EVENT INVESTIGATION REPORT

TF-AOP-015 Response at AZ-102 Leak Detection Pit

EIR-2015-024

Event Investigation Team Lead — Date: 6/23/15

PER Responsible Manager — Date: 6/24/15

PER No. WRPS-PER-2015-1136

TF-AOP-015 Response at AZ-102 Leak Detection Pit

Investigation Summary

At 0847 on June 10, 2015, during the performance of TO-020-595, Leak Detection Pit/Radiation Detection Drywell Transfers, at the AZ-102 leak detection pit, ammonia levels reached thirty-six (36) parts per million (ppm) (at a location of 10' into the pit). This was indicated by an instrument alarm. The work crew backed away and secured the job. No action levels were met in the breathing zone. Three (3) workers reported odors of a burnt plastic/chemical smell, ammonia, and/or onion, but no symptoms were initially reported. Notifications were made to the Area Day Shift Manager and the Central Shift Office. Symptoms were reported approximately 15-30 minutes later and the Central Shift Manager entered TF-AOP-015, Response to Reported Odors or Unexpected Changes to Vapor Conditions, at 0920.

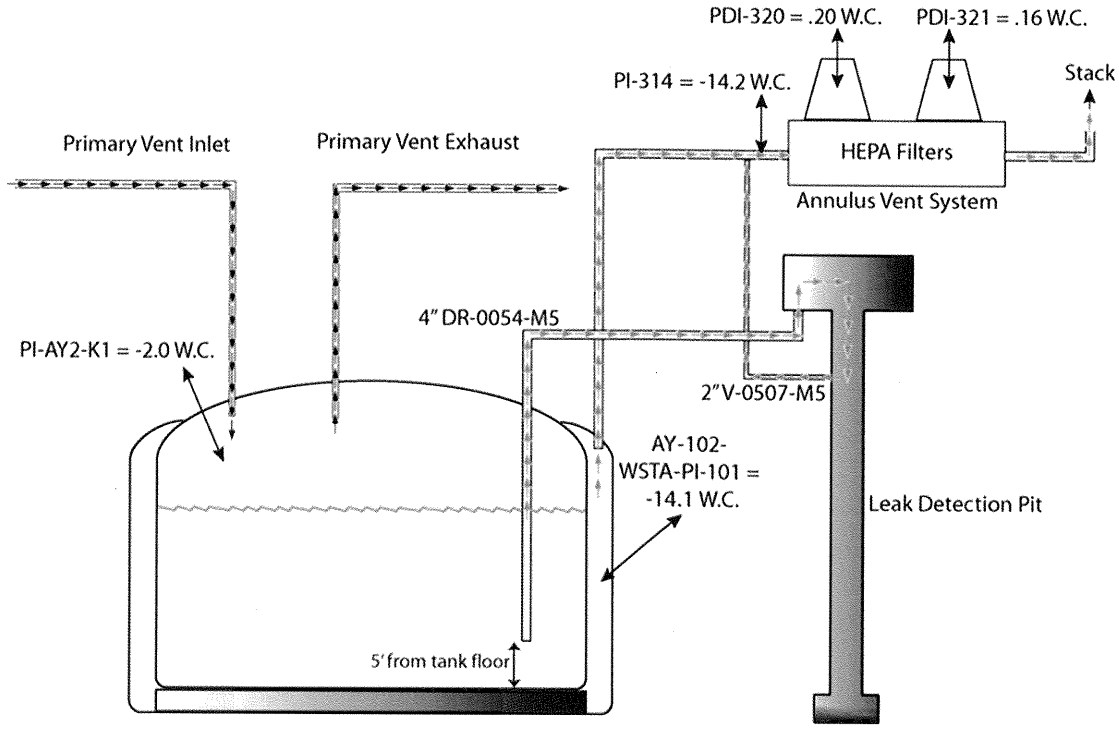
At 1400 a post job review was held and an event investigation was initiated.

Background

Double-shelled storage tank (DST) leak detection pits (LDP) are tertiary containment systems designed to collect any liquid draining from the beneath the secondary liner. The concrete foundation is slotted and fitted with drain connections at the center, midpoint, and edge of the slab. The drain line manifold runs to a 4-feet diameter well that sits below the tank foundation and is equipped with a single 24-inch riser to a separate leak detection pump pit. The leak detection pits are ventilated with 2-inch vent line tied to the DST annulus vent line. [Ventilation was confirmed in the AZ012 LDP.] The leak detection pump pits are also equipped with floor drains. In the aging waste tanks (AY and AZ farms), these drain back to a drop leg in the primary tank. [In the other DST farms these pump pit drains are routed back to the leak detection pit riser.]

The designs of the AY and AZ Leak Detection Pits (LDP) are nearly identical. The main containment is a 47-inch inside diameter tank by 17.75-inch high tank for AZ-102 (note AY-102 tank is 17.25-inch high) that is approximately 62-feet below grade. An approximately 11-feet deep pit just below grade is connected to the tank via a 24-inch diameter pipe. The following figure shows a typical arrangement for the LDP; however it does not show the completed 24-inch diameter pipe which provides access in the installed concrete pits located at grade.

Figure 1. Typical Primary-Annulus-LDP Connectivity in Aging Waste Tanks



Pumping of the LDP is considered an intra-farm transfer from the LDP to the receiving tank. Typical equipment utilized includes a portable generator, pump, water hose, portable eyewash station cleaning supplies for contamination control, pH paper, and a calibrated volt/Ohm meter (VOM) to verify static bonding. [See TO-020-595 for more details.] This transfer was to occur from the AZ-102 LDP to the central pump pit of AZ-102 to tank AZ-102 via the pit's drain line. [At the time of the event, the LDP had been accessed and work place sampling had been initiated. At the central pump pit, the pit's drain valve had been closed, but the no other work had occurred. The hose and pump had not yet been installed to connect the two systems.]

Event Timeline

May 19, 2015

Daily Report: AZ-102 Leak Detection Pit (LDP) is greater than the maximum authorized limit of 23" per OSD-00007 [OSD-T-151-00007, Operating Specifications for Double Shell Storage Tanks]. AZ-102 LDP is required to be pumped below the maximum authorized limit no later than (NLT) 6/18/15. (POC:

June 9, 2015

1954 C-105 retrieval operations secured and administrative lock condition installed due to personnel concerns over minimum staffing requirements. [No retrieval in progress during event.]

June 10, 2015

0610 Pre-job briefing was held for TO-020-595. Thirteen (13) workers were on the job: ten (10) wore no respiratory protection equipment and three (3) wore voluntary self-contained breathing apparatus (SCBA) per the General Hazard Analysis (GHA) Respiratory Protection Form (RPF).

- Radiological Work Permit (RWP) TF-100
- Tank Vapor Information Sheet TVIS-AY-AZ-001 (specifying that for static conditions, open path, or intrusive activities with controlled or restricted pathway; where ventilation maintains negative pressure Similar Exposure Group (SEG) 2 using IHSP EABO-11050)
- Industrial Hygiene Sample Plan (IHSP) EABO-11050 (in accordance with TVIS-AY-AZ-001 work activities are considered to be SEG 2 when an open path or tank intrusive activity is performed with a controlled or restricted pathway).

~0824 Workers enter AZ farm. Nuclear Chemical Operators (NCOs) start setup of equipment for pumping. Electricians assured sniffer tube was grounded. Pipefitter removed cap/top off LDP and NCO inserted the sniffer tubing for the Industrial Hygiene Technician (IHT) to take LEL and oxygen readings before pumping could start.

