepared a report that estimates current water use and makes projections for future water needs. The report compares the demands from oil and gas operations with those of other users including agriculture, municipal, industrial, recreation, thermoelectric, snowmaking, and other energy development industries. The amount of water currently used for hydraulic fracturing in Colorado is slightly less than one-tenth of one percent of the total water used in the state and is projected to increase to slightly more than one-tenth of one percent by 2015. The report also provides a summary of the potential sources of water that can or could be used for hydraulic fracturing or other oil and gas drilling and completion activities.

A copy of this report is provided in Appendix 3.

Voluntary Baseline Groundwater Quality Sampling Programs

The Colorado Oil and Gas Association (COGA), in cooperation with COGCC has developed a Voluntary Baseline Groundwater Quality Sampling Program that went into effect January 1, 2012. It is open to all oil & gas operators throughout the state and provides a standardized program for baseline and post-drilling and completion sampling and analysis of domestic water wells and other groundwater features such as seeps and springs. COGCC will act as custodian of the data generated from the sampling program and the results will be used to determine if impacts to groundwater related to oil and gas operations have occurred. This voluntary program does not exempt oil and gas operators from the mandatory groundwater monitoring required in the Greater Wattenberg Area by Rule 318A.e.(4), or the Rule 608.b. requirements for coalbed methane wells or other existing field-wide orders.

During 2011, several oil and gas operators performed voluntary baseline ground water sampling and provided analytical data to COGCC. These operators are actively developing the Niobrara Formation in northern Weld County and collected samples from over 200 domestic water wells in this area.

How Well Do You Know Your Water Well

The brochure *How Well Do You Know Your Water Well* has been updated and revised to include information about mitigating methane in water wells, current contact information for various agencies, and water well maintenance and record keeping. Water well owners are provided this useful brochure when water samples are collected from their wells by COGCC staff, operators, or third party contractors. The update project was initiated by the Colorado Oil and Gas Association (COGA) with support from the COGCC and cooperation of CDPHE and DWR. An electronic version of the brochure is available in the Library section of the COGCC website and copies have been provided to the WQCC Commissioners.

3. COGCC COORDINATION WITH WQCD/WQCC

In 2011 the COGCC, WQCD, and WQCC staff and commission representatives met twice. Craig Wiant is the WQCC representative at these meetings.

4. OIL & GAS EXPLORATION & PRODUCTION ACTIVITY IN COLORADO BY REGION/FIELD

This section summarizes oil and gas activities within Colorado and highlights COGCC studies, issues and concerns relating specifically to ground water by region. In each region there are remediation projects of various sizes and types in which impacted soils and/or ground water are being investigated or cleaned up by operators. Not all of the projects are described in this report. The COGCC environmental staff directs and monitors these projects, as described in Section 1.

Southwest Colorado

Oil and Gas E&P Activity

Most of the gas produced in the southwestern part of Colorado comes from coalbed methane (CBM) wells. Drilling activity has decreased in response to lower gas prices throughout the region. In 2011 approximately 140 permits for new wells and recompletions of existing wells were approved. Currently there are approximately 3,336 active wells in La Plata County. These wells produce approximately 1.02 billion cubic feet (bcf) of natural gas per day, which is approximately 25% of the total gas production in the state. Also there are approximately 473 active oil, gas, and carbon dioxide wells in four other southwestern Colorado counties, including San Miguel, Dolores, Montezuma, and Archuleta. Approximately 270 bcf of carbon dioxide is produced from wells in Montezuma and Delores Counties. This is approximately 96% of total carbon dioxide production in the state.

Public Involvement

Gas and Oil Regulatory Team (GORT)

In 2000 the COGCC established the Gas and Oil Regulatory Team (GORT) to provide a forum for meaningful dialogue between operators, citizens, county and local governments, the Southern Ute Indian Tribe, the Bureau of Land Management (BLM), the US Forest Service (USFS), and the COGCC. Members of this group continue to fund and provide technical support for the ongoing monitoring and mitigation of methane seeps along the Fruitland Coal outcrop.

Northern San Juan Basin Stakeholders Group

In July 2006 the USFS and BLM issued the final Environmental Impact Statement (EIS) for the Northern San Juan Basin. As an outgrowth of the EIS process, the USFS and BLM established the Northern San Juan Basin Stakeholders Group to provide a forum similar to the GORT group, but one that more directly addresses issues relating to oil and gas development within the EIS geographic area.

Ground Water and Other Environmental Issues

Conditions for Optional Additional Coalbed Methane Wells

As a result of COGCC Orders 112-156 and 112-157 and numerous subsequent orders related to CBM development in the San Juan Basin, operators have collected more than 7,000

water samples from more than 2,128 water wells. The analytical results have been submitted to the COGCC and to the land owners. To date impacts to water wells from CBM wells drilled under these orders have not been detected. As a result of the December 2008 rulemaking, water well sampling in advance of CBM development is now required statewide by COGCC Rule 608.

3M-4M Project

Methane gas has been observed seeping from the outcrop of the Fruitland Formation in many areas along the northern margin of the San Juan Basin in southwestern Colorado. Some of these seeps were identified prior to the initial development of any Fruitland Coal wells; however, in places the intensity and areal extent of these seeps appears to have increased subsequent to CBM production. Recent seep monitoring, however, has indicated an apparent decrease in gas seepage at the outcrop in La Plata County over the past 3 years (2009-2011). This is consistent with 3M modeling predictions. Methane seeps from the Fruitland Formation have not been documented in Archuleta County.

In 2000, the COGCC and the BLM funded the “3M Project” to include **M**apping, **M**odeling, and **M**onitoring of the Fruitland Outcrop in La Plata County. Tasks included the installation of a network of monitoring wells at 4 locations between the outcrop of the Fruitland Formation and down basin production. The wells are equipped with transducers and data loggers and are used for the long term monitoring of pressure and water levels in the Fruitland Formation. A total of 7 wells, were completed and data continues to be collected. Pressure monitoring data from these wells are available upon request from the COGCC. In late 2009 upgraded transducers and data loggers were installed in each of the existing 7 outcrop monitoring wells so that satellite telemetry could be used to collect and transmit data from these remote locations.

In 2007 the COGCC received an additional appropriation of \$4,452,000 from Fund 170 for the Fruitland Formation Seep Mitigation Project in La Plata County and the Fruitland Formation Outcrop Monitoring Project in Archuleta County; collectively known as the “4M Project”, **M**itigation being the fourth “**M**”. The COGCC allocated \$2,944,000 of this appropriation to evaluate methods for mitigating the seepage of methane gas and to expand the existing monitoring network along the outcrop of the Fruitland Formation in La Plata County, and \$1,508,000 to install monitoring wells in the Fruitland Formation in Archuleta County. The COGCC Commission approved a mill levy increase under §34-60-129 C.R.S., which was required to fund the 4M Project.

This project builds on and adds to the existing 3M Project monitoring network and included geological mapping of the outcrop in Archuleta County by the Colorado Geological Survey. Between 2007 and 2010 a total of 3 additional monitoring wells were installed in La Plata County in areas where access had previously been denied, and the monitoring network was extended into Archuleta County with the installation of 7 new monitoring wells between the La Plata County line and the Southern Ute Indian Tribe (SUIT) reservation boundary. All monitoring wells are equipped with downhole pressure transducers that communicate twice daily via satellite telemetry to a central data-center managed by InSitu, Inc.

The first phase of the mitigation portion of the 4M Project was to install, test and operate 2 pilot scale methane gas collection systems in La Plata County, one along the South Fork of Texas Creek and one in the Pine River Ranches subdivision. Methane gas escapes from the outcrop of the Fruitland Formation to the atmosphere via surface seeps at these locations, killing vegetation and creating safety hazards. The intent of each system was to capture the gas in the shallow subsurface and route it to a combustion chamber where it could be used to generate electricity to power the mitigation system.

Start-up of both 4M Outcrop Mitigation Pilot Projects in La Plata County occurred during the week of May 4, 2009, and continuous operations were implemented during the week of May 18, 2009. Both systems are functioning as planned; however, methane concentrations are too

low and oxygen is too high at the Pine River Ranch (PRR) for effective combustion.

During 2011 the South Fork Texas Creek (SFTC) Mitigation system was optimized to increase gas collection and electrical generation. The most significant methane seep at this location was within the stream channel, which had been avoided during the initial design phase due to permitting and logistical issues coupled with the uncertainty of success. The original design focused on the installation of 4 separate land-based reverse french-drain systems to capture and transport the gas to a central turbine combustion unit which would produce power to run the system and net-meter any excess back into the grid. Although operational problems did occur during start-up, the system was a success and during 2010 an Army Corps of Engineers permit was obtained and the collection system was extended underneath the South Fork of Texas Creek. Operational problems continue to occur when the system is operated under high power output; therefore, the system is being operated between 11 and 13 KWH resulting in a net power generation ranging between 3,180-5,500 KWH per month. Re-vegetation has been successful above the collection systems and a significant amount of gas has been captured and prevented from entering the atmosphere.

4M well installation, mitigation and operations and maintenance reports can be found on the COGCC website (www.cogcc.state.co.us) under Library, Area Reports/Data, San Juan Basin, 4M Project Reports.

During 2012, approximately \$70,000 was used to provide operation and maintenance support for the entire monitoring and mitigation network.

