



Prudent Resource Development

RBDMS makes efficient use of taxpayer money in overseeing resource protection and responsible development.

Reasons for Program Support

• RBDMS's technical excellence is reducing barriers to data exchange.

The GWPC has been an effective partner with regulatory agencies and industry operators in enabling the transfer of oil, gas, and water data between states, federal agencies, the regulated industry, and the public through standard formats via the Web.

• A flexible development framework fulfills mission-critical tasks.

RBDMS applications are developed to accommodate state and regional differences in geology and widely varying statutory requirements. Each new rollout adds to the programming base, analytical features, and data store, all of which is then shared with the other RBDMS stakeholders.

• Industry benefits from RBDMS Web interfaces.

Benefits that flow to industry from increased RBDMS deployment include the ability to target new plays through RBDMS Data Mining's GIS display. Operators can obtain quicker approval of routine permits and increase their compliance with permit conditions through ePermit, so drilling programs can be managed with efficiency and environmental safety. Automating the flow of monthly regulatory reports through eReport also frees staff for other work.

• State agency support includes direct match and in-kind support.

In appreciation of the efficiencies derived from RBDMS and the GWPC's peer support network over the years, state agencies have consistently matched Federal support. In 2008, state agencies directly contributed \$1.6 million.



2010

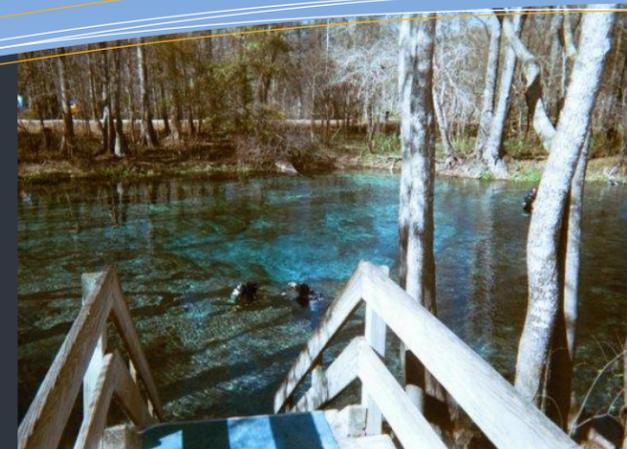
FEDERAL FISCAL YEAR

RBDMS Priorities FFY 2010

1. Expanding RBDMS to track data from hydraulic fracturing.
2. Expanding RBDMS to monitor the effects of CO₂ geo-sequestration on the environment.
3. Continuing to automate permitting, environmental reporting, and data access.
4. Automating the transfer of industry's laboratory data to agency servers so that the data can be used to evaluate the effectiveness of oil and gas and other mineral extraction regulations in protecting water resources.
5. Continuing to track national trends in oil and gas production.
6. Developing a Web site to promote oil and gas BMPs for pollution prevention.

REPORT TO THE U.S. CONGRESS

Water-Energy Sustainability and the Program Goals for the Risk Based Data Management System (RBDMS)



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RBDMS: adapting to meet new requirements

Water and energy consumption rates are perilously dependent on the delicate balance of the hydrologic cycle. Stresses on the hydrologic cycle from environmental, population, and economic pressures, consumptive uses of water (municipal, agricultural, and industrial), and the choices made in energy production processes ultimately will take their toll. Whether the United States will be able to provide sustainable sources of affordable energy and clean water depends greatly on resource management policy decisions and practices.

The GWPC's RBDMS program is now an integral tool in 22 states in managing oil and gas activity and evaluating the risk to source water posed by mineral extraction operations. RBDMS was begun specifically to help states regulate the oil and gas industry's use of Class II injection wells. It has been expanded several times and is now also used to monitor the environmental effects of oil and gas exploration and production activities as well as coal, industrial, and aggregate minerals mining operations.

