

## The Toolbox of Water Solutions

### Tool Categories



Livestock Tanks like this one are a common surface discharge tool in the PRB. Photo courtesy of Nance Petroleum.



Side-roll sprinkler on a PRB managed irrigated field. Farmers experience larger crop yields with managed irrigation. Photo courtesy KC Harvey, LLC.



Infiltration Pond in the Powder River Basin. Photo courtesy of Nance Petroleum.



An injection facility, south of Gillette, showing the water tank and chlorination building. Photo courtesy of Marathon Oil.

**Tool 1: *Surface Discharge*** is a tool whereby coalbed natural gas water is directly discharged into surface drainages or used for purposes like stock watering and irrigation. Surface discharge continues to be the most broadly utilized method on the east side of the Powder River Basin. Surface discharge is all conducted under the Clean Water Act.

**Tool 2: *The Managed Irrigation*** technique combines soil science, water chemistry and agronomic principles to utilize produced water to grow forage for livestock and wildlife while protecting the soil. Many options exist for managed irrigation, including several types of manual and automatic irrigations systems. Examples of these systems include center-pivot sprinklers, side-roll or wheel-line sprinklers and fixed irrigation systems.

**Tool 3: *Impoundments*** are commonly used as a water management tool throughout the Basin. These are small reservoirs or ponds that can be lined (or unlined) and bring many benefits such as storage for managed irrigation projects, trout ponds, increased irrigation and a proliferation of wildlife that the additional water attracts.

**Tool 4: *Injection*** - Shallow aquifers, like those in the Powder River Basin, limit opportunities for injection of the water, which is a more common practice in some other areas where coalbed natural gas is produced. While there are many approaches to injecting water into aquifers, the geological challenges of the area make injection a complex process that is not used often in the Powder River Basin.

**Tool 5: *The Treatment*** tool encompasses at least ten different options for coalbed natural gas water. Today treatment remains one of the more expensive options, but pilot projects continue to experiment with the advancement of a variety of options in this water management arena. Treatment is usually regulated by the Montana and Wyoming Departments of Environmental Quality.

**Tool 6: *Dust Abatement*** - Many industrial applications exist for the water as well. Coal mines often use discharge water for dust abatement on roads.

**Tool 7: *Emerging technologies*** continue to evolve, bringing innovative approaches for water management. One recent success is subsurface irrigation, which is currently being evaluated as new tool that may add long-term value.



First full-scale treatment prototype unit. Constructed by Drake Engineering Incorporated, Helena, MT, and operated at the Raging Bull Impoundment near Sheridan, patents are pending.



Dust Abatement with CBNG discharge water in the PRB. Photo Courtesy of Fidelity Exploration.