



MARCELLUS SHALE LEASE GUIDE



PRINCIPLES FOR THE CONSERVATION-MINDED LANDOWNER

June 2011

Marcellus Shale Lease Guide Version 1.0 (June 2011)



Pennsylvania Environmental Council, Inc.

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INTRODUCTION

The current boom in natural gas leasing and production from the Marcellus Shale formation affects all residents of Pennsylvania in one way or another. Residents are concerned about potential impacts from drilling operations to water supplies, soil, air quality, wildlife populations, forests, and other natural resources, as well as to the communities hosting Marcellus Shale gas development. Many residents are considering leasing their property for Marcellus Shale development, or have already decided to do so, but want to protect environmental values associated with their property and community.

Property owners (landowners or mineral owners) who choose to lease their land for Marcellus Shale gas production can minimize adverse impacts from gas operations by negotiating environmentally protective provisions in the lease they sign. Pennsylvania has laws and regulations that apply to Marcellus Shale gas development; but these laws and regulations are best viewed as a floor, not a ceiling, for protecting environment values. The property owner who wishes to require a higher level of environmental protection for gas operations on their property should seek to negotiate heightened protection into the terms of the lease itself.

This Lease Guide is intended as a resource for Pennsylvania residents who are considering leasing their property for Marcellus Shale gas production, or who have decided to lease and are beginning the negotiating process. It identifies some of the key environmental issues that can be addressed in a lease; summarizes the types of approaches that have been used to address these issues in Marcellus Shale gas leases in Pennsylvania; and offers options for handling these issues in a more protective Marcellus Shale gas lease, using best management practices employed in oil and gas leasing in Pennsylvania and nationwide.

The “perfect” Marcellus Shale gas lease does not exist; each lease should be designed to meet the unique features of the property proposed for lease. Moreover, the technology and best management practices associated with Marcellus Shale gas recovery are constantly evolving. As a result, this Lease Guide does not attempt to identify every environmental issue to be addressed in a lease or to prescribe exact language for lease provisions. Instead, it suggests a menu of approaches for the property owner, together with his or her attorney, to consider in crafting lease language for certain key environmental issues that best suits individual circumstances. In many cases the options suggested below are paraphrased substantially; actual lease terms will be more detailed and precise.

This Lease Guide is just one tool a property owner may want to use when considering whether to lease or in negotiating the terms of a lease. Several other valuable tools are available, and ideally a conservation-minded property owner will use all of them. These tools include:

- **Consult a qualified oil and gas attorney and other professionals.** This Lease Guide is not intended to provide legal advice or to substitute for the advice of a qualified Pennsylvania oil and gas attorney. Any property owner contemplating leasing their property for Marcellus Shale gas development should consult an attorney to educate them about the law and, if they decide to lease, guide them through the leasing process. The property owner may also wish to obtain technical advice from one or more experts in areas such as engineering and technology, hydrogeology, forestry, wildlife, and botany.
- **Learn from others who have considered leasing.** The property owner should do his or her own research to learn what terms others in the community and region have been able to work into their leases. Property owners can do this by joining, or communicating with, a property owner group in their area, as well as other property owner groups throughout the Commonwealth of Pennsylvania (and the State of New York) that have already negotiated and signed Marcellus Shale gas leases. Property owner groups can be found online at <http://gomarcellusshale.com/page/marcellus-landowner-groups>.
- **Review best management practices.** Numerous academic, government, and public interest groups have published best management practices (“BMPs”) for shale gas operations. Some of the BMPs address all environmental aspects of leasing, while others concentrate on protection of a specific resource. The property owner can review the BMPs and decide which topics or specific provisions to attempt to negotiate into his or her lease. Some examples of recently published BMPs include:
 - Penn State College of Agricultural Sciences, *Water Facts #28: Gas Well Drilling and Your Private Water Supply* (Rev. March 2, 2010).
 - Pinchot Institute for Conservation, *The Marcellus Shale: Resources for Stakeholders in the Upper Delaware Watershed Region* (Dec. 15, 2010).
 - Pennsylvania Department of Conservation and Natural Resources, *Guidelines for Administering Oil and Gas Activity on State Forest Lands* (April 26, 2011).
 - Penn State College of Agricultural Sciences Cooperative Extension, *Forest Landowners and Natural Gas Development: Timber Resources* (2009).

- Penn State College of Agricultural Sciences Cooperative Extension, *Forest Landowners and Natural Gas Development* (2009).
- Cornell Cooperative Extension, *Gas Rights and Right-of-Way Leasing Pointers for Forest Owners* (Dec. 12, 2008).
- Western Pennsylvania Conservancy, *Conservation Guidelines for Landowners on Natural Gas Development* (June 2010).
- U.S. Bureau of Land Management and U.S. Forest Service, *Oil and Gas Exploration and Development: The Gold Book* (Rev. 2007).
- Environmental Defense Fund, *Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements* (January 26, 2009).
- Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management, *Oil and Gas Operators Manual* (Oct. 30, 2001).
- **Use other available research tools.** An abundance of information is readily available relating to the geology of the Marcellus Shale formation, the mechanics of the oil and gas production process, potential environmental impacts from shale gas production, and other topics of interest to property owners considering entering into a lease. The following resources can be a good place to start.
 - Pennsylvania Environmental Council, *The Marcellus Shale Amendments: A Proposal for Reforming the Pennsylvania Oil & Gas Act* (May 2011).
 - Pennsylvania Environmental Council, *Developing the Marcellus Shale: Environmental Policy and Planning Recommendations for the Development of the Marcellus Shale Play in Pennsylvania* (July 2010).
 - National Sea Grant Law Center and Pennsylvania Sea Grant, *Citizens' Guide to Marcellus Shale in Pennsylvania* (December 2010).
 - The League of Women Voters of Pennsylvania, *Marcellus Shale Natural Gas Extraction Study 2009-2010: Marcellus Shale Natural Gas: From the Ground to the Customer* (2009).
 - U.S. Department of Energy Office of Fossil Energy and the National Energy Technology Laboratory, *Modern Shale Gas Development in the United States: A Primer* (April 2009).
 - PennState websites:
 - College of Agricultural Sciences Cooperative Extension Natural Gas website: <http://extension.psu.edu/naturalgas>
 - Marcellus Center for Outreach & Research website: <http://marcellus.psu.edu/>
 - Marcellus Shale Education & Training Center website: <http://www.msetc.org/>

- Pennsylvania Department of Environmental Protection Marcellus Shale website:
http://www.dep.state.pa.us/dep/deputate/minres/oilgas/new_forms/marcellus/marcellus.htm

SECTION ONE: OPERATIONAL STANDARDS FOR OIL AND GAS ACTIVITIES

Background:

While Pennsylvania laws and regulations provide standards covering oil and gas activities, they do not address all operational aspects of Marcellus shale gas well siting, development, production, and reclamation.

Why These Issues Matter to the Property Owner:

Marcellus Shale gas operations pose two types of impacts: short-term impacts that may last only as long as a particular phase of development is occurring, or up to a few years; and long-term impacts that may last for decades. Short-term impacts may include noise from activities associated with well development, and surface disturbances relating to well drilling. Long-term impacts may include water or soil contamination and deforestation. Property owners considering leasing their land for Marcellus Shale gas development may be able to lessen both types of impacts by including appropriate protective provisions in their lease.

How Existing Leases Approach these Issues:

Many leases seek to supplement existing laws and regulations by including additional requirements aimed at minimizing the impact of oil and gas operations on the leased property, the property owner, and the surrounding community. The leases vary as to what issues they address through additional lease terms; each lease is tailored to the specific leased property, property owner, and oil and gas company. However, a growing number of leases address most or all of the following issues.

Possible Lease Terms Based on Best Management Practices:

1.1 Adaptive Management

- Require the oil and gas company to commit to employ current best management practices in all aspects of oil and gas operations. As technology develops and

best management practices evolve along with technological and policy changes, require the oil and gas company to implement updated best management practices.

- Specify that when new laws or regulations are enacted regarding environmental impact or controls or technical aspects of oil and gas operations, oil and gas operations on the leased property must immediately comply with their terms.
- Require the oil and gas company to meet formally with the property owner at least once annually to investigate current laws and regulations, current technology applicable to Marcellus Shale gas operations, current best management practices, and environmental performance of oil and gas operations on the leased property since the last meeting.
- Require that current best management practices identified in the annual investigation be implemented immediately on the leased property.

