Sulfolane Investigation Update

Provided by the Technical Project Team to inform the North Pole community on recent developments in the investigation and remediation of soil and groundwater contamination related to the North Pole refinery.

February 2013

DEC announces sulfolane cleanup level

Ongoing remediation efforts in North Pole now have a clear target following DEC's establishment of 14 parts per billion (ppb) as the cleanup level for sulfolane-contaminated groundwater.

The announcement is a major milestone in the Technical Project Team's efforts to clean up the plume discovered more than three years ago underlying the North Pole refinery and surrounding areas.

"From the first time sulfolane was detected at Flint Hills, all parties have been uncertain as to a protective target level," said Ann Farris, the outgoing TPT project manager. "Saying 'nondetect' or zero means nothing when laboratories have different limitations on how low they can detect the chemical.

"Setting a regulatory limit drives the laboratory techniques and provides a defensible, legal basis for DEC's oversight of the cleanup at the North Pole refinery and for regulating the industry," she said.

A view of Flint Hills Resources' North Pole refinery property last September. (FHR photo)

Local impact

Farris said affected North Pole residents won't notice an immediate impact from the new cleanup level. But in the long term, that critical regulatory guide will be key to ensuring ongoing cleanup efforts are successful.

Additionally, Flint Hills Resources spokesman Jeff Cook confirmed the company doesn't anticipate any changes to its water supply programs in 2013.

How the cleanup level is set

In Alaska, groundwater cleanup levels are set for a number of chemicals with known toxicity values.

Sulfolane, however, is a rather obscure chemical compound about which a lot is still unknown. Alaska regulations did not contain cleanup levels for sulfolane. In those situations, regulators use a scientific formula to calculate the safe

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EPA ponders future course of action at refinery

The Environmental Protection Agency continues to evaluate findings of a Preliminary Assessment it conducted over the past two years at Flint Hills Resources' North Pole refinery.

Once completed, the evaluation, along with ongoing consultations with DEC, will help the federal agency determine what it considers the best approach to further investigation and remediation of sulfolane-contaminated groundwater underlying the site and surrounding areas.

At that point, the EPA may choose to exercise jurisdiction over the project, or defer to DEC's continued management of the effort it has successfully pushed forward since the contamination was discovered in late 2009.

Brandon Perkins, EPA Region 10 Site Assessment manager, said recently that his agency has not yet made a jurisdiction decision, and it does not have a specific timeline for issuing one.

In an Aug. 7, 2012, letter announcing EPA's completion of the Preliminary Assessment, or PA, and the issuance of its report, Perkins noted that:

> *"… there has been substantial work completed already. Throughout the PA process EPA engaged in conversations with ADEC to further understand groundwater contamination issues related to the refinery as well as their current actions and future plans to investigate and address sulfolane contamination within North Pole groundwater. It is our understanding, since the discovery of sulfolane in North Pole drinking water in 2009, ADEC has made significant progress in delineating the extent of the sulfolane plume, minimizing exposure to sulfolane contaminated groundwater, and is working towards determining potential actions for addressing and remediating contamination related to the site. In addition, ADEC has been working to develop appropriate public health action levels."*

Tamara Cardona, the new TPT project manager, said DEC is scheduled to meet again with the EPA in February to discuss the project and bring the agency up to date on recent developments.

Once that happens, the two agencies will discuss future coordination to continue effective oversight of the investigation and cleanup.

From the PM's Desk

I'd like to introduce the new DEC contaminated sites project manager, Dr. Tamara Cardona.

After four years of overseeing this work, it's time for me to step down and pursue other interests. March 8 will be my last day on the project, but Dr. Cardona has already stepped into the lead at the Jan. 8 Technical Project Team meeting in Fairbanks.

The North Pole Refinery site continues to be the top priority for DEC's Contaminated Sites Program. Dr. Cardona brings fresh energy and an exceptional background in environmental cleanup to the project. I have the utmost confidence in her ability to doggedly pursue an aggressive cleanup at the site and continue to provide the most robust oversight of the industry possible.

During the transition, Tamara and I will work closely together to make sure nothing falls through the cracks. Both Flint Hills Resources, the current owner and operator of the refinery, as well as Williams, Inc., the previous owner and operator, will continue to be held accountable for investigating and cleaning up their releases and making sure there is a clean water supply for the community until the groundwater can be restored to safe levels.

As you will read in this newsletter, DEC has set a scientifically defensible cleanup level that provides the legal basis to hold the companies accountable for the cleanup of the groundwater and supply of alternative water. We will continue to work with the Environmental Protection Agency to make sure the investigation and cleanup meets national CERCLA standards, and we will continue the ongoing investigation for other chemicals to ensure no stone has been left unturned.

It's hard to walk away from this project when there is so much work still to be done, but I am leaving it in even better hands, and with the best technical resources available at the University of Alaska, EPA, within DEC's Contaminated Sites Program and other DEC programs, other State of Alaska departments, and with DEC's expert technical consultants.

