

AOP-015 Event Investigation Reports (Redacted) EIR-2023-083 (11/30/2023)

(Settlement Agreement Deliverable)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800



**P.O. Box 850
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Washington River Protection Solutions

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WRPS

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Date

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EVENT SUMMARY

NOTE: This form provides timely notification to management and documents preliminary information of an event that may require a more formal investigation. Details may change upon further examination and analysis. The following is a current status of available information:

1. **Project:** Tank Farm Projects **2. Report Date:** 11/30/2023
3. **Investigation Title:** TF-AOP-015 at B-105
4. **Investigation Report Number:** EIR-2023-083
5. **Responsible Manager:** [REDACTED]
6. **Event Investigator:** [REDACTED]
7. **Area / Building / Location:** 200E/241-B Farm/Near Tank 241-B-105
8. **Date and Approximate Time of Event:** Date: 11/27/2023 Time (military): 0850
9. **Associated Action Request (AR) Number:** WRPS-AR-2024-0439
10. **Associated Occurrence Report Number (if applicable):** _____
11. **Event Investigation Meeting Held:** Yes [] or No [X] Date: _____ Time (military): _____

12. Activity in Progress: (What activity was under way, include procedures and work order numbers, as applicable)

A Sampling Operations Field Work Supervisor (FWS) and a drilling operator were in 241-B Farm preparing the work area and equipment to perform vadose direct push drilling activities associated with Work Order (WO)# 1045104, "B-Farm Direct Push."

13. Personnel Involved: (Job positions, number of personnel, identify any support organizations or subcontractors)

-1 Sampling Operations FWS (WRPS)
-1 Drilling Operator (Atkins)

14. What Happened: (Provide a short discussion of what happened)

On 11/27/2023, a Sampling Operations FWS was in 241-B Farm taking pictures and ensuring the drilling rig was in the correct location for upcoming vadose drilling activities associated with WO# 1045104. Simultaneously, a drilling operator was performing pre-checks and preparing the drilling rig for the upcoming vadose drilling activities associated with WO# 1045104.

At approximately 0850 hours, the FWS was traversing from 241-B-106 to 241-B-105, when they heard an audible alert or instrument beeping described as being similar to when a radiological electronic dosimeter (ED) has a low-battery. The FWS checked their Ventis Pro5 personal ammonia monitor (PAM), which was displaying an ammonia concentration of 0 parts per million (ppm) and confirmed the Ventis Pro5 was not indicating a "Response Level" alarm¹. The drilling operator located in proximity to the Sampling Operations FWS (approximately 5 feet away near tank 241-B-105), also checked their Ventis Pro5 PAM, which was displaying a 0 ppm ammonia concentration and was not indicating a "Response Level" alarm.

The Sampling Operations FWS exited 241-B Farm and reported the audible alert/instrument beeping to two R&C Industrial Hygiene Technicians (IHTs) located within the MO-825 change trailer. One of the R&C IHTs reviewed the peak readings log of the FWS's Ventis Pro5 instrument and observed a peak reading of 5 ppm. The Sampling Operations FWS was directed to report the information to the Central Shift Manager (CSM).

The information reported by the Sampling Operations FWS to the CSM was that their Ventis Pro5 PAM alarmed and had a reading of 5 ppm. Based on the information reported

¹ Response Level alarm setpoint is 6 ppm ammonia.

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to the CSM at the time of the event, the CSM contacted a Production Operations-East (POE) Industrial Hygienist (IH). The CSM and POE IH evaluated the information reported by the Sampling Operations FWS and after further discussions with an R&C IH a determination was made to enter Abnormal Operating Procedure, TF-AOP-015, *Response to Personal Ammonia Monitor Alarm*.

The two workers completed Odor/Vapor Response cards. The workers declined precautionary medical surveillance by the onsite medical provider.

15. Where Did It Happen: (Description of work area and working conditions. Include information on weather conditions, PPE, Postings, etc.)

At 241-B Farm, near tank 241-B-105 (Refer to Figure 1).

