

**EVENT INVESTIGATION REPORT**

**AOP-015 Event at 241-AY-02C Pit**

**Event Investigation Report Number - EIR-2015-014**

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Event Investigation Team Lead

4/15/2015  
Date

PER Responsible Manager

4/15/2015  
Date

PER No. WRPS-PER-2015-0559

## Event Title: AOP-015 Event at 241-AY-02C Pit

### **Investigation Summary**

On Thursday April 2, 2015 a WRPS HPT experienced odors and developed symptoms while supporting the lifting of the first cover block off of the 241-AY-02 C sluice pit. The HPT was in the Airborne Radiation Area (ARA) surrounding the pit and was wearing an air purifying respirator (APR) with P-100 filtration. Real time monitoring inside the pit area near the bottom indicated up to 13 ppm VOC's. Monitoring outside the pit in the general work area indicated nothing above background. Two other members of the team working nearby experienced odors but developed no symptoms at the time. Two additional workers outside the ARA experienced odors of some sort and developed symptoms.

It is estimated that over 30 workers were in the AY farm and in the general work area of AY-102 at the time when AY-02C pit was opened. This other work included a construction crane crew performing preparatory work to remove a jumper from the AY-02E pit (see attached picture of the work area).

The Central Shift Office entered TF-AOP-015 for this event.

A Fact Finding Meeting was held April 6, 2015 from 12:30 to 2:00 p.m.

### **Event Timeline**

#### **7/30/2014**

AY-02C cover block shield plug pulled, Investigative Rad Survey and video of AY-02C pit show source reading of 2.0 ppb VOCs and 5.0 ppm Ammonia (survey ID 14-04717)

#### **3/30/2015**

AY-02C shield plug pulled, IH monitoring of AY-02C pit at 2 feet into the pit show source reading of 55.0 ppb VOCs and 2.0 ppm Ammonia (survey ID 15-02194) work included putting ~20 gallons of water down the drain and spraying ~10 gallons of Safeguard fixative throughout the pit.

#### **04-02-2015**

- 0700 FWS held pre-job brief for removal of AY-02C cover block.
- 0930 While supporting AY-02C cover block removal a WRPS HPT, in the established ARA, experienced an odor. He was wearing an APR with P-100 filtration for potential radiation contamination. As the cover block was being removed continuous IH monitoring recorded VOC readings from 1.2 ppm (back ground) in the work area and up to 13 ppm VOC's at approximately 9 feet down into the pit. Two construction labors inside the ARA also experienced the odor, however, did not experience symptoms. The IHT discussed the VOC readings with the FWS and since they could not contact the Industrial Hygienist as required for VOC reading above 2ppm (action level) the decision was made to place the job in a safe configuration and leave the area.

- 0935 Crew starts placing the work area into a safe configuration and leaves the farm.
- 1040 HPT drives to 200 East Area Mask Station to request a respirator with combo cartridges. He made this request as he thought the activity would re-start after lunch. The mask station attendant inquired as to why he was requesting a respiratory with combo cartridges. The HPT explained that he had smelled odors on the earlier entry. At that point the mask station attendant informed him that he first needed to fill out an Odor Response Card. The HPT then drove back to his field office.
- 1055 HPT notifies his first line supervisor that he needs to fill out the Odor Response Card and that he is experiencing some coughing and a mild headache. Supervisor contacts Central Shift Operations Manager (CSM) and informs him that the HPT is being taken to HPMC for evaluation due to headache, dizziness, and cough.
- 1105 Central Shift Office entered TF-AOP-015 for HPT experiencing symptoms while in AY Farm during the AY-02C Pit work. (TFC-WO-14-4508).
- CSM Contacted the AY-02C FWS for assistance in obtaining AOP-015 IH response due to the fact that the standing AOP-015 response RWP did not address obtaining an air sample from a ARA. AY-02C Construction FWS was not aware of the odor concern until notified by CSO for assistance.
- 1155 SOEN sent for HPT being taken to HPMC.
- 1156 CSM notified DOE Facility Representative and Safety Representative of 1155 entry.
- 1200 CSM continues working through the issues associated with getting samples inside the ARA
- 1216 AY-02C Construction FWS received phone call while in Central Shift Office (CSO) and was informed that two additional employees (Laborers) report having symptoms. One Laborer who was outside ARA experienced headache and another Labor outside ARA experienced runny nose.
- 1232 CSM Notified On call Sr. Mgmt. of AOP-015 event.
- 1242 CSM Notified DOE Facility Representative (FR) of entry 1216, discussed five employees smelled odor, three had symptoms.
- 1252 IHTs enter 241-AY-farm for AOP-015 response sampling
- 1318 HPT released to return to work with no restriction.
- 1534 New Red Arrow issued stating that 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 AY-02C event investigation.
- 1653 Construction Laborers released to return to work with no restrictions.