1.2 Crops

- Require the oil and gas company to use the highest degree of care and all reasonable safeguards to prevent injury to growing crops, timber, native or cultivated grasses, fruit or nut trees, or pastures.
- Require the oil and gas company to pay for any damage to growing crops, calculated as the current market value over all of the affected growing seasons. Require the oil and gas company to retain an independent expert mutually agreed to by the oil and gas company and the property owner to value the crops prior to any earth disturbance on the leased property and ultimately to determine the amount of damages.

1.3 Emergency Response Plan

- Require the oil and gas company to provide a copy of the emergency response plan to the property owner as well as the local emergency (police, fire, and rescue) services, and to keep a copy of the plan on the leased property.

1.4 Erosion and Sediment Control

- Prohibit the oil and gas company from causing or contributing to soil erosion or sedimentation, or to injury to terraces, grades, or other soil-conserving structures on the leased premises.
- Before any earthmoving or disturbance activities take place, require the oil and gas company to obtain the property owner's approval of the soil erosion and sedimentation control plan. Require the oil and gas company to provide a copy of the erosion and sedimentation control plan to the property owner and to keep a copy on the leased property.
- Require the oil and gas company to minimize soil erosion in connection with construction, drilling, and other activities.
- Require the oil and gas company to re-grade cleared areas immediately, reseed with temporary or permanent native, noninvasive grasses, and perform any other necessary work to prevent erosion in these areas.
- Require the oil and gas company, immediately after completion of construction of each drilling site, to restore all high walls and reseed high walls and the down slope embankment of each drilling site with native, noninvasive species.
- Prohibit the oil and gas company from constructing an earthen dam across any stream to obtain a water supply for its operations.
- Require the oil and gas company to construct water bars or similar diversion channels on pipeline rights-of-way and access roads to carry surface runoff away from these areas and prevent siltation of streams. Require the oil and gas company, during construction, to build a settling basin at the base of each pipeline right-of-way or access road to impound runoff and capture sediment.
- Require the oil and gas company to maintain and repair, when necessary, all erosion and sedimentation control facilities and devices.
- Require the oil and gas company to retain an independent expert mutually agreed to by the oil and gas company and the property owner to conduct periodic monitoring of its compliance with the soil erosion and sedimentation plan. For example: after initial clearing and grading; after any subsequent substantial grading work; after installation or alteration of any roadways or

pipeline; after installation of the well pad or other facilities or equipment; after any interim reclamation/revegetation; after removal of the well pad, other facilities or equipment, or any roadway or pipeline; and after final reclamation of the leased property. Require that monitoring results be reported in writing and a copy of the monitoring results be provided to the property owner.

1.5 Existing Structures and Features

- Require the oil and gas company to use reasonable safeguards to prevent injury to buildings, roads, structures, ensilage pits, improvements, farm implements and fences on the leased property.
- Prohibit removal from the leased property of any artifacts, shrubs, rocks (including Bluestone) or other natural features.
- Require the oil and gas company to repair any improvements to the land that are damaged by its operations. If repair is not possible, require the oil and gas company to replace the improvements or, at the property owner's election, compensate the property owner for the damage.
- Require the oil and gas company to immediately cease operations and notify the property owner if it encounters any historical or archaeological sites on the leased property.

1.6 Fencing

- Require the oil and gas company to install fences with gates, locks, or cattle guards (at the property owner's discretion) around well sites and other dangerous structures and equipment.
- Require the oil and gas company to fence and gate all well access roads.
- Specify a minimum height for fences and gates.
- Require the oil and gas company to maintain all fences and gates in good repair and keep gates closed when not in active use.
- Prohibit the installation of fences in rights of way.

1.7 Fire

- Require the oil and gas company to prevent or suppress fires on the leased property.
- Prohibit the oil and gas company from burning of refuse, brush or other materials on the leased property.
- Specify that the oil and gas company is liable for any damages resulting from fires caused by oil and gas operations on the leased property.
- Require the suspension of drilling and other operations during periods of unusually high fire danger.

1.8 Noise Control

Most of the following possible lease terms derive from the Pinchot Institute for Conservation's publication *The Marcellus Shale: Resources for Stakeholders in the Upper Delaware Watershed Region* (Dec. 15, 2010).

- Require use of mufflers on drill rig engines.
- Require use of quieter electric motors rather than diesel or gas engines.
- Use engineered sound barriers and sound insulated buildings when well sites are within close proximity of residential or other buildings.
- Require planting of trees or construction of berms to mitigate noise.
- Require use of automated well monitoring systems after well completion. This has the additional benefit of reducing vehicle traffic for monitoring purposes.
- Limit operational hours to prevent excessive noise during night time hours.
- Prohibit the siting of compressor stations on the leased property or require them to be placed in sound-insulated buildings.

1.9 Noxious Weeds and Invasive Species Control

- Require the oil and gas company to obtain a pre-construction inventory by a professional biologist of planned areas of disturbance to determine appropriate methods for preventing introduction of invasive species.
- Minimize areas of soil disturbance by collocating equipment and facilities to the greatest extent possible.
- Require the oil and gas company to properly clean all equipment prior to bringing it onto the leased property.
- Require the oil and gas company to arrange for an annual survey of disturbed areas to identify invasive species.
- Require the oil and gas company to clear disturbed areas of new invasive species.

1.10 Pollution Prevention

- Require the oil and gas company to perform a site assessment of the property to determine if there are any abandoned oil or gas wells located on the property. If any abandoned wells are identified, require proper plugging of the abandoned well prior to any new drilling or extraction activity.
- Require the oil and gas company to use alternative, less-toxic materials to the greatest extent practicable.
- Prohibit the oil and gas company from allowing waste oil, fracking fluids, flowback water, produced water, or any other liquids or wastes used in or produced by oil and gas operations to flow onto the surface of the leased property, or into any drains, creeks, or ravines located on the leased property. Require the oil and gas company to dispose of all liquids and wastes outside the boundaries of the leased property at an approved facility and in compliance with the rules and regulations of the Pennsylvania Department of Environmental Protection or other governmental authority.
- Prohibit storage of any liquids or wastes in pits, ponds or impoundments (collectively, “pits”) on the leased property. Require storage in closed tanks that meet the requirements discussed in Section 5.3 of this Lease Guide.

- Alternatively, require written permission from the landowner prior to construction of any pond, impoundment or pit. If written permission is granted, include requirements for location, construction, and reclamation of these structures, as discussed in Section 4.1 of this Lease Guide.
- Require the oil and gas company to fill pits (if allowed), regrade the area to approximate original contours, and revegetate to the surface owner's specifications on completion of the related well.
- Prohibit the oil and gas company from burying pit liners (if pits are allowed) or any other waste material, whether liquid or solid, on the leased property.
- Require the oil and gas company to immediately notify the property owner and the Pennsylvania Department of Environmental Protection of any contamination of soil or water on or under the leased property.
- Require the oil and gas company to clean up, remove, remediate, and repair any soil or surface or ground water contamination or damage caused by its presence or release of any contaminant in, on, under or about the leased property, whether or not caused by the negligence of the oil and gas company, its agents, representatives, invitees, contractors or subcontractors, or their employees.
- Require the oil and gas company to reimburse the property owner for any actions taken by, or paid for by, the property owner to clean up, remove, remediate, and repair any soil or surface or ground water contamination or damage caused by the presence of the oil and gas operations or the presence or release by the oil and gas company or its agents, representatives, invitees, contractors or subcontractors, or their employees, of any contaminant in, on, under or about the leased property.

1.11 Reclamation

- Require the oil and gas company to obtain a pre-construction baseline inventory of the leased property condition in order to have a benchmark for restoring the property to its original conditions, contour, and drainage. Require the oil and gas company to provide a copy of the inventory to the property owner.
- Require the oil and gas company to remove topsoil separately from subsoil when creating any surface disturbance or constructing any pad, pipeline, or other

service facility, stockpile at least 12 inches of top soil separately, and at reclamation replace the subsoil first, with topsoil replaced last.

