



**Maryland Department of the Environment**

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# Current Status of Maryland's Draft Marcellus Shale Risk Assessment

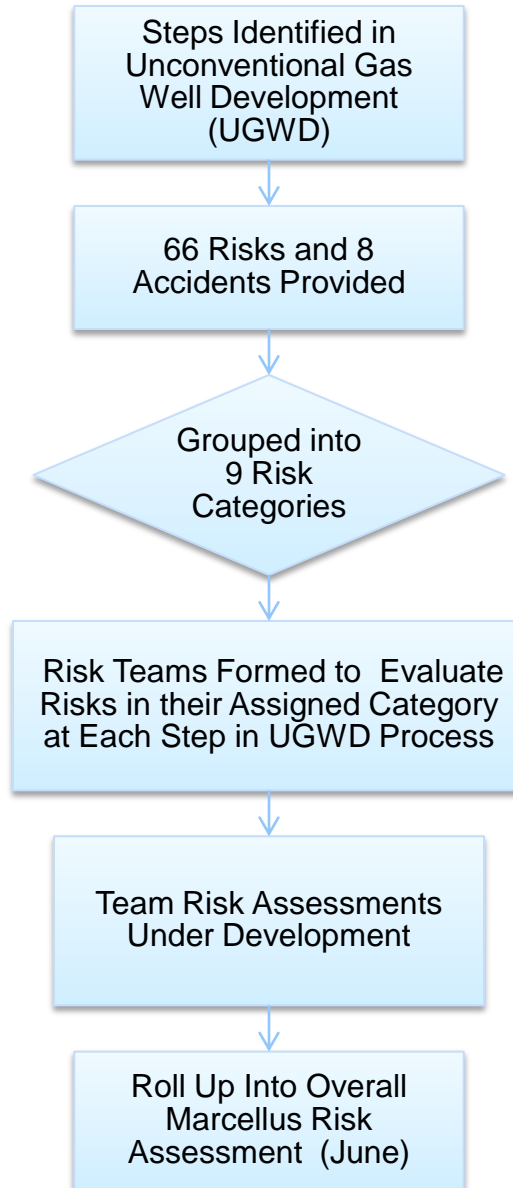
*Presentation to the Marcellus Shale Advisory  
Commission*

5/16/14





# Current Risk Assessment Process





# Steps in UGWD Process

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1. Site Identification
2. Site preparation
3. Drilling, Casing, Cementing
4. Hydraulic Fracturing/Completion
5. Well Production/Processing
6. Site Reclamation and Abandonment



# Grouped Risks

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1. Air Emissions
2. Vehicles and Roads
3. Drilling Fluids and Cuttings
4. Noise/Visual Impacts
5. Fracking/Flowback Fluids and Surface and Groundwater
6. Impacts from Wells/Formation
7. Habitat Fragmentation and Invasive species
8. Water Quantity
9. Waste Water Treatment



# Assembled MDE/DNR Risk Teams

Impact to	From	Activity	Team Addressing	Step
Air quality	Methane	Escape of methane during fracking and well completion	TEAM 1 - Air Emissions	4
Air quality	Methane	Escape of methane during drilling	TEAM 1 - Air Emissions	3
Air quality	VOCs	On-site pit or pond storage	TEAM 1 - Air Emissions	3,5
Air quality	Conventional air pollutants and CO2	Compressor operation	TEAM 1 - Air Emissions	3,5
Air quality	VOCs	Condensate tank, dehydration unit operation	TEAM 1 - Air Emissions	3
Air quality	Diesel exhaust	Fuel burning equipment on the pad site	TEAM 1 - Air Emissions	2
Air quality	Dust	Construction and traffic on dirt roads	TEAM 1 - Air Emissions	2,5,7
Community	Damage to roads	On-road vehicle activity during site development	TEAM 1 - Air Emissions	2,7
Surface water	Flowback and produced water constituents	Application of wastewater for road deicing, dust suppression	TEAM 2 - Vehicles and Roads	5
Community	Industrial landscape	Clearing of land for roads, well pads, pipelines, evaporation ponds	TEAM 2 - Vehicles and Roads	1,2
Community	Road congestion	On-road vehicle activity during site development	TEAM 2 - Vehicles and Roads	1,2
Community	Road congestion	On-road vehicle activity during drilling	TEAM 2 - Vehicles and Roads	3
Community	Road congestion	Transport off-site	TEAM 2 - Vehicles and Roads	3,5
Community	Road congestion	On-road and off-road vehicle activity during fracking	TEAM 2 - Vehicles and Roads	4
Air quality	Diesel exhaust	On road vehicles	TEAM 2 - Vehicles and Roads	2,5
Surface water	Drilling fluids and cuttings	Disposal of drilling fluids, drill solids, and cuttings	TEAM 3 - Drilling Fluids and Cuttings	1,3
Groundwater	Drilling fluids and cuttings	Disposal of drilling fluids, drill solids and cuttings	TEAM 3 - Drilling Fluids and Cuttings	1,3
Surface water	Drilling fluids and cuttings	Storage of drilling fluids at surface	TEAM 3 - Drilling Fluids and Cuttings	1,3
Surface water	Drilling fluids and cuttings	Drilling equipment operation at surface	TEAM 3 - Drilling Fluids and Cuttings	1,3
Air quality	Radioactivity	Handling and disposal of drill cuttings and flowback	TEAM 3 - Drilling Fluids and Cuttings	1,3
Habitat	Noise, light, traffic	Drilling	TEAM 3 - Drilling Fluids and Cuttings	1,3
Surface water	Flowback and produced water constituents	Leak or release from tank	TEAM 3 - Drilling Fluids and Cuttings	4,5





