EVENT INVESTIGATION REPORT

Investigation of AOP-015 at 271AP Instrument Building
Event Investigation Report 2019-003

241-AP-271

[Redacted]
Event Investigation Team Lead

[Redacted]
Responsible Manager

2/20/19
Date

2/20/19
Date
Executive Summary
At 0800 on January 28, 2019, a pair of Nuclear Chemical Operators (NCOs) entered the 271AP instrument building to support scheduled work. Upon entering the building, both NCOs smelled what was initially described as a sulfur smell. The NCOs contacted the Field Work Supervisor (FWS) who came to the building. The FWS entered the building and noticed the smell, as well. All three individuals left the building. The two NCOs secured the building and the FWS notified the Area Day-Shift Manager (ADM) who then informed the Central Shift Office (CSO). The CSO entered an AOP-015 in response to the reported odor and dispatched Industrial Hygiene. The CSO notified the on-call Facility Representative (FacRep). A SOEN was also sent out. The three individuals who initially reported the odor reported no signs or symptoms and declined medical evaluation. An Event Investigation was initiated.

Investigation Summary
At 0700, at January 28, 2019, two NCOs received pre-job briefings to assist with two different work orders that were scheduled (Receiving SCBA bottles, and standing pressure watch inside the instrument building). At 8am, the two NCOs went over to the 271AP instrument building to prepare for work. The two NCOs entered the building and noticed the odor in the room on the right of the entrance hallway. The first NCO directed the second NCO to inform the FWS. Both NCOs left the building. The FWS returned to the building with the second NCO. The odor was still present when the FWS arrived. The three individuals exited the building but checked the trash can and rodent traps on their way out. All were empty. Hanford Weather Station 6, which is the weather station for the 200 East area, showed wind speeds approximately 3 miles per hour at 8am. The FWS and the second NCO reported the odor to the Area Day-Shift Manager (ADM). The first NCO stayed at the building and secured it. The ADM notified the Central Shift Manager (CSM) who then declared an AOP-015 entry, notified the FacRep, sent out a SOEN, and activated the IH response team. An event investigation was also initiated.

CSO sent out the Industrial Hygiene (IH) response team. All samples taken tested at less than detectable levels.

Both NCOs and the FWS personnel declined medical evaluation. None of the three exhibited any signs or symptoms. All three submitted completed odor response cards.

On January 31, 2019, the Event Investigator conducted an informal interview with one of the NCOs and the FWS. They walked down the building and the surrounding area. There were no obvious sources of for the odor. However, the FWS indicated that the septic system directly across the road to the northeast of the 271AP building entrance had been pumped by MSA at 5am on January 28 and this was a potential cause of the odor.
Event Timeline

1/28/2019

0700  Pre-Job Brief conducted for AP Farm NCOs
0800  NCOs enter 241-AP-271 and notice a sulfur odor in HMI room of the building
0805  First NCO leaves building and notifies FWS of odor
0810  FWS returns to 241-AP-271 and confirms odor
0815  FWS notifies Area Day Shift Manager
0820  ADM contacts CSO and notifies CSM of sulfur odor
0824  SOEN for AOP-015 issued.
0855  Completed odor response cards delivered to Central Shift Office
0930  FacRep notified of initiation of Event Investigation 2019-003
0955  Field IHTs obtain samples from inside and outside 241-AP-271
1720  AOP-015 exited
1725  Notified FacRep of sample results and that AOP-015 has been exited.
<table>
<thead>
<tr>
<th>Event</th>
<th>271AP Instrument Building AOP-015 Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date/time of event</td>
<td>January 28, 2019 0800</td>
</tr>
<tr>
<td>Location</td>
<td>Inside 271AP Instrument Building</td>
</tr>
<tr>
<td>Odor</td>
<td>Sulfur</td>
</tr>
<tr>
<td>Symptoms</td>
<td>None</td>
</tr>
<tr>
<td>DRI results during event</td>
<td>Less than the Level of Detection (LOD) for ammonia (NH3) and Volatile Organic Compounds (VOCs) on sweep of reported odor location</td>
</tr>
<tr>
<td>IH investigative monitoring/sampling</td>
<td>Readings from bag samples were at or below background levels.</td>
</tr>
<tr>
<td>Possible source(s)</td>
<td>Fugitive emissions from septic pump-out earlier in morning</td>
</tr>
</tbody>
</table>

