Department of the Environment

Marcellus Shale Development

Current Requirements

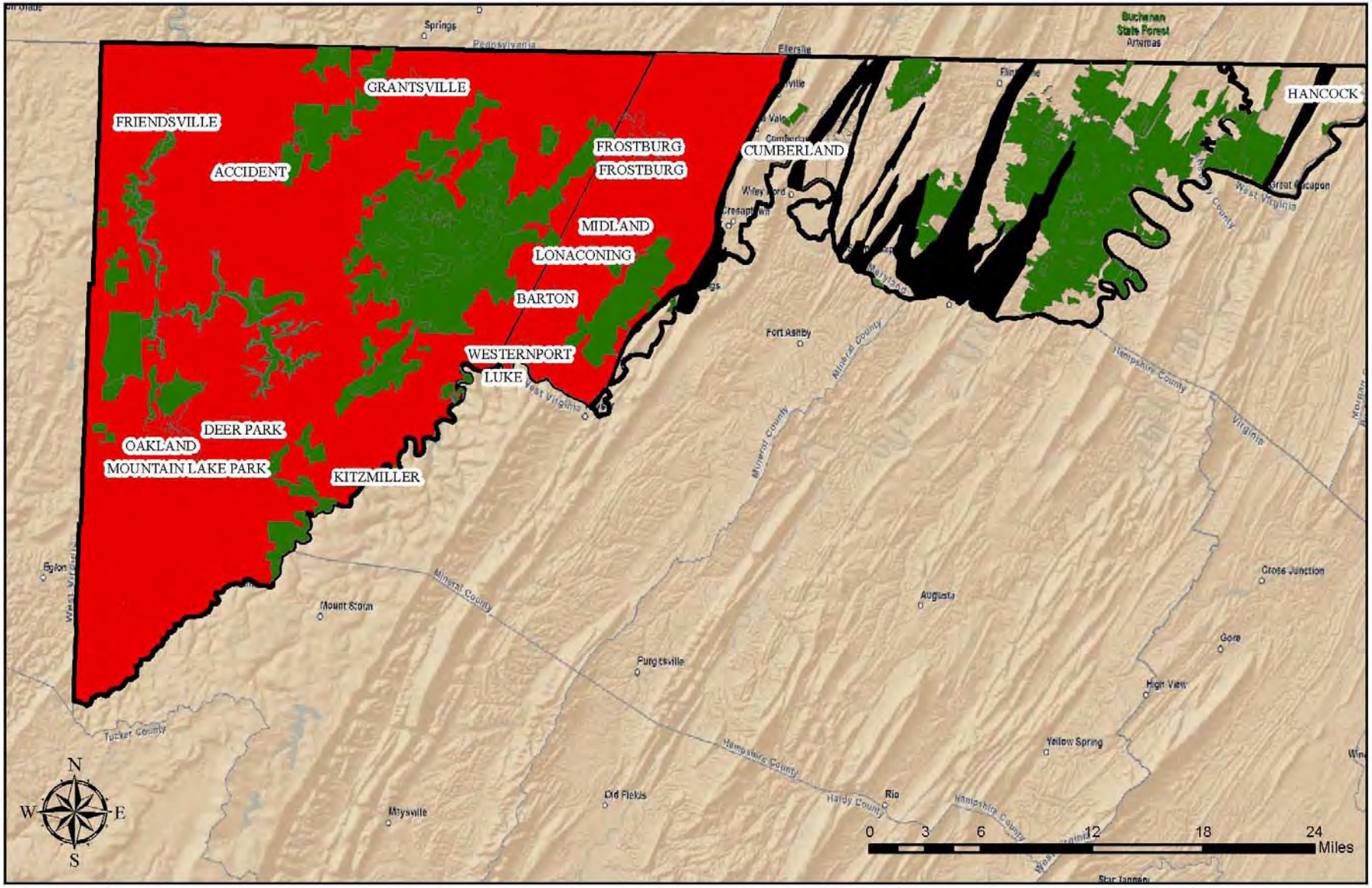
Prepared By:

Maryland Department of the Environment For Marcellus Shale Safe Drilling Initiative Advisory Commission

