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Water and Air Quality Issues in Oil and Gas
Development: The Evolving Framework of
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Conference, June 5-6)

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SLIDES: Produced Water – Beneficial Reuse

Cabell Hodge

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Colorado
Energy Office



Produced Water – Beneficial Reuse

Cabell Hodge, Policy, Regulation, and Emerging Markets Manager

June 5, 2014



The Colorado Energy Office

Mission

The CEO's mission is to improve the effective use of all of Colorado's energy resources and the efficient consumption of energy in all economic sectors, through providing technical fieldwork and guidance, financial support, policy advocacy and public communications.

Vision

The CEO's vision is to help Coloradans live more prosperous and healthy lives by promoting innovative energy production and efficient energy consumption practices that are beneficial to the economic and environmental health of the state.

Produced Water

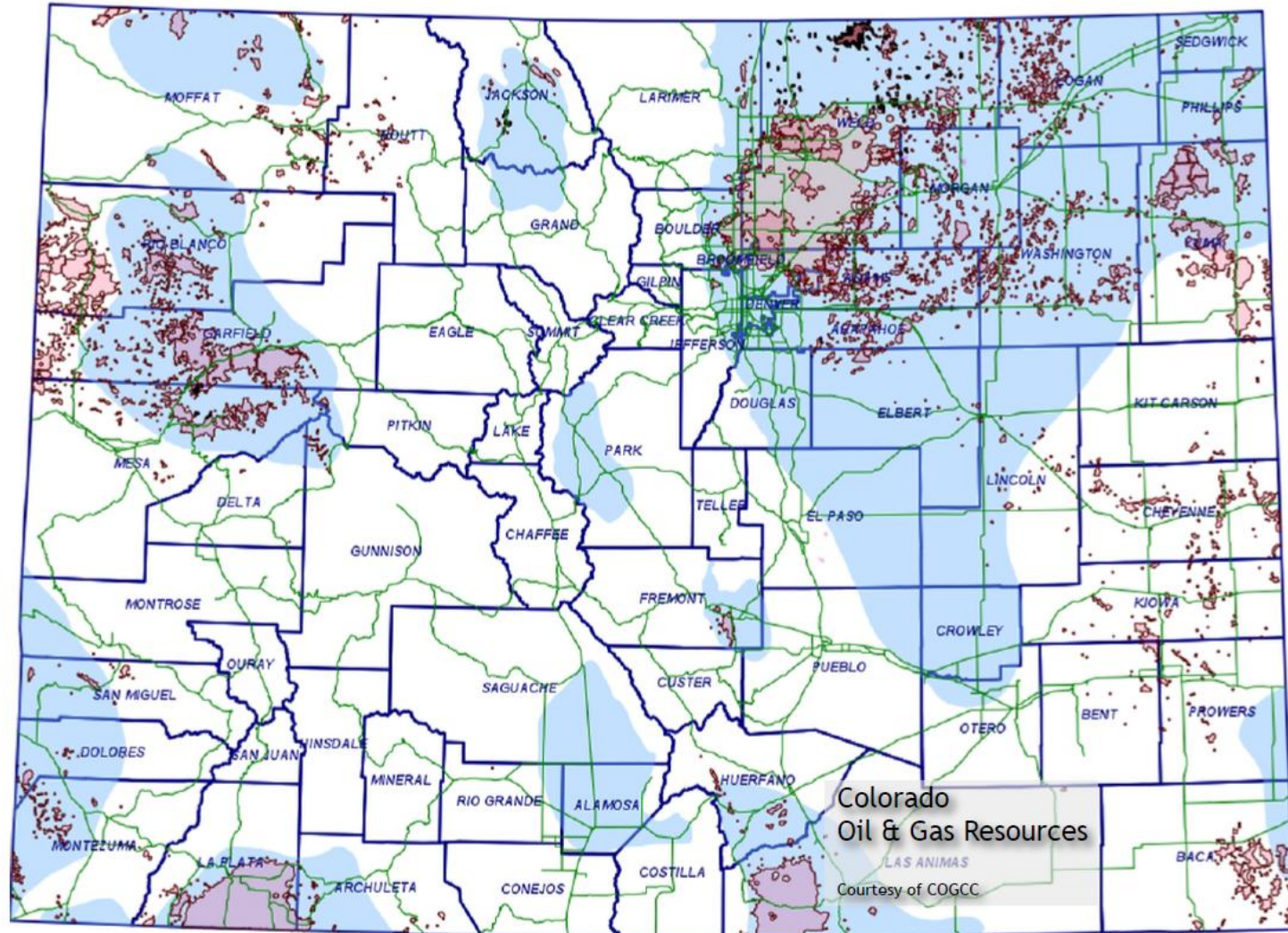
Quantity

- 41,000 AF produced water in 2012
- 20,000 AF on the west slope alone
- Estimates of 22,000 AF needed for annual exploration and production in Colorado

Quality

- Formation water vs. flowback distinction
- Varies by basin and other factors
- Heavy Metals – Filtration processes
- Organic Compounds – Treatment processes
- Salt – Chlorides and Sulfates

Colorado Oil and Gas Basins



Produced Water Dialogue

Produced Water Initiative

- Water Center at Colorado Mesa University
- CDR Associates organized forum and drafted white paper
- 65 stakeholders gathered in Grand Junction

