Alaska Department of Environmental Conservation
Division of Spill Prevention and Response
Contaminated Sites Program

2003 FACT SHEET
LONG-TERM MONITORING & RESIDENTIAL WELL RESULTS
SIX MILE RICHARDSON HIGHWAY

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What's New?

This fact sheet presents the results for the annual long-term ground water monitoring and residential well testing in the Six Mile Richardson Highway area. This monitoring event was conducted by the Contaminated Site Program of the Alaska Department of Environmental Conservation (ADEC). The information is presented in the following order: an executive summary, background information, a synopsis of results, and planned future activities.

Executive Summary

Overall, the regional ground water contaminant plume has not changed significantly in location or size from last year. Some portions of the plume are decreasing in size while other portions have remained the same.

Only one known private drinking water well in the Six Mile Village Subdivision has a contaminant concentration that is slightly above the public drinking water standard. This compares to 12 private wells in 1995 that were at or above the standard.

Only one monitoring well within the Six Mile Village Subdivision has a contaminant concentration that has shown a statistically significant increase over time. Although this increase is relatively small, the reason for the increase is not known.

The majority of private and monitoring wells show a slow decrease in contaminant concentrations.

The remaining private and monitoring wells show a statistically stable concentration level.

Monitoring wells installed after 1999 do not yet have enough sampling events for a statistical determination.

The monitoring well located closest to the major source area has shown a continuous decline since 2001.

ADEC is optimizing the long-term monitoring program and some changes are planned in future years.

Background

In 1995 Trichloroethene- (TCE) contaminated ground water was discovered in the Six Mile Richardson Highway area. (Please refer to previous fact sheets for the chronology of detailed events and results.) A regional TCE ground water plume originates south of the New Richardson Highway and travels in a northwesterly direction with the distal end of the plume terminating within the Six Mile Village Subdivision (see Figure 1). Some private residential drinking water wells in the subdivision and nearby areas were impacted by the TCE-contaminated ground water. Benzene, a soluble component of gasoline, was also unexpectedly discovered in 1995 in some of the wells impacted by the TCE.

The ADEC has conducted site assessments, some remedial efforts, and annual long-term ground water monitoring and residential well testing since 1995. Residential drinking water wells that were contaminated with a concentration exceeding 70% of the public drinking water standard were fitted with household treatment systems in 1995. The 70% level was selected as a criterion because of the limited sampling data available at the time and the estimated sampling variance.

The source of the benzene, a historical gasoline release, was located on the southern boundary of the subdivision (Denny Property) and the source area was remediated in 1998. The benzene-contaminated ground water eventually was remediated below drinking water standards by using natural attenuation.

In the same time period, over one hundred 55-gallon drums of hazardous substances were consolidated and removed from the Six Mile Truck property (an abandoned facility) to prevent any future releases.

Three source areas for the regional TCE plume were located on the Walsky property and two other source areas were located on the Holder property. One of the source areas on the Walsky property appears to be the largest contributor to the regional TCE plume. Unfortunately, it also appears to be the deepest source area (i.e., depth of contamination below the water table) thereby complicating potential remedial efforts. Likewise, the existence of multiple source areas that were probably caused by separate releases at different times, and the co-mingling of their individual ground water plumes have complicated the on-going analysis.

Since 1995, the ADEC has conducted long-term ground water monitoring and residential well testing. This effort consisted of the installation of strategically placed monitoring well clusters (i.e., co-located wells with each well sampling different depth of the aquifer) followed by the annual sampling of these wells and other selected residential wells. The monitoring network has evolved over time with the installation of new wells and the abandonment of others with the goal of providing cost-effective and reliable information about the nature and extent of the regional TCE plume.

In 2003 the monitoring effort included the installation of two new well clusters to gain a better understanding of the TCE ground water plume dynamics along the apparent center-line of the regional plume. The locations for the new well clusters were determined using the data from a series of temporary wells. Transects of temporary wells were placed perpendicular to the regional plume and sampled at different depths. In addition, the data from the temporary wells were qualitatively compared to results from preliminary three dimensional ground water modeling of the local conditions.

The primary purpose of the annual ground water monitoring is to track the location, size, and concentration levels of the regional TCE ground water plume. To this end, the current and cumulative ground water data are analyzed to detect "statistically significant" changes (i.e., changes that are not the result of chance alone) using various temporal and spatial analyses. The three statistical conclusions for a change or trend in concentrations are: an increasing trend, a decreasing trend, or no trend. No trend implies a stable condition.

