



EVENT INVESTIGATION REPORT

EIR-2018-043 "TF-AOP-015 Event Southeast of AW Farm"

(WRPS-PER-2018-2932)



[Redacted Signature]

Event Investigation Team Lead

1/3/2019

Date

[Redacted Signature]

PER Responsible Manager

1/3/2019

Date

Executive Summary

At approximately 10:15am, on 11/16/18, a four-man MSA work crew began to prepare for an electrical outage in support of a Washington River Protection Solutions maintenance work order. The outage required two MSA Electrical Utilities (EU) Linemen to access a utility pole mounted transformer, located between the southeast corner of AW Farm and Building 272-AW. While accessing the transformer via travel in a “Bucket Truck”, and reaching a height of approximately ten feet above ground, the EU Linemen noticed an abnormal odor and stopped. Both workers notified the on-site EU Supervisor and assigned MSA Health Physics Technician (HPT), and immediately descended back to the truck. By the time both EU Linemen had returned to the truck, the EU Supervisor and HPT smelled odors they would later describe as “ammonia”.

The work location for this job was directly southeast of the A and B Air Train Stacks located in AW Farm. At the time, the winds were coming out of the northwest, heading in a southeasterly direction. Given the elevation gain of the “Bucket Truck” in relation to the top of the Air Train Stacks, the wind speed and direction, and the limited amount of vertical dispersion, the air train stacks would be a plausible source of potential tank farm odors.

Taking into account the conditions, the EU Supervisor went to inform the Central Shift Manager (CSM) of the issue, with the three remaining MSA crewmembers eventually meeting up with both of them in the Central Shift Office. The CSM offered the MSA work crew medical surveillance at this time, however, all declined. The CSM then dispatched the two assigned B-Shift Industrial Hygiene Technicians to conduct sampling of the area using a direct reading instrument (DRI). The multi-gas meter readings were less than background for ammonia and total volatile organic compounds at ground level. Additionally, the DRI was mounted to the “bucket” and transported to the approximate height originally obtained by the two EU Linemen. The DRI indicated the same multi-gas meter reading samples at height, as those samples taken at ground level (none).

No MSA crewmembers presented symptoms during the sampling plan; however, the EU Supervisor indicated “difficulty breathing” when filling out the Odor Response Card, which was completed after the sampling plan was conducted. Once symptoms were indicated, the CSM had the B-Shift Operations Engineer transport the EU Supervisor to the Site Occupational Medical Clinic for evaluation. Appropriate notifications were made to WRPS, MSA and DOE management and AOP-015 was entered into at 1115. The EU Supervisor was eventually released to return to work without restriction at 1432.

Though originally declining medical attention, the HPT assigned to the MSA work crew, did elect to be evaluated by the Site Occupational Medical Clinic that same day. The HPT eventually returned to work without restriction as well.

AOP-015 was exited at 1450 on 11/16/18.

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Investigation

On the morning of 11/16/18, a Mission Support Alliance (MSA) work crew prepared to conduct an electrical outage, utilizing Work Order # 4977734/W. A portion of the outage was in support of Washington River Protection Solutions (WRPS) Work Order # 290497, which allowed for the inspection and testing of the low voltage electrical distribution system within Building 272-AW. The MSA work crew consisted of one Electrical Utilities (EU) Lineman Supervisor, two EU Linemen and one Health Physics Technician (HPT).

In order for the MSA work crew to conduct the outage, a “Bucket Truck” was required to access Transformer C6692L, which is mounted on a utility pole located between the southeast corner of AW Farm and Building 272-AW (see photos below).



MSA Bucket Truck



Utility Pole and Transformer C6692L

The MSA work crew conducted a pre-job briefing prior to leaving their shop and then proceeded to the job site. The bucket truck was positioned (parked and set up for operations) just outside the SE corner fence line of AW Farm, south of the utility pole being accessed. At approximately 1000, the work crew conducted another pre-job briefing referred to as a “Tailboard”. During the tailboard session the crew specifically discussed the current wind direction, the close proximity of the AW Farm ventilation system (including stack height), and the height to which they would be required to ascend in order to reach the transformer. The winds during that period were coming from the northwest, heading in a southeasterly direction (~ 305 degrees).

Hanford Weather Station readings for Station 6, between 0800 and 1500, were as follows:

Time Stamp (PST)	Station 6 Wind_Direction (degree)	Station 6 Wind_Speed (mile per hour)	Station 6 Max_Wind_Speed (mile per hour)	Station 6 Avg_Temp (Fahrenheit)	Station 6 Max_Temp (Fahrenheit)	Station 6 Min_Temp (Fahrenheit)	Station 6 Total_Rain (Inches)	Station 6 Avg_Barometric_Pressure (inches of mercury)	Station 6 Avg_Relative_Humidity (percent)
11/16/2018 8:00	301.85	9.74	13.80	41.73	41.94	41.50	0.00	29.50	82.24
11/16/2018 9:00	307.30	9.65	13.12	44.05	44.52	43.59	0.00	29.51	76.77
11/16/2018 10:00	304.5	8.8	12.4	48.3	48.7	47.9	0.0	29.5	64.9
11/16/2018 11:00	316.0	9.6	13.9	50.8	51.4	50.3	0.0	29.5	57.4
11/16/2018 12:00	262.0	10.8	15.7	52.6	53.3	52.0	0.0	29.5	51.0
11/16/2018 13:00	101.0	7.1	12.4	53.5	54.2	53.0	0.0	29.5	41.5
11/16/2018 14:00	92.0	8.2	14.6	55.3	56.0	54.6	0.0	29.5	35.3
11/16/2018 15:00	18.4	6.7	11.1	54.9	55.3	54.5	0.0	29.5	34.0

At approximately 1015, the two EU Linemen entered the bucket¹ and began to travel (ascend) towards Transformer C6692L. After reaching a height of approximately ten feet above the ground (5 ft. above the truck platform), the EU linemen noticed an abnormal smell and stopped travel. EU Lineman #1 smelled an unrecognizable odor at first, eventually describing it as sour and musty. EU Lineman #2 described the odor as earthy and musty. Both workers notified the EU Supervisor and HPT and immediately began to travel (descend) back to the truck. Neither the EU Supervisor nor the HPT smelled any odors while the two EU Linemen were traveling up or down in the bucket, however both eventually would, with the HPT smelling odors on two separate occasions.

