

Storage Tank Emissions Pilot Project (STEPP) in the Oil and Gas Producing Region of the Uinta Basin

Introduction

The Utah Legislature's 2016 budget includes a \$150,000 appropriation for the Utah Department of Environmental Quality (DEQ) to create a pilot program to screen for leaks of volatile organic compounds (VOC) primarily coming from the "thief hatch" on oil and gas-condensate storage tanks. DEQ proposes a partnership agreement with the Tri-County Health Department and the Bingham Entrepreneurship and Energy Research Center to carry out a field program to assess emissions that are not currently accounted for in the Division of Air Quality (DAQ) emissions inventory. Air quality scientists at DAQ are well positioned to develop and manage a pilot program that will build upon technology and experience already within the Division. This includes a tablet-based GIS application currently supported by a grant from the EPA, as well as the Google high-resolution imagery purchased by the State with a legislative appropriation last year. This project will also make use of DAQ's infrared cameras for observing natural gas leaks, and data from a new emissions inventory that is the result of a collaborative effort between DAQ and the Western Energy Alliance.



Figure 1. Example of an oil or gas condensate storage tank battery on site in the Uinta Basin.

In the current DAQ inventory, VOC emissions from oil and gas storage tanks (Figure 1) are estimated using factors for what are known as "standing, working and breathing" losses. According to these estimates, storage tanks for oil and gas-condensates account for a significant amount of total VOC emissions from oil and gas operations. Recent, independent estimating techniques done on a limited set of measurements within the Uinta Basin (Basin) have concluded that traditional estimation methods may be significantly underestimating these emissions. If this is the case, this underestimation is likely due to emissions coming from leaking equipment.

In a very limited and random number of cases DAQ, with the use of an infrared camera that can detect VOCs that are invisible to the naked eye, observed that the majority of tanks that they viewed had emissions coming from the thief hatch. Since these emissions should only be continually visible during some type of malfunction of the system, it indicates that this may be a significant source and should be analyzed further. For this reason, DAQ believes that an organized, methodical approach that will maximize the number of sites tested and categorize the results will provide definitive information about the potential underestimation of VOC from storage tanks. This information will greatly improve the emissions estimates that are currently available.

Project Description

The Storage Tank Emissions Pilot Project (STEPP) is directed towards a subset of oil and gas wells in the Basin that are on land that is regulated for air quality by the State of Utah. The project has two goals; the first is to create an efficient, collaborative approach to identify fugitive VOC emissions from oil and gas condensate storage tanks. The second goal is to demonstrate a method to evaluate whether traditional emissions estimating techniques need to be modified to account for a potential undercounting of emissions.

In 2014 there were 14,222 producing and shut-in oil and gas wells within the state (Figure 2). Using a geographic information system (GIS) and the latitude and longitude coordinates for each well, along with county boundaries, it was determined that 11,400 of the wells were located within Uintah and Duchesne counties, in what is roughly considered the Basin. Approximately 2,350 of those wells are regulated by the State, with the remainder under the jurisdiction of the Ute Tribe and EPA (Figure 3).

Due to the large number of wells in the Basin and its unique air quality problems linked to VOC emissions, this is an ideal location to analyze the potential contribution of fugitive tank emissions. While DAQ has a leak detection and repair (LDAR) program in place, it only covers permitted facilities. However, the large number of wells in the Basin distributed over a large and remote geographic area points to the need for a very well-focused program. It would be impractical to visit every one of the 2,350 plus wells in the Basin; however, it is possible, given the limited number of wells that have control technology installed to reduce emissions from storage tanks, to assess the situation. To determine which specific sites to visit DAQ has made use of the new 2014 oil and gas emissions inventory that was collected with extensive input from the oil and gas producers as well as other stakeholder groups. Results of this inventory indicate that there are 474

