DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: On-site Inspection

N268860415

FACILITY: Arbor Hills Landfill, Inc.		**SRN / ID:** N2688
LOCATION: 10690 W. SIX MILE RD, NORTHVILLE		**DISTRICT:** Jackson
CITY: NORTHVILLE		**COUNTY:** WASHTENAW
CONTACT: Suparna Chakladar , Vice-President		**ACTIVITY DATE:** 10/08/2021
STAFF: Mike Kovalchick	**COMPLIANCE STATUS:** Unknown	**SOURCE CLASS:** MAJOR
SUBJECT: Methane/H2S ambient air inspection. Significant methane and H2S concentrations detected on the roof of the treatment and turbine buildings.		
RESOLVED COMPLAINTS:		

Major / ROP Source. Inspection of Arbor Hills Energy LLC portion (Section 3) of the Arbor Hills Landfill (Green for Life Environmental) and Arbor Hills Energy Stationary Source.

Facility Contacts

Carlos Wilson(CW)-Plant Supervisor-Opal Fuels LLC, cwilson@fortistar.com

Facility Contacts not present during inspection

Suparna Chakladar-Vice President-Opal Fuels LLC, 951-833-4153 SChakladar@fortistar.com

Anthony Falbo, Senior Vice President-Opal Fuels LLC, Address: 5087 Junction Road, Lockport, New York 14094

Eric Kataja, Senior Environmental Analyst -Opal Fuels LLC, (716) 420-114, ekataja@fortistar.com

Purpose

On October 8, 2021, Mike Kovalchick (MK) and Diane Kavanaugh Vetort (DKV), EGLE -AQD, conducted an announced compliance inspection of Fortistar Methane Group-Arbor Hills Energy LLC (AHE) facility located in Northville, Michigan (Washtenaw County) at 10611 West 5 Mile Road. The purpose of the inspection was to determine the facility's compliance status with applicable federal and state air pollution regulations, particularly Michigan Act 451, Part 55, Air Pollution Control Act and administrative rules, and the conditions of the Company's Renewable Operating Permit (ROP) number MI-ROP-N2688-2011a, issued on January 24, 2011. This inspection focused on conducting ambient air testing for methane and hydrogen sulfide (H2S) on the facility's leased property including the adjacent grounds to the facility buildings and on the roofs of the treatment building and the turbine building.

Facility Location

AHE plant is located at 10611 West Five Mile Road which is directly adjacent to the landfill on its south side. There are no nearby homes.

Arrival & Facility Contacts

Upon our arrival, no odors or opacity were noted. The Utility Flare (EU5000CFMFLARE) at the AHL flare compound was operating with a large visible

flame with no opacity. DKV proceeded to the facility office to request access for an inspection. I provided my identification and met with Carlos Wilson (CW) who is plant supervisor for the facility. DKV brought CW out into the parking lot where MK was in process of setting up monitoring equipment. We informed him of our intent to conduct a facility inspection; specifically taking ambient air measurements for methane and H2S due to odors that were noted during a previous inspection in September.

Regulatory Applicability

The stationary source is in Washtenaw County, which is currently designated by the U.S. Environmental Protection Agency (USEPA) as attainment/unclassified for all criteria pollutants except ozone. Washtenaw County is currently considered non-attainment for ozone.

The stationary source has emission units that were subject to R 336.1220, for Major Offset Sources. Now Part 19 Rules (i.e. Rule 1902) NSR for Major Sources Impacting Non-Attainment Areas applies.

Several emission units at the stationary source were subject to review under the Prevention of Significant Deterioration regulations of 40 CFR, Part 52.21. In particular, the potential to emit (PTE) of carbon monoxides exceeds 250 tons per years.

The stationary source is subject to 40 CFR Part 70 because the PTE of carbon monoxide, sulfur dioxide and nitrogen oxides exceed 100 tons per year.

The stationary source is considered a major source of Hazardous Air Pollutants (HAP) emissions because the potential to emit of a single HAP, hydrogen chloride, is greater than 10 tons per year.

The facility is also subject to the following federal requirements:

1. Federal Plan Requirements for Existing Municipal Solid Waste Landfills promulgated in 40 CFR Part 62, Subpart OOO. The Federal Plan will apply until a State Plan is approved or delegation of the Federal Plan approved. (New replaces WWW; effective date June 2021)

2. The Maximum Achievable Control Technology Standards (MACT) for Municipal Solid Waste Landfills promulgated in 40 CFR Part 63, Subparts A and AAAA. Revised and effective date of September 27, 2021. (Note: This applies to EUTREATMENTSYS-S3.)

