

Fact Sheet: Produced Water Ponds and Air Quality

What We Know

Produced water ponds are used in oil and gas fields to store and dispose of wastewater that comes up during well completion and production. This water can contain oil, salts, and other chemicals from underground. Research shows that some of these chemicals can evaporate into the air from the ponds. These emissions contribute to air pollution in the Uinta Basin.

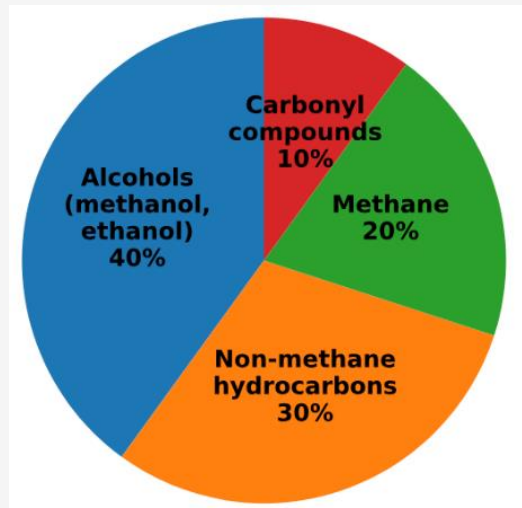
What are Produced Water Ponds?

- Produced water contains methane and other hydrocarbons, salts, and minerals from underground petroleum reservoirs, as well as chemicals such as alcohols that are added during industry operations.
- After it is brought to the surface during well completion and production, produced water is typically stored in tanks at well sites. When those tanks are full, the water is transported by truck either to facilities where it is injected back into the reservoir it came from or to facilities that contain ponds for storage and evaporative disposal. Prior to entering ponds, oil is often removed from the water by gravity separation, but this separation is incomplete.
- Less than 10% of Uinta Basin produced water is disposed of by evaporation. Most is reinjected into the geologic reservoir it came from or recycled for hydraulic fracturing.

How Produced Water Ponds Impact Air Quality

When produced water is exposed to the atmosphere, hydrocarbons and alcohols (part of a group of chemicals referred to as Volatile Organic Compounds, or VOC) evaporate into the air. During winter, the basin's geography and weather conditions can trap pollution from these and other sources near the ground and allow for the formation of wintertime ozone, which impacts respiratory health, especially for those with asthma and other lung conditions.

- The pie chart at right shows the different types of VOC emitted from a typical produced water disposal facility. Some of these compounds and compound groups can be directly hazardous to human health, but levels beyond the oil facilities' fencelines are generally too low to be a direct health concern. The main health concern from produced water-related pollution is its contribution to wintertime ozone.
- Other activities at disposal sites, including oil-water separation, also emit VOC.



Quantifying Emissions

- VOC emission rates from produced water vary widely depending on temperature, wind conditions, pond surface area, the time since the water was brought to the surface of the pond, and the chemical composition of the produced water. Also, all available methods for measuring emissions from open water surfaces are subject to significant error.
- The Bingham Research Center has used several different methods to directly measure emissions from produced water ponds. Some regulatory agencies have used mass balance approaches, which generally result in higher emission estimates than direct measurements.
- The Bingham Center estimates that produced water storage and disposal contributes 4-14% of the total VOC pollution in the Uinta Basin. The mix of individual organic compounds emitted from produced water storage and disposal facilities is more reactive than most other oil and gas pollution sources. This means that, pound for pound, produced water pond emissions make more wintertime ozone than oil and gas pollution generally.

Information for Policy and Practice

✓ **Produced water ponds are an important source category in emissions inventories and regulation**, contributing an estimated ~4–14% of VOC emissions from oil and gas operations in the Uintah Basin. Their contribution to wintertime ozone is even higher, because produced water pond emissions are more reactive than typical oil and gas emissions.

✓ **Effective emission reduction strategies** include: (1) disposing of produced water by injection, rather than evaporation; (2) covering ponds used to store produced water prior to injection or use of that water in hydraulic fracturing; (3) centrifuging water before evaporative disposal, rather than utilizing gravity-based separation; and (4) routing vapors from covered ponds and other emission sources at facilities to combustors or flares.

✓ **The WYPEC model (developed by Bingham Research Center)** was developed from direct measurements of produced water emissions and provides a way to estimate emissions of individual compounds, considering pond conditions and meteorology. The model is freely available and approved for regulatory purposes in some states.

More Information

The **Wyoming Pond Emissions Calculator (WYPEC)** for estimation of emissions from produced water ponds is available at: <https://www.usu.edu/binghamresearch/data-access>.

The Bingham Research Center has authored **peer-reviewed publications** about [the nature and composition of produced water emissions](#), [comparisons of emissions measurement methods](#), [development of an emissions inventory for the Uinta Basin's produced water facilities](#), and [emissions from an oil-water separation vault](#). These and other technical reports involving produced water are available at: <https://www.usu.edu/binghamresearch/papers-and-reports>.

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