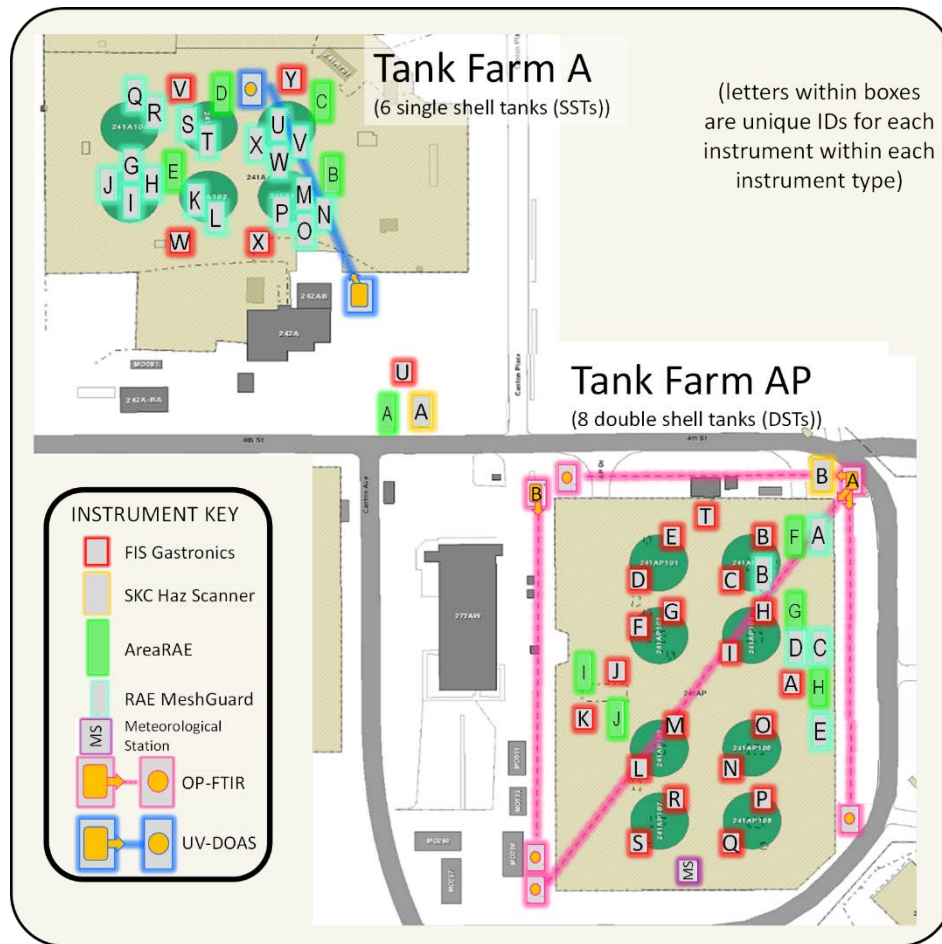


OP-FTIR Weekly Summary

01/04/17 6:00 – 01/11/17 6:00



The following information is for the time period from January 4th at 6:00am through January 11th at 6:00am. This summary contains Vapor Monitoring and Detection System (VMDS) pilot-scale data collected over one week for the open path Fourier transform infrared spectrometer (OP-FTIR). Pilot-scale testing is focused on evaluating component integration and functionality. Data shown may include results from calibration and bump tests performed verify instruments function; these tests result in data spikes.

- Abbreviations:
- CH₄ = methane
 - NH₃ = ammonia
 - NO = nitric oxide
 - N₂O = nitrous oxide
 - NO₂ = nitrogen dioxide
 - OEL = occupational exposure limit
 - OP-FTIR = Open Path Fourier Transform Infrared Spectrometer
 - R² = R-squared
 - VMDS = Vapor Monitoring and Detection System

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Weekly Summary: The OP-FTIR spectrometer provides real-time multi-gas measurement (qualitative and quantitative) of gases¹. Even though the instrument is very accurate regarding the quantification of compounds, reported results cannot be directly calculated into a concentration for a specific location, this is due to its sample size – an open path between two points. The sample path is defined by the location of the emitter and the reflector which may be tens to hundreds of meters apart. Therefore data from these instrument types will not be directly compared to Occupational Exposure Limits (OELs) and Action Levels, but used to determine concentrations of compounds along the path of the instrument's beam.