As the two EU Linemen were re-stowing and securing the bucket, the EU Supervisor walked over to the Central Shift Office to see if an odor event had occurred or been reported. Once the two EU Linemen secured the bucket, they moved the truck to a different location but remained within the same general area of the Central Shift Office.

When the EU Supervisor reached the Central Shift Office (CSO), he met with the B-Shift Operations Engineer (OE) and Central Shift Manager (CSM) to discuss the conditions his crew had just encountered. The 11/16/2018 – 1025 CSM e-Log entry states the EU Supervisor notified the CSM that, *“while working on a man-lift about 15 feet off the ground on the south east side of AW Farm, he and fellow workers...(names redacted)...smelled ammonia like odors. Due to wind speed and direction and proximity of work to AW Stack, they believe the smell to be emanating from the AW Farm Primary Ventilation Exhaust Stack. Workers have exited the man-lift and are coming to the shift office.”*

During this time, two WRPS Industrial Hygiene Technicians (IHTs) assigned to B-Shift in support of the CSM were completing flammable gas readings in AW Farm. The IHTs had noticed the MSA work crew during this time, including the evolution of raising and lowering the bucket, but did not notice or consider anything to be out of the ordinary.

To conduct flammable gas readings in AW Farm, the IHTs used a Direct Reading Instrument (MultiRAE Pro RAE, ID: 001680) commonly referred to as a DRI. Due to current WRPS policy, both IHTs were wearing a Self-Contained Breathing Apparatus (SCBA) with full mask and obviously did not (or could not) smell any abnormal odors in AW Farm.

Shortly after noticing the two EU Linemen descend back to the truck, the IHTs received notification to report to the CSO. Both of them exited AW Farm, doffed (removed) their SCBAs and went to the CSO as directed. During the transit, they continuously monitored the DRI with

¹ The man-lifting portion of the bucket truck

no elevated readings indicated. Once they reached the CSO (~1045), the IHTs met with the CSM, B-Shift Operations Engineer (OE) and the MSA work crew.

The group discussed path forward including, but not limited to, the following exchange of information:

- All MSA work crewmembers were offered, and declined, medical surveillance.
- No MSA work crewmembers presented any symptoms at this time.
- The MSA crew would reposition the truck in the same or approximate area in which it was originally located.
- The IHTs would conduct DRI ground readings at the event location.
- Since the IHTs were not qualified to operate or utilize the bucket truck, they would clip/mount their DRI to the un-manned bucket and have the MSA crew raise the DRI/bucket to the approximate location of where the EU Linemen first noticed the odors.
- The IHTs briefed the MSA crew on how the DRI functioned (including readings and alarms) and what they were looking for.
- Due to the location of the sampling plan, no SCBA use was required.
- Industrial Hygiene Sample Plan (IHSP) number IHP-09001 R6 would document the sampling results.

After the discussion and briefing, the MSA work crew and two IHTs departed the CSO for the event area to conduct the DRI sampling. The MSA work crew repositioned the bucket truck back to the approximate area in which it was originally located, and the IHTs conducted DRI ground readings. No readings above background were indicated. The IHTs then mounted their DRI to the bucket and the MSA work crew raised the bucket to the approximate height of where the original odors were noticed. The DRI was kept at this height (continuously monitoring) for approximately two minutes and brought back to the truck.

Once retrieved, the IHTs scrolled through the DRI readings, but found no readings above background. At no time did any audible alarms alert personnel of any gases (above background) being present. The CSM e-Log entry for 1115 states *“IHTs return to shift office and report that they did not detect any readings above background for NH4 or VOCs”*²

Upon completion of the sampling plan, the two IHTs returned to their shop, and the B-Shift OE had all four MSA work crewmembers fill out an Odor Response Card (ORC). Prior to filling out his ORC, the EU Supervisor made three phone calls to communicate the delay in the electrical outage; his manager, MSA Dispatch and the WRPS Field Work Supervisor for Work Order # 290497. During an interview with the EU Supervisor, he stated that after placing the third phone call, he took a deep breath that felt like he inhaled “cold air”.

During that time, the CSM contacted the EV Team Industrial Hygienist (EV IH) via phone to see if further action was required. However, given the following information, the EV IH deemed bag samples as unnecessary:

1. No detectable DRI readings or alarms were indicated inside AW Farm while the IHTs were conducting their rounds.

² (NH4) = Ammonia, (VOC) = Volatile Organic Compounds

2. No detectable DRI readings or alarms were indicated during the IHTs transit (walk) from AW Farm to the CSO, via the event area.
3. No detectable DRI readings or alarms occurred during the sampling plan.
4. No additional odors were detected by any personnel during the sampling plan.
5. No MSA crewmembers presented symptoms prior to filling out their Odor Response Card.

The EV IH presented the decision to forgo bag samples to the Production Operations Safety and Health Manager at 1107.

While the two MSA EU Linemen and HPT filled out their ORCs, the EU Supervisor came in from making his three phone calls and began to fill out his. During an interview, EU Lineman #2 stated that the EU Supervisor looked “white” when he came back in to the shift office. After all of the MSA work crewmembers had filled out their individual ORCs, the CSM quickly noted the EU Supervisor had documented having a symptom of “Difficulty Breathing”. At this point (1130), the CSM had the B-Shift OE transport the EU Supervisor to the Site Occupational Medical Provider (Building 2719WB), as the other three MSA work crew members had already left the shift office. The CSM contacted the EU Supervisor’s Manager to notify him of the issue and provided the appropriate notifications up the management chains for WRPS, MSA and DOE (See CSM e-Log 1130 entry).

Once notified by the CSM, the EU Supervisor’s Manager and three MSA work crewmembers (EU Linemen #1 and #2 and the HPT) went to the Site Occupational Medical Provider in support of the EU Supervisor. Several concerns related to the medical attention received by the MSA work crew were communicated during their interviews, however, those concerns fall outside the scope of this Event Investigation. However, this report recognizes those concerns could be more adequately addressed through a patient safety representative or other advocacy care type program.

At 1432, the Site Occupational Medical Provider released the EU Supervisor to return to work without restriction (see corresponding CSM e-Log entry).