- Require the oil and gas company to clean up each well site as soon as practicable after each well is drilled.
- Require the oil and gas company, within 30 days after completion of a well (or the final well of a continuous drilling operation) to reclaim that part of the well site not used for production related activities as nearly as possible to the pre-drilling conditions, contour and drainage. Require the oil and gas company to follow recommendations for interim restoration listed in Pennsylvania Department of Conservation and Natural Resources' *Guidelines for Administering Oil and Gas Activity on State Forest Lands* (April 26, 2011).
- Require the oil and gas company, within 30 days after a dry hole is drilled or after plugging and abandonment of a producing well, to restore the surface of the leased property to pre-operation conditions, contour and drainage.
- When reclaiming a portion or the entirety of the leased property, require the oil and gas company to:
 - Fill in all ruts, holes, and depressions caused by its operations, remove gravel or similar materials, restore the contours and drainage of the ground to its original condition, and spread stockpiled topsoil over disturbed areas.
 - Use low compaction grading techniques to minimize compacting soils.
 - Fertilize and plant graded areas with native noninvasive seeding approved by the Pennsylvania Department of Environmental Protection, and install appropriate erosion controls to protect newly graded areas.
 - Remove all drilling fluids and solids from the property, and restore any area where any fluids or solids were temporarily placed.
 - Remove from the leased property gravel, stone, or other materials and debris introduced by the oil and gas company to the property. Require the oil and gas company to replace any fences, stone walls, or barriers previously removed by the oil and gas company.

- When reclaiming a portion of the leased property, require the operator to maintain the reclaimed portion of the site until the lease is terminated.
- Require the oil and gas company to plug the wellbore in compliance with all applicable laws and regulations, and install casing in such a way as to fully and completely protect all ground water.
- Require the oil and gas operator to comply with all recommendations for soil erosion and reclamation contained in the Pennsylvania Oil and Gas Operators Manual.

1.12 Recreational and Other Uses by Personnel

- Prohibit hunting, fishing, swimming, camping, boating, and other personal or recreational uses of the leased property by the oil and gas company, its agents, representatives, invitees, contractors and subcontractors, and their employees.
- Prohibit employees of the oil and gas company, its agents, representatives, invitees, contractors and subcontractors, and their employees from bringing any animal onto the leased property.
- Unless necessary for safety purposes, prohibit overnight housing of employees on the leased property. If housing is necessary for safety purposes, include restrictions regarding surface disturbance for employee housing, source of water, sanitary facilities, et cetera.

1.13 Seismic Testing

- Require that, prior to any seismic work being conducted on the leased property, the oil and gas company must submit to the landowner for approval a document describing any seismic work proposed for the property and a map showing the proposed location of all seismic lines.
- Specify what types of seismic testing are authorized on the leased property.
 - If 3D seismic testing is authorized in the lease:
 - Require the oil and gas company to provide the property owner with a map showing the location of each shot hole; and

- Require that each shot hole be filled immediately to prevent ground water contamination.
- Require 24 hour notice to the property owner prior to conducting any seismic testing.
- Require use of vibroseis trucks and helicopters rather than drill buggies to conduct seismic surveys.
- Prohibit seismic testing during wet seasons and periods of wet weather.
- Require seismic testing to comply with setbacks for all oil and gas-related activities on the property.
- Require the oil and gas company to compensate the property owner for any damage to the property that results from seismic work.

1.14 Timber

- Prohibit the oil and gas company from cutting or injuring forest growth except that which is necessary to enable oil and gas company to carry out operations under the lease. Require the oil and gas company to indicate on the Site Plan any timber that is to be removed. On leased properties subject to a sustainable timber management plan, require any timber cutting or handling to comply with the plan.
- Require the oil and gas company to give the property owner prior notice of timber removal, mark the timber to be removed, and secure an appraisal of the timber by an independent certified professional forester mutually agreed to by the oil and gas company and the property owner. Specify that this appraisal shall be final and conclusive as to the value of the timber.
- Allow the property owner to choose whether to take the timber or payment for the timber at the appraised value.
- If the property owner chooses not to harvest the timber:
 - Require the oil and gas company to pay the property owner the appraised value of the timber prior to harvesting the timber.

- Require the oil and gas company to cut and set aside logs using due care, and remove uprooted stumps from the property or grind them on-site at the discretion of the property owner.
- Require the oil and gas company to plant and maintain grasses and/or trees or shrubs at the property owner's discretion in cleared areas.
- If the oil and gas company damages or harvests timber that was not marked and indicated on the Site Plan, require the oil and gas company to secure an appraisal of the additional damaged or harvested timber by an independent certified professional forester mutually agreed to by the oil and gas company and the property owner. Require the oil and gas company to pay the property owner an amount equal to twice the market rate for the additional damaged or harvested timber.

1.15 Visual

- Select locations for well site and other facilities, equipment, and infrastructure that minimize visual impact and maximize topographic screening.
- Modify the shape or size of the well pad, facilities, and equipment to allow less visible placement on the leased property.
- Require the oil and gas company to install vegetative, topographic and/or fenced screening to mitigate the visual impact of facilities, equipment, and infrastructure from the property owner's dwelling and other specified locations on the leased property, as well as from specified locations outside the leased property.
- Require the oil and gas company to limit the amount of disturbed area on the leased property to the bare minimum necessary for oil and gas operations as authorized by the lease.
- Require the oil and gas company to use drilling rigs with fully shielded lighting consistent with Occupational Safety and Health Administration (OSHA) regulations.
- Prohibit the oil and gas company from creating a visual nuisance to the property owner or neighboring properties.

- Require the oil and gas company to maintain the leased property in a neat and presentable manner, removing all rubbish and debris as it accumulates and disposing of it offsite.
- Prohibit parking or storage on the leased property of vehicles or equipment not currently engaged in operations on the leased property.

1.16 Wildlife

- Prohibit the oil and gas company from harming or in any way injuring wildlife or any animals, poultry, fish or livestock owned by the property owner or its tenant and kept or pastured on the leased property. Require the oil and gas company to use reasonable safeguards to prevent injury to animals, poultry, fish or livestock, including fencing, netting, and other measures to keep wildlife out of pits (if pits are allowed).
- Require the oil and gas company to obtain a survey of wildlife resources and habitat on the leased property prior to any earthmoving or disturbance to characterize wildlife populations and identify any threatened or endangered species or critical habitat. The survey should be conducted by an independent expert wildlife biologist mutually agreed to by the oil and gas company and the property owner.
- Require the oil and gas company to report to the Department of Conservation and Natural Resources, Fish & Boat Commission, and/or Game Commission observation of any threatened or endangered species or critical habitat on the leased property and cease operations pending consultation with DCNR and implementation of measures to protect the species or habitat.
- Require the oil and gas company to share roads on the leased property to the greatest extent possible to minimize surface damage and habitat fragmentation.
- If any forest clearing is conducted, require the oil and gas company to feather the edges of cleared areas to create wildlife habitat.
- Require the oil and gas company to follow best management practices for restoration/habitat enhancement listed in the Pennsylvania Department of Conservation and Natural Resources' *Guidelines for Administering Oil and Gas Activity on State Forest Lands* (April 26, 2011).

SECTION TWO: AIR QUALITY AND DUST

Background:

The property owner, as well as other nearby residents, can be subject to fumes, dust, and other forms of air pollution from all stages of Marcellus gas recovery operations. Gas recovery operations generate air pollution from construction activities, truck traffic, drilling, equipment operations, and off-gas flaring.

Why This Issue Matters to the Property Owner:

Air pollution created by oil and gas activities on the leased property could pose an inconvenience to the property owner and the surrounding community (for example, by impairing visibility and producing unpleasant smells and fumes), a health risk (due to emissions of dangerous pollutants), or both. In a broader context, there are concerns that state and federal regulators are not adequately assessing the cumulative impacts of the numerous pollution sources at Marcellus Shale gas operations state- and region-wide.

How Existing Leases Approach the Issue:

Several leases include controls on truck traffic and require dust suppression. Most leases we reviewed did not otherwise address other air quality concerns in any significant way.

Possible Lease Terms Based on Best Management Practices:

Most of the following possible lease terms derive from the Pinchot Institute for Conservation's publication *The Marcellus Shale: Resources for Stakeholders in the Upper Delaware Watershed Region* (Dec. 15, 2010).

