



Flint Hills' North Pole Refinery Contaminated Site

Frequently Asked Questions

On dec.alaska.gov/spar/csp/sites/north-pole-refinery
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What is DEC doing about contaminated groundwater in the North Pole area?

- DEC continues regulatory oversight of the former North Pole Refinery, in particular the groundwater plumes contaminated with sulfolane, petroleum and per- and polyfluoroalkyl substances (PFAS). Groundwater monitoring is performed under DEC oversight every year to track changes in the sulfolane plume off the former refinery property and also in the sulfolane and petroleum plumes on the property. Results are reported annually and posted on DEC's project web page. Plans are under development for future PFAS sampling to be performed under DEC oversight.
- **Off the former refinery property:** The sulfolane contamination extending off the property is expected to remain in the groundwater for many years. The sulfolane plume continues to gradually migrate towards the north-northwest, and concentrations in water wells may change

over time. To protect North Pole residents and businesses, monitoring is to continue until the plume reaches a cleanup level to be set by the State of Alaska.

- In 2018, DEC investigated PFAS in the North Pole area groundwater. PFAS were present in fire-fighting foams used historically on the former refinery and have been found in soil and groundwater on that property. In 2018, DEC collected groundwater samples from monitoring wells and water wells both within and outside of the city's piped water expansion area. Sample results showed a PFAS groundwater plume migrating off the former refinery property. Plans are under development for future sampling to be performed under DEC oversight.
- **On the former refinery property:** Sulfolane and petroleum contamination are expected to remain in soil and groundwater on this property for many years. Petroleum contamination is contained on the property, while sulfolane continues to migrate beyond the property line, below levels allowed under the 2017 settlement agreement (400 parts per billion [ppb]). Contingencies are in place to resume active groundwater treatment if petroleum is found to be migrating off the property above DEC cleanup levels or sulfolane above 400 ppb.
- PFAS contamination is also present in soil and groundwater on the former refinery property, and plans are under development for future sampling to be performed under DEC oversight.

How can I find out if there is PFAS or sulfolane in the groundwater under my property, and if so, what the concentrations are?

- Maps of groundwater sulfolane concentrations are updated annually and posted on the project web page. The most recent (2019) sulfolane groundwater map may be found on DEC's website at <https://dec.alaska.gov/spar/csp/sites/north-pole-refinery/map/>
- The extent of PFAS contamination in groundwater off the former refinery property has not been fully characterized. Plans are under development for future sampling to be performed under DEC oversight. The current understanding of PFAS in groundwater, represented by data from the 2018 sampling event, may be found on DEC's website at the link in the above paragraph.
 - Contact DEC at 907-451-2117 or james.fish@alaska.gov for further assistance.

Is the sulfolane plume still being monitored?

- DEC continues regulatory oversight of the former North Pole Refinery sulfolane, petroleum, and per- and polyfluoroalkyl substance (PFAS) plumes. Groundwater monitoring is performed under DEC oversight every year to track changes in the sulfolane plume off the former refinery property and in the sulfolane and petroleum plumes on the former refinery property. Results are reported annually and posted on the project web page's Maps pages and Documents pages.

I live in the sulfolane and PFAS plume and recently connected to city water. Why does DEC advise against using my well water for watering my yard or washing my car?

- Using your well for purposes such as watering your lawn or washing your car brings contaminated water to the surface and can disperse the chemicals, allowing them to run off your property and on to uncontaminated areas or nearby surface water.

- To avoid spreading contamination to places where people or wildlife might be exposed, DEC is seeking community assistance in stopping the spread of contamination from untreated, contaminated groundwater use. See DEC's Groundwater Advisory, issued November 2018, page 8.

What is sulfolane and what do we know about its health effects?

- **Sulfolane** is an industrial solvent used primarily in natural gas and petroleum refining.
- No studies have looked for health effects in people who have been exposed to sulfolane. Most of what we know comes from studies in which laboratory animals were exposed to high levels of sulfolane for short periods of time. High levels of sulfolane (much higher than what has been measured in the groundwater off the former refinery in North Pole) were shown to affect the central nervous system, immune system and the liver, kidneys, and spleen of test animals. Animal studies suggest that sulfolane at very high levels may cause developmental and reproductive problems in mice.
- No long-term, or chronic, studies in animals to determine if sulfolane might cause cancer have been published. Research began in May 2015 by the National Toxicology Program (NTP) to evaluate the effects of long-term exposure to sulfolane. The NTP is an expert interagency program, housed within the United States Department of Health and Human Services, that evaluates the toxicity of chemicals of public health concern.