At 1450, the AOP-015 event for odors outside of AW Farm was exited (see corresponding CSM e-Log entry).

On 11/17/18, the CSM was notified that the MSA HPT crewmember involved with the AOP-015 event on 11/16/18 had been treated at the Site Occupational Medical Provider that same day. The CSM e-Log entry for 0838 states “...*(MSA HPT) that was involved in the odor response event outside of AW Farm on 11/16/18, and had initially declined medical evaluation, reported to HPMC and was evaluated and released to return to work without restriction.*”

Event Timeline³

11/16/18

- 0431: Production Operations Shift Manager Turnover Checklist records A-Train as the primary means of ventilation for AW Farm with A-Train Stack Continuous Air Monitor (CAM) and Record Sampler are recorded as “Operating”
- ~0900: MSA crew (EU Supervisor, EU lineman #1 and #2, HPT) conducted a pre-job briefing at the shop
- ~1000: MSA crew (EU Supervisor, EU lineman #1 and #2, HPT) assemble at worksite to set up bucket truck and conduct “tailboard”.
- ~1015: EU Lineman #1 and Lineman #2 enter the bucket on bucket truck
- 1025: CSM e-Log entry states “...while working on a man-lift about 15 feet off the ground on the south east side of AW Farm, he and fellow workers... (names redacted)...smelled ammonia like odors. Due to wind speed and direction and proximity of work to AW Stack, they believe the smell to be emanating from the AW Farm Primary Ventilation Exhaust Stack. Workers have exited the man-lift and are coming to the shift office.”
- 1030: WRPS-PER-2018-2932 initiated
- 1045: CSM e-Log entry states the MSA EU Linemen crew and two IHTs “assembled in the shift office to discuss odors detected outside of AW Farm. Dispatched IHTs to perform sampling per IHP-09001”
- 1050: CSM e-Log entry states “CSM Confirmed that all workers who were involved with odors detected outside of AW Farm were offered, and declined, medical surveillance.”
- 1100: CSM e-Log entry states “Discussed IH Sample Plan requirements for AOP-015 response with... (IH)...does not want a bag sample for this event. As such, all required actions are complete for IHP-09001 sample plan” with second 1100 entry stating “... Will enter AOP-015 (vs. C-67) since source of odor appears to be the AW Farm exhaust stack...”
- 1115: Three CSM e-Log entries document; the on-call DOE Facility Representative was notified of the event and access to the man-lift restricted; AOP-015 was being entered; IHTs returned to shift office reporting no detectable readings above background for NH4 or VOCs.
- 1117: SOEN released stating “Entering AOP-015 for odors reported on man-lift outside of AW Farm. Access to man-lift restricted at this location. CSM”
- 1130: CSM e-Log entry states notifications were made to the DOE on-call FACREP, WRPS Safety and two other individuals for “First Aid and Injury, MSA lineman reported concern near AW Farm and was taken to HPMC for evaluation”. A second entry states “... (MSA Lineman) developed symptoms (unusual feeling in chest) after smelling ammonia odors on elevated platform (man-lift) outside of AW Farm. He is being taken to 200W HPMC by...”
- 1330: Event Investigation EIR-2018-043 initiated (CSM e-Log)

³ Additional event timeline stamps are contained within the attachments to this report.

- 1432: CSM e-Log entry states “...(MSA Lineman) that reported concern near AW Farm was evaluated at HPMC and released to return to work without restriction”.
- 1447: SOEN released stating “Exited AOP-015 for odors outside of AW Farm. IH sample results complete; no readings above background. CSM”.
- 1450: Exiting AOP-015 Event (CSM e-Log entry)
- 1647: Production Operations Shift Manager Turnover Checklist records A-Train as the primary means of ventilation for AW Farm. A-Train Stack CAM and Record Sampler are recorded as “Operating”.

11/17/18

- 0838: CSM e-Log entry (Late Entry) states “...(MSA HPT) that was involved in the odor response event outside of AW Farm on 11/16/18, and had initially declined medical evaluation, reported to HPMC and was evaluated and released to return to work without restriction.”

11/19/18

- 1431: Received email from MSA point of contact for Water & Septic services stating no septic services were being performed during the AOP-015 Event on 11/16/18. *This information was requested by the Lead Investigator to rule out any of these services being a potential source of odors.*

11/20/2018

- 0627: Received an email from the MSA point of contact for herbicide and biological control, stating services were being performed neither at nor near AW Farm that day (11/16/18). *This information was requested by the Lead Investigator to rule out any of these services being a potential source of odors.*
- ~ 0810: Conducted interviews with MSA work crew EU Supervisor, EU Lineman #1, EU Lineman #2 and HPT. The MSA Manager of the EU Supervisor attended the interview session as well.
- 1052: Received and email from EV Team Operations, stating no work was released for AW Farm during the weekend of 11/16/18 thru the morning of 11/18/19. *This information was obtained to rule out any AW Farm activity as a source of odor.*

11/29/2017

- 0800-1000: Conducted interviews with WPRS IHT #1 (and supervisor), B-Shift OE, EV IH and CSM.

Immediate Actions

- Upon noticing abnormal odors, the two EU Linemen in the bucket (man-lift) notified the worksite EU Supervisor and HPT and immediately began to descend back to the truck.
- The MSA work crew exited the area.
- The EU Supervisor notified the CSM. Both the EU Supervisor and CSM made proper notifications to their respective management chains.
- Work area restricted and AOP-015 entered.
- IHP-09001 sampling plan conducted.

Compensatory Actions

No compensatory actions were issued for this event.

Preliminary Extent of Condition Review

This event was bound to the area located at the southeast end of AW Farm just outside of the AW Farm fence line.

Discussion of Potential Causes

The following *factors* (operational, environmental and geographical) were analyzed to determine potential causes for the odors:

1. The A-Train ventilation stack was operational.
2. No waste disturbing work was scheduled, released or performed in AW Farm.
3. No septic, herbicide or biological work was being performed near AW Farm.
4. Wind direction was coming out of the NW heading in a SE direction.
5. The A-Train Stack is located in close proximity to the utility pole.
6. The utility pole accessed is located SE of the A-Train Stack.
7. Modeling taken from the Air Pollutant Graphical Environmental Monitoring System (APGEMS)⁴ suggests the two EU Linemen were in the lateral plume of the A-Train Stack (see Attachment 4 for additional details regarding this AOP-015 event).
8. The height of the A-Train Stack, in relation to the total approximate height obtained by the two EU Linemen using the bucket truck, would not provide the vertical dispersion of the stack exhaust gases normally associated with a greater stack height differential.