3. Federal New Source Performance Standards for Stationary Gas Fired Turbines, 40 CFR Part 60 (NSPS Subparts A & GG) (Note: This applies to FGTURBINES-S3.)

4. Federal New Standards of Performance for Stationary Combustion Turbines, 40 CFR Part 60 (NSPS Subparts A & KKKK) (Note: This applies to EUTURBINE4-S3)

5. National Emissions Standards for Hazardous Air Pollutants for Stationary Combustion Turbines, 40 CFR Part 63 (MACT YYYY) (Note: This applies to EUTURBINE1-S3, EUTURBINE2-S3, EUTURBINE3-S3, EUTURBINE4-S3 and FGDUCTBURNERS-S3.)

-One 250 HP diesel fired emergency generator is subject to 40 CFR Part 60, Subpart IIII New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines (Meeting NSPS requirements satisfies RICE MACT Subpart ZZZZ.)

Facility Background

Previously, a roof inspection was conducted on 11/14/2019, with the relevant sections included below:

"Next, we visited the treatment building to investigate the issue of venting of landfill gas during compressor shutdowns. I confirmed that there are 4 vent stacks, one for each of the 4 compressors (compressors are 1000 to 1200 hp in size each) all located in the treatment building roof. Venting occurs each time a compressor is shutdown. (He estimated that this occurs about once a month with exact number of times being determined via required preventative maintenance/SSM reporting forms.) The venting is automatic/computer controlled. When the compressor shuts down, it is isolated both up/down stream then the gas contents are evacuated. CW estimated the venting all occurs in a couple of seconds. He showed me the various valves/skip plate associated with the venting system and where it ties in an exhaust stack. (4 separate venting systems that all operate in a similar manner.) While CW explained to me how the system worked, I noted a pipe several inches in diameter that was coming from below the grated floor of the building that tied directly into the exhaust stacks for one of the compressors below the roof line but above the valve skid plate. CW mentioned that this pipe is venting sewer gas to the roof using the same exhaust pipe as the compressor vent. As noted in previous visits, there is a large volume of odorous liquid below the floor grate which at least suggests the possibility that this is potentially another odor source to be concerned with.

CW showed me the venting system associated with the 2 smaller compressors. In this case, the vents are pressure relief valves. They would only open during some sort very unusual malfunction. The vents combine to a single stack on the roof."

***"EUTREATMENTSYS-S3:* Non-Compliant**

This emission unit treats landfill gas as it first enters the facility before it is used for subsequent use or sale. The landfill gas is directed from the well field through the following stages; 1) suction scrubber; 2) first stage compression; 3) gas cooler; 4) liquid knockout vessel; 5) second stage compression; 6) gas cooler; 7) refrigerant chiller; 8) liquid knockout vessel; 9) third stage compression; 10) final filtration and coalescing (removes oil and water); and 11) transport to turbine plant gas header. During the cooling stages the temperature of the landfill gas drops resulting in generation of condensate. Thus, the chilling stages serve to cool, dehumidify, and to reheat the gas. The treatment system removes particulate to at least the 10-micron level and removes enough moisture to ensure good combustion of gas for subsequent use; therefore, guaranteeing that the intent of the destruction of the non-methane organic compounds (NMOC) will be maintained. An estimated 3000 to 4000 gallons of odorous condensate is removed from the landfill gas every day and stored in a 10,000 gallon above ground storage tank. The condensate is shipped off-site every other day. A u-shaped vent pipe is located on top of the tank. Everything was off line during the inspection. There are 4 main compressors for the turbines and 3 smaller compressors (referred to as auxiliary compressors) for the duct burners. See AHE response attachments. Shows gallons of condensate collected per month in 2019. Amounts per month have roughly doubled from the beginning of the year to more than 100,000 gallons per month.