Fruitland Outcrop Study La Plata County and Archuleta County

Industry, BLM, and the COGCC continue to contribute money and/or staff for the ongoing evaluation, maintenance, and monitoring of the 140 permanent soil gas monitoring probes and one meteorological station. Aerial surveying with infrared imagery technology is also being used to detect areas of stressed and/or dead vegetation, which can be an indication of methane gas seepage. This detailed work covers the entire Fruitland Formation outcrop in La Plata County and Archuleta County on land north of the Southern Ute Indian Tribe reservation boundary. The expanded survey includes the mapping of springs discharging from the Fruitland Formation. The 2003, 2004, 2005, 2006, 2007, 2008, 2009 and 2010 La Plata County reports are available on the COGCC website (www.cogcc.state.co.us) under Library, Area Reports, San Juan Basin, 3M Project Reports. The 2004, 2005, 2006, 2007, 2008, 2009 and 2010 Archuleta County reports are available on the COGCC website (www.cogcc.state.co.us) under Library, Area Reports, San Juan Basin, Archuleta County.

San Juan Basin Ground Water Quality Analysis (WQA)

The objective of this study is to assess potential long-term trends in general groundwater quality in the San Juan Basin based on data available in the COGCC database. Data for more than 2,000 water wells in the San Juan Basin from a period of approximately 15 years was used. Statistical evaluations were conducted by the COGCC's contractor using the Mann-Kendall trend analysis as a means to filter a large amount of data to allow staff to identify and focus on potential areas of concern. Runs were limited to those wells with at least 4 available data points (sampling events) to best delineate statistically significant or relevant trends. Parameters evaluated included: total dissolved solids, alkalinity, pH, calcium, magnesium, potassium, sodium, carbonate, bicarbonate, chloride, sulfate, methane, and ratios of two stable isotopes of methane, deuterium and carbon-13.

Initial evaluation of available data using the Mann-Kendall trend analysis did not delineate any clusters of significant upward trends in methane or major cation/anion concentrations within the San Juan Basin. To the contrary, just as many significant downward

trends were identified as significant upward trends. An annual update of the assessment was concluded in July 2011 with no noted change in results. Further evaluation of individual wells exhibiting trends and/or changes in methane concentrations will be conducted by the COGCC on a well-by-well basis. The final report and 2011 update can be found on the COGCC website (www.colorado.gov/cogcc) under Library, Area Reports/Data, San Juan Basin, Studies in the San Juan Basin

Citizen Complaints, Spills and Other Issues Regarding Ground and Surface Water

The COGCC received 27 complaints alleging impacts from or because of concerns about potential impacts from oil and gas operations in La Plata and Archuleta Counties. Sixteen (16) complaints alleged impact to water wells or were requests for baseline sampling. Of these 13 were determined to be unrelated to oil and gas activities and 3 are still under investigation or awaiting data.

The COGCC received 11 complaints regarding other environmental damage or operational issues. Of these 7 were noise complaints of which 6 were from an incident at one location, 1 was related to reclamation or surface damage issues, 1 was related to chemical hazard issues, 1 was related to surface spills, and 1 was related to a combination of noise, dust and road damage issues.

Twenty-two (22) spills/releases of E&P waste were reported in La Plata, Montezuma, Dolores and San Miguel Counties during 2011. Of these, 4 were releases to surface water; two into dry channels and two into irrigation canals. One of the surface water releases to a dry channel occurred on the Southern Ute Indian Tribe (SUIT) reservation and the SUIT took the lead in oversight of the assessment and remedial action. One of the remaining surface water spills was assessed and placed into vegetative monitoring, a second was assessed and closed with no identified impacts, and the third is under assessment and awaiting data. Two of the remaining spill cases were on SUIT land and were addressed by the SUIT. Two spill sites were placed into vegetative monitoring by COGCC staff. All of the other spills have been closed.

COGCC staff and third party contractors continue to investigate and monitor soil and ground water impacts associated with methane leakage from a 1930's orphan oil and gas well (Bryce 1-X). COGCC has shown that this well and a previously plugged and abandoned orphan well (Nick Spatter Bryce Farm #1) were the sources of the elevated levels of methane in the subsurface soils and in 6 nearby water wells. Fund 170 money has been used to respond to this emergency situation by installing methane monitors and alarms in three homes, a fire station, and a water well house, to continue monitoring of the areal extent of the gas seepage, and to investigate and identify the source of the gas. In July and August 2006 COGCC staff and a third party contractors successfully plugged and abandoned the Bryce 1-X. This resulted in a decrease in the concentration of methane in the soil. Methane has not been detected in the soil and shallow subsurface since July 2007, which was again confirmed by a follow-up soil gas survey in September 2010. Elevated concentrations of methane persist in the ground water and water wells. The COGCC continues to provide assistance for the water treatment system that supplies the three homes.

COGCC staff in southwest Colorado continues to work with area operators to systematically assess the status of "pits" in the COGCC database throughout the region. In 1995 operators were required to submit an inventory of all of the "pits" they operated. In addition to pits, some operators reported containment vessels, including partially buried steel and fiberglass tanks, and these were entered into the database as "pits". The intent of this assessment is to update the database to accurately reflect waste management facilities previously and currently used in the San Juan Basin.

COGCC received over 50 requests for baseline water well testing near a proposed well pad in Rio Grande County. These requests are being catalogued and a testing program will be conducted in advance of the proposed drilling activities. The APD is currently under evaluation by COGCC staff. Required Federal (BLM) and County permit applications have not yet been submitted for review.

Northwest Colorado

Oil and Gas E&P Activity

Northwest Colorado continues to experience a high level of oil and gas activity, especially in Garfield, Mesa, and Rio Blanco Counties. Northwest Colorado drilling permits account for approximately 33% of the state total (28% in Garfield County, 2% in Rio Blanco County, and 3% in Mesa County). The driving force behind this active development continues to be the extensive natural gas reserves in the Piceance Basin, and an expanding pipeline infrastructure that enables improved marketing of natural gas from the area.

Public Involvement

The Northwest Colorado Oil and Gas Forum

The Northwest Colorado Oil and Gas Forum (NWCOGF) meets quarterly in Rifle. The NWCOGF is an important forum for the discussion of oil and gas issues and concerns at the local level. The participants include the COGCC, other state, federal, and local government agencies, the oil and gas industry, and concerned landowners and citizens. Meetings are well attended by the various stakeholders.

Environmental Issues

COGCC staff investigated citizen and other agency's complaints and responded to requests for baseline sampling, processed and tracked spill/release reports submitted by operators, and followed up on the findings of COGCC field inspections and conducted other environmental studies in northwestern Colorado. In accordance with the MOA for Response to Spills/Releases to Surface Water, the COGCC notifies the CDPHE of releases impacting waters of the state. In all cases where ground water was impacted, operators were required to conduct a site investigation and perform appropriate remediation to comply with COGCC requirements.

Ground Water

There was 1 complaint alleging an impact to a water well, 1 complaint alleging an impact to a pond, and 5 requests for baseline in the northwestern portion of Colorado. Upon investigation, COGCC staff determined the water well had not been impacted by oil and gas operations.

The COGCC investigated a number of complaints about releases of exploration and production (E&P) waste that either impacted or threatened to impact ground water in northwestern Colorado. Impacts to ground water from a pipeline leak discovered in 2010 continue to be remediated. Two (2) ground water impacts that had been previously identified continue to be monitored by COGCC and the operators.

Surface Water

One spill/release of E&P waste fluids was discovered that impacted a dry irrigation ditch in Mesa County. The operator was issued an NOAV for the incident. A spill/release of E&P

waste fluids in Garfield County occurred when pipe valve froze and ruptured and fluids flowed onto a frozen pond. The operator responded with appropriate emergency procedures and other corrective measures to comply with COGCC and WQCD requirements. An NOAV was issued to the operator for the incident. There were 6 spill/releases of E&P waste fluids that impacted either surface water or dry drainages leading to surface water. CDPHE and COGCC were notified by the complainant simultaneously in one case. In each of the above-mentioned situations, the COGCC has enforced on the responsible operators or enforcement actions are pending.

There were 20 complaints requesting baseline sampling of surface water that is used for livestock watering. Two alleged impacts to domestic water wells and one alleged impact to Kannah Creek were reported in Mesa County. Water samples were collected for laboratory analysis and based upon the analytical results and other information gathered during our investigations, COGCC staff will determine if surface water has been impacted by oil and gas operations. One ongoing investigation into a complaint alleging an impact to a water well from a nearby spill continued in 2011. COGCC has sampled the water well twice and it does not appear to be impacted by oil and gas operations.

Enforcement Related to Impacts to Ground Water, Surface Water, and Springs

In 2008, spills and releases of E&P waste at several locations on the Roan Plateau impacted springs, ground water, and surface water. Investigation, remediation, and enforcement have continued since then. During 2011 enforcement actions were taken against three operators related to impacts to surface and ground water and springs. These matters were resolved by Administrative Orders by Consent, penalties were assessed by the COGCC Commission. COGCC staff consulted with WQCD Enforcement Group during the resolution of these matters. \$133,000 of the total fine amounts was provided to the Middle Colorado River Watershed Partnership to help fund a watershed assessment and to support an application by the Colorado River Conservation District to the EPA for matching funds pursuant to Section 319(h) of the Clean Water Act.

Drilling Near Project Rulison Test Site

In 1969, the Atomic Energy Commission, a predecessor to the U.S. Department of Energy (DOE), conducted several experiments on the use of nuclear devices to enhance natural gas production from wells. The project conducted in Garfield County is known as Project Rulison and the well in which the nuclear device was detonated is located on Battlement Mesa.

In 2005, Presco Corporation (PRESCO) submitted APDs for and began drilling a number of wells in Garfield County in the vicinity of Project Rulison, but outside the 0.5 mile buffer zone established by the COGCC. To address concerns regarding the potential for new gas wells to intercept materials impacted by the nuclear test, PRESCO agreed to conduct a monitoring program to test for radionuclides. This monitoring program included background monitoring of non-impacted gas and water from the Williams Fork Formation and overlying formations, of surface and ground water in the vicinity, and monitoring of drilling mud, cuttings and gas brought to the surface during drilling, completion, and production at selected locations. Reports summarizing the results of the 2004 Baseline and the 2005 and 2006 Annual Water Sampling activities conducted by PRESCO have been submitted to the COGCC. PRESCO also submitted reports summarizing the results of Gas Well Drilling Monitoring activities to the COGCC.

