

# **C-67 Event Investigation Reports (Redacted) EIR-2023-045 (06/19/2023)**

**(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  
Richland, Washington 99352**

# C-67 Event Investigation Reports (Redacted) EIR-2023-045 (06/19/2023)

## (Settlement Agreement Deliverable)

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Washington River Protection Solutions

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WRPS

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**Richland, Washington 99352**

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**APPROVED**  
*By Lynn M Ayers at 10:58 am, Aug 21, 2023*

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Date

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Washington River Protection Solutions  
**EVENT SUMMARY**

Check PART 1 box to hide that section of the form. Check PART 2 box it will show that section.

**PART 1 (hide)\***       **PART 2 (show)\***

**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:

**Project:** Tank Farm Projects/Construction      **Date:** Jun 19, 2023

**Area/Building/Location:** 200W/U Farm/ U-107      **Approximate Time of Event:** 0612 hours

**AR Number:** WRPS-AR-2023-1755      **Responsible Manager:** [REDACTED]

**EIR Number:** EIR-2023-045      **Event Investigator:** [REDACTED]

**EVENT SUMMARY PART 1**

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

Hand excavation to prepare for installation of interim surface barrier was being performed between tanks U-107 and U-104 with Health Physics Technician (HPT) radiation surveys, per Work Order (WO) #945335, "241-U, Install Bollards, Caisson's, and Grading for Barrier." Powered equipment including a compactor (plate wacker), mini excavator, and Georgia Buggy (motorized wheelbarrow) were being used in the area.

**Personnel Involved** (Job positions, number of personnel, identify any support organizations or subcontractors directly involved):

Personnel that reported smelling an odor working near tank U-107:  
- 2 Fowler (WRPS sub-contractor) laborers  
- 2 WRPS Health Physics Technicians (HPT).

Approximately 20 other workers were also in U farm when odors were reported.

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

On 6/19/2023, at approximately 0612 hours, hand excavation was being performed by a crew of 2 laborers with 2 HPTs performing radiation surveys. Three of the crew smelled an odor they described as "metallic, smoky, burnt charcoal, earthy musty, or rotten." All personnel in the farm were evacuated. Initially, none of the workers reported symptoms, but three were transported to the onsite medical provider (HPMC) for precautionary medical evaluation. About 45 minutes later, the fourth worker also reported smelling odors and was also taken to the onsite medical provider (HPMC) for precautionary medical evaluation. Two of the individuals later reported symptoms, including a sore throat, taste, headache, itchiness, and runny nose. After evaluation at the onsite medical provider (HPMC), the four individuals were released to return to work without restriction.

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

U Farm on the North side of U-107 and between U-104 and U-107.

At the time the odors were reported, the individuals were working in an area requiring the use of respiratory protection. All four workers who smelt odors were wearing full-face air purifying respirators (FFAPRs) with chemical cartridges per Respiratory Protection Form (RPF) MDRPF-STD-07 as directed by Standing Order SO-OPS-17-003 "Use of Respiratory Protection in Tank Farms."

As directed by TVIS-U-001, Personal Ammonia Monitors (e.g., VentisPro) were used by all workers.

Workers were within a posted radiological Contamination Area (CA) and were wearing anti-contamination clothing as required by Radiological Work Permit (RWP) WTP-0608.

A 0 to 5 mph breeze from the Southwest (SW) was reported by the workers in the cool morning. Hanford Meteorological Station #31 recorded conditions at 0615 hours on 06/19/2023:

- . Wind Speed: 2 miles per hour (mph)
- . Wind Direction: 090 ° (out of East)
- . Stability Class: E (slightly stable conditions)
- . Temperature: 44°F
- . Barometric Pressure: 29.06 inches Hg
- . Humidity: 44%.

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**EVENT SUMMARY (Continued)**

Project: Tank Farm Projects/Construction Date: Jun 19, 2023

Area/Building/Location: 200W/U Farm/ U-107 Approximate Time of Event: 0612 hours

AR Number: WRPS-AR-2023-1755 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-045 Event Investigator: [REDACTED]

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

Access was restricted to U Farm.  
No additional impacts to scheduled 06/19/2023 work evolutions occurred.

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

- Work in the farm was stopped, the Field Worker Supervisor (FWS) evacuated his personnel from the farm and Central Shift Manager (CSM) was notified.
- The CSM initiated TFC-OPS-OPER-C-67 odor response, restricted access to U Farm, and issued Shift Office Event Notification (SOEN).
- Production Operations Industrial Hygiene Technician (IHT) responded to the area and took direct-reading instrument (DRI) readings. DRI readings were below action levels.
- CSM made required TFC-OPS-OPER-C-67 notifications.
- Event Investigation EIR-2023-045, "U Farm C-67 Odor Event," was initiated.

**Notifications Already Made** (Time and personnel notified):

- [0618 hours] - CSM received call from field of reported odor. Entered C-67 odor response and approximately 20 workers evacuated the farm.
- [0633 hours] - CSM sent SOEN restricting U-Farm; notified DOE FR.
- [0656 hours] - CSM received update of four individuals smelling metallic odor.
- [0701 hours] - CSM received update that a Lockout/Tagout (LOTO) boundary was in place in area.
- [0714 hours] - CSM received odor response cards.
- [0720 hours] - CSM received notification the LOTO boundary in U-Farm is under TSU-23-010.
- [0726 hours] - Response plan created and signed.
- [0731 hours] - CSM received call from Safety Integration and provided information.
- [0759 hours] - CSM initiated event investigation and notified DOE FR.

This event does not merit an Event Investigation meeting

This event merits an Event Investigation meeting

**Basis for Determination:**

Information gathered from interviews and documentation reviews have provided sufficient information regarding this event.

**Responsible Manager:**

[REDACTED] \_\_\_\_\_ Digitally signed by [REDACTED]  
Print First and Last Name Signature / Date

**CAS Manager:**

[REDACTED] \_\_\_\_\_ [REDACTED]  
Print First and Last Name Signature / Date

**EVENT SUMMARY PART 2**

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

In summary of the Industrial Hygiene Event Investigation report, IHIR-00073 "Unusual Odor 241-U Farm"; direct reading instrument (DRI) monitoring could not readily identify a source. However, the odor encountered by four workers was not indicative of an employee chemical exposure event or changing Tank Farm conditions related to Tank Farm vapors and was determined to likely be resultant of exhaust emissions from the Georgia Buggies, plate compactors, and/or mini excavators operating within the work area.

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**EVENT SUMMARY (Continued)**

**Project:** Tank Farm Projects/Construction **Date:** Jun 19, 2023

**Area/Building/Location:** 200W/U Farm/ U-107 **Approximate Time of Event:** 0612 hours

**AR Number:** WRPS-AR-2023-1755 **Responsible Manager:** [REDACTED]

**EIR Number:** EIR-2023-045 **Event Investigator:** [REDACTED]

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

Direct Reading Instrumentation monitoring performed during TFC-OPS-OPER-C-67 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 and work was allowed to continue.

The following considerations support the IHIR-00073 conclusion:

(1) This determination is consistent with the conclusions from a previous event that occurred during a similar work evolution in TX Farm on 06/18/2021 while performing the WO# 669415, "Performing grading of TX Farm" work evolution while installing the TX Farm interim barrier. This event occurrence was concluded to be resultant of poorly or erratically/inefficiently running gasoline fueled internal combustion engines in powered wheelbarrows/Georgia Buggies [Reference EIR-2021-046 and IHIR-00020]. During the 06/18/2021 event response and investigation activities, there were three additional instances where qualitative odor observations by IHTs, IH, and IS Professionals were consistent with the 06/18/2021 odor descriptors, two of those additional instances were also coupled with abnormally elevated exhaust emissions from Georgia Buggy equipment identified utilizing DRI monitoring and grab air sampling.