0847 Industrial Hygienist 1 (IH1) receives call from field Industrial Hygiene Technician (IHT) notifying IH1 of elevated source reading of 36ppm Ammonia (with 4% LEL, volatile organic compounds (VOC) 118ppb). [The action level for Ammonia is 12 ppm.] No action levels were met in the breathing zone. No symptoms reported, but three (3) employees reported smelling onion like odor.

[Field Work Supervisor (FWS) initiates communication with Area Day Shift Manager. In the interim, the work crew places a wet rag over the access.]

0848 IH1 notifies FWS to exit farm and discuss path forward.

0848 Health Physics Technician (HPT) and NCO without SCBA removed cap and used a wet rag to wipe and remove IH sampling hose so that the cap would be able to sit firmly without leaving an air gap. During this process, the group began to exit the farm. This was at the request of the FWS. [There were no HPTs or NCOs on SCBA and they were asked is they were comfortable performing this as there were no elevated readings in the breathing zone.] This was performed on the upwind side of the riser.

[Prior to leaving the farm, a pipefitter on supplied air removed the wet rag and replaced the cap on the LDP.]

0852 IH1 reports to change trailer.

0853 Crew still exiting the farm. IH1 and IHTs discuss readings.

0904 Area Day Shift Manager for AZ Team reports to the Central Shift Manager that during pumping of AZ-102 leak detection pit work ammonia levels reached 36 ppm, work crew backed away, and secured the job. Multiple people smelled an oniony smell, no symptoms were reported, at this time the event does not meet TF-AOP-015 entry requirements. Area Day Shift Manager is notifying U.S. Department of Energy, Facility Representative. [Central Shift Manager's Logbook]

0905 Three (3) employees that smelled odors were asked to fill out odor response cards.

0915 Two (2) employees report symptoms on their odor response card. The third did not. The two (2) employees then chose to go to the onsite medical provider.

0918 IH1 notifies Central Shift Office (CSO) of the employees going to the onsite medical provider for odor response and that IH1 was en route to the shift office.

0919 Industrial Hygienist (IH1) reports to the Central Shift Manager that two (2) employees are being taken to the onsite medical provider for the 0904 entry. One with no symptoms and one with symptoms. [Central Shift Manager's Logbook]

0920 Central Shift Manager enters TF-AOP-015 for reported vapors in AY/AZ farms. 36 ppm ammonia from source and 4% LFL (should be LEL). [Central Shift Manager's Logbook]

0925 IH1 reports to the shift office as Shift Operations Engineer (OE) enters TF-AOP-015.

0925 Third employee (second employee with symptoms) is being taken to the onsite medical provider. [Central Shift Manager's Logbook]

0928 IH2 arrives at CSO.

0931 Central Shift Manager briefs IH2 that TF-AOP-015 was entered based on reported symptoms even though a source was known and the direct reading instrument (DRI) readings were below action levels (in the worker's breathing zone).

0933 SOEN: "Entering AOP-015 for reported odors in AY/AZ Farms. Access is restricted. CSM"

0933 IH1 briefed IHT on response actions to TF-AOP-015. Briefing included where representative bag samples would be taken along with general surveying around the farm.

0940 IH2 reports to mask station and pre-acquires SCBA for responding IHTs.

0944 Second IHT reports to shift office after prepping instrumentation.

0944 Shift Office Event Notification (SOEN) C-105 to AN-106 retrieval has started. Potential odor increase in AN and C farms. [No retrieval in progress during event.]

0945 Second IHT briefed on where bag samples would be taken.

0946 IHTs leave for mask station.

0948 Additional affected employees (from AY work location) report to CSO by Industrial Safety (IS) and HAMTC Safety Representative.

0948 IH2, IS, and HAMTC Safety rep. report to AY/AZ to instruct employees on filling out odor response cards.

1003 IH2 observes IHT supervisor and additional IHTs preparing instrumentation for use upon delivery of bag samples in 272AW IHT lab.

1007 IH1 calls 2704HV IHT lab to ensure GC/MS is warmed up and ready to process bag samples upon delivery.

1011 IHT contacts CSM to acquire HPT support to release bag samples from AY/AZ farm.

1012 IHT contacts IH1 to acquire additional information about odor location. IH1 calls Field Work Supervisor (FWS) to verify location information and relays information to IHT.

1013 Additional employees report to CSO to report that odors were detected on 06/08/2015 and 06/10/2015 on non-intrusive job at AY101 leak detector pit around risers 90 and 91. No symptoms were reported. No IH monitoring was performed during the AY101 odor event and no employees reported to the onsite medical provider.

1014 IH calls responding IHTs to direct them to include survey around AY-101 LDP.

1018 Workers report smelling a musty smell around AY101 during annulus ENRAF calibrations. They reported no symptoms. They also reported a musty smell on June 8, 2015 but had Industrial Hygiene support and all readings were below background so they did not report it. Notified DOE Facility Representative. [Central Shift Manager's Logbook]

1028 IHTs enter AY/AZ Farm.

1036 First bag sample collected from within AZ-102LDP at -10ft from riser opening.

1046 Second bag sample was collected from within AZ-102LDP at -2ft from riser opening.

1050 Third bag sample was collected from area around AZ-102LDP.

1052 IHTs sweep AY/AZ farm with no detectable readings.

1100 IHTs deliver bag samples to another IHT at change trailer (for transport to 272AW).

1104 Bag samples arrive at 272AW IHT Lab for Miran and Lumex analysis.

1105 IHTs responding to TF-AOP-015 exit farm.

1111 Analysis of atmosphere in bags begins at 272AW IHT Lab.

1133 Bags transported to 2704HV IHT Lab for Hapsite GC/MS analysis.

1315 Radiological Control First Line reports that when pulling out the plastic tubing that was 10 feet down in AZ-102 LDP that it read 4,000 dpm/100 cm2 beta/gamma. The tubing is currently bagged and sitting in AZ farm until TF-AOP-015 is exited. [Central Shift Manager's Logbook]

1400 Post Job Review (in-process review with the work crew) was held at MO-577 on AZ-102 LDP pumping.

1423 Shift IHT completed flammable gas readings for AY/AZ farms. All readings were 0% of LEL. [Central Shift Manager's Logbook]

1529 Three (3) workers were released from the onsite medical provider with no restrictions. [Central Shift Manager's Logbook] [Two (2) of the workers were restricted from ACES (access control/entry system) pending laboratory results.]

2104 Central Shift Office exits TF-AOP-015.

<u>June 11, 2015</u>

Engineering confirmed that the drain in the AZ-102 LDP is in the closed position. [The video reviewed (from 9/27/07) was after the handle was removed, so this is believed to be the current state today.]

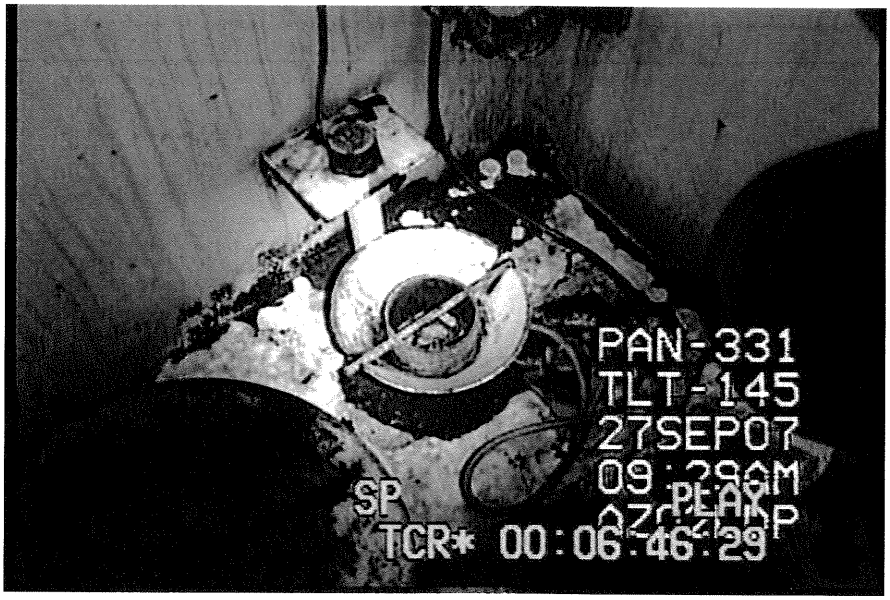


Figure 2. Drain in the AZ-102 LDP

The IH sample tube that was reported as having 4,000 dpm/100cm2 beta/gamma was surveyed again today and had no contamination levels above background, indicating that the sample tube had picked up Radon the day before.

