

Addition of Pond/Landfill/Landfarm Emissions to the 2014 Utah Air Agencies O&G Emissions Inventory

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Utah Division of Air Quality (DAQ) in collaboration with EPA and the Ute Tribe recently developed the Utah Air Agencies 2014 Oil and Gas Emissions Inventory. Additionally Bingham Research Center at Utah State University Uintah Basin (USU) recently completed a study (Mansfield 2016) looking at the VOC emissions associated with oil and gas waste water facilities. During this same period of time, DAQ's air permitting section began completing the permitting process for oil and gas waste water facilities, as well as oil and gas landfill and landfarm facilities in the State. Combining the information from these three projects, it became evident that the Utah Air Agencies 2014 Emissions Inventory was missing wastewater and solid waste emission sources, and that this may be resulting in an exclusion of a large amount of VOC emissions from the inventory. As a result, DAQ began the process to incorporate these sources into the Utah Air Agencies 2014 Oil and Gas Emissions Inventory.

In an attempt to determine the best method to estimate emissions from wastewater facilities, DAQ met with researchers from USU as well as DAQ permit engineers to discuss different emission estimate approaches. USU utilized flux chamber measurements on various ponds throughout the basin, though they were required to keep the specific site measured anonymous. One big drawback from this measurement method is that USU was also unable to identify how recently new waste water had been added to the pond. The timing of this has a large effect on the amount of VOC volatilizing from the ponds; a measurement too long after a dump has occurred could mean that the majority of VOC has already been released to the atmosphere and would be much lower than a measurement taken soon after a dump. Additionally this method suffers from the artificial conditions introduced with a FLUX chamber, a semi-contained system, such as lack of wind flow; which also impacts the emission measurements.

Methodology

The emissions calculations method used by DAQ engineers, is the method used to calculate emissions from these facilities for air quality permits. The method is a mass balance approach where all inflows and outflows are accounted for. This method requires sampling to determine the amount of volatile material dumping into the ponds. DAQ recently worked to issue permits for six waste water pond facilities and was thus able to analyze collected samples from these facilities. These samples were used to develop an averaged lbs VOC/bbl emission factor both for higher emitting skim ponds and lower emitting evaporation ponds. One issue that will require further evaluation is that this method calculates total emissions for the product over the lifetime it takes that product to decay or volatilize. The time period for this process may exceed one year, however we are only trying to calculate the emissions of

the product over a one year period. Thus, there is a chance that we may be overestimating the emissions from the product for the year we are estimating emissions.

This is not an issue for the calculations involved in issuing an air quality permit, because they are looking to determine a potential to emit (PTE) emissions value, but in the case of an inventory where we are trying to determine actual emissions this may be inaccurate. However, research has shown that the majority of emissions from the types of product being dumped into a waste water pond decays or volatilizes within a very short time period (Mansfield 2016). Thus the potential over-calculation that may result from this method may be negligible. After exploring the different methodologies DAQ decided to utilize the mass balance method which it uses to issue air quality permits for waste water facilities.

There are a couple reasons DAQ selected this approach for the inventory calculation. First, it enables DAQ to maintain consistency across the Permitting and Planning Branches within DAQ. This should simplify the reporting and calculation burden for wastewater operators as they will not have to use different methods for calculating emissions for their air quality permits and for the tri-annual emissions inventory. Additionally, this method has the benefit of determining emissions using samples directly from the inlet stream which will provide more certainty that all emissions are accounted for and that no prior decay or volatilization occurs. Finally, DAQ has a better understanding of the facilities that these samples originated from and can better determine how representative they are of facilities across the basin, rather than relying on anonymized samples available from the USU method.

DAQ also utilized the emissions estimating method used for issuing air quality permits for solid waste disposal facilities including landfills and landfarms. This method, which is also a mass balance approach, also relies on samples taken from facilities in the Basin. The landfarm emission factor was developed using the same approach utilized by the State of Colorado, although bio-degradation controls, which are not widely used in Utah, are not included. The method accounts for 100% of GRO emissions and 60% of DRO emissions (C10-C28). The landfills emission factor was based on data from three landfill facilities; it was noted that these facilities only intermittently cap their landfills so an 80% rather than 100% control was included in the calculation. Additionally, no sampling information was provided for landfills with sludges, so theoretical data was used to account for these types of emissions. The emission factors developed with this method were lbs VOC/kg solid waste factors.

Application to the 2014 Inventory

In addition to determining the emissions calculation methods noted above. DAQ was also able to obtain throughput data for wastewater and solid waste facilities for 2014 from the Utah Division of Oil Gas and Mining (DOGGM). Using these throughput values in conjunction with the emission factors developed from the methods above, DAQ was able to determine a 2014 annual VOC emissions estimate for wastewater ponds (skim ponds and evaporation ponds), landfills and landfarms in the Uinta Basin. One complication to this method is the difficulty in determining what type of ponds existed at each specific wastewater facility. However, in discussion with DAQ permitting engineers, in prior years the use of skim ponds at these facilities was still relatively ubiquitous. It has only been in the last year or so, mostly due to the requirements associated with DAQ permits, that facilities have begun to move away from the

use of these ponds. For this reason, in DAQ's emissions estimate, all facilities are assumed to include a skim pond.

To verify adequate accounting for all applicable facilities in the inventory calculation, DAQ compared the dataset of wastewater and solid waste facilities from DOGM to one provided by USU and the Ute tribe. The datasets appear to confirm that the DOGM list utilized by DAQ is comprehensive to the best of our knowledge. There is still the potential that specific facilities or operators are missing from both lists, and the list likely excludes small ponds or solid waste sites that may be located directly at a well-pad. However, given the current data available to DAQ the list seems to be as comprehensive as is reasonably possible. The noted issues however, can be further resolved in the data request for the 2017 Air Agencies Oil and Gas Emissions Inventory.

For the 2014 Air Agencies Oil and Gas Emissions Inventory, DAQ estimated a total of $\approx 73,000$ TPY VOC from wastewater ponds, and ≈ 700 TPY VOC from solid waste disposal in the Uinta Basin (Uintah and Duchesne counties).

References

Mansfield, M., Lyman, S., and Tran, H.: RPSEA Final Report: Measurement of hydrocarbons and greenhouse gases from uncharacterized area sources, Bingham Research Center, Utah State University, 2016.