

DELINEATING BEDROCK FRACTURES FOR OPTIMIZED WELL PLACEMENT

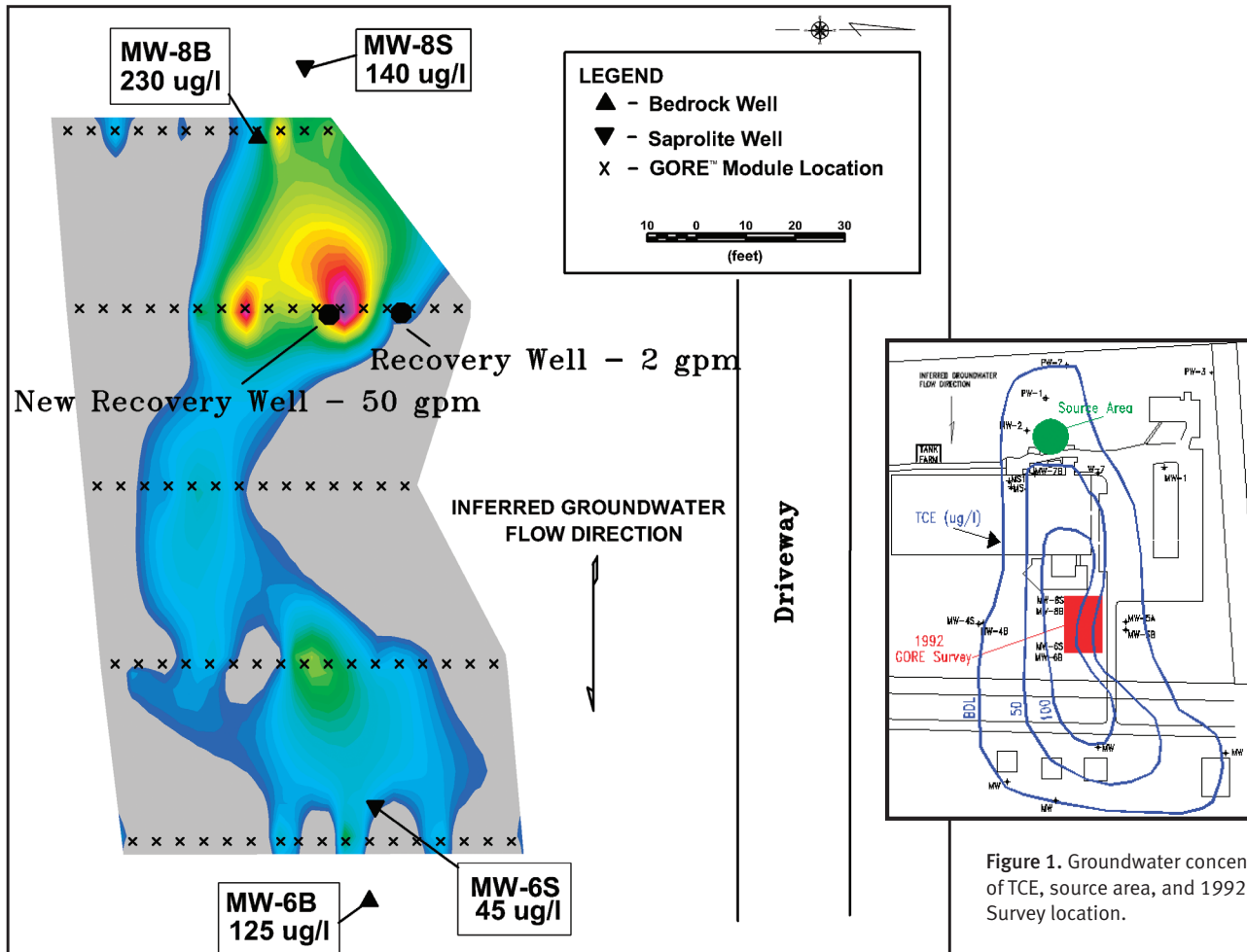


Figure 2. AGI Survey results – TCE.

Figure 1. Groundwater concentrations of TCE, source area, and 1992 AGI Survey location.

Survey Summary

- Location: Mid-Atlantic, US
- Property: Light manufacturing facility
- Objective: Optimize site selection for new recovery well
 - 30 ft. low permeability clays above fractured bedrock
 - Prior investigations identified low groundwater concentrations of chlorinated VOCs (<250ppb)
 - AGI Survey identified TCE exiting the groundwater
 - High flow bedrock fracture identified
 - New recovery well installed, flow rate increased from 2 to 50 gpm
 - TCE removal increased by 70%

Survey Objective

The property owner wanted to install a down-gradient recovery well within a high flow bedrock fracture, to optimize a pump and treat remediation system. AGI Survey methods were utilized to map a soil gas plume, indicating the presence of a bedrock fracture.

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Site Background & Geology

- Light manufacturing facility, Mid-Atlantic, US
- Routine degreasing & maintenance activities
- 25 to 30 ft. of low permeability clays, above fractured bedrock
- Vertical fractures oriented east-west in bedrock (seismic data)
- Groundwater depth: 30 ft.; flow controlled by fractures
- TCE in groundwater (<250 ppb)
- TCE in soils near the loading docks and storage pads only (source area, Fig. 1)

Prior Investigations

- 1986 - Contaminant plume migration to off-site receptors identified
- 1986 - active soil gas survey, no usable data
- 1989 - Petrex® survey identified known source area; failed to delineate the contaminant plume in the groundwater
- 1990 - Seismic investigation provided insufficient data for optimized well placement
- 1992 - Recovery well installed based on seismic data, pumping 2 gpm
- By 1992 - Sixteen monitoring wells installed to determine extent of groundwater contamination

AGI Survey

- 77 AGI passive samplers
- Regular grid pattern, 30 ft. by 4 ft. spacing, 4 ft. deep
- 21-day exposure
- Modified EPA method 8260/8270 GC/MS analysis at AGI labs

Survey Results

AGI Survey detected low concentrations (<250 ppb) of TCE in groundwater through thick, low permeability clays. Mapping the data identified a TCE soil gas plume that was restricted to a narrow region in-line with the groundwater flow direction (Fig. 2). This suggested the location of a high flowing bedrock fracture. Using this information, a new recovery well was installed, successfully penetrating the high flowing fracture zone and increasing pumping rates from 2 gpm to 50 gpm.

Survey Conclusions

The first recovery well, installed prior to the AGI Survey, did not provide adequate pumping rates to remove contaminated groundwater effectively. The AGI Survey identified a high flow bedrock fracture that prior investigations, including a seismic survey, failed to identify. With this information, the site owner was able to place a recovery well in a location that resulted in a 25-fold increase in fluid removal, and a 70% increase in TCE recovery. Long-term sampling, remediation, and monitoring costs were subsequently reduced.