Why Bradford County, PA?

- Small Industrial Towns
- Scenic Beauty
- Major Agricultural County
- Major Tourism Sector Based on Outdoor Recreation
- Vibrant, Historic Downtowns
Marcellus Shale Formation

Map Courtesy Susquehanna River Basin Commission
Bradford County – 5th Largest Agricultural County in PA

“Clean & Green” Agricultural Parcels w/ Natural Gas Wells
Western Bradford County Study Area
November 2010

- 13 active drilling/ fracking operations;
- 7 pads – no drilling/ not restored;
- 4 pads – restored
- 2 pads – newly built/ no drilling commenced.
- 3 water impoundments
Typical Well Pad

• 3-5 acres;
• Level;
• Gravel surface.

* Large open storage pits such as in this aerial image have not been observed in Bradford County drilling operations. Drilling operations appear to prefer closed storage trailers.

Washington County - WA7
Source: M. Bu, S. Upadhyay
Typical Well Pad

- 3-5 acres;
- Level;
- Gravel surface.
Typical Well Pad – Drilling Phase

- Drill rig, offices, storage, dorms (sometimes)
Typical Well Pad

- Hydraulic Fracturing Phase
Storm Water Pollution Prevention

Well pads permitted by PADEP & Susquehanna River Basin Commission.

Pad design must include SWPP best management practices.
Storm Water Pollution Prevention
Storm Water Pollution Prevention
Storm Water Pollution Prevention
Site Restoration

Mandatory stockpiling of topsoil at time of well pad construction

(& possible use as sound barrier)
Site Restoration – W05

8/27/09
Site Restoration – W05

12/17/10
Site Restoration – W05
Site Restoration – AT02
Site Restoration – AT02
Site Restoration – W09
Site Restoration – W08

Equipment left on site after restoration generally will include 1-10 wellheads, gas cleaner, brine storage tanks, & metering system.
Restored Drilling Site Aerial View

Original pad size:
+/- 310 ft x 285 ft/
+/- 88,500 sq. ft

Restored pad size:
+/- 16,000 sq. ft
(1 wellhead)

Source M. Bu & S. Upadhyay. 2010
Views of a Drilling Rig – approx. 2 miles
Views of a Drilling Rig – approx. 1 mile
View of Drilling Rig – approx. 1,000 ft.
Washington County, PA

Canton Twp.
Chartiers Twp.
Mt. Pleasant Twp.

Source M. Bu & S. Upadhyay. 2010
Each square = 4 sq. miles.

Source: M. Bu & S. Upadhyay, 2010
Washington County – High Impact Area

Source M. Bu & S. Upadhyay. 2010
Gas Collector Lines
Potential Impacts of Collector Lines

- Topsoil and subsoil mixing;
- Soil compaction;
- Damage to drainage systems;
- Proper restoration and two years of monitoring needed.
Gas Transmission Lines

• So far, so good…
• Temporary disruption of fields during construction;
• SWPPP BMPs critical;
• Site restoration BMPs critical.
Gas Transmission Lines
Delayed Site Restoration – W17

Drilling Pad
September 2009

Storage Site
February 2010

Equipment Staging
October 2010
Drilling Support Services

- ARE subject to local zoning regulations;
- Potential long-term impacts;
- Potential larger impacts.
Drilling Support Services

• Is your Town ready for the types of commercial & industrial land uses that follow the rigs?
Heavy Truck Traffic
New York State Department of Agriculture and Markets

Guidelines for Agricultural Resources Protection at Gas Well Drilling Sites
Gas Well Development

- Regulated by DEC;
- Very little protection in the regulations for agricultural resources;
- Protection measures need to be included in easement.
Phases of Project

• Siting of Access Roads and Well Pads;
• Construction;
• Restoration;
• Monitoring and Remediation.
Siting Goals

- Locate access roads and well pads along field edges and in nonagricultural areas when possible;

- Locate access roads along ridge tops and follow field contours where possible;

Photo: NYS Dept. Agriculture & Markets
Siting Goals

• Permanent width of access roads in agricultural fields should be no more than 16 feet;

• All existing drainage and erosion control structures should be avoided.
Construction Guidelines

- The surface of the access roads constructed through agricultural fields should be level with the adjacent field surface;

- Culverts and ditches should be installed along access roads to maintain natural drainage patterns;
Construction Guidelines

• All topsoil must be stripped from agricultural areas used for vehicle and equipment access and parking;

• Topsoil must be stripped from the well pad area and stockpiled separate from other material;
Construction Guidelines Cont.

- Topsoil and subsoil graded from the drill site should not block drainage;

- Provisions for drainage tile repair should be included in the easement agreement;

Photo: NYS Dept. Agriculture & Markets
Construction Guidelines Cont.

- Materials from brine pits should be removed from agricultural areas;
- Brine pits should be covered with several feet of subsoil and the original depth of topsoil;
- Drilling mud should be hauled off site;
Restoration Guidelines

• All disturbed agricultural areas must be de-compacted to a depth of 18 inches;
• All rocks 4 inches and larger in diameter must be removed from the soil surface;
• Topsoil is replaced;
• Stone removal from the topsoil surface prior to reseeding;
• All access roads must be regraded level with adjacent field;
• All agricultural areas should be reseeded with the seed mix specified by the landowner;
• All surface and subsurface drainage structures must be repaired to preconstruction conditions;
• All construction debris must be removed from the site.
Monitoring

- The project sponsor needs to monitor agricultural areas for two years following restoration;

- Monitoring should include topsoil thickness, stone content, crop production and drainage.
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