New during this inspection was discovery of sewer gas vent pipes on the roof of the treatment building. The main concern being that it is a possible source of odors. Post inspection, AHE provided the following description:

"Sewer gas is required by code to be vented to the atmosphere as a safety precaution. As a result, each process unit that has a condensate drain or that otherwise utilizes a drain is considered part of the sewer system and requires a vent. Water collected by the sewer system is composed of condensate from the compressors and water from a sump that collects the "wash-down" water from cleaning of the compressor area. Sewer gas from the system is vented out of the roof of the treatment building via seven (7) unobstructed vertical vents on the roof of the building. Five of the seven sewer gas vents are tied into vents associated with process equipment (primarily compressors servicing the turbines.) As noted above, venting is required under applicable building codes as a safety measure and to allow for proper function of the sewer system (rather than to address any meaningful emissions.)

Relevant excerpt from previous PTI Application dated October 22, 2019:

"Topic 3-Pressure Relief Venting.

Following LF gas conditioning, the incoming gas is compressed and then introduced into the respective turbine for combusting. When a turbine is shutdown, a small quantity of LF gas is vented to relieve the pressure (between the LF gas compressor and the turbine), to prevent an unsafe situation and combustion or explosion hazard in the turbine fuel delivery header. EGLE-AQD has requested that AHE describe and quantify releases from pressure venting from the turbines. It is estimated the pressure relief sequence lasts approximately 10 seconds. A volume of gas vented for the turbines was estimated based upon the worst case LF gas cycle of 1475 scf for all units (combined). A calculation of gas venting from pressure relief can be estimated as follows:

1. Venting duration per shutdown cycle – approximately 10 seconds.

2. Maximum gas flow rate – 8,848 scfm (to all emission units)

3. Approximate maximum gas flow rate per emission unit 2,212 scfm (8,848/4=2,212)

4. Using the foregoing as a basis of calculations, the approximate emission from each turbine per shutdown can reasonably be calculated as follows:

2,212 scfm LF gas X 10 seconds (or .16666) = 368.7 scf per shutdown cycle/per turbine X 4 turbines = 1,475 scf for all turbines, for one shutdown cycle.

5. Turbines generally would not need to be shut down more than 16-32 times per month (or anywhere between 4 and 8 shutdowns per turbine). Assuming 32 shutdowns per month, the approximate emissions would be calculated as follows:

32 shutdown periods x 368.7 scf = 11,7988.4 scf per month of LF gas emissions

-11,798 scf per month of LF gas with a max H2s concentration of 0.0475 percent would result in emissions of approximately 0.40 lbs of H2S from all shutdown venting

-11.798 scf per month of LF gas with an EPA AP-42 Table 2.4-2 NMOC default concentration of 2,420 PPMv results in emissions of approximately 2 lbs./month of NMOC s from all shutdown venting. This is less than 0.003 pounds of NMOC per hour on an average annual basis at worst case…etc"

Pre-Inspection Meeting

We met with CW and asked several general operations questions. CW explained that the steam turbine was down and this impacts the turbine boilers, duct burners and the heat recovery generating system (HRSG). 2 of the 3 turbines that are tied into the HRSG were operating without the EGT's duct burners or HRSG. One of the turbines and associated compressor was down.

Per Carlos, they are also working on addressing the uncontrolled vents on the Treatment System compressors by ducting them back into the treatment process. This NSPS non-compliant condition was identified during the prior AQD compliance inspection and is part of the EGLE/EPA enforcement action. He indicated that the work is out for bid with quotes expected soon and work possibly beginning by the end of the year.

Onsite Inspection

This is an inspection results brief provided to AHE shortly after the 10-8-21 Inspection:

"Myself and Diane conducted a methane/H2S survey today at AHE between 9 and 10 am this morning. The main purpose was determine if the AHE facility was a significant source of odors and secondly on a more information only basis was to gauge whether the facility was also a significant source of landfill gas emissions; methane in particular. Weather was overcast with some light showers, wind light out of the east with low mixing heights. The candle stick flare was operating and at least one compressor, one turbine and the steam unit were down during the survey.

A SEM5000 methane detector and a Jerome H2S meter were deployed.

The survey of the grounds around the facility/flares was unremarkable with background levels of methane detected. A small area of moderate to strong leachate odors were detected very close to the condensate tank on the downwind side with an H2S reading of .006 ppm.

Next, we surveyed the roof of the treatment building. Overall, moderate H2S odors were observed with occasional whiffs of intense/extreme odors. Significant methane and H2S readings were detected. The most significant concentrations were encountered by sampling the condensate sump passive vent. (See attached photo. Note that almost all the vents of the roof were too high above the roof line to sample.) Methane readings were as high as 129,000 ppm from this stack. H2S readings exceeded the detection limits of the device. (In excess of 50 ppm.) Note that methane levels in the 100,000 range are within the explosive range for methane which is concerning. Carlos confirmed that this is a passive vent from where all the condensate from all the liquids in the facility are collected into a sump. All the liquids appear to flow in the opposite direction to the condensate tank for disposal. Carlos estimated temperatures of the escaping gases would be the same as the gas temperature entering the facility so around 90 degrees F.