(2) Georgia Buggies, plate compactors, and mini excavators were operating within the work area at the time of the event occurrence. Two of the four workers who reported experiencing the odors were approximately 25 feet west of the plate compactor and 50 feet north of the mini excavator, however, the distance from Georgia Buggies was not determined. One of the four workers was ~5 feet from the Georgia Buggies, however, their distance from the plate compactor and mini excavator was not determined. And one of the four workers was ~1 foot from the Georgia Buggies, 5 feet east of the mini excavator, and 50 feet west of the plate compactor. Based on the location of the workers and the emission generating equipment in operation at the time of the event occurrence, workers could have potentially been downwind of equipment exhaust.

(3) Two of the four individuals who reported encountering the odor stated the odor smelt like Georgia Buggy exhaust. In addition, several workers stated they have smelled exhaust through their respirator on multiple occasions while supporting multiple jobs throughout tank farms. Therefore, lending further support the odor encountered was likely resultant of exhaust emissions from the Georgia Buggies utilized during this work evolution.

(4) Common byproducts of gasoline combustion are various carbon, sulfur, and nitrogen oxides. A review of the respiratory cartridge information provided by MSA (respiratory equipment being worn by the four workers who reported odors) reveal that while MSA GME cartridges used should filter out sulfur dioxide, they may not be effectively filtering out nitrogen or carbon oxides. While carbon dioxide, carbon monoxide, and nitric oxide would not be filtered by MSA GME cartridges, these components are odorless. Nitrogen Dioxide is reported to have a pungent, acrid, strong, harsh odor with physical symptoms of coughing or nose, throat, and eye irritation.

(5) Because nitric acid was utilized in nearly all production processes that generated tank waste, and the most common byproduct of those processes was reduction of nitrate ion to ammonia during the dissolution (oxidation) of irradiated fuel, ammonia is the most prevalent chemical of potential concern (COPC) found in all tanks. Therefore, ammonia is utilized as a sentinel indicator for Tank Waste Chemical Vapor COPCs, thus direct reading instruments (DRIs) equipped with an ammonia sensor are utilized at a minimum when monitoring for tank waste chemical vapors/COPCs. Monitoring for Volatile Organic Compounds (VOCs), utilizing a DRI equipped 10.6 eV photoionization detector, and mercury provides further indication for Tank Waste Chemical Vapors/COPCs.

Investigative TFC-OPS-OPER-C-67 DRI monitoring indicated less than detectable concentrations for ammonia (< 1 ppm), mercury (< 0.00 ng/m3) and VOCs (≤ 0.01 ppm) utilizing a DRI equipped 10.6 eV photoionization detector. Providing indication the cause of the reported odor was unlikely to be resultant of Tank Farm vapors.

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**EVENT SUMMARY (Continued)**

Project: Tank Farm Projects/Construction

Date: Jun 19, 2023

Area/Building/Location: 200W/U Farm/ U-107

Approximate Time of Event: 0612 hours

AR Number: WRPS-AR-2023-1755

Responsible Manager: [REDACTED]

EIR Number: EIR-2023-045

Event Investigator: [REDACTED]

(6) Investigative DRI monitoring for nitric acid, nitrogen dioxide, sulfur dioxide, and hydrogen sulfide was conducted during the TFC-OPS-OPER-C-67 response based on the odor descriptor "rotten" and reports of the odor smelling like "exhaust". Investigative DRI monitoring indicated less than detectable concentrations for nitric acid, nitrogen dioxide, sulfur dioxide, and hydrogen sulfide.

(7) As directed by TVIS-U-001, all twenty-seven workers within 241-U Farm at the time of the event occurrence were wearing a Personal Ammonia Monitor (PAM) to detect the presence of changing/emerging conditions related to Tank Waste Chemical Vapor COPCs gas/vapor concentrations utilizing ammonia as a sentinel indicator. None of the twenty-seven workers Ventis Pro personal ammonia monitors alarmed or indicate elevated ammonia concentrations at the time of the event occurrence, including the four individuals who had reported experiencing the odors. If the odors were resultant of changing Tank Farm conditions related to Tank Farm vapors, it is expected the Ventis Pro personal ammonia monitors would have indicated a "Response Level" alarm.

(8) The reported odor of "metallic, smoky, burnt charcoal, earthy musty, or rotten" is not consistent with the odor descriptors anticipated for U Farm tank vapors. Odor descriptors associated with U Farm COPC's are:

- Ammonia: Pungent, irritating, suffocating, sharp, cloying, repellent, dying urine
- Furan: Strong, Ethereal; chloroform-like odor
- Mercury: Odorless
- N-Nitrosodimethylamine: faint characteristic or no distinct odor
- N-Nitrosodimethylethylamine: N/A
- N-Nitrosomorpholine: N/A
- Nitrous Oxide: weak, pleasant, sweet

(9) As a pre-requisite to the WO# 945335 work evolution, ten soil samples were collected in 241-U Farm at depths ranging from ~6-18 inches to identify indicators of legacy tank waste or chemical spills in the soils that would be disturbed during excavation/digging activities. There was no evidence of constituents indicating legacy tank waste/chemical spills. In addition, no compounds were identified that would present an occupational exposure concern or would be a likely odor source.

(10) Weekly DRI monitoring of potential Fugitive Emission sources in 241-U Farm is conducted. Fugitive emission monitoring data from 06/02/2022 to 06/12/2023 includes 1000 data points. All 1000 readings indicated less than detectable ammonia concentrations, 992 readings indicated less than detectable VOC concentrations, and the eight detectable VOC readings (ranging from 10 ppb to 280 ppb) were still below anticipated background levels.

**Additional Compensatory/Remedial Measures (any additional measures taken if different from immediate actions):**

- IH took wipe samples from the respirators being worn by the four individuals who reported observing the odors. Wipe sampling were sent for VOCs, anions, and metals analytical analysis.
- The GME(chemical) cartridges from the FF-APR respirators being worn by the four individuals who reported observing odors were secured and sent for further analytical testing and analysis.

In response to this odor event, Industrial Hygiene has implemented the following:

- (1) Validation of engineering controls: IHT's conduct Tank Farm Vapor monitoring around each isolated breather filter at the start of work each morning and complete general farm sweeps in the morning and the afternoon.
- (2) Additional Fugitive Emissions monitoring is being conducted.
- (3) IHTs are continuously monitoring for emission by-products: Carbon Monoxide, Nitrogen Dioxide, Nitrous Oxide, Sulfur Dioxide and VOCs.
- (a) If elevated levels are reached IH will work with the FWS on different work practices and/ or remove the equipment from the farm to reduce worker exposure.
- (4) Streamlining the respirator sampling process in the event another odor event occurs.

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**EVENT SUMMARY** (Continued)

Project: Tank Farm Projects/Construction Date: Jun 19, 2023

Area/Building/Location: 200W/U Farm/ U-107 Approximate Time of Event: 0612 hours

AR Number: WRPS-AR-2023-1755 Responsible Manager: [REDACTED]

EIR Number: EIR-2023-045 Event Investigator: [REDACTED]

**Additional Compensatory/Remedial Measures** (any additional measures taken if different from immediate actions):

(5) Developing sampling protocols for emissions.

**Lessons Learned or Information That the Work Force Needs Immediately:**

None. Per TFC-OPS-OPER-C-28, "Operating Experience/Lessons Learned", this event did not meet the criteria requiring generation of a Lessons Learned.

- 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

**Basis for Determination:**

This event does not require continuation of the event investigation process under TFC-OPS-OPER-C-14, "Event Investigation Process". The facts, findings, and comprehensive account captured under this Event Summary and the Industrial Hygiene Event Investigation Report, IHIR-00073 "Unusual Odor 241-U Farm" form the basis that further investigation will provide no additional information or operational benefit.