- Require the company to implement procedures and equipment designed to reduce truck and other vehicle traffic, including use of centralized production and liquids gathering systems, and use of automated well monitoring equipment.
- Prohibit the burning of refuse or brush on the leased property.
- Require the oil and gas company to abate any dust from roads or any oil and gas-related equipment using environmentally sensitive methods. The company

should select dust suppressants from the “Approved Products List” or similar document published by the Penn State Center for Dirt and Gravel Road Studies.

- Require the oil and gas company to disperse foam if operations are conducted with air, gas, or airfoam.
- Require the use of better control valves for separator units and compressors (for example, replace wet seals with dry seals in centrifugal compressors).
- Require the use of electric motors or air or nitrogen driven pumps, rather than diesel or gasoline engines.
- Require the use of proper catalytic converters on exhaust pipes from pumps and other engines.
- Require use of emission controls on glycol dehydrators and vapor recovery on tanks.
- Require that the oil and gas company recapture methane gas, rather than releasing or flaring it, and return it to the collection system.
- Require the use of other applicable techniques designed to reduce methane emissions listed as “Recommended Technologies and Practices” by the U.S. Environmental Protection Agency Natural Gas STAR Program (<http://www.epa.gov/gasstar/tools/recommended.html>).

SECTION THREE: WATER MANAGEMENT ISSUES

Background:

Each Marcellus Shale Gas well uses an average of 2 to 7 million gallons of water during the hydraulic fracturing (“fracking”) process to stimulate the extraction of gas from the shale formation. The water, along with chemical additives and sand (so-called “fracking fluid”) is injected underground at high pressure. Some of this solution returns fairly quickly to the surface as “flowback water,” while some returns to the surface over a longer period of time as a component of “produced water.”

Numerous significant concerns exist regarding the use of water in connection with a Marcellus Shale gas well. If the oil and gas company uses water from the leased

premises – either from springs, watercourses (including streams and rivers), bodies of water (including natural or artificial lakes, ponds, reservoirs, swamps, marshes, or wetlands), or from existing or new water wells – it may negatively affect the quantity or flow rate of the property owner’s water supply or of bodies of water and watercourses in the area.

Another major concern is the potential for contamination to water supplies, bodies of water, and watercourses from liquids used or produced in drilling operations, hydraulic fracturing, and gas production. Fracking fluids can include a host of chemicals, including acids, diesel fuel, foams, and lubricants. In addition to the chemicals in the fracking fluids, flowback and produced water can also pick up high levels of salts and minerals, including naturally occurring radioactive elements, as they flow through underground strata. There have been instances of these liquids contaminating water supplies, bodies of water, and watercourses in Pennsylvania.

3.1 Use of Existing On-Site Water Sources

Do you, as the property owner, want to allow the oil and gas company to use water from existing wells or other water sources on your property in their operations?

Why This Issue Matters to the Property Owner:

The oil and gas company is not necessarily prohibited by regulation from using surface or subsurface water from your property for hydraulic fracturing or other uses relating to gas drilling or operations; although withdrawals may require the approval of the Department of Environmental Protection or the Susquehanna or Delaware River Basin Commission.

An oil and gas company’s use of large amounts of surface or subsurface water on your property could interfere with your source of water for drinking, agricultural operations, recreation, scenic, and other uses, and could reduce or even halt stream flows.

How Existing Leases Approach the Issue:

Some existing leases prohibit the oil and gas company from using surface water or subsurface water on the property for any purpose. Other leases require the property owner’s written consent prior to use of any on-site water. Some leases that allow the oil and gas company to use water from the leased premises with prior written consent nonetheless prohibit the use of fresh water from the property for certain purposes.

Some leases that otherwise prohibit the oil and gas company from using water from the property or that require prior written consent include an exception to allow the oil and gas company to reuse/recycle flowback and produced water.

Possible Lease Terms Based on Best Management Practices:

- Prohibit the oil and gas company from using surface water or subsurface water on the property (including water from existing springs and watercourses), bodies of water (including natural or artificial lakes, ponds, reservoirs, swamps, marshes, or wetlands), or other water sources or facilities for any purpose.
- Alternatively, require the property owner's written consent prior to use of any on-site water. Specify that the consent will take the form of a separate written agreement between the property owner and the oil and gas company, may contain limitations on the source, amount, and use of the water, and will require separate compensation for the oil and gas company's use of the water.
- If the oil and gas company is authorized to use water from the property under a separate written agreement, include the following types of requirements in the agreement:
 - Determine what uses the water can be put to. Consider prohibiting use of the water for hydraulic fracturing, stimulation or completion processes, or secondary recovery operations.
 - Require best management practices for centralization of infrastructure.
 - For surface water withdrawals, include:
 - Limitations on location of withdrawal points (for example, downstream from headwater areas).
 - A requirement to consult with county conservation districts, local and county governments, river basin authorities, and existing water users to determine the best location for water withdrawals.
 - A limitation on timing of withdrawals (for example, avoid large withdrawals during dry periods, when stream flow is low).

- Requirements for intake structures (for example, the use of dry hydrants, design of structures to protect aquatic life and avoid altering the stream, provision of adequate surface stabilization to support truck traffic).
- Require a comprehensive Pollution Prevention and Contingency Plan to cover the water withdrawal locations.
- For ground water withdrawals, include a requirement to consult with existing groundwater users in the area prior to accessing ground water, in order to ensure that an adequate ground water supply exists to support the proposed activities without negatively impacting existing users.
- Clarify that any prohibition or limitation on the oil and gas company's authority to use water from the leased property does not affect its ability to reuse/recycle water and drilling fluids.

3.2 Drilling of Water Wells for Site Use

Do you, as the property owner, want to allow the oil and gas company to drill or operate a water well on your property and use that water for oil and gas operations?

Why This Issue Matters to the Property Owner:

The oil and gas company is not necessarily prohibited by regulation from drilling or operating a water well on the leased premises and using water from the well for hydraulic fracturing or other uses relating to gas drilling or operations.

An oil and gas company's use of large amounts of well water on the leased property could interfere with the property owner's source of water for drinking, agricultural or commercial operations, recreation, wildlife, scenic, and other uses.

How Existing Leases Approach the Issue:

Some leases either prohibit the oil and gas company from drilling any new water well on the property or allow the drilling of one or more new wells under certain conditions. The leases attempt to provide protection to the property owner's existing wells and, in cases where the oil and gas company is allowed to drill one or more new water wells, to clarify what happens to those wells at the end of the lease.

Possible Lease Terms Based on Best Management Practices:

- Prohibit the oil and gas company from drilling or operating any water well on the property.
- Alternatively, require the property owner's written consent prior to drilling or operating any water well on the property.
 - Provide that any written consent by the property owner is subject to specific standards and limitations relating to, at a minimum, the following areas:
 - Location:
 - The property owner has authority to approve or disapprove the location of the well.
 - Require any new well on the property to comply with the setback requirements contained in Section Six of this Lease Guide.
 - The water well shall not interfere with the property owner's water supply or injure any water supply.
 - The oil and gas company shall notify the property owner of any water-bearing formations encountered during drilling.
 - Well Drilling Standards:
 - The water well shall be fully cased.
 - Use of the well:
 - ◆ Any water well drilled or operated by the oil and gas company shall not do injury to any other water supply.
 - ◆ Any water well drilled or operated by the oil and gas company shall not interfere with or restrict the supply of water to the property owner or his/her tenants for domestic, livestock, agricultural, irrigation, commercial, recreational, or other purposes.

- Who owns the well after operations cease and whether/how it is to be plugged:
 - ◆ Any well drilled reverts to the property owner after termination of the lease; or
 - ◆ The oil and gas company must plug the water well from the bottom to the top with clay, cement or other impervious materials, consistent with current standards.

3.3 Testing of Water Supplies

Do you, as the property owner, want to have your water supply tested to help detect any potential pollution or diminution of your water supply caused by oil and gas operations?

Why This Issue Matters to the Property Owner:

A major concern related to shale gas development is potential contamination to bodies of water bodies, water courses, and water supplies from the chemicals in fracking fluids, flowback water, and produced water, as well as the mobilization of naturally occurring elements such as salts and radioactive isotopes in the flowback water and produced water.