Within the last few years, the regulatory landscape has changed significantly as industry has turned its focus to more non-conventional techniques and plays as a result of declining production. In particular, two of the processes industry has been increasingly using have posed new challenges for the agencies: **hydraulic fracturing (HF)** and the geologic sequestration of carbon dioxide (**CO₂ geo-sequestration**) and its use for enhanced oil recovery (EOR). In response, the GWPC is planning new RBDMS development for the next fiscal year and beyond to provide regulators with better methods of tracking these activities and their effects on underground sources of drinking water (USDWs).

Hydraulic Fracturing (HF)

HF is often used to increase the flow of oil, gas, or coal bed methane from the producing formation or to increase the flow of injected fluid into a formation. A fracturing fluid, such as various gel polymers or foaming agents, is pumped through a perforated zone in the well casing at a rate that causes the down-hole pressure to fracture the receiving formation. A proppant mixed with the injected fluid keeps these fractures open, thus improving deliverability to the well bore.

The use of HF in formations such as the Marcellus, Fayetteville, and Woodford shales has greatly improved production from these wells. However, the potential for source water contamination from this procedure is of concern to regulators. The great quantities of water used to fracture horizontal shale formations has called into question the ultimate disposal of the wastewater from this process, referred to as **flowback**, and the potential fate and transport of the fracturing fluids that are left in the formation must be better understood.

As a result of EPA's 2004 decision that HF posed little or no threat to USDWs, HF was exempted from regulation under the Safe Drinking Water Act. But the study has been called into question by internal inconsistencies and by more than 1,000 reported contamination incidents allegedly caused by HF in NM, AL, OH, TX, PA, and CO. To date, state oil and gas and environmental agencies have not confirmed a link between any of these alleged cases of contamination and HF. Concern continues to mount, though, as industry seeks to use HF near populous areas.

Article continues inside...

Water-Energy Sustainability and RBDMS

Federal Fiscal Year 2010



Dedicated to Protecting the Nation's Ground Water

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Rules We Can Use

The GWPC has conducted an in-depth study of the effectiveness of oil and gas regulations in protecting water resources.

Regulations from agencies in 31 oil- and gas-producing states are under review with respect to permitting, construction, tanks, pits, waste disposal, compliance monitoring, and plugging and abandonment.

In September 2009, on the basis of the peer-reviewed study results, the GWPC will work with selected pilot states to determine regulatory update needs for those agencies.

New RBDMS Deployments 2007-2008

RBDMS.NET: IN
EPA UIC Node: MT
RBDMS Water: OH Ph 1, NE
ePermit: UT
eReport: AR, ND
Data Mining: NE, OH, MS, NY

2009-2010

RBDMS.NET: MS, OK, PA
EPA UIC Node: IL
RBDMS Classic: IL
RBDMS Water: OH Ph 2
ePermit: CO, OK, AL, NY
eReport: MS, PA
eInspect: KS, MS, NE, OK, NY



What UIC managers really need to know

RBDMS provides the data regulators and industry need to make informed environmental decisions.

Objectives

The GWPC plans to develop a hydraulic fracturing (HF) module for its RBDMS program to track the following data:

- (1) The quantities and quality of water used to support this procedure and the sentinel indicators HF effects on watersheds.
- (2) The methods and locations used to dispose of flowback from the wells.
- (3) The chemical constituents of the fracturing fluids where required by states.
- (4) Down-hole pressures within the wells and the formations.
- (5) The mechanical integrity of wells used for HF.
- (6) Other pertinent information such as operator, location, and date of fracturing.

By updating RBDMS to help regulators assess the water quality and the effects of hydraulic fracturing, agencies will be able to develop protective measures for source water without over-regulating hydraulic fracturing.

The data will be collected and imported electronically into RBDMS. In combination with other

analytical tools, such as RBDMS Data Mining and RBDMS for Water (RBDMSW), the well locations will be hyperlinked to well construction and inspection data, overlain on area of review and source water protection area maps linked to monitoring data from public water supply wells, and integrated with data from regulatory agencies' laboratory information management systems. The GWPC also will update its RBDMS well schematic diagramming utility to generate to-scale drawings of well construction details that include notations of stratigraphy and location of the fracture zone. The resulting application will be queryable via the Web.

