

Water Quantity and Quality Regulations Concerning Marcellus Shale Gas Development

*AAEE Workshop on Water Management in
Marcellus Shale Gas Exploration & Production
Atlantic City, NJ – May 9, 2011*

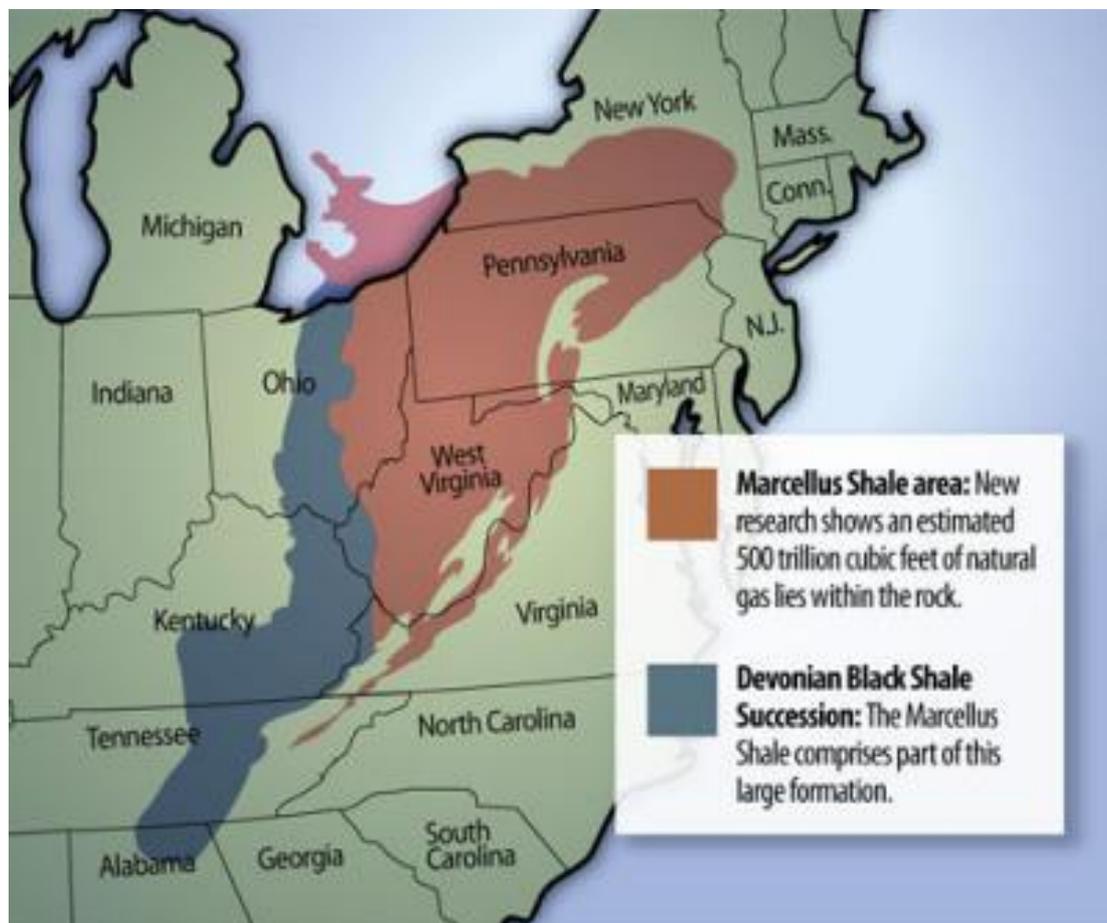
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Overview

- Orientation: Marcellus Shale & River Basins
- Legal Background re Water Rights
- Key Developments for Marcellus Shale Water Use
 - DRBC, SRBC, PADEP, NYS DEC, WVDEP
- Hydraulic fracturing
- Wastewater management

Marcellus Shale Area



Key basins:

