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

2004 FACT SHEET
SIX MILE RICHARDSON HIGHWAY
FAIRBANKS, ALASKA

JANUARY 2005

What's New

This fact sheet provides a summary of the Alaska Department of Environmental Conservation (ADEC) 2004 long-term ground water monitoring program for the Six Mile Richardson Highway area. The annual monitoring program began in 1995 and has evolved over time.

The monitoring program consists of two major components: annual sampling of a series of permanent ground water monitoring wells, and annual sampling of private residential drinking water wells that have been significantly impacted by the area-wide Trichloroethene (TCE) ground water plume.

An executive summary of the major findings for the 2004 sampling event is presented next. This is followed by detailed discussions of the monitoring results, an evaluation of the 1995 water treatment criterion, and future monitoring activities. Historical information may be found in previous fact sheets.

Executive Summary

Salient points from the 2004 long-term ground water sampling are:

Both the overall size and location of the area-wide TCE ground water plume have not changed significantly. Please see Figure 2 for the estimated extent and location of the plume.

TCE concentration trends vary depending on the position and depth of the monitoring wells. About 42% of the wells have decreasing trends. Another 32% of the monitoring wells have stable (no statistically discernable trend) TCE concentrations. And 21% of the monitoring wells have not been sampled enough times to determine a trend. Conversely, one monitoring well continues to show a slight, but statistically significant increasing trend. The reason for this single continued increase is unknown.

About 66% of the residential drinking water wells have decreasing TCE concentrations. Another 16% of the residential wells have stable TCE concentrations. One residential well has insufficient data to determine a trend. Finally, one residential well has a TCE concentration that is increasing over time, but the latest concentration remains below the safe drinking water maximum contaminant level (MCL). The reason for the increase is unknown.

Two residential wells have TCE concentrations that are above the safe drinking water MCL. Both wells have water treatment systems installed to clean the water before use.

Most residential wells that have TCE concentrations greater than 3.5 microgram per liter (µg/L), or 70% of the MCL, have operable treatment systems installed. However, four residential wells could not be sampled because either the homeowner refused sampling or the homeowner could not be contacted after repeated attempts. One additional residential well qualified this year for the possible installation of water treatment system in 2005.

The majority of both monitoring wells and residential wells have slightly higher TCE concentrations in 2004 as compared to 2003. These increases from last year may be attributable to natural variation rather than a shift in overall trends.

Long-term ground water monitoring will be required until at least the year 2025.

The water treatment criterion of 3.5 µg/L of TCE, established in 1995, is a protective threshold for future risks.

The long-term ground water program will continue to evolve in the coming years with the goals of protecting public health using a cost-effective monitoring program.

The following is a detailed discussion of the long-term ground water monitoring results, the limited risk evaluation of the water treatment criterion, and future long-term ground water monitoring activities.

Additional Details of the Long-term Ground Water Monitoring Results

Permanent Monitoring Well Results

As in past years, the area-wide TCE ground water plume appears to be stable in overall size and location. (See Figure 2.) The cumulative water quality data from the individual monitoring and residential wells were analyzed using the Mann-Kendall nonparametric statistical analysis. A minimum of four independent sampling events are necessary for the analysis. The purpose of the analysis is to identify discernable trends in concentration (changes that are not attributable to chance alone) over time at specific well locations.

A total of 28 permanent ground water monitoring wells were sampled. The TCE concentrations for 2004 are generally consistent with previous sampling events. Of the 28 monitoring wells sampled in 2004, 12 exhibit a decreasing TCE concentration trend, 9 exhibit no trend (inferred as stable trend), six had too few data to determine a trend, and one well (MW-13) exhibited a slight, but statistically significant increase.

MW-13 has shown an increase in TCE concentration from 1.7 µg/L in 1995 to an average 5.41 µg/L in 2004. For reference, the cleanup level for TCE in ground water is 5 µg/L. The reason for the increasing trend is unknown. Four additional monitoring wells were installed hydraulically up gradient from MW-13 over the last couple of years to aide in the interpretation of the MW-13 data. Unfortunately there is insufficient data at this time for these "up gradient" wells to be statistically significant.