The annual ground water monitoring event at Six Mile has matured and it is prudent to consider the optimization of the monitoring system. Specifically, can the sampling frequency or number of wells sampled be reduced without a significant loss of information? In other words, is there a more cost effective way of obtaining the necessary information without comprising public health and trust? In 2003, a beta version of the Air Force Center for Environmental Excellence's public domain software Monitoring and Remediation Optimization (MAROS) was utilized to complement the existing analysis.

The ADEC also performed annual servicing of the household treatment systems, originally installed in 1995, to ensure the continuing integrity of the systems. Originally the servicing of the systems was the responsibility of the individual home owners; however the ADEC has performed the task since 2000.

Synopsis of Results

The following is a list of the major findings from the 2003 monitoring effort. The results for private drinking water wells are summarized first followed by the results for the monitoring wells. Locations in the following figures are approximate:

1. Only one private residential well has TCE above the public drinking water standard (maximum contaminant level or MCL) of 5 micrograms per liter (µg/L) (See Figure 1). Duplicate measurements at the well at 1357 Sloan detected TCE at 5.1 µg/L and 5.0 µg/L respectively resulting in an average concentration of 5.05 µg/L. For comparison, twelve residential wells in the Six Mile Village Subdivision had TCE at or above the MCL in 1995. It should be noted that two of the twelve residences sampled in 1995 were not re-sampled in 2003 due to lack of the well owners' consent. It is unknown if these two homes are still above the safe drinking water standard.
2. The TCE concentrations in most of the other private wells are slowly declining; some are declining at a predictable rate that can be modeled mathematically with confidence.
3. A few of the private wells show neither an increasing nor decreasing trend; in other words, the concentrations are stable.

4. The location and size of the regional TCE plume has not changed significantly; overall, its location has remained constant and its size is relatively stable. In some areas, the plume's size is slowly decreasing as a result of corresponding decreases in concentrations.
5. MW-13 is the only monitoring well within the Six Mile Village Subdivision that has a statistically significant increase in TCE concentration (See Figure 2). The concentration has increased from 5.2 µg/L in 2002 to 5.52 µg/L in 2003. Since 1995, the TCE concentration has increased from 1.7 µg/L to 5.52 µg/L. It is interesting to note that in a nearby private well at 1366 Sloan Avenue the TCE concentration decreased from 10.1 µg/L to 3.95 µg/L over the same time period. Likewise, the TCE concentrations in other nearby private wells have shown similar decreases with time. The reason for the steady increase at MW-13 is not clearly understood at this time. MW-34/MW-35 and MW36/37 were installed in 2003 to aide in the interpretation of the data at MW-13.
6. The TCE concentrations in the monitoring wells that are located outside of the Six Mile Village Subdivision are behaving similarly to the private drinking water wells. Concentrations are slowly decreasing in most wells while the concentrations are stable in others.
7. For monitoring wells that were installed after 1999, there are insufficient data to measure a statistical trend. A minimum of four sampling events is needed for the statistical determination.
8. The TCE concentration at MW-32, the monitoring well immediately down gradient from the major source area on the Walsky property, has decreased from an average of 370 µg/L in 2001 to 230 µg/L in 2003 (See Figure 2). With the addition of next year's data (fall 2004), the concentration decrease at this well will be able to be modeled with some confidence.

Planned Future Activities

ADEC plans to conduct long-term ground water monitoring and residential well testing in 2004.

ADEC will continue to optimize the long-term ground water monitoring program. This will include the addition or elimination of selected wells from the program and the reduction in sampling frequency for others. Since the decreasing concentration levels in some private and monitoring wells can be modeled with confidence, ADEC is considering a reduction in sampling frequency for these wells. These wells will be sampled bi-annually rather than annually.

ADEC will evaluate the accumulated risk for those wells that have contaminant concentrations that are below the public drinking water MCL, yet above the 70% level of the MCL.

ADEC will also re-evaluate possible remedial actions for the known source areas in lieu of recent advancement or applications of practical remedial technologies in Alaska.

If you have any questions or need additional information, please contact the ADEC Project Manager, Mr. Douglas Bauer at (907) 451-2192 or at Doug_Bauer@dec.state.ak.us.