Compensatory Measures

June 10, 2015

0933 Entered TF-AOP-015 for reported odors in AY/AZ Farms. Access was restricted.

Verified that the LDP had negative ventilation (provided by the annulus exhauster).

Bench calibrations of the Industrial Hygiene instruments used were performed and successfully completed. No issues.

June 11, 2015

Confirmed LDP drain plug position (closed). [LDP isolated from primary tank.]

Re-surveyed sample tubing and confirmed that the tubing was not contaminated.

Preliminary Extent of Condition Review

The extent of condition for this event extends to all intrusive work, specifically tank waste transfers, for the determination of adequate hazard controls by review. [Thus the reasoning behind the implementation of the current Red Arrow.]

Discussion of Potential Causes

Inadequate facility configuration review to support hazard identification and the determination of controls.

- Prior knowledge that the LDP is under vacuum (from the annulus exhauster), historical indications that included no vapors/odors being reported, and real time monitoring in the worker's breathing space led the team to conclude that hazards were being adequately addressed. After the fact, the LDP activity was confirmed to be not intrusive because the LDP has been confirmed to be sealed off from the primary tank's headspace by the closed drain plug. This should have been known during the planning phase of this work (during the development of the technical procedure so that it could either be verified or ensured prior to the initiation of work without additional controls).
- At the receiving tank of the liquid transfer, the liquid is being transferred through the central pump pit and its drain line directly into the primary tank. The end of the drain pipe, however in this case, is known to be submerged in waste thereby forming a seal from tank's headspace. The impact of this configuration would result in the determination that this work would be intrusive.

Discussion of Barriers That Could Have Impacted the Cause

1. Red Arrow, dated April 2, 2015, failed to provide adequate review of potentially waste intrusive work. "Implementation of appropriate respiratory control requirements for work activities with potential exposure to tank vapors (e.g. pit work, breaking waste system boundaries, etc.) shall be verified and approved by the ESHQ Manager and Shift Production Operations Manager pending completion of AY02C event investigation. (POC: "

Recommendations/Proposed Corrective Actions

1. Continue with TO-020-595 to pump the LDP and confirm pH of liquid to confirm source.
2. Evaluate the need for a standalone Industrial Hygiene Sample Plan for this activity to provide better direction.
3. Add a step to the technical procedure validation process to verify that the assumed engineering controls (valve position, ventilation flow direction) or the appropriate hazard controls have been specified for the work to be performed.
4. Review the implementation of the April 2, 2015 Red Arrow.

Attachments

1. TF-AOP-015 Industrial Hygiene Investigation Report issued June 11, 2015
2. WRPS Post Job/ALARA Review (meeting held June 10, 2015 at 1400)
3. Central Shift Manager's Log Book Entries
4. Hanford Site Weather Data (400' tower).

ATTACHMENT 1

TF-AOP-015 Industrial Hygiene Investigation Report issued June 11, 2015

Washington River Protection Solutions **TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT**	**PER Number:** N/A

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

1. Event Summary (including number of workers involved and activity in progress):
   - Was an IHT Present? [X] Yes [ ] No
     Monitoring was being performed in accordance with EABO-11050 AY/AZ Farms SEG 2 Work Activities. DRI Survey #15-04319 inside of Riser Port H-14-102963-ZZ at ~-10ft (below surface of riser) for LFL, NH3, VOC, O2. Monitoring was performed in area and breathing zone after odors were detected for NH3 and VOC.
   - Was Respiratory Protection Being Worn by Affected Worker(s)? [ ] Yes [X] No
     Out of 13 employees on the work crew 10 wore no RPE, 3 wore voluntary SCBA (GHA RPF).

2. Summary of Employee Reported Information (e.g., symptoms):
   - See Attached Completed Odor Response Card(s)
   - Reported odors:
     - Burnt plastic/chemical smell
     - Ammonia smell
     - Onion smell
   - Reported symptoms: Initially no symptoms were reported, however the following symptoms were reported about 15-30 minutes after odors were reported:
     - Itchy throat
     - Nasal irritation

     After transport to HPMC the following symptoms were reported by an individual who did not experience earlier onset symptoms:
     - Vomiting
   - Odors were first detected after ITX began alarming during LFL readings from within AZ-102LDP at -10ft level (10 feet below the riser surface inside of the AZ102 LDP)
   - A rag placed over the riser opening indicated that negative pressure was present within LDP during LFL readings.
   - After sample tube was withdrawn odors began to get worse as a function of proximity to riser (odors reduced as work group exited work area).

3. Identification of Source of the Concern: [X] Yes [ ] No
   - AZ-102 Leak Detection Pit

4. Time Line of the Event:

   0847: IH1 Receives call from field IHT notifying IH1 of elevated readings from source. 36ppm Ammonia, 4%LEL VOC 118ppb. No action levels were met in the breathing zone. No symptoms reported but 3 employees reported smelling onion like odor. Negative readings were seen on the ITX for ammonia. These negative readings receded after about 5 mins and the instrument then read zero again.
   0848: Notify field work supervisor to exit farm and discuss path forward.
   0852: IH1 reports to change trailer
   0853: Crew still exiting the farm. IH1 and IHT's discuss readings.
   0905: Three employees that smelled odors were asked to fill out odor response card.
   0915: Two Employees report symptoms on odor response card. The third did not. Two employees then chose to go to HPMC.
   0918: IH1 notifies shift office of the employees going to HPMC for odor response and that IH1 was en route to shift office
   0925: IH1 reports to shift office as Shift OE calls out AOP-015
   0928: IH2 arrives at CSO
   0931: CSM briefs IH2 that AOP-015 was entered based on reported symptoms even though a source was known and DRI readings were below action levels
   0933: SOEN: "Entering AOP-015 for reported odors in AY/AZ Farms. Access is restricted. CSM"
   0933: IH1 briefed IHT on response actions to AOP-015. Briefing included where representative bag samples will be taken along with general surveying around the farm
   0940: IH2 reports to mask station and pre-acquires SCBA for responding IHTs.