Residential Well Results

A total of 12 private residential drinking water wells were sampled. TCE concentrations were generally consistent with previous sampling events. (See Figure 1A and Table 1.) Eight residential wells showed statistically significant decreasing trends for TCE. Two residential wells have stable TCE concentrations. One residential well had insufficient data to determine a statistical trend. And, one residential well showed an increasing trend in TCE concentration.

The residential well with the increasing concentration is located at 1378 Smithson Street. The TCE concentration has increased from 1.4 µg/L in 1995 to 4.0 µg/L in 2004. Although the concentration is not above the safe drinking water MCL, it is above the criterion used to install a water treatment system. Funds will be obtained to install a treatment system in 2005.

The residential wells located 1357 Sloan Street and 1369 Sloan Street had TCE concentrations at 5.9 µg/L and 6.2 µg/L, respectively. The well at 1369 Sloan Street had not been sampled for several years due to a house fire at the location. Both locations have water treatment systems installed to clean the water before household use.

Most of the residential wells known to have a TCE concentration greater than the 3.5 µg/L water treatment criterion have operable treatment systems. Since the residential well at 1378 Smithson Street tested above the 3.5 µg/L level for the first time in 2004, funds are being obtained to install a system in 2005.

The status of the drinking water is unknown for the four residences located at 1357 Leslie Street, 1319 Smithson Street, 1345 Smithson Street, and 853 Conley Avenue. The homeowners at 1319 Smithson Street and 853 Conley Avenue could not be contacted after repeated attempts (e.g., certified letters and telephone calls, or personal visits). The homeowners at 1357 Leslie Street and 1345 Smithson Street refused sampling.

Ten out of 28 monitoring wells and ten out of the 12 residential wells had TCE concentrations in 2004 that were greater than in 2003, or at the last sampling event. The reason for this "increase" relative to the previous sampling event is not known, however, it may represent natural variation rather than a shifting trend.

Long-term Ground Water Monitoring Likely Necessary Until 2025

The data from the monitoring well closest to the major TCE source area on the Walsky property was analyzed. This well represents the highest concentration of TCE within the plume and should be the last well to reach the TCE MCL. Therefore the "cleanup time" for this well may be used as a rough approximation for the cleanup time for the remainder of the plume. On this basis, long-term ground water monitoring is projected to continue until at least 2025.

The statistical analysis used for the prediction of "cleanup time" has inherent and significant uncertainty associated with it. As additional data are collected in future years, the uncertainty will be reduced but never completely eliminated. Therefore any predictions should be viewed as "order-of-magnitude" or "rough approximations" rather than exact.

Evaluation of the Water Treatment Criterion

An evaluation of the water treatment criterion, a TCE concentration below 3.5 µg/L, is protective from a risk perspective. In other words, drinking water from a typical residential well in the Six Mile Village Subdivision that has a TCE concentration below the criterion and no other detectable contaminants does not exceed a risk of one in 100, 000.

In 1995 the TCE concentration of 3.5 µg/L was established as the criterion that would determine which residences would qualify for household water treatment systems (water treatment criterion). Most residential wells in the Six Mile Village Subdivision at the time not only had TCE but other contaminants at various concentration levels. These other contaminants were mostly natural degradation products of TCE, 1,1,1-Trichloroethane (TCA), and TCA's natural degradation products. Some residential wells also had components of petroleum products such as benzene and napthalene.

Residential wells that had one or more contaminants above the safe drinking water MCLs automatically qualified for a household water treatment system. However, there was the question of which homes would qualify for treatment systems when none of the contaminants exceeded their individual MCLs, yet there were multiple contaminants in the residential well water.

The safe drinking water MCL for TCE and benzene as individual contaminants is 5 µg/L. The MCL for TCA is 200 µg/L. Similarly, the other contaminants have various different MCLs. Therefore, to take into account the potential risks posed by the combination of contaminants and the uncertainty associated with the concentrations at that time because of the limited data, it was decided that a 3.5 µg/L concentration of TCE would be the water treatment criterion.

In general, the contaminant concentrations have slowly decreased since 1995. Some residential wells now have TCE concentrations that are very close to or slightly below 3.5 µg/L. Also, the other historical contaminants are no longer detectable. The question now becomes whether water treatment is necessary to be protective from a risk perspective with the relative low concentration of TCE and non-detectable amounts of any other historical contaminants.