1924 CSO Exited AOP-015 from this event.

#### 4/4/2015

One of the Laborers who was in the ARA but did not experienced symptoms on Thursday April 2, 2015 reported that he has developed a cough and sore throat. He was escorted to HPMC.

#### 4/6/2015

The other Laborer who was in the ARA reported cough and difficult breathing (symptoms that had developed over the weekend) and was taken to HPMC.

### **Compensatory Measures**

1. 4/2/2015 Work associated with pit work at 241-AY-102 was suspended until the fact finding meeting from this event was completed and appropriate actions implemented.

2. 4/2/2015 CSO Issued a Red Arrow control:

*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 AY-02C event investigation.*

3. 4/8/2015 Incorporated into the AY-02C work package (TFC-WO-14-4508) requirements for additional respiratory protection and the establishment of a larger respiratory control boundary around the Pit.

### **Preliminary Extent of Condition Review**

The extent of condition for this event extends to Tank Farm work activities where there is a potential exposure to tank vapors such as when opening waste transfer pits, opening waste transfer piping systems and or opening risers that are directly in communication with SST/ DST head spaces and or extent into the waste itself. This condition could also be possible when DST and or SST ventilation systems are opened.

### **Discussion of Potential Causes**

From the investigation to date plausible factors that influenced the consequences from this event include:

- AY-02C pit does not have an open pathway into the head space of the AY-102 DST and therefore the only escape of VOCs within the pit was out through the opening once the first cover block was being removed.
  - Without an open pathway to the headspace of AY-102 the vapors measured in the AY-02C pit are not from the waste within the AY-102 waste (i.e. not tank

- waste vapors) This factor is supported by the IH survey results obtained last July 2014 and from the survey information from March 30, 2015.
- This fact was substantiated during the event investigation meeting where workers noticed that unlike the other AY 102 pits the plastic over the shield plug opening did not pull into the pit (not under a vacuum).
  - The VOCs detected in the AY-02C pit were generated as a result of the Safeguard fixative reacting with the debris in the bottom of the pit. This hypothesis is supported by the IH survey results before the safeguard was added in July 2014 and on March 30, 2015 compared to the monitoring that occurred on July 2, 2015.
  - Even though monitoring for VOCs in the general work area were not detected above background levels, the slight swirling wind condition at the AY-02C pit (due to the proximity of the large tent surrounding the AY-02A pit) allowed the VOCs from within the pit to mix with other gases/ vapors from the two nearby operating cranes and possibly the spray adhesive (Super 77) used to attach the plastic for wrapping the cover block as it is being removed to cause the symptoms experienced.
  - The lack of a standing RWP with controls for entrance into an ARA, delayed the AOP-015 response for slightly over one hour.

## **Discussion of Barriers That Could Have Impacted the Cause**

### **1. Physical:**

- a. Unlike pits in other farms the AY pits drains extend to near the bottom of the DST. This creates a liquid seal/trap with respect to the head space and therefore the engineered feature for a slight vacuum due to the tank ventilation system in the pit is not necessarily in place. The other sluice pits on AY-102 (02E, 02D, 02B) have waste transfer pumps or other devices that create an opening between the pit and the head space that aids in this flow of air from the pit into the DST headspace.
- b. The ARA boundary and the general work area boundary were not established with controlling fugitive gases and vapors in mind.
- c. Respiratory protection for the work in close proximity to AY-02C pit was based on radioactive air borne hazard and therefore the PPE was established for particulate and did not include a chemical component.