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Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

0944: Second IHT reports to shift office after prepping instrumentation.
0945: Second IHT briefed on where bag samples will be taken.
0946: IHT's leave for mask station
0948: Additional affected employees report to CSO by IS and HAMTC Safety rep.
0948: IH2, IS and HAMTC Safety rep. report to AY/AZ to instruct employees on filling out odor response cards.
1003: IH2 observes IHT supervisor and additional IHTs preparing instrumentation for use upon delivery of bag samples in 272AW IHT lab.
1007: IH1 calls 2704HV IHT lab to ensure GCMS is warmed up and ready to process bag sample upon delivery.
1011: IHT contacts CSM to acquire HPT support to release bag samples from AY/AZ farm.
1012: IHT contacts IH1 to acquire additional information about odor location, IH1 calls FWS to verify location information and relays information to IHT.
1013: Additional employees report to CSO to report that odors were detected on 06/08/2015 and 06/10/2015 on non-intrusive job at AY101 leak detector pit around risers 90 and 91. No symptoms were reported, no IH monitoring was performed during odor event, no employees reported to HPMC.
1014: IH calls responding IHT's to direct them to include survey around AY-101 LDP
1028: IHTs enter AY/AZ Farm
1036: First bag collected from within AZ-102LDP at -10ft from riser opening. DRIs are shown in section 5 (10ft below pit surface)
1046: Second bag was collected from within AZ-102LDP at -2ft from riser opening DRIs are shown in section 5 (2ft below pit surface)
1050: Third bag was collected from area around AZ-102LDP Seen in section 5 (@ odor)
1052: IHT's sweep AY/AZ farm with no detectable readings.
1100: IHT's deliver bags to another IHT at change trailer (to transport to 272AW)
1104: Bag samples arrive at 272AW IHT Lab for Miran and Lumex analysis
1105: IHT's responding to AOP-015 Exit farm
1111: Analysis of atmosphere in bags begins at 272AW IHT Lab.
1133: Bags transported to 2704HV IHT Lab for Hapsite GCMS analysis
2104: Exited AOP-015

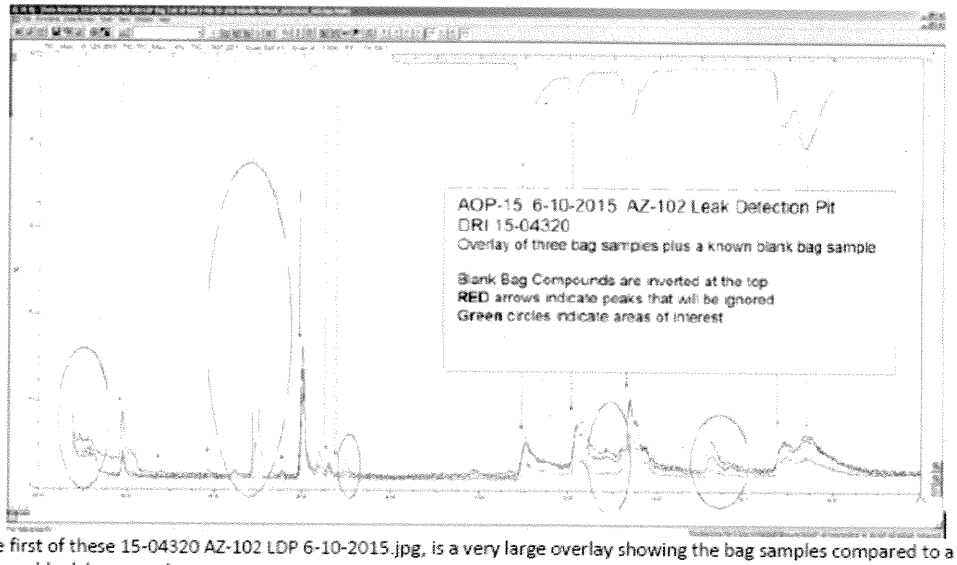
5. Summary of IH Monitoring and Sampling Data: DRI survey #15-04320
   a. Monitoring

AGENT	@ODOR	@SOURCE (10 ft below pit surface)	@SOURCE (2 ft below pit surface)	EXPOSURE LIMIT	REPORTING LIMIT
Ammonia	0ppm	23.0ppm	0.0ppm	25 ppm OEL/35ppm STEL	>0 ppm
Total VOCs	0.034ppm	0.546ppm	0.117ppm	2 ppm AL	>0 ppm
Mercury	6.0x10^-6 mg/m³	$14X10^{-6}$mg/m³	$11X10^{-6}$mg/m³	0.025 mg/m³ OEL	0.000016 mg/m³
Nitrous Oxide	0ppm	0.3ppm	0.0ppm	25 ppm AL	>0 ppm

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

b. GCMS Sample Results:

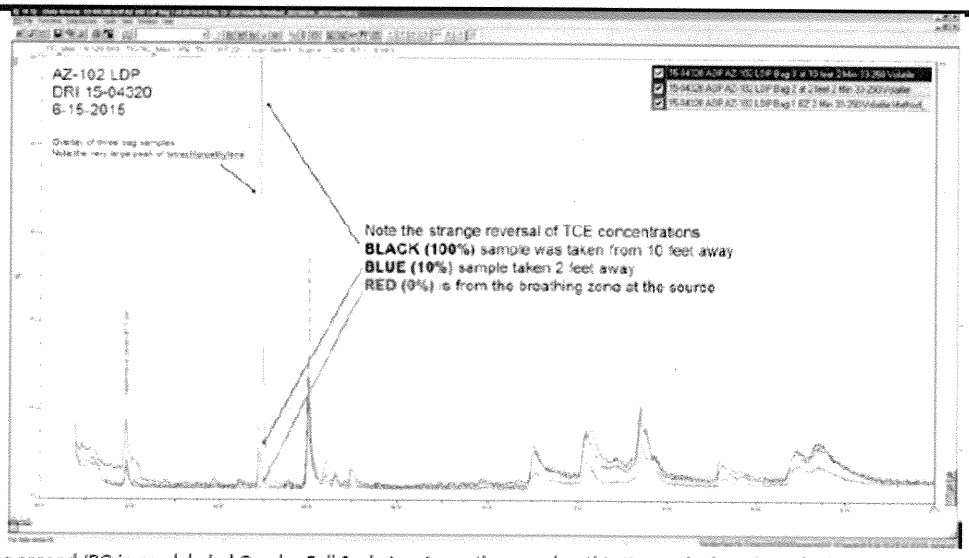
Please review the following three JPG images relating to today's AOP-15 event in AY/AZ farm:



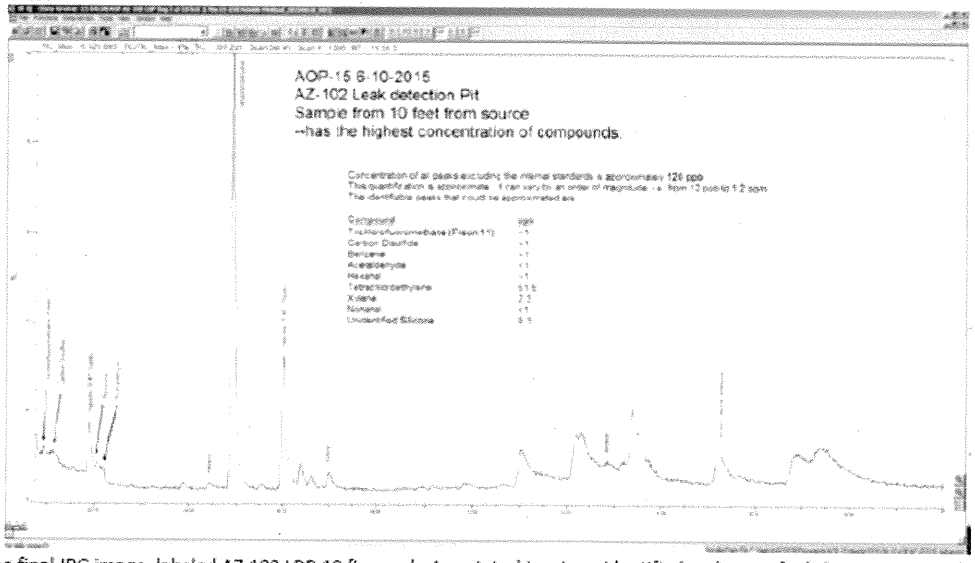
The first of these 15-04320 AZ-102 LDP 6-10-2015.jpg, is a very large overlay showing the bag samples compared to a known blank bag sample.

