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(Listed alphabetically by senior author's last name)

**ARSENIC USAGE IN U.S. OILFIELDS, 1930S-1970S:
FORGETTING AND REMEMBERING OILFIELD
WASTE HISTORY**

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American Petroleum Institute publications from 1998 and 2011 on arsenic sources, fate, and transport at petroleum industrial-impacted sites failed to list once-common arsenic corrosion-inhibitor usage as a potential source. In 2015, an environmental company's emergency pit cleanup plan to the Louisiana Office of Conservation stated that the pit's groundwater was expected to exhibit natural arsenic background characteristics (up to 0.12 ppm), although a known 1955 public document stated that an arsenic corrosion inhibitor was circulated in the produced water of this site. No matter why such incomplete documents are generated, one thing is certain—accurate oilfield history records and stories are more threatened when those topics are part of modern litigation. Oilfield arsenic is an example of lost and found history. Old patents, dusty books, forgotten technical articles, litigation records and obscure regulatory cleanups are the saviors of this history.

Arsenic was first used in a Michigan oil well in 1932 as a corrosion inhibitor in a hydrochloric acid (HCL) job. The common 15% HCL acid job that we know today was derived from decades of associated arsenic inhibitor usage (2,000 ppm of sodium arsenite, 58% arsenic) that was not effective in HCL concentrations over 17%. By the early 1960s, low-temperature acid jobs switched to exclusively organic inhibitors, and all arsenic acid-job usage was phased out by the mid-to late-1970s. The second oilfield arsenic usage type was for production equipment exposed to corrosive produced water. This usage extended from 1949 into the early 1970s. Variations included: 1) introducing arsenic (up to 50 ppm dissolved arsenic) either in the wellbore or at the surface and circulating it in the produced water flow system, and 2) placing brine with dissolved arsenic (1,000 ppm dissolved arsenic documented) into temporarily-abandoned wells. W-41, patented in the early 1950s by Standard Oil of California (Chevron), is the most publically-documented arsenic corrosion inhibitor. The author has found two major oilfield usages described in public clean-

up records, Elk Hills Field of California and Lake St. John Field of Louisiana, yet old publications indicate arsenic use was more widespread. Cleanup of an old Dowell acid-mixing facility in Hays, Kansas, also documents arsenic usage and spillage.

**THE IMPACT OF DRAKE'S DISCOVERY ON MAPS
OF THE EARLY PENNSYLVANIA OIL REGION**

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Prior to August 27, 1859, most maps of northwestern Pennsylvania were just a general overview of the towns, rivers, and of the few roads that existed then. But almost immediately after Edwin Drake and his driller, "Uncle Billy" Smith, discovered oil in their well on August 27, 1859, more detailed maps were necessary to keep track of who owned which tract of land, who had drilled what well, and where the wells were located. The map scales changed so these details could be shown on reasonable sized reproductions.

The name Charles C. Smith, a surveyor from Painesville, Ohio, is on several of the maps from the early 1860s which show detail information about the various wells and land ownership in the region, but little is known about him. In 1865 a Mr. James Miller of New York City published a map of the oil region to accompany his publication, *The Derrick and Drill*, which had details of some of the local oil farms (oil fields) as well as location of various petroleum businesses.

But the greatest of these, however, was published by Frederick W. Beers and Company, also in 1865. Frederick W. Beers (1839-1933) was a cartographer in New York City who specialized in large-format atlases (18.75 x 15.5 inches/50 x 39 cm) of regions mostly in the Northeastern United States. The *Atlas of the Oil Region of Pennsylvania* was based on surveys made in the region by several of Frederick Beers' associates and included more than 40 pages of maps. The Atlas is more than just a collection of maps because it also included "Historical Facts," "Scientific Facts," "Commercial Facts," as well