February 27, 2012

MDE

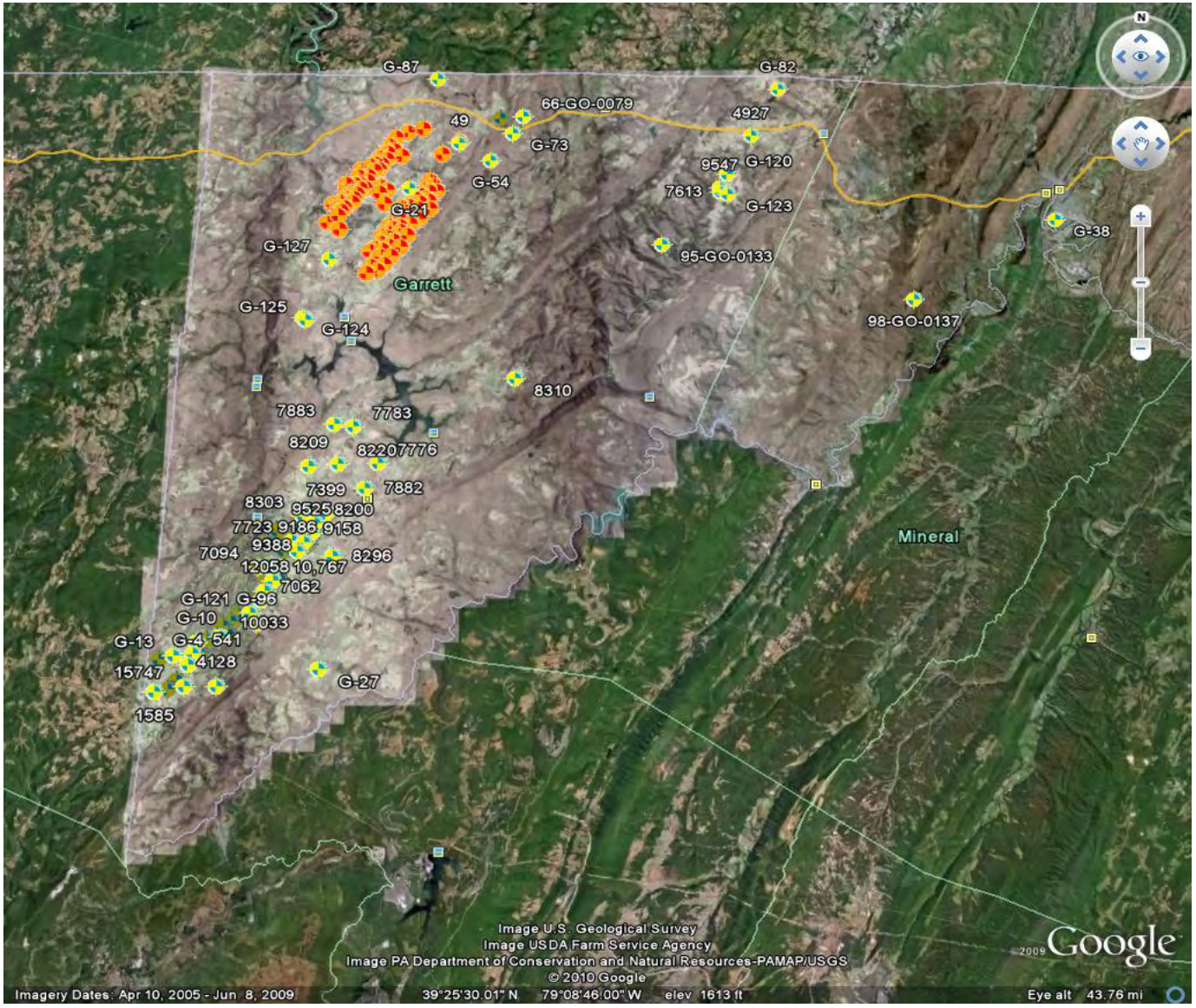
Potential Areas for Marcellus Shale Exploration



