

# AY-102 Recovery Project ERSS Retrieval Briefing

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December 2016



# **AY-102 Recovery Project**

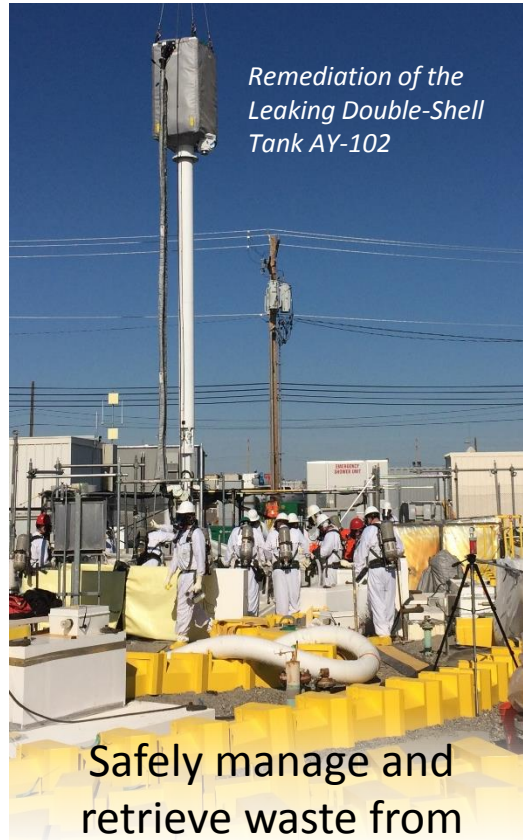