Concerns also exist about the potential for shale gas development to diminish water supplies, bodies of water, or watercourses (for example, by diminishing well flow), or in extreme cases to result in a total loss of the water supply.

Current laws and regulations do not require the oil and gas company to test or monitor water quality or quantity on the leased property.

How Existing Leases Approach the Issue:

Many existing leases require the oil and gas company to test the quantity and quality of the property owner's water supply before and after drilling, and some leases require testing at additional points in the well development and operation process. Some leases enlarge on the oil and gas company's duty to conduct testing by requiring, for example, testing of all watercourses, bodies of water, and water supplies on the property, and specifying what water quality parameters to test for.

Possible Lease Terms Based on Best Management Practices:

- Require testing of the quality and quantity of all wells, watercourses, bodies of water, and water supplies on the property.
- Require water quality and quantity testing at key stages of the drilling and recovery process, including:
 - Before conducting any seismic work;
 - Before and after any well is drilled on the leased premises or an adjacent parcel;
 - After hydraulic fracturing;
 - After re-stimulation; and
 - When reasonably requested by the property owner.
- Include specific requirements for water quality and quantity testing:
 - Require measurement of water quality to be performed by a state-certified water testing laboratory, with payment provided by the oil and gas company. Specify that water be tested for a comprehensive set of specified water quality constituents, at a minimum those identified by Penn State University as Tier 1 through 3 pollutants.¹
 - Require the oil and gas company to obtain measurement of watercourse and body of water quantity and flow by an independent professional hydrogeologist mutually agreeable to the oil and gas company and the property owner.
 - Require documentation of water supply conditions to be conducted by a professional water well contractor certified by the National Ground Water Association, with payment provided by the oil and gas company. Require

¹ At press date, these included: **Tier 1** – total dissolved solids (TDS), pH, barium, chloride, methane ; **Tier 2** – total suspended solids (turbidity), iron manganese, hardness (calcium & magnesium), sodium, total organic carbon, strontium, oil and grease, detergents (MBAS), lead, arsenic, alkalinity, coliform bacteria, sulfate, nitrate; **Tier 3** – volatile organic compounds (VOCs) (TCL or BTEX), radionuclides (gross alpha, radium and radon).

documentation of water supply conditions to include measurement of water flow from wells and springs and characterization of underground aquifers including a determination of direction of ground water flow.

- Require testing to comply with all procedures specified in 25 Pa. Code Section 78.52 for all water testing.
- Require that initial water quality and quantity testing form the basis of a comprehensive baseline site characterization, which describes and quantifies all water supplies, bodies of water, and water courses on the property, and includes a plan for ongoing monitoring of water quality and quantity.
- Require the oil and gas company to drill one or more water quality monitoring wells in the vicinity of gas wells, impoundments/pits (if allowed), storage areas, et cetera, to increase the likelihood of early detection of water quality or quantity problems – before they affect the property owner’s water supply. One or more monitoring wells should be located downgradient of any planned gas well.
- Require the results of all water quality and quantity tests, including ongoing monitoring and a copy of the baseline site characterization, to be provided to the property owner.

3.4 Restoration of Water Supplies

What level of responsibility do you, as the property owner, want to place on the oil and gas company to clean up your water supply if their operations pollute it, or restore the existing quantity of your water supply if their operations reduce it?

Why This Issue Matters to the Property Owner:

Existing laws and regulations contain a limited requirement for the oil and gas company to restore or replace a private water supply if drilling, alteration, or operation of an oil and gas well adversely affects the water supply. Under certain circumstances, the oil and gas company must restore or replace the water supply with an alternate source of water adequate in quantity or quality for the purposes served by the supply. To trigger this requirement the property owner must notify the Department of Environmental Protection of adverse effects to their water supply; within 45 days the Department makes a determination and may order the oil and gas company to restore (and, in the short term, replace) the water supply.

Currently, contamination of a domestic water supply is presumed to be a result of drilling or alteration of a gas well if the well is located within 1,000 feet of the contaminated supply, and if the contamination occurs within 6 months after operations cease. There is growing concern about whether this 1,000 feet/6 month limitation is stringent enough to protect the property owner's water supply.

The existing presumption that contamination of the domestic water supply is due to oil and gas operations is rebuttable – that is, the oil and gas company has the opportunity to show that factually the contamination has some other source or is not linked to oil and gas operations.

There is no corresponding presumption for impact to the *quantity* of the property owner's water supply, so under existing law the property owner must prove that the oil and gas company is responsible for diminution to the property owner's water supply.

How Existing Leases Approach the Issue:

Some leases extend the presumption of impact to include the quantity of the property owner's water supply, to include other water sources on the property, or by extending the regulatory 6-month time period within which the impact can occur. Some leases require the oil and gas company to furnish a replacement supply immediately (rather than the possibility of DEP ordering replacement after a 45-day decision period), require restoration to pre-existing conditions (not just to a level sufficient for the type of use), and require replacement and restoration of the water supply regardless of cause.

Possible Lease Terms Based on Best Management Practices:

- Extend the oil and gas company's responsibility for damage to any body of water, water course or water supply on the property, rather than just the property owner's current domestic water supply. (This would help protect all waters on or under the property, including water supplies used for agricultural, commercial, industrial, or other legitimate beneficial uses.)
- Clarify that the oil and gas company is responsible for damage to water quality or quantity resulting from any aspect of seismic, oil and gas, construction, land clearing, storage, processing, disposal, or other activities on the leased property, rather than just damage from drilling, alteration, or operation of an oil and gas well.

- Require the oil and gas company to take immediate action to replace/restore water quality or quantity when testing indicates deterioration of water quality or diminution of water quantity or flow.
- Require the oil and gas company to restore the water quality and quantity regardless of its cause. That is, replace the presumption of a duty to replace/restore with an unqualified duty to replace/restore. Expand the area of the oil and gas company's duty to replace/restore to 2,500 feet from the well and extend the time period for discovery to 12 months.
 - Alternatively, expand the area of presumption of injury to water quality and quantity to 2,500 feet / 12 months.
- Require restoration of the water supply quantity and quality to its pre-existing condition, rather than simply to an adequate quality for the purposes served by the supply.
- Restoration to pre-existing condition can be specified to mean: matching the baseline water quality levels or better on a parameter-by-parameter basis. Alternatively, restoration of water quality can be defined as restoration of the water supply to standards contained in the Pennsylvania and Federal Safe Drinking Water Acts and implementing regulations.
 - Restoration of water quantity to its pre-existing condition can be defined as achieving the quantity, flow rate, and other conditions reflected in the baseline site characterization.
 - Restoration to pre-existing condition also means utilizing the same means of dispensing water on the premises (i.e. replacing in-house tap supply with an external water tank or bottled water supply is not sufficient.)

SECTION FOUR: STORAGE AND DISPOSAL ISSUES

Background:

A key issue relating to Marcellus Shale gas production is how to most safely store and dispose of materials used in and produced from the construction, drilling, hydraulic fracturing, and operation of gas wells and associated equipment.

Shale gas production involves large amounts of fresh water, fracking fluids, flowback water, and produced water, as well as drilling muds and drill cuttings; storage and disposal of these materials presents practical and technical challenges. In the past, large amounts of fracking fluids, flowback water, produced water, and drilling muds were routinely stored in uncovered (and sometimes unlined) pits, and were disposed on- or off-site in a variety of ways, and drill cuttings were stored and disposed in an on-site pit or through land application. The current best management approach is to minimize the amount of these materials on site, contain the materials as fully as possible, reuse or recycle them to the extent feasible, and dispose of the remainder offsite.

Questions also arise about whether an oil and gas company can store gas or other materials underground on the leased property, and whether and how the oil and gas company may dispose of other materials, such as pit liners and trash, on-site.

4.1 On-Site Storage of Treated and Industrial Fluids

How do you, as the property owner, want the oil and gas company to store fracking fluids on your property prior to using them for hydraulic fracturing? How do you want the oil and gas company to store the flowback and produced water on your property, prior to disposing of it?

Why This Issue Matters to the Property Owner:

Storage of fracking fluids, flowback water, and produced water on the leased property poses a risk of contamination to surface and underground water, as well as to soils. Pits, ponds or impoundments (again for reference, collectively “pits”) can leak or overflow, allowing the chemical-laden liquids to spill or leak onto the leased property. Migration of the liquids into water sources could contaminate those sources to the extent that they could no longer be used for drinking water or other purposes.