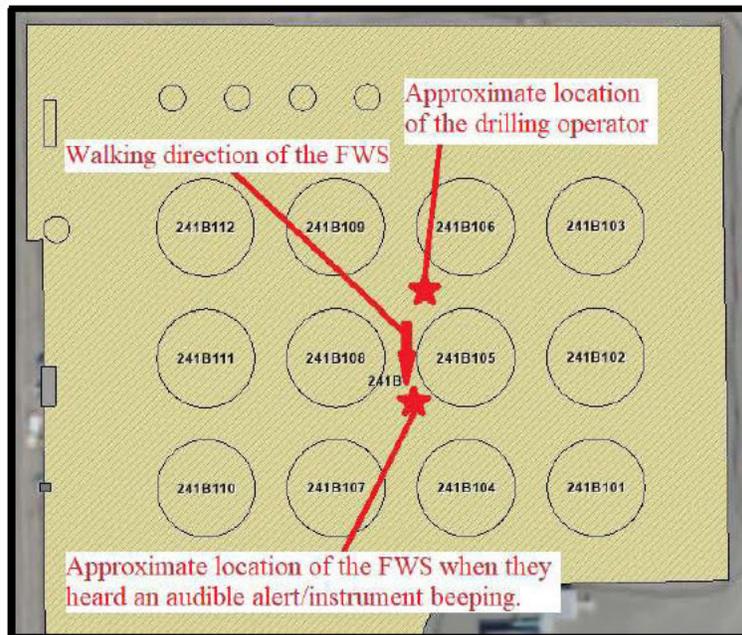


Figure 1 – Location of Personnel at the Time of The PAM Alarm

Workers were within a posted radiological Contamination Area (CA) and were wearing anti-contamination clothing as required by Radiological Work Permit (RWP) # WTP-0634, "241-B- Farm Vadose".

Workers were wearing Full-Face Air Purifying Respirators (FF-APR) with Gas/Vapor cartridges (MSA GME) as required by Standing Order SO-OPS-17-003, "Use of Respiratory Protection in Tank Farms" and TFC-ESHQ-IH-STD-07, "Respiratory Protection."

As directed by TVIS-B-001, workers were wearing personal ammonia monitors (i.e., Ventis Pro5) when performing work activities in support of WO# 1045104.

The Hanford Site Meteorological Station #6 and Data Fusion and Advisory System (DFAS) application, powered by SmartSite™, was utilized for outdoor weather details at the time instrumentation beeping was reported. The Hanford Site Meteorological Station #6 and DFAS dashboard indicated the following weather conditions at 0900 hours on 11/27/2023:

Wind Speed: 2.6 miles per hour (mph)
Wind Direction: 139° (out of Southeast)
Mixing Height: 200 feet above grade
Stability Class: E (slightly stable conditions)
Temperature: 31° F
Barometric Pressure: 29.61 inches Hg
Humidity: 84%

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16. Impact to Facility: *(Caused by the event or a description of known consequences)*

Access was restricted to 241-B Farm for approximately one hour. No impacts to facility safety status, operational capabilities, or facility reliability occurred.

17. Immediate Actions Taken: *(List immediate actions taken to stabilize the scene or respond to the event)*

- CSM initiated TF-AOP-015 and restricted access to 241-B Farm.
- CSM requested Odor/Vapor Response Cards from affected workers.
- Production Operations-East Shift IHTs initiated TF-AOP-015 response actions and monitoring per IHSP-PROG-MULTI-TF-AOP-15. Direct reading instrument (DRI) area readings indicated at or below background levels for ammonia concentration.
- Event Investigation EIR-2023-083, " TF-AOP-015 at B-105," was initiated.

18. Compensatory Actions Taken:

None.

19. Remedial Actions Taken:

None.

20. Key Elements of the Investigation: *(Key investigation points)*

To summarize the conclusions of the Industrial Hygiene Event Investigation Report, IHIR-0084 "TF-AOP-015 at B-105," the Ventis Pro5 PAM audible alert was not indicative of an employee chemical exposure event or changing Tank Farm conditions related to Tank Farm vapors. Direct Reading Instrumentation monitoring performed during TF-AOP-015 response actions did not indicate further action was necessary with regard to a worker safety and health occupational exposure standpoint. As a result, the area was released from restricted access.

