



Flint Hills' North Pole Refinery Contaminated Site

Posted on DEC website at various dates and
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Why is Flint Hills monitoring groundwater and not DEC?

Alaska law is set up so that the responsible or liable party must do the investigation and clean up the spill at the direction of DEC and in compliance of Alaska State regulations. DEC has established a technical project team to provide the highest level of oversight of Flint Hills's work. The team consists of technical experts in every aspect of environmental investigation and cleanup, including members from the University of Alaska, federal and state health agencies, private sector consultants, federal and state regulatory agencies, and local utility experts. This team meets approximately every six weeks to review the field data and direct the investigation and cleanup. There are seven sub-groups that focus more in-depth on specific aspects of the project such as the toxicity of sulfolane and its fate and transport in the subsurface.

What are the health effects of sulfolane?

The Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology has released several documents addressing the health effects of sulfolane. Please review the documents on the Documents page.

Sulfolane was first used at the refinery in 1985. Why didn't DEC know of the problem sooner?

We weren't looking for it. Sulfolane was not on the federal or state government's list of regulated chemicals, and it's not on the list of contaminants of concern for a typical fuel spill. Currently, the North Pole Refinery is the only site in Alaska that we are aware of that uses sulfolane. In 2000-2001, DEC directed Williams to do additional site characterization and cleanup. This resulted in identifying sulfolane as contaminant in the groundwater but still there was no regulatory limit for the chemical. A long-term monitoring program was started and Williams was required to find the source of the sulfolane contamination and contain it onsite until a regulatory limit could be set. In 2006, a site-specific interim cleanup level was

set at 350 ppb and a cleanup plan approved. In 2009, based on additional site information and a public health evaluation, the interim cleanup level was dropped to 25 ppb. As we have learned more about this chemical, DEC has responded. Prevention of this situation would have required knowing more about sulfolane and having stricter regulation prior to the industry beginning to use it in 1985. This is regulated by the US EPA Toxic Substances and Control Act, <http://www.epa.gov/lawsregs/laws/tsca.html>.

How much sulfolane was in the groundwater before you first knew of it in 2001?

We don't know of any tests previously done at the refinery for sulfolane, so we can't say right now what concentrations existed in the past. Computer modeling will be used to make some estimates of historical concentrations, but we will never know the exact answer to this question.

Why haven't you asked Flint Hills to test for benzene along with sulfolane in people's well water? The refinery has petroleum contamination from past spills.

How can we be sure that benzene isn't leaking off the property?

The technical project team has reviewed the benzene data available on the refinery, which goes back over 20 years, unlike the sulfolane data. Benzene is a well researched chemical with strict regulations because of its high toxicity. We understand and can predict its behavior much better than sulfolane. We know from the many years of monitoring data that benzene has not left the refinery property. If Flint Hills were to sample private water wells north of the property and find benzene or other petroleum compounds, those compounds would not be from the refinery and therefore not the responsibility of Flint Hills. If you suspect that your well contains contamination other than sulfolane, we encourage you to have your well tested independently.

I'm still not convinced that benzene isn't coming off the property with the sulfolane.

Sulfolane and benzene don't have the same chemical properties, meaning they don't act the same in groundwater. They do bond well to each other, making sulfolane useful in the refining process; however, sulfolane and benzene separate easily when dissolved in water.

Benzene can dissolve in water, but it clings to soil, evaporates through the soil and breaks down much more easily than sulfolane by natural underground processes. All these

processes mean that benzene, like other petroleum compounds, does not move as far in the groundwater. Sulfolane, by comparison, dissolves easily in water, does not cling well to soil, and does not evaporate. When gasoline, containing both benzene and sulfolane leak into the soil and makes its way to groundwater, the benzene doesn't travel far, but the sulfolane dissolves into the water and travels much further.

Is this plume of sulfolane going to keep on going, northwest, even to Fairbanks and beyond?

No, we see no evidence the plume extends that far. Sulfolane in groundwater thins out (dilutes) by mixing with more water as it travels away from the refinery. Groundwater carries sulfolane from the source at the refinery to the north and northwest ("downgradient"). The concentrations become lower as it moves further away from the source area and will be too low to measure well before it could reach Fairbanks.

As sulfolane travels in groundwater, biological organisms like bacteria break down the sulfolane, although this happens very, very slowly in low-oxygen, cold groundwater. (Biological action is much faster in surface waters, where there is more oxygen). These dilution and attenuation mechanisms are why the concentrations at the source by the refinery are higher than those seen further north (towards Fairbanks). It is also why we don't expect concentrations to significantly increase downgradient of the refinery as long as no new spills occur.

Why haven't wells been tested in areas close to but east of the refinery? Just because the river flows away from the area doesn't mean sulfolane hasn't traveled to the East.

Approximately 25 drinking water wells have been tested to the east of the refinery, and there have been no detections of sulfolane. The private wells tested to the east are on Laurance Rd. and Evolyn Drive toward the south end of Blanket Blvd. Monitoring wells on the refinery property have allowed testing over years and have helped to determine groundwater flow direction and have shown the groundwater, and therefore sulfolane, travels towards the north-northwest direction. Data from monitoring wells on the east portion of the refinery's pad have tested non-detect. We also have regional groundwater flow information from the U.S. Geological Survey as well as the new testing off the refinery property to the north and northwest. All of this information supports our understanding of the groundwater and contaminant flow direction to the north and northwest. The direction

of groundwater flow may vary over time, and its depth may vary seasonally. However, all of the chemical and water data we have over the past 25-30 years of monitoring at the refinery and the surrounding areas do not indicate contaminant movement to the east. Ongoing monitoring will continue in order to track the plume and any changes.

How will the plume of sulfolane eventually go away and the groundwater become clean?

Interim cleanup actions have been started in the source areas at the refinery. There was an existing remediation system on the refinery for the petroleum contamination when the sulfolane was discovered offsite. This system could be upgraded to attempt some treatment and containment of the sulfolane as well. The technical project team has overseen Flint Hills' upgrades on this system and in 2010 the system removed approximately 1800 gallons of fuel and treated roughly 200,000 gallons per day of petroleum and sulfolane-contaminated water. Removing this mass of contamination from the environment will reduce the concentrations in groundwater away from the source over time as dilution, degradation and other natural processes take place. In addition to this interim step Flint Hills is required to conduct an evaluation of other treatment options. This is taking some time because there are no standard methods for treating sulfolane in the environment so laboratory bench tests and pilot-scale testing must be done. This evaluation is expected to be completed in the summer of 2011 along with more accurate estimates of the time to clean up the groundwater.

What's a "monitoring well" or a "sentinel" well?

Monitoring wells are put in only to sample and test water, rather than for drinking or other purposes. Their installation is regulated and the details of construction are well-documented. The wells can be temporary or permanent depending on their purpose. Their depth is recorded. Flint Hills is installing monitoring wells that will remain in place and continue to be sampled over the years. These wells will be used to more thoroughly understand the regional and local groundwater flow and chemical movement.

Sentinel wells are monitoring wells installed at the edge of a plume or beyond it as a way of understanding the leading edge of the plume and any changes in the groundwater or contaminant movement. Drinking water wells can also be used for monitoring purposes with the owner's permission. However the depth of drinking water wells and other important construction details are often unknown.