This permits the materials arising from the bag composition to be ignored. Several unique peaks were circled in green.

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit



The second JPG image labeled Overlay Full Scale.jpg, is another overlay, this time only describing the large compound of interest



The final JPG image, labeled AZ-102 LDP 10 ft sample Annotated.jpg, is an identified and quantified chromatogram of the sample with the largest concentrations of unique, non-bag related compounds.

Time/Date & Event location:
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The odor that instigated this incident was described as "garlic" and "onion-like"
The chemicals normally associated with this type of odor, Butanal and Butanoic acid, were not observed, even when using a Reconstructed Ion Chromatogram.
The only compound identified with a known odor was a barely identifiable, but not really quantifiable, amount of Carbon Disulfide.
Carbon disulfide if highly pure, has a sweet odor, but outside of a research laboratory, it is never found pure.
Most commonly, carbon disulfide has a disagreeable fecal odor from trace contaminants and oxidation products.

The very large peak of trichloroethylene has a completely different odor profile.
--TCE is instantly recognizable as the "chemical" odor of freshly dry-cleaned laundry. It is also used as a metal cleaning solvent.
There is no possible way that this compound could have been responsible for the odor described.
The ACGIH TLV for TCE is 25 ppm for an 8-hr workday. It has a STEL of 100 ppm.

Several other aldehydes were observed, but not quantifiable amounts. These aldehydes range in odor from "sweet fruit-like", "woodsy", to "earthy mushroom" odors.
None are particularly objectionable, indeed, these are commonly used in perfumes. (Chanel No.5 is famous for its "fresh", "woodsy", aldehyde scent).

If you should require further information, please give me a call.

Industrial Hygiene Programs
washington river protection solutions
Contractor to the U.S. Dept of Energy
[redacted]

c. Sampling:
- *Source* [X] Yes [ ] No DRI survey #15-04319
- *Area* [X] Yes [ ] No DRI survey #15-04319
- *Personal* [ ] Yes [X] No Air survey #15-04177 Voluntary personal pump was requested, but was refused to be worn by requester at change trailer at time of job.

6. Weather Conditions at Time of Event: Station 6 0845 06/10/2015:
   - Wind Direction & Speed: N/NW 6mph w/gusts to 13mph
   - Barometric Pressure (steady/rising/falling): 29.05inHg rising slightly
   - Temperature (°F): 81F and rising

7. Recommendations/Conclusions: Formal fact finding should occur to clarify discrepancies.

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

8. Other:

- Odor Response Cards:

4196529

Odor Response Card

1. Contact CSM [redacted] complete below bulleted information and map.
   - Your name and the work you were performing AZ102 LDP
   - Your symptoms (if any) Slight Tiles on hand
   - Time odor was noticed 0847
   - Location of odors (mark area on map and wind direction) AZ-102 LDP
   - Describe the odor Tannic, Sour, Grain, Chemical
   - Name of others in or near the affected area
   - Was an IHT present? Yes
   - Possible source AZ-102 LDP
2. Send this card to the Central Shift Office.

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Washington River Protection Solutions

TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number: N/A

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

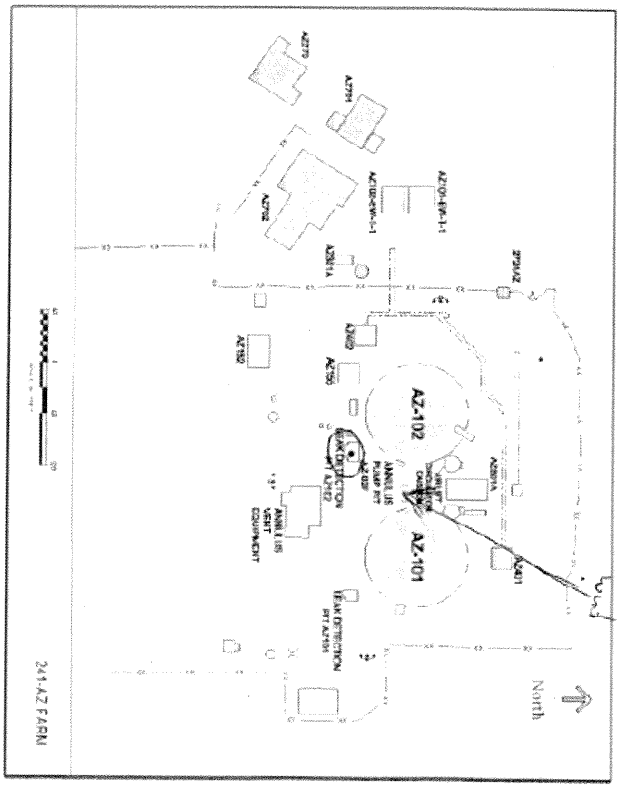
Odor Response Card

Odors Detected with NO Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager [redacted] Provide below bulleted information
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)
   - Time odor was noticed
   - Location of odors (mark area on map and wind direction)
   - Describe the odor
   - Name of others 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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Odor Response Card

1. Contact CSM [redacted] complete below bulleted information and map.

   - Your name and the work you were performing
     IHT physiological monitoring
   - Your symptoms (if any) _____
   - Time odor was noticed 0847
   - Location of odors (mark area on map and wind direction) A2-102 LDP
   - Describe the odor ONIONS
   - Name of others in or near the affected area _____
   - Was an IHT present? yes
   - Possible source LDP

2. Send this card to the Central Shift Office.

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Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit

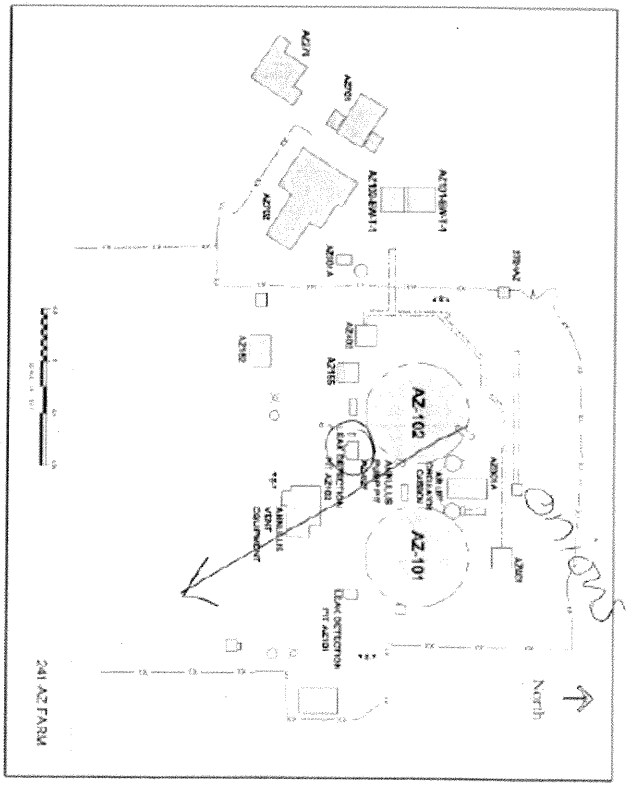
Odor Response Card

Odors Detected with NO immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager [redacted] Provide below bullated information
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 bullered information and map.
   - Your name and the work you were performing
   - Your symptoms (if any)
   - Time odor was noticed
   - Location of odors (mark area on map and wind direction)
   - Describe the odor
   - Name of others in or near the effected 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.



