



EPA ERT Air Monitoring Summary: Arthur Richards School Unknown Odor Deployment

The Arthur Richards School, in Frederiksted, St Croix USVI, has been impacted by odors from unknown sources. The school nurse, faculty and students have expressed concern over potential health impacts associated with these odors, which lead to the request for support.

The USVI Department of Planning and Natural Resources (DPNR) requested the support of USEPA Region 2 (EPA), which led to the activation of the USEPA Environmental Response Team (ERT). EPA was tasked to perform air monitoring at and around the impacted classrooms and surrounding areas to potentially identify compounds and sources of those compounds impacting the students, faculty and support staff.

EPA and ERT targeted screening and sampling of the rooms and areas based on documents received from the DPNR, the school nurse, other school officials, and based on discussion in the field.

The EPA team was equipped with monitors that can detect volatile organic compounds (VOCs), and a variety of other compounds that included Sulfur Dioxide (SO₂), Hydrogen Sulfide (H₂S), Amines as Trimethylamine (TMA), Carbon Monoxide (CO), Lower Explosive Limit (LEL), oxygen, and Mineral Acids (as hydrochloric acid (HCl)). The sensors/monitors were chosen based on the potential impact from the following sources: sewer gases, the on-site wastewater treatment plant and associated lines/pipes, building materials, and odors described in documents obtained by EPA.

ERT and Leidos SERAS began monitoring on Tuesday, November 5, 2019. Air monitoring surveys of 15 rooms/classrooms, plus ambient locations around the complex, wastewater treatment plant, sewer/manholes, and under the modular buildings/skirting. On November 6th the team screened TMA in one additional room, two storm sewer locations, room 237 (rescreen), and at ambient locations.

ERT performed a longer duration air monitoring event (approximately 24 hours) for TMA in rooms 222, 241, and 244, and H₂S in Room 213 (where rotten egg smell was reported), plus sampling for VOCs using EPA TO-15. Additional sampling for formaldehydes, aldehydes and ketones using EPA TO-11A compounds was conducted as these compounds may be present in new construction materials. All monitoring data streamed on the VIPER telemetry network and was available for viewing real-time on ERT's Deployment Manager website.

General Observations/Discussion: The school classrooms are modular style structures with 4 single units combined as a group, each with its' own exterior door, window and HVAC unit. The classrooms are built tight with minimal natural air flow, well insulated, which may contribute to odor issues being isolated and contained to individual classrooms. The lack of air flow (other than the HVAC and doors periodically opening) may also contribute to the persistence of the odors. It could not be determined if the HVAC systems drew outside air or recirculated indoor air at the time of monitoring. Many rooms had air fresheners (plug in, automated, aerosol were all documented), which may have masked other odors and also could account for low VOC detections on the PID.

Room 222 had a present "fishy odor" at the time of monitoring, which was consistent with reports obtained by EPA. The HVAC unit in the unit has been replaced and there is the potential that wiring

might account for the odor if the wiring or circuit breaker is not properly installed and/or if wires/wiring is burning or shorting out. EPA ERT is not qualified to inspect HVAC system, circuits or electrical wiring and did not attempt to do so. Room 222 is not in a location that sewer lines should impact the classroom, although no diagrams were available to confirm.

Although EPA was not directly looking for or testing for mold, no evidence of widespread mold or interior water intrusion was documented. The team viewed areas above the drop ceilings in most rooms to ensure odors were not from those areas and look for water/moisture.

Sewer lines connect to an on-site wastewater treatment plant and are believed to run from the restrooms to a common line centrally located between the grouped classrooms, to the plant. No “as-built” diagrams of the sewer lines were available for the new construction. It was also not known if the lines from the damaged school could be impacting the new classrooms, for example, if they were broken or otherwise compromised. There is also the potential that a storm sewer could be tied into a wastewater line as there was a report that the wastewater plant had leaves and much more water volume after a rain event, although EPA has no way to confirm. Although not in EPA’s response objectives, a dye test could potentially be used to test the theory that a storm sewer is connected to a wastewater treatment line.

No widespread odors were detected outside of the classrooms and no off-site source was identified nor determined to be a source during the EPA monitoring period. The wind was predominantly out of the East.