The following considerations support the IHIR-0084 conclusion:

- (1) The Sampling Operations FWS reported the Ventis Pro5 PAM indicated a reading of 0 ppm ammonia at the time the audible alert/instrument beeping was observed. In addition, they reported the Ventis Pro5 PAM was not indicating a "Response Level" alarm. Further, the description of the audible alert/instrument beeping provided by the Sampling Operations FWS (i.e., similar to when a radiological ED has a low-battery) is not consistent with Ventis Pro5 "Response Level" or "Action Level" alarms.
- (2) Review of the 11/27/2023 datalog for the FWS's Ventis Pro5 PAM confirmed no alarm events occurred. In addition to there being no record of any detectable ammonia concentrations (≥ 1 ppm).
- (3) An additional worker was in proximity (approximately 5 feet) of the individual when the Ventis Pro5 PAM alarmed. The additional worker's Ventis Pro5 PAM did not alarm or indicate elevated ammonia concentrations. If changing Tank Farm conditions related to Tank Farm vapors were present, it is expected the Ventis Pro personal ammonia monitor of the additional worker within the immediate area would have alarmed or indicated ammonia concentrations > 0 ppm.
- (4) Further discussions after TF-AOP-015 had already been entered and response actions initiated determined there had been a miscommunication relayed to the R&C IH, CSM and POE IH. The information that had been provided to the R&C IH, CSM and POE IH was the FWS's Ventis Pro5 PAM initiated a "Response Level" alarm with a peak 5 ppm ammonia concentration displayed. Instead of the description of the audible alert/instrument beeping that was provided, the Ventis Pro5 PAM not indicating a "Response Level" alarm, or a reading of 0 ppm ammonia being displayed at the time the audible alert/instrument beeping was observed.

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- (5) Associated timestamps when peak readings occurred are not provided within the Ventis Pro5 PAM peak readings window displayed on the instrument. Therefore, IHTs are unable to confirm if the recorded peak reading occurred when personnel were utilizing the Ventis Pro5 PAM during tank farm entries from a field location. Associated timestamps of peak readings can only be determined once the Ventis Pro5 instrument datalog is uploaded to the DSX-L database from a designated docking station. Evaluation of the Ventis Pro5 instrument datalog determined the 5 ppm peak reading did not occur when the FWS was utilizing the PAM during WO# 1045104 work activities. Although, it appears the R&C IHT who reviewed the peak readings log of the FWS's Ventis Pro5 PAM likely incorrectly assumed/concluded the 5 ppm ammonia peak reading occurred while the FWS was in B Farm, ultimately contributing to the inaccurate initiation of TF-AOP-015.
- (6) Prior to checkout of a Ventis Pro5 instrument/field deployment, the instruments are subjected to a sensor bump (i.e., sensor response test that exposes the sensor to a predetermined ammonia gas concentration to ensure the sensor is responding accordingly). As identified during a previous TF-AOP-015 response and event investigation [Reference: WRPS-AR-2023-2077/EIR-2023-056/IHIR-00078]; a peak reading caused by calibration gas exposure and the propensity of ammonia gas to linger on a sensor is registering in the Ventis Pro5 PAM peak readings window after the instrument is turned on. Resolution of this issue is ongoing and is being addressed through Condition Report WRPS-CR-2023-2077.
- (7) Even though Ventis Pro PAMs are programmed to begin datalogging 80 seconds after turning on the instrument, they are still recording the peak readings occurring during instrument calibration before datalogging begins. Therefore, the Ventis Pro5's peak readings window displayed on the instrument are indicating peak ammonia readings even though never being exposed to ammonia concentrations outside of the calibration docking station.
- (8) Ammonia is used as a sentinel tank waste chemical vapor for chemicals of potential concern (COPC), therefore, DRIs equipped with an ammonia sensor are utilized at a minimum when monitoring for tank waste chemical vapors/COPCs. Field response DRI monitoring conducted by a shift IHT around the affected area in 241-B Farm, following initiation of TF-AOP-015, indicated a less than detectable ammonia concentration (< 1 ppm), which is below background levels. Providing additional indication, the cause of the personal ammonia alarm was unlikely to be resultant of Tank Farms exhauster emissions.