What is PFAS and what do we know about the health effects?

- Per- and polyfluoroalkyl substances (PFAS) are a large and complex class of human-made compounds that have a wide-range of toxicities. They are found in some firefighting foams and many consumer products. Some animal studies show health effects from PFAS exposure, but human health studies are less conclusive.
- Scientists are still learning about the health effects of long term PFAS exposure. Although more research is needed, studies conducted in highly exposed communities have shown that certain PFAS may have effects on the:
 - **Gastrointestinal System**
Ulcerative colitis (an inflammatory bowel disease that causes inflammation in the digestive tract)
 - **Liver**
Liver damage, abnormal fat metabolism, high cholesterol
 - **Kidney**
Kidney cancer and chronic kidney disease
 - **Cardiovascular system**
High blood pressure in pregnant women
 - **Immune system**
Decreased response to vaccines
 - **Reproductive system**
Testicular cancer and decreased fertility
 - **Endocrine system**
Thyroid disease

- **Development**
Reduced birth weight
- For more information on the toxicity of PFAS, see the following:
 - DEC's PFAS webpage: <https://dec.alaska.gov/spar/csp/pfas/>
 - Alaska Department of Health and Social Service's PFAS page: <http://dhss.alaska.gov/dph/Epi/eph/Pages/PFAS.aspx>
 - U.S. Environmental Protection Agency's Per- and Polyfluoroalkyl Substances (PFAS) page: <https://www.epa.gov/pfas>
 - Agency for Toxic Substances & Disease Registry (ATSDR) page on Perfluoroalkyls: <https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=237>

How is the public protected from potential exposure to contaminated groundwater?

- The public in the affected area has been provided access to alternative drinking water solutions and recently has had the opportunity to connect to the North Pole municipal water system. Starting in 2009, alternative water supplies were provided to all properties with any detection of sulfolane in the water. Sampling conducted in 2018 showed the alternative water solutions provided for protection from sulfolane were also protecting residents from PFAS in their well water. In February 2017, the State of Alaska, FHRA, and the City of North Pole reached a settlement agreement to expand the City's piped water system to all improved properties located within the sulfolane plume or in its anticipated migration path. Implementation of the expanded piped water system is expected to be complete by the end of 2020 and will provide permanent protection from contamination in drinking water.
- For more information about the piped water expansion project and use of well water within the expansion area, see:
 - the City of North Pole's web page, <https://www.northpolealaska.com/utilities>
 - DEC's Groundwater Advisory, issued November 2018, page 8

Should I use my well water for fruit or vegetable gardening?

- Within the sulfolane plume, DHSS recommends using a clean, alternative water source for growing fruits and vegetables. In addition, DEC issued a Contaminated Groundwater Advisory to all property owners within the North Pole piped water expansion area where many private water wells contain sulfolane and/or PFAS. In its Groundwater Advisory, DEC advises against using untreated, contaminated well water after a property is eligible for connection to the water utility service to reduce spreading pollution and eliminate human exposure. See DEC's Groundwater Advisory, issued November 2018, page 8.
- Plants irrigated with contaminated water or grown in contaminated soil have been shown to take up some PFAS from the surrounding environment. The amount of PFAS taken up by fruits and vegetables will vary based on the severity of the PFAS contamination, the type(s) of PFAS in the water and/or soil, and the type of produce grown. Ultimately, the Alaska Department of Health and Social Services has indicated exposure to PFAS through produce is not likely to be substantial compared to other exposure routes, like drinking contaminated water. Furthermore,

the health benefits of eating fresh produce generally outweigh the risks associated with PFAS exposure from plants.