Other sources of high methane included previously identified vents from the compressors of which at least a couple were actively venting while others had exhaust stacks too high to sample. Oddly, a leaking air intake vent powered by an electric motor that exhausted back into the building also had elevated readings. (See attached photo.) Note that it was suspected that there are other significant sources of gas emissions on the roof but they could not be sampled due to the height of the

ventilation equipment above the roof. Readings as high a 6 ppm H2S were detected as measured at waist level when not sampling a particular stack/vent.

Next, we surveyed the roof of the turbine building. Some elevated methane readings were also encountered but at much lower levels/extent than the treatment building. The main source appeared to be vents associated with air that is used to cool "the package" that includes the turbines themselves which are then vented back out to the roof. (See attached photo.) One vent appears to be associated with each turbine. The vent associated with Turbine 2 had the highest readings that were in excess of 500 ppm and relatively high volumes of exhausted air. These are new sources of gas emissions that had not been previously documented. No readings higher than 0.15 ppm H2S were encountered on the roof of the turbine building."

Compliance Evaluation

Overall, the amount/concentration/aerial extent of landfill gas detected on both the treatment building and turbine building was beyond what was expected and is concerning. (EGLE-AQD has not previously conducted methane readings on the roof of this facility.) It also should be noted that the overall condition of the ventilation equipment on the roof was found to be in poor condition with holes noted in the seams of a number of ventilation ducts.

The compressor vent issue was described in previous inspection reports and is also part of Consent Decree Civil No. 5:21-cv-12098-SDD-EAS.

Proper Operation of Control Equipment at AHE Facility. Regardless of whether

AHE and AHRNG elect to pursue the RNG Option Compliance Pathway or AHE elects to pursue the STS Option Compliance Pathway, within 180 Days after the lodging of the Consent Decree, AHE shall ensure that the AHE Facility captures all emissions from the existing LFG compressor atmospheric vents and reroutes such LFG to the flares at the adjacent landfill, or back to the inlet of an operating turbine."

The CD was lodged on September 9, 2021 so AHE has until March, 2022, to complete rerouting of the compressor atmospheric vents.

There are 7 passive sewer type vents present on top of the treatment building. 5 of the 7 vents are combined into the compressor vent stacks. It was one of the uncombined vents that was measured at 129,000 ppm methane and excess of 50 ppm H2S. It appears that at least 2 of the passive sewer type vents (including the one that was sampled) are not part of rerouting that is scheduled to occur in the next 180 days. Emissions from these passive sewer types of vents have not been quantified. Note that between 350,000 to 450,000 gallons of condensate are being processed through treatment building per month so emissions of gas from this amount of liquid could be considerable. (In 2018, it was less than 50,000 gallons per month. In 2019, it was about 100,000 gallons per month. In May 2021 is was 468,271 gallons, August it was 335,990 gallons so the trend is dramatically upward which no doubt is negatively impacting methane/H2S emissions.

Down wind readings of the compressor vents showed that two or more than of them were actively venting landfill gas during the inspection. This was unexpected since the vents should only be venting for few seconds a handful of times per month during a compressor shutdown sequence. (There is no indication of this occurring

during the inspection.) One possible explanation is that the landfill gas measured was coming from the gas condensate sewer vents that are in some cases combined with the compressor vents.

Landfill gas emissions from the turbine cooling vents is a new finding not previously described. (Note: It is unknown if the shutdown of the HRSG system was a factor in landfill gas emissions from the cooling vents.)

One vent appears to be associated with each turbine. The amount of scfm coming from the forced air vents is unknown but thought to be significant based on the size of the vent and the amount of flow velocity observed coming out of the vents. A maximum concentraton of 1500 ppm methane was measured coming from Turbine 2 cooling vent with elevated valves coming from at least one other vent. H2S was measured at 0.15 ppm. The exact source of how landfill gas is getting into these vents is unknown but suggests that auxiliary ventilation that feeds the turbines is leaking. These vents are likely a much larger source of landfill gas emissions than the compressor vents since the emissions are continuous and involve a much larger volume of gas flow. It isn't known if there are also products of combustion in the emissions as well.