- Delaware
- Susquehanna
- Ohio
- Great Lakes/
St. Lawrence

Delaware River Basin



Marcellus Shale Formation in the Delaware Basin



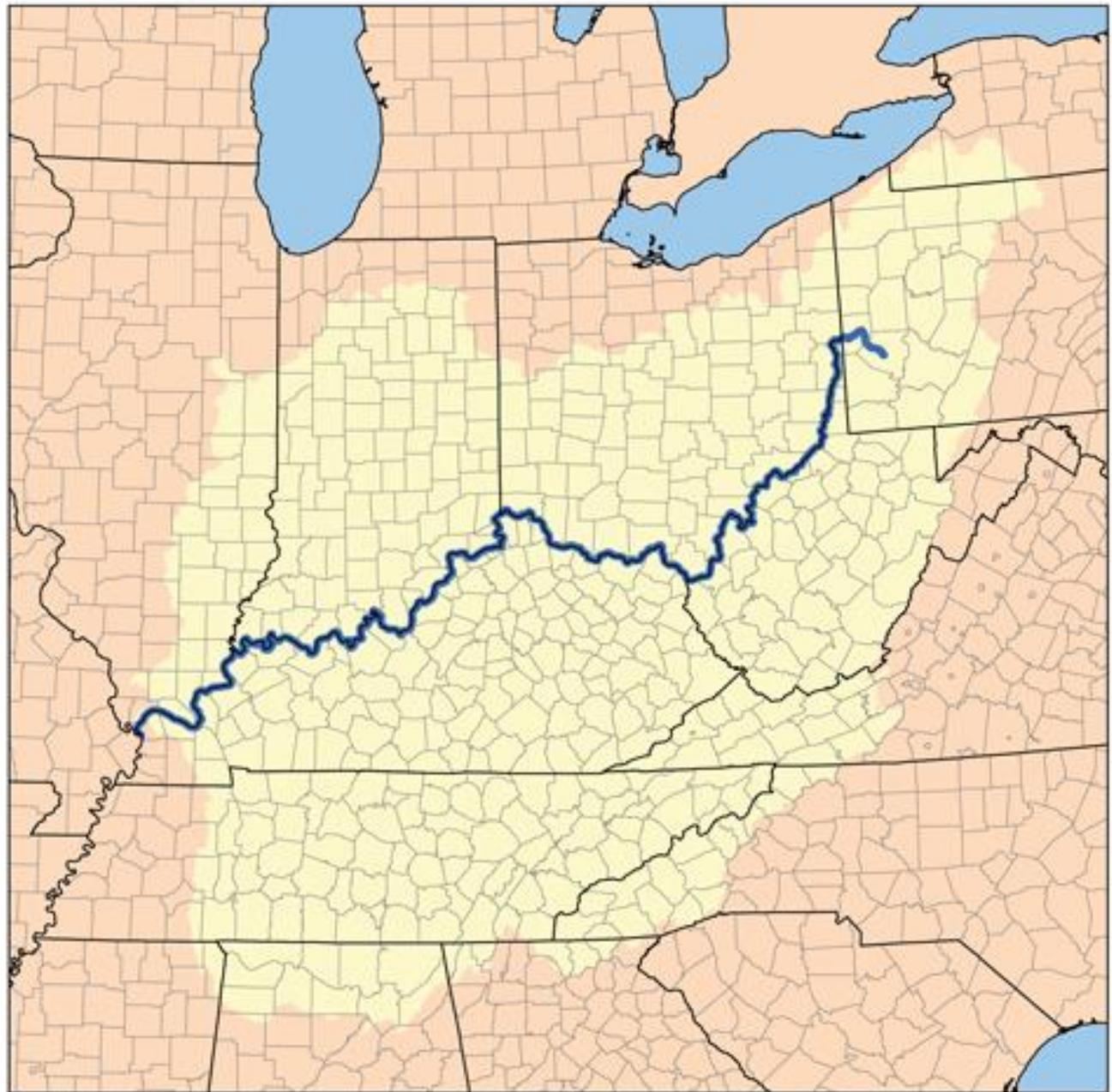
Susquehanna River Basin



Marcellus Shale Formation in the Susquehanna Basin



Ohio River Basin

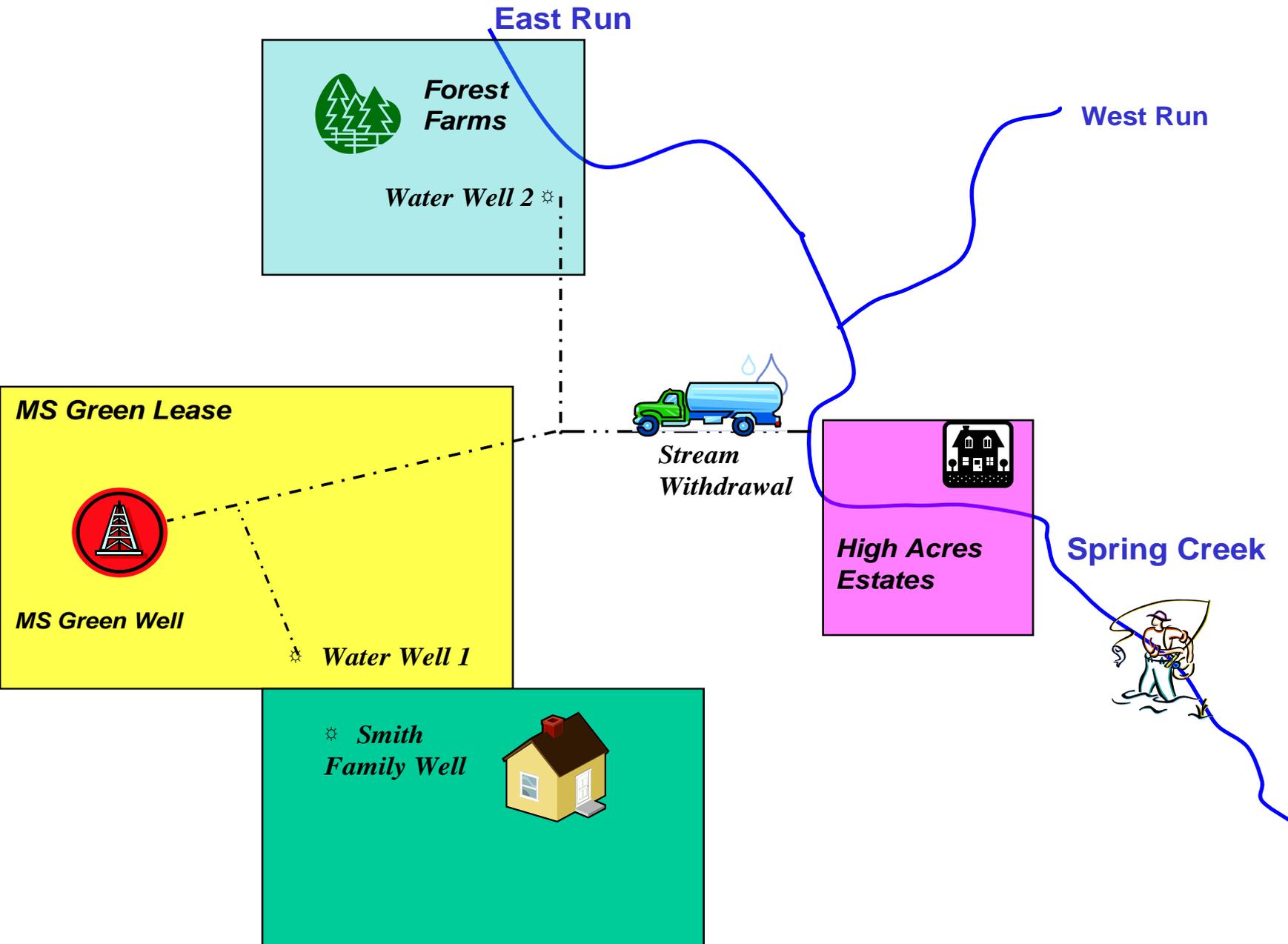


Water resource requirements for shale development

- 1-5+ million gallons for each well
- Opportunity to reuse return flow, **but** significant freshwater needed
- Marcellus Shale occurs in areas with small headwater streams & sometimes limited groundwater supplies
- From an overall perspective, water requirements for Marcellus Shale development are comparatively modest, but concerns regarding –
 - Impacts to small local streams
 - Cumulative impacts of many withdrawals in a watershed
 - Maintaining a baseline low flow (seasonal impacts)

Key questions

- What water rights may Marcellus Shale developers acquire to procure necessary supplies?
- What regulatory and permitting programs affect water supply development?
- If water withdrawals adversely impact other water users or in-stream uses, what liability can be imposed on the gas well developer?
- If gas well development affects the quantity or quality of water supplies used by third parties, what are the well operator's responsibilities?



What is a water right?

- No one owns the water; water rights are **rights of use**
- Two ways of looking at water rights:
 - What can I do? (*Where, when & how much can I withdraw?*)