Operators have implemented the approved sampling and analysis plan (SAP) are monitoring their activities. To date, samples have been collected for laboratory analysis from 16

Tier I wells and 63 Tier II wells.. There have been a total of 244 samples from Tier I locations and 265 samples from Tier II locations. Various media including produced water, natural gas, drilling mud, flowback fluid, drill cuttings, and frac fluid have been sampled and analyzed. Rulison related constituents have not been detected in any of the samples.

Quarterly and annual reports from 2006 to the present have been submitted by Noble Energy, Inc., EnCana Oil & gas (USA), Inc., Williams Production RMT, Inc., and Laramie II, LLC. These reports, as well as the PRESCO reports are available on the COGCC website, www.cogcc.state.co.us under Library.

The U.S. Department of Energy – Office of Legacy Management (DOE-OLM) completed a Draft Rulison Path Forward report. DOE developed the path forward report as guidance for Colorado state regulators and other interested stakeholders in response to increased drilling for natural gas reserves in the vicinity of the Project Rulison test site. COGCC and CDPHE staff reviewed the report and their comments are being incorporated by DOE-LM. The Draft Path Forward Report is available on the DOE-LM website at <http://www.lm.doe.gov/land/sites/co/rulison/rulison.htm>.

Noble Energy, Inc., EnCana Oil & Gas (USA), Inc., and Williams Production RMT, Inc. prepared revision 3.0 of the Sampling and Analysis Plan (SAP). This version of the SAP, comments from regulatory agencies and other interested parties, quarterly monitoring reports, and annual monitoring reports are available on the COGCC website (www.cogcc.state.co.us) under Library, Piceance Basin. Additionally, an email address has been set up to convey Project Rulison related information. That address is: Rulison.submittal@state.co.us.

In the calendar year 2011, 70 spring, surface water, and water well samples were collected as part of the annual Rulison environmental sampling performed by Noble. Rulison related constituents were not been detected.

Drilling Near Project Rio Blanco Test Site

Project Rio Blanco is the site of the detonation of three 30 ± 3-kiloton nuclear devices at depths of 5,838, 6,230, and 6,689 feet below ground that occurred on May 17, 1973. The oil and gas operators, in consultation with other affected working interest owners, have voluntarily agreed to a drilling moratorium within the area between the 600-foot Department of Energy (DOE) exclusion zone and a ½-mile radius of Project Rio Blanco until additional radiological data have been collected outside of this zone to demonstrate that gas drilling, completion, and production can be safely accomplished.

The operators also agreed to a voluntary drilling exclusion zone around the Fawn Creek Government No. 1 (FCG No. 1) well where radioactively-contaminated water produced from the Rio Blanco test well was injected into an interval between 5,360 and 6,072 feet below the ground surface. Although the federal government did not implement a drilling exclusion zone around FCG No. 1, the voluntary drilling exclusion zone around this well will be maintained until sufficient radiological data have been collected to confirm that radionuclides at the FCG No. 1 well have not migrated to producing gas wells outside this zone. Under the voluntary drilling exclusion zone, the operators propose to limit drilling and gas production within a 600-foot radius of the FCG No. 1 well to a true vertical depth of 6,500 feet below ground surface. FCG No. 1 is also within the ½-mile voluntary drilling moratorium area discussed above.

The COGCC has adopted special procedural requirements regarding APDs in the Project Rio Blanco area. The COGCC collaborated with the CDPHE, BLM, DOE, Rio Blanco County, operators and surface owners in the preparing and releasing version 1.0 of the

Sampling and Analysis Plan (SAP). The SAP and related information and correspondence are available on the COGCC website, www.cogcc.state.co.us under Library. Additionally, an email address has been set up to convey Project Rio Blanco related information. That address is: Rioblanco.submittal@state.co.us. In the calendar year 2011, there was no drilling near Project Rio Blanco; however, one well is scheduled to be plugged and abandoned in 2012.

West Divide Creek Gas Seep Remediation Update – Garfield County

In accordance with the COGCC requirement for periodic reporting on the ongoing remediation of shallow ground water contamination at the West Divide Creek Seep, EnCana provides quarterly reports on the status of the seep remediation and these status reports are available on the COGCC website (www.cogcc.state.co.us) under Library, Piceance Basin. The low-flow air sparge system designed to remediate shallow ground water contaminated with benzene, toluene, ethylbenzene, and total xylenes (BTEX), continues to decrease concentrations and areal extent of these compounds in the impacted area. The concentration and areal extent of thermogenic methane in the ground water in the impacted area also continues to decrease although at a lower rate than the BTEX compounds. There were no detections of BTEX compounds in any West Divide Creek surface water sample locations in 2011. EnCana evaluated and implemented modifications to the air sparge system to increase remediation effectiveness in 2011.

DeBeque Orphan Natural Gas and Oil Wells – Mesa County

An attempt to plug and abandon an “orphan” oil and gas well in 2010 was not successful because surface casing could not be located before the limits of the excavator were reached. The COGCC will return to this well in January 2012 and attempt to reenter the well, drill out the old plug, and replug it. The plugging and abandonment of the other orphan wells in this area will be prioritized based on potential risk and impact to the environment, including ground and surface water resources, and public health and safety. Plugging and abandonment of these wells will proceed as time and funding allows.

Divide Creek Unit Orphan Natural Gas and Oil Wells – Garfield County

An old natural gas well located on public land on Uncle Bob Mountain in Garfield County is being evaluated by the COGCC as the result of a complaint from the public. The gas producing zone of the well was plugged in the 1970's and the well was converted to a water well. Ownership of the well was turned over to the USGS, but the well was not permitted with DWR. Currently water is discharging from the well into Clear Creek. The discharge exceeds allowable limits for TDS and barium. The COGCC collected gas and water samples in November 2011 and down-hole temperature and conductivity readings to aid in the evaluation. If the plug is found to be compromised, the COGCC will work with BLM, the Forest Service and USGS, to remediate or plug the well.

Northeast Colorado

Oil and Gas E&P Activity

Oil and gas activity in the northeastern portion of the state remains high with continued interest in oil production from the Niobrara Formation using horizontal wells. In 2011, approximately 49% of the total well permits approved by the COGCC were issued to operators in Weld County, which has the largest number of active wells (approximately 17,000) in the State. Smaller oil and gas fields with lower levels of activity are located in other counties throughout northeast Colorado. In 2011 approximately 260 billion cubic feet (BCF) of gas were

produced in northeast Colorado (approximately 18% of the total gas production for the state) and 25 million barrels (bbls) of crude oil were produced (approximately 73% of the total crude oil production for the State).

Public Involvement

COGCC staff continues to receive and follow-up on complaints and requests for presentations and participation in public meetings from local governments and the public throughout northeastern Colorado.

Environmental Issues

COGCC staff investigated citizen and other agency's complaints and responded to requests for baseline sampling, processed and tracked spill/release reports submitted by operators, and followed up on the findings of COGCC field inspectors. In accordance with the MOA for Response to Spills/Releases to Surface Water, the COGCC notifies the CDPHE of releases impacting surface water. COGCC staff and third party contractors collected water samples from 53 water wells and 1 spring for laboratory analysis. Twenty six of the wells sampled are located in Elbert and Douglas and were sampled in response to requests for baseline sampling. This work is discussed in more detail below.

Ground Water

In all cases where ground water was impacted, operators were required to conduct site investigations and perform appropriate remediation to comply with COGCC requirements. In addition, the COGCC continues to oversee the investigation and remediation of contaminated soil and ground water associated with gas plants and compressor stations throughout northeast Colorado.

The water sampling conducted by operators as required under COGCC Rule 318A.e. has identified several water wells impacted by thermogenic gas. Upon investigation, COGCC staff determined that 5 water wells had been impacted. The investigations to identify the sources of the gas in these water wells are continuing. In three instances, the owners of the impacted water wells and the operators have either reached private settlements that include connection to a public drinking water source or longer term solutions to the water supplies are under discussions with the affected well owners. One ground water monitoring well was found to have been impacted by thermogenic gas and the source of that gas is under investigation.

Baseline Ground Water – Elbert and Douglas Counties

Although there is only one approved oil and gas well permit in Elbert County and none in Douglas County, the COGCC has received numerous requests from residents for baseline water well sampling. Staff prioritized the requests and sampled 26 water wells that are completed in the Dawson and Denver Aquifers. These requests are being tracked as complaints in the COGCC database under the baseline sampling request category. Staff also provided concerned landowners with information about the COGCC permitting and regulatory process, as well as an overview of the current level of activity in these areas.

Preliminary assessment of the analytical results indicates that water quality is good. Three of the 26 sampled wells contain methane concentrations sufficient for isotopic analysis and the analytical results for these tests are pending. A written report summarizing the analytical results of the baseline sampling in Elbert and Douglas Counties will be prepared and

placed in the Library section of the COGCC website.

Wattenberg Field - Bradenhead Testing Area, Weld County

In response to incidents of water wells impacted by thermogenic methane and other hydrocarbon gases from oil and gas activities, the COGCC staff proposed and on November 30, 2009 the COGCC Commission approved, the establishment of a bradenhead testing area covering approximately 25 townships of the Wattenberg Field in Weld County. This provides the COGCC and operators with a tool for cost effectively and systematically identifying oil and gas wells with a potential to act as conduits for gas migration into the Laramie/Fox Hills and other aquifers. As these wells are identified, operators are required to perform appropriate remediation.