How Existing Leases Approach the Issue:

Many leases prohibit the use of storage pits on the leased property. Some leases that allow this method of storage place restrictions on the location and construction of the pit.

Possible Lease Terms Based on Best Management Practices:

- Prohibit storage of chemicals, fracking fluids, flowback water, and produced water in pits. Require storage in closed tanks that meet requirements discussed in Section 5.3 of this Lease Guide.

- Require use of a “closed loop” system, in which liquids and solids are separated, liquids are combined with fresh make-up water and reused at the well site or at an off-site well, and solids are disposed of off-site in approved facilities.
- Alternatively, require written permission from the landowner prior to construction of any pond, impoundment or pit. If written permission is granted, include requirements for location, construction, and reclamation of these structures, including:
 - Prohibition against siting pits in a floodplain area.
 - Requirement to install a double liner under any pit with adequate “freeboard” between the expected surface level of the fluid or other material and the top of the pit.
 - Requirement to install fencing and netting around and over pits for safety.
 - Requirement that the oil and gas company fill the pits on completion of the related well, regrade the area to approximate original contours and revegetate to the surface owner’s specifications.
 - Prohibit the oil and gas company from burying pit liners or any other waste material, whether liquid or solid, on the leased property.

4.2 Disposal of Treated and Industrial Fluids

Do you, as the property owner, want to allow the oil and gas company to dispose of wastes associated with oil and gas operations, including flowback water, produced water, drill cuttings, and residual waste on or under your property?

Why This Issue Matters to the Property Owner:

On-site disposal of liquids and wastes containing chemical additives, potentially high levels of naturally occurring radioactive materials, and high levels of salts that could contaminate water and soil on the leased property. This is true whether disposal is by injection into an underground well located on the leased property or, for some wastes, by land application or disposal in pits.

How Existing Leases Approach the Issue:

Numerous leases prohibit on-site disposal of flowback water, produced water, or other liquids or wastes on or under the leased property. Some leases prohibit drilling or operating water or gas disposal wells on the leased property, and prohibit the conversion of existing wells into injection or disposal wells. Some leases broadly prohibit disposal, discharge, or burial of any substance on the leased property.

Possible Lease Terms Based on Best Management Practices:

- Require the oil and gas company to reuse/recycle as much flowback and produced water as possible, either on-site or at off-site wells.
- Prohibit underground injection of the flowback or produced water on the leased property.
- Prohibit the use of flowback or produced water for dust control or stabilization of unpaved secondary roads on the leased property.
- Prohibit the disposal of any waste, including residual waste, in an on-site pit or by land application.
- Prohibit the disposal, discharge, or burial of any substance on the leased property, including but not limited to trash, pits, pit liners, water, fracking fluids, flowback water, produced water, drill cuttings, drilling muds, and residual wastes.
- Prohibit the on-site storage or use of hazardous materials, toxic substances, or solid wastes.

4.3 On-Site Storage of Other Materials

Do you, as the property owner, want to allow the oil and gas company to store gas or any other substance under your property?

Why This Issue Matters to the Property Owner:

Oil and gas companies may wish to inject and store gas in underground formations such as depleted gas reservoirs or aquifers. Underground storage of gas on the leased property could result in water and soil contamination. The oil and gas company may also wish to store or “sequester” carbon dioxide under the property to prevent it escaping into the atmosphere and contributing to global warming.

How Existing Leases Approach the Issue:

Some leases prohibit underground storage of gas on the leased property. Some also prohibit storage or sequestration of carbon dioxide under the property.

Possible Lease Terms Based on Best Management Practices:

- Prohibit underground storage of gas or any other substance on the leased property.
- Prohibit underground storage/sequestration of carbon dioxide on the leased property.

4.4 Safeguards for Transport and Storage of Materials

What safeguards do you, as the property owner, want the oil and gas company to use when transporting or handling materials that could potentially contaminate water sources or soil on your property?

Why This Issue Matters to the Property Owner:

Water and soil contamination can result from spills of fracking fluids, flowback water, produced water, or other liquids or wastes relating to Marcellus Shale gas operations.

How Existing Leases Approach the Issue:

Leases reviewed for this Lease Guide did not emphasize safety in transporting and handling potential contaminants.

Possible Lease Terms Based on Best Management Practices:

- Require secondary containment when chemicals or liquids are being transported to, on, or from the leased property.
- Require periodic inspection by independent, certified inspectors of pipes, couplings, valves, tanks and other containment structures to detect leaks.

SECTION FIVE: WELL SITES

In our review of existing leases for Marcellus Shale development, we found numerous instances where leases limited the size or number of well pads, or facilities and infrastructure associated with those well pads, on the leased property. This suite of provisions is likely to be of great significance to individual landowners, and we do not intend to diminish their importance in lease negotiation. However, we have opted not to include them in this Lease Guide for the following reasons.

The Pennsylvania Environmental Council and many other conservation-minded organizations consider consolidation of well facilities and infrastructure as a vital means of reducing adverse and cumulative impacts – particularly to natural and community resources. In some instances this could result in greater concentration of well activities or structures on certain properties, rightfully subject of course to the restrictions of individual lease arrangements between the oil and gas companies and the particular landowner. While we respect and support the landowner’s right to determine what is in their own best interests through lease negotiation, we do not wish to characterize lease practices that would potentially further distribute well facilities and infrastructure across a broader landscape as a “conservation principle”. Therefore they are not included here.

Conversely, there may be some instances where conservation-minded landowners would be receptive to greater development on their own property if it allowed for reduction of ecological or surface impacts on a regional scale. In these instances landowners should consider what additional consideration may be necessary or appropriate to accommodate concentrated development.

Background:

A typical well pad for Marcellus Shale gas recovery is 3 to 7 acres in size and may be the location for numerous wells. The pad is created by flattening the area, removing the topsoil, installing a liner, and covering the area with compacted stone. The well pad must be large and strong enough to support and contain tanks to store liquids (and/or pits if pits are allowed), well drilling machinery, and other machinery and equipment.

Preventing soil and water contamination is less expensive and more effective than trying to clean it up after the fact. Implementation of best practices in siting, design, and construction of the well pad can help protect the leased property from spills and contaminated stormwater runoff, minimize erosion, and protect forested areas. It can also lessen visual impact of the oil and gas operations.

5.1 Associated Facilities

Do you, as the property owner, want to allow placement of any facilities on the surface of your property, or to allow access to your property?

Why This Issue Matters to the Property Owner:

In some instances it is possible for the property owner to negotiate a “no surface use” lease, which gives the oil and gas company the right to access the subsurface of the property to recover underground gas, but prohibits construction of any facilities or infrastructure on the property. This type of lease can be difficult to negotiate with an oil and gas company, but it can afford the property owner far greater protection than a lease that allows placement of wells and other equipment, facilities or infrastructure on the property.

How Existing Leases Approach the Issue:

Some leases prohibit surface access or occupancy, while others prohibit drilling a well on the leased property unless it contains a minimum acreage.

Possible Lease Terms Based on Best Management Practices:

- Prohibit the oil and gas company from accessing or disturbing the surface of the leased property.
- Prohibit drilling of any well on the leased property unless the property is a set minimum acreage (some leases establish 10 acres as the minimum) and substantially all of the drilling location will be on the leased property.

5.2 Site Selection Standards

What standards do you, as the property owner, want the oil and gas company to follow when selecting a well site?

Why This Issue Matters to the Property Owner:

Careful selection of the well site (or sites) on the leased property can reduce the potential for contamination of soil and water on the property, minimize erosion, and lessen visual impact as well as impact to the landscape.

How Existing Leases Approach the Issue:

Existing leases require minimum setbacks from existing structures or features on the leased property and typically include a few additional well location standards.

Possible Lease Terms Based on Best Management Practices:

- Select a well site that:
 - Avoids or minimally affects forested areas.
 - Avoids steep slopes and minimizes the need to cut and fill.
 - Is visually screened to the extent possible by vegetation or topography.
 - Avoids areas of highly erodible soils, prime agricultural soils, and areas prone to severe erosion.
 - Avoids water bodies and wetlands areas.
 - Avoids floodways and floodplain areas.
 - Minimizes the need for truck traffic to and from the site.
- Require location of the well pad or any clearing related to construction of the pad to meet minimum setbacks from key structures or features on the leased property. Setbacks are addressed in Section Six of this Lease Guide.