A-6005-744 (REV 3)

Odor Response Card

1. Contact CSM, [redacted] complete below bulleted information and map

- Your name and the work you were performing Pumping leak detection pit
- Your symptoms (if any) Onion smell / Nose irritation
- Time odor was noticed 08:47
- Location of odors (mark area on map and wind direction) A2-102 leak detection pit
- Describe the odor Onion smell
- Name of others in or near the affected area
- Was an IHT present? yes
- Possible source Opening leak detection pit

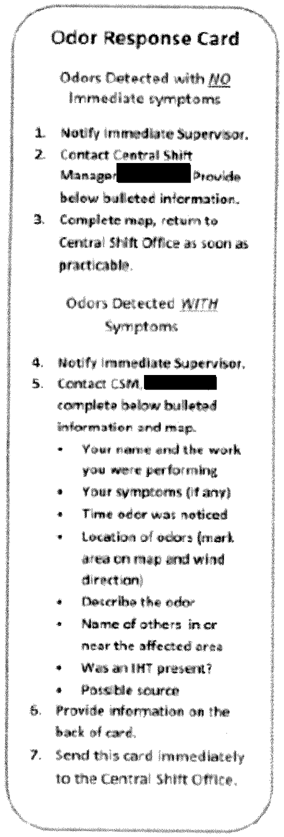
2. Send this card to the Central Shift Office.

Washington River Protection Solutions

TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT

PER Number: N/A

Time/Date & Event location:
0847 6/10/2015; AY/AZ AZ102 Leak Detection Pit



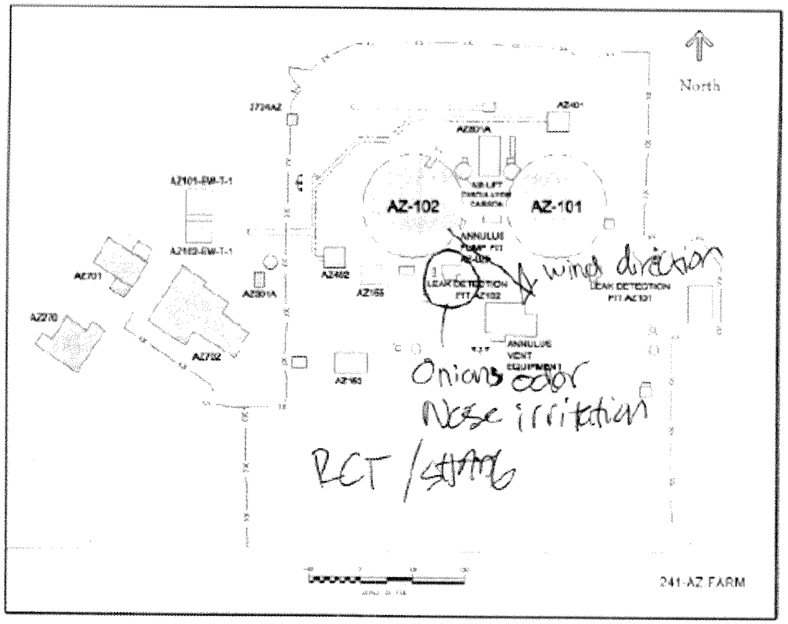
Odor Response Card

Odors Detected with *NO* Immediate symptoms

1. Notify Immediate Supervisor.
2. Contact Central Shift Manager [redacted] Provide below bulleted information.
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)
   - Time odor was noticed
   - Location of odors (mark area on map and wind direction)
   - Describe the odor
   - Name of others 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.



wind direction

Onions odor

Nose irritation

RCT / [illegible]

9. IH Monitoring/ Sample Survey Reports:

Washington River Protection Solutions
IH DRI Monitoring Field Log

Survey ID: 15-04319 - Pump AZ102 leak detection pit

Survey Date: 06/10/2015

Survey ID: 15-04319 **Survey Date:** 06/10/2015

Survey Title: Pump AZ102 leak detection pit
Sample Plan: EABO-11050 - AY/AZ Farms SEG 2 Work Activities
WO/Procedure: TO-020-595 **Project IH:**
Job Contact: **Phone:** [redacted] **Cell Phone:** [redacted]
Surveyor: **Signature/Date:** S 6/10/15

Engineering/Administrative Controls: Mechanical Ventilation (Fixed) Boundary

Comments: (Briefly describe jobs being performed)
Enter AZ-farm at 0824. Inside AZ-102 tent cap H-14-102963-ZZ was removed from pit IHT source monitored for NH3 and VOCs above open pipe, readings were; NH3 0ppm and VOC 0ppm at 0835. Tube was put into pathway for LEL reading. IHT attached iTX and ppb to tube, readings for LEL was 0%, NH3 was 0, and VOC was 51ppb at 0838. Outside tent at Leak detection pit 241-AZ102, cap was removed from extension, source reading was taken at 0840 NH3 reading was 0ppm and VOC reading was 0ppb. Flam gas tube was then put into pathway IHT attached to tube at 0841. NH3 reading climbed to 36ppm, 4% LEL, VOC 118ppb, O2 20.4%, operator was told to back away from source and a rag was placed over opening. NH3 LEL and VOC declined to 0 with tube still in opening and instruments still attached. FWS wanted cap placed back on opening, rag was removed. Tube still in opening and instruments still attached. NH3 climbed to 15ppm, LEL 4% VOC at 118ppb. Instruments were detached from tube. At this point another IHT on SCBA took a breathing zone reading over top of the opening using the same instruments, cap was removed. His NH3 reading was (-28ppm). Cap was placed back onto opening everyone was going to exit from when 3 workers started smelling what they described as an onion smell. IHT associated with this DRI had the instruments back and did an area monitoring in the area around the workers at 0846, no readings were detected. everyone in the crew exited the farm. IHT received extremely high SOURCE readings of NH3 = 36ppm. However, BZ readings for workers surrounding as well as near the SOURCE were undetermined. An IHT wearing an SCBA was given the OK to take BZ readings near the source with cap removed. Results for NH3 in the BZ = -28.0 ppm and slowly dissipated to 0.0 ppm as the SOURCE as it was allowed to vent out. BZ VOC'S = inconclusive. BZ O2 = 20.4%, BZ LEL = 0.0%

Farm: AZ-Farm **Specific Location:** AZ-102
Other: AZ-102 Leak Detection Pit
Farm Status: ☐ N/A ☒ Static ☐ Tank Intrusive ☐ Unknown ☐ Waste Disturbing ☐ Waste Intrusive

Job Activity: Pumping AZ-102 Leak Detection Pit

Device	Type	Time	Location	Agent	Results/Units
000801	S	0835	Inside AZ-102 tent Cap H-14-102963-ZZ	Volatile Organi	0 ppb
001115	S	0835	Inside AZ-102 tent Cap H-14-102963-ZZ	Ammonia	0 ppm
001115	S	0836	Inside AZ-102 tent Cap H-14-102963-ZZ	Flammable Gas	0%
001115	S	0836	Inside AZ-102 tent Cap H-14-102963-ZZ	Oxygen	21.1%
000801	S	0836	Inside AZ-102 tent Cap H-14-102963-ZZ	VOC	51 ppb
001115	S	0836	Inside AZ-102 tent Cap H-14-102963-ZZ	NH3	0 ppm
000801	S	0838	Leak detection Pit 241-AZ102	VOC	0 ppb
001115	S	0838	Leak detection Pit 241-AZ102	NH3	0 ppm
000801	S	0841	Leak detection Pit 241-AZ102	VOC	118 ppb
001115	S	0841	Leak detection Pit 241-AZ102	NH3	36 ppm
001115	S	0841	Leak detection Pit 241-AZ102	LEL	4%
001115	S	0841	Leak detection Pit 241-AZ102	Oxygen	20.4%
000801	A	0846	Leak detection Pit Area	VOC	0 ppb
001115	A	0846	Leak detection Pit Area	NH3	0 ppm
			Gary Cole 6/15		

