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STATE OF ALASKA
DEPARTMENT OF HEALTH AND SOCIAL SERVICES

Fact Sheet

COMMISSIONER'S OFFICE

Sulfolane Groundwater Contamination in North Pole: Health Recommendations and Next Steps

This fact sheet summarizes the Alaska Department of Health and Social Services' (DHSS) recommendations for using sulfolane-impacted water for everyday activities in the affected area (plume), and other sulfolane-related health topics. See the 2012 DHSS Health Consultation, *Sulfolane Plume in Groundwater: Evaluation of Community Concerns about Sulfolane in Private Water Wells*, for more information. Refer to the attached map at the end of this document to see if your home is within the plume.

Cooking and preparing food
Affected residents who have an alternative water source, such as bottled water, for drinking and eating should use that alternative water source for making water-based foods (e.g., soups and beverages); however, they do not need to use the alternative water source for cooking foods where the water is tossed out after cooking (e.g., boiling eggs). Any trace amount of sulfolane that might remain on foods after washing or rinsing would be too small to present a health concern.

Bathing and showering
Based on current information, using well water to shower and bathe does not pose a health risk for North Pole residents. Studies have shown that sulfolane is not readily absorbed by the skin. In other words, human skin is a very good barrier for keeping sulfolane from reaching the bloodstream. In addition, sulfolane has low volatility, which means that it does not readily go from a liquid to a gas (vapor) that people could breathe in while bathing or showering.

In summary…

Continue to use your alternative water source for:

- drinking and most cooking
- growing garden produce
- pets and other animals

Continue to use your well water for:

- bathing and showering
- washing household items
- watering lawns and plants

Washing dishes and clothes
Using well water to clean dishes or clothes does not pose a health risk. Any trace residue of sulfolane that might remain after washing would be too small to present a health concern.

Drinking water for pets and other household animals
Affected residents should continue to use their alternative water source for pets and other household animals (e.g., chickens).

Watering non-edible plants and grass
As mentioned earlier, sulfolane is not readily absorbed by the skin. Thus, contact with plants and grass that have been watered with well water does not pose a health risk.

Contact with soil
Studies in the scientific literature have shown that sulfolane does not readily stick to soils; therefore, sulfolane exposure from incidentally eating small amounts of soil, as children sometimes do, or as may happen when eating garden produce or dirt on your hands, is not expected to harm people's health. This also

applies to handling soil that has been watered with well water. Similarly, picnicking or playing on ground exposed to water with sulfolane poses no health risk. Soil tests at two North Pole residences were negative for sulfolane.

Contact with surface water
Swimming or playing in ponds, streams or gravel pits in the affected area does not pose a health risk. As mentioned earlier, sulfolane does not readily absorb through the skin. In addition, limited sampling of surface water in the area has shown no detections of sulfolane in gravel pits.

Gardening (growing fruits and vegetables)
Affected residents should use an alternative water source for growing edible plants (produce). Very little research has been done on how much sulfolane can be taken up by plants, including different parts of plants and different kinds of plants. North Pole gardeners within the plume and not on city water have been offered garden watering tanks. If you live within the plume (see map below) and are not sure if your well water is safe, please contact the Flint Hills Groundwater Office or the Alaska Department of Environmental Conservation (contact information provided below).

More on Sulfolane and Health

Future sulfolane toxicity studies
The National Toxicology Program is currently designing toxicity studies to evaluate the health effects of sulfolane exposure. The first phase of the studies is planned to begin in 2014. These studies will first evaluate how different levels of sulfolane exposure impact various lab animals. Further studies will evaluate how sulfolane affects the animal's growth and development and whether there is any impact on the animal's immune system. Depending on the results of these studies, the final phase of the research would consist of a two-year study to evaluate long-term exposure to sulfolane in drinking water.

Health studies
North Pole residents have been concerned about potential health effects from long-term exposure to low levels of sulfolane in drinking water, and have asked the state to conduct a health study or health survey to address this concern.

In late 2010, the Alaska Section of Epidemiology, Environmental Public Health Program conducted a limited health study by reviewing data from the state's cancer and birth defects registries (see the DHSS health consultation, pages 18–22). The state requires health care providers and facilities to report all cases of cancer and birth defects to DHSS. An analysis of cancer data from 1996 to 2007 (the time period for which records were available) did not find a statistically significant difference in overall cancer rates between an area in North Pole that includes nearly all of the sulfolane plume (census tract 16) and the entire state. Similarly, an analysis of birth defects data from 1996 to 2009 did not find any evidence that the prevalence (number of cases) of birth defects was higher than expected in North Pole. The Environmental Public Health Program plans to conduct follow-up cancer and birth defects analyses this year to include additional years of data that have become available since the first analyses were done.