Consequently, ADEC performed a limited risk evaluation for the individual residential wells that are close to 3.5 µg/L. The evaluation used conservative assumptions, or in other words, worst case scenarios. For example, it was assumed that an individual would reside there for the next thirty years; drink only contaminated water at the 2003 measured TCE concentrations; would shower or bathe using only the contaminated water; and would eat only vegetables that were grown in a garden watered by the contaminated water. In addition, the well water would not only contain TCE but it would also have any other historical contaminant at concentrations equivalent to the minimum analytical detection limits.

The risk level using the above assumptions did not exceed one in 100,000.

Future Long-term Monitoring Activities

ADEC will continue to optimize the monitoring program with the goals of protecting the public health using a cost-effective management scheme.

The number of monitoring and residential wells that are sampled on annual basis will continue to change over the next few years. Several monitoring and residential wells have decreasing concentrations that can be readily modeled mathematically with a high degree of confidence. Therefore, these particular wells will be sampled on a less frequent basis.

It is envisioned that a smaller number of monitoring and residential wells will be sampled annually for several years followed by periodic sampling of a larger number of wells to validate modeling results.

All residential wells that are at or above the water treatment criterion will be sampled on annual basis until the TCE concentration decreases below the criterion. Thereafter, these wells may be sampled on a periodic basis.

When the TCE concentration in the residential wells consistently remains below the water treatment criterion, ADEC will no longer be responsible or pay for the annual maintenance of the installed treatment system. The home owner has the option of assuming responsibility for the operation and maintenance of the water treatment system.

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

Table 1 - Summary of 2004 Residential Well Sampling and Maintenance
Six Mile Richardson Highway

Residential Well Location	Sample Number	Summary of Analytical Results (EPA 524.2) *					Comments
		Trichloro-ethene (µg/L)	1,1-Dichloro-ethane (µg/L)	*cis*-1,2-Dichloro-ethene (µg/L)	*trans*-1,2-Dichloroethene (µg/L)	Toluene (µg/L)	
EPA Maximum Contaminant Level (MCL)		5	3,650	70	100	1,000	
842 Conley	*1246-100804-012*	4.3	0.67	0.72	<0.50	<0.50	Carbon filter changed out.
885 Conley	*1246-092404-001*	3.1	0.81	<0.50	<0.50	<0.50	Carbon filter changed out.
891 Conley	*1246-102504-013*	1.6	0.86	<0.50	<0.50	<0.50	Carbon filter changed out.
1374 Leslie	*1246-092704-006*	2.9	0.78	<0.50	<0.50	<0.50	Carbon filter changed out.
1410 Richardson	*1246-092404-002*	4.6	0.66	0.54	<0.50	0.61	Carbon filter changed out.
1430 Richardson	*1246-100404-010*	3.8	0.56	<0.50	<0.50	<0.50	Carbon filter changed out.
1343 Sloan	*1246-092704-008*	3.8	0.64	<0.50	<0.50	<0.50	Carbon filter changed out.
1354 Sloan	*1246-100804-011*	3.5	1.1	0.54	<0.50	<0.50	Unable to contact resident for carbon filter maintenance.
1357 Sloan	*1246-100104-009*	**5.9**	0.65	0.68	<0.50	<0.50	Carbon filter changed out.
1366 Sloan	*1246-092704-004*	4.0	0.98	1.3	1.9	<0.50	Unable to contact resident for carbon filter maintenance.
1366 Sloan	*1246-092704-005*	3.9	1.0	1.3	1.9	<0.50	Duplicate sample
1378 Smithson	*1246-092704-003*	4.0	0.63	0.81	<0.50	<0.50	No carbon treatment system.
1369 Sloan	*1246-092704-007*	**6.2**	0.93	0.86	0.56	<0.50	Well back in use. Treatment system installed 11/16/04.
1357 Leslie	–	–	–	–	–	–	Refused sampling.
1319 Smithson	–	–	–	–	–	–	Unable to contact resident.
1345 Smithson	–	–	–	–	–	–	Refused sampling.
853 Conley	–	–	–	–	–	–	New residence. Refused sampling.