5.3 Site Design and Construction Standards

What design and construction standards do you want the oil and gas company to follow for each well site?

Why This Issue Matters to the Property Owner:

All Marcellus Shale gas well sites are not created equal. Management practices exist that can greatly reduce the likelihood of contamination of soil and water by liquids and other materials used or produced at the well site.

How Existing Leases Approach the Issue:

Most leases include only minimal standards for well site design and construction. However, practical best management practices can and should be required.

Possible Lease Terms Based on Best Management Practices:

- Require the oil and gas company to install an impervious liner under the entire well pad, underlain with composite decking to prevent punctures of the liner.
- Prohibit the use of any pit, impoundment or pond for storage or disposal of fracking fluids, flowback water, produced water, or other liquids or wastes used in, or produced by, oil and gas activities. Instead, require all chemicals, liquids, and wastes to be stored in closed, double-walled tanks in storage trailers placed on the well pad. For liquids that must be stored in a well ventilated environment, require secondary containment around tanks, separators, and other receptacles in the form of a dike, berm, firewall or other structure designed to catch any leakage or overflow from the tanks.
- Require construction of a berm around the well pad to prevent runoff from the pad site.
- Require the well pad to be sloped so as to collect all liquids for disposal or reuse/recycling.

SECTION SIX: COMPREHENSIVE PLANNING

Background:

Pennsylvania law and regulations currently do not require or provide incentives for oil and gas companies to conduct comprehensive planning for Marcellus Shale gas operations. In some other states, regulations have been adopted to promote planning for well sites and infrastructure on a large geographic scale.

Why This Issue Matters to the Property Owner:

Comprehensive planning can result in reduced surface impacts and more economical gas recovery by maximizing the efficiency of well site spacing and encouraging

collocation of infrastructure. Collocation of infrastructure can also minimize the risk of soil, water, and air pollution from oil and gas activities.

Planning at a landscape scale , however, may result in one or more individual property owners being requested to host equipment, facilities, or infrastructure on their property that are not directly related to production from their individual property, or even the unitized area. This arrangement may, however, suit property owners who negotiate economically favorable lease terms reflecting the additional burden to their property.

At a leasehold scale, planning can help to protect important features of the leased property and minimize pollution risk.

How Existing Leases Approach the Issue:

Most leases contain provisions requiring the oil and gas company to engage in some level of planning at the parcel scale, rather than on a larger, comprehensive planning, scale. Most leases reviewed included setbacks from key features of the leased property and the requirement to use existing roads where possible, and several included a requirement for the oil and gas company to complete a Site Plan for review by the property owner.

Possible Lease Terms Based on Best Management Practices:

Most of the following possible lease terms derive from the Pinchot Institute for Conservation's publication *The Marcellus Shale: Resources for Stakeholders in the Upper Delaware Watershed Region* (Dec. 15, 2010).

- Require the oil and gas company to aggregate all leased properties in the immediate area when engaging in well site selection and planning where to locate infrastructure such as pipelines, water withdrawal points, and roads.
- Require the oil and gas company to create a comprehensive plan for gas development over all leased properties in the immediate area. Include in this plan identification of environmental constraints on development such as waterways, floodways and floodplains, wetlands and vernal pools, forested areas, steep slopes, occupied dwellings, public buildings, drinking water supplies, significant wildlife habitats, soil conditions, and viewsapes. Require the oil and gas company to provide a copy of the comprehensive plan to the property owner prior to engaging in any site selection activities on the leased property.

- Require the oil and gas company to collocate infrastructure on the leased property and with other properties in the immediate area to the extent possible, including:
 - Use existing roads where possible.
 - Run pipelines along road right of ways.
 - Share pipelines with other companies.
 - Use existing water withdrawal points or construct access points strategically considering future use. Consider traffic impacts and site stability when selecting and designing water withdrawal points.
- Require the oil and gas company, prior to engaging in any earth disturbance on the leased property, to submit a Site Plan to the property owner for approval.
 - Require that the Site Plan specify:
 - All existing improvements or uses within 2,500 feet of the proposed well pad and any related facilities or improvements.
 - Topographic surface contour information.
 - Information available from existing databases, county records, local municipality records and/or surface property owners concerning prior surface and subsurface uses or other potentially limiting conditions within the proposed well pad site.
 - Identification of designated post-well development surface use(s).
 - Location of surface waters and riparian areas, private water sources, and public water supply sources.
 - Pennsylvania Natural Diversity Index (PNDI) and other ecological baseline information.
 - Location of pre-existing, permanent infrastructure (*e.g.*, gathering lines, compressor stations, metering and processing facilities) within 2,500 feet distance of the proposed well pad site.

- The locations of all surface facilities proposed for the leased property, including well sites, flow lines, pipelines, tank batteries, compressor stations, access roads, and any other surface facility or equipment.
- Require equipment and facilities to be located so as to take advantage of natural topography and increase distances from dwellings, habitable structures, bodies of water, watercourse, and water supplies.
- Prohibit the oil and gas company from engaging in any earth disturbance, cutting any vegetation, or installing any roads, equipment or structures except in the location and manner specified in the approved Site Plan.
- Require all surface disturbance, clearing, operations, facilities, equipment, and infrastructure to meet minimum horizontal setbacks from key features of the leased property. Example of minimum setbacks:
 - 300 feet from any body of water (defined as a natural or artificial lake, pond, reservoir, swamp, marsh or wetland), watercourse (defined as a channel or conveyance of surface water having defined beds and banks, whether natural or artificial, with perennial or intermittent flow), or septic system; or 500 feet from any high quality or exceptional value waters.
 - 500 feet from any water supply (defined as a supply of water for human consumption or use, or for agricultural, commercial, industrial or other legitimate beneficial use; water supply includes a water well).
 - 500 feet from any existing building.
 - 300 feet from the boundary line of the leased property.

SECTION SEVEN: ROAD CONSTRUCTION AND USE

Background:

Marcellus Shale gas operations are large industrial uses that generate substantial truck and other traffic to and on the leased property. Trucks and other vehicles may be used in construction activities on the property, transporting equipment to and from the property, hauling water and wastes, operating and monitoring equipment and

operations on the property, and other purposes. Each well site will require a road of sufficient width and strength to withstand the intense road use associated with Marcellus Shale gas production.

Why This Issue Matters to the Property Owner:

New roads can claim large areas of the leased property, but this area can be minimized with proper planning and limitations on road construction. Roads improperly constructed can contribute to erosion, sedimentation, and pollution of soils and waters.

How Existing Leases Approach the Issue:

Many leases address road construction and use standards, but most do not include substantial detail.

Possible Lease Terms Based on Best Management Practices:

- Limit the oil and gas company's access to, and travel on, the leased property to improved roads only. Require the oil and gas company to specify in a Site Plan which road(s) it will use on the leased property.
- Include lease provisions designed to minimize road construction on the leased property:
 - Require the oil and gas company to keep road construction to a minimum on the leased property.
 - Require the oil and gas company to use existing roads where possible to reduce surface impacts and habitat fragmentation.
 - If it is necessary for the oil and gas company to build a new road, limit to one the number of roads to each well site and require the road to be placed in or near already disturbed areas.
 - Establish a maximum width for any roadways on the property.
 - At the termination of the lease, provide that all new roads belong to the property owner. For all new roads that are not needed by the property owner, require the oil and gas company to remove the road surface and reclaim the roadbed and surrounding area. For roads the property owner

wishes to remain on the leased property, require the oil and gas company to repair the road prior to lease termination.