Based upon the information and factors above, it is suggested, though unsubstantiated; the most likely source (potential cause) of the event odors would come from the AW Farm, A-Train ventilation stack

⁴ The Air Pollutant Graphical Environmental Monitoring System (*APGEMS*) is a state-of-the-art atmospheric transport and diffusion model. *APGEMS* is the primary atmospheric dispersion and dose assessment model for emergency planning, preparedness, and response applications at the US Department of Energy's Hanford Site (<https://mepas.pnnl.gov/earth/apintro.stm>)

Recommendations/Proposed Corrective Actions

1. When work requires personnel to go aloft near a potential source of Tank Waste Vapors (regardless of mechanism used), identify and institute a means to consider and evaluate the likelihood of exposure due to operational, environmental and geographical conditions (i.e., General Hazard Analysis, Job Hazard Analysis, Pre-Job Briefing, Tailboard Sessions, etc.).

Conditions Adverse to Quality




1. The MSA bucket truck was moved from the immediate area, after the work crew detected odors, but prior to conducting IHP 09001 R6 sampling plan. In the event tank vapors were present, this could have resulted in unnecessary or prolonged exposure. (SWIMS protocol ineffectively implemented)
2. The EV IH was never informed (made aware) that MSA personnel were evaluated by the Site Occupational Medical Provider for symptoms until the following Monday (11/19/18).
3. The CSM was never notified the MSA HPT elected to seek medical surveillance after leaving the Central Shift Office.
4. Other contractors (prime or sub) may not be familiar with the standard WRPS protocol for AOP-015 events or what may be expected once the procedure is entered. In turn, this may create a level of uncertainty for individuals outside of WRPS.
5. Other contractors (prime or sub) may not be fully aware of the medical surveillance options and/or treatment limitations provided by the Site Occupational Medical Provider.

Attachments:⁵

1. WRPS TF-AOP-015 Industrial Hygiene Investigation Report (13 pages)
2. Industrial Hygiene Sample Plan (IHP-09001 R6) for TF-AOP-015 (1 page)
3. TF-AOP-015 Rev G-5, pages 7, 9 and 10 of 10 (3 pages)
4. APGEMS-TF Modeling Information of Event

⁵ All other administrative documents referenced in this report are available via the IDMS system

<p style="text-align: center;">Washington River Protection Solutions TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT</p>	<p>PER Number: N/A</p>
<p>Time/Date and Event Location: 11/16/2018 @ 1015 Southeast of AW Farm</p>	<p>EIR Number: EIR-2018-043</p>
<p>1. Event Summary (including number of workers involved and activity in progress): 1 MSA Electrical Utilities(EU) worker and 1 MSA HPT performing "stab pull" 15 feet in the air on a man-lift at the Southeast corner of AW farm noticed a "Sour, Musty, Earthy, Ammonia" odor. 2 additional MSA EU workers on the ground reported odors. Work was paused. Workers lowered the man-lift and reported odors to the Central Shift Manager at 1025. Initially no symptoms were reported and medical evaluation was declined. Later, 1 MSA EU worker reported symptoms "unusual feeling in chest" (reported to shift office) "difficulty breathing" (odor response card) and was evaluated at the Site Occupational Medical Provider. The following day the HPT still without symptoms was evaluated at the Site Occupational Medical Provider.</p> <p>• Was an IHT present during initiating event? [] Yes [X] No</p> <p><u>IH Monitoring/Sample Survey Reports:</u> 18-10000</p> <p><u>Weather Conditions at Time of Event:</u></p> <ul style="list-style-type: none"> • Weather Station: 6 • Wind Direction and Speed: WNW @ 9mph • Barometric Pressure (steady/rising/falling): 29.53 in/Hg Steady • Temperature (F°): 48.1 degrees F Rising <p><u>Field Response Timeline:</u> 11/16/18</p> <p>1031 EV IH receives missed call from Central Shift Office</p> <p>1059 EV IH returns phone call to Central Shift Office and is briefed by the Central Shift Manager. Briefing: 1 EU worker and 1 HPT on a man-lift outside of AW farm smelled ammonia odors. No symptoms were identified and both declined medical evaluation. During the occurrence, IHTs were performing flammable gas readings in AW farm. Central Shift manager directed the IHTs to evaluate the man-lift including sending a DRI instrument up in the man-lift and no readings for ammonia nor total VOC were above background. Central Shift Manager asked EV IH if a bag sample or personal sample should be taken or respiratory prescribed. EV IH informed the Central Shift Manager that it was not necessary to perform additional sampling if the direct reading instruments did not identify any anomalies and the workers did not experience any symptoms.</p> <p>1107 EV IH called acting Production Operations Safety and Health Manager to inform him of the AOP-15 event and decision logic.</p> <p>1115: "SOEN-Entering AOP-015 for odors reported on man-lift outside of AW farm. Access to man-lift restricted at this location. CSM"</p> <p>1445: "SOEN-Exited AOP-015 for odors outside of AW Farm. IH sample results complete; no readings above background. CSM"</p> <p>11/19/2018</p> <p>0850 EV IH reviews Odor Response Cards with the Central Shift Manager and timeline of events. Four individuals reported odors instead of two. It was 2 lineman in the bucket with HPT support on the ground. Additional description of odor from cards</p>	