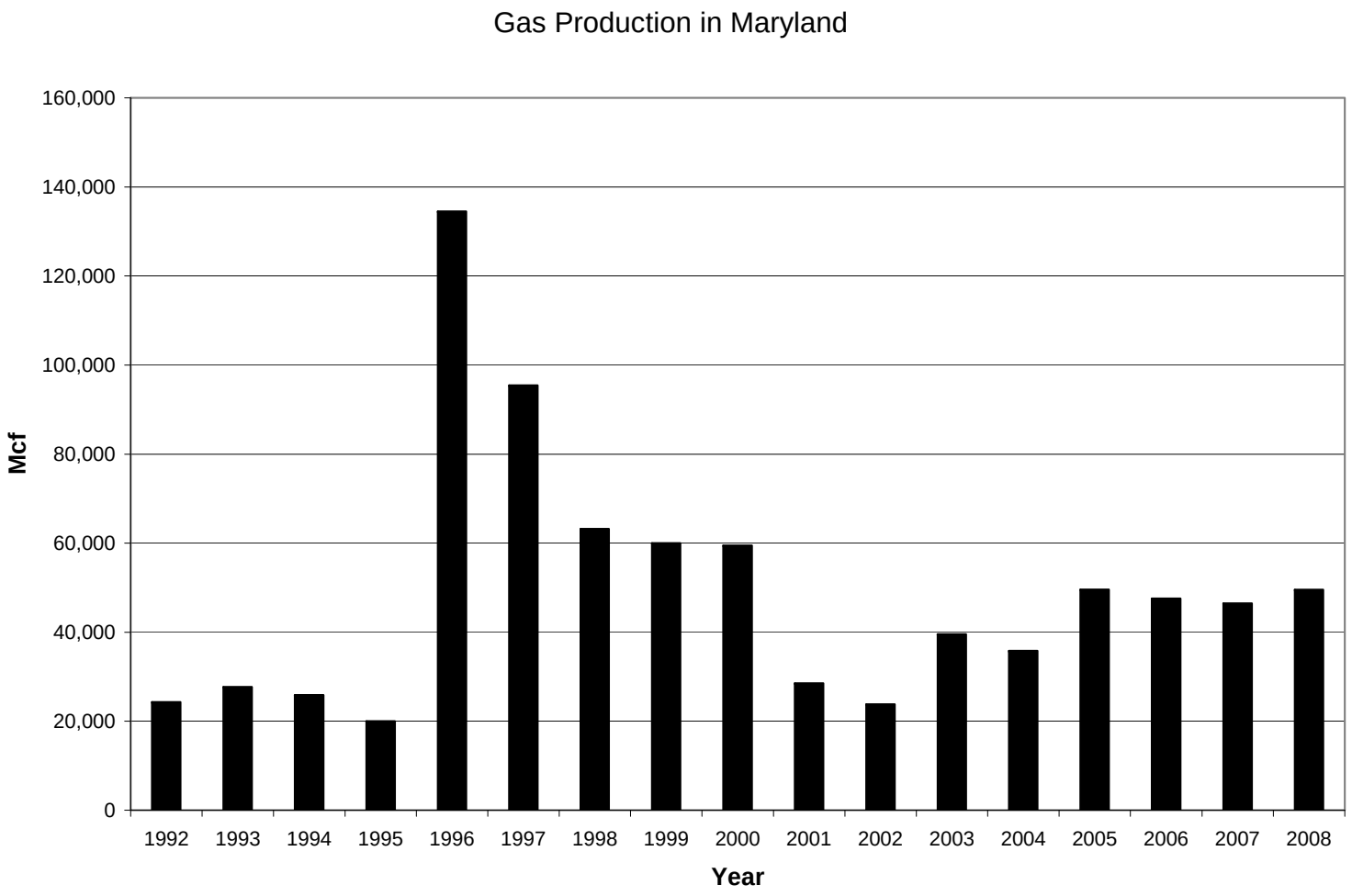
Legend Marcellus Shale Outcrops | Potential Areas for Marcellus Exploration | State Owned Land

Activity in Maryland

- Gas drilling in Maryland is not a new activity.
- Several hundred producing wells were drilled in Western Maryland in the 1950's and 60's. (yellow)
- 10 Gas production wells are currently permitted.
- Approximately 90 permitted sites are being used for gas storage. (orange)