Washington River Protection Solutions
IH DRI Monitoring Field Log

Survey ID: 15-04320 - AOP 015 Response in AY/AZ

Survey Date: 06/10/2015

Survey ID: 15-04320 **Survey Date:** 06/10/2015

Survey Title: AOP 015 Response in AY/AZ
Sample Plan: IHP-09001 - AOP-015
WO/Procedure: AOP-015 **Project IH:** [redacted]
Job Contact: **Phone:** [redacted] **Cell Phone:** [redacted]
Surveyor: **Signature/Date:** 6·10·15

Engineering/Administrative Controls: Mechanical Ventilation (Fixed), None / Boundary, None

Comments: (Briefly describe jobs being performed)
IHT's were notified of the AOP 015 in AZ Farm at 0930. 2 IHT's (, ntered into the AY/AZ Farm at 1028. 3 bag samples were collected at the possible source of AZ-102 LDP. Bag sample 1 (10ft sample) was collected at 1036. The second bag sample was collected at 1046(2ft sample). The third bag sample (breathing zone) was collected at 1050. A reading was taken at the 10ft sample point with the ITX and PPB Rae for VOC, NH3 and LEL. A full walk down of the AZ and AY farm was complete monitoring for VOC and NH3. Both IHT's exited the AY/AZ Farm at 1100. A third IHT (ran the bag samples through the Miran, Lumex ITX and PPB Rae. Once the insturments were warmed up a pre-response test was completed on the Miran and Lumex. The readings from the bags samples collected in the field began at 1111. Once the testing was complete, the 3 bags were transported to the 2704HV building for the Hapsite testing.

Farm: AY/AZ **Specific Location:** Inside Farm
Other: AOP015 Response AZ102 ~~LDP~~ LDP NS 6-10-15
Farm Status: ☐ N/A ☒ Static ☐ Tank Intrusive ☐ Unknown ☐ Waste Disturbing ☐ Waste Intrusive

Job Activity: AOP 015 Response

Device	Type	Time	Location	Agent	Results/Units	
000402	S	1111	AZ-102 LDP East Riser @ 2ft	Volatile Organi	117ppb	
~~000402~~				~~Volatile Organi~~		N/A NS 6-10
000799	S	1111	AZ-102 LDP East Riser @ 2ft	Nitrous Oxide	0ppm	
001115	↓	↓	↓	Ammonia	0ppm	
~~001121~~				~~Ammonia~~		N/A NS 6-10
~~001121~~				~~Flammable Gas~~		N/A NS 6-10
001832	S	1111	AZ-102 LDP East Riser @ 2ft	Mercury	11ng/m³	
000402		1125	AZ-102 LDP East Riser @ 10ft	VOC	546ppb	
000799				N_2O	0.3ppm	
001115				NH_3	23ppm	
001832		↓	↓	Hg	14ng/m³	
000402		1131	AZ102 LDP East Riser Breathing Zone	VOC	348ppb	
000799				N_2O	0ppm	
001115				NH_3	0ppm	
001832		↓	↓	Hg	6ng/m³	
000402		1041	AZ102 LDP East Riser @ 10ft	VOC	310ppb	
001121				NH_3	18ppm	
001121	↓	↓	↓	LEL	0%	
						N/A NS 6-10

Washington River Protection Solutions **TF-AOP-015 INDUSTRIAL HYGIENE INVESTIGATION REPORT**	**PER Number:** N/A
Time/Date & Event location: 0847 6/10/2015	

IH Author	(Print) (Sign)	06/11/2015 Date
S&H Program Mgmt.	(Print) (Sign)	6/11/15 Date

ATTACHMENT 2

WRPS Post Job/ALARA Review (meeting held June 10, 2015 at 1400)

WRPS POST JOB / ALARA REVIEW

Job Title/Description: Pumping AZ102 LDP **Date:** 6/10/2015

Area: **Facility:** **Job Location(s):**

Work Order/Procedure Number: TO-020-595 **Work Completed Date:** 6/10/2015

SM/OE/FWS:

RWP (s) (if applicable): TF-100

Required Attendance (RadCon Supervisor (for radiological work) and Representative from each craft involved in critical job elements): Verify required attendees are present prior to starting meeting.

- ☑ Cognizant Radiological Control Personnel
- ☐ Stationary Operating Engineer (SOE)
- ☐ Carpenter
- ☐ Millwright
- ☐ Teamster
- ☑ Pipefitter
- ☑ Electrician
- ☐ Other
- ☑ Nuclear Control Operator (NCO)
- ☐ Insulator
- ☑ IH Technician
- ☐ Other

Summary *(Provide details of the work activity)*

PUMPING AZ102 LDP TO AZ02A. WHEN CAP WAS REMOVED AND SNIFFER TUBE WAS INSERTED FOR FLAM GAS READING, ELEVATED AMMONIA + LFL WAS RECORDED + ALARMED.

PART A **Post Job Review Section** (required for Formal Post Jobs and ALARA reviews)

Note: Provide comments in text box below each question.
Identify any items of concern and Lessons Learned (both good and bad) for improvement opportunities.

1. Were all hazards adequately identified? YES

2. Were appropriate hazard controls identified and implemented? YES

3. Did the Pre-Job Briefing adequately prepare workers to do the activity safely and effectively? YES, ROUTINE

4. Were work instructions, procedures, permits, and checklists (e.g., RWP and others) adequate and clearly written?
INSTALL PORT ON LDP FOR SAMPLING SAMPLING HEAD SPACE

5. Was the activity planned appropriately, and was it performed as planned? YES UP UNTIL HIGH READINGS DETECTED

6. Was the balance of craft skills, supervision, and written instructions appropriate for the activity? YES

7. Were correct tools, parts, and materials available and adequate? YES

8. Was the appropriate change management process followed for any required changes to the work documents or activity (configuration, work instructions, hazards, etc.)? NO CHANGES

9. Were any training, qualification or proficiency issues identified? YES

10. Are there any other considerations/changes/recommendations for future similar work to improve the process?
CHANGE THE AREA WE WILL BE TAKING THE FLAM GAS

WRPS POST JOB / ALARA REVIEW

PART B ALARA Review Section

ALARA Review No.: _____

What triggered the completion of this ALARA review?

- ☐ Work Stopped due to radiological event
- ☐ Dose exceeds 150% of estimate (>200 mrem estimate)
- ☐ Dose exceeds 125% of estimate (>1000 mrem estimate)
- ☐ Dose differs >25% of estimate (>1000 mrem dose)
- ☐ Job triggers higher risk category
- ☐ Significant methods to reduce dose for the remainder of the job
- ☐ Other:
- ☐ Dose >5000 mrem
- ☐ Radiological stop work exercised
- ☐ Reportable radiological occurrence
- ☐ Significant lessons learned
- ☐ High risk work
- ☐ Management Request

Estimated Pre Job Collective Dose: (person-mrem)

Actual Post Job Collective Dose: (person-mrem)

Corrected Dose Saving/Difference: (person-mrem)

Describe the effectiveness of each and any modifications made to the original work plan to increase, decrease, or change the following:

1. Dosimetry
2. Respiratory Protection
3. Protective Clothing
4. Time/Distance/Shielding
5. Personnel
6. Engineered Control
7. Contamination Control
8. Source Reduction
9. Administrative Controls
10. Describe any deviations from the original scope not detailed above including any planned ALARA controls that were not implemented and the reasons.
11. Describe any unplanned situations encountered during the job, especially those that caused increased personnel doses.
12. Compare actual and estimated pre-job collective dose.

