



# NEW YORK STATE WATER RESOURCES INSTITUTE

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## Overview of Framework

(Updated April 26<sup>th</sup>, 2011)

**Activities associated with the recovery of natural gas from shale have multiple and significant impacts on water resources.** Shale gas development entails construction of multi-acre well pads, vertical drilling – often through potable groundwater supplies, and horizontal drilling and hydraulic fracturing requiring millions of gallons of water. During the course of these operations, water needs to be acquired and transported to the well pad, stored and managed on site, and mixed with chemicals during hydraulic fracturing procedures. Wastewater generated after hydraulic fracturing (flowback water), as well as wastewater that is generated over the life of the well (produced water) must also be stored, transported, and treated.

The public, regulators and industry are all concerned with minimizing water resource impacts associated with shale gas development. However, obtaining a clear understanding of potential impacts is difficult because a) shale gas development entails a wide array of activities and risks, and b) there are few rigorous evaluations of risk and impacts. To help provide clarity and to assist all stakeholders, we have developed a simple framework for considering important water resource impacts from natural gas development (Figure 1).

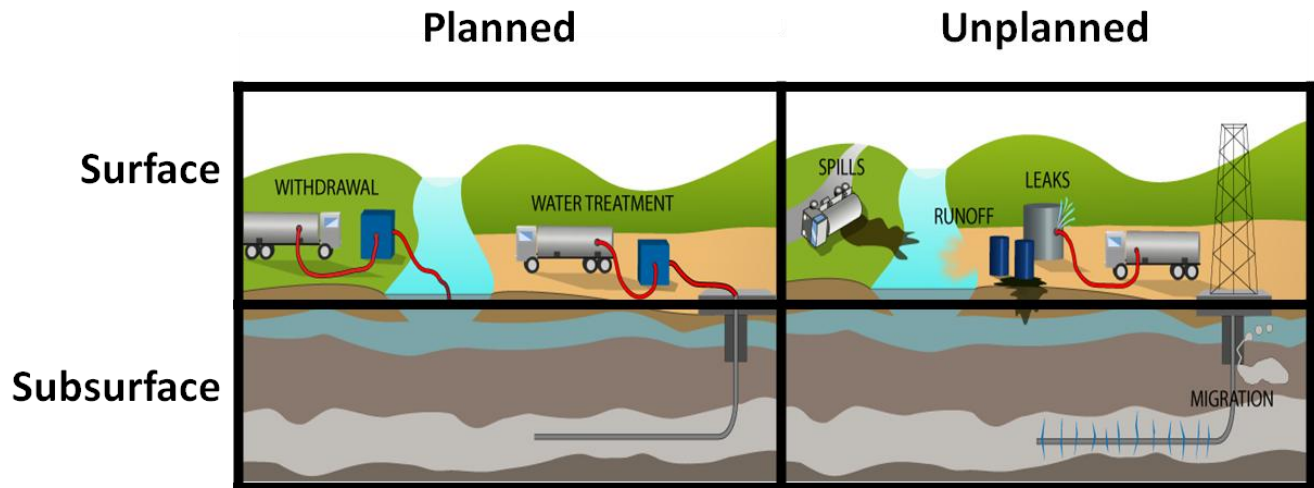


Figure 1. The NYSWRI framework for water resource impacts associated with shale gas development.

### Categorizing Water Impacts

One simple way to categorize gas development impacts on water resources is to distinguish between events that occur at the surface and events occurring below ground.

#### Surface events include:

- well pad, road and pipeline construction
- water withdrawals (whether from surface or groundwater)
- treatment and disposal of flowback and produced wastewaters
- surface spills that may occur during transportation, storage and handling of chemicals and waste
- storm water contamination and runoff

#### Subsurface events include:

- drilling and well casing
- hydraulic fracturing

A distinction between surface and subsurface events could be used to determine who should be responsible for regulating various aspects of shale gas drilling. For example, the Mineral Division of the New York State Department of Environmental Conservation (NYSDEC) is likely to be tasked with all below surface regulation of shale gas drilling, but other agencies or NYSDEC divisions could be tasked with regulating and monitoring

various above ground activities such as transportation, storage and treatment of chemicals and wastewaters, and storm water pollution prevention controls.

Gas drilling impacts on water resources can also be classified as arising from **planned** or **unplanned** events. Events that are planned include those integral to drilling operations. For example, each well requires a source of water, and each well produces wastewater that must be treated or otherwise disposed of. These events can be anticipated and closely regulated, and their magnitude is directly related to the pace and scale of gas drilling development. In other words, as the number of wells increases, the need for water, and the capacity to treat wastewater will also increase. Unplanned events can be considered accidents. While they can be anticipated in the sense that they are likely to occur at some point, their occurrence and consequences are highly uncertain over time and space. Unplanned events include surface runoff during storms, spills and leaks, and subsurface events related to well integrity. The distinction between planned and unplanned events is useful for developing and prioritizing strategies for preventing, mitigating and monitoring for water resource impacts.

### **Using the Framework to Envision Management & Monitoring**

The WRI framework presented here can be used to help stakeholders better understand the wide range of events associated with shale gas development that will or could potentially impact water resources. Distinguishing between planned and unplanned events is important from both a public policy and communications perspective, and supports the following recommendations:

- Planned events (water withdrawal and waste disposal) can be managed and regulated to minimize or avoid impairments to surface and groundwater, and also to control and monitor the scale and pace of development.
- Impacts from unplanned events (spills and leaks, contaminant migration) can be minimized by targeted regulations, encouragement of preventative best management practices, and establishment of accurate and timely reporting guidelines.

Unfortunately, events having negative impacts on water resources will occur. New York has an opportunity to plan for and mitigate these impacts, as well as an obligation to communicate to residents both the risks and responsibilities inherent in gas development and its regulation. Industry and regulators can employ methods that address and manage the range of possible negative impacts on water resources

associated with shale gas, as well as develop transparent monitoring and reporting systems that help ensure shale gas development is occurring in a manner that protects our water resources.

A more complete discussion of the framework has been published [here](#) in the Winter 2010 issue of Clear Waters, the journal of the New York Water Environment Association.