THE MONITOR

Tracking Emerging Regulations & Technologies on Active Assessment & Remediation Projects

ENVIRONMENTAL ALLIANCE

Produced by Environmental Alliance, Inc., an environmental project management and remediation firm
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Finding Cost-effective Remediation Solutions for Our Clients

Don't Look Past Using Your Old Remediation System To Treat A New Problem

Alliance personnel are aware that it is our duty to find the most cost effective remediation solutions available for all of our clients. With that in mind we will always try to use existing equipment to attack a new problem. The following article describes the conversion of an existing (ten year old) water treatment system at an industrial facility that had originally been designed to treat groundwater for use as facility process water into a fully functional in situ bioremediation/ recirculation system.

A groundwater pump and treat system at an industrial facility was built in the early 1990's to extract water from approximately three hundred feet at a rate of sixty to eighty gallons/minute and pump through a forty foot air-stripper tower to remove chlorinated solvents from the groundwater. The pump and treat system achieved approximately a 100% removal rate for the chlorinated VOCs. This water was then pumped via transfer pumps into a holding tank or directly out to the site for use as facility process water.

In 2001 the pump and treat system at the facility was shut down with the detection of perchlorate in the deep groundwater aquifer and the facility switched to the local county water system.

Perchlorate is a highly soluble chemical that is not amenable to remediation via air-stripping. After examination of the existing pump and treat system it was determined that with minor modifications the existing system could be converted to an in situ recirculating bioremediation treatment capable of remediating both VOCs and perchlorate while maintaining hydraulic control of both plumes.

The deep groundwater remediation system consists of an extraction well, the existing air-stripper treatment and an injection well. These wells were selected for their historically proven hydraulic connection and effectiveness in creating hydraulic control. The existing submersible pump installed in the extraction well is used to pump groundwater into the existing treatment building. Extracted groundwater enters the treatment building and is then pumped through the existing air-stripper to remove VOCs prior to reinjection upgradient into the injection well. Groundwater is extracted continuously at approximately thirty gallons/minute or 43,000 gallons/day. The air stripper is equipped with a low-level and a high-level float switch that control cyclic operation of a 10-Hp transfer pump. When the stripper fills to the high-level, the transfer pump is activated and pumps water from the stripper into the injection well under pressure through a Baski inflatable packer system.

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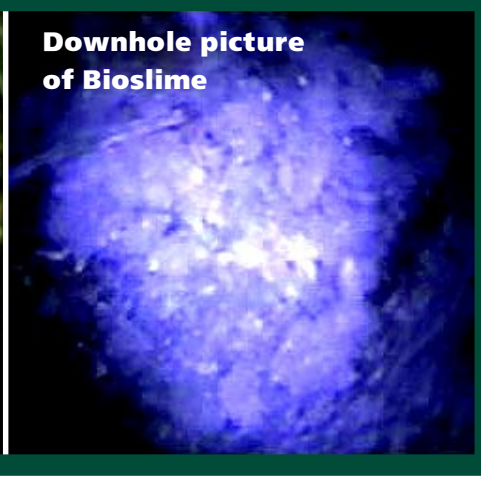


Figure 1.

Topics Presented

A 3/8-inch polyethylene tube fed from a chemical metering pump is connected to the transfer pump discharge piping. The metering pump is supplied by a 1,100-gallon plastic tank containing a 25% (by weight) calcium magnesium acetate (CMA) solution. Sodium iodide was added to the CMA solution to introduce a 100 mg/L iodide tracer.

The discharge line from the transfer pump flows through a check valve and then through a 36-inch, 50-micron bag filter to remove scaling and iron particles. The discharge line is then connected to the original facility 3-inch pipe that used to feed the water treatment system. The original flow meter is still in line but was reversed to enable gauging the flow rate in the new direction. The discharge line is then hard-piped with 2-inch diameter galvanized steel directly through the casing and down into the packer system. A small tee, ball valve and 100 psi pressure gauge are installed in-line before the discharge line enters the injection well casing. This system allows the discharge line backpressure to be safely drained prior to performing maintenance activities. Additionally, the discharge line is equipped with a standard brass pressure-relief valve rated for 125 pounds per square inch (psi), also installed in line before the discharge line enters the casing. The purpose of the relief valve is to ensure that potentially harmful backpressures in excess of 125 psi are not maintained during injection cycles.

The extraction rate was originally set at 20 gallons per minute (gpm), and was increased to 30 gpm approximately three months into the pilot test. To maintain system water balance, the extraction and injection rates have been adjusted so that the injection rate is approximately double the extraction rate. To maximize the systems efficiency the current extraction rate was set to 25 gpm.

The deep groundwater pilot system has been in operation since the fall of 2002, with approximately four weeks of downtime for system repairs and upgrades. This represents approximately 80% operational time and is considered positive considering the use of aged pre-existing pumping and treatment equipment. As of the date of this article approximately 2,835,590 gallons of water have been extracted, treated for VOCs, and reinjected. The reinjected water is treated per the UIC requirements for VOCs via the air-stripping tower and the water is then augmented with a substrate to facilitate the in situ microbiological treatment of perchlorate and VOCs.