- Include provisions for road construction and maintenance that minimize erosion and the potential for soil and water contamination from roadways:
 - Require the oil and gas company to maintain all roads used in connection with oil and gas operations.
 - Require road construction and maintenance to comply with recommendations of the Penn State Center for Dirt and Gravel Road Studies.
 - Require roads to be designed and maintained for good drainage and require installation and maintenance of erosion control measures.
 - Require road construction material to be clean and not contaminated material.
 - Require roads in poor condition to be improved by being built up, not widened.
 - Require roads to be in sloped, out sloped, or crowned as specified in a Site Plan.
 - Require ditches and culverts to be installed for all roads.
 - Require dirt and gravel roads to be graded not less than once per year.
 - Require the oil and gas company to control dust from roadways if necessary using environmentally sensitive methods. The company should select dust suppressants from the “Approved Products List” or similar document published by the Penn State Center for Dirt and Gravel Road Studies.

SECTION EIGHT: PIPELINES

Background:

Pipelines are used in Marcellus Shale gas operations to transport gas through and off the leased property, through compression and processing facilities, and ultimately to

market. Each well site will require installation of a pipeline on the leased property, along with related equipment and facilities.

Why This Issue Matters to the Property Owner:

Pipeline corridors can claim large areas of the leased property, but this area can be minimized with proper planning and limitations on the types of pipelines that can be placed on the property. As with any surface disturbance activity, placement of pipelines can contribute to erosion and sedimentation if adequate erosion control and reclamation measures are not implemented.

How Existing Leases Approach the Issue:

Many leases limit the types of pipelines that can be placed on the property, and include standards for pipeline construction such as minimum depths.

Possible Lease Terms Based on Best Management Practices:

- Require the placement of pipelines along existing or proposed roads where possible.
- Require the collocation of electric, water, and gas transmission lines where possible.
- Prohibit, absent a separate written agreement, the placement of any pipelines or related equipment or facilities on the leased property except those related to development and production of oil or gas from the leased property.
 - Alternatively, prohibit pipelines, equipment, or facilities other than those related to development and production of oil or gas from the leased property or the unitized area.
 - Require the oil and gas company to attempt to avoid pipeline stream crossings; where stream crossings are necessary, require the oil and gas company to minimize disturbance to the stream using best management practices enumerated in the Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management's *Oil and Gas Operators Manual* (Oct. 30, 2001).

- Prohibit the oil and gas company from assigning to a utility or pipeline company or any other third party the right to any pipelines or related equipment or facilities placed on the leased property.
- Provide that the oil and gas company's right to use any pipelines placed on the leased property terminates when all wells on the leased property are plugged and abandoned. Provide that any pipelines placed on the property will be deemed abandoned after 24 months of disuse, and require the oil and gas company to remove the pipeline and related facilities and equipment in compliance with environmental laws and reclaim all disturbed areas.
- Include requirements for pipeline construction and maintenance:
 - Require the oil and gas company to bury all pipelines and related utility lines to a specific depth (for example, below plow depth, or 36 inches).
 - Require the use of the "double ditch" method for laying pipeline (that is, stockpiling the topsoil and subsoil separately and replacing the subsoil first so topsoil is replaced on top).
 - Require the oil and gas company immediately after laying pipeline or installing related facilities or equipment to refill excavations, fertilize, and seed or replant all disturbed areas, and take any measures necessary to control erosion or sedimentation and restore the natural and aesthetic values of any disturbed areas.
 - Specify a maximum width for pipeline right-of-way.
 - Require the oil and gas company to maintain and repair all pipelines and related equipment and facilities, and to maintain and keep in good appearance all pipeline rights-of-way.

SECTION NINE: GENERAL PROVISIONS

Background:

Leases include general terms relating to the legal relationship and obligations of the parties that are not limited to environmental aspects of oil and gas operations. Certain

terms come into play when an environmental harm has occurred, and help to sort out who must take what steps to remedy the harm.

Why This Issue Matters to the Property Owner:

The cost of remedying environmental contamination or other harms can be extremely high. Unless the lease clearly establishes who is responsible for such harms, the property owner runs the risk of being burdened with some or all of the cost, and the property runs the risk of long-term, unremediated contamination. Property owners should include in the lease strong provisions placing responsibility on the oil and gas company for harms and claims resulting from oil and gas operations on the property.

How Existing Leases Approach the Issue:

Most leases reviewed include detailed provisions relating to limitations on the oil and gas company's rights to use the leased property, compliance with laws and regulations, liability and indemnification, financial security, and insurance.

Possible Lease Terms Based on Best Management Practices:

9.1 Oil and Gas Company's Use of Leased Property

- Limit the oil and gas company's use of the leased property to uses authorized in the lease.
- Limit the oil and gas company's use of the surface of the leased property to specified operations directly related to a gas well on the leased property or a unit in which the leased property is incorporated (for example, well drilling, installation of pipelines, installation of equipment and facilities directly related to the gas well). Require a separate written agreement for any other surface uses.
- Limit the oil and gas company's access to the property to that necessary to enable it to carry out the purposes of the lease.
- Specify the depth of minerals covered by the lease. The Marcellus Shale is just one of numerous strata from which an oil and gas company might ultimately wish to recover gas. Any attempt to develop other strata should be the subject of a subsequent lease.

- Prohibit the oil and gas company from interfering with the valid rights of other users/uses of the leased property, including the property owner.
- Enumerate other existing or likely future uses of the property.
- Require the oil and gas company to use the highest degree of care in operations on the leased property and to employ all reasonable safeguards to prevent soil erosion, environmental damage or contamination, or any other harm to the leased property or soil, water, and air in and around the leased property.
- Require the oil and gas company to pay damages to the property owner or the appropriate lessee for any damage caused to the surface or subsurface of the property.
- Require the oil and gas company to conduct all operations in accordance with good industry practice and consistent with the Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management's *Oil and Gas Operators Manual*, and/or other specified best management practices.
- Specify that all of the oil and gas company's employees, agents, representatives, invitees, contractors, and subcontractors are bound by the terms of the lease, and that any reference in the lease to the oil and gas company includes these additional persons and entities. Require the oil and gas company to provide a copy of the lease to each of these groups.

9.2 Compliance with Permits, Regulations, and Laws

- Require the oil and gas company to obtain and comply with all local, state, and federal permits.
- Require the oil and gas company to comply with all local, state, and federal laws and regulations, policies, and agency or court orders.
- Specify that any failure by the oil and gas company to comply with laws, regulations, agency or court orders, or permit terms is a default of the lease.
- Specify that when laws, regulations, policies, permit terms, or agency or court orders applicable to oil and gas activities on the leased property differ regarding environmental controls, protection, or clean up, the most stringent version applies.

- Require the oil and gas company to comply with all recommendations in the Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management's *Oil and Gas Operators Manual*.
- Require the oil and gas company to comply with all recommendations in the U.S. Bureau of Land Management and U.S. Forest Service, *Oil and Gas Exploration and Development: The Gold Book*.
- Require the oil and gas company to immediately notify the property owner of any violation of any environmental law, regulation, policy or agency or court order, or any environmental impact at or from the leased property or any breach of any of the terms of the lease relating to environmental impact or controls. Require the oil and gas company to provide the property owner with all documentation relating to the event requiring notification.

9.3 Liability and Indemnification

- Specify that the oil and gas company alone is liable for any contamination of air, water, or soil resulting from the oil and gas company's operations on the leased property.
- Require the oil and gas company to indemnify and hold harmless the property owner, and pay any judgment against the property owner, resulting from all claims relating to oil and gas operations on the leased property, including claims of injury or death to any person, damage to real or personal property, or any violation of environmental laws or regulations. Require the oil and gas company to pay attorneys fees and costs relating to such claims.

9.4 Financial Security

- Require the oil and gas company to post a financial security of a specified amount (in addition to the financial security required by state government) to ensure its performance under the lease. Require an additional financial security of a specified amount for each well drilled to cover plugging, abandonment, and reclamation of the well site.
- Specify that the security can be used by the property owner to remedy any breach by the oil and gas company of any term of the lease.

- Specify that the property owner and the oil and gas company must reconsider the security amount every 5 years, and if it is no longer adequate the bond is to be increased.

9.5 Insurance

- Require the oil and gas company to provide specified types of insurance in specified amounts including, for example, comprehensive (covering specified hazards and activities), excess umbrella liability (covering specified hazards and activities), workers compensation and disability, well drilling insurance, well control insurance, and pollution liability insurance.
- Require that the property owner is a named insured on all insurance policies.
- Require insurer to waive right of subrogation against property owner.

9.6 Assignment

- Require the property owner's written approval prior to the transfer of the lease to another oil and gas company.