

About Schlumberger Water Services

We offer innovative groundwater solutions through professional expertise to meet the advancing technological requirements of today's professionals.

Schlumberger's Water Services division specializes in assessing, developing, and managing groundwater resources using some of the finest, advanced and cost-effective technologies available today.

Whether you're looking for field-scale data collection, data management, modeling, or resource decision-making solutions, our teams of specialists are here to help you address all your groundwater projects safely and efficiently.

Applied Technologies:

- Westbay System*
- Pressure Profiling
- Discrete Sampling
- Hydraulic Testing

Multilevel Monitoring for Groundwater Characterization

DuPont Belle, West Virginia



DuPont Belle, West Virginia facility and the adjacent mountain area

Highlights:

- Groundwater characterization and monitoring of a 600 acre mountain area
- Westbay System multilevel well technology was chosen as the best monitoring solution for the site's complex hydrogeological conditions
- Five Westbay Systems were installed in 1994. Based on the quality of data and ease of operation, seven more wells have been installed since that time
- Westbay Systems provide the key to DuPont's understanding of the complex groundwater flow system, and are much less expensive to install at the site than conventional wells

Background

In 1988, DuPont was tasked with completing a groundwater investigation at the DuPont Belle, West Virginia, facility, as required by the U.S. Environmental Protection Agency's site Resource Conservation and Recovery Act (RCRA) Corrective Action permit. The focus of the investigation was a number of historically utilized solid waste management units in the 600 acre mountain area adjacent to the plant. The work was carried out by the DuPont Corporate Remediation Group (DCRG) and URS consultants.

Challenges

After installing a number of traditional monitoring wells at the site, it became clear to the project scientists that more and better data would be necessary to properly characterize the complex groundwater flow system.

The plant is located in south-central West Virginia, a region with steep mountainous terrain and heavily dissected valleys. The 100 acre main plant, where agricultural and special chemicals are manufactured, lies on an alluvial terrace along the Kanawha River. The 600 acre mountain area is a contiguous property north of the main plant, characterized by bedrock consisting of multiple layers of interbedded sandstone, shale, coal, and claystone.

The monitoring program faced multiple challenges:

- The groundwater system in the area was impacted with low concentrations of site-related and naturally occurring semivolatile and volatile organic chemical constituents.
- Monitoring had to be carried out in five different aquifers, all separated by shale aquitards.
- The monitoring well locations were primarily on the tops of mountains, which required wells as deep as 920 ft.

Case Study: Multilevel Monitoring for Groundwater Characterization

- Also, the steep topography and layered stratigraphy was expected to result in exceptionally high differential pressures over very short distances in the boreholes.

Solution

The high cost (measured in both time and money) of installing conventional well clusters at high-elevation locations caused DCRG to consider other options. In addition to the need for cost-effective monitoring, the special site conditions required a monitoring system that was reliable and robust. After considering all of the available options, DCRG decided to install Westbay Systems.

Bedrock well completions

In 1994, the Westbay System was installed in five open bedrock boreholes to depths of over 880 ft, with up to 40 monitoring zones in each well.

Westbay Systems can be installed directly into open bedrock boreholes, with Westbay System packers providing annular seals at pre-determined locations. The Westbay System

casing components can be arranged in a wide variety of configurations, providing the ability to monitor virtually any borehole feature and an unlimited number of monitoring zones. The systems can also be installed through a removable protective guide tube for installation in boreholes of uncertain rock quality.

The water chemistry and hydraulic data from the first five wells at the Belle site proved to be invaluable. As a result, an additional six Westbay Systems were installed at the site in 2000, and one more well was installed in 2005.

Results

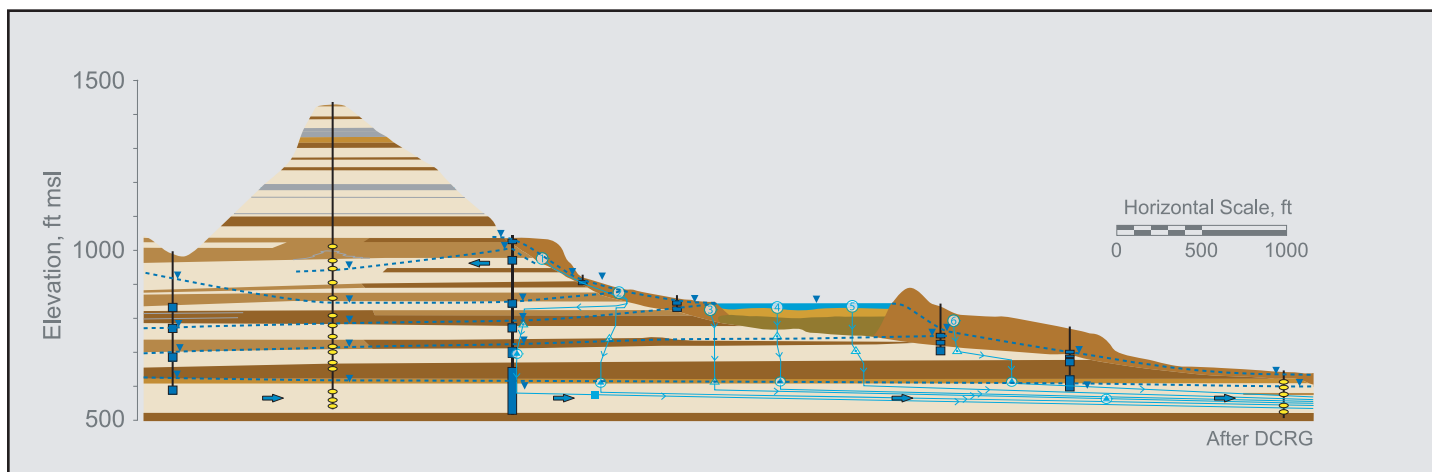
Westbay System wells enabled DCRG to monitor the large number of zones required by the complexity of the site at a greatly reduced cost in comparison to other technologies.

DCRG was able to detect and continue to monitor the presence of low concentrations of site-related and naturally occurring semivolatile and volatile organic chemical

constituents present at the site. The increased data density provided by Westbay System multilevel technology also enabled them to delineate the horizontal and vertical extent of the impact of these constituents on the multiaquifer system. The Westbay System provided DCRG with the ability to add monitoring zones for a fraction of the cost of the well, enabling them to establish the areal extent of groundwater constituents efficiently and cost effectively.

The hydraulic data supplied by the Westbay Systems was used to help develop a three-dimensional conceptual hydrogeologic model of groundwater flow at the site. DCRG could not have created such an accurate predictive model without the data density provided by the Westbay System wells. The model has since been accepted by the regulatory agency that originally directed DuPont to carry out the work.

Thus, at the same time DuPont was collecting and using the valuable data provided by the Westbay System, they were also realizing savings in well costs, field oversight costs, and waste treatment costs.



The Westbay System was key to DuPont gaining a better understanding of the complex groundwater flow system at their Belle, West Virginia facility.