SAMPLING ACTIVITIES: Upon completion of the air monitoring survey, five of the classrooms were selected for air sampling. Samples were deployed at the end of the school day (after 3:30 PM local time). Samples were collected for VOCs and tentatively identified compounds (TICs) over a 24-hour period following SERAS standard operating procedure (SOP) #1814, *Analysis of Volatile Organic Compounds (VOCs) in Summa Canister Air Samples by Gas Chromatography/Mass Spectrometry (GC/MS)*. Samples were collected for formaldehyde, aldehydes and ketones by EPA Compendium Method TO-11A, *Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC)*, over a 12-hour period using DNPH-treated silica gel sorbent tubes (SKC #226-119).

Room	Sampling	Monitoring
213	VOC + TO-11A	Flex H2S
222	VOC + TO-11A	Flex TMA, MR Pro
237	VOC + TO-11A	no monitoring
241	VOC + TO-11A	Flex TMA, MR Pro
244	VOC + TO-11A	Flex TMA, MR Pro
Ambient	VOC + TO-11A	no monitoring

RESULTS (Preliminary VOCs only)

Preliminary results for the VOCs samples are summarized in the table below. None of the 55 target compounds were detected in the Trip Blank, two TICs were detected. For the field samples, 12 to 25 target compounds were detected in the samples and 11 to 19 TICs were identified per sample. Two samples, 50591 and 50592, rooms 237 and 222, respectively, had compounds that exceeded the Regional Screening Levels at the 10^{-6} RSL level. In sample 50591, chloroform and carbon tetrachloride were detected above the 10^{-6} RSL. Chloroform was detected at $0.271 \mu\text{g}/\text{m}^3$ and carbon tetrachloride at $0.554 \mu\text{g}/\text{m}^3$. In sample 50592, carbon tetrachloride was detected above the 10^{-6} RSL at $0.496 \mu\text{g}/\text{m}^3$. No compounds were detected above the 10^{-4} RSLs.

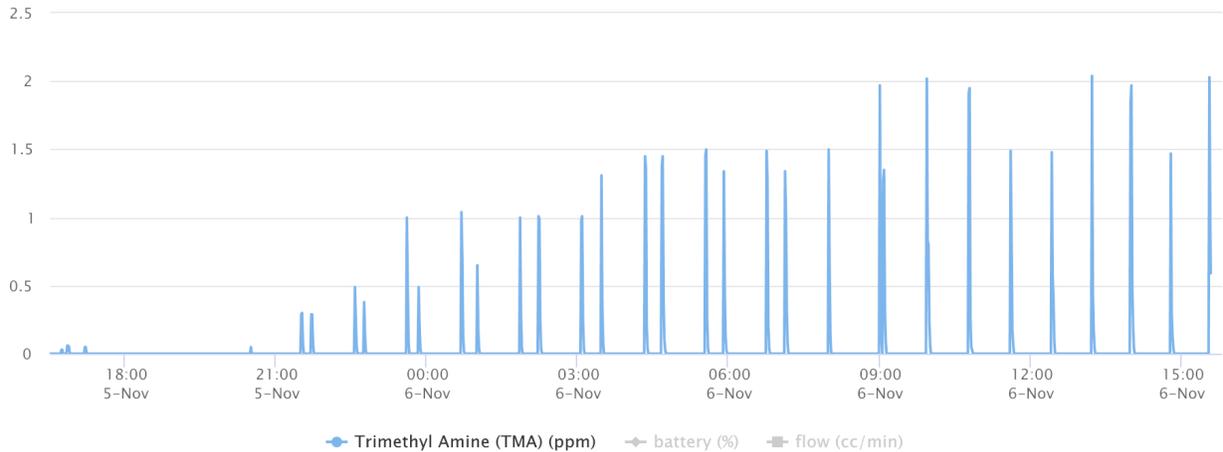
Preliminary results for the **formaldehyde, aldehydes and ketones** samples are expected 11/15/2019.