Washington River Protection Solutions TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT (Continued)		PER Number: N/A
Time/Date and Event Location: 11/16/2018 @ 1015 Southeast of AW Farm		EIR Number: EIR-2018-043
<p>included "sour, musty, earthy." Lineman with symptoms reported at 1130 the sameday and was sent for evaluation. The HPT did not report symptoms but decided on medical evaluation the following day 11/17/18. IHT survey in SWIHD is not complete and is in the process of evaluation.</p> <p>11/28/2018 Met with IHT supervisor to clear up discrepancies in the IHT survey. IHT sent monitoring equipment in the bucket with the lineman due to fall protection requirements and no detectable readings were observed or recorded. Readings for VOC and Ammonia were not taken in AW farm during flam gas monitoring. Monitoring at the man-lift occurred between 0930 and 1015.</p> <p>IH Author:  Print First and Last Name Signature Phone No. Date 11/29/2018 </p> <p>2. GCMS Sample Results: N/A</p> <p>IH Author:  Print First and Last Name Signature Phone No. Date 11/29/2018 </p> <p>3. Additional Information:</p> <ul style="list-style-type: none"> • Odor Response Cards received: • Summary of IH Monitoring and Sampling Data: <ul style="list-style-type: none"> a. Monitoring: b. Sampling: <p>4. Summary of Employee Reported Information (e.g., symptoms)</p> <p>5. Recommendations/Conclusions: Identification of Source of the Concern: [] Yes [] No </p> <p>6. Other:</p> <p>S&H Program Management:  Print First and Last Name Signature Phone No. Date 11/29/18 </p>		

ODOR RESPONSE CARD - 241-AW FARM	
1. Contact CSM, Complete below bulleted information and map.	
● Date and time odor was noticed	<u>8/16/18</u> <u>10:15 am</u>
● Your name and the work your were performing	<u>[REDACTED]</u>
● Location of odors (mark area on map and wind direction)	<u>See Map</u>
● Name(s) of others in or near the affected area	<u>[REDACTED]</u>
● Was an IHT present?	<u>Not at time of incident</u>
● Describe the odor	<input type="checkbox"/> Sweet <input type="checkbox"/> Sour <input type="checkbox"/> Musty <input type="checkbox"/> Earthy <input type="checkbox"/> Metallic <input type="checkbox"/> Smoky <input type="checkbox"/> Rotten <input type="checkbox"/> Onion <input type="checkbox"/> Cleaning Solution <input checked="" type="checkbox"/> Ammonia <input type="checkbox"/> Other: _____
● Possible Source	<u>Stacks to East</u>
● Your symptoms (if any)	<input type="checkbox"/> Headache <input type="checkbox"/> Dizziness/Light-Headed <input type="checkbox"/> Nausea <input type="checkbox"/> Cough <input type="checkbox"/> Fatigue/Drowsiness/Weakness <input type="checkbox"/> Sore/Burning Throat <input checked="" type="checkbox"/> Difficulty Breathing <input type="checkbox"/> Watery/Irritated Eyes/Trouble with Vision <input type="checkbox"/> Tingling/Numbness/Paralysis <input type="checkbox"/> Rash/Itching <input type="checkbox"/> Other: _____
2. Send this card to the Central Shift Office.	

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ODOR RESPONSE CARD - 241-AW FARM

Odors Detected with NO Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager, [REDACTED]
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, [REDACTED]
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 the 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.

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A-8006-930 (REV 0)

ODOR RESPONSE CARD - 241-AW FARM

1. Contact CSM, Complete below bulleted information and map.

- Date and time odor was noticed 11/16/18 ~~10:30~~ 10:15
- Your name and the work your were performing [REDACTED]
- Location of odors (mark area on map and wind direction) SEE MAP
- 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 ☐ Other: _____
- Possible Source STACK
- 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/Itching
☒ Other: NONE RIGHT NOW

2. Send this card to the Central Shift Office.

ODOR RESPONSE CARD - 241-AW FARM

Odors Detected with NO Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager, [REDACTED].
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, [REDACTED], 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 the 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.

The map shows the layout of 241-AW FARM. Key areas include AW-101, AW-102, AW-103, AW-104, AW-105, and AW-106. Other labeled locations are AW-01A, AW-01B, AW-01C, AW-02A, AW-02B, AW-02C, AW-03A, AW-03B, AW-03C, AW-04A, AW-04B, AW-04C, AW-05A, AW-05B, AW-05C, AW-06A, AW-06B, AW-06C, AW-07A, AW-07B, AW-07C, AW-08A, AW-08B, AW-08C, AW-09A, AW-09B, AW-09C, AW-10A, AW-10B, AW-10C, AW-11A, AW-11B, AW-11C, AW-12A, AW-12B, AW-12C, AW-13A, AW-13B, AW-13C, AW-14A, AW-14B, AW-14C, AW-15A, AW-15B, AW-15C, AW-16A, AW-16B, AW-16C, AW-17A, AW-17B, AW-17C, AW-18A, AW-18B, AW-18C, AW-19A, AW-19B, AW-19C, AW-20A, AW-20B, AW-20C, AW-21A, AW-21B, AW-21C, AW-22A, AW-22B, AW-22C, AW-23A, AW-23B, AW-23C, AW-24A, AW-24B, AW-24C, AW-25A, AW-25B, AW-25C, AW-26A, AW-26B, AW-26C, AW-27A, AW-27B, AW-27C, AW-28A, AW-28B, AW-28C, AW-29A, AW-29B, AW-29C, AW-30A, AW-30B, AW-30C, AW-31A, AW-31B, AW-31C, AW-32A, AW-32B, AW-32C, AW-33A, AW-33B, AW-33C, AW-34A, AW-34B, AW-34C, AW-35A, AW-35B, AW-35C, AW-36A, AW-36B, AW-36C, AW-37A, AW-37B, AW-37C, AW-38A, AW-38B, AW-38C, AW-39A, AW-39B, AW-39C, AW-40A, AW-40B, AW-40C, AW-41A, AW-41B, AW-41C, AW-42A, AW-42B, AW-42C, AW-43A, AW-43B, AW-43C, AW-44A, AW-44B, AW-44C, AW-45A, AW-45B, AW-45C, AW-46A, AW-46B, AW-46C, AW-47A, AW-47B, AW-47C, AW-48A, AW-48B, AW-48C, AW-49A, AW-49B, AW-49C, AW-50A, AW-50B, AW-50C, AW-51A, AW-51B, AW-51C, AW-52A, AW-52B, AW-52C, AW-53A, AW-53B, AW-53C, AW-54A, AW-54B, AW-54C, AW-55A, AW-55B, AW-55C, AW-56A, AW-56B, AW-56C, AW-57A, AW-57B, AW-57C, AW-58A, AW-58B, AW-58C, AW-59A, AW-59B, AW-59C, AW-60A, AW-60B, AW-60C, AW-61A, AW-61B, AW-61C, AW-62A, AW-62B, AW-62C, AW-63A, AW-63B, AW-63C, AW-64A, AW-64B, AW-64C, AW-65A, AW-65B, AW-65C, AW-66A, AW-66B, AW-66C, AW-67A, AW-67B, AW-67C, AW-68A, AW-68B, AW-68C, AW-69A, AW-69B, AW-69C, AW-70A, AW-70B, AW-70C, AW-71A, AW-71B, AW-71C, AW-72A, AW-72B, AW-72C, AW-73A, AW-73B, AW-73C, AW-74A, AW-74B, AW-74C, AW-75A, AW-75B, AW-75C, AW-76A, AW-76B, AW-76C, AW-77A, AW-77B, AW-77C, AW-78A, AW-78B, AW-78C, AW-79A, AW-79B, AW-79C, AW-80A, AW-80B, AW-80C, AW-81A, AW-81B, AW-81C, AW-82A, AW-82B, AW-82C, AW-83A, AW-83B, AW-83C, AW-84A, AW-84B, AW-84C, AW-85A, AW-85B, AW-85C, AW-86A, AW-86B, AW-86C, AW-87A, AW-87B, AW-87C, AW-88A, AW-88B, AW-88C, AW-89A, AW-89B, AW-89C, AW-90A, AW-90B, AW-90C, AW-91A, AW-91B, AW-91C, AW-92A, AW-92B, AW-92C, AW-93A, AW-93B, AW-93C, AW-94A, AW-94B, AW-94C, AW-95A, AW-95B, AW-95C, AW-96A, AW-96B, AW-96C, AW-97A, AW-97B, AW-97C, AW-98A, AW-98B, AW-98C, AW-99A, AW-99B, AW-99C, AW-100A, AW-100B, AW-100C. A wind direction indicator shows North (N), South (S), East (E), and West (W). A circled cross symbol is located at the bottom right of the map area.