Methods and Outcomes

The GWPC will update its Area of Review (AOR) utility for Class II oil and gas wells and RBDMSW program now in use to assess acid mine drainage abatement procedures. These updated utilities will be linked with GIS thematic

mapping, and the chemical parameters now tracked in RBDMSW will be expanded to include the constituents of various fracturing fluids and proppants in use. The resulting .NET/SQL Server application, which will help regulators to monitor and to analyze the effects of industry's use of HF, will be pilot tested and rolled out. Agencies in PA, NY, AR, and CO will participate in the project. RBDMS HF will help regulators to assess the variables of geology, well and formation pressures, the water quality of overlying aquifers, and watershed monitoring program results. They will be able to assess the fate and potential transport of fracturing fluids, calculate the risk to USDWs, and regulate the disposal of flowback. As more is learned about the effects of HF, agencies will be able to make permitting processes more transparent and will be better able to adjudicate complaints.

“Effective data management is crucial to managing fragile resources.”

Web Technology to Protect Source Water

CO₂ Geo-sequestration

Capturing carbon from fossil-fueled power plants for permanent below-ground storage is a new approach to managing global climate change, and the feasibility and efficiency of the technology will be similar to the oil and gas EOR process. However, again, the potential risk to source waters must be assessed and monitored.

Objectives

The RBDMS CO₂ module will give regulators the software tools to assess the variables of geology, current use of the formation, and stoichiometric calculations derived from computer models of the *in-situ* water quality to predict chemical interactions that may pose risk to USDWs.

Methods and Outcomes

The module will store miscibility effects and reservoir characteristics for evaluating the CO₂ flooding potential of oil fields. The CO₂ storage capability of oil fields will be calculated from the analysis of the geochemistry and the geology of the receiving formation. The

integrity of the injection well is a primary factor for successful CO₂ geo-sequestration. The types of casing used for well construction and the performance of those materials over time and exposure to CO₂ will be tracked in RBDMS. Compliance tracking, mechanical integrity testing, and field inspection results will be monitored for these wells within the RBDMS CO₂ module. The success of the technology also depends on the makeup of the receiving formation. The geochemistry, porosity, and permeability of the receiving formation

must be evaluated to determine how CO₂ will change the chemistry in the formation and the chemicals that may be liberated. The geology of the receiving formation also must be understood to determine the vertical and horizontal migration potential of the CO₂ plume. Faults, penetrations, plugged drill holes, and the condition of the overlying impermeable layer must be analyzed. The CO₂ module also will record the results of sampling from monitoring wells in both the receiving formation and in overlying USDWs.

Meeting Today's Demand, Fulfilling Tomorrow's Promise

Q: How can we manage irreplaceable resources wisely when small mistakes could make for planet-scale regrets?

A: By doing our homework. Nationwide, much environmental compliance monitoring data is not yet in electronic format. We must share and validate data across agency jurisdictions, with the regulated industries, and for public discussion. Only then can we accurately assess trends in energy production, source water quality and supply, and the delicate balance of the two resources.

RBDMS is unlocking vast amounts of stored data for trend analyses and interpretation of the environmental effects of fossil fuel and mineral extraction operations. Supporting the GWPC's RBDMS initiative will help give environmental managers working in both regulatory agencies and industry clear guidance for confident decisions to protect the country's source waters.

SOFTWARE Current Tools of Development

The GWPC is updating RBDMS to use



the latest .NET technology in MS, OK, and PA. The new interface combines the best aspects of the Web interfaces—full-text searching, GIS, automated notifications, and highly granular security—in a .NET application suitable for use within agency offices and for field inspection. The result will provide immediate access to data for purposes of area trend analyses, well and mine history tracking (ownership, bonding, permitting, location, construction, inspection, production, and plugging/restoration), compliance monitoring, and complaint adjudication.

In the last 2 years, RBDMS Web programs have been installed in many agencies, greatly leveraging efficiency in mission-critical tasks. MT now reports UIC data directly to EPA from RBDMS. ND and AR joined five other states in using eReport to automate industry's production and injection reporting. In CO, the GWPC's ePermit application includes several data quality control tiers, a public comment forum, and an alerts/workflow system.