N/A

Post-Job ALARA Evaluations

Evaluate Information for Lessons Leaned. Process any applicable lessons learned in accordance with TFC-OPS-OPER-C-28

Lessons Learned (check box) ☐ Yes ☑ No

Evaluate Information for problem evaluation requests (PER). Process any applicable PER submissions in accordance with TFC-ESHQ-Q-C-C-01.

PER Issued (check box) ☐ Yes ☑ No

SIGNATURES

SM/OE/FWS: (Print/Sign/Date)

Name:	**Date:** 6/11/2015

Facility ALARA Chairperson (if applicable): (Print/Sign/Date)

Name: N/A	**Date:**

Facility RadCon Manager (if applicable): (Print/Sign/Date)

Name: N/A	**Date:**

WRPS POST JOB / ALARA REVIEW

Leader (SM/OE/FWS) Date: 6-10-15

Document/Procedure Number: TO-020-595

Post Job / ALARA Review Attendance Roster

		Signature

ATTACHMENT 3
Central Shift Manager's Log Book Entries

6/6/15 B-Shift

0127 Revised Standing Order OPS-13-011 to clarify minimum staffing requirements during C-105 Retrieval operations, specifically the HPT requirements during Rad monitoring plan walk downs.

0138- agreed to lift their stop Work on C-105 retrieval operations due to revision of Standing Order OPS-13-011.

0158- SCEN and radio announcement complete for 0138 entry. Notified ORP On-Call FR, and WRPS On-Call Senior Manager, f ~~[illegible]~~ 0138 entry.

0458- Relieved as CSM by

0458- Assumed duties as CSM."

0508 - Assume duties as CSM under instruction

0750 - Closed Process Memo PM-15-05 and SUPERSEDED by PM-15-07 242-A Evaporator Hot Run Campaign EC-01.

0904- reports that during Pump AZ102 leak detection pit work ammonia levels reached 36ppm, work crew backed away and secured the job. Multiple people smelled an ammonia smell, no symptoms were reported, at this time the event does not meet TF-AOP-015 entry requirements. is notifying DOE FR.

0919- reports that two employees are being taken to HPMC for the 0904 entry no symptoms and was experiencing nose irritation.

0920 - Entered AOP-015 for reported vapors in AY/AZ Farm, 36ppm ammonia from source and 4% LFL.

0920 cont - Radio announcement made, SOEN sent.
Notified DOE FR 2nd Sr Mgr
on-call
0925 - It was reported that [redacted]
had an itchy throat and is being taken
to HPMC. was on AZ-102 LDP job.
1001 - SOEN sent for employees in 0919 and 0925
entries. Notified Notified DOE
FR
1018 - and report
smelling a musty smell around AY101
during annulus enraf cals. They have
no symptoms. They also smelled a
musty smell on 6/8/15 but had IH
support and all readings were
below background so they did
not report it. Notified DOE FR
1024 - reports that
from 5/26/15 1245 entry was reviewed
again at HPMC and released to
work with no restriction.
12:32 - reports as of 1215 A-Train VTP, SY
the in-service fan, is Operable and operating.
1247 - reports. was
a work related re-occurring injury
to his left hand/wrist. Taken to HPMC
1308 - SOEN sent for entries 1232 and 1247.
1315 - reports that when pulling out the
plastic tubing that was 10ft down in AZ-102
LDP that when pulled up it read 4000 dpm/100cm²
Beta Gamma. The tubing is currently bagged
and sitting in AZ farm until we ext
ALP-015
1320 - Notified DOE FR on entries

6/10/15 C Shift

1320 cont - 1232, 1247, and 1315. Notified Sr Mgr On-call of entries 1232 and 1315. Notified of entry 1247.

1423 Shift IHT completed flam gas readings for AY/AZ farm. All readings 0% of LFL

1425 Entered LCO 3.1.A on 1-10-15 at 1100 hours for AY/AZ farms. In Service VTP O/S. LCO 3.1.A.2.1 due NLT 6-13-15 at 0803 hours LCO 3.1.A.2.3 due NLT 3-14-16. (P050-001, pg. 225 @ 1545)

1522 pg 188 1247, returned to work with no restrictions. SOEN Sent. Notified DOE FR

1526 - AW PCM back in Service. AN PCM is out of service.

1529 - were all released from HPMC with no restrictions. SOEN sent. Notified DOE FR

1554 Secured U1 6-10-15

ATTACHMENT 4

Hanford Site Weather Data (400' tower)

Tower Information Thu Jun 11 00:02:20 PST 2015

yr	mo	day	hr	Solar	Prevailing Wind Degrees	Speed	Direction	Peak Gust Degrees	Speed	Time	Stab
15	6	10	1	0.00	290.0	15.7	WNW	281.2	28.888	00:30	E
15	6	10	2	0.00	290.0	14.6	WNW	287.0	25.734	01:07	E
15	6	10	3	0.00	280.0	9.1	W	270.0	17.322	02:05	E
15	6	10	4	0.00	270.0	7.1	W	284.2	11.855	03:09	E
15	6	10	5	0.05	240.0	7.8	WSW	259.7	13.117	04:13	F
15	6	10	6	0.24	270.0	5.5	W	270.6	12.065	05:04	E
15	6	10	7	0.48	310.0	7.3	NW	315.4	12.276	06:50	D
15	6	10	8	0.74	330.0	7.8	NNW	336.0	13.748	07:19	A
15	6	10	9	0.97	340.0	5.1	NNW	347.4	13.327	08:02	B
15	6	10	10	1.15	310.0	3.7	NW	311.6	11.645	09:55	C
15	6	10	11	1.29	180.0	5.1	S	172.8	16.271	10:44	B
15	6	10	12	1.35	70.0	5.9	ENE	84.6	18.794	11:40	A
15	6	10	13	1.34	40.0	2.3	NE	356.8	18.794	12:46	A
15	6	10	14	1.27	70.0	0.9	ENE	314.9	19.635	13:43	B
15	6	10	15	1.12	300.0	6.9	WNW	267.8	28.678	14:59	B
15	6	10	16	0.92	290.0	8.1	WNW	1.3	25.734	15:53	B
15	6	10	17	0.70	320.0	16.0	NW	293.0	26.995	16:17	A
15	6	10	18	0.45	320.0	21.7	NW	319.0	33.304	17:43	B
15	6	10	19	0.21	320.0	22.2	NW	313.3	34.355	18:22	D
15	6	10	20	0.04	300.0	18.5	WNW	309.6	29.519	19:06	D
15	6	10	21	0.00	290.0	19.0	WNW	304.1	37.720	20:03	D
15	6	10	22	0.00	300.0	21.8	WNW	301.5	38.140	21:24	E
15	6	10	23	0.00	270.0	11.9	W	272.4	23.000	22:57	D
15	6	10	24	0.00	280.0	14.3	WNW	283.5	27.206	23:53	D

15 61024 848 809-999 740 748 749 747 744 742 740 719 9928149929199929232827 8

Delta T1 = T200 - T3 = 0.4
Delta T2 = T250 - T50 = -0.7
Delta T3 = T200 - T30 = -0.4 (NRC)

Pasquill Category = E
200 ft Winds = 2919
Least Dilution = 17.9