**Weather conditions on January 28, 2019 (data from Weather Station 6)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Wind Dir (From)</th>
<th>Wind Speed</th>
<th>Ave Temp</th>
<th>Bar</th>
<th>RH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0745</td>
<td>103.30</td>
<td>2.04</td>
<td>31.17F</td>
<td>29.795</td>
<td>96.06</td>
</tr>
<tr>
<td>0800</td>
<td>159.19</td>
<td>3.42</td>
<td>31.25F</td>
<td>29.791</td>
<td>95.97</td>
</tr>
<tr>
<td>0845</td>
<td>153.10</td>
<td>3.09</td>
<td>31.26F</td>
<td>29.779</td>
<td>96.08</td>
</tr>
</tbody>
</table>

| Waste disturbing or tank work in adjacent area | No waste disturbing activities or tank work occurring in AP Farm or adjacent areas. |

**Compensatory Measures**

- The FWS stopped work in the field and the IH response team sampled the interior and exterior of the 241-AP-271. The results of all the sampling less than detectable levels.

**IH Response Team Sample Results (Inside 271AP Building)**

<table>
<thead>
<tr>
<th>Agent</th>
<th>Result</th>
<th>Action Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>0.000 ppm</td>
<td>12 ppm</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>0.000 ppm</td>
<td>12.5 ppm</td>
</tr>
<tr>
<td>Flammable Gas</td>
<td>0.000 %</td>
<td>25 %</td>
</tr>
<tr>
<td>Oxygen</td>
<td>20.900 %</td>
<td>23.5 %</td>
</tr>
<tr>
<td>Volatile Organic Compound</td>
<td>0.000 ppb</td>
<td>2 ppm</td>
</tr>
</tbody>
</table>
Preliminary Extent of Condition Review

• No extent of condition exists for this investigation.

Discussion of Potential Causes

• The septic system located directly across the road from the entrance to 241-AP-271 is a potential source of the odor. FWS supervisor reports that he verified with MSA the septic system was pumped at approximately 0500.

Discussion of Barriers That Could Have Impacted the Cause

• There were no barriers that could have impacted the cause

Recommendations/Proposed Corrective Actions

• No recommendations or proposed corrective actions.

Attachments:

1. CSO logs for AOP-015 event
2. Industrial Hygiene Investigation Report (IHIR) (Includes Odor Response Cards, 38 pages total)
<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/28/2019</td>
<td>Investigation of AOP-015 at 271AP Instrument Building</td>
</tr>
<tr>
<td>02/28/2019</td>
<td>CSO logs for Investigation of AOP-015 at 271AP Instrument Building</td>
</tr>
</tbody>
</table>

### Figure 1 - CSO logs for Investigation of AOP-015 at 271AP Instrument Building

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>01/28/2019</td>
<td>Investigation of AOP-015 at 271AP Instrument Building</td>
</tr>
<tr>
<td>02/28/2019</td>
<td>CSO logs for Investigation of AOP-015 at 271AP Instrument Building</td>
</tr>
</tbody>
</table>

**Notes:**
- Sample analytics for the TF-4OP-015 event have been completed and the results are as follows:
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- Notified DL - WRPS AOP-015 Event Notification
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1. Event Summary (including number of workers involved and activity in progress):

At approximately 0808 1 FWS and 2 NCOs reported a "rotten" odor in 271AP instrument building HLAN room.