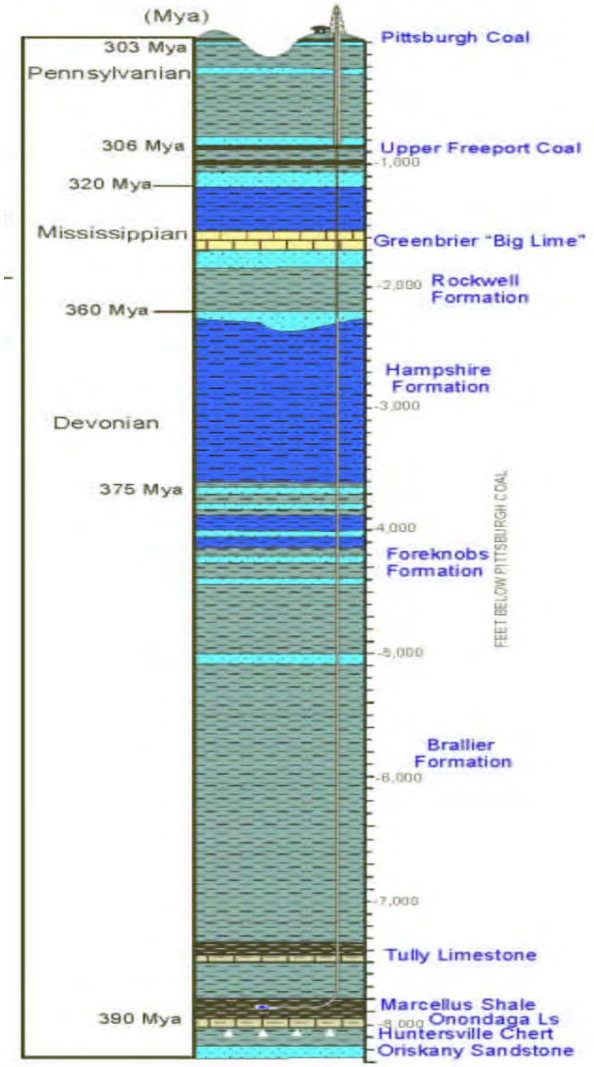


Gas Production - Past



Geology – Marcellus Depth

- Depth in MD:
  - Unknown until drilled
  - Anticipated at 5,000– 8,000 ft.



Requirements vs. Application

- Regulations set out minimum requirements
- Application requests additional information because the Department is authorized to impose additional conditions if necessary
  - MDE may place in a permit conditions which the Department deems reasonable and appropriate to assure that the operation shall fully comply with the requirements of this subtitle, and provide for public safety and the protection of the State's natural resources.

Key Regulatory Requirements

Location – Adjoining Property

- No permit to drill a well closer than 1,000 feet to the boundary of any adjoining property unless the landowner and royalty owner agree in writing
- OR
  - If there are site constraints AND
  - The applicant has notified all landowners and royalty owners within 2,000 feet of the proposed well

Location – Specific Uses

- Unless the applicant obtains written permission of the owners and MDE approves, no permit for a well closer than 1,000 feet of
  - A school
  - Church
  - Drinking water supply
  - Wellhead protection area
  - Occupied dwelling

Permit Will Require

- Property be posted and kept in good condition
- Wells shall be drilled with rotary tools unless the Department approves drilling by cable tool
- When drilling liquid is used, it shall be conditioned and tested daily to assure it
  - Can seal off each oil, gas, salt water or fresh water zone encountered
  - Exerts pressure in excess of those anticipated
- Except in an emergency, additives to drilling liquids are not permitted without MDE's approval

Pits and Tanks

- Pits or tanks shall be used to contain or condition liquids used in drilling or killing the well, and must
  - Have sufficient capacity
  - Have at least 2 feet of freeboard
  - Be at least 1 foot above the ground water table
  - Be impermeable
  - Allow no liquid or solid discharge to waters of the State
  - Provide for diverting surface runoff from pits

Drilling

- Notify MDE at least 72 hours before drilling
- Collect samples of drill cuttings for MDE's use if directed to
- Conduct an electrical induction and gamma ray log to determine depth of fresh water zones

Surface Casing

- Run and permanently cement a string of surface casing (the first casing set inside the conductor pipe) in the hole to a depth at least 100 feet below the deepest known stratum bearing fresh water
- Circulate cement in sufficient volume to return to the surface and completely fill the annular space
- Unless MDE approves a different type, use API Class A ordinary portland cement with not more than 3% $CaCl_2$
- Allow cement to set for a minimum of 12 hours before drilling the plug

Casing other than Surface Casing

- If other casing is run in the hole, it shall be
  - Of a type and weight sufficient for the depth and pressure expected
  - Cemented with sufficient cement circulated in the annular space to provide an effective seal above any producing zone
  - Properly pressure tested
  - Allowed to set a minimum of 12 hours before operations continue

Blowout Prevention Equipment

- Must be installed before drilling the plug on the surface casing
- Must be tested to a pressure in excess of that which may be expected at the production casing point before
  - Drilling the plug on the surface casing
  - Penetrating the target formation
- Must be tested weekly

For Directional Drilling

- When a permit authorizes directional drilling, a complete angular deviation and directional survey of the well shall be made to determine the exact course of the directionally drilled hole following completion of drilling and before setting the final string of casing.