### **2. Administrative:**

- a. From a hazard analysis stand point it was not recognized that the pit was not directly connected to the DST headspace. This assumption was reinforced by the success at the other three pits due to their configuration (installed equipment). This assumption should have been validated by smoke testing or an equivalent technique.
- b. The lack of an AOP-015 RWP for an ARA delayed the response to obtain area and source samples in an effort to identify the source.
- c. LTA knowledge of the pit configuration (connection to headspace) could have contributed in not applying standing order OPS-14-007 "Respiratory Requirements for SST & DST Farms"

**3. Cultural:**

- a. The decision to place the work area in a safe condition due to not being able to consult with the IH for the job was a positive action consistent with our ISMS expectations.
- b. Communications with the work team was difficult due to the PPE (masks) and crane noise. This led to some confusion as to what was causing the IH Technicians instrument to alarm (high VOCs) and why the follow on actions were taken as they were.
- c. The time delay in reporting the symptoms between the worker and his FWS. In some cases the onset of symptoms do not occur immediately; however, for the first worker (HPT) this was not the case.

**Recommendations/Proposed Corrective Actions**

1. Establish additional controls to allow the safe resumption of work in the AY-02C pit with the current understanding that it is not connected to the headspace of the DST. This action should also be utilized as the other AY-102 pits are reconfigured.
2. Issue an RWP to support AOP-015 recovery actions that may include the need to enter an ARA. (See WRPS-PER-2015-0664)
3. Establish a process where when engineered hazard controls are assumed during the planning process that steps in the procedures/ work instructions have been included to verify these assumptions. In this case the pit connection to the tank headspace should have been tested by applying smoke or by checking the ventilation pressure for confirmation of the engineered control.

Attachment 1 Fact Finding Meeting Rosters

Date: 4/6/2015		EVENT INVESTIGATION ATTENDANCE FORM		
Event Title: AOP-015 AT A9-02C PIT ON 4/2/2015				
Event Number: EIR-2015-014 WRPS-PER-2015-0559				
Print Name	Signature	HID	Job Position	Organization
			LABORER	AET
			II	II
			LABORER	AET
			LABORER	AET
			Softy	Internech
			SW	AET
			FLANNEN	FOWLER
			MGR	TFD
			SUP.	AET
			MANAGER	WRPS
			NPI	R/C
			Fed Com Sup.	R/C
			HDT	R/C
			HDT	R/C
			CPC	WRPS/Recom
			FWS	AET
			CONDUCTOR	WRPS
			CM	WRPS
			IHT	WRPS
			IH	WRPS
			IS	AET
			IS/IH	AET