Surface Water

There were 2 spill/releases which E&P waste fluids reached surface water. These were reported to the WQCD in accordance with our MOA. In cases where surface water was impacted, the operators responded with appropriate emergency procedures and other corrective measures to comply with COGCC and WQCD requirements.

Oil and Gas Location Assessment Volume, Northeast Colorado

The Northeast region continues to be an active area for oil and gas development; approximately 79% of oil and gas location assessment Form 2As received in 2011 were from twelve counties in northeast Colorado. Of those, 1,405 or 65% of all Form 2As received were submitted for locations in Weld County. Operators are submitting location assessments for single vertical well pads, multi-well directional pad locations, multi-well remote tank battery locations, and horizontal well pad locations. Horizontal well bores in the Niobrara Formation are becoming more common in northern Weld County, as drilling and completion technology allows operators to produce oil from this low permeability formation. In many cases, operators are drilling wells diagonally across entire sections, and completing the wells with multi-stage hydraulic fracturing techniques that expose significantly more well bore to the producing formation.

The long-term economics have yet to be determined because the drilling and completion costs for this type of well are substantially higher than traditional drilling and completion operations; however, many operators are increasing their leasing activities in Weld, Adams, Arapahoe, Douglas, Elbert, and El Paso Counties as a first step in the possible development of the oil resources of the Niobrara Formation.

Southeast Colorado

Oil and Gas E&P Activities

Southeastern Colorado produces conventional gas, CBM gas, and crude oil from several basins, including the Raton Basin, the southern portion of the D-J Basin, the Cañon City Embayment, and the Hugoton Embayment. There are approximately 3,750 active wells within the region. Approximately 2,919 and 314 of the active wells are located in Las Animas and Cheyenne Counties, respectively. Approximately 105 billion cubic feet (bcf) of gas and 2,103,000 bbls of oil were produced in this region during 2011. Approximately 91% of the gas was produced from the 2,919 CBM wells in Las Animas County and approximately 60% of the oil was produced from wells in Cheyenne County. Approximately 11 billion cubic feet of the carbon dioxide was produced from wells in Huerfano County. This is approximately 4% of the

total amount of carbon dioxide produced in the state.

Approximately 164 drilling permits were issued for oil and gas wells in southeastern Colorado in 2011. Approximately 92% of the 164 were issued in five counties (45% in Las Animas, 19% in Lincoln, 10% in Kiowa, 9% in Fremont, and 9% in Cheyenne).

Approximately 78,000,000 barrels of produced water were generated in southeast Colorado during 2011. Eighty-three (83) percent of the produced water was generated from CBM wells in Las Animas County. Produced water is managed by underground injection, CDPS permitted surface water discharge, and in evaporation/percolation pits. There are eighty-eight (88) active injection (UIC) wells in this region; 36 in Cheyenne County, 21 in Las Animas County, 14 in Baca County, 9 in Kiowa County, and 8 additional wells in various other counties. There are 57 UIC wells in Baca County used as part of an active gas storage field.

Public Involvement

COGCC staff participated as a stakeholder in the Colorado Water Quality Forum Agricultural Diversion Work Group held in previous years. The work group consisted of representatives from the oil and gas industry, the Colorado Water Quality Control Division (WQCD), irrigators, the agriculture community and wastewater treatment facilities. Permits, including narrative standards that were discussed by this group to protect agricultural interests, have been issued to four operators in the Raton Basin. Norwest Applied Hydrology (on behalf of Pioneer Natural Resources) installed and maintains continuous monitoring stations in the Apishapa River drainage in an attempt to better define possible impacts from WQCD permitted discharges of CBM produced water into the waters of the state. Temperature, conductivity and pressure are monitored at 3 locations in the watershed. Local irrigators have access to data collected from these stations (<http://www.apishapawatershed.org/>).

The measurement of pressure can be used to estimate flow. The conductivity of the water can be used to calculate sodium adsorption ratio (SAR) by comparison with laboratory measured sodium, calcium and magnesium concentrations collected on a monthly basis. Three oil and gas operators installed a similar 9 station continuous monitoring network in the upper Purgatoire River drainage as part of an effort to gather information that might aid them in understanding whether there are impacts from discharging produced water from CBM wells under CDPS permits issued by the WQCD (<http://purgatoirewatershed.org/>).

Environmental Issues

COGCC staff investigated citizen complaints and followed up requests for baseline water sampling, investigated the findings of COGCC field inspections, and conducted special projects and emergency response actions. The citizen complaints included investigating water wells, sampling produced water, investigating pit overflows and leaks, sampling springs and soil. The special projects included two ground water monitoring projects, soil sampling at an abandoned pit, and gas sampling at two leaking orphaned gas wells.

Ground Water

Twenty-three (23) water wells were sampled during 2011. Two (2) water wells were sampled twice as part of continuing investigations of impacts from CBM operations in Huerfano County. These Huerfano County water wells were also sampled by U.S. EPA and operators as part of the EPA's national study of potential impacts from hydraulic fracture well completion practices. Five (5) water wells were sampled in and around the North Fork Ranch area in Las Animas County as part of investigations regarding possible impacts to groundwater from nearby CBM

operations. Investigation of possible impacts to groundwater from a leaking produced water pit in Las Animas County is continuing.

Alleged Impacts from Hydraulic Fracture Stimulation (Fracing)

The Raton Basin in southeastern Colorado was one of several areas chosen by the U.S. EPA for a retrospective study of hydraulic fracture well completion practices and possible impacts. COGCC is working with EPA staff and operators on the Colorado portion of the study.

Baseline Sampling

Ten (10) water wells were sampled at the request of landowners to establish baseline conditions prior to drilling. Overall the water quality in the sampled wells is good.

Huerfano County Methane in Water Wells

As part of the ongoing investigation, monitoring, and mitigation efforts conducted by a CBM operator in response to impacts to water wells. The operator's CBM wells were plugged and abandoned this year after remaining shut-in since July, 2007. The remediation system consisting of three removal wells and eight injection wells was also shut down this year. The operator has installed and tested passive mitigation systems at three homes in accordance with orders adopted by the Oil and Gas Conservation Commission in September, 2011. Installation and testing of an active methane mitigation system at one home is still underway.

Corsentino Dairy Farms Site Investigation and Remediation Workplan

The owners of Corsentino Dairy Farms, Petroglyph Energy Inc. (PEI), and COGCC staff have reached agreement on a voluntary site investigation and remediation workplan intended to remediate impacts to soils at the dairy farm from CDPHE-WQCD permitted discharge of CBM produced water by PEI into the Cucharas River upstream of the dairy's irrigation water intake. The operator has demonstrated to staff's satisfaction that soil conditions have been returned to those likely to have existed on the farm prior to the permitted discharge activities; however, the dairy's owners believe that further remediation is necessary.

COGCC Enforcement Related to North Fork Ranch Water Well Impacts and Ongoing Investigation

COGCC Staff and a gas operator continue to investigate and monitor 2 domestic water wells in the North Fork Ranch (NFR) subdivision in western Las Animas County that were impacted during the drilling of the surface casing for a nearby CBM well in 2006. In 2010 and 2011, these two matters were resolved by Administrative Orders by Consent and penalties were assessed by the Commission.

The gas operator has installed 6 monitoring wells in this area. The monitoring includes downhole continuous monitors for pressure and electrical conductivity. Water samples are collected and analyzed on a regular basis and the analytical results for samples from the monitoring well system are reported to the COGCC on a semi-annual basis. The initial 3 monitoring wells were installed in late November 2006 and 3 domestic wells have been added to the monitoring network, 1 in 2007, 1 in 2008 and 1 in 2011. No pressure upsets have been observed since installation of the monitoring network.

In fiscal year 2008-2009, benzene was detected above the groundwater standard in 2 of the

monitoring wells installed by the operator. Dissolved methane concentrations in 2 of the operator's monitoring wells also increased significantly. Five NOAVs have subsequently been issued concerning continuing or new impacts to groundwater from CBM activities in and around the North Fork Ranch subdivision. The source of benzene detected above the groundwater standard in the 2 monitoring wells has not been determined at present. The source of increasing methane concentrations in 4 of the monitoring wells is of microbial and not of thermogenic character.

Lincoln County Ground Water Impact

The investigation and monitoring of a well site in Lincoln County continued in 2011. The soils and groundwater at this site were impacted due to the improper management of E&P waste. The issue was first observed during an inspection conducted by a COGCC field inspector. The operator has submitted a Form 27 Site Investigation Plan and has conducted an extensive soil and groundwater investigation. The investigation has included the installation of monitoring wells and ground water and soil sampling. Analytical data indicates that the shallow alluvial aquifer has been impacted by produced water. Additional work has included the excavation and remediation of the pit and removal of all production equipment from the site.

Elevated levels of total dissolved solids (TDS) are present in the groundwater, but BTEX compounds have not been detected. The extent of the plume has been determined and points of compliance established. No water wells have been impacted. Quarterly monitoring is conducted and results evaluated. The results of the most recent sampling event indicate that, although groundwater quality has improved since use of the evaporation pit ceased in 2007, concentrations of chloride and TDS in groundwater still exceed allowable concentrations (defined as 1.25 x background) in two of the monitoring wells. The operator has requested that the sampling frequency be changed to semi-annual until concentrations in the impacted wells are below allowable levels.

Springs

No impacts to springs were observed in the 2011.

Surface Water

Spills of E&P Waste to State Waters

There were 5 spill/release events in which E&P waste entered surface water. E&P waste spilled was mainly CBM produced water. These 5 events occurred within the Raton Basin. WQCD staff was notified as required under the MOA between WQCD and COGCC. There were 7 additional spills that reached dry arroyos that were reported as spills impacting waters of the state. One spill from a leaking lined pit may have impacted groundwater nearby as discussed above.