- Was an IHT Present during initiating event? [ ] Yes [X] No

IH Monitoring/ Sample Survey Reports:

19-00556 “AOP-015 241-271-AP indoors”
19-00550 “AOP-015 241-271-AP outside”

Weather Conditions at Time of Event:

Ambient outside conditions:

- Weather station: 6 at 0800
- Wind Direction and Speed: SSE 3mph
- Barometric Pressure (steady/rising/falling): 27.79 inHg rising slowly
- Temperature (F°): 31.2
- Humidity: 96%

Inside conditions:

- Temperature (F°): 77 (thermostat setting)
Field Response Timeline:

0824: SOEN: "Entered AOP-015 for odors reported inside 271AP. Access to 271AP is restricted unless authorized by CSM. CSM"

0826: AN Field IH and COMS Field IH arrive at CSO

0827: CSM 1 briefs AN Field IH and COMS Field IH:
  - FWS and two NCOs encountered "Sulphur" odor in HLAN room of 271AP Instrument building, searched the building and garbage cans for possible odor source and found no readily apparent source. They then reported odor to CSM 1

0827: PO Safety and Health Manager arrives at CSO

0830: AN Field IH asks CSM 1 to consult TF-AOP-015 procedure

0832: PO Safety and Health Manager contacts PO IHT Lead to mobilize PO IHTs and instrumentation

0833: CSM 1 determines Tank Waste cannot be ruled out as odor source

0835: CSM 1 requests actions in accordance with TF-AOP-015 3.1.12
  - IHT monitoring as per IHP-09001
  - IHIR is initiated
  - RPE worn in accordance with TF-AOP-015 RPF Task 2

0848: AN IHT Supervisor arrives at CSO

0849: PO IHT arrives at CSO and is briefed by COMS Field IH

0850: 2 additional PO IHTs arrive at CSO

0852: CSM 1 directs collection of 2 grab samples: Interior and exterior to 271AP instrument building

0853: CSM 1 directs to wait no more than 5 additional minutes to receive Odor Response Cards before response

0854: Shift PO Manager asks CSM 1 to direct Terra Graphics truck to respond

0855: FWS and Odor Response Cards arrive at CSO. FWS confirms sewage pumping was conducted in the area before dayshift started at approximately 0500.

0855: COMS Field IH directs PO IHTs:
  - Monitor for NH3 and VOCs
  - Collect 2 grab samples: Interior and exterior.
  - Acquire RPE with TF-AOP-015 RPF Task 2
  - Analyze grab samples with H2S, SO2, NOx, NO2, Hg, FID, DRI sensors

0857: PO IHTs depart CSO

0858: CSM 1 contacts Terra Graphics truck to respond. Terra Graphics truck is 30-45 minutes out.

0914: PO Safety and Health Manager contacts IH programs to ensure HAPSITE and other sensors support is prepared.

0918: PO IHT lead confirms PO IHT field response

0924: PO Safety and Health Manager briefs ESH&Q Manager

1003: COMS Field IH and AN Field IH report to CSO and brief CSM 1 with progress. CSM 1 informs AN Field IH and COMS Field IH that Terra Graphics Van response has been cancelled due to timeliness concerns.

1526: PO Safety and Health Manager briefs CSM 2 on monitoring results.

1720: SOEN: "Sample analysis for the TF-AOP-015 event has been completed and the results are at or below background levels. Exiting AOP-015. CSM"
2. GCMS Sample Results:

Samples 19-00550 271AP Outside and 19-00556 271AP Inside were analyzed by GC-MS.