Date: 4/16/2015 EVENT INVESTIGATION ATTENDANCE FORM

Event Title: AOP-015 AT A9-02C PIT ON 4/2/2015

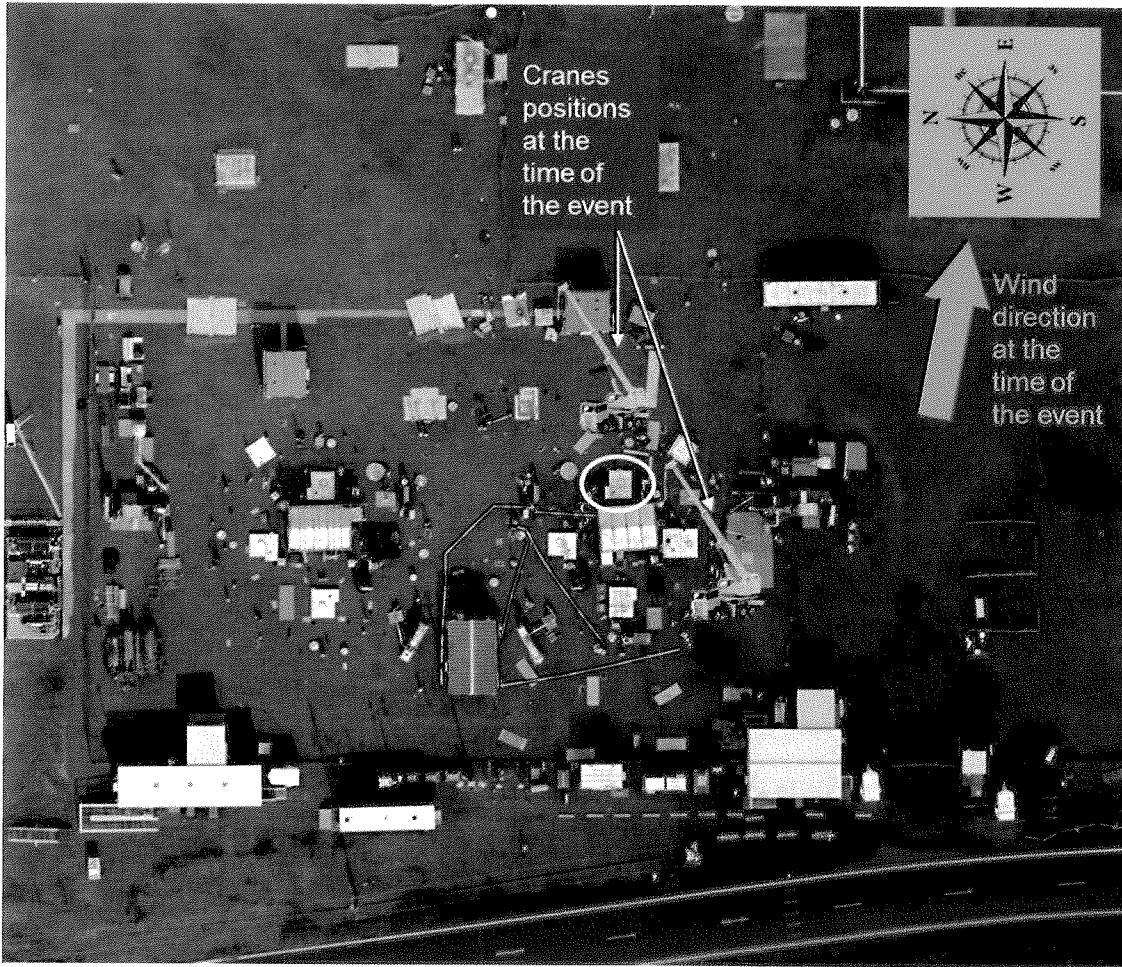
Event Number: EIR-2015-014 WRIS-TER-2015-0559

Print Name	Signature	HID	Job Position	Organization
			1 Myr	SST RETURN
			2 Safety Rep	R/C
			3 PF	Intermech
			PF	Intermech
			PF	INT
			PF	INT
			PF	INT
			Pipefitter	Intermech
			Pipefitter	Intermech
			LAB	AEI
			Lab/FM	AEI
			CSM	PO
			Ops Spec	Retrievals
			Ops Spec	Retrievals
			R/C Safety	R/C
			prod op sell	SA PO
			MGR	EST RETRIEVALS
			PO Hyg Supp	PO
			IH	PO





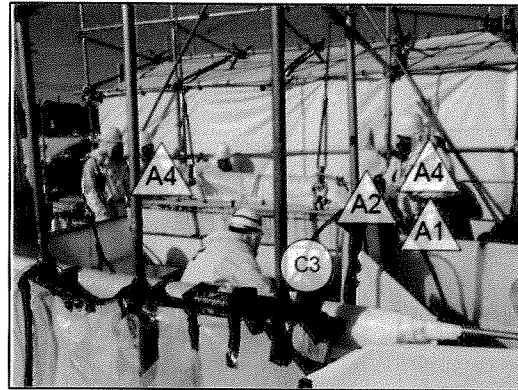
Attachment 2 - Photos



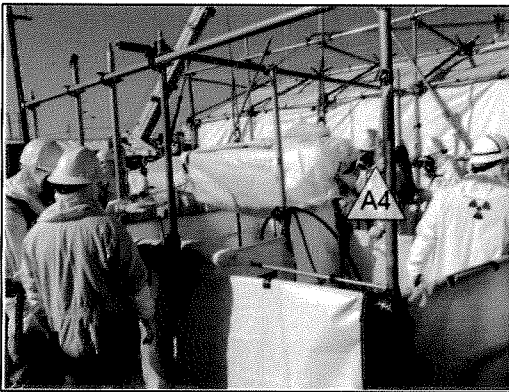
Aerial view of AY-02C (yellow circle) and immediate area. Wind direction and position of cranes depicted.