Some North Pole residents and stakeholders have asked why the state is not conducting a more extensive health study to collect information about medical conditions and/or diseases potentially related to sulfolane exposure. Performing an extensive health study often takes years and considerable resources to successfully implement and complete. There are many factors to consider before deciding to perform such studies. Success of such studies depends on a number of conditions, including: 1) an ability to reasonably estimate or document individual exposure, 2) an ability to document or validate human health outcomes, 3) a large enough population to make the results meaningful, 4) an ability to identify and locate subjects and records, 5) availability of an appropriate control or comparison population, and 6) an ability to determine the influence

of environmental, behavioral, and other factors. DHSS has not pursued an extensive health study because several of these necessary conditions are lacking (see DHSS health consultation, pages 22–23).

A possible alternative to an extensive health study would be a health survey. Health surveys can be useful in certain circumstances, such as when past exposures are well understood and specific diseases or health conditions are reasonably expected. A successful health survey requires many of the same conditions as a health study (documentation of exposure, expected health outcomes, sufficient population size). DHSS has not performed a health survey in North Pole because several of these conditions are not present with respect to the sulfolane exposure. Performing such a study could also raise false expectations that specific health conditions could be attributed to sulfolane exposure, which would be purely speculative at best.

DHSS is committed to continue working with the North Pole community on this issue by listening to their concerns, staying abreast of new information as it becomes available, and responding appropriately using the best available evidence-based practices.

For More Information

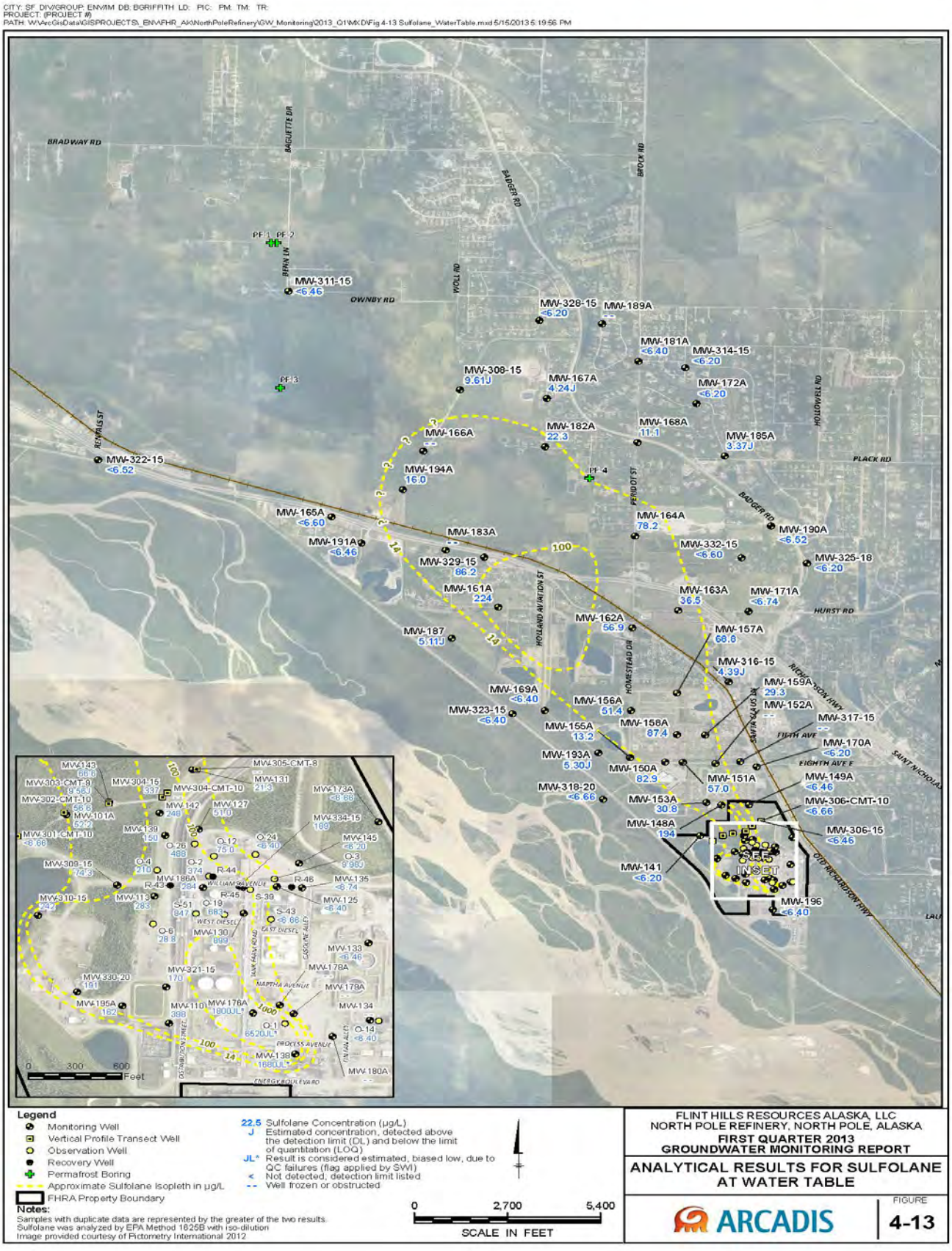
Alaska Department of Environmental Conservation, Contaminated Sites Program
Kimberly DeRuyter, (907) 451-2192, kim.deruyter@alaska.gov (Updated December, 2014)