- Two studies have been conducted to look at the uptake of contaminants in fruits and vegetables grown in the North Pole area:
 - Uptake of Sulfolane in Locally Grown Produce - In 2010, produce was sampled from North Pole gardens that used sulfolane-impacted well water for watering. The results were based on the testing of 23 types of plants from seven North Pole gardens. Results affirmed that some edible garden plants retain sulfolane from contaminated well water. Sulfolane levels in produce varied depending on the type of plant and part of the plant tested. DHSS recommends using a clean, alternative water source for growing fruits and vegetables.
 - More information is available on the fact sheet: Final Results of the North Pole Garden Sampling Project, 2011, available on DEC's website's Documents page, <https://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents/#factsheet>
 - Uptake of PFAS in Locally Grown Produce – In 2018, DEC evaluated the uptake of PFAS into garden produce irrigated with PFAS contaminated groundwater. Water from a well at a local North Pole farm was found to contain PFOA and PFOS at a total of 16 parts per trillion (ppt). DEC collected samples from 14 types of fruits and vegetables. The study found that some PFAS can be taken up and accumulate in fruits and vegetables irrigated with water containing PFAS. DHSS determined the hazard associated with exposure to PFAS through eating vegetables and strawberries grown at the local farm is negligible.
 - Results of this evaluation are summarized in PFAS in North Pole produce fact sheet, at <https://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents/pfas-produce-fact-sheet/>

Is it safe to eat fish caught in Kimberly Lake?

- Three rainbow trout from Kimberly Lake, north of the former former-NPR, were collected and submitted to a commercial laboratory for PFAS analysis in 2018. All three fish were found to contain elevated levels of two PFAS: PFOS and PFNA. Kimberly Lake has been closed to fishing since April 2019 by the Alaska Dept. of Fish & Game (ADF&G) because of PFAS levels found in fish. The ADF&G released an emergency order closing Kimberly Lake to sport fishing.
 - See the fact sheet on PFAS found in Kimberly Lake Fish: <https://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents/pfas-fact-sheet-fish-kimberly-lake/>
- No other gravel ponds in the North Pole area have been investigated for the presence of PFAS in surface water or fish. Other surface water bodies on Eielson Air Force base have been sampled and found to contain PFAS, and some fishing restrictions have been implemented (see <https://dec.alaska.gov/spar/csp/sites/eielson/>). DEC is currently working with responsible parties to evaluate additional ponds associated with the former North Pole Refinery, and in greater North Pole area.

- In 2013, Badger Slough and seven gravel ponds, including Kimberly Lake, were sampled for sulfolane. Sulfolane was not detected in any of the surface water samples. Sulfolane is known to degrade readily in environments with an adequate supply of oxygen, like gravel ponds.

What is the status of the City of North Pole's expanded public water system?

- The City of North Pole expanded their piped water system to provide permanent protection from contamination in drinking water. By the end of 2020, all affected community members will have been able to connect to the service, phasing out the use of contaminated groundwater wells. DEC considers a public water system to be the best way to provide clean drinking water to those affected by contamination in groundwater, now and into the future, and encourages eligible residents to connect to piped water. The latest information available from the city about the piped water expansion project, including maps of the expansion area, may be found at the City of North Pole's web page <https://www.northpolealaska.com/utilities>

How can I find out if the home or apartment I am renting is connected to city water?

- The latest information available from the city about the piped water expansion project, including maps of the expansion area, may be found at the City of North Pole's web page <https://www.northpolealaska.com/utilities>

I have recently connected to the City of North Pole's expanded piped water system. What am I advised to do with my water well?

- DEC advises against using untreated, contaminated well water after a property is eligible for connection to the water utility service.
- To avoid spreading contamination to places where people or wildlife might be exposed, DEC is seeking community assistance in stopping the spread of contamination from untreated, contaminated groundwater use.
 - If you wish to use your well water, treatment is an option to remove both sulfolane and PFAS from well water. DEC is available to provide guidance on this question. Contact DEC at 907-451-2117 or james.fish@alaska.gov for further assistance.

I live outside the area served by the City of North Pole's piped water system. What should I do if I am concerned about contamination in my water well?

- Sulfolane groundwater monitoring is performed under DEC oversight every year to track changes in the sulfolane plume. Maps of groundwater sulfolane concentrations are updated annually and posted on the project website's Maps page.
- For PFAS, plans are under development for future sampling to be performed under DEC oversight. The current understanding (2018) of PFAS in groundwater is shown on the 2018 offsite PFOS + PFOA plume map, available on the website's Maps page.
- If you are concerned you may have sulfolane or PFAS in your well water, DEC has prepared fact sheets to provide step-by-step advice for testing your water. These are available on the project's

website on the Documents page. DEC recommends you contact Brian Englund at (907-269-7526) or the Contaminated Sites Program at (907-451-2143) if you have any questions about testing.

How can the public stay informed?