Compliance Status and Recommendations

Staff used a SEM5000 methane detector and measured methane in excess 1500 ppm coming from cooling air ventilation stacks on the roof of the turbine building. These emissions are originating from enclosures that house each of the 3 turbines.(Turbine 4 was not examined.) This indicates that landfill gas diluted with air is being vented to the atmosphere. Landfill gas emissions from these vents have not been previously described by any permit application submitted by the Company.

In addition, AQD staff observed that meaningful landfill gas emissions coming from one or more vertical stacks on the treatment building roof that originates from the collection of gas coming from a basement sump that do not share a common stack with the compressor stacks. Please note that the Company has previously described this ventilation system as follows: "water collected by the sewer system is composed of condensate from the compressors and water from a sump that collects the "wash-down" water from cleaning of the compressor area. Sewer gas from the system is vented out of the roof of the treatment building via seven unobstructed vertical vents on the roof of the building. Five of the seven sewer gas vents are tied into vents associated with process equipment (primarily compressors servicing the turbines." Using a SEM5000 methane detector, AQD staff measured methane in excess 100,000 ppm from one of these vents. AQD staff also used a Jerome 631-X hydrogen sulfide meter and measured concentrations that exceeded the detection limit of the device which is 50 ppm. The amount of landfill gas condensate passing through the treatment building has dramatically increased in the last 2 years with over 350,000 gallons per month disposed of via a condensate storage tank. This has likely increased landfill gas emissions from the sump which resulted in these measured landfill gas emissions on the treatment building roof.

AHE should investigate these vents to fully characterize emissions from them such as determining mass flow rates of landfill gas and other pollutants. The actual source of landfill gas that is getting into the cooling vents should be either eliminated or controlled per the requirements in AAAA.

AHE should ensure that ALL condensate sewer vents are being ducted back into the treatment process to prevent high odor emissions and potential violations of the fire code.

AQD Staff may conduct further investigations to delineate/explore the compliance issues encountered during this inspection.

