

Ground Survey of the Firestone Area for Methane Anomalies

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Introduction

Apogee Scientific, Inc. (ASI) conducted a ground methane survey of the Firestone, CO area for the Colorado Oil and Gas Conservation Commission (COGCC). The survey was conducted on April 26, 2017 between 1:50 PM and 4:23 PM using a 4-wheel drive vehicle equipped with an infrared-based gas detector developed by ASI. This gas detector was designed to find leaks in natural gas pipelines, and is referred to as the Apogee Leak Detection System (LDS). The LDS is a three-channel instrument capable of measuring methane (CH₄), total hydrocarbons (HC) and carbon dioxide (CO₂) at sub part per million (ppm) concentrations and a speed of 10 samples per second. The vehicle was also equipped with a Global Positioning System (GPS) based navigation system. Additional information on the LDS is available at [http:// http://www.apogee-sci.com/leak-detection](http://www.apogee-sci.com/leak-detection).

The LDS was mounted in the rear of the survey vehicle. Ambient air was collected at the front of the vehicle at a height of approximately 3 inches above the ground, passed through a filter to remove particles and other debris from the air stream, and was carried to the LDS through 2-inch diameter pipe. The delay time between gas entering the entrance of the collection system and being detected by the LDS was approximately 1 second.

Wind speed and direction estimates were made by an experienced observer. At the start of the survey the wind speed was estimated to be between 3 and 7 mph and increased to 10 to 15 mph at the end of the survey. The wind direction was highly variable during the survey with winds observed out of all quadrants. The highly variable wind directions were likely caused by the building thunderstorm activity in the area as well as being influenced by the buildings in the area. In open areas, the predominate wind direction was out of the south west.

The survey vehicle was driven on all public roads on the survey area (Figure 1). Any increase in ambient methane concentration above the local background was investigated.

Two areas of elevated methane concentrations were observed. The first was directly downwind of oil processing equipment located west of the west end of Twilight Avenue as shown in Figure 2. At this location, plumes of both hydrocarbons (ethane, propane, etc.) and methane were observed. The peak concentrations observed at this location were 4.5 ppm methane and 8 ppm hydrocarbons. These low concentrations are observed downwind of most oil and gas processing equipment.

The second area of elevated methane was observed on Oak Meadows Blvd. south of Twilight Ave. and is shown in Figure 2. The maximum methane concentration measured was 4.5 ppm. The ratio of methane to hydrocarbons in the gas measured in this area was 2.4, which is typical of unprocessed gas from an oil/gas well. Gas from a distribution pipeline typically has a methane to hydrocarbon ratio closer to 10. The source of the elevated methane was not obvious from these measurements. It is possible that the gas was coming from the oil and gas processing equipment located on the west side of the field. No methane was observed on the east-west running driveway shown in the bottom of Figure 2.



Figure 1. The roads driven by the survey vehicle (blue lines).

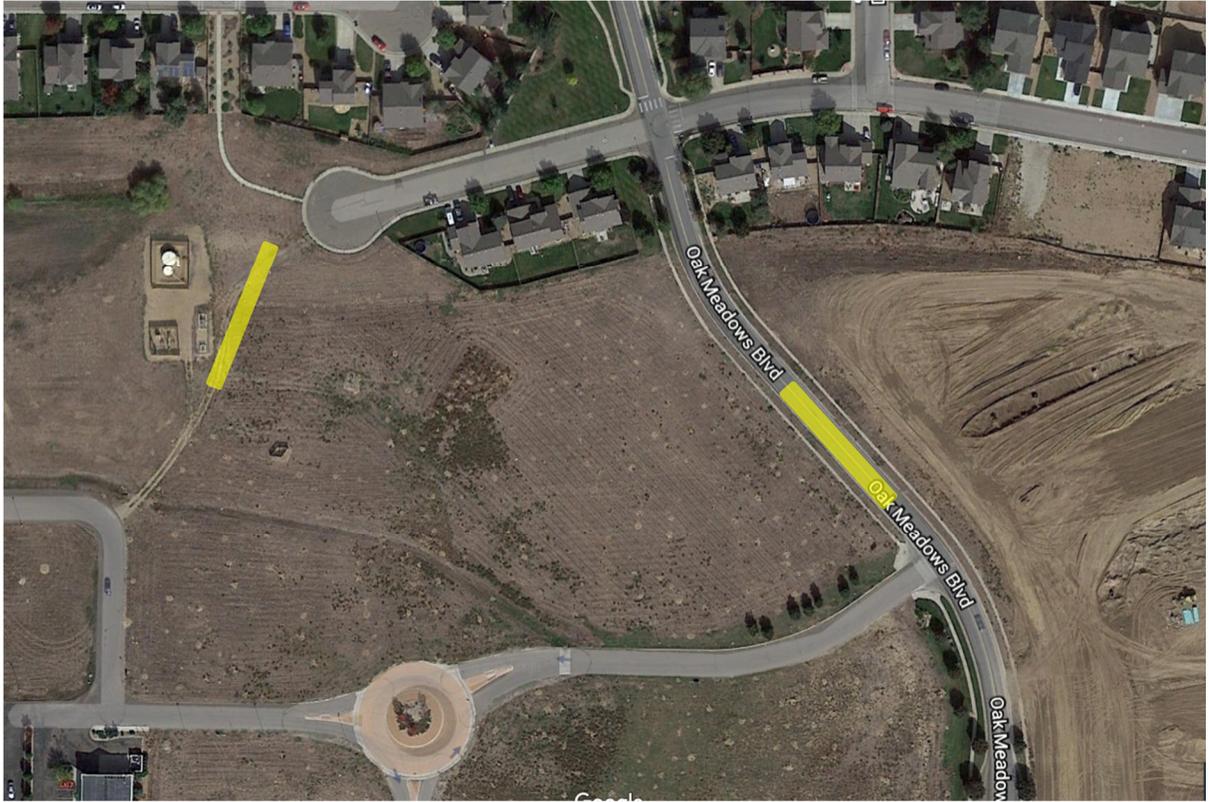


Figure 2. Map of the area on Oak Meadows Blvd where elevated methane concentrations were observed. The wind direction was fluctuating between west and south south west during the measurements.