21. Positive Aspects Identified:

-Sampling Operations FWS reported audible alert/instrument beeping to IHTs for further investigation.

22. Key Take Aways / Learning Opportunities:

-IHTs/IHTs to validate all data associated with a potential PAM alarm prior to initiating a TF-AOP-015 entry to ensure requirements are met.
-Ensuring communication of necessary information to all personnel involved in an event is essential to ensure the proper PAM level actions and expectations are executed.

23. Event Investigation:

- An Event Investigation will be completed per [TFC-OPS-OPER-C-14](#).
- This event will be managed by another process, i.e., Operability Evaluation, Engineering Technical Evaluation, etc.
- This event does not require continuation of the Event Investigation process.

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Responsible Manager Approval:

Name (First, Middle Initial, Last)

Signature / Date 11/30/2023

CAS Manager Approval:

Name (First, Middle Initial, Last)

Signature / Date

ODOR/VAPOR RESPONSE CARD - 241 B FARM

1. Complete below information and map (Page 1).

- Date and time of event: 11/21/23 0900
- Check Applicable:
 Odor Ammonia Alarm (6 ppm) Ammonia Alarm (12 ppm) Alarm (other - describe):
- Your name and the work you were performing: [Redacted] walk down / picture
- Other Work Underway? Describe: N/A
- Location of event (mark area on map and wind direction): B-105
- Name(s) of others in or near the affected area: [Redacted]
- Was Industrial Hygiene present, who? No
- Describe the odor:
 Sweet Sour Smoky Septic/Sewer Musty Rotten
 Metallic Onion Earthy Ammonia Citrus Solvent
 Other (describe): None
- Is source known/likely? Describe:
- Your symptoms? None
 Headache Dizziness Nausea Cough Fatigue
 Weakness Sore Throat Difficulty Breathing Eye Irritation Rash
 Itch Tingling Numbness Taste
 Other (describe):

2. Provide this completed card (Page 1 & 2) to Supervisor, Industrial Hygiene, your Union Safety Representative or the CSM. If received by Supervisor/IH/U-SR, Supervisor/IH/U-SR will ensure card is provided to the CSM.