Page 1 of 2

A-6006-930 (REV 0)

ODOR RESPONSE CARD - 241-AW FARM	
1. Contact CSM, Complete below bulleted information and map.	
● Date and time odor was noticed	11-16-18 10:15 PM
● Your name and the work your were performing	[redacted] Linework for E4
● Location of odors (mark area on map and wind direction)	see Map
● Name(s) of others in or near the affected area	[redacted]
● Was an IHT present?	NO
● Describe the odor	<input type="checkbox"/> Sweet <input type="checkbox"/> Sour <input checked="" type="checkbox"/> Musty <input checked="" type="checkbox"/> Earthy <input type="checkbox"/> Metallic <input type="checkbox"/> Smoky <input type="checkbox"/> Rotten <input type="checkbox"/> Onion <input type="checkbox"/> Cleaning Solution <input type="checkbox"/> Ammonia <input type="checkbox"/> Other:
● Possible Source	two stacks
● Your symptoms (if any)	<input type="checkbox"/> Headache <input type="checkbox"/> Dizziness/Light-Headed <input type="checkbox"/> Nausea <input type="checkbox"/> Cough <input type="checkbox"/> Fatigue/Drowsiness/Weakness <input type="checkbox"/> Sore/Burning Throat <input type="checkbox"/> Difficulty Breathing <input type="checkbox"/> Watery/Irritated Eyes/Trouble with Vision <input type="checkbox"/> Tingling/Numbness/Paralysis <input type="checkbox"/> Rash/Itching <input checked="" type="checkbox"/> Other: none at this point
2. Send this card to the Central Shift Office.	

**Washington River Protection Solutions
IH DRI Monitoring Survey**

Date: 11/29/2018, 10:53 AM

Survey ID: 18-10000 - AOP 15 Outside AW farm

Survey Date: 11/16/2018

Survey ID:	18-10000	Survey Date:	11/16/2018	Survey Status:	Complete
Survey Title:	AOP 15 Outside AW farm				
Sample Plan:	IHP-09001 - AOP-015				
WO/Procedure:	N/A				
Requestor:	Prod Ops Shift Office	Project IH:	[REDACTED]		
Surveyor:	[REDACTED]				
Job Contact:	[REDACTED]				
Contact Phone:	[REDACTED]	Contact Cell Phone:	[REDACTED]		
Engineering Cntls:	None	Administrative Cntls:	Boundary		

Meteorology Data			
Standard Conditions:	No	Weather Date:	11/16/2018
		Time:	0930
Pressure:	29.05 in/Hg	Humidity:	65.9 %
Wind Direction:	WNW	Wind Speed:	9 mph
		Temperature:	48.1 °F

Comments
Linemen were working outside AW farm going to shut power of to buildings for a scheduled power outage. They were up on their man lift bucket and noticed an odor. All came down and notified shift manager who called IHT's to perform area monitoring of area. No reading above background were noticed. Shift manager got a hold of IH and we were instructed that a bag sample was not needed.

Washington River Protection Solutions

Date: 11/29/2018, 10:53 AM

Survey ID: 18-10000 - AOP 15 Outside AW farm

Survey Date: 11/16/2018

Calibration

Instrument		Pre Use Function Test	Post Use Function Test
ID:	001680	Date: 11/16/2018	Date: 11/16/2018
Type:	MultiRAE Pro RAE	Time: 0740	Time: 1300
Serial Number:	MCB3Z005R1	Flow/Fault Check: Yes	By: [REDACTED]
Last Cal Date:	09/13/2018	Battery Check: Yes	Location: Office
Next Due Cal Date:	03/13/2019	By: [REDACTED]	
Lamp:	10.6ev	Location: Office	
Sensor(s)		Pre Use Function Test	Post Use Function Test
Sensor:	MultiRAE Pro RAE CO	As Found: 69 ppm	As Left: 69 ppm
Calibration Source:	Tri-Gas (CO)	Adjusted To: N/A	
Lot Number:	7-116-201		
Manufacture Date:	04/26/2017		
Expiration Date:	04/26/2020		
Cal Source Value:	70.0 ppm		
Sensor:	MultiRAE Pro RAE LEL	As Found: 24 %	As Left: 24 %
Calibration Source:	Tri-Gas (Isopentane)	Adjusted To: N/A	
Lot Number:	7-116-201		
Manufacture Date:	04/26/2017		
Expiration Date:	04/26/2020		
Cal Source Value:	25% LEL		
Sensor:	MultiRAE Pro RAE NH3	As Found: 25 ppm	As Left: 24 ppm
Calibration Source:	Ammonia	Adjusted To: N/A	
Lot Number:	7-116-121-3		
Manufacture Date:	05/01/2017		
Expiration Date:	05/01/2019		
Cal Source Value:	25.5 ppm		
Sensor:	MultiRAE Pro RAE O2	As Found: 19 %	As Left: 19 %
Calibration Source:	Tri-Gas (O2)	Adjusted To: N/A	
Lot Number:	7-116-201		
Manufacture Date:	04/26/2017		
Expiration Date:	04/26/2020		
Cal Source Value:	19%		
Sensor:	MultiRAE Pro RAE ppb PID	As Found: 9.9 ppm	As Left: 9.9 ppm
Calibration Source:	Isobutylene	Adjusted To: N/A	
Lot Number:	7-116-205		
Manufacture Date:	05/01/2017		
Expiration Date:	05/01/2020		
Cal Source Value:	10.0 ppm		