- DEC's website on contamination from the former North Pole Refinery, now Marathon Terminal, remains the best way to learn about the extensive investigation, monitoring, and cleanup efforts at this site.
 - dec.alaska.gov/spar/csp/sites/north-pole-refinery
- The City of North Pole now provides a permanent source of sulfolane-free water to residents, land owners and businesses in the areas where groundwater has been contaminated by sulfolane and/or PFAS. If you have questions, please contact those listed below.

Contact us with questions:

The City of North Pole (owner of the public water system to serve the impacted area)

Bill Butler, Director of City Services
907-488-8593, bill.butler@northpolealaska.org

State of Alaska:

DEC Contaminated Sites Program (provides regulatory oversight on contaminated sites)

DEC's Spill Prevention and Response Division, Contaminated Sites Program
Jim Fish, Project Manager
907-451-2117, james.fish@alaska.gov

DEC Public Water Systems (provides regulatory oversight of public water systems)

DEC, Division of Environmental Health, Drinking Water Program
Cindy Christian, Program Manager
907 451-2138, cindy.christian@alaska.gov

Dept. of Health & Social Services (provides health-related recommendations and information)

DHSS Division of Public Health
Sarah Yoder, Public Health Specialist
907-269-8054
sarah.yoder@alaska.gov



Contaminated Groundwater Advisory North Pole Piped Water Expansion

The Alaska Department of Environmental Conservation (ADEC) is providing this contaminated groundwater¹ advisory to property owners within the North Pole piped water expansion area. Some private water wells within this area draw groundwater that has been contaminated by sulfolane and/or per- and poly-fluoroalkyl substances (PFAS). This Advisory explains precautions to help residents avoid unintentional contact with or spreading of contamination.

Description of Contamination: Releases of sulfolane at the former North Pole Refinery contaminated the groundwater throughout much of the City of North Pole and beyond the city boundaries. The sulfolane contamination affects many residents, homeowners, and landowners and is expected to remain in the groundwater for many years. The area of groundwater carrying sulfolane is approximately 2 miles wide, 3.5 miles long and over 300 feet deep. The sulfolane plume is not static. It continues to gradually migrate towards the north-northwest, and contaminant concentrations in groundwater wells may change over time.

The State has recently determined that historical releases of PFAS (chemicals used in some fire-fighting foams) at the former North Pole Refinery have also contaminated some of the groundwater in the North Pole area. Groundwater sampling is ongoing, and the extent of PFAS pollution has not yet been delineated.

Water Use Advisory: ADEC advises eligible property owners to connect to the expanded water utility service.

- The 2017 settlement agreement between the State of Alaska, Flint Hills Resources, Alaska (FHRA), and the City of North Pole will extend the city's piped water system to include the area currently impacted by sulfolane along with areas expected to be impacted in the future.
- Connecting to water utility service will protect the owner and anyone else on the property from any health effects that could be caused by exposure to contaminated well water.

ADEC similarly advises against using untreated, contaminated well water after a property is eligible for connection to the water utility service.

- Ceasing use of untreated, contaminated well water reduces spreading the pollution and eliminates human exposure. The sulfolane plume is not static. Concentrations in wells can change over time, and the extent of PFAS pollution in the groundwater is still uncertain. Understanding of the toxicity of these chemicals is also still evolving, with long-term toxicity studies on sulfolane pending and new cleanup levels for PFAS recently proposed. To best prevent spreading these chemicals to places where people might be exposed to them, ADEC is seeking community assistance in ceasing spread of chemicals from untreated, contaminated groundwater use.
- To avoid spreading the contaminants and help the community minimize additional impacts, owners are advised to cease future use of their existing well and to not construct new wells unless concentrations of sulfolane and PFAS are below levels of concern. ADEC is available to help owners with this determination and will provide guidance at the December 5, 2018 Open House.

Monitoring: Groundwater samples are being collected periodically (generally annually) from some private water wells to track movement of the contamination. ADEC may request access to your water well by the State of Alaska, FHRA, Williams Alaska Petroleum, Inc., and/or agents acting on their behalf for purposes of collecting groundwater samples and monitoring the groundwater contamination. Monitoring parties will always notify you prior to the desired sample date and work with you to sample during mutually agreeable times.

For additional information, please contact ADEC at 907-451-2143.

¹ The term, groundwater, refers to water stored under the surface of the ground in the tiny pore spaces between rock, sand, soil, and gravel. The term, well water, refers to groundwater that is obtained through a supply well.