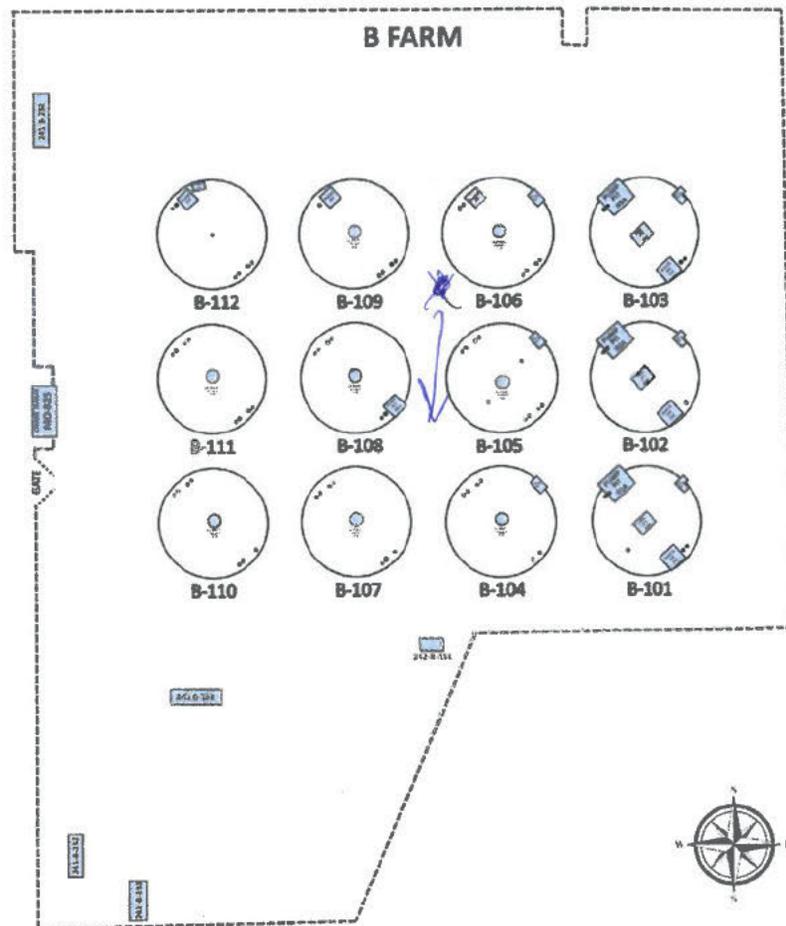
* Alarm

ODOR/VAPOR RESPONSE CARD - 241 B FARM

Instructions:

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), at [REDACTED]
3. Complete both pages of this form and include as many details as possible, including:
 - a. Approximate location, see map at right;
 - b. Wind direction, speed and description, such as stable or gusty wind;
 - c. Environmental conditions, such as hot, cold, windy, rainy;
 - d. Other work or contractors in the area;
 - e. Anything else you think is relevant.
4. Provide the completed card to your Supervisor*, Industrial Hygiene*, Union Safety Representative* or the CSM.

* If received by Supervisor, IH, or Union Safety Representative, the Supervisor/IH/ Union-SR will ensure card it is provided to the CSM.



ODOR/VAPOR RESPONSE CARD - 241 B FARM

1. Complete below information and map (Page 1).

- Date and time of event: 11/27/23 0900
- Check Applicable:
 Odor Ammonia Alarm (6 ppm) Ammonia Alarm (12 ppm) Alarm (other - describe): _____
- Your name and the work you were performing:
[REDACTED] - Prepare for drilling activities
- Other Work Underway? Describe:
N/A
- Location of event (mark area on map and wind direction):
B-105
- Name(s) of others in or near the affected area:
[REDACTED]
- Was Industrial Hygiene present, who?
no
- Describe the odor:
 Sweet Sour Smoky Septic/Sewer Musty Rotten
 Metallic Onion Earthy Ammonia Citrus Solvent
 Other (describe): none
- Is source known/likely? Describe:
no
- Your symptoms? None
 Headache Dizziness Nausea Cough Fatigue
 Weakness Sore Throat Difficulty Breathing Eye Irritation Rash
 Itch Tingling Numbness Taste
 Other (describe): _____

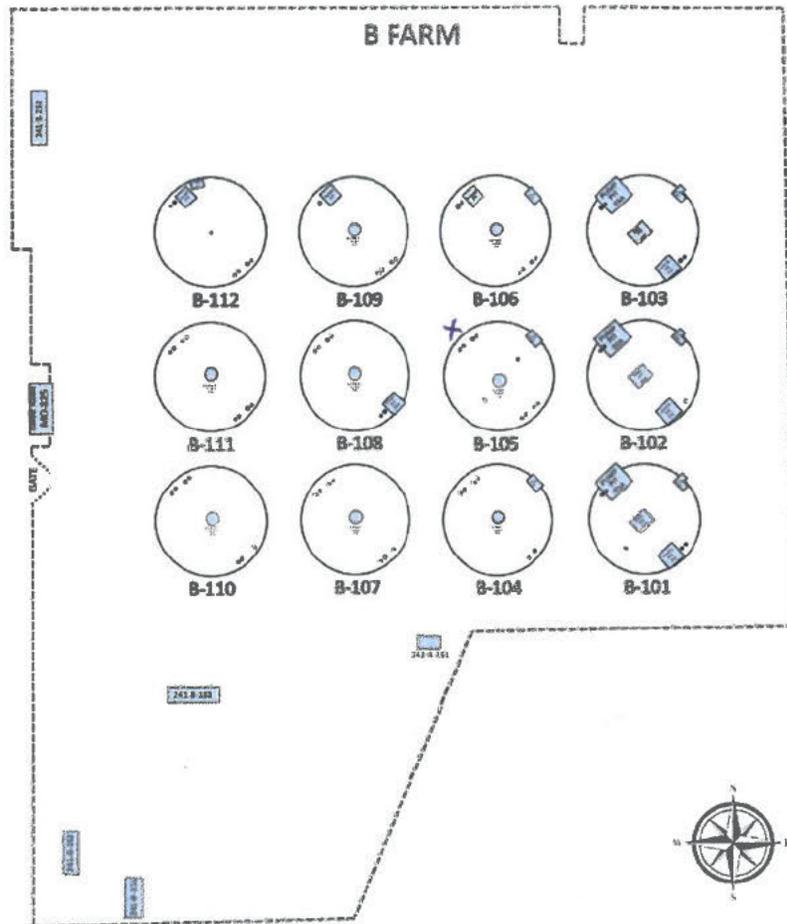
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ODOR/VAPOR RESPONSE CARD - 241 B FARM