Each analyte has a specific predetermined infrared (IR) trace which represents the model for that chemical. The detection and reporting of that chemical is based on evaluation of the R-squared (R^2) values (coefficient of determination) calculated by comparing the detection trace to the model trace for that chemical. R^2 is a statistical value representing the "percent of variance explained" by evaluating the detected trace with the model trace, or an estimate of how well the two traces match. R^2 values range from 0 to 1 with higher values indicating a better fit. R^2 values for OP-FTIR data are dependent on sample concentration, chemical compounds [chemicals present can interfere/overlap with each other at key locations; typically those having the same functional groups (e.g., methane or ketone groups)], and many other factors. Results presented here are for compounds having an R^2 value of greater than or equal to 0.5. Typically the trigger used for reporting is an R^2 value of greater than or equal to 0.5; some compounds may have different trigger levels based on optimization of the analysis method using AP and A Tank Farm data.

During the week in review, instrument 506A detected nitrous oxide (N_2O), ammonia (NH_3), and methane (CH_4). A recurring pattern of simultaneous N_2O and CH_4 spikes (0.5 and 2.2 ppm, respectively) was noted again this week (see Figure 1). Instrument 506A was not reporting data from 1/7/2017 6:30 am through 1/10/2017 6:00 am due to the IR side of the computer stopping and had to be restarted. Ammonia is not typically detected along the 506A paths, but an ammonia peak of 0.022 ppm was detected on January 5th. This concentration is well below the OEL of 25 ppm for ammonia². Instrument 506B detected N_2O and CH_4 at intermittent times during the week. This unit went off-line and did not report data from 1/4/2017 11:00 am through 1/5/2017 8:00 am and from 1/5/2017 6:00 pm through 1/10/2017 9:30 am due to the IR side of the computer stopping and had to be restarted.

Most compounds detected by both instruments are typically present in background air at detectable levels. This information indicates that the OP-FTIR units are effectively measuring composition of the gas components within its path. Specific instrument information is reported below.

Waste retrieval activities resumed on 1/6/2017 at 9:30 pm. Sluicing operations were performed for approximately 2 hours before operations shut down because temperature of a waste transfer pit fell below the required minimum temperature.

¹ OP-FTIR Fact Sheet: <http://hanfordvapors.com/wp-content/uploads/2016/10/OP-FTIR-fact-sheet.pdf>

² OSHA: https://www.osha.gov/dts/chemicalsampling/data/CH_218300.html

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Retrieval operations were not performed much of the week due to adverse winter weather. Retrieval operations did not restart until the early morning of 1/11/2017, when the supernate and slurry pumps operated between 2:00 am and 4:30 am. No anomalies in response to the waste retrieval activities were observed this week with the OP-FTIR instruments.

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January 4th – January 11th 2017 Instrument Notes:

Table 1. Chemical Species Detected on Open Path FTIRs at AP Tank Farm.

Chemical	506A: OP-FTIR Multipath	506B: OP-FTIR Single
Nitrous Oxide*	0.21 – 0.58 ppm ^a	0.35 - 0.46 ppm ^a
Ammonia*	ND – 0.022 ppm	ND
Methane	0.956 – 2.16 ppm ^a	1.47 – 1.96 ppm ^a
1-3-Butadiene*	ND	ND
1-Butanol*	ND	ND
2-Hexanone*	ND	ND
3-Buten-2-one*	ND	ND
Acetaldehyde*	ND	ND
Acetonitrile*	ND	ND
Benzene*	ND	ND
Butanal*	ND	ND
Butyl Nitrite*	ND	ND
Ethylamine*	ND	ND
Formaldehyde*	ND	ND
Furan*	ND	ND
Methanol*	ND	ND
Methyl Isocyanate*	ND	ND
Methyl Nitrite*	ND	ND
N-Nitrosodiethylamine*	ND	ND
N-Nitrosodimethylamine*	ND	ND
N-Nitrosomorpholine*	ND	ND
Propanenitrile*	ND	ND
Pyridine*	ND	ND
Tributyle Phosphate*	ND	ND

Notes: *Chemical is on COPC list

ND – Not detected by instrument (i.e., either value reported was 0 or R² value is <0.5)

(a) Disturbed data not included in the table for these compounds

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Figure 1. OP-FTIR A (506A) Review.
(Note that concentration units are ppb)