Required Records and Logs

- Each pressure test and mechanical test of
  - Casings
  - Blowout preventers
  - Surface connections
  - Fittings
  - Auxiliary wellhead equipment
- Daily record of
  - Footage drilled
  - Hole size
  - Accidents

Completion Report Within 30 Days

- Depth where any fresh water inflow was encountered
- Lithology
- Total depth
- Oil and gas encountered
- All salt water inflows
- A record of all casing used and amount of cement used
- Generalized core descriptions
- Existing data on perforating, stimulating, and testing
- Existing data on bridge plugs
- A copy of all logs (electric, radiation, sonic, caliper, directional)

Information Requested from Applicant

Application

- Information about Applicant
- Location of Well (latitude, longitude and elevation)
- Total Affected Area
  - Includes access roads, pad, pond, equipment staging and storage, but not gathering lines
- Distance from Well to Nearest Residence
- Compliance with local zoning and land use plans; are other permits needed

Will the drilling be within

- 2,000 feet of an existing gas well
- 1,000 feet of any unleased* tract**
- 1,000 feet from any State land
- A minable coal seam
- 2,000 feet from an underground gas storage reservoir
- 1,000 of a school, church, dwelling or drinking water supply**
- 1,000 feet from an active coal mine
- 25 feet from wetlands
- 200 feet from any 100 year floodplain

***Shorthand for land for which the applicant has no gas rights.**
**** If so, written permission from landowner(s) is required.**

Other Information

- A plat showing boundaries and certain features within ½ mile
  - Active and abandoned oil and gas wells, storage wells and injection wells
  - Water wells
  - Churches, schools, buildings and occupied dwellings
- Present land uses within ¼ mile of the well
- Name and address of Surface Land Owner
- Name and address of Gas Owner or Lessee

Environmental Assessment (EA)

- Applicant must prepare an EA
- MDE will coordinate review with DNR and other agencies as appropriate
- Guidance Document: Topics
  - Site Conditions
  - Historical Landmarks
  - Endangered Species
  - Streams and Water Bodies
  - Noise Analysis

Property Rights Information

- A copy of the gas lease(s)
- If mineral rights have been severed, a copy of the right of entry agreement with the surface owner
- A right of entry agreement for MDE

Drilling and Operating Procedures

- Estimated dates of drilling and completion
- Proposed total depth of well
- Description of anticipated bottom hole Geologic Formation
- Where and how will drill cuttings be stored
- A pit design plan to prevent drilling liquid from contacting waters of the State
- What waste by-products will be produced
- A plan for disposing of the cuttings

More Procedures

- How will the wellhead be secured against unauthorized access
- How will the final product be stored and transported
- How will the well be metered
- Sediment and Erosion Control Plan
- Stormwater Management Plan
- Spill Prevention, Control, and Countermeasures Plan

Protecting Drinking Water

- How will drinking water aquifer be protected
- How will fresh water be identified
- What drilling additives will be used; describe toxicity
- Provide casing plan for protection of fresh water

Safety Procedures

- Listing of all equipment available for detection, prevention, and containment of gas leaks and oil spills
- How will blowouts from the drilling operation be prevented
- How will SO_2 or other potentially harmful gases be handled
- Will any gas flaring be done
  - If so, how will public safety be protected
- Liability insurance and performance bond

Reclamation Procedures

- How will the well site, roads, pits and tank areas be reclaimed
- How will any solid waste (drill cuttings) be disposed of
- If the hole is dry, how and when will it be plugged
- How will free liquid fraction and contaminated liquids be treated and disposed of
- How will any containment ponds be reclaimed

Marcellus Wells/Hydro-fracing

- Number and length of lateral(s)
- Names and addresses of all surface owners over laterals
- Amount of water to be used for drilling and hydro-fracing
- Source of water
- Plan for water treatment and disposal

Pits, Impoundments and Dams

- Will a centralized pit or impoundment be used to contain fresh water
- Will a pit or impoundment be used to contain fresh water
- Will a pit or impoundment be used to contain Frac-Flowback
- If yes, provide dimensions and storage volume

Maryland Department of the Environment

Minerals, Oil & Gas Division

Land Management Administration

Some Information from:

Modern Shale Gas;

http://www.netl.doe.gov/technologies/oil-gas/publications/EPreports/Shale_Gas_Primer_2009.pdf

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