Ground Water Science
Science and Planning for Earth's Most Critical Resource

How do We Protect Our Raw Water Supply with Resource Development All Around?

A raw water supply is a crucial resource for any human settlement, and maintenance of a quality and sufficient water supply is one of the most important services in any community. However, in any settled region, no water supply exists without pressure on its quality. Often at the top the risk list is human generated pollution, such as from industry. An important second is impact from human and animal waste (improperly performing onsite wastewater systems, spread manure, etc.). These are both subjects of whole discussions in themselves.

Resource extraction and water supplies: A third category is resource development: aggregates and minerals, coal, and oil and gas. Solid aggregate or dimensional stone and minerals such as gypsum and coal are extracted by excavation and oil and gas by drilling wells that bring the product to the surface. Some soluble minerals (salt and some uranium ores) can be dissolved by injecting water and pumping slurry to the surface (solution mining). Each of these pose potential risks:

- Solid ore, coal, and dimensional stone can be the aquifers themselves or in contact with them, or the solid rock under a reservoir. Disturbances such as removal or blasting alter hydrology and water quality. In some rare cases, quarry pumping may improve local water quality. Water coming in contact with ores and coal can become contaminated (for example, acid mine drainage) and badly pollute surface water especially. Generally, excavation and blasting should be kept far enough away from water supplies that impacts are avoided, and contaminated fluid must be contained and treated.

- Oil and gas activities can have several effects – the drilling itself may affect nearby wells, penetration of confining layers (cap rock) may release hydrocarbons into the water zones, casings or cement may leak, or spills may occur. Hydrofracturing (HF) is used to open up tight zones, and some of these completions extend laterally away from the wells' origin on the surface. Finally, produced fluids require disposal by some means, some safer than others. Generally, these effects are controlled by robust regulation of construction regulations. HF as such as currently practiced has not been successfully linked to contamination, and generally the physics works against such problems. Mismanagement of HF fluids in storage and transport (or illegal disposal) are bigger problems.
- A hybrid involving coal is coal gas extraction. This has the benefit of removing deadly methane from coal seams, which also leaks into the atmosphere, but HF of rather shallow coal zones can impact water quality. Fluid issues with HF in oil and gas apply.
- Solution mining pumps water and chemicals into the ore zone, where the ore is dissolved and pumped to the surface. As the extracted material is soluble, it must be carefully contained, especially as one of the ores especially suited to this kind of extraction is radioactive uranium. Injection and extraction control strategies used in oil and gas generally apply (regulated as Class III injection wells).

So what to do about this in protecting a water supply?

Self-protection

Source water protection: A seeming "paper tiger" but important nevertheless is SWP. Defining a SWAP and establishing monitoring and protection measures gives you an edge in dealing with resource extraction, although you may need to establish that it is "for real" and you mean it. A key component is education: of the public and resource people in your area. As a rule, resource people really have no desire to mess up the water, but may be unaware of their effects or under commercial pressure.

Preventive vigilance: Don't leave inspection to the state people. Get involved if a site is near water supply assets. Insist that the cementing of the well through the drinkable water zone is done right. Work with land owners to be onsite and monitor this operation or have a 3rd party representative working for you. Foot the bill if the operator will not – it's a lot less expensive than moving your wellfield or reservoir. Insist and watch that the regulatory inspectors do their jobs. Insist on a certified report that the cementing is successfully done. If the cementing is not successful, then be appraised of the remediation or shut down. Insist that the fracture job report is made from the pressure and pump rate data of the actual fracture job operation.

Testing: While you have a SWAP and protection plan, and even a good relationship with your resource extraction neighbors, you should still monitor well upstream and upgradient and between your resource and the extraction activities. The testing program must be able to detect problems in time for you to react to them and avoid drinking water contamination.

- Test for baseline water quality before activities commence: Establish a trend with sampling over time incorporating seasonal and use changes. The Ohio Department of Natural Resources has detailed recommendations for sampling and analysis.
- Install a "live, real time" monitoring system: Instrumentation permits automatic and continuous sampling of key parameters to detect anomalies that indicate a leakage of fluid that is "alien" to the fresh water of the water source. Instead of the "snap shot" of conventional sampling and analysis, this type of monitoring is "the movie" and can be "3-D". These systems should be installed around drill pads or mines, and outside of the SW area. Results – which can be hooked into the existing utility SCADA system – permit rapid decision-making.
- Testing has the additional advantage of detecting natural problems you may be having.
- Seismic monitoring devices installed near possible sources can detect potential problems.

Such testing can also demonstrate what a good neighbor or even an advantage the producer's operations may be. Results can fend off misplaced blame. Data collected can also be placed where all relevant parties (utility, public, producer, regulators, environmental activists) can review the data.

We can coexist. Data – quality and available for evaluation helps make it possible.

More information and links on our web site www.groundwaterscience.com
Ground water Science develops long-term monitoring plans and helps to design and set up monitoring arrays and monitoring programs that are cost-effective and work for you.

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