Instructions:

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager (CSM), at [REDACTED]
3. Complete both pages of this form and include as many details as possible, including:
 - a. Approximate location, see map at right;
 - b. Wind direction, speed and description, such as stable or gusty wind;
 - c. Environmental conditions, such as hot, cold, windy, rainy;
 - d. Other work or contractors in the area;
 - e. Anything else you think is relevant.
4. Provide the completed card to your Supervisor*, Industrial Hygiene*, Union Safety Representative* or the CSM.

* If received by Supervisor, IH, or Union Safety Representative, the Supervisor/IH/ Union-SR will ensure card it is provided to the CSM.



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INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT

Event Title: <p style="text-align: center;">TF-AOP-015 at B-105</p>	PER Number: <p style="text-align: center;">N/A</p>	
		IHIR Number: <p style="text-align: center;">IHIR-0084</p>

Date: 11/27/2023	Time: 0850	Location: 241-B Farm B-105
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Event Summary and Timeline:

Event Summary:
A Ventis Pro V personal ammonia monitor (PAM) alarmed while reading zero parts per million (ppm) inside 241-B-Farm, near B-105. Once the worker entered the change trailer, an IHT identified a peak reading of five ppm on the instrument. At the time of the PAM alarm, a total of two workers were present and were preparing for vadose push activities. The individual whose PAM alarmed was traversing the farm alone, the other worker's PAM did not have detectable ammonia (NH3) readings. At 0918, the Central Shift Manager (CSM) restricted access to B Farm.

Field Response Timeline:
0850 Approximate time of event - PAM alarm
0855 Retrieval Closure (R/C) Industrial Hygiene Technician (IHT) inspects PAM at B Farm change trailer and identifies a peak reading of 5ppm
0856 R/C IHT contacts R/C Industrial Hygienist (IH)
0901 Affected Worker (AW) contacts CSM

- No odors detected
- No symptoms reported
- Individual declined medical
- CSM requested Odor/Vapor Response Cards (OVRC) and PAM from FWS

0905 CSM contacts POE IH-1
0911 CSM contacts AW

- Two personnel in farm at time of alarm
- One PAM alarmed
- IHT has PAM, transporting to Central Shift Office (CSO)
- Peak reading of 5 ppm

0911 POE IH-1 contacts POE IHT shift support
0912 POE IHs arrive at CSO
0918 SOEN: "Entered TF-AOP-015 Response to Personal Ammonia Monitor Alarm for Ventis Pro Alarm in B Farm. Access to B Farm is restricted. All personnel exit B Farm. CSM"
0918 Review of Data Fusion Advisory System (DFAS), powered Smart Site™, for current weather details:

- Wind Speed: 2.6 miles per hour (mph)
- Wind Direction: 139° East-Southeast (ESE)
- Mixing Height: 200 feet above grade
- Stability Class: E (slightly stable conditions)

0922 CSM contacts Department of Energy (DOE) Facility Representative
0925 POE IH-1 contacts POE IHT shift support
0926 POE IH-2 contacts R/C IH-1 to update on AOP-015
0929 POE Shift IHT Supervisor arrives at CSO
0930 AW arrives at CSO and completes Odor-Vapor Response Card (OVRC) and PAM Equipment Alarm, Issues, and Concerns card
0930 POE Shift IHTs arrive at CSO
0937 R/C IHs arrive at CSO
0938 POE IHs and R/C IHs check DSXL