Sample Number	Room Number	Number of VOCs Detected	Number of TICs Detected	Comments
50590	241	22	19	No compounds greater than RSLs
50591	237	18	19	Chloroform and Carbon tetrachloride $>10^{-6}$ RSL
50592	222	19	19	Carbon tetrachloride $> 10^{-6}$ RSL
50593	222	20	19	No compounds greater than RSLs
50594	244	22	19	No compounds greater than RSLs
50595	213	25	19	No compounds greater than RSLs
50596	Ambient	12	11	No compounds greater than RSLs
50597	Trip Blank	0	2	No compounds greater than RSLs

Overnight Monitoring Results for Amines as Trimethylamine (TMA)

Room 222

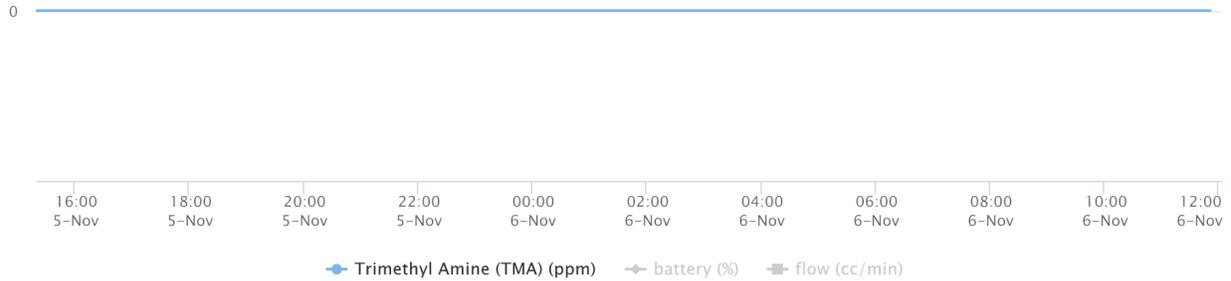
(.151) SPM Flex



In room 222, 2.04 ppm was the maximum TMA reading during the monitoring event. Generally, the detections of TMA were recorded every ~45 minutes. The cycling of the readings could be due HVAC cycling on or off, causing something to trigger the readings. The HVAC may be drawing vapor from an unknown source outside of the room or the HVAC itself could be problem. It was reported that the original HVAC in Room 222 was replaced. A potential reason for the HVAC replacement and subsequent issues could be faulty wiring. If this is the case, the cycling of the HVAC could be burning/shorting the wiring, thus producing the odor that persists in the classroom. The HVAC systems are active 24-hrs/day, although EPA couldn't determine actual cycle periods.

Room 244

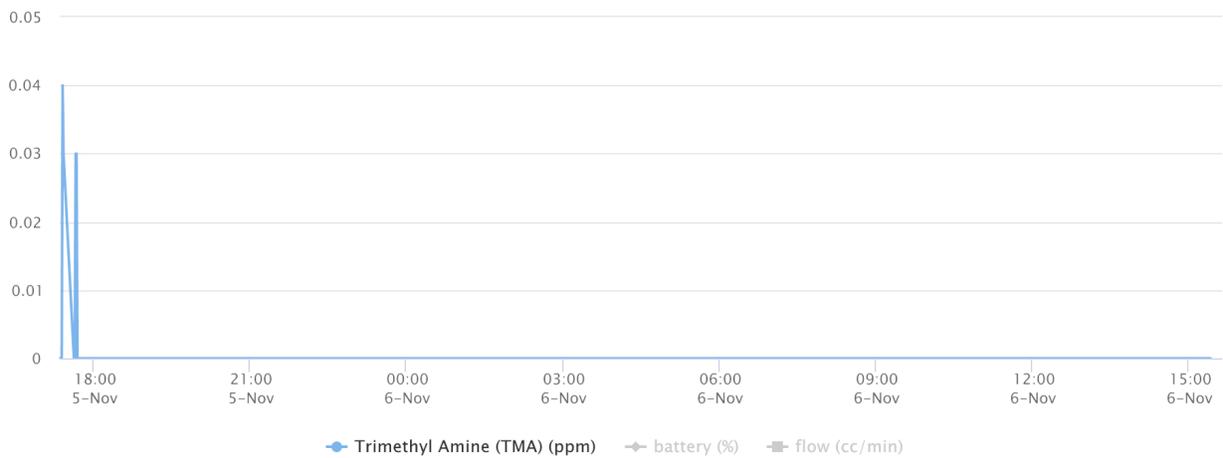
(.143) SPM Flex



Room 244. No TMA Detections recorded.