Notes:

* Only analytes reported above the Practical Quantitaion Limit (PQL) are shown.

BOLD Values in **Bold Type** exceed the EPA Maximum Contaminant Level (MCL) for that analyte.

<0.50 Analyted not reported above given PQL.

BADGER ROAD

OLD RICHARDSON HWY

ALASKA RAILROAD

HERBERT AVE

MW-11

1319

SMITHSON STREET

MW-38,39

1345

1343

SLOAN STREET

1349

1353

1354

1357

1357 L

MW-13,14

1365

1366

1378

1369

MW-106, 107,108

LESLIE STREET

1374

GIANNA'S COURT

CONLEY AVE

CONLEY AVENUE

842

MW-103, 104,105

885

891

NEW RICHARDSON HIGHWAY

MW-34,35

1410

1430

MW-15,16

WARNER ROAD

N

APPROXIMATE SCALE (FEET)

0 150 300

REVISION

NO.: DATE: BY:

PROJECT:

WELL LOCATIONS

LOCATION: SIX MILE RICHARDSON HIGHWAY
FAIRBANKS, ALASKA

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

DATE: 1/05 PROJECT: 31-1-11246

DRAWN: JAK FILE: 2004 Figures.dwg

CHECKED: JEL SCALE: 1" = 300'

FIGURE
1A

DRAFT

APPROXIMATE EXTENT OF 2004 TCE PLUMES
AT 30-FOOT DEPTH
SIX MILE RICHARDSON HIGHWAY
FAIRBANKS, ALASKA

REVISION | BY: | DATE: | NO.:

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

DATE: 1/05 | PROJECT: 31-1-11246
DRAWN: JAK | FILE: 2004 Figures.dwg
CHECKED: JEL | SCALE: 1" = 600'

FIGURE
2

APPROXIMATE GROUNDWATER FLOW DIRECTION: N 34° W

LEGEND:
APPROXIMATE EXTENT OF 1 µg/L TCE PLUME (30-FOOT DEPTH) – 2004 _ _ _
APPROXIMATE EXTENT OF 5 µg/L TCE PLUME (30-FOOT DEPTH) – 2004 _____

APPROXIMATE SCALE (FEET)
0 300 600

REFERENCE POINT

OLD ALASKA RAILROAD RICHARDSON HWY
ALASKA RAILROAD OLD RICHARDSON HIGHWAY
NEW RICHARDSON HIGHWAY
BRADWAY
BADGER ROAD
HERBERT AVE
CONLEY AVENUE
ENSLEY ROAD
WESCOTT LANE
LOT 4 ZIEGLER SUBD
LOT 3 ZIEGLER SUBD
STIER AVENUE
DODGE AVE
CLAYPOOL AVE
BARRACK AVE
GRACE AVENUE
CUBE AVENUE
WOJO AVENUE
ANTHONY COURT
TYRONE WAY
GLORY
HEALY ROAD
SPUR COURT
PHEASANT DRIVE
LOON LANE
SNOWBIRD ROAD
WARNER ROAD
DENNIS ROAD
MOSES DRIVE
DAVISON
BEGICH
JUANITA
PEGGY
HENRY
BETHANY
SMITHSON STREET
SLOAN STREET
LESLIE STREET
GIANNA'S COURT
COBB ROAD
LU ANNE ROAD
BAY STREET
WORNING

MW-11, 1319
MW-38,39, 1345, 1343, 1349, 1353, 1354, 1351, 1357, MW-13,14, 1365, 1366, 1378, 1389, MW-106, 1374, 107,108
MW-103, 104,105, 842, 885, 891
MW-34,35, 1410, 1430
MW-15,16
MW-36,37
MW-25,26
MW-19,20
MW-29,30
MW-17,27
MW-18,28
MW-4,5
MW-33
MW-31,32
MW-6,7
TL-2806
MW-23
MW-3
TL-2829
MW-8,9
MW-1
MW-2
MW-10
MW-24
TL-2841
TL-2800

7000 ft
6000 ft
4000 ft
3000 ft
2000 ft
1000 ft