 - What can someone else do to me? (*To what extent is my source of supply or use protected?*)

“Water rights” in typical mineral leases

- Specific lease terms govern relationship between surface fee owner and mineral rights holder
- Typical lease language: “including the privilege of using sufficient ... water for operating on the premises”
- Typical lease language may not authorize extraction of water from one leased parcel for use on another leased parcel
- Rights granted by lease are no greater than water rights of the landowner granting the lease
- Scope of water rights defined under applicable state law

Bases of water rights

- Common law
 - Historical basis
 - Administration of rights ▶ courts
- Evolving to “regulated riparian” regimes
 - Statutory & regulatory codification / modification of common law
 - Administration of rights ▶ administrative agencies

What water is subject to water rights?

- Not all “water” is legally the same
 - Different rules apply to different sources
- Common law classifications
 - Surface waters in defined lakes & streams
 - Diffused surface waters
 - Groundwater in well-defined subterranean streams
 - Percolating groundwater
- Different rules for each class
- Doctrines based on legal fictions, rather than hydrologic fact

Common law riparian rights in surface waters

- Right to make use of water on riparian land
- Applicable to surface waters in streams (defined bed and banks), lakes, and identifiable subterranean streams
- What is “riparian land”?
 - Unity of title test
 - Rights do not extend to non-contiguous land
 - Rights do not extend to lands not in same watershed
- What is the measure of a riparian right?
 - Natural flow doctrine
 - Reasonable use doctrine

Common law rights in groundwater

- Three theories:
 - “English rule” of absolute dominion by overlying landowner
 - “American rule” of “reasonable use”
 - Correlative rights doctrine
- Use on overlying land vs. off-land
 - “*Per se*” unreasonable (some states) for off-land use
- Surface-groundwater interaction not often addressed

Regulated riparian regimes

- Statutory/regulatory arrangements requiring permit for water withdrawals (above certain quantity)
- Applied statewide or in certain regions, basins, watersheds
- Examples:
 - Delaware River Basin Compact
 - Susquehanna River Basin Compact

Key developments for Marcellus Shale water use

- Pennsylvania Department of Environmental Protection – Water Management Plan permit requirement
- New York State Department of Environmental Conservation – Supplemental Generic Environmental Impact Statement
- West Virginia Department of Environmental Protection – Permit Application Addendum & Water Withdrawal Guidance Tool
- Susquehanna River Basin Commission – Executive Director’s Determination and series of rulemakings, “approval by rule” projects
- Delaware River Basin Commission – Executive Director’s Determination, moratorium on well projects, and rulemaking re standards for well projects