**Responsible Manager:**

[REDACTED]  
\_\_\_\_\_  
Print First and Last Name

Per [REDACTED] Digitally signed by [REDACTED]  
Date: 2023.07.03 15:24:00 -07'00'  
\_\_\_\_\_  
Signature / Date

**CAS Manager:**

[REDACTED]  
\_\_\_\_\_  
Print First and Last Name

[REDACTED] [REDACTED]  
\_\_\_\_\_  
Signature / Date

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**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**

<b>Event Title:</b>  <p style="text-align: center;">Unusual Odor 241-U Farm</p>	<b>PER Number:</b> <p style="text-align: center;">N/A</p>
<b>IHIR Number:</b> <p style="text-align: center;">IHIR-00073</p>	

<b>Date:</b> 06/19/2023	<b>Time:</b> 0605	<b>Location:</b> 241-U Farm between U-104 and U-107 Tanks
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**Event Summary and Timeline:**

Event Summary:

At approximately 0610 while excavating by hand, four workers, two laborers (LB) and two Health Physics Technicians (HPT) experienced a unexpected "smoky, metallic, charcoal" odor at 241-U Farm between tanks U-104 and U-107. At the time of the event all four workers verified their Personal Ammonia Monitor (PAM) was not alarming and asked others in the work area to do so as well. No workers reported alarming PAMs and the entire work crew exited the farm. Work crew in the farm consisted of twenty-five individuals. The four workers who reported the odors initially stated they had no symptoms and all four received precautionary medical surveillance. Both HPTs reported the development of symptoms; sore throat, itching eyes, runny nose, taste and burning throat, after the initial event. All four workers were released to work with no restrictions.

On the job personnel: Two HPTs, two Operators (OPs), one Field Work Supervisor (FWS), twenty LBs.  
 Field Response Team: Two HPTs, two Industrial Hygiene Technicians (IHTs)

Field Response Timeline:

0605 Two Fowler LBs and two HPTs detected an unusual odor.  
 -All Workers verified that their PAMs were not alarming.

0608 All workers exited 241-U Farm.

0610 Fowler FWS contacts Construction Management and informs them of odor.

0611 Projects Industrial Safety (IS) contacts Projects Industrial Hygienist (IH) and informs them of odor in 241-U Farm.

0613 Project IH arrives at MO-2194 (U-Farm change trailer) and communicates with odor discoverers.  
 -Two HPTs and one LB stated odor smelt like smoke or metal.  
 -One LB stated odor smelt like exhaust from a flooded engine.  
 -Project IH verified no PAMs alarmed.  
 -Project IH request masks and PAMs used by the odor discoverers be secured and set aside.  
 -Project IH ask odor discoverers if they have any symptoms. All stated no symptoms.

0615 Projects IH contacts Projects Level 3 Safety and Health (S&H) manager and informs them of the odor event.

0619 One Production Operation East (POE) IH, POE Level 3 S&H Manager, POE Industrial Hygiene Technician (IHT) Supervisor arrive at Central Shift Office (CSO).

0620 Projects Level 3 S&H Manager arrives at MO-2194.

Field Response Timeline continued on next page.

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**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**(Continued)

**Event Summary and Timeline:**

Field Response (continued):

0622 POE Level 3 S&H Manager updates Level 1 Environmental Safety Health and Quality (ESH&Q) Manger, Level 2 IH Manager and Projects Level 3 S&H Manger on TFC-OPS-OPER-C-67:

- TFC-OPS-OPER-C-67 at U-Farm
- Two LBs and One HPT (later corrected to two HPTs)
- Unusual Odor
- Approximately twenty individuals on the job
- No PAM alarms
- No medical required
- Work crew exiting the farm

0622 Level 1 ESH&Q request information on respirators from POE Level 3 S&H Manager.

0622 POE IH reviews Data Fusion & Advisor System (DFAS): Weather Details & Plume Details Dashboards for current conditions.

- Stability Class: E, Slightly stable conditions
- Wind Speed: 3.3 MPH.
- Wind Direction: 29 degrees
- Mixing Height: 1400 feet

0623 Projects Level 3 S&H Manger updates Level 1 ESH&Q Manager, Level 2 IH Manager and POE Level 3 S&H Manger.

0623 Central Shift Manger (CSM) states Radial HEPA filters (breather filters) for U-Farm Tanks have been isolated.

0624 POE Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager and POE Level 3 S&H Manger on TFC-OPS-OPER-C-67:

- Preliminary Respirator use by odor discoverers: Mix of Air Purified Respirators (APR) and Powered Air Purified Respirators (PAPR) but do not have exact numbers.
- Awaiting Odor/Vapor Response Cards

0630 Shift Office Event Notification (SOEN): "Initiating C-67 Odor Response for an unusual odor smelled in U-Farm. Access to U-Farm is restricted until Odor Response has been completed. CSM"

0632 Projects Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and POE Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- Four workers encountered odors
- Compactor, Georgia Buggies and Mini Excavator were running near by
- Odor Descriptor: metallic, burnt charcoal
- Two workers stated it smelt like a Georgia Buggy
- Breather Filters were closed last week.  
See Red Arrow RAE-23-026

0632 POE Shift IHT support arrives at CSO.

0633 CSM updates Facility Representative on TFC-OPS-OPER-C-67:

- Three employees involved and none have symptoms

0634 Projects Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and POE Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- All odor discoverers wore Full Face APR (FFAPR).

0639 POE Shift IHT Supervisor updates POE Shift IHT on response Requirements:

- Direct Read Instrument (DRI) with the following sensors
  - VOC, Ammonia, Nitrogen Dioxide, Sulfur Dioxide, Carbon Monoxide
- Grab air samples
- Need additional POE Shift IHT resources

Field Response Timeline continued on next page.

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**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**(Continued)

Field Response (continued):

0640 POE Shift IHT acknowledges POE IHT Supervisor update

0640 The four odor discoverers complete Odor/Vapor Response Cards for 241-U Farm and then are transported to HPMC Occupational Medical Services for precautionary medical surveillance.

0641 POE Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and Projects Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- POE Shift IHTs preparing DRI
- Response Plan drafted

0648 POE Shift IHT Supervisor updates POE Shift IHT on response requirements:

- DRI with the following sensors:
  - Mercury

0650 Project IHT transports Odor/Vapor Response Cards for 241-U Farm to CSO.

0653 Projects Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and POE Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- Odor/Vapor Response Cards are being copied and will soon be sent to CSO

0654 POE Shift IHT Supervisor updates POE Shift IHTs on response requirements:

- Once pre-use function test are complete, head to the CSO.

0656 Central Shift Manager contacts Fowler FWS for update.

- Updated Information:
  - Four workers discovered odor: Three LBs and one HPT
  - FFAPR with GME (chemical) cartridges
  - No Symptoms
  - All four workers in route to HPMC for precautionary medical surveillance.
  - All four workers reported "metallic" odor
  - All four workers were in different locations around U107.

0657 POE Shift IHT acknowledges POE Shift IHT Supervisor update.

0701 POE Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and Projects Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- All odor discoverers wore FFAPRs with GME (chemical) cartridges.
- All odor discoverers heading for precautionary medical evaluation.
- No symptoms reported by workers.
- Odor descriptor by all: Metallic odor

0702 POE IH reviews Vapor Data Management System (VDMS) ammonia data for 0612:

- POR 518: 1.989 ppm
- POR 519: 1.237 ppm
- AN: 28.913 ppm
- AW: 0 ppm
- POR 126: Not Available
- POR 127: Not Available
- 702AZ 0 ppm
- AP: Not Available

0705 POE IH reviews VDMS alternate data sources for ammonia:

- Ammonia data for 241-SY Farm on 06/18/2023 at 1943: 4 ppm Ammonia

0711 Fowler FWS communicates to CSM:

- LOTO boundary is installed inside of U-Farm around paving area.
- CSM request Tagout Authorization Form (TAF)

Field Response Timeline continued on next page.

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**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**(Continued)

Field Response (continued):

0711 POE Shift IHT Supervisor updates POE Shift IHTs on response requirements:

- Need locks for Lockout/Tagout (LOTO).