Sincerely,
Ann Farris
Outgoing TPT Project Manager

Note: CERCLA stands for the Comprehensive Environmental Response, Compensation and Liability Act, enacted by Congress in 1980. Among other things, this law is the basis for the federal government's program to clean up uncontrolled hazardous waste sites, and respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

When I first moved to Alaska from the East Coast, I was overwhelmed by the welcoming demeanor of the Interior Alaska community. Almost seven years later, I continue to be impressed every day by the people around me and their small acts of commitment to the welfare of our community and the environment.

Ann Farris is one of those people who have impressed me. She has been unconditionally committed to this project and the safety of the North Pole community for four years. She has been successful in building a Technical Project Team that works together for a common goal, despite the many challenges that have emerged throughout the process.

Coming into this position, I am aware I have very big shoes to fill. But I am a firm believer that perseverance and commitment are keys to achieving our goals. My goal is to continue on Ann's path – a path dedicated to the well being and safety of the people of North Pole, and to the protection of the environment in the North Pole community. I am excited to be part of the TPT and am devoted to following the footsteps Ann has carefully traced for me.

Please don't hesitate to contact me with any questions or concerns you may have. I will do my best to answer them for you or find someone else who can.

I look forward to working with you and the rest of the North Pole community. See you at the Open House!

Sincerely,
Tamara Cardona
TPT Project Manager

North Pole Open House on Sulfolane

Wednesday, Feb. 20 • 5:30–7:30 p.m.
in the North Pole Plaza Mall

The Technical Project Team overseeing the investigation and remediation of the sulfolane groundwater plume in North Pole is hosting an open house to update the community on the project and answer questions.

For more information, call DEC at (907) 451-2182.

The investigation continues at the refinery

While DEC and Flint Hills Resources continue their efforts to investigate and clean up sulfolane-contaminated groundwater, they're also running a parallel testing regimen for other Contaminants of Potential Concern, or COPCs, to ensure no other contaminants are present.

It's standard procedure that once contamination has been identified at a site, additional testing is done to ensure other types of contamination related to site operations aren't present as well, said Jane Paris, head of the Technical Project Team's Site Characterization subgroup. Paris is a DEC contractor with ERM Alaska, Inc. (formerly Oasis Environmental).

She said contamination at oil and gas facilities spurs scientists to look for a certain range of chemicals known to be associated with these operations, including fuel, fuel constituents, chemicals used in the refining process, and waste products from the refining process. Those typically make up the initial list of COPCs investigators look for.

FHR consultants also reviewed past spill records to determine whether any chemicals might potentially persist from past known spills at the North Pole site. If so, they were added to the COPC list for testing.

Finally, DEC and FHR looked at the actual refinery site and the operation to determine whether any situational considerations warranted investigating for other COPCs. This step identified an active fire training area on the property where contamination from long-chain perflourinated compounds, or PFCs – man-made chemical compounds – was considered a possibility due to past use of fire-fighting foam at that location.

Once the site was identified, DEC hired an expert in that field to advise the TPT. PFCs are a set of chemicals DEC is just now beginning to consider at contaminated sites based on new information being published by the Environmental Protection Agency.

COPC findings

"Sulfolane is the only contaminant detected to date in groundwater off of refinery property," said Max Schwenne, a senior TPT advisor, and also a DEC contractor with ERM Alaska, Inc.

A field technician performs groundwater sampling from a monitoring well at Flint Hills Resources' North Pole refinery last month. (FHR photo)

He said other contaminants of concern such as fuel and fuel constituents, like benzene, are present in groundwater and soils at the facility. However, extensive monitoring work has shown those chemicals are not leaving the property boundaries. Work is ongoing to identify and remediate the fuel, and explore further alternatives to accelerate that process as appropriate and feasible.

Until recently, sulfolane had been the only major contaminant identified in addition to standard petroleum constituents, Schwenne said. Over several years of testing, no other COPCs had been identified at levels exceeding regulatory guidelines, and the only ones still being looked at were sulfolane degradation byproducts and intermediaries, he said.

Initial sampling for PFC contamination began in late 2012 and focused on the fire training area and its immediate surroundings within the refinery property. In December, Arcadis, an FHR contractor, reported to the TPT that some of the monitoring wells had tested positive. Those analytical findings were validated as accurate.

Based on those results, DEC asked that FHR conduct additional testing that widened the search area on refinery property in order to delineate further the extent of contamination.

Although the data collected has not yet been validated, Schwenne said preliminary results suggest that PFC contamination does not appear to be widespread and is not migrating off-site.

Tamara Cardona, the new TPT project manager, added that, "work will continue at an aggressive pace to confirm these findings and ensure nothing has been missed."

What are PFCs?

According to a Centers for Disease Control fact sheet, PFCs are man-made chemical compounds used in the manufacture of products that resist heat, oil, stains, grease and water.