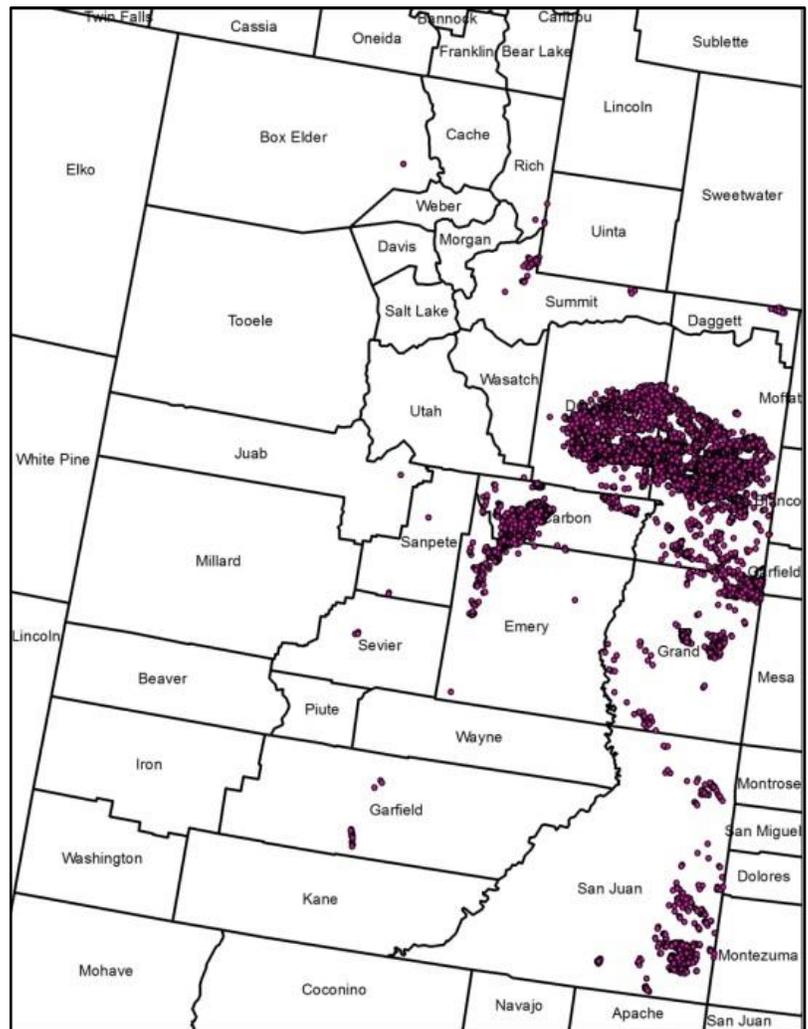


Figure 2. Shows all (14,222) producing and shut-in oil and gas wells (purple dots) within Utah in 2014.

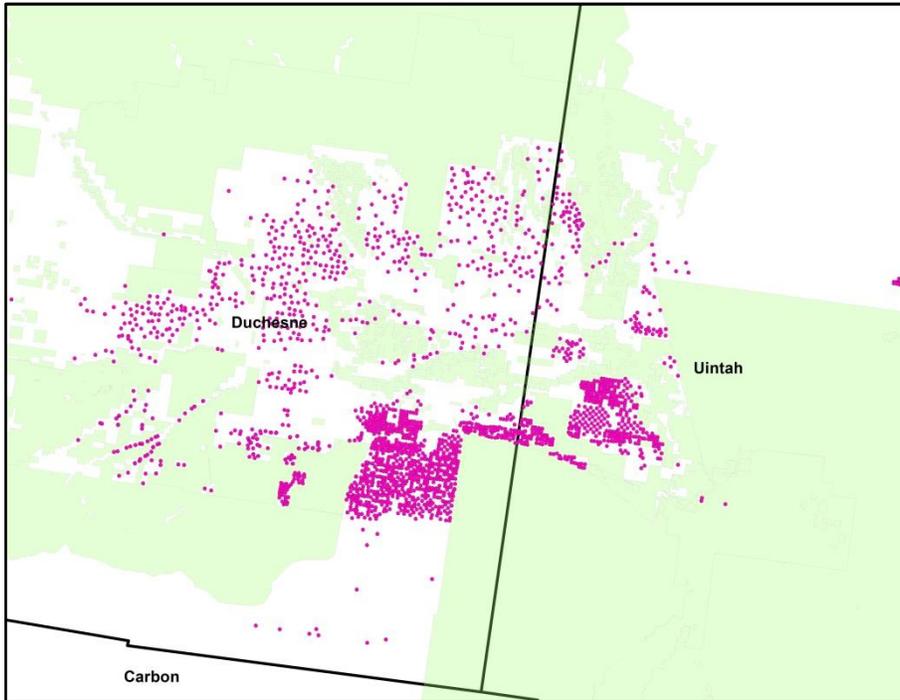


Figure 3. Shows Uintah and Duchesne Counties with a Tribal/EPA jurisdictional boundary layer (green). All wells shown (pink dots) are 2014 producing and shut-in oil and gas wells on State jurisdiction.

facilities on state-administered land that have VOC combustors installed on their storage tanks. The data gathering protocol for this project will combine a GIS with high resolution aerial photography and a mobile tablet application that can be used to gather information in the field for this subset of sites.

The sample size is important because, even though this will not be a statistically random sample, it is a representative sample. If a similar project is undertaken that includes lands under Tribal and EPA jurisdiction at a later time it will provide valuable information to compare against current emissions estimates.

Tanks are a good first priority for the STEPP program for several reasons: 1) tanks are easy to identify on site, 2) tanks are relatively accessible, and 3) the leaks from these tanks tend to be easy to identify with an IR camera even if not standing directly on site. In addition, if significant leaks are found at the thief hatch, these are likely to be relatively easy to remedy.