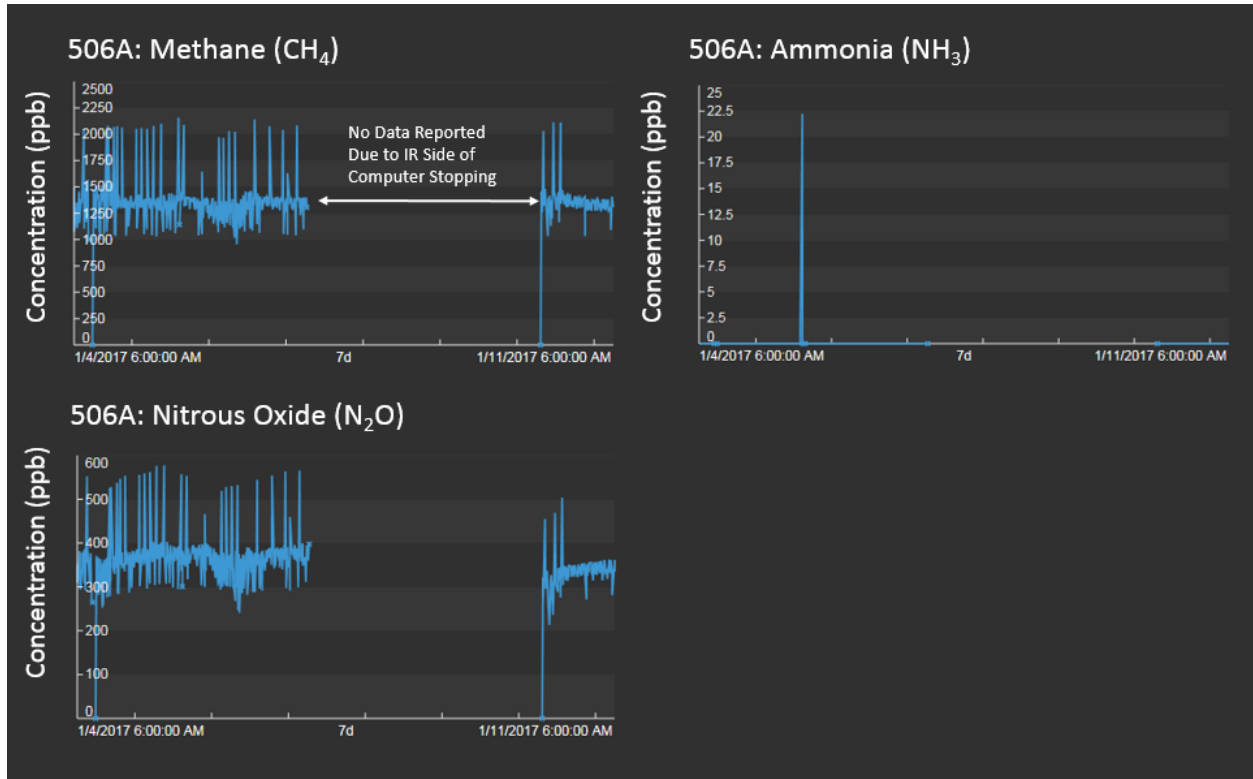
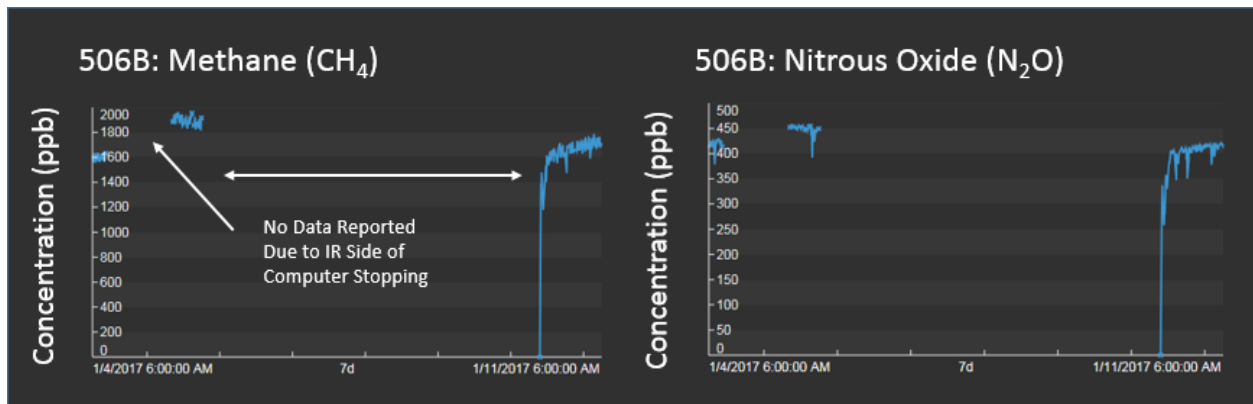


Figure 2. OP-FTIR B (506B) Review.
(Note that concentration units are ppb)



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Table 2. OP-FTIR Instrument Time Reporting^a.

Instrument	Comments
506A	The instrument was reporting 56% of the time.
506B	The instrument was reporting 20% of the time.

Notes: a) % down is based on data reported to OSI PI System³

³ OSI PI System is a data visualization software package from [OSIsoft](#).