Results:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Xylenes</th>
<th>D-Limonene</th>
<th>Paraffin Hydrocarbons</th>
</tr>
</thead>
<tbody>
<tr>
<td>271AP Outside</td>
<td>~20 ppb</td>
<td>~10 ppb</td>
<td>~75 ppb</td>
</tr>
<tr>
<td>271AP Inside</td>
<td>~20 ppb</td>
<td>~10 ppb</td>
<td>~50 ppb</td>
</tr>
</tbody>
</table>

D-Limonene is the primary ingredient in Simple Green®

No compounds were found at concentrations of concern (All concentrations well below OELs)

See Attachment “A” for GCMS Laboratory Results
3. Additional Information:
   - Odor Response Cards received:

   **ODOR RESPONSE CARD - 241-AP FARM**

1. Contact CSM, Complete below bulleted information and map.
   - Date and time odor was noticed: 2/8/19 0800
   - Your name and the work you were performing: [Redacted]
   - Location of odor (mark area on map and wind direction): 241-AP Instrument Building
   - Name(s) of others in or near the affected area: [Redacted]
   - Was an IHT present? No
   - Describe the odor: Sweet, Sour, Musty, Earthy, Metallic, Smoky, Rotten, Onion
     - Cleaning Solution
     - Ammonia
   - Possible Source: Cleaners/Pesticides
   - Your symptoms (if any): Headache, Dizziness/Light-Headed, Nausea, Cough
     - Fatigue/Drowsiness/Weakness
     - Sore/Burning Throat
     - Difficulty Breathing
     - Watery/Irritated Eyes/Trouble with Vision
     - Tingling/Numbness/Paralysis
     - Rash/Violting
     - Other: None

2. Send this card to the Central Shift Office.
ODOR RESPONSE CARD - 241-AP FARM

1. Contact CSM, Complete below bulleted information and map.
   • Date and time odor was noticed _1/28/19_ 9:00 am
   • Your name and the work you were performing _Marking, QC, 6.4
   • Location of odors (mark area on map and wind direction) _A, A-
   • Name(s) of others in or near the affected area _Marking, QC, 6.4
   • Was an IHT present? _No_
   • Describe the odor _Sweet, Sour, Musty, Earthy, Metallic, Smoky, Rotten, Onion_
     • Cleaning Solution, Ammonia, Other: 
   • Possible Source _Marking, QC, 6.4_
   • Your symptoms (if any) _Headache, Dizziness/Light-Headed, Nausea, Cough_
   • Fatigue/Fatigue/Crowdness/Weakness, Sore/Burning Throat, Difficulty Breathing
   • Watery/Irritated Eyes/Trouble with Vision, Tingling/Numbness/Paralysis, Rash/Hitching
   • Other: _None_

2. Send this card to the Central Shift Office.

ODORS DETECTED WITH NO Immediate symptoms
1. Notify Immediate Supervisor.
2. Contact Central Shift Manager: Provide the bulleted information below.
3. Complete map, return to Central Shift Office as soon as practicable.

ODORS DETECTED WITH Symptoms
4. Notify Immediate Supervisor.
5. Contact CSM: Complete below bulleted information and map.
   • Your name and the work you were performing
   • Your symptoms (if any)
   • Date and time odor was noticed
   • Location of odors (mark area on map and wind direction)
   • Describe the odor
   • Name of other in or near the affected area
   • Was an IHT present?
   • Possible source
6. Provide information on the back of card.
7. Send this card immediately to the Central Shift Office.
Summary of IH Monitoring and Sampling Data:

a. Monitoring:


<table>
<thead>
<tr>
<th>Substance</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>H₂S</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>Hg</td>
<td>5.000 ng/m³</td>
</tr>
<tr>
<td>LEL</td>
<td>0.000%</td>
</tr>
<tr>
<td>N₂O</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>NH₃</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>NO</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>NO₂</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>O₂</td>
<td>20.9 %</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>VOC (FID)</td>
<td>consistent with background</td>
</tr>
<tr>
<td>VOC (PID)</td>
<td>0.000 ppb</td>
</tr>
</tbody>
</table>