Washington River Protection Solutions

Date: 11/29/2018, 10:53 AM

Survey ID: 18-10000 - AOP 15 Outside AW farm

Survey Date: 11/16/2018

Readings

Type:	Area			
Farm - Specific Location:	Non-Farm - See Other			
Other:	South East corner of AW farm Outside farm			
Farm Status:	N/A			
RC:	N/A			
Activity:	Electrical Maintenance			
Date/Time:	11/16/2018 1025			

Device	Agent	Range	Result	Action Limit
Inst-001680 - NH3	Ammonia		0.000 ppm	12 ppm
Inst-001680 - CO	Carbon Monoxide		0.000 ppm	12.5 ppm
Inst-001680 - LEL	Flammable Gas		0.000 %	25 %
Inst-001680 - O2	Oxygen		20.900 %	23.5 %
Inst-001680 - ppb PID	Volatile Organic Compound		0.000 ppb	2 ppm

Reading Details:	Checked around the Bucket truck and the area where workers were on the ground and smelled odors.
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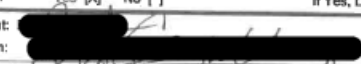

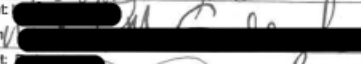



Field Information Verified By: [REDACTED]

Date: November 16, 2018

Approved By: [REDACTED]

Date: November 29, 2018

(The electronic approval indicated above acts as the authentication of this record on the above date)

INDUSTRIAL HYGIENE SAMPLE PLAN		Contractor:	IHSP Number
Exposure Assessment: <input checked="" type="checkbox"/>	Job Specific: <input type="checkbox"/>	Washington River Protection Solutions	IHP-09001 R6
Brief Job Description and Type of Area: TF-AOP-015: This sample plan will be implemented at the direction of the shift manager for IHT field response to odor event. Continuous IHT coverage is required during evolution of event.			
INSTRUCTIONS <u>Action Limit (Direct reading instrument results)</u> Ammonia: 12 ppm VOCs: 2 ppm <u>Monitoring</u> <ul style="list-style-type: none"> Source: Possible odor source if noticeable increase in intensity Area: General area where employees identified the odor and, Personal: N/A <u>Sampling</u> Bag sampling is conducted at the direction of the industrial hygienist, collect a minimum volume of 20L in grab air samples with polypropylene (or equivalent) bags: <ul style="list-style-type: none"> Source: If possible odor source if noticeable increase in intensity Area: General area where employees identified the odor Personal: Personal sampling will not be conducted as an immediate response action unless directed by the responsible <u>IHT</u>. Process the grab air samples using the Hapsite, Miran and Lumax. MONITORING <ul style="list-style-type: none"> Area monitoring will be performed for ammonia and VOCs. General area where employees identified the odor and, Possible odor source if noticeable increase in intensity or positive reading If odor source is readily apparent, e.g. vehicle exhaust, septic systems, animal odors, discontinue monitoring and inform shift office that source has been identified. <u>Pre-Job Briefing Information N/A</u> <u>Other</u> <ul style="list-style-type: none"> IHT to monitor their way in, moving from an upwind location if possible. If collected, a minimum volume of 20L in grab air samples with polypropylene (or equivalent) bags: If collected, deliver grab air sample(s) to IHT Lab at 2704-HV for Hapsite analysis. If grab samples are collected: Ensure ammonia and VOC levels are denoted on the polypropylene bag(s) when air samples are delivered to the IHT Lab at 2704-HV for Hapsite analysis. Sample plan may be modified per written direction from the project IHT in accordance with field deviation guidelines of TFC-ESHQ-S-IH-C-48. Record comments in field log. Transfer comments from field log to SWHD Comments field. Provide copy of field notes to project IHT. Additional direction for access control may be provided by the Shift Manager based upon monitoring and sampling results A EZ may be established or farm access restricted if air monitoring levels reach and remain above an action level. 			
Did IHT Lead Review? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes, Lead IHT INITIAL  & DATE: 10-4-2018			
IH Author	Print: 	Phone: 	Date: 10/4/2018
N/A IH Peer Review	Print: 	Phone: 	Date: 10/4/2018
N/A IH Mgmt.	Print: 	Phone: 	Date: 10/4/2018

Response to Reported Odors or Unexpected Changes to Vapor Conditions

5.0 RECORDS


5.1.1 **PERFORM** the following for records identified within this procedure.

5.1.1.1 **RECORD** the number of times the record was generated in applicable column

OR

PLACE a check mark (✓) in the N/A column.

5.1.1.2 **SUBMIT** the package to the central shift office.

Records Submittal Checklist	Number of times completed	N/A (✓)
Attachments		
Attachment 1 – Odor Response Plan		✓
Attachment 2 - Communication Template (Printed copy of electronic version)	1	
Attachment 3 - Follow-Up Event Summary (Printed copy of electronic version)	1	
FWS/OE/Shift Manager SEND the completed records to the Central Shift Office for records retention.		
<div style="display: flex; justify-content: space-between;"> <div>  Signature FWS/OE/Shift Manager </div> <div> Print (First and Last) </div> <div> <div style="text-align: right;">/ 11/17/18</div> Date </div> </div>		

The record custodian identified in the company-level Records Retention and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

Type	Document No.	Rev/Mod	Release Date	Page
REFERENCE	TF-AOP-015	G-5	06/25/2018	7 of 10

Response to Reported Odors or Unexpected Changes to Vapor Conditions

Attachment 2 - Communication Template

The following is example of detail to provide in the electronic form of Communication Template.