Stormwater and Surface Water Complaints

Two (2) complaints alleging inadequate implementation and maintenance of stormwater best management practices along a lease road was investigated. In both cases, the operator had installed and maintained sediment traps and other filtering BMP's and successfully performed interim reclamation and maintained the installed BMPs.

Orphaned Wells and Sites

Methane seeping from the Trinidad MGP-1 well caused a house explosion in 2007 and

in response to this emergency situation the COGCC attempted to plug the leaking well; however these efforts were not successful and gas still is leaking. Currently the well is surrounded by a security fence and, to prevent gas from building up in the subsurface, gas is allowed to vent to the atmosphere from the well.

One pre-1910 orphaned well in Fremont County in close proximity to an occupied home was plugged by the COGCC in 2011. Three (3) other orphaned wells located further from homes were plugged and abandoned by COGCC inspection and engineering staff in Fremont County in 2011. Several other orphaned oil wells have been identified for future plugging by the COGCC. COGCC staff will be developing a program to systematically search for additional orphaned wells that may pose a threat to public health, safety, and welfare.

APPENDIX 1

COGCC COMMISSIONERS

Colorado Oil & Gas Conservation Commission Statutory Requirements

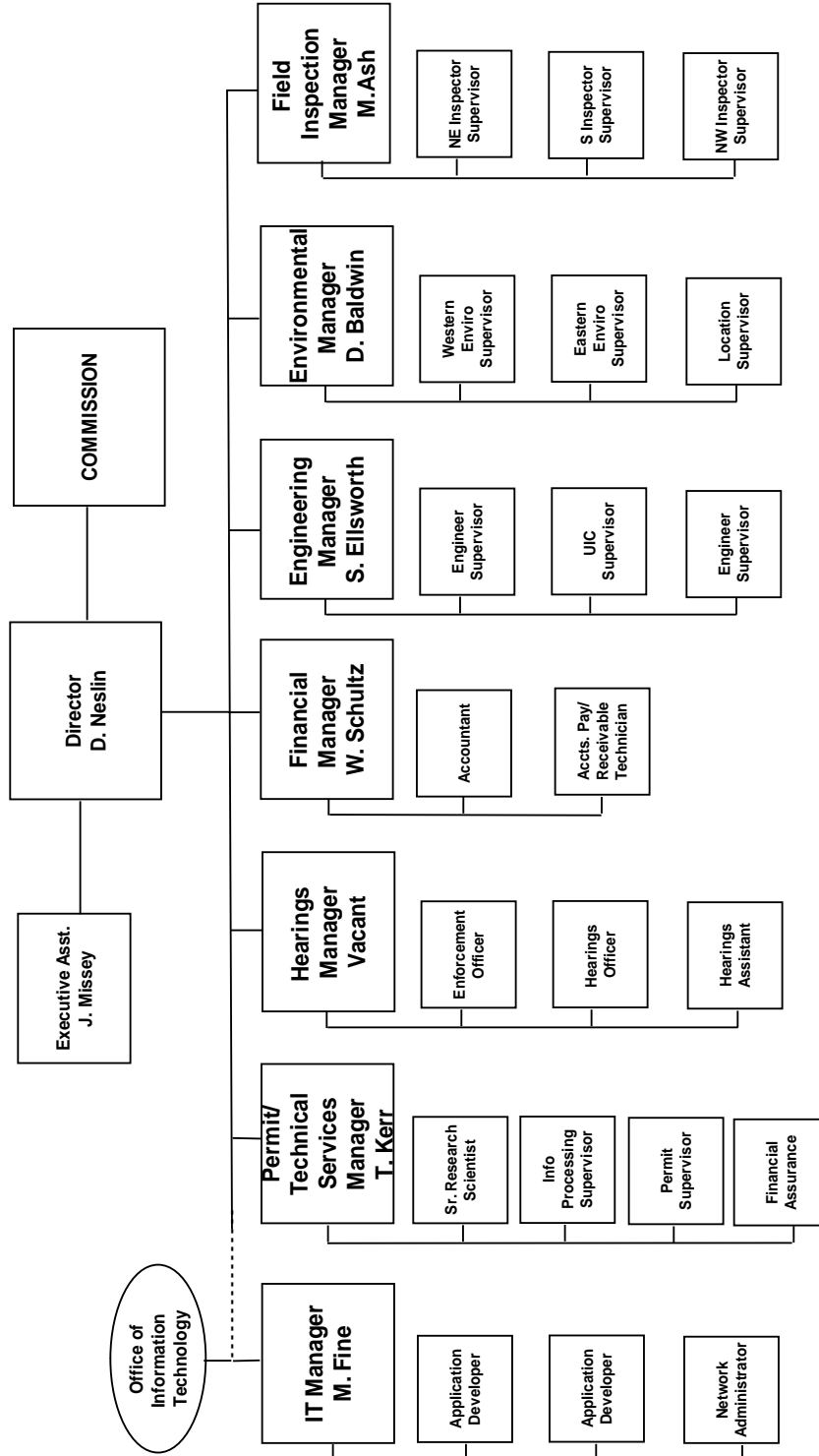
*Please note that information within parentheses is additional background information and not a statutory requirement

Commissioner (Officer)	2 Executive Directors (ex-officio voting members) (Current Employment)	2 West of Continental Divide (Resident County)	3 with Substantial Oil & Gas Experience (Employed by Oil & Gas Industry) (Current Employment)	2 Out of 3 Must Have a College Degree in Petroleum Geology or Petroleum Engineering	1 Local Government Official (Current Employment)	1 with Substantial Environmental or Wildlife Protection Experience (Current Employment)	1 with Substantial Soil Conservation or Reclamation Experience (Current Employment)	1 engaged in Agricultural Production and a Royalty Owner (Current Employment)	Maximum of 4 from Same Political Party (excluding Executive Directors)	Current Term Expires
Richard Alward		X (Mesa)					X (Ecologist)		D	7/1/2015
Tom Compton Chairman		X (La Plata)						X (Rancher)	R	7/1/2015
Tommy Holton		(Fort Lupton)			X				R	7/1/2015
John Benton		(Littleton)	X	X					R	7/1/2015
W. Perry Pearce Vice Chair		(Denver)	X						D	7/1/2015
DeAnn Craig		(Denver)	X	X					R	7/1/2012
Andrew Spielman		(Denver)	X			X			D	7/1/2015
Mike King	X (Department of Natural Resources)	(Denver)								
Chris Urbina	X (Department of Public Health and Environment)	(Denver)								

Commissioner requirements are set by statute in the Oil and Gas Conservation Act at §34-60-104 (2) (a)(1), C.R.S. (Current as of 09-19-2011)