The PADEP approach to Marcellus Shale water use

- No state-wide water withdrawal permit requirement (other than public water supplies); registration & reporting only
- Requirement for Water Management Plan imposed by well permit standard condition
- Plan requirements:
 - Identification of sources (by sub-basin)
 - Specific impact questions for each type of source
 - Monitoring plan and water withdrawal reporting requirements
 - Deference to SRBC and DRBC reviews (detailed impact evaluation not required for sources subject to SRBC or DRBC)

The NYS DEC approach to Marcellus Shale water use

- No state-wide water withdrawal permit requirement for non-potable purposes
- Draft SGEIS issued 09-30-09
 - Comment period closed 12-31-09
 - 13,500+ comments received and under review
 - Proposes surface water withdrawal restrictions potentially beyond DRBC and SRBC requirements – pass-by flows based on “Natural Flow Regime Method”
- April 24, 2010 announcement that pending SGEIS will not apply to Syracuse and New York City watersheds

The WVDEP approach to Marcellus Shale water use

- Water Resources Protection Act (2003) – requires registration of large quantity users > 750,000 gallons per month
- January 8, 2010 Industry Guidance:
 - Sources & anticipated volumes to be provided as part of well permit application (Well Work Permit Application Addendum)
 - Precludes withdrawal at volumes that the source cannot sustain
 - Introduced Water Withdrawal Guidance Tool – provides real-time data to determine suitability of conditions for withdrawal

SRBC approach to regulating shale gas development

- Executive Director Determination 08-15-08 and Dec. 2008 rule amendments
- Project review jurisdiction extended to all natural gas well development projects targeting the Marcellus or Utica Shales (irrespective of quantity of water)
 - No minimum quantity of water withdrawal or consumptive use
 - Approval required prior to commencement of construction
 - “Project” definition = the drilling pad upon which one or more wells are undertaken, and all water-related appurtenant facilities and activities
 - “Construction” = commencement of drilling
 - Impacts “re-completion” of wells formerly drilled into other formations
- Approval-by-rule (ABR) process for consumptive use (well pads) (approved by SRBC staff)
- Dockets required for surface water and groundwater withdrawals (approved by full Commission after hearing)

The SRBC approach (con't)

- Increased concern regarding cumulative impacts on stream flow, with potential for passby flow imposition
- Significant penalties imposed for project commencement without approval
- Revised rules effective 11/1/2010 – re public notice, transfer of approvals, and water sharing arrangements

The DRBC approach to Marcellus Shale water use

- May 19, 2009: Executive Director issued jurisdictional determination extending project review authority to all shale gas development projects in special protection water drainage (effectively, all Marcellus Shale projects)
 - Exploratory wells excluded
- May 5, 2010: Commission staff directed to develop regulations for shale gas well pad projects
 - Applications for pad or drilling approval will not be considered until rulemaking is complete
 - Applications for source water withdrawal to continue to be considered under Commission's existing surface or groundwater withdrawal review rules
 - Draft regulations released for public comments 1/24/2011; comments due 5/15/2011

DRBC Proposed Regulations

- Requirement for natural gas development plans (NGDP) covering all of operator's leased area in basin
 - Operators with > 3200 acres of leases of ≥ 5 well pads
 - Foreseeable gas development (specific sites, with detailed site information)
- Siting restrictions for natural gas wells
- Well construction and operating procedures
- Approval of specific well pads – via approval by rule or dockets
- Approval of water withdrawals – via dockets
- Financial assurance requirements

Evolving issues in water withdrawal

- Obtaining access – for withdrawal and pipelines
- Passby flow requirements (how calculated and monitored)
- Cumulative impact analysis and management
 - How to manage amount and timing of withdrawals from multiple producers drawing from same watershed
 - SRBC: total amount of approval withdrawals appears to far exceed actual use
 - Producer / area withdrawal limits vs. cross-producer withdrawal limits
 - ***Strong encouragement for water sharing arrangements***
- Water sharing arrangements
 - Fresh water sources (allowed by SRBC consumptive use ABR)
 - Transfer of flowback/produced water between producers
 - Negotiation of arrangements (risk allocation, cost-sharing, control and management responsibilities)
 - Potential regulatory impediments – permitting and residual waste regulations