Using GIS software tools it will be possible to plan ahead of time the most efficient route for site visits on a daily basis (Figure 4). However, since the Basin region is so remote, another factor we will want to take into account is site accessibility by using the road network and the proximity of roads to selected wells. Since inspectors will actually have to be traveling to all of the chosen locations, it will be necessary to ensure that all of the sites are reasonably accessible using the local road network. Again using GIS, the Utah local road network can be overlaid on the oil and gas wells (Figure 5). The selection of well sites can be further refined as necessary taking into account road proximity in assessing the feasibility of inspecting all 474 sites. Additionally, to further refine our well selection, we propose to use the Google high resolution imagery with a GIS to zoom into each of the potential well sites so that project staff can verify that the selected sites are good candidates for a visit. Using the imagery, staff will be able to identify whether there are tanks located at the site, the number of tanks, and get a rough idea of the status of the well (whether it is abandoned, how remote and isolated it is, etc.) (See Figure 6 for example).

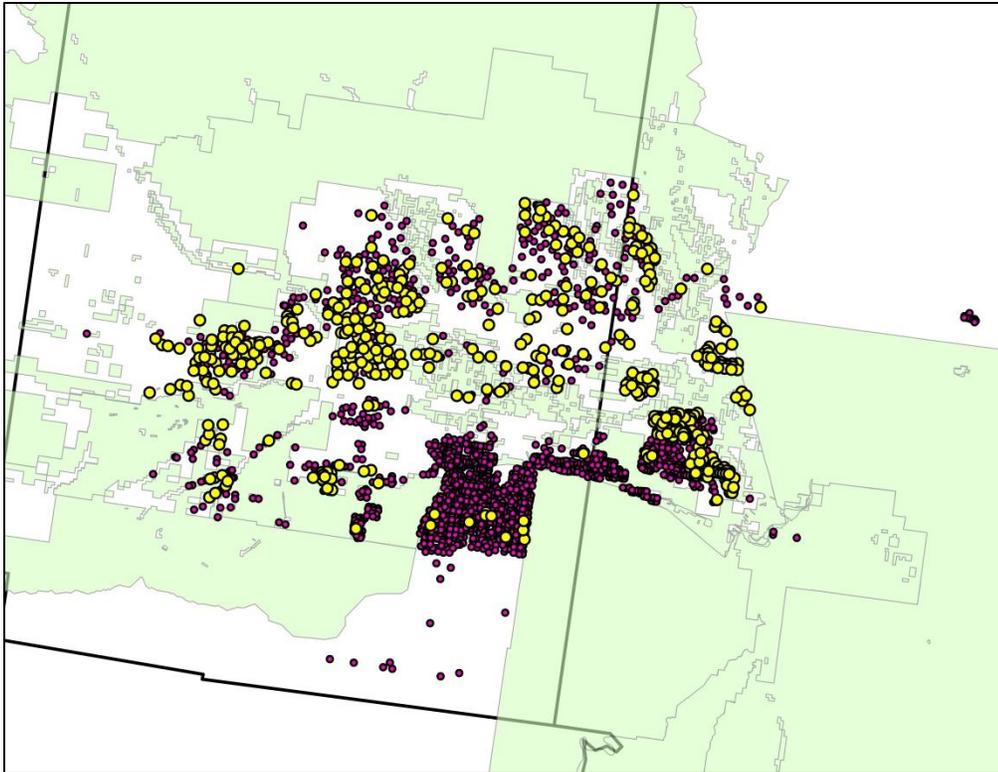


Figure 4. 2014 oil and gas wells within State jurisdiction are shown (pink dots). All 2014 controlled tank facilities are also shown (yellow dots).

Equipped with the analysis noted above, project analysts involved in the partnership would be able to very precisely plan sites visits. Staff using the DAQ developed tablet-based GIS application will be able to navigate in the jurisdictionally complex and remote Uinta Basin using real-time GPS based navigation. Users will also be able to plan their trips and explore sites using high resolution imagery before traveling to the site. Additionally the application will be an essential tool for organizing IR video and field notes and creating a database to analyze the information captured during the field campaign.

This project is predicated on a full working relationship with oil and gas company producers in the Basin. The inclusion of producers in the project provides a number of opportunities. These include simple benefits such as site access to gated facilities, and informal education opportunities (raising awareness among operators of these types of leaks). But, most importantly, the collaboration facilitates the necessary interaction that must occur between all of the stakeholders in the Basin to find innovative and efficient means of reducing VOC emissions. DAQ believes that this is a simple and straightforward way to help improve air quality in the Uinta Basin.



Figure 5. Using the road network (blue lines) the site selection (yellow dots) can be further refined, to facilities within a reasonable distance of a main road.



Figure 6. Shows zoomed in image of a single oil or gas well, using Google high resolution imagery. Three tanks can be seen in the lower-left hand corner of the well pad.