**Event Response: 19-00550 “AOP-015 241-271-AP outside”**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>H₂S</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>Hg</td>
<td>7.000 ng/m³</td>
</tr>
<tr>
<td>LEL</td>
<td>0.000%</td>
</tr>
<tr>
<td>N₂O</td>
<td>0.100 ppm</td>
</tr>
<tr>
<td>NH₃</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>NO</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>NO₂</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>O₂</td>
<td>20.9 %</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.000 ppm</td>
</tr>
<tr>
<td>VOC (FID)</td>
<td>consistent with background</td>
</tr>
<tr>
<td>VOC (PID)</td>
<td>0.000 ppb</td>
</tr>
</tbody>
</table>

b. Sampling:

N/A
4. **Summary of Employee Reported Information (e.g., symptoms)**

No symptoms were reported
The workers that reported the odors refused voluntary HPMC medical evaluations

5. **Recommendations/Conclusions:**

Identification of Source of the Concern: [ ] Yes [X] No

No recommendations at this time.

6. **Other:**

N/A

S&H Program Management:

[Redacted]

Print First and Last Name  Phone No.  Date

z/19/19
Attachment A

GCMS Laboratory Results
HAPSITE GC-MS Bag Sample Results Survey 19-00556

A bag sample was collected inside of the 271 AP change trailer and analyzed using an Inficon HAPSITE GC-MS on January 28, 2019. Data was interpreted and reported on January 28, 2019. Results are found below:

Compounds identified in Bag Sample Collected Inside 271 AP Survey 19-00556

<table>
<thead>
<tr>
<th>Compound</th>
<th>COPC</th>
<th>Estimated Sample Concentration (ppb)</th>
<th>Typical Sample Bag Concentration (ppb)</th>
<th>Net Concentration (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl methacrylate</td>
<td>No</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>Not found</td>
</tr>
<tr>
<td>Toluene + Xylenes</td>
<td>No</td>
<td>20</td>
<td>20</td>
<td>Not Found</td>
</tr>
<tr>
<td>D-Limonene</td>
<td>No</td>
<td>10</td>
<td>&lt;5</td>
<td>10</td>
</tr>
<tr>
<td>Aliphatic Hydrocarbons, C11 – C16</td>
<td>Yes</td>
<td>75</td>
<td>100</td>
<td>Not Found</td>
</tr>
</tbody>
</table>

If you have questions contact [Contact Information Hidden]
Methyl Methacrylate

Methyl methacrylate (Si #: 651)

Scan 171 - B' [106]
Ethylbenzene (SI #: 831)

Scan 410 - B1 [385] - B2 [415]
o-Xylene

o-Xylene (SI #: 782)

Scan 450 - B1 [440] - B2 [464]
1, 2, 4-Trimethylbenzene

Scan 643 - B1 [635] - B2 [665]
1, 1, 3, 3, 5, 5-Hexamethyldisiloxane (Bag Plasticizer)
D-Limonene

Scan 722 - B1 [710]

D-Limonene (SI #: B13)
Tetramethylsilane (Bag Plasticizer)
Aliphatic Hydrocarbons (continued)
Survey 19-00550

Compounds identified in Bag Sample Collected Outside 271 AP Survey 19-00550

<table>
<thead>
<tr>
<th>Compound</th>
<th>COPC</th>
<th>Estimated Sample Concentration (ppb)</th>
<th>Typical Sample Bag Concentration (ppb)</th>
<th>Net Concentration (ppb)</th>
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<td>Aliphatic Hydrocarbons, C11 – C16</td>
<td>Yes</td>
<td>75</td>
<td>100</td>
<td>Not Found</td>
</tr>
</tbody>
</table>
o-Xylene

Scan 407 - B1 [39V]
1, 2, 3-Trimethylbenzene

Benzene, 1,2,3-trimethyl- (SI #: 670)

Scan 040 - E1 [154, 034]
1, 1, 3, 3, 5, 5-Hexamethyltrisiloxane (Bag Plasticizer)
D-Limonene
Heptadecane (or other aliphatic hydrocarbon)