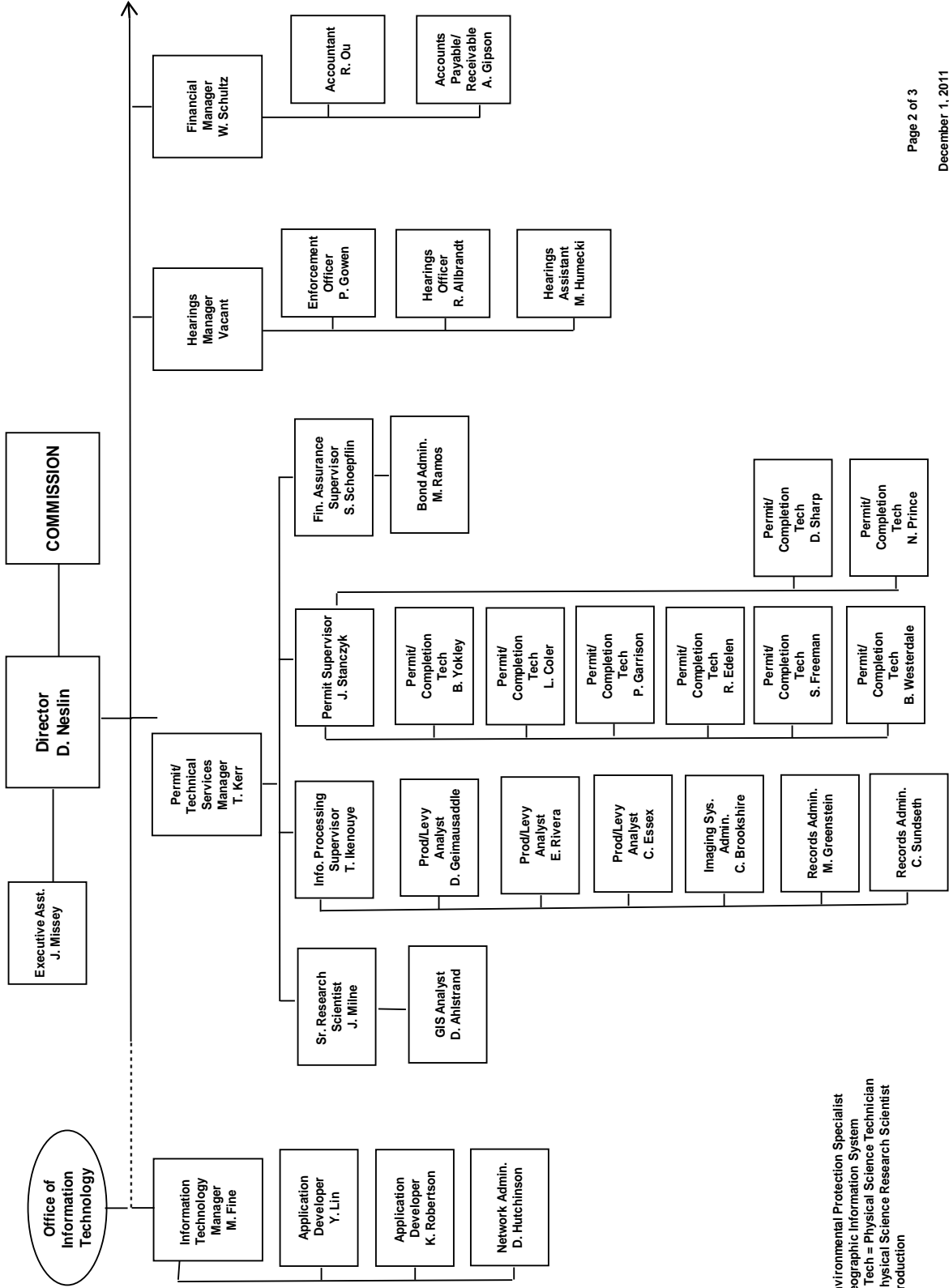
APPENDIX 2
COGCC ORGANIZATION CHART

COLORADO OIL & GAS CONSERVATION COMMISSION



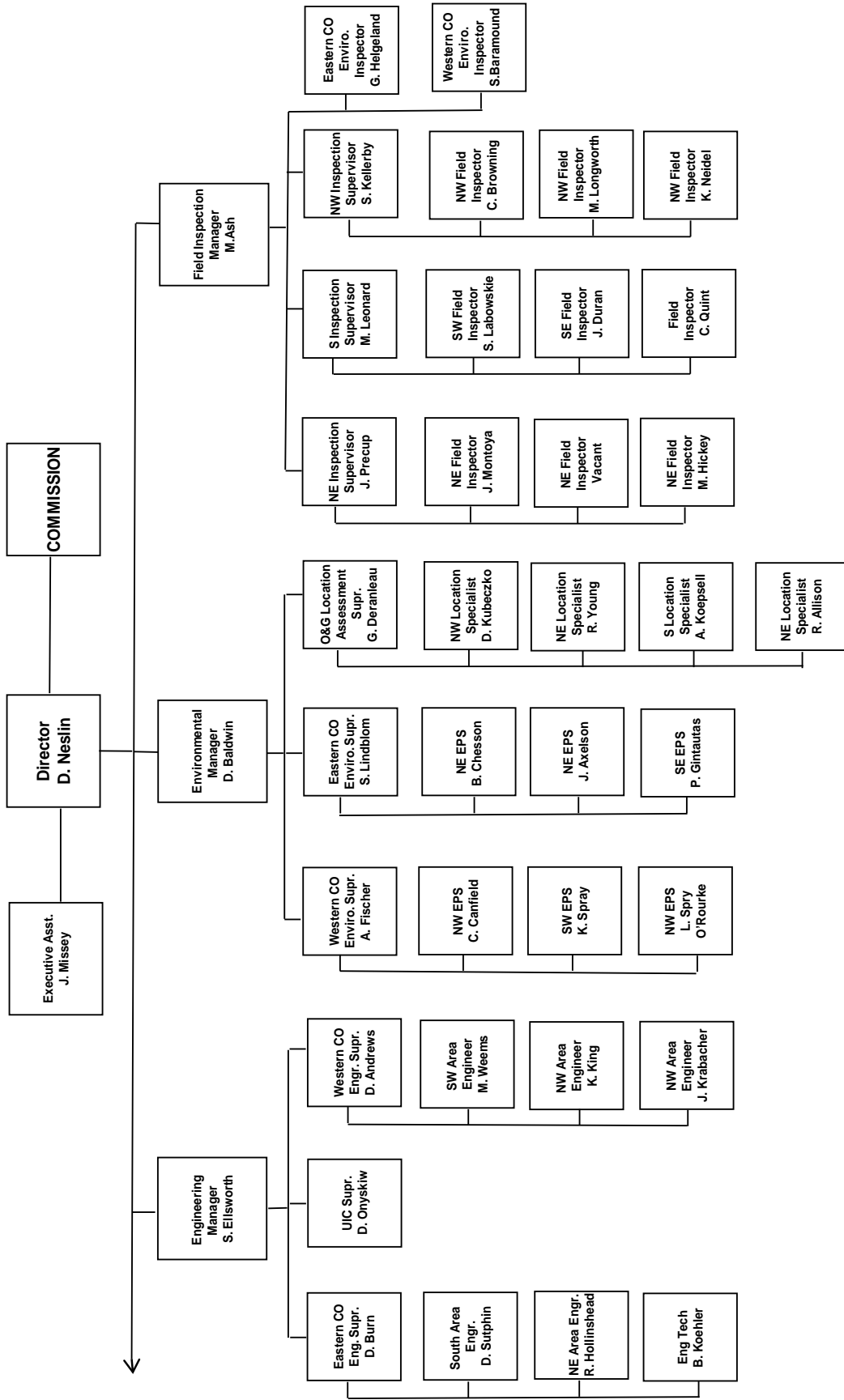
See the next two pages for details

COLORADO OIL & GAS CONSERVATION COMMISSION ORGANIZATION



EPS = Environmental Protection Specialist
 GIS = Geographic Information System
 Phys/Sci Tech = Physical Science Technician
 PSRS = Physical Science Research Scientist
 Prod = Production

COLORADO OIL & GAS CONSERVATION COMMISSION ORGANIZATION



EIT = Engineer in Training
 EPS = Environmental Protection Specialist
 OGLA = Oil & Gas Location Assessment
 Phys Sci Tech = Physical Science Technician
 UIC = Underground Injection Control

APPENDIX 3

**Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells
in Colorado from 2010 through 2015**

**By
Colorado Division of Water Resources
and
Colorado Oil and Gas Conservation Commission
Department of Natural Resources**

Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015¹

Recently, questions have been raised about the quantity of water that will be needed for the hydraulic fracturing of oil and gas wells in Colorado. This report is intended to address these questions.

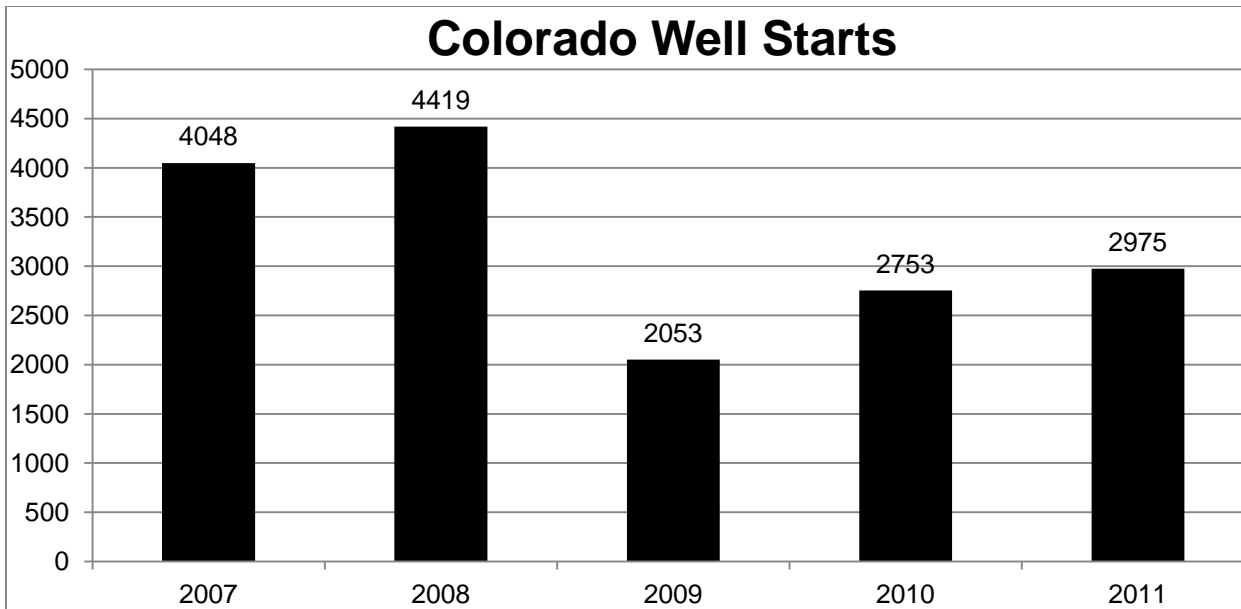
Hydraulic fracturing is the process of creating small cracks, or fractures, in underground geological formations to allow oil and natural gas to flow into the wellbore and thereby increase production. To fracture the formation, special fracturing fluids are injected down the well bore and into the formation under high pressure. These fluids typically consist of approximately 90% water, 9.5% sand, and 0.5% chemicals. The volume of fluids used for this purpose depends upon a variety of factors, including the well type and the formation depth and geologic composition. For example, horizontal wells require more water than vertical or directional wells (because of the length of the borehole that will be fracture stimulated), and deeper shale formations require more water than shallower coal bed methane formations. Hydraulic fracturing has been used in Colorado to increase the production of oil and gas wells since the 1970s, and in recent years most Colorado oil and gas wells have been hydraulically fractured.

The following pages will examine the current and projected water demands for hydraulic fracturing in Colorado, compare those demands to the amount of water that is used for other purposes in Colorado, identify potential sources of water for hydraulic fracturing, and summarize the legal and administrative requirements for using those sources.

Projected Water Demands for Hydraulic Fracturing in Colorado During the Period from 2010 Through 2015

The pace and type of oil and gas well construction in Colorado and other states depend upon a variety of factors that are difficult to predict or control. These factors include national and regional economic conditions, oil and gas prices, capital availability, corporate strategies, and technological innovations. The variability in these factors is reflected in recent well starts in Colorado, which increased from 2007 to 2008, decreased from 2008 to 2009, and then increased again from 2009 to 2010 and from 2010 to 2011:

¹ Jointly prepared by the Colorado Division of Water Resources, the Colorado Water Conservation Board, and the Colorado Oil and Gas Conservation Commission



The various factors that influence oil and gas development, and the resulting variations in development activity, make it extremely difficult to predict future development levels. Nevertheless, the Colorado Oil and Gas Conservation Commission has attempted to predict such development during the period of 2010 through 2015 for the purpose of quantifying the amount of water that could be used for hydraulic fracturing during these years. These predictions are tentative, general, and should be used with caution. They are based upon the following assumptions, which may or may not prove accurate:

- The demand for new gas wells will remain relatively flat.
- The number of drilling rigs in the state will remain relatively flat.
- The number of wells drilled will remain relatively flat because of rig count.
- The number of horizontal oil wells drilled will increase approximately 20% each year.
- The number of vertical wells drilled will decrease proportionally with the increase in horizontal wells drilled.