The well packer system was installed in the injection well in late fall 2002, in response to significant rises in hydraulic head in this well during injection cycles. Prior to installation of the packer, a downhole submersible video camera was used to determine the most effective location for packer placement. During this event, old well piping and wiring was observed at a depth of 50 feet below ground surface (bgs) and extending to depths beyond the ability of the camera (see Figure 1 on page 1). The steel casing was observed to end at the 50-foot depth, and so the packer was placed just above the casing edge at 45 feet bgs. Placement of the packer at this depth ensures a good seal to prevent short-circuiting of the injected water through the casing. The packer is a Baski Inflatable Packer (BIP) and is inflated to approximately 400 psi with nitrogen gas. The Packer now allows for pressurized injections into the injection well to facilitate the distribution of the substrate into the subsurface.

Upgrades and repairs to reconfigure former pump and treat system

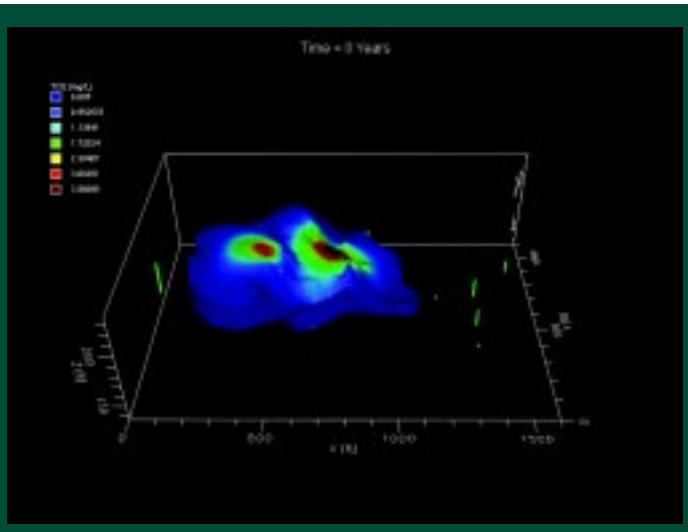
- **Installation of a packer system at DW-72B to allow for pressurized injection.**
- **Upgrade transfer pump from 5 to 10 Hp to enable the increase in extraction rates and to accommodate higher backpressures during injection cycles.**
- **Removal of mineral scaling from inside the air stripper tower.**
- **Repair of leaking discharge piping inside Building 72C.**
- **Increase of extraction rate to 30 gpm.**

A good indication of the system's effectiveness is the change in the potentiometric surface. As is evident from field data and groundwater modeling, the recirculation system has significantly changed the potentiometric surface, creating an extensive cone of depression surrounding extraction well and a cone of impression surrounding the injection well. The capture zone for the injection well currently extends southward to approximately 1,400 feet downgradient, indicating that the system is hydraulically controlling most of the VOC and perchlorate plumes. Additionally, the system is capturing the majority of the fluid injected to the upgradient injection well. After eight months of operation perchlorate concentrations have fluctuated in the deep groundwater samples collected at the extraction well but the most recent sampling event from the spring 2003 indicate perchlorate levels have been reduced by approximately 80%. With operation and maintenance of the recirculation system, the reduction of the VOCs and the remaining perchlorate will continue until achieving levels that are protective of human health and the environment.

Software is Useful in Site Assessment and Design

Environmental Alliance has recently upgraded its groundwater modeling capabilities to include the pre-and post-processing package Visual MODFLOW Pro (Waterloo Hydrogeologic). This software package, which includes standard groundwater flow, particle-tracking, and solute transport codes such as MODFLOW 2000, MODPATH, RT3D, and MT3D99, also provides superior 3-D graphical capabilities and interfaces with Alliance's GIS and environmental database software. Alliance has recently applied this package to diverse projects, including:

- Design of a multi-well groundwater extraction and reinjection system in support of a RCRA Corrective Measures Study;
- Evaluation of anaerobic reductive dechlorination of chlorinated solvents in support of a risk assessment at a Virginia Voluntary Remediation Program (VRP) site; and
- Evaluation of natural attenuation of perchlorate in groundwater in support of a RCRA Facility Investigation (RFI)



Example of the Visual MODFLOW Pro Software Package for pre-and post-processing information.

For more information about Alliance's modeling capabilities, call Jason Early at the Virginia Office: (540) 834-4616.

USEPA and Virginia DEQ Enter into Landmark Environmental Partnership

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

For more information about the partnership, go to the VDEQ website: http://www.deq.state.va.us.

On June 5, 2003, officials from the Virginia Department of Environmental Quality (VDEQ) and the U.S. Environmental Protection Agency, Region III, signed a performance partnership agreement. Through this agreement, the EPA and Region III will cooperate to improve human health and the environment in Virginia. Projects include brownfields redevelopment, improvement of impaired waters, development of a statewide water supply plan, and improvement of stormwater management practices.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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Alliance Volunteers For Adopt-a-beach!

Twice a year Alliance employees road trip to the beach to pick up trash for the State's Adopt-A-Beach Program. Similar to highway cleanup projects, Alliance has "adopted" a one-half mile section of the Fenwick State Park beach that they comb for trash at least twice a year. There is always a contest to see who can find the strangest piece of trash!