AY-02C pit prior to cover block removal



AY-02C pit as cover block is lifted



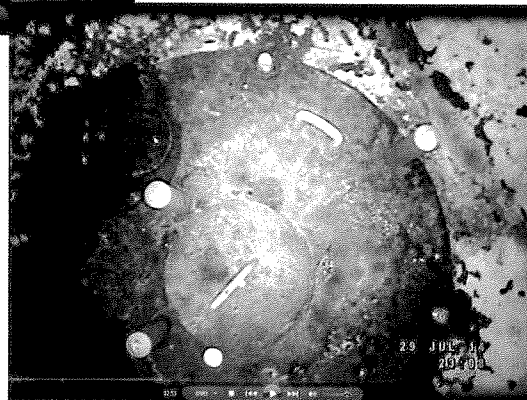
AY-02C pit as cover block is lifted away



AY-02C Pit opened prior to temporary cover installation



### AY-02C Pit Video Screen Captures



# Attachment 3 – Weather Tower Information

Tower Information				Thu Apr 02		00:02:20 PST 2015					
yr	mo	day	hr	Solar	Prevailing Degrees	Wind Speed	Direction	Peak Gust Degrees	Speed	Time	Stab
15	4	1	1	0.00	270.0	8.5	W	278.5	14.589	00:00	F
15	4	1	2	0.00	280.0	7.4	W	266.9	12.696	01:01	E
15	4	1	3	0.00	280.0	10.0	W	262.5	17.112	02:41	E
15	4	1	4	0.00	280.0	7.8	W	249.6	13.958	03:59	E
15	4	1	5	0.00	250.0	10.7	WSW	254.8	15.640	04:07	E
15	4	1	6	0.01	250.0	12.0	WSW	238.1	17.533	05:37	F
15	4	1	7	0.16	250.0	10.9	WSW	248.6	17.322	06:48	E
15	4	1	8	0.43	260.0	14.2	WSW	253.9	21.738	07:21	D
15	4	1	9	0.68	280.0	11.6	W	287.9	20.897	08:58	B
15	4	1	10	0.89	280.0	14.3	WNW	279.8	26.575	09:16	A
15	4	1	11	0.99	300.0	14.5	WNW	315.6	26.995	10:01	A
15	4	1	12	1.08	290.0	12.1	WNW	281.1	22.369	11:47	A
15	4	1	13	0.71	300.0	13.4	NW	303.1	23.000	12:36	B
15	4	1	14	0.37	280.0	9.9	W	294.3	19.005	13:52	D
15	4	1	15	0.45	300.0	12.0	WNW	293.5	23.631	14:21	C
15	4	1	16	0.26	300.0	13.8	WNW	299.7	25.523	15:57	D
15	4	1	17	0.37	310.0	16.4	NW	310.8	24.892	16:18	D
15	4	1	18	0.12	310.0	16.4	NW	319.2	25.313	17:25	D
15	4	1	19	0.01	310.0	14.5	NW	302.7	22.790	18:04	E
15	4	1	20	0.00	310.0	15.8	NW	314.0	28.678	19:23	E
15	4	1	21	0.00	310.0	16.6	NW	324.4	27.206	20:27	E
15	4	1	22	0.00	300.0	19.4	WNW	295.0	30.780	21:45	E
15	4	1	23	0.00	310.0	17.2	NW	310.5	28.888	22:19	E
15	4	1	24	0.00	300.0	15.7	WNW	297.0	26.364	23:00	E

15 4 124 527 540-999 450 456 456 457 456 457 456 458 99301699302499302930260

Delta T1 = T200 - T3 = 0.6 Pasquill Category = E  
 Delta T2 = T250 - T50 = 0.1 200 ft Winds = 3024  
 Delta T3 = T200 - T30 = 0.0 (NRC) Least Dilution = 20.3 >20