Examples of their end use include non-stick cookware, stain-resistant carpets and fabrics, coatings on food packaging, as components of fire-fighting foam, and many other industrial applications.

Future actions

"We're awaiting confirmation [validation] of the final results of the second round of testing," said Ann Farris, the TPT's outgoing project manager. "Once received, we'll be in a better position to determine our next course of action, but the investigation will continue until we can be assured that nothing has been missed on-site or off-site."

Pilot testing shows air sparging removes sulfolane

Flint Hills Resources has concluded pilot testing of the air sparge system discussed in the last issue of this newsletter (September 2012). Its 2012 air sparge pilot test demonstrated that air sparging is an effective technology for treating sulfolane-impacted groundwater.

Based on the positive results observed, FHR now plans construction of a complete on-site air sparge system in 2013. The new system, if DEC approves it, will provide an additional remedial barrier beyond the groundwater extraction system to further minimize future migration of sulfolane off-site.

Plans call for the air sparge system to span the on-site width of the sulfolane plume. The spacing of its 38 wells was determined based on findings of the 2012 air sparge pilot test and the project team's extensive experience with those types of systems in similar geologic settings.

Air flow and pressure testing will be completed to confirm the design of the air sparge system. Performance will be monitored and based on a reduction of sulfolane concentrations in groundwater downstream of the system, while levels of oxygen in groundwater around the system wells are observed. Optimization of system operation will be ongoing to ensure maximum efficiency in removing sulfolane.

The granular activated carbon, or GAC, system installed in 2011 has now been on line for more than a year and continues to function as expected. In 2012, the system was tested monthly with results showing sulfolane removed to below detection limits. The system effectively treated 188.3 million gallons of water in 2012.

In addition to the on-site efforts, FHR will also conduct a fourth round of residential well testing beginning in April focusing on homes near the boundary of the plume area that have tested non-detect in the past. As in the previous rounds, Shannon and Wilson Inc., FHR's subcontractor, will call homeowners to schedule an appointment for the testing.

– Flint Hills Resources

Cleanup Level, *Continued from Page 1*

cleanup level.

"The formula is a bit complex, but basically hinges on two important unknowns: sulfolane's toxicity value and the potential for exposure to sulfolane that was assessed in the risk assessment," said Stephanie Buss, a toxicologist with TPT's Toxicology subgroup. Buss is a DEC contractor with SPB Consulting.

Of the two unknowns, determining sulfolane's toxicity value was by far the most challenging, she said.

That's because state law mandates that when calculating the formula, regulators must use the contaminant's toxicity value as listed in the Environmental Protection Agency's Integrated Risk Information System (IRIS) database, when available. Since that database currently only lists the 550 most common contaminants, no such value existed for sulfolane.

When an IRIS value isn't available, state law then requires the use of the EPA's Provisional Peer Reviewed Toxicity Value (PPRTV) instead. Again, owing to sulfolane's relative obscurity, EPA had never established a PPRTV for sulfolane.

That prompted DEC to formally request that the EPA review sulfolane toxicity and set a PPRTV value, if possible, Buss said.

After more than a year of research and study, it did so early last year.

Concurrently, Flint Hills conducted a risk assessment that determined human exposure pathways were primarily ingestion of groundwater and ingestion through eating plants grown using groundwater.

The result

Once the EPA set the PPRTV and results of the risk assessment were available, DEC used the formula to determine that the cleanup level for sulfolane in groundwater should be 14 ppb.

"This new cleanup level is protective of human health, both in terms of drinking water and ensuring the groundwater is safe to use for gardening and other general purposes," Farris said.

"DEC is confident this cleanup level incorporates the best available toxicity data with protective assumptions about possible current and future exposure to provide a protective, legal basis for cleanup and enforcement at the site," she said.

Moving forward

Farris said that DEC continues to monitor the ongoing National Toxicity Program sulfolane toxicity studies currently being conducted and will incorporate the NTP's findings as more information becomes available.

Project Contacts

DEC, Spill Prevention and Response Division, Contaminated Sites Program
Tamara Cardona, environmental program specialist and TPT project manager
(907) 451-2192, tamara.cardona@alaska.gov

DHSS, Division of Public Health, Epidemiology Section
Nim Ha, health educator
(907) 269-8028, nim.ha@alaska.gov

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

Flint Hills Resources
Marisa Sharrah, Koch Companies Public Affairs
(907) 488-5103, marisa.sharrah@kochps.com
Jeff Cook, Koch Companies External Affairs
(907) 488-5104, jeff.cook@kochps.com

City of North Pole
Mayor Bryce Ward
(907) 488-8584, mayor@northpolealaska.com

Fairbanks North Star Borough
Mayor Luke Hopkins
(907) 459-1300, mayor@co.fairbanks.ak.us

dec.alaska.gov/spar/csp/sites/north-pole-refinery