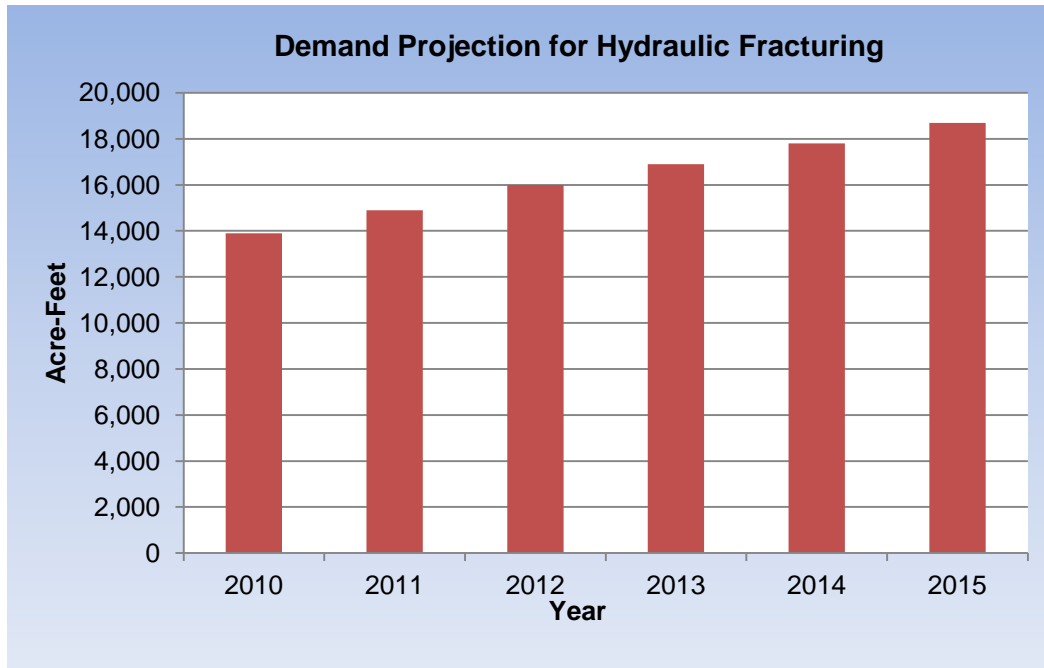
Based upon these assumptions, the Colorado Oil and Gas Conservation Commission estimates that during the period from 2010 through 2015 hydraulic fracturing will require the following volumes of water:

Projection of Annual Demand for Hydraulic Fracturing (Acre-Feet ²) ³					
2010	2011	2012	2013	2014	2015
13,900	14,900	16,100	16,900	17,800	18,700

² One acre-foot is approximately equal to 326,000 gallons.

³ The demands for hydraulic fracturing are based on actual numbers of wells constructed for the years 2010 and 2011 and estimated numbers of wells to be constructed for the following years based on a county-specific projection. The amount of water demand was determined using the number of wells, using vertical or horizontal construction practices, multiplied by an amount of water required for hydraulic fracturing per well. The amount of water required per well is based on reported data.

Regional geology dictates how wells will be drilled, either vertical or horizontal, and the volume of water that will be necessary to provide the most effective fracture stimulation treatment (frac). Frac water volumes have been calculated by predicting the number of new vertical and horizontal wells to be drilled in each county. Completion records were then evaluated to determine a typical water volume used in 2011 completions for each type of well construction in the county. The number of vertical and horizontal wells was multiplied by the typical water volume used in order to predict a total county water use. All of the county volumes were summed to determine the statewide use.



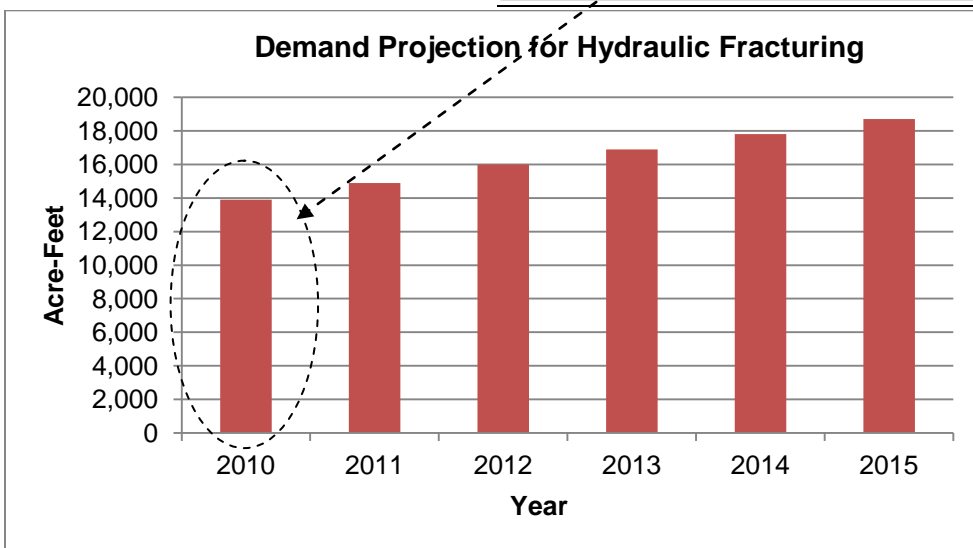
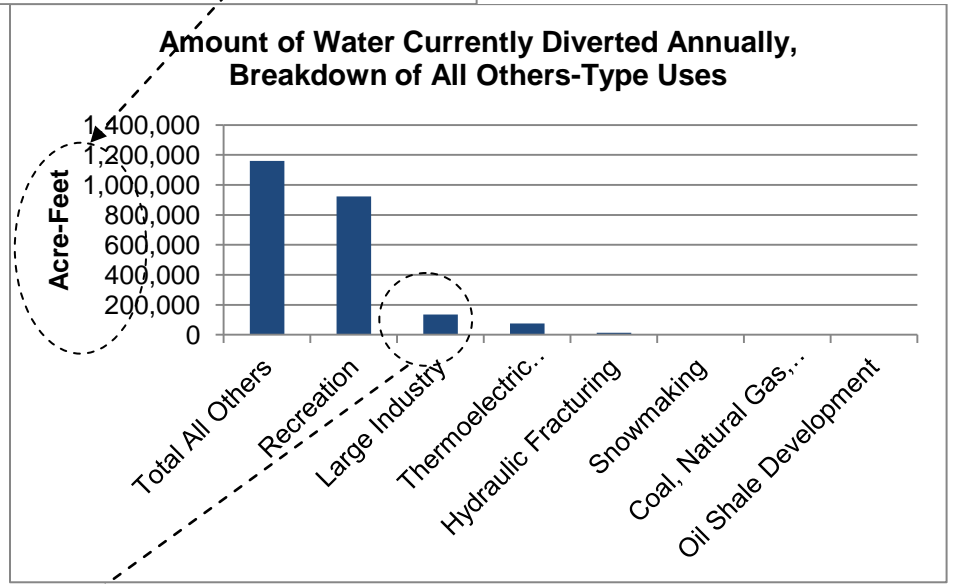
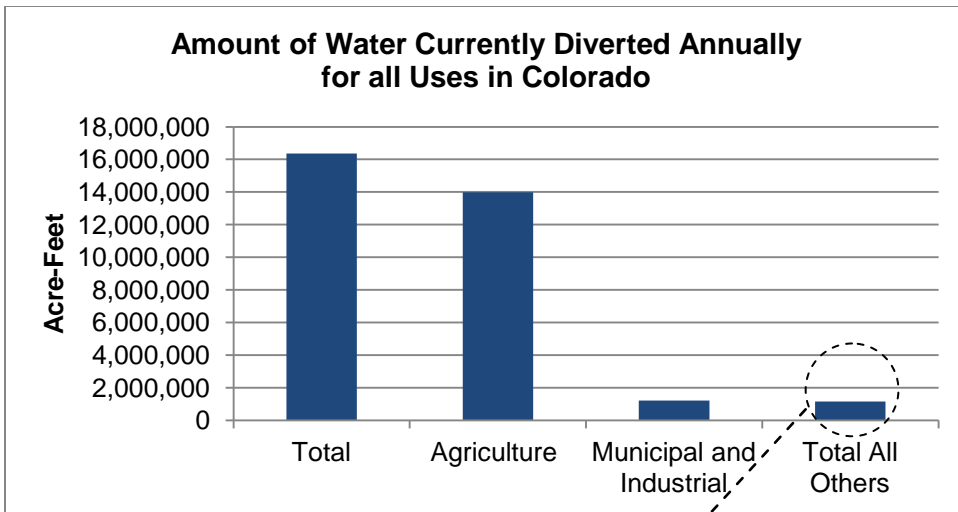
Water Demands in Colorado

The table below shows the amount of water currently diverted for beneficial use for all uses in Colorado on an average annual basis. It is important to note that water use in Colorado varies significantly on a year to year basis, and the projected increase in demand for hydraulic fracturing is well within Colorado's current year to year variation. This table is broken down into three categories. The third category, "Total All Others", is then further broken down into seven categories, including hydraulic fracturing.