# Standardized Assumptions

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- Individual Site Impacts, 150 well, and 450 wells
- 15-acres Site disturbance per pad (forest disturbance pending)
- 5-million gallons water/well
- 30% flowback volume





# Standardized Assumptions, cont.

Well Pad Activity	Early well pad scenario (All water transport by truck)	
	Heavy trucks	Light trucks
Drill pad construction	45	90
Rig mobilization	95	140
Drilling fluids	45	
Non-rig drilling equipment	45	
Drilling (rig crew, etc.)	50	
Completion chemicals	20	326
Completion equipment	5	
Hydraulic fracturing equipment (trucks & tanks)	175	
Hydraulic fracturing water hauling	1000*	
Hydraulic fracturing sand	23	
Produced water disposal	300**	
Final pad prep	45	50
Miscellaneous	0	85
<b>TOTAL truck trips per well (1 well on 1 pad)</b>	<b>1848</b>	<b>831</b>



# Ranking of Risk Information\*

Reliability	Literature Sources	Web Sites
Most Reliable	Published, peer-reviewed, copious reliable references, cited, author credentials/expertise, independent organization, no apparent funding bias.	Government, academic and research institutions, some non-profit groups, international organization (e.g., top level domains of .gov, .edu., .org, .int)
Generally Reliable	Published, not peer-reviewed, reliable references, author credentials/expertise.	For profit commercial industries and some non-profit advocacy groups (e.g., .com and .org)
Somewhat Reliable	Published, not peer-reviewed, fewer reliable references, author credentials/expertise but potential bias.	For profit commercial industries and some non-profit advocacy groups (e.g., .com and .org)
Unreliable	Unpublished, not peer-reviewed	Blogs, opinions, diaries/journals, independent/unaffiliated web pages

\*Have identified documents that all teams must be familiar with.





# Risk Analysis at Each Step

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- Description/Quantification of Activity Duration/Scope at Each Step that Influence Team's Assigned Risks
- Consideration of Current Regulations or Proposed BMPs to Mitigate Activities and Risks
- Assessment of Assigned Risks at Each Step in the UGWD Process



# Risk Ranking

Probability	Definition
Low	Rarely happens under ordinary conditions; not forecast to be encountered under foreseeable future circumstances in view of current knowledge and existing controls on gas extraction
Moderate	Occurs occasionally or could potentially occur under foreseeable circumstances if management or regulatory controls fall below best practice standards
High	Occurs frequently under ordinary conditions
Insufficient Data to Determine	Lack of available data to confidently assign probability

Consequence	Definition
Minor	Slight adverse impact on people or the environment; causes no injury or illness
Moderate	Considerable adverse impact on people or the environment; could affect the health of persons in the immediate vicinity; localized or temporary environmental damage
Serious	Major adverse impact on people or the environment; could affect the health of persons in a large area; extensive or permanent environmental damage
Insufficient Data to Determine	Lack of available data to confidently assign consequence





# Summary of Team Risk Assessments

Team	Risks Evaluated	Risk Assessment (probability/consequence) Steps in UGWD					
		Site Identification	Site Preparation	Drilling, Casing, and Cementing	Hydraulic Fracturing/Completion	Well Production	Site Reclamation and Abandonment
Air Emissions	Methane Emissions	Low/Minor	Low/Minor	Moderate/Minor	Moderate/Minor	Moderate/Minor	Low/Minor
Air Emissions	VOC Emissions/HAPs	Low/Minor	Low/Minor	Moderate/Minor	Low/Minor	Moderate/Moderate	Low/Minor
Air Emissions	Greenhouse Gases	Low/Minor	Low/Minor	Moderate/Minor	Low/Minor	Moderate/Minor	Low/Minor
Air Emissions	Criteria Pollutants	Low/Minor	Low/Minor	Moderate/Minor	High/Minor	High/Minor	Low/Minor

**For Example Purposes Only**



# Questions?



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