

Crude Oil Contamination in the Shallow Subsurface—Bemidji, Minnesota



Aerial view of surface oil contamination from the pipeline rupture at the Bemidji Crude Oil Spill Research Site, Minnesota (circa 1979). Much of the black area was caused by oil spraying from the rupture.

This investigation provides the science needed to understand how to economically and effectively minimize the health risks due to environmental exposures caused by fuel and oil spills in the United States.

This long-term investigation has provided an understanding of the mobilization, transport, and fate of crude oil in the shallow subsurface following accidental releases to understand the time-frame required for natural attenuation. Understanding processes and properties controlling the fate, transport, and natural attenuation of petroleum products following a spill are important to understanding the actual versus perceived risks to humans and other organisms through exposure to the contaminants associated with the spills.

The foundational work for this investigation was accomplished at the U.S. Geological Survey (USGS) [Bemidji Crude-Oil Spill Research Site](#), Minnesota. This site was ideally suited for the initiation of the investigation because a pipeline rupture in 1979 contaminated a shallow aquifer providing a unique opportunity to study a contaminant plume where the location, amount, and timing of the spill were precisely known.

News

[Cyclical Mobilization and Attenuation of Naturally Occurring Arsenic in an Underground Petroleum Plume](#)

Scientists found that naturally occurring arsenic in aquifer sediments was mobilized into groundwater and attenuated through reattachment to sediments within an underground petroleum plume. Understanding these patterns identifies anthropogenic factors that affect arsenic presence and magnitude in groundwater. ...

[Program Scientist Receives Meritorious Service Award](#)

Dr. Isabelle M. Cozzarelli received the U.S. Department of Interior's second highest honorary award—the Meritorious Service Award—for her numerous contributions to understanding the biogeochemical controls of contaminant degradation in groundwater and near-surface environments. ...

[U.S. Geological Survey Identifies Crude-Oil Metabolites in Subsurface Plumes](#)

USGS scientists studying two subsurface crude-oil spill sites in Minnesota measured concentrations of oil breakdown products (metabolites) at greater concentrations than parent compound concentrations. ...

MORE SCIENCE FEATURES

Publications

Bibliography

Access to all publications from this investigation.

New Publications

- [Field-scale observations of a transient geobattery resulting from natural attenuation of a crude oil spill](#): Heenan, J.W., Ntarlagiannis, D., Slater, L.D., Beaver, C.L., Rossbach, S., Revil, A., Atekwana, E.A., and Bekins, B., 2017, *Journal of Geophysical Research--Biogeosciences*, v. 122, no. 4, p. 918-929, doi:10.1002/2016JG003596.
- [Effects of crude oil on water and tracer movement in the unsaturated and saturated zones](#): Delin, G.N., and Herkelrath, W.N., 2017, *Journal of Contaminant Hydrology*, v. 200, p. 49-59, doi:10.1016/j.jconhyd.2017.03.007.
- [The role of alluvial aquifer sediments in attenuating a dissolved arsenic plume](#): Ziegler, B.A., Schreiber, M.E., and Cozzarelli, I.M., 2017, *Journal of Contaminant Hydrology*, doi:10.1016/j.jconhyd.2017.04.009 (In Press, Corrected Proof).



U.S. Geological Survey (USGS) scientists collecting a groundwater sample from a well at the USGS Bemidji Crude-Oil Spill Research Site, Minnesota. The scientists monitored in real time the dissolved oxygen, pH, specific conductance, and temperature of the water as the well is pumped so they can know when to collect a representative sample. Photo Credit: Jared Trost, USGS

Multimedia

Photo Gallery

A collection of photos illustrating this investigation's activities.

More Information

More Information on this Investigation

The Bemidji research team maintains it's own home page that contains additional information.

Connect

For more information please contact:

- [Jared Trost](#), USGS [Minnesota Water Science Center](#)
- [Barbara A. Bekins](#), USGS [National Research Program](#)

[Back to Toxic Substances Hydrology Program Investigations Index](#)

[U.S. Department of the Interior](#) | [U.S. Geological Survey](#)

Page Content Contact Information: webmaster@toxics.usgs.gov