0712 POE Shift IHTs acknowledge POE Shift IHT Supervisor update.

0717 Fowler Safety contacts Project IH and informs them that both Fowler LBs who discovered the odor are being transported downtown due to staffing shortage at HPMC Occupational Medical Services.

0718 POE Shift IHTs inform POE Shift IHT Supervisor lock and tags have been acquired.

0721 POE Level 3 S&H Manager updates Level 1 ESH&Q Manager, Level 2 IH Manager, and Projects Level 3 S&H Manager on TFC-OPS-OPER-C-67:

- Odor/Vapor Response Cards Received.

- Two of the four odor discoverers listed symptoms on Odor/Vapor Response Cards.

0721 POE IH request POE IHT support to include H2S on DRI.

0723 Fowler FWS provides CSM with TAF.

0731 POE IH and CSM sign Attachment A - Response Plan located in TFC-OPS-OPER-C-67.

0733 Safety Integration Manager provides update to CSM:

- four workers discovered the odor and two reported symptoms.

- All four workers were transported to HPMC.

0741 POE Shift IHT Supervisor updates POE Shift IHTs on response requirements:

- Workers to work to Radiological Controls in RWP-WTO-0492.

0741 POE IH and CSM sign updated Attachment A - Response Plane located in TFC-OPS-OPER-C-67 which now includes H2S.

0745 POE Level 3 S&H Manager contacts Projects IH and confirms Respiratory Protection Equipment (RPE) and PAMs are secured.

0749 Project IH contacts Safety Integration Manager and informs them that the Radial HEPA filters (breather filters) for U-Farm Tanks have been isolated and that no PAMs alarmed. Requested that the information be shared with HMPC and that Tank Vapors are not an expected cause of the odor.

0749 POE Shift IHTs arrive at CSO.

0751 CSM confirms location of LOTO briefing and that necessary support personal are available.

- Briefs POE Shift IHTs on LOTO and Radiological Work Permit (RWP).

0752 POE IH briefs POE Shift IHTs on:

- Industrial Hygiene Sample Plane (IHSP): IHSP-POE-MULTI-TFCOPSOPERC67

- Ammonia, VOC, H2S, NO, NO2, SO2, Hg

- Grab Bag sampling if source is identified

- RPE

- Respiratory Protection Plan (RPF): MDRPF-STD-07 Task 1.

- Area map was provided to IHTs

0753 POE Shift IHT Supervisor and POE Shift IHTs depart CSO.

0755 Project IH contacts Production Operation West (POW) IHT Supervisor and ask for data on U-Farm Fugitive Emissions.

- Project IH reviews preliminary data showing results less than detectable for ammonia and VOCs.

Field Response Timeline continued on next page.

Washington River Protection Solutions  
**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**(Continued)

Field Response (continued):

0755 Performance Assurance 1 (PA) contacts CSM:

- CSM provides update on TFC-OPS-OPER-C-67.
- PA provides Event Investigation Report (EIR) number 2023-045.

0759 PA-2 Contacts CSM and CSM informs individual that PA-1 is assigned to the event.

0804 CSM contacts Facility Representative:

- Updates Facility Representative on TFC-OPS-OPER-C-67
- Informs individual that four workers and not 3 workers were involved
- Two workers reported symptoms
- POE Shift IHTs in route to begin investigation
- EIR initiated
- Informs individual that further updates will be provided after POE Shift IHTs complete investigate monitoring with DRI.

0807 PA-3 informs CSM that PA-2 is now the Point of Contact for the EIR for the event.

0808 Programs IS contacts Projects IH. Projects IH informs Programs IS that breather filters were isolated and no PAMs alarmed.

0810 POE Shift IHTs arrive at U-Farm and receive briefing and sign onto the Lock and Tag (LOTO).

0812 POE Shift IHT Supervisor contacts CSO.

0813 CSM contacts POE Shift IHTs. IHTs inform CSM That HPT support is needed to exit the farm.

0819 CSM contacts POE Shift IHT Supervisor and determines when and where HPT support is needed.

0820 CSM contacts HPT and informs the individual to meet at MO-2194. HPT informs CSM ETA is 10-15 minuets.

0830 POE Shift IHTs enter U-Farm.

0834 Project IHTs transport odor discoverer's masks to Washington State River Protection Solution (WRPS) Respiratory Protection Program Administer (RPPA).

0856 POE Shift IHTs exit the U-Farm.

0900 POE Shift IHTs report all readings are less than detectable.

0907 POE Shift IHT Supervisor contacts CSM and reports POE Shift IHTs are in route to post DRI and that no restricted access signage is posted at 241-U Farm.

0953 POE Shift IHT Supervisor informs POE IH that all DRIs passed post function use.

0959 POE IH and CSM sign Attachment A - Response Plane located in TFC-OPS-OPER-C-67.

1011 Shift Office Event Notification (SOEN): "Completed C-67 Odor Response for unusual odors smelled in U-Farm, the Farm has been swept per C-67 Response Plan, and all readings are below background. Normal Access to U-Farm is Restored. CSM"

Field Response Timeline continued on next page.

Washington River Protection Solutions  
**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT**(Continued)

Field Response (continued):

Field Response Timeline Acronyms:

ADM	Area Dayshift Manager	LEL	Lower Explosive Limit
CSM	Central Shift Manager	mph	miles per hour
CSO	Central Shift Office	OP	Operator
DFAS	Data Fusion Advisory System	PA	Performance Assurance
DFLAW	Direct Feed Low Activity Waste	PID	photoionization detector
DOE	Department of Energy	POE	Production Operations-East
DRI	direct reading instrument/instrumentation	POW	Production Operations East
EIR	Event Investigation Report	ppm	parts per million
ESH&Q	Environmental, Safety, Health, & Quality	S&H	Safety & Health
eV	electron-volts	SMO	Sample Management Organization
FWS	Field Work Supervisor	SOEN	Shift Office Event Notification
HIHTL	hose-in-hose transfer line	TDU	thermal desorption unit
HPT	Health Physics Technician	TSCR	Tank Side Cesium Removal
IH	Industrial Hygienist	VMDS	Vapor Monitoring Detection System
IHT	Industrial Hygiene Technician	VOC	volatile organic compound
L	liter		
LB	Laborer		

**Sampling/Monitoring Results:**

Monitoring Results from 06/19/2023

Ventis Pro (Personal Ammonia Monitor) worn by the odor discoverers:

Ventis Pro 004864  
-Peak Ammonia 0.00 ppm

Ventis Pro 004558  
-Peak Ammonia 0.00 ppm

Ventis Pro 004540  
-Peak Ammonia 0.00 ppm

Ventis Pro 004525  
-Peak Ammonia 0.00 ppm

Field Response (See SWIHD survey 23-03800):

-Nitric Acid 0.000 ppm  
-Nitrogen Dioxide 0.000 ppm  
-Sulfur Dioxide 0.000 ppm  
-Hydrogen Sulfide 0.000 ppm  
-Ammonia 0.000 ppm  
-VOC 0.000 ppb  
-Mercury 0.000 ng/m<sup>3</sup>

Other Relevant Sampling and Monitoring Results.

Validation of breather filter isolation (SWIHD Survey 23-03738):

Survey was conducted on 06/15/2023 in performance of U-Farm breather filter isolation. Monitoring of VOCs and ammonia was conducted to validate that breather filters were isolated from the tank head space.

Washington River Protection Solutions  
**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT(Continued)**

**Sampling/Monitoring Results:**

-Ammonia: All results 0.000 ppm ammonia.

-VOC: All results 0.000 ppm VOCs.

Fugitive Emission Monitoring Data for 241-U Farm (06/02/2022-06/12/2023):

Fugitive Emission Monitoring data includes 1000 data points.

-Ammonia: All results 0.000 ppm ammonia.

-VOC: Eight data points are greater than 0.000 ppb with readings ranging from 10 ppb to 280 ppb VOC.