Goals

- Gather diverse group of stakeholders
- Identify opportunities
- Discuss barriers/constraints
- Developing potential next steps

Reuse and Disposal

Current Reuse

- Companies are reusing a significant amount of their water for drilling new wells

Common Disposal Methods

- Deep well injection
- Evaporation Ponds

Opportunities

- 41,000 AF produced minus 22,000 AF needed for annual exploration and production
- Reuse of produced water could supply Colorado's oil and gas industry with all the water it needs and more

Produced Water Dialogue – Report

Produced Water Beneficial Use Dialogue:

Opportunities and Challenges for Re-Use of Produced Water on Colorado's Western Slope

Prepared by: CDR Associates, for the Colorado Energy Office & Colorado Mesa University Water Center



<p>Goals for the Dialogue</p> <ul style="list-style-type: none"> • Listen, learn, and meaningfully discuss: <ul style="list-style-type: none"> ○ Environmental issues and risks ○ Economic/environmental benefits ○ Treatment technologies, e.g., for surface discharge or for irrigation ○ Value of water resources ○ Regulation issues ○ Economic feasibility of re-uses ○ Radiation and treatment thereof ○ Handling of waste and residuals ○ Handling of logistics/local impacts, e.g., infrastructure, transportation • Find areas of common interest • Hold respectful conversation • Explore re-uses that are both practical and environmentally sound • Explore ways to engage/better educate public 	<p>Goals, continued</p> <ul style="list-style-type: none"> • Find alternatives to injection/evaporation • Ensure standards and regulations in place without being duplicative or unduly time-consuming • Consider possibility of different tiers of treatment based on different uses • Develop new ideas for furthering re-use • Act as think tank – what can be done legislatively, academically, or via regulations • Discuss role of academic/research bodies • Protection of water resources from domestic water perspective • Discuss ideas for pilot project to test, study, and evaluate different re-uses • Better understand the issue • Network and have dialogue
<p>Opportunities for Re-Use of Produced Water</p> <ul style="list-style-type: none"> • Clean to groundwater standards • Decrease demands on fresh water • Augment fresh water uses (in-stream, ag.) • Use of brine in lieu of magnesium chloride (for dust suppression) • Large companies helping small with infrastructure • Treat for use outside industry • Use of disposal wells for storage • Unlimited use of brine that meets criteria • Current surplus because of reduced drilling • Can lay water line in gas trench to move produced water to where there is demand 	<p>Constraints</p> <ul style="list-style-type: none"> • Disposal of residuals • Variable volumes • Cost of treatment for non-industry uses • Lack of coordination, delays and overlap in regulations and permitting (challenging for water-sharing and among industry users as well as non-industry uses, including meeting requirements for surface discharge) • Lack of public trust • Liability pertaining to use of produced water • Location and geography – supply/demand • Mobile treatment – cost, volume fluctuations, permitting
<p>Issues</p> <ul style="list-style-type: none"> • Economic viability • CDOT use of MgCl₂ – study of impacts • Maintain flexibility • Need increased transparency of data • Effect of local conditions on re-use possibilities • Potential to incentivize re-use • Truck traffic impacts • Public perception and education • New technologies lack long-term testing/study 	<p>Potential Next Steps</p> <ul style="list-style-type: none"> • Pilot project – involve academia • Expanded stakeholder dialogue • Educate and engage the public • Process to address regulatory overlap • Define process to explore other uses • Involve/communicate with different interests • Develop guiding principles and/or roadmap to govern the above next steps

www.colorado.gov/energy

Opportunities and Constraints

Opportunities

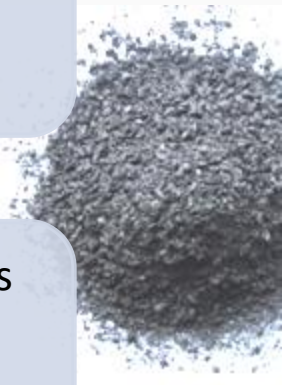
- Within oil and gas operations
- Offsite options such as dust suppression
- Augment freshwater uses

Issues/Constraints

- Non-industry uses require higher treatment levels
- Economic viability of alternative uses
- Location and geography affect options
- Disposal of residuals

Potential Solutions

- Sharing of water and treatment among operators
- New treatment options like ecochar may be able to treat produced water more affordably
- Further study of treatment and reuse options



Regulations

COGCC Disposal Options

- Injection into Class II well (under Rule 325)
- Evaporation/percolation in a properly permitted pit
- Disposal at permitted commercial facilities
- On lease roads with surface owner permission if Total Dissolved Solids (TDS) < 3,500 mg/liter

CDPHE Guidance

- No negative impacts on groundwater
- Specific concentration limits
- Produced Water Stakeholder Discussions
- Broader TENORM Guidance
- Flowchart with other state permitting requirements

Next Steps

Pilot Project Involving Academia

- CMU has studied water samples and expressed interest in pursuing a suitable pilot project
- CU has appropriate expertise as well
- Colorado School of Mines is studying reuse options

Oil and Gas Collaboration

- Potential to share resources: water, storage, and treatment technology

Expanded Stakeholder Dialogue

- January forum focused on West Slope
- Opportunities vary by basin
- Interest in convening stakeholders to pursue options

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The Colorado Energy Office



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