GATHERING THE DATA ON: WATER

**GROUND WATER ASSESSMENT:**
**MONITORING THE BASELINE OF GROUNDWATER RESOURCES**

The Ground Water Assessment Program improves the understanding of Montana’s groundwater resources by collecting, interpreting, and documenting essential groundwater information. There are three components of the program:

**Ground Water Monitoring:** Baseline Water-Quality and Water-Level Data
- Long-term data from 267 wells covering 560 changes in water level and water quality at Montana’s major aquifers.
- The map above shows how groundwater basins vary, covering most of Montana.

**Ground Water Characterization:** Assessing Aquifers and Groundwater Quality
- Field work complete in 8 areas (22 counties)
- High-quality data from more than 5,000 wells
- Released 59 maps and reports describing groundwater conditions

**Ground Water Information Center Database:** Montana’s Repository for Groundwater Information
- Databases on the Montana regional seismograph network, water-quality monitoring, and water-level monitoring.
- The data is integrated into a coherent structure that links different information available for a given well.

**GROUND WATER INVESTIGATION PROGRAM:** PROVIDING SCIENCE FOR GROUNDWATER MANAGEMENT

The Montana Bureau of Mines and Geology (MBMG) serves as a cooperating agency in the Advanced National Seismic System and exchanges seismic data in real-time with other surrounding seismic networks.

PHYSICAL SCIENCE FOR POWERFUL WATER POLICIES

**GROUNDWATER ASSESSMENT**
14 years have passed since Montana’s largest “Bakken” field—the Elm Coulee field in Richland County—contains over 1 billion barrels of oil and natural gas production since the early 2000s.

**RESERVOIR MODELING**
Montana’s largest “Bakken” field has low permeability and high reservoir pressure. The temperature and salinity of the aquifer are typically 150°F and 35,000 ppm, respectively. This makes it a challenging reservoir to develop.

**PROPPANT SOURCES**
Hydraulic fracturing (“fracking”) is a drilling technique that involves injecting a mixture of water, sand, and chemicals into the ground to create fractures in the formation. These fractures help release the oil and gas from the formation.

**SAND AND GRAVEL MAPS**
Montana leads the nation in demonstrated coal reserves, consistently produces about 3.5% of the nation’s coal, and is 5th in annual coal production. Five surface mines and one underground mine produced about 42 million short tons in 2011.

**DATA DELIVERY**
WHAT WE BRING TO YOU EVERY DAY

The side panels show all the research we do, gathering data in all areas of natural resources. But a key part of our mission is to disseminate that information to whoever needs it. We consider the public and the legislature our customers.

**DATABASES**
We provide free digital and downloadable publications of most of our maps, a database of downloadable and in-person courses, and databases of drillers’ logs and mineral information for Montana, as well as other databases.

**PUBLICATIONS**
The MBMG provides digital and printed publications to all of Montana’s counties and communities for free. We currently have over 1,000 publications available online.

**DATA PRESERVATION**
The MBMG has accepted donated data from public and private entities for many years. Beginning in 2008, using NGGDPP funds, the MBMG created a new digital database, which is a logical extension of the existing databases. The database is called Montana’s Statewide GIS and includes over 30,000 digital features and 1,200 of 6,500 mining and engineering maps have been digitized. Montana’s digital database includes 300,000 surface features and 14,000 in-person features, and includes over 14,000 pages of information and 1,200 maps.

**INDEPENDENT STUDIES**
In addition to major programs, the MBMG participates in over 150 independent water studies throughout Montana. We currently are working on many projects, including:

- **Coal mining:**
  - Acid drainage mitigation through revegetation and changes in surface control at abandoned underground coal mines, 2009
  - Monitoring and rehabilitation at abandoned underground coal mines, 2010
  - Evaluating acid conditions in abandoned underground coal mines, 2011
  - Water levels in abandoned underground coal mines, 2012

- **Groundwater monitoring and research:**
  - Groundwater monitoring of abandoned underground coal mines and active mines, 2008
  - Groundwater monitoring of abandoned underground coal mines and active mines, 2009
  - Groundwater monitoring of abandoned underground coal mines and active mines, 2010

- **Groundwater investigations:**
  - Groundwater investigations of abandoned underground coal mines, 2008
  - Groundwater investigations of abandoned underground coal mines, 2009
  - Groundwater investigations of abandoned underground coal mines, 2010

- **Mine reclamation:**
  - Mine reclamation and restoration of abandoned underground coal mines, 2008
  - Mine reclamation and restoration of abandoned underground coal mines, 2009
  - Mine reclamation and restoration of abandoned underground coal mines, 2010

- **Mine waste:**
  - Mine waste studies of abandoned underground coal mines, 2008
  - Mine waste studies of abandoned underground coal mines, 2009
  - Mine waste studies of abandoned underground coal mines, 2010

- **Remote sensing:**
  - Remote sensing of abandoned underground coal mines, 2008
  - Remote sensing of abandoned underground coal mines, 2009
  - Remote sensing of abandoned underground coal mines, 2010

- **Driller’s logs:**
  - Driller’s logs of abandoned underground coal mines, 2008
  - Driller’s logs of abandoned underground coal mines, 2009
  - Driller’s logs of abandoned underground coal mines, 2010

- **Geophysical studies:**
  - Geophysical studies of abandoned underground coal mines, 2008
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- **In situ monitoring:**
  - In situ monitoring of abandoned underground coal mines, 2008
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- **Hydrogeological studies:**
  - Hydrogeological studies of abandoned underground coal mines, 2008
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- **Geochemical studies:**
  - Geochemical studies of abandoned underground coal mines, 2008
  - Geochemical studies of abandoned underground coal mines, 2009
  - Geochemical studies of abandoned underground coal mines, 2010

- **Technical reports:**
  - Technical reports on acid drainage mitigation, 2008
  - Technical reports on acid drainage mitigation, 2009
  - Technical reports on acid drainage mitigation, 2010

- **Data preservation:**
  - Data preservation of abandoned underground coal mines, 2008
  - Data preservation of abandoned underground coal mines, 2009
  - Data preservation of abandoned underground coal mines, 2010

- **Data delivery:**
  - Data delivery of abandoned underground coal mines, 2008
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- **Water-quality studies:**
  - Water-quality studies of abandoned underground coal mines, 2008
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- **Water-level studies:**
  - Water-level studies of abandoned underground coal mines, 2008
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- **Groundwater investigations of abandoned underground coal mines:**
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- **Mine waste studies of abandoned underground coal mines:**
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- **Remote sensing of abandoned underground coal mines:**
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- **Driller’s logs of abandoned underground coal mines:**
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- **Technical reports on acid drainage mitigation:**
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- **Data preservation of abandoned underground coal mines:**
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