**Soil Sampling:**

Soil sampling was conducted in 241-U Farm in support of excavation activities associated with the work being performed during the odor event. Soil sampling was conducted at ten locations at a depth of six and eighteen inches. Soil sampling results showed no abnormally high concentrations in the soil for anylates that would be associated with Tank Waste.

**SWIHD References:**

Event Response Site Wide Industrial Hygiene TFC-OPS-OPER-C-67 at 241-U-107 Survey #23-03800 "TFC-OPS-OPER-C-67.

**Additional Information:**

At the time of the initiating event a total of twenty-seven workers, two HPTs, two OPs, one FWS and twenty LBs where located inside of 241-U Farm. All twenty-seven workers where wearing RPE in accordance with Management Directed Respiratory Protection Form "TFC-ESHQ-IH-STD-07". Workers wore either; FFAPR with either GME (chemical) cartridges or particulate/chemical (combo) cartridges, a PAPR hood or Tight Fitting Face piece with combo cartridges. Ten workers, including the four who detected the odor, were located near tank U-107 and U-104 at the time of the event. At the time the odor was detected a Mini Excavator, Georgia Buggy, and plate compactor were operating in the work area. Both HPTs who detected the odor were approximately fifty feet north of the mini excavator and twenty-five feet west of the plate compactor. Neither HPT reported the use of a Georgia Buggy. One of the LB that reported odors was approximately five feet from the Georgia Buggy but was unsure of the location and distance of the plate compactor or the Mini Excavator. The other LB that reported odors was fifty feet west of the plate compactor and five feet east of the Mini Excavator and one feet from the Georgia Buggy.

The four workers who reported the odor wore FFAPR with GME (chemical) cartridges and were located between tanks U-104 and U-107. Odors reported include: "metallic, smoky, musty, earthy and charcoal campfire" smell. One worker stated the likely source of the odor was either the plate compactors, Mini Excavator or the Georgia buggies. No symptoms were initially reported by the four workers. Two workers later reported symptoms which included: sore throat, taste, headache, itch, and runny nose. All four workers received precautionary medical screening from HPMC Occupational Medical Services and all were released to work without restrictions.

At the time of the event DFAS shows winds blowing at 3.3 mph from the Northeast to the Southwest. Though it was noted that herbicide application had occurred at the corner of 16th and Camden Avenue that location is at the Southeast corner of 241-U Farm and is an unlikely source of the odor. Based on the location of the workers and the emission generating equipment such as the plate compactor, mini excavator, and Georgia Buggies workers could have potentially been downwind of there exhaust stream.

Ammonia is used as sentinel Tank Waste Chemical Vapor for chemicals of potential concern (COPC) and PAMs are worn by workers in the Tank Farms to detect its presence. All twenty-seven workers within 241-U Farm wore a PAM. If ammonia had been present it is expected that at least one PAM would have alarmed, when in fact, none did and the odor discoverers PAMs recorded 0.00 ppm ammonia at the time of the event. There are no Tank Farms located Northeast of 241-U Farm so any potential source of ammonia would most likely come from within the boundaries of 241-U itself. However, the HEPA filter isolation valves on U101-U112 and U201-U204 were closed per Red Arrow RAE-23-026 and the isolation was validated by DRI monitoring (see SWIHD Survey 23-03738), and soil sampling and fugitive emissions monitoring show no other potential sources of Tank Farm vapors and ammonia. Based on the isolation of the breather filters and the sampling and monitoring data, including the PAMs it is highly unlikely that odors detected by the four workers where due to Tank Vapors.

Washington River Protection Solutions  
**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT(Continued)**

**Additional Information:**

The plate compactor and mini excavator run off diesel fuel and the Georgia Buggies run off gasoline. The common products of combustion include Carbon Dioxide, Carbon Monoxide, Sulfur Dioxide and various Nitrogen Oxides. Nitrogen Dioxide which is a common byproduct of combustion has a pungent acrid odor with physical symptoms ranging from nose, throat and eye irritation to coughing. In addition, a review of not only MSA, the manufacturer of the respiratory cartridge used by the four workers, and 3M reveal the cartridge used may not be effective at filtering Nitrogen Dioxide from the workers air supply. However, at the time this report is being written it has yet to be verified by MSA. In addition, several workers stated that they have smelled exhaust through their respirator on multiple occasions and on multiple jobs, lending further support to the possibility that the odor encountered by the four workers came from the exhaust from either the plate compactor, mini excavator, or the Georgia Buggy.

In response to the odor event and the investigation into the cause of the odor Industrial Hygiene has implemented the following:

(1) Validation of engineering controls: IHT's conduct Tank Farm Vapor monitoring around each isolated breather filter at the start of work each morning and complete general farm sweeps in the morning and the afternoon.

(2) Additional Fugitive Emissions monitoring is being conducted.

(3) IHTs are continuously monitoring for emission by-products: Carbon Monoxide, Nitrogen Dioxide, Nitrous Oxide, Sulfur Dioxide and VOCs.

(a) If elevated levels are reached IH will work with the FWS on different work practices and/or remove the equipment from the farm to reduce worker exposure.

(4) IH took wipe samples from the respirators worn by the four odor discoverers for VOCs, anions, and metals, in addition to sending the cartridges out for further testing and analysis.

(5) Streamlining the respirator sampling process in the event another odor event occurs.

(6) Developing sampling protocols for emissions.

See attached maps (Area Map 1 and 241-U Farm Map 2) for location details regarding wind direction, work location, herbicide application site, and proximity to other Tank Farms.

**Recommendations/Conclusions:**

Recommendations:

N/A

Conclusions:

DRI monitoring performed during response actions did not indicate further action was necessary to protect worker safety and health. As a result 241-U Farm was released from restricted access and work was allowed to continue. Monitoring results are not indicative of Tank Chemical Vapors, nor did monitoring readily identify a source.

**Other:**

All involved workers were offered and accepted precautionary medical surveillance. Two of the involved workers experienced symptoms but all four workers were later released to work with out restrictions. See Event Investigation Report #2023-045 for additional information.

**Industrial Hygienist:**

\_\_\_\_\_

*Print First and Last Name*

\_\_\_\_\_

*Signature / Date*

Digitally signed by \_\_\_\_\_  
Date: 2023.06.26 12:33:18 -07'00'

**Industrial Hygiene Level 2 Manager:**

Washington River Protection Solutions  
**INDUSTRIAL HYGIENE EVENT INVESTIGATION REPORT** (Continued)

[Redacted]