Hydraulic fracturing – background

- Current state of law: Safe Drinking Water Act excludes injection of fluids for hydraulic fracturing from the definition of “underground injection” –
 - No USEPA Underground Injection Control Program permit required
 - Regulation at state level only
- Current technical information:
 - USEPA (2004) study concluded that injection of hydraulic fracturing fluids by coalbed methane wells posed little or no threat to underground sources of drinking water – found no instances of contamination of drinking water sources

Hydraulic fracturing – recent developments

- 2009: Federal legislation introduced to withdraw SDWA exemption and to require public disclosure of fluid content
- 2010: USEPA announces new study to examine impacts of hydraulic fracturing on public health
 - Draft study plan issued in Feb. 2011
 - Broadly looking at all aspects of well development (not just fracturing operations, but also water use and wastewater management)
- NY, PA, WV all provide disclosure of fluid content to some degree
- Website established by Ground Water Protection Council and the Interstate Oil and Gas Compact Commission for disclosure of materials in fracturing fluids: www.fracfocus.org

Wastewater – key issues

- Characterization of return flows
 - TDS typically exceeds 100,000 mg/l
 - Other constituents: barium, strontium, NORM, bromides
- Reuse of return flows – practical limits from development life-cycle
- Growing constraints on stream discharges

Federal regulation

- Produced water and drilling fluids are exempt from regulation as “hazardous waste” (*unused* fracturing fluids and hydraulic fluids are not exempt)
 - State requirements apply, *e.g.*, PA residual waste management
- Under categorical treatment standard, produced water and drilling fluids may not be discharged to navigable waters from a well site
- Off-site disposal through centralized treatment works allowed
- Environmental groups are lobbying USEPA to develop additional standards for the onshore oil and gas category
- USEPA has solicited comment on whether to study hydraulic fracturing in connection with the potential development of additional standards

Example of state regulation – Pennsylvania

- TDS Discharge Limitations: 25 Pa. Code §95.10 (published Aug. 21, 2010)
 - Treatment requirements for new and expanding loadings of total dissolved solids (TDS)
 - Wastewater source reduction strategy (maximizing reuse) required for natural gas operations by 8/22/2011
 - New discharges from natural gas operations allowed only through centralized treatment facilities with strict discharge limits (500 mg/l TDS, 250 mg/l Chlorides, 10 mg/l Barium and Strontium)
- PaDEP's call for operators to cease taking wastewater to 15 grandfathered treatment plants by May 19

Example of state regulation – Pennsylvania (con't)

- *Proposed* Ch. 93 instream water quality criteria for Chlorides for aquatic life protection
 - 230 mg/l as 4-day average; 860 mg/l as 1-hour average
 - EPA is restudying its chloride guidance

Underground injection requirements

- New York State
 - Federal (USEPA) primacy under SDWA – UIC Class II permit
 - State well permit and state discharge permit required
- Pennsylvania
 - Federal primacy under SDWA – UIC Class II permit
 - State well permit required
- West Virginia
 - State primacy – state issues UIC program permit
- DRBC asserts concurrent jurisdiction over injection wells within the Delaware River Basin
- Geology may substantially constrain this option

Treatment and reuse technology choices

- Natural pond evaporation – not practical in eastern U.S.
- ***Direct reuse for drilling & fracturing***
- ***Underground injection of brines***
- Conventional treatment technologies
- TDS reduction via reverse osmosis
- ***TDS reduction via evaporation***
- ***TDS reduction via evaporation / crystallization***

Challenges to developing a new facility

- Facility siting
 - State & local criteria (as applicable)
 - Conveyance of wastewater to facility (pipeline or truck)
- Discharge permitting
 - Technology & water quality based limits
 - Special protection waters / “anti-degradation”
 - Degraded or impaired waters
- Air quality permitting
 - Major source determination
 - New source review
- Management of residuals

Questions ?