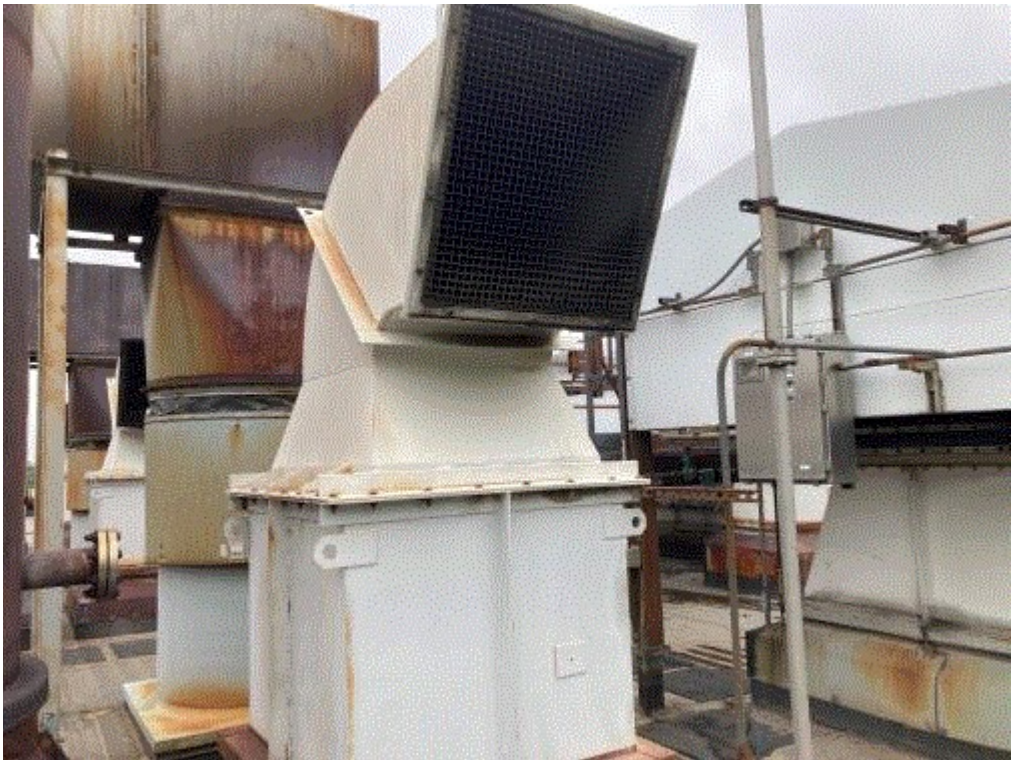

Image 1(Cooling Stack) : Turbine cooling stack on roof of turbine building

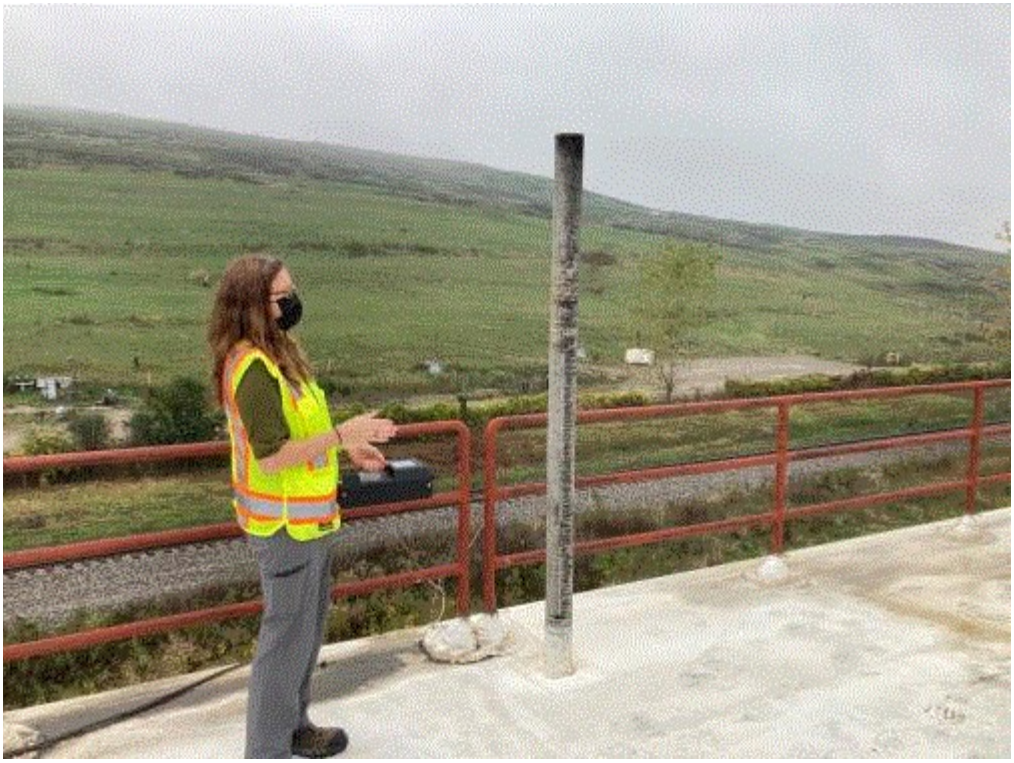

Image 2(Passive vent) : Passive vent from condensate sump. Measured methane at 129,000 ppm with measured H2S greater than 50 ppm.