Room 241

(.150) SPM Flex

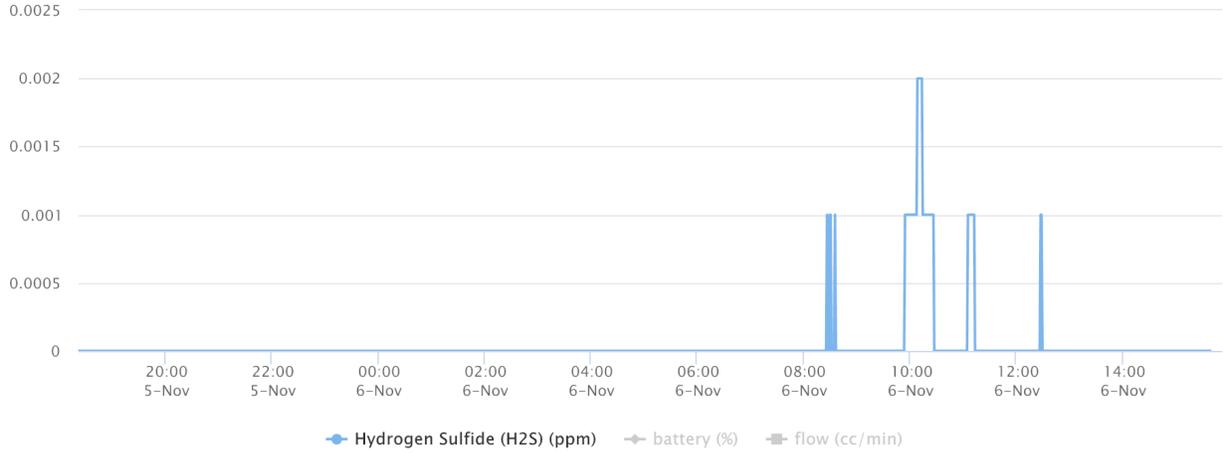


In room 241, readings up to 40ppb were recorded early in the monitoring period. NOTE: These readings could be a result of drift due to SPM electronics acclimating to the air-conditioned environment after the equipment was utilized outdoors in a hot/humid environment. No other readings were recorded after the initial start as the system acclimated to the indoor environment.

Overnight Monitoring Results for Hydrogen Sulfide

Room 213

(.144) SPM Flex



Room 213 was monitored for H₂S based on reports obtained by EPA describing a “rotten egg” type odor. EPA placed the monitor on the washer, near the drain used by the washer for its’ used water. Low levels of H₂S were recorded, with a maximum concentration of 2ppb.

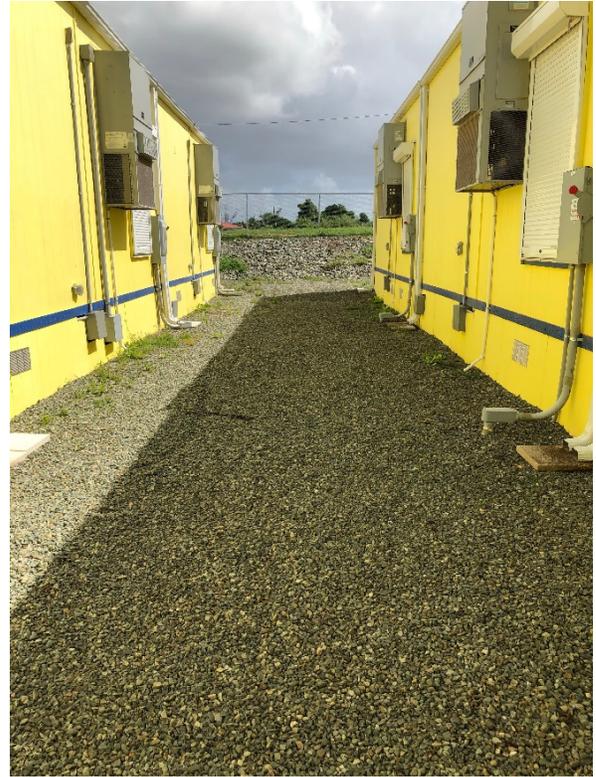
Photographs of Activities:



Air monitoring instruments equilibrating to room temperature



Downspout



Several Downspouts leading to French Drain system



Monitoring through Building Skirt



Monitoring Sewer



Air Monitoring and Sampling Room 213

Overnight Air Monitoring Locations