- Alarm at 7ppm identified (from a previous event on 4/6/2023)

0939 POE IH-1 briefs POE Shift IHT.

- Monitor per IHSP-PROG-MULTI-TF-AOP-15 "Response to Ammonia Monitor Alarm"
- Map of area where PAM alarmed
- Respiratory Protection Form "TF-AOP-015" Task 5 (Voluntary Use)
- If not voluntarily used, then "MDRPF-STD-07" Task 1

0940 POE Shift IHTs and R/C IH-1 depart CSO
1016 R/C IH-1 notifies R/C IH-2 that field response is complete and all readings were below

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INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT(Continued)

Event Summary and Timeline:

detection limits (<1ppm)

1035 POE Shift IHT notifies CSM that direct readings instrument (DRI) passed Post-Use Function Test
1039 SOEN: "Exited TF-AOP-015 Response to Personal Ammonia Monitor Alarm. Response actions for the TF-AOP-015 event have been completed and the results are at or below background levels. Normal access to B Farm is restored. CSM"

Sampling/Monitoring Results:

Field Response Area Readings:

- Ammonia: Less than detectable (< 1ppm)

The responding IH and IHT entered A Farm to perform DRI monitoring with the MultiRAE. Monitoring was performed around the area where the PAM alarmed for potential sources of ammonia and/or tank vapors. DRI monitoring and observations made by the IH and IHT demonstrated no ongoing conditions which could result in PAM alarm.

PAM Datalog:

Review of the data-log reported all readings below detectable limits for ammonia for the duration of the session. PAM data is recorded in 10-second increments. Additionally, no alarm events were recorded to the datalog on 11/27/2023.

SWIHD References:

Field Response Site Wide Industrial Hygiene Database Direct Reading Instrumentation Survey:

- #23-07863 "TF-AOP-015 Response at 241-B Farm"

Additional Information:

At the time of the PAM alarm, the worker whose PAM alarmed was wearing respiratory protection equipment in accordance with the Management Directed Respiratory Protection Form, "MDRPF-STD-07" Task 1: Full Face Air Purifying Respirator (FF-APR) with Gas/Vapor cartridges (MSA GME Chemical Vapor).

After an interview by R/C IH-1 of the worker wearing the PAM, it became apparent that there was a miscommunication. It was reported to R/C IH-1 and the CSM that the "PAM alarmed with a peak of 5ppm" but it was not reported that the worker wearing the PAM saw a reading of 0 ppm during the alarm. While reviewing the alarming PAM data in DSXL, an alarm event of 7ppm was identified, but it was overlooked that the event occurred on 4/6/2023. The PAM that alarmed was last calibrated on the morning of the alarm, 11/27/2023. A review of the data log showed that all readings were below detection limits.

Recommendations/Conclusions:

The datalog of the alarming PAM revealed no alarm event and did not record any readings above detection limits once data logging began for 11/27/2023. After review of the calibration and sensor bump schedule from the PAM that alarmed, it was discovered that the sensor was calibrated the morning of the event. Due to the propensity of ammonia gas to linger, it is likely that after the calibration test when the instrument turned on it registered a peak reading. WRPS owned Ventis Pro PAMs are programmed to begin datalogging 80 seconds after turning on, but will still record peak readings before datalogging begins. This would explain why the peak is not recorded in the data log.

In addition to the lack of resulting ammonia data on the alarming device, there were no reports of odors associated with ammonia- typically a pungent odor detected at low concentrations. It is unlikely this audible alert was a response to changing conditions of tank farm chemical vapor.

Other:

The worker did not report any symptoms and was offered and declined medical surveillance.

Industrial Hygienist:

Print First and Last Name

Signature / Date

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INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT (Continued)

Industrial Hygiene Level 2 Manager:

[Redacted]

Print First and Last Name

[Redacted]

Signature / Date