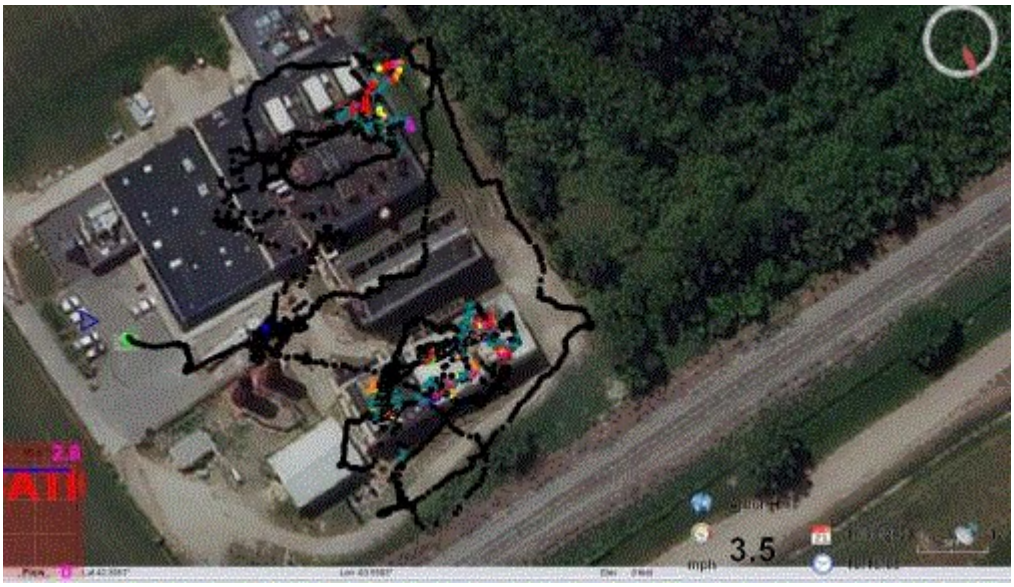

Image 3(Map of Results 1) : Map of route of methane survey. Red shows areas above 100 ppm.

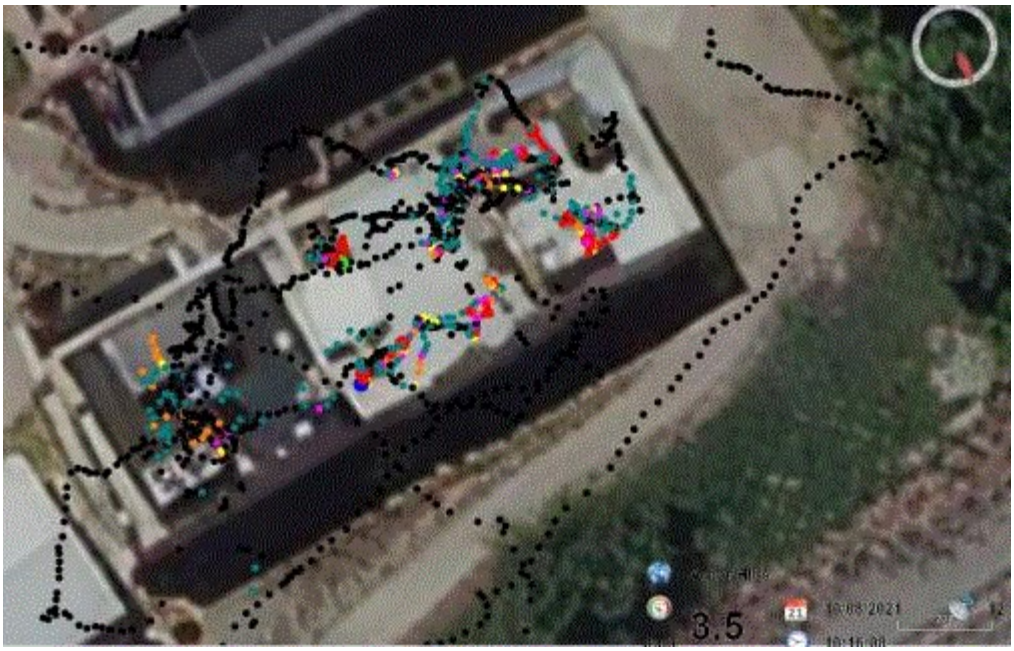

Image 4(Map 2) : Map of route of methane survey. Red shows where levels where above 100 ppm.

