

## **MONITORING ACTIONS IN THE POWDER RIVER BASIN**

1. Ground water monitoring. Effects to static water levels in the coal and over or underlying sand aquifers in CBM production areas have been monitored since the 1992 Marquiss Environmental Assessment was completed. This action has expanded over the years and now includes 38 locations and 65 wells. Industry is required to drill and equip the wells. BLM is responsible for monitoring. Main items of concern are static water levels, water quality and gas content. This network will be expanded with the completion of the Powder River Basin Oil and Gas EIS with an additional 35 locations and up to 150 new wells.
2. Cooperative surface water basic data collection. In cooperation with USGS and the Wyoming State Engineers Office, 17 surface gauging stations are now operated on major streams and their tributaries which receive CBM produced water. The amount of increased flow attributable to CBM water production and quality of the water is being monitored. This effort started in 1992.
3. Effects of recharging shallow groundwater aquifers with CBM discharged water. Shallow wells are drilled to the alluvial aquifer and are monitored for water quality and quantity as surface discharge infiltrates the alluvium. This project was initiated in 1998.
4. PRB water balance investigation. Basic information on recharge, (rate, quantity, sources, mechanisms, locations) and total water available in the groundwater system is being studied to provide baseline information for analysis use in various NEPA documents.
5. CBM water quality monitoring/inventory. Monitoring is being done to sample CBM discharges, production wells and surface water, and the placement of CBM discharge points. Project also added in FY2002 monitoring of selected sites to assess potential accumulation of sodium and other chemical constituents. The effectiveness of detention/retention ponds to remove trace metals was also added in FY2002.
6. Methane soil vapor monitoring at selected sites is being done to determine if we are experiencing migration of methane through the overburden to the surface. Project has been in place two years and is expanded as new potential areas are identified.
7. Air quality monitoring. BLM is operating three WARMS stations in the basin to track air quality. Stations have been in place since 1999 and PM 10 and visibility capabilities were added in 2001.
8. Channel stability monitoring. BLM has and will continue to establish channel cross sections to determine if there are impacts to channel morphology due to the discharge of CBM waters in drainages.
9. Cultural resources protection. Monitoring of register eligible sites is done during construction activities to insure mitigation protection measures are carried out. In some cases, archaeologists are required to be on site during construction to insure no impacts occur.
10. Wildlife monitoring. BLM in cooperation with the Wyoming Game and Fish do aerial raptor nest surveys in the spring to identify active nest sites. These sites, once identified are protected from disturbance. Sage grouse and sharp tailed grouse leks are surveyed and protected from disturbance during the breeding season. While not yet in a developed area, the elk herd in the Fortification Creek area will be protected from disturbance with the use of mitigation stipulations. As a result of Threatened and Endangered Species Section 7 Consultation concerning eagles and other raptors, BLM began a carcass monitoring program in FY2002 to determine the number of road kills that are related to CBM activity. USFWS is concerned that raptors feeding on road kills will themselves be hit by vehicles. Raptor electrocution is also a concern and BLM has been working with industry to insure raptor safe distribution lines are constructed.

## **RESEARCH/STUDIES IN THE POWDER RIVER BASIN**

11. A two to three year multi-agency study in CBM production areas was started in the spring of 2003. Sage grouse in predevelopment and post development areas are being trapped and radio collared to assess the impacts from CBM development. Cooperating agencies include BLM Miles City and Buffalo, Wyoming Game and Fish, Montana Fish, Wildlife and Parks and the University of Montana.
12. BLM had funded a "Change Analysis" study in cooperation with the Wyoming Game and Fish Department. The intent of the study is to determine how much change has occurred in the landscape from 1999 to 2002. Landsat satellite imagery from these two periods will be used to make the comparison. We plan to use this type of work in tracking cumulative effects to various habitats in the Powder River Basin over time.
13. BLM was funded in FY2002 to pursue a study of land application of produced water. Dr. George Vance of the University of Wyoming is heading this study. The study will look at various soil types to determine soil suitability for possible irrigation with CBM produced water.

14. BLM was funded in FY2002 in a five state area to look at potential beneficial uses of produced water. This study will provide a laundry list of potential uses of CBM water for the manager to use in making decisions about how produced water will be handled.
15. Invasive plant inventory/inventory of areas within the Powder River Basin impacted by coal bed methane development, including the disposal of produced water, will be initiated in 2003. Research will be conducted by Paul Evangelista from the Natural Resources Ecology Laboratory, located at Colorado State University. First year funding will be provided by USGS. Future funding will be acquired through BLM PRB EIS monitoring budget, opportunities with DOE, NASA, EPA, grants and other related sources. It is anticipated that research products will enhance predictive modeling of invasive plant establishment and spread in areas of coal bed development which, in turn, will allow land managers to conduct environmental analysis and develop associated NEPA documents in a more efficient and timely manner.
16. BLM is a task cooperater with the USGS on a project evaluating soil suitability for application of coal bed methane produced water by the use of airborne hyperspectral data.
17. The Utah State University, BLM and NRCS in a cooperative effort have developed a GIS soils survey project and are field testing this GIS based approach to improve the efficiency and quality of soil surveys.
18. BLM, in conjunction with the Department of Energy, is participating in a project to use electro-magnetic technology to assess ground water distribution patterns.

### **INSPECTION AND ENFORCEMENT ACTIVITIES**

19. During permitting, well drilling techniques are specified. Typically, this will require the use of surface casing, drilling with fresh water to protect the shallow surface aquifers and the cementing of production casing from the top of the coal to ground surface. BLM Petroleum Engineering Technicians (PET-s) are present at approximately 50% of these actions to ensure approved procedures are followed.
20. Mitigation monitoring is done by Natural Resource Specialists (NRS) and Hydrologists to ensure mitigation stipulations applied at the time of permit approval are implemented by the permittee to protect environmental concerns. This may include roads, pipelines, power lines, discharge points, well locations and any associated items. They also ensure that reclamation of disturbed areas are completed in a timely manner according to the approved reclamation plan. Archaeologists and wildlife biologists are also involved in mitigation monitoring to insure mitigation measures adopted as part of plan approvals are being followed.
21. PET-s carry out production inspections to ensure production/royalty is properly accounted for. This will involve field and office inspections.
22. During abandonment operations, PET-s ensure the well is properly plugged and abandoned while the NRS-s are responsible for ensuring proper reclamation of the surface in accordance with the approved reclamation plan.