One Hanford worker taken to HPMC for precautionary medical evaluation after reporting ammonia odors while working on man-lift outside of AW Farm. The same Hanford Worker reported symptoms of exposure shortly after leaving the area. Three other Hanford workers reported smelling ammonia odor in the area. These three employees declined medical evaluation. The employees were installing a lockout for electrical work. The job required accessing an electrical power pole via man-lift. Two workers were on an elevated work platform (man-lift) while two workers remained on the ground. Workers were not in an area that requires use of a supplied air respirator. Workers were instructed to ground the man-lift, and not continue work at that location until further evaluation has been conducted.

NOTE - This communication template is to be completed as soon as enough information is available.

Central Shift Manager: _____ / 11/16/18
 Signature Print (First and Last) Date

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Response to Reported Odors or Unexpected Changes to Vapor Conditions

Attachment 3 - Follow-Up Event Summary

The following is example of detail to provide in the electronic form of Follow-Up Event Summary.

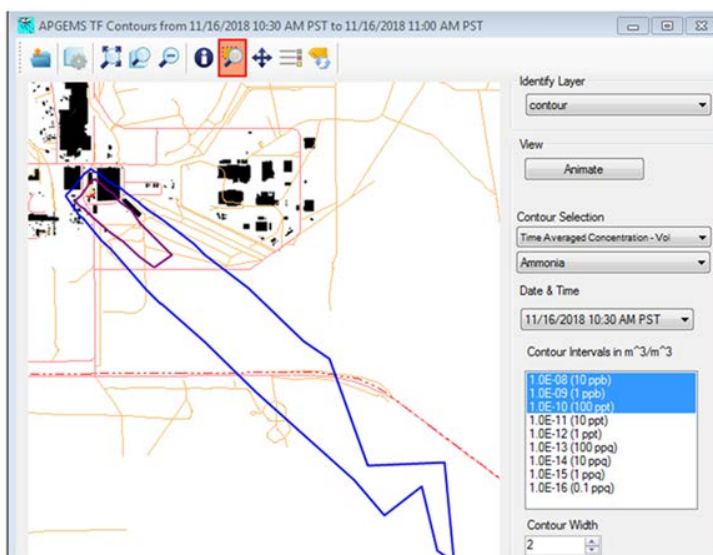
TF-AOP-015 Initial Report		
Date: 11-16-18	Time: 1000 hours	Location: Canton Ave Outside AW Farm
Number of Workers Involved: 4	Sampling Results #: DRI-18-10000	
Event Summary		
<p>At approximately 1015 hours 4 MSA EU Linemen were installing a lockout for electrical work. The job required accessing an electrical power pole via man-lift. Two workers were on an elevated work platform (man-lift) while two workers remained on the ground. Initially one worker reported symptoms and was transported to HPMC by WRPS OE for medical evaluation. One MSA worker did not report symptoms but elected to be seen at HPMC for precautionary medical evaluation. The other two workers declined medical evaluations.</p> <p>At the time odors were reported, the individuals were not working in an area requiring use of supplied-air respiratory protection. Workers were instructed to ground the man-lift, and not continue work at that location until further evaluation has been conducted</p> <p>IHTs responded to the area and took DRI readings. DRI instrument readings were below action levels. Per IH direction, bag samples were not collected for this event.</p> <p>An event investigation has been initiated.</p>		
Return to Work Status		
Number of workers returned to work without restriction	2	
Number of workers returned to work with restriction	0	
Number of workers referred for further evaluation	0	
<p>NOTE - Complete once event is stabilized and all details are known.</p> <p>- To learn more about chemical exposure evaluations see http://hanfordvapors.com/wp-content/uploads/2016/09/2a-HPMC-procedure.pdf</p>		
Central Shift Manager: _____	_____/_____/11-16-18	
Signature	Print (First and Last)	Date

Type	Document No.	Rev/Mod	Release Date	Page
REFERENCE	TF-AOP-015	G-5	06/25/2018	10 of 10

The event was modeled using APGEMS-TF using 43 ppm as a maximum source concentration for the AW Farm stack in APGEMS-TF, which is based on the bounding concentration of this source from the Kenexis Quantitative Assessment Report (62043-000-SUB-020-001-02, Quantitative Risk Analysis 241-AW Tank Farm, Rev 1) for AW Farm during a normal quiescent steady-state operations. No waste disturbing activities were being performed in AW Tank Farm at the time of the event. Workers were accessing a utility pole located between the SE corner of AW Farm and Building 272-AW (which is a big, N-S-oriented building directly across the street, to the West of the AW Farm) and were in a bucket truck about 10-15 feet above the ground. The workers were elevated, but still lower than the stack release point. Based on the photo, the utility pole is presumed to be directly east of the SE corner of AW Farm, which is about 50 m SE of the 27.9-ft AW Farm stack.

The met data for that time (as indicated in the EIR as well) had winds out of WNW (going toward ESE). The atmospheric mixing height was 60 ft., and stability was neutral. Since the stack was lower than the mixing height, and the temperature profile was neutral, one would expect limited vertical mixing (i.e., the emission would disperse horizontally).

The screen shot from the APGEMS model of the 10:00-10:30 plume from the AW stack, just showing the three highest concentration contour levels. The plume went directly to the SE, so from a lateral perspective, the workers were in the line of the plume. However, from the vertical perspective, they were probably below the centerline of the plume. Based on the analysis of the model output, it's likely that the short-duration concentration was less than 1 ppm, and perhaps less than 0.1 ppm. (The highest concentration here is 10 ppb = 0.01 ppm, so going an order of magnitude higher for shorter duration makes sense.) The OEL for ammonia is 25 ppm; the action level for Ammonia is 12.5 ppm. The modeled concentrations are well below these regulatory thresholds. The odor threshold is noted to be as low as 0.037 ppm (37 ppb). Modeling results are consistent with direct reading instrument readings taken by IH during the AOP-015 response and would be consistent with the workers smelling the odors at the ppb concentrations.



⁶ This information was provided via email from the Manager, ESHQ Chemical Protection Integration on 12/20/2018