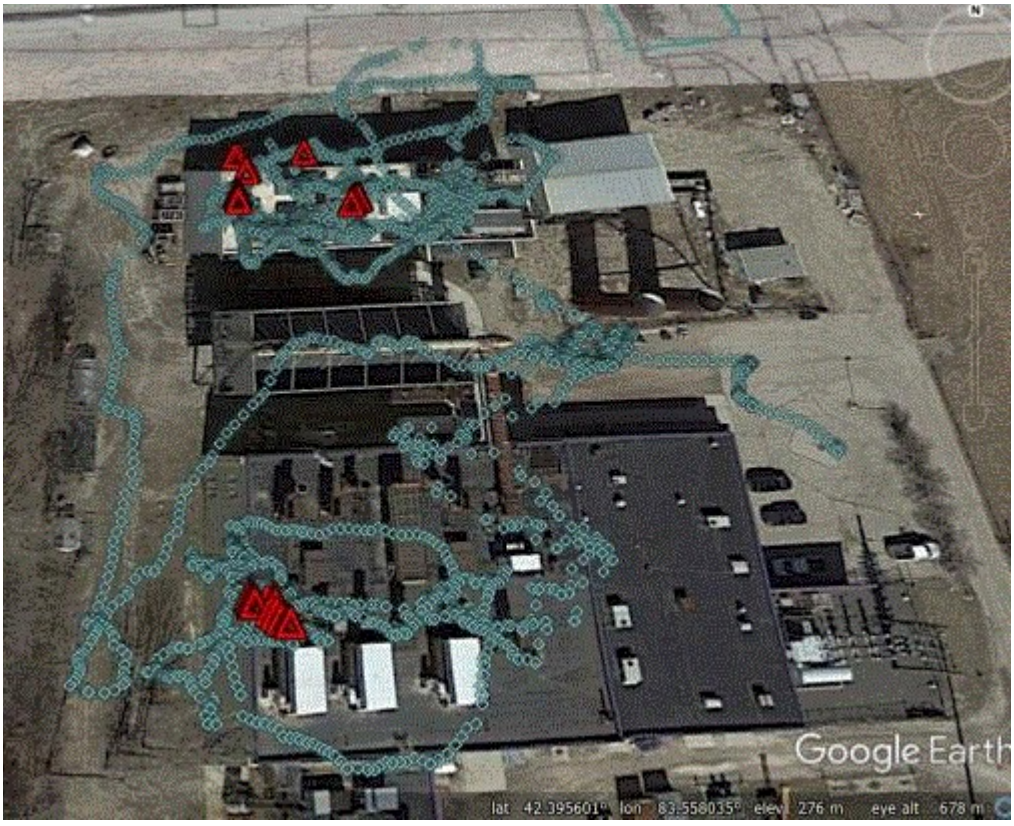

Image 5(Map 3) : Red triangles show where methane concentrations exceeded 500 ppm.

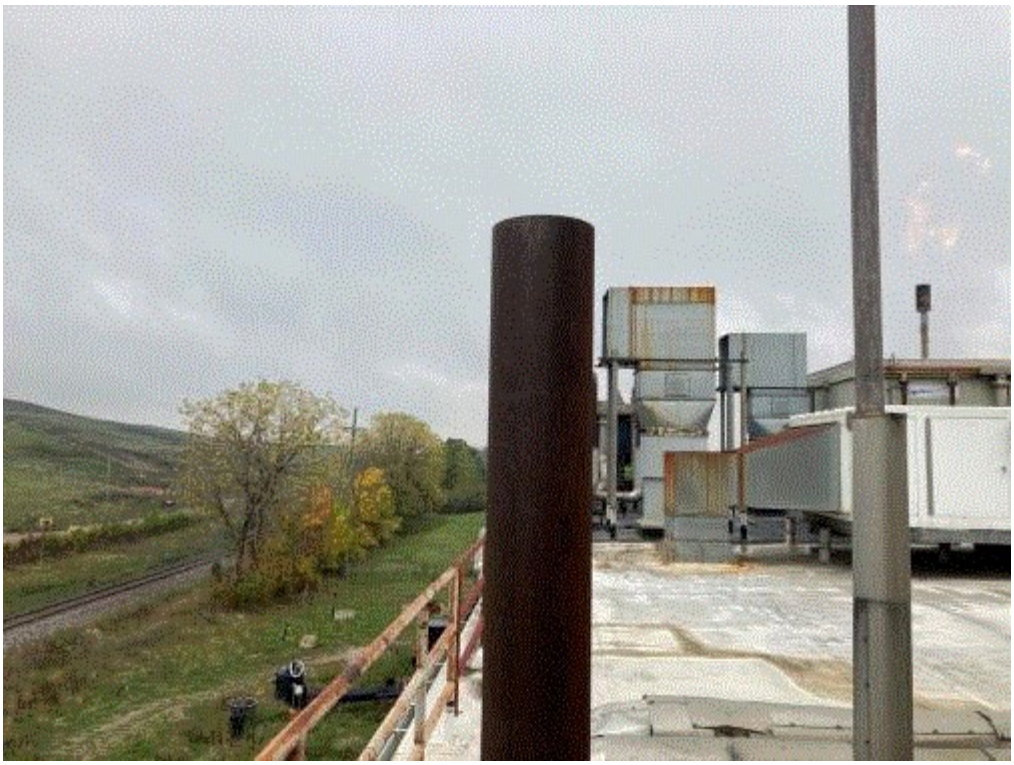

Image 6(Compressor Vent) : Compressor Vent stack

NAME Mike Kovalchick DATE 10/08/2021 SUPERVISOR