Alaska Department of Health and Social Services, Environmental Public Health Program
Ali Hamade, (907) 269-8086, ali.hamade@alaska.gov (Updated December, 2014)

Flint Hills Resources, Groundwater Office
Shannon Price, (907) 488-0723, shannon.price@fhr.com

DHSS Health Consultation, January 19, 2012:
http://www.epi.hss.state.ak.us/eh/sulfolane/DHSSHealthConsultSulfolaneGroundwater.pdf

DEC North Pole refinery website: http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/
Local call-in number for North Pole: 451-2182


CITY: SF_DIV/GROUP: ENV/IM DB: BGRIFFITH LD: PIC: PM: TM: TR:
PROJECT: (PROJECT #)
PATH: W:\ArcGisData\GISPROJECTS_ENV\FHR_AK\NorthPoleRefinery\GW_Monitoring\2013_Q1\MXD\Fig 4-13 Sulfolane_WaterTable.mxd 5/15/2013 5:19:56 PM
BRADWAY RD
BAGUETTE DR
BADGER RD
BROCK RD
PF-1
PF-2
BEHN LN
MW-311-15 <6.46
OWNBY RD
WOLL RD
MW-328-15 <6.20
MW-189A --
MW-181A <6.40
MW-314-15 <6.20
MW-308-15 9.61J
MW-167A 4.24J
MW-172A <6.20
HOLLOWELL RD
PF-3
MW-166A --
MW-182A 22.3
MW-168A 11.1
MW-185A 3.37J
PLACK RD
MW-322-15 <6.52
MW-194A 16.0
PF-4
PERIDOT ST
MW-165A <6.60
MW-164A 78.2
MW-190A <6.52
MW-191A <6.46
MW-183A --
MW-332-15 <6.60
MW-325-18 <6.20
MW-329-15 86.2
MW-161A 224
MW-163A 36.5
MW-171A <6.74
HURST RD
MW-162A 56.9
MW-187 5.11J
MW-157A 68.8
HOLLAND AVIATION ST
HOMESTEAD DR
MW-316-15 4.39J
MW-159A 29.3
MW-169A <6.40
MW-156A 51.4
MW-323-15 <6.40
MW-152A --
MW-317-15 --
MW-155A 13.2
MW-156A 87.4
FIFTH AVE
MW-170A <6.20
MW-193A 5.30J
MW-150A 82.9
EIGHTH AVE E
MW-151A 57.0
MW-149A <6.46
MW-318-20 <6.66
MW-153A 30.8
MW-306-CMT-10 <6.66
MW-148A 194
MW-306-15 <6.46
SEE INSET
MW-141 <6.20
OLD RICHARDSON HWY
MW-196 <6.40
SAINT NICHOLAS
MW-143 66.6
MW-305-CMT-8
MW-303-CMT-8 19.6J
MW-304-15 337
MW-131 21.3
MW-302-CMT-10 56.6
MW-304-CMT-10
MW-173A <8.66
MW-101A 52.2
MW-142 248
MW-127 510
MW-334-15 189
MW-301-CMT-10 <6.66
MW-139 150
O-24 <8.40
MW-145 <8.20
O-26 488
O-12 75.0
O-3 9.98J
MW-309-15 74.8
O-4 210
O-2 374
R-44
MW-135 <8.74
MW-186A 284
R-43
R-48
MW-310-15 242
MW-113 283
R-45
S-39
MW-125 <8.40
O-51 847
O-19 683
S-43 <8.66
WEST DIESEL
EAST DIESEL
O-6 28.8
MW-130 899
MW-133 <8.46
MW-178A
MW-321-15 170
MW-330-20 191
MW-178A
MW-195A 162
MW-110 398
MW-176A 1800JL*
MW-134
O-1 6520JL*
O-14 <8.40
PROCESS AVENUE
MW-138 1880JL*
MW-180A --
ENERGY BOULEVARD
0 300 600 Feet
Legend
Monitoring Well
Vertical Profile Transect Well
Observation Well
Recovery Well
Permafrost Boring
Approximate Sulfolane Isopleth in µg/L
FHRA Property Boundary
22.5 Sulfolane Concentration (µg/L)
J Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
JL* Result is considered estimated, biased low, due to QC failures (flag applied by SWI)
< Not detected; detection limit listed
-- Well frozen or obstructed
Notes:
Samples with duplicate data are represented by the greater of the two results.
Sulfolane was analyzed by EPA Method 1625B with iso-dilution
Image provided courtesy of Pictometry International 2012
0 2,700 5,400
SCALE IN FEET
FLINT HILLS RESOURCES ALASKA, LLC
NORTH POLE REFINERY, NORTH POLE, ALASKA
FIRST QUARTER 2013
GROUNDWATER MONITORING REPORT
ANALYTICAL RESULTS FOR SULFOLANE AT WATER TABLE
ARCADIS
FIGURE
4-13