Sector	2010 Use (Acre-Feet/Yr) ⁴	Percent of State Total
Total	16,359,700	
Agriculture	13,981,100	85.5%
Municipal and Industrial	1,218,600	7.4%
Total All Others	1,160,000	7.1%
Breakdown of "All Others"		
Total All Others	1,160,000	
Recreation	923,100	5.64%
Large Industry	136,000	0.83%
Thermoelectric Power Generation	76,600	0.47%
Hydraulic Fracturing	13,900	0.08%
Snowmaking	5,300	0.03%
Coal, Natural Gas, Uranium, and Solar Development	5,100	0.03%
Oil Shale Development	0	0.00%

The graphs on the following pages indicate that the amount of water currently used for hydraulic fracturing in Colorado is a small portion of the total amount of water used. In 2010, it reflected slightly less than one-tenth of one percent of the total water used. In 2015, it is projected to increase by 4,800 acre-feet to slightly more than one-tenth of one percent of the total water used.

⁴ The estimated values for Current Annual Use are based on diversion records from the Colorado Division of Water Resources. For some categories, those amounts are further apportioned consistent with 2010 Statewide Water Supply Initiative data from the Colorado Water Conservation Board.



Potential Sources of Water for Hydraulic Fracturing

Several sources of water are available for hydraulic fracturing in Colorado. Because Colorado's water rights system is based in the prior appropriation doctrine, water cannot be simply diverted from a stream/reservoir or pumped out of the ground for hydraulic fracturing without reconciling that diversion with the prior appropriation system. Like any other water user, companies that hydraulically fracture oil

and gas wells must adhere to Colorado water laws when obtaining and using specific sources of water for this purpose.

Below is a discussion of the sources of water that could potentially be used for hydraulic fracturing. The decision to use any one source is dependent on the ability to satisfy the water rights obligations and will also be driven by the economics associated with that source.

Water transported from outside the state

An Operator may transport water from outside of the state. As long as the transport and the use of the water carries no legal obligation to Colorado, this is an allowable source of water from a water rights perspective.

Irrigation water leased or purchased from a landowner

A landowner may have rights to surface water, delivered by a ditch or canal that is used to irrigate land. An Operator may choose to enter into an agreement with the owner of the water rights to purchase or lease a portion of that water. This is allowable, however, in nearly every case, the use of an irrigation water right is likely limited to irrigation uses and cannot be used for Well Construction. To allow its use for Well Construction, the owner of the water right and the Operator may apply to change the water right through a formal process. (See "Change of Water Right" below.)

Treated water or raw water leased or purchased from a water provider

An Operator may choose to enter into an agreement with a water provider to purchase or lease water from the water provider's system. Municipalities and other water providers may have a surplus of water in their system before it is treated (raw water) or after treatment that can be used for Well Construction. Such an arrangement would be allowed only if the Operator's use is compliant with the water provider's water rights.

Water treated at a waste water treatment plant leased or purchased from a water provider

An Operator may choose to enter into an agreement with a water provider to purchase or lease water that has been used by the public, and then treated as waste water. Municipalities and other water providers discharge their treated waste water into the streams where it becomes part of the public resource, ready to be appropriated once again in the priority system. But for many municipalities a portion of the water that is discharged has the character of being "reusable." As a result, it is possible that after having been discharged to the stream, it could be diverted by the Operator to be used for Well Construction. Such an arrangement could only be exercised with the approval of the Division of Water Resources' Division Engineer and would be allowed only if the water provider's water rights include uses for Well Construction.

New diversion of surface water flowing in streams and rivers

In most parts of the state, the surface streams are "over appropriated," that is, the flows do not reliably occur in such a magnitude that all of the vested water rights on those streams can be satisfied. Therefore, the only time that an Operator will be able to divert water directly from the river is during periods of higher flow and lesser demand. Those periods do occur but not necessarily reliably or predictably.

Ground water diverted from wells completed in tributary formations outside [Designated Ground Water Basins](#) ("Designated Basins")

An Operator may choose to enter into an agreement with the owner of a well outside of the Designated Basins to divert the well's water for Well Construction, or to divert additional water for Well Construction. However, most existing wells will be located in parts of the state where the surface streams are over appropriated. In those locations, because of the wells' relatively junior water rights, the well is actually a diversion structure only and not a source of appropriated water. Instead, all water withdrawn by the well must be withdrawn according to a plan that acknowledges the impact of the

well's pumping on the over-appropriated stream and an accompanying plan for replacing that water to the stream to correct for the depletive impact. Therefore, the complexity of using the well to divert ground water for Well Construction will be primarily a result of the need to develop a plan for replacing depletions to the stream system. (See "Augmentation Plans" below.)

Ground water diverted from wells inside Designated Basins

An Operator may choose to enter into an agreement with the owner of a well inside the Designated Basins to divert the well's water for Well Construction. If the well's water right allows Well Construction as a use and there are no other restrictions on its use, this is a viable source of water. However, the water right for most wells in the Designated Basins generally does not include an allowance for oil and gas well construction purposes. If there is a question as to whether some other term in the well's water right can be construed as an allowance for Well Construction, since these terms are usually ambiguous, the Division of Water Resources will evaluate them on a case-by-case basis to determine whether the intent of that term could have been for Well Construction purposes. If the well's water right does not allow for Well Construction, the owner of the well and the Operator may apply to change the water right through a formal process. (See "Change of Water Right" below.)

Ground water diverted from wells completed or to be completed in nontributary aquifers

An Operator may choose to enter into an agreement with a landowner to divert nontributary ground water from the aquifer underlying the landowner's land. The most recognizable occurrence of nontributary ground water is the water in the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers of the [Denver Basin](#) situated along the Front Range of Colorado. This is permissible and can be done through the issuance of a well permit. In most cases there are no restrictions on the types of use allowed for nontributary ground water if it is not already subject of a decree or a well permit. There are, however, limits to the amount of water that may be withdrawn in a given period of time. Specifically, the amount of water that may be withdrawn from a piece of land under consideration is the amount of ground water calculated to be contained in the aquifer underlying that land; and no more than one percent of the amount calculated may be withdrawn annually (many will recognize this limitation as the basis for the term: "100-year aquifer life"). This withdrawal limitation would be applied to any well permit that allows the use of Well Construction and it is the exact same limitation that would be applied to wells that would withdraw the water for domestic, commercial, agricultural, or other uses. The amount of water currently being withdrawn for all uses from the bedrock aquifers of the Denver Basin is estimated to be 350,000 acre-feet annually.⁵

Produced Water

An Operator may choose to use water produced in conjunction with oil or gas production at an existing oil or gas well. The water that is produced from an oil or gas well falls under the administrative purview of the State Engineer's Office and as a result is either nontributary, in which case, it is administered independent of the prior appropriation system; or is tributary, in which case, the depletions from its withdrawal must be fully augmented if the depletions occur in an over-appropriated basin. The result in either case is that the produced water is available for consumption for other purposes, including Well Construction. The water must not be encumbered by other needs and a proper well permit must be obtained by the Operator before the water can be used for Well Construction. The exception to this permitting requirement is the allowance in [Section 37-90-137\(7\), C.R.S.](#), whereby produced water from a nontributary formation using a non-coal-bed methane operation may be applied to uses associated with Well Construction without a well permit.

Reused or Recycled Well Construction Water

For all of the different sources listed above that are used for Well Construction, the water right in question must contain provisions that allow the water to be fully consumed. Under that scenario, water

⁵ According to the Citizens Guide to Denver Basin Groundwater, 2007, produced and distributed by the Colorado Foundation for Water Education.

that is used for well construction of one well may be recovered and reused in the construction of subsequent wells.

The COGCC encourages reuse and recycling of both the water used in Well Construction and the water produced in conjunction with oil or gas production. Reuse and recycling of water is covered in COGCC Rule 907 MANAGEMENT OF E&P WASTE, which describes the process for submitting a plan to the COGCC for review and approval. In the Piceance Basin several of the larger operators have constructed pipelines and use trucks to convey produced and already used water and other fluids to their centrally located water management facilities. At these facilities the water is treated so that it can be reused for drilling and completing new wells.

Explanation of Terms

Change of water right

In Colorado, a water right may be changed to allow for uses other than those originally granted to the water right and the water right can keep its original priority date. However, whether it is a water right inside or outside of the Designated Basins, such a change of use must be done through a formal process with notice to other water users. While the standards vary for each individual situation, in each case the change process is meant to ensure there will be no increase in use of the water right over what the water right allows or what has historically been done. Further, the change must include provisions to ensure that other owners of vested water rights are not impacted by a change to the system as a result of the change of water right. For designated ground water in the Designated Basins, the change of water right will be accomplished through an application to the Colorado Ground Water Commission according to the [Designated Basin Rules \[2-CCR-410-1\]](#). Outside the Designated Ground Water Basins, the change of water right may be accomplished through an application to the [water court](#) or an application to the State Engineer for temporary approval of a substitute water supply plan pursuant to [37-92-308](#) and the State Engineer's [Policy No. 2003-2](#), or an Interruptible Water Supply Agreement pursuant to [37-92-309](#).

Augmentation plans

In Colorado, water may be diverted when the result is a depletive effect on the stream system even though the diverter does not have a water right with the priority to do so, as long as the diverter obtains formal approval of a plan to offset the depletive effect on the stream with a source of replacement water. Such a plan is called an augmentation plan. The plan must acknowledge the depletive effect of the diversion on the stream, including consideration of the amount of the depletion as well as the time and location of the depletion. Then the plan must identify a source of water that has been obtained to replace those depletions to ensure that no party with a senior vested water right will be injured. Approval to operate the augmentation plan may be accomplished through an application to the [water court](#) or an application to the State Engineer for temporary approval of a substitute water