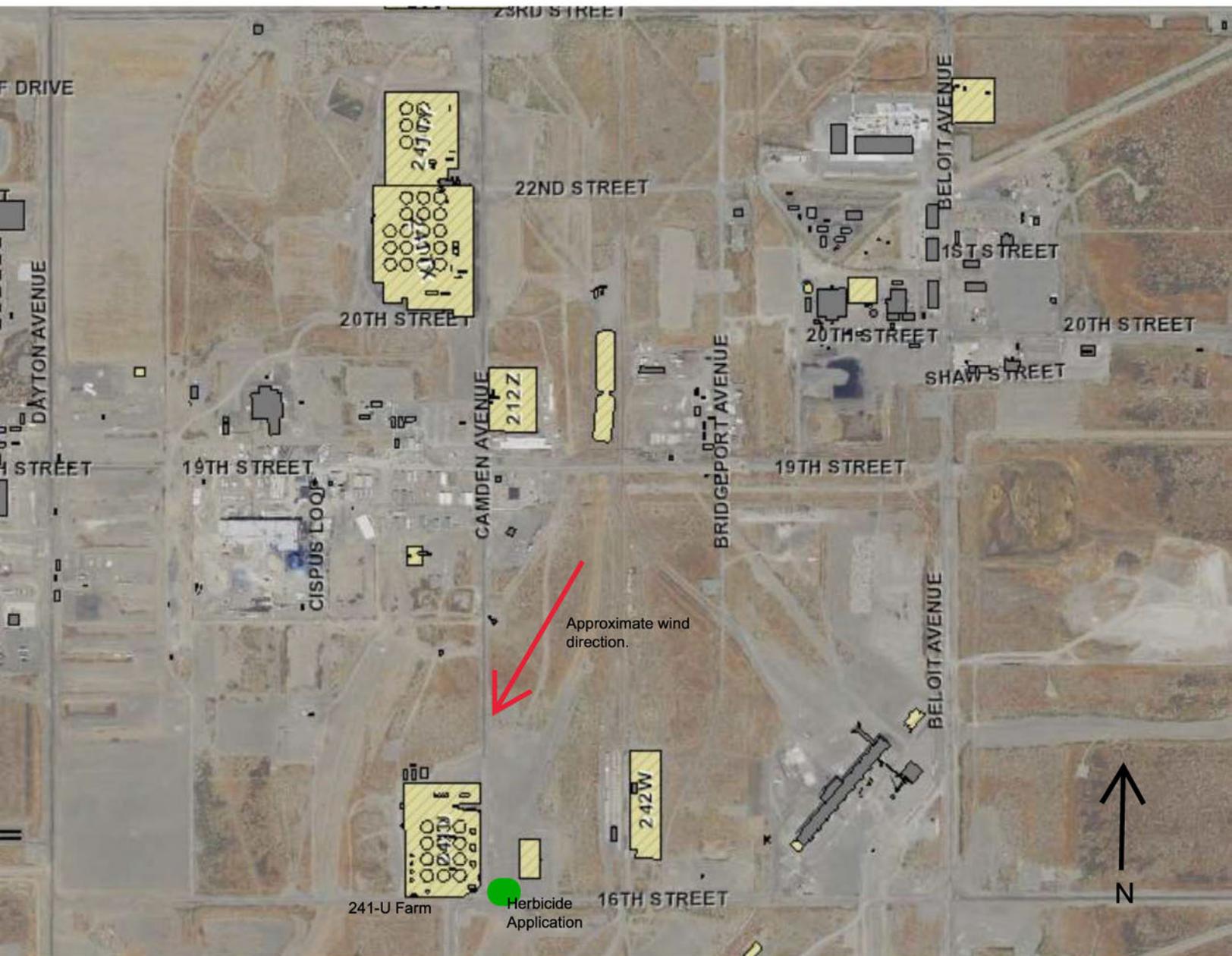
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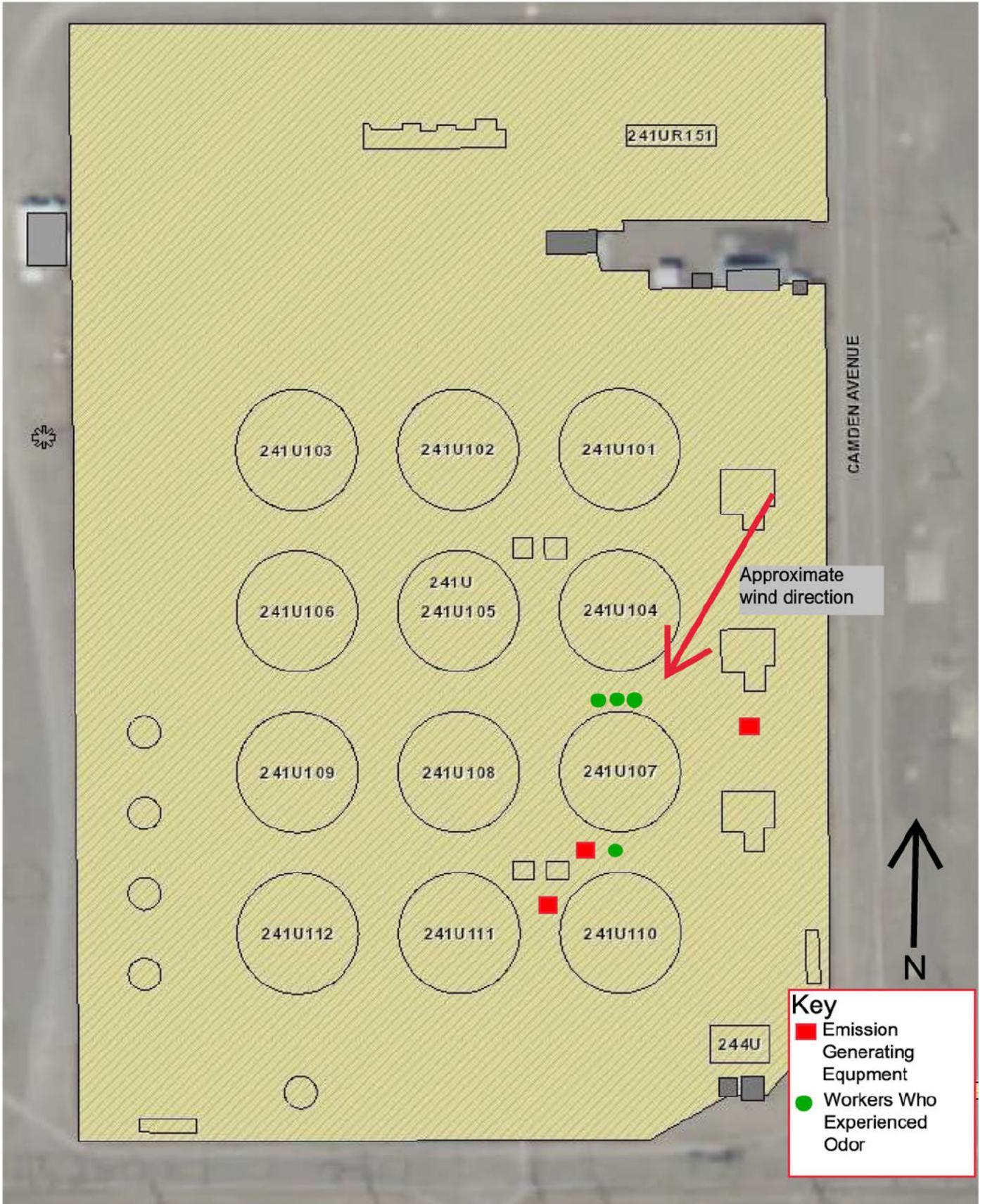
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*Signature / Date*



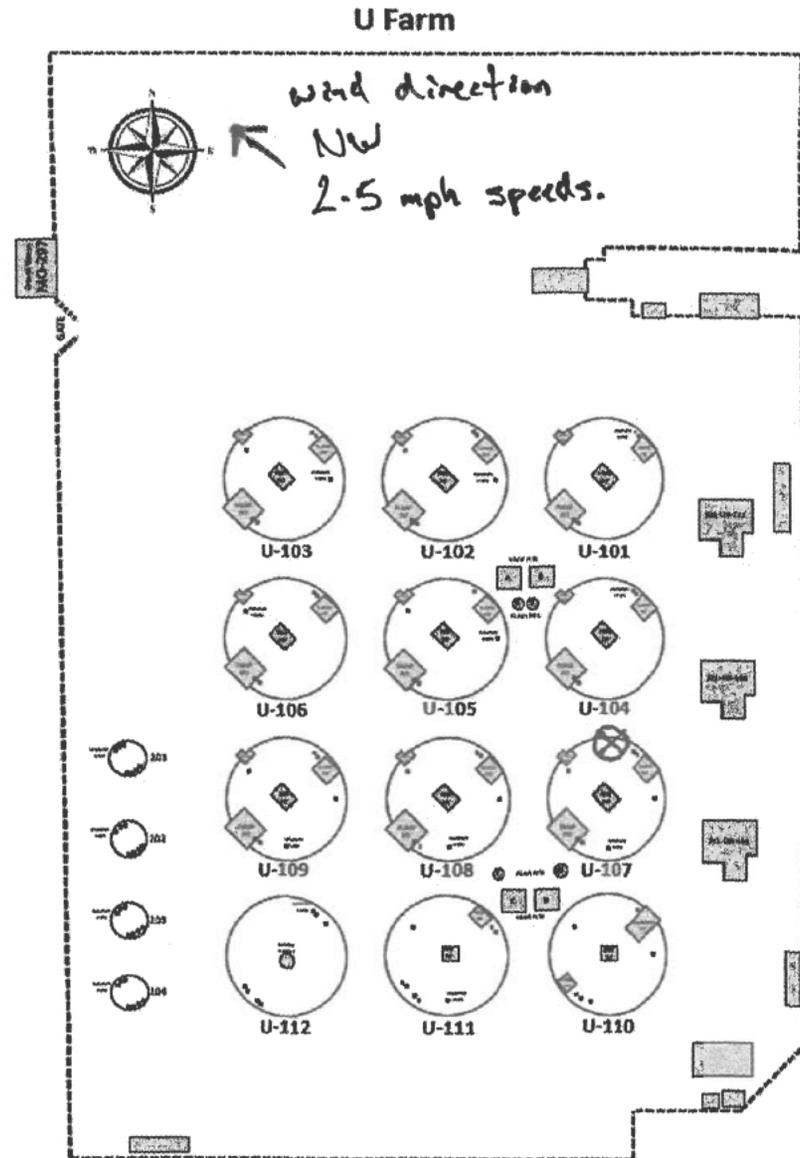


# ODOR/VAPOR RESPONSE CARD - 241 U FARM

## 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 U FARM

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

- Date and time of event: 06-19-23 06:15
- Check Applicable:
  - Odor
  - Ammonia Alarm (6 ppm)
  - Ammonia Alarm (12 ppm)
  - Alarm (other - describe):
- Your name and the work you were performing:  
[REDACTED] HPT radcon surveys
- Other Work Underway? Describe:  
Digging by hand, Mini excavator, Compactor, Georgia Buggy.
- Location of event (mark area on map and wind direction):  
in between 107 and 104
- 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): Charcoal campfire smell
- Is source known/likely? Describe:  
likely compactors, Georgia Buggy, Mini ex
- 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.

# ODOR/VAPOR RESPONSE CARD - 241 U FARM

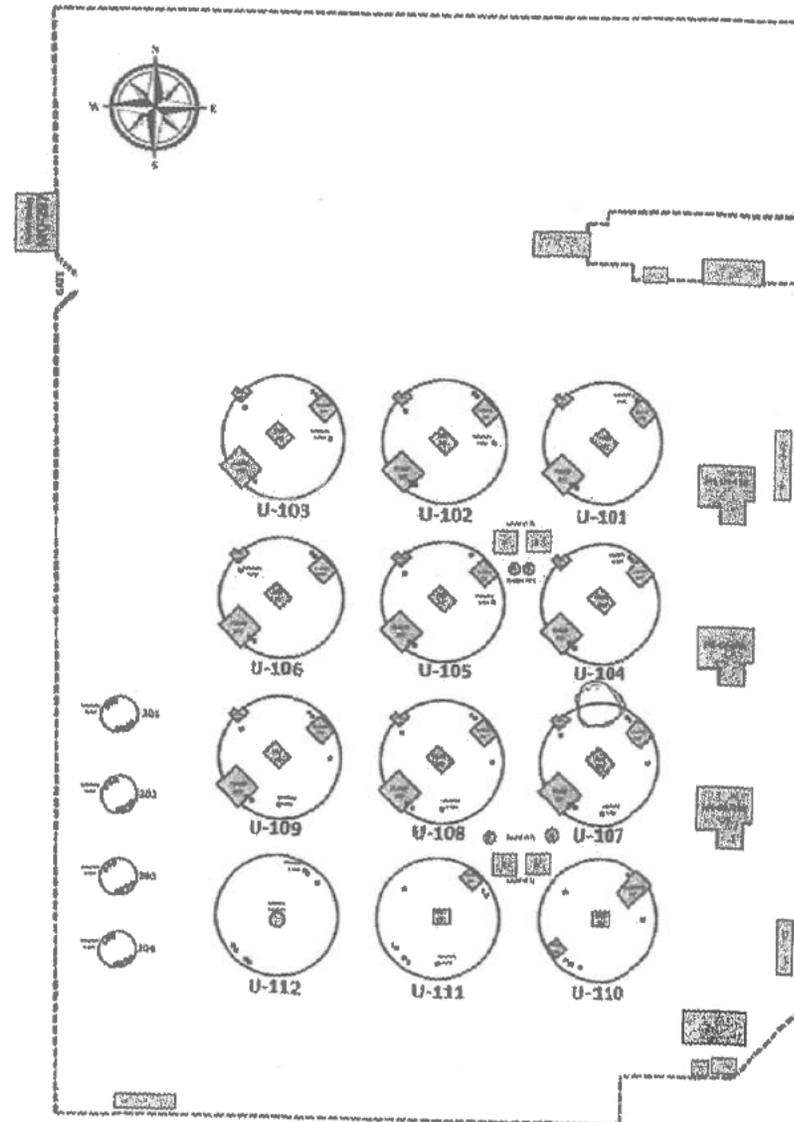
## Instructions:

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.

Not sure

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

## U Farm



# ODOR/VAPOR RESPONSE CARD - 241 U FARM

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

- Date and time of event: 6/19/2023 06:15
- Check Applicable:
  - Odor
  - Ammonia Alarm (6 ppm)
  - Ammonia Alarm (12 ppm)
  - Alarm (other - describe): \_\_\_\_\_
- Your name and the work you were performing: \_\_\_\_\_  
HPT
- Other Work Underway? Describe: \_\_\_\_\_  
Excavating
- Location of event (mark area on map and wind direction): \_\_\_\_\_
- 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
  - Rotien
  - Metallic
  - Onion
  - Earthy
  - Ammonia
  - Citrus
  - Solvent
  - Other (describe): \_\_\_\_\_
- 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): \_\_\_\_\_  
Ronny Nose

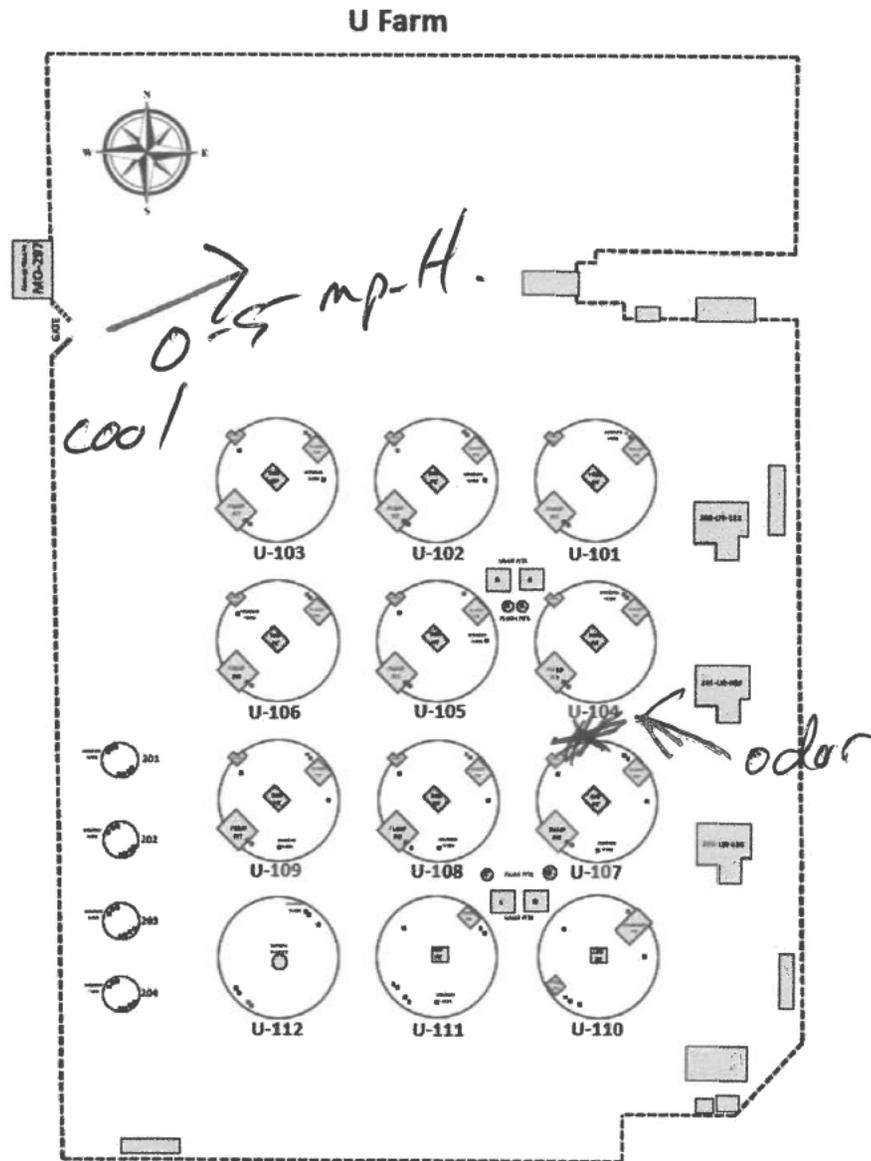
2. Provide this completed card (Page 1 & 2) to Supervisor, Industrial Hygiene, your Union Safety Representative or the CSM. If received by Supervisor/IH/U-SR, Supervisor/IH/U-SR will ensure card is provided to the CSM.

# ODOR/VAPOR RESPONSE CARD - 241 U 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 U FARM

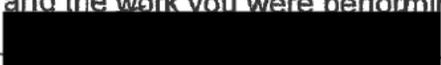
## 1. Complete below information and map (Page 1).

• Date and time of event: 6-19-23 6:15am

• Check Applicable:

Odor     Ammonia Alarm (6 ppm)     Ammonia Alarm (12 ppm)     Alarm (other - describe):

• Your name and the work you were performing:

 Excavation in U farm

• Other Work Underway? Describe:

excavation, with shovels, & plate whacker running sot. away

• Location of event (mark area on map and wind direction):

U farm

• Name(s) of others in or near the affected area



• Was Industrial Hygiene present, who?

NO

• Describe the odor:

Sweet     Sour     Smoky     Septic/Sewer     Musty     Rotten  
 Metallic     Onion     Earthy     Ammonia     Citrus     Solvent  
 Other (describe):

• Is source known/likely? Describe:

No. ~~Correct~~

• Your symptoms?  None

Headache     Dizziness     Nausea     Cough     Fatigue  
 Weakness     Sore Throat     Difficulty Breathing     Eye Irritation     Rash  
 Itch     Tingling     Numbness     Taste  
 Other (describe):

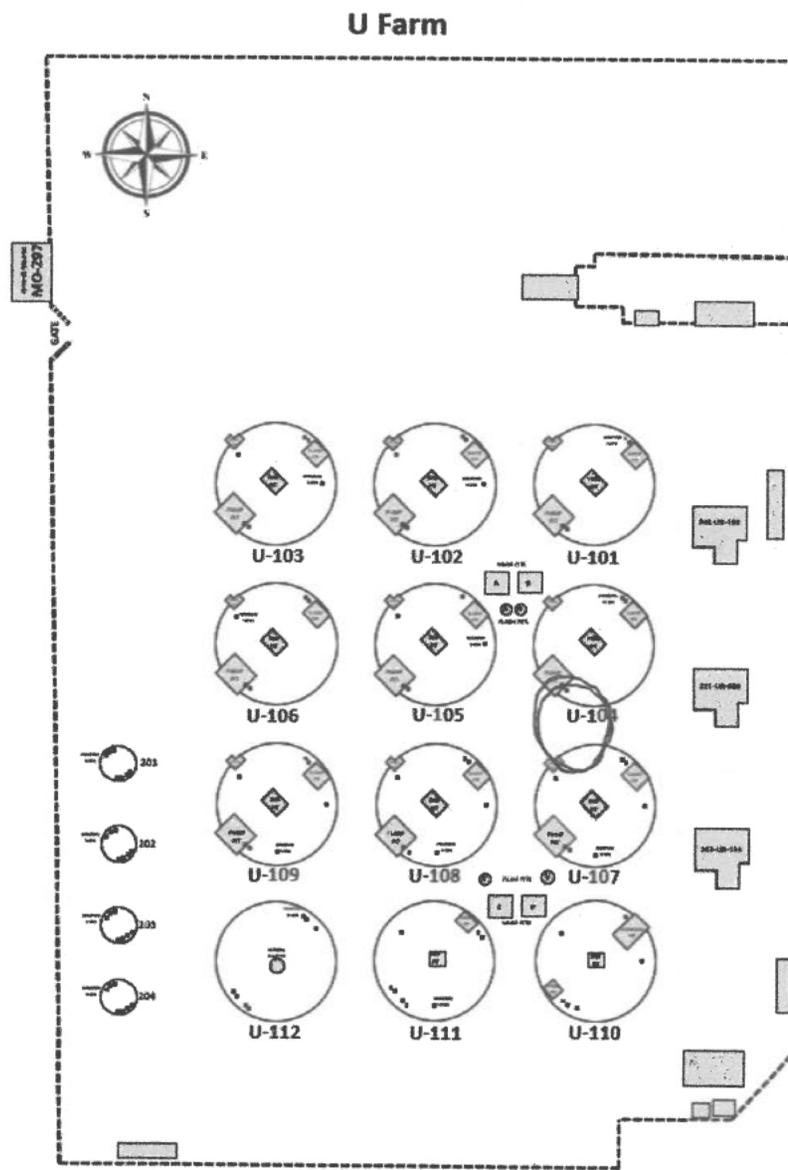
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# ODOR/VAPOR RESPONSE CARD - 241 U FARM

## Instructions:

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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;
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## ODOR/VAPOR RESPONSE CARD - 241 U FARM

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

- Date and time of event: 06/19/23 6:15 am
- Check Applicable:  
 Odor     Ammonia Alarm (6 ppm)     Ammonia Alarm (12 ppm)     Alarm (other - describe): \_\_\_\_\_
- Your name and the work you were performing:  
[REDACTED] digging
- Other Work Underway? Describe: \_\_\_\_\_
- Location of event (mark area on map and wind direction):  
Between 107 + 104
- Name(s) of others in or near the affected area:  
[REDACTED]
- Was Industrial Hygiene present, who?  
N/A
- Describe the odor:  

<input type="checkbox"/> Sweet	<input type="checkbox"/> Sour	<input type="checkbox"/> Smoky	<input type="checkbox"/> Septic/Sewer	<input type="checkbox"/> Musty	<input checked="" type="checkbox"/> Rotten
<input checked="" type="checkbox"/> Metallic	<input type="checkbox"/> Onion	<input type="checkbox"/> Earthy	<input type="checkbox"/> Ammonia	<input type="checkbox"/> Citrus	<input type="checkbox"/> Solvent
<input type="checkbox"/> Other (describe): _____					
- Is source known/likely? Describe: \_\_\_\_\_
- Your symptoms?  None  

<input type="checkbox"/> Headache	<input type="checkbox"/> Dizziness	<input type="checkbox"/> Nausea	<input type="checkbox"/> Cough	<input type="checkbox"/> Fatigue
<input type="checkbox"/> Weakness	<input type="checkbox"/> Sore Throat	<input type="checkbox"/> Difficulty Breathing	<input type="checkbox"/> Eye Irritation	<input type="checkbox"/> Rash
<input type="checkbox"/> Itch	<input type="checkbox"/> Tingling	<input type="checkbox"/> Numbness	<input type="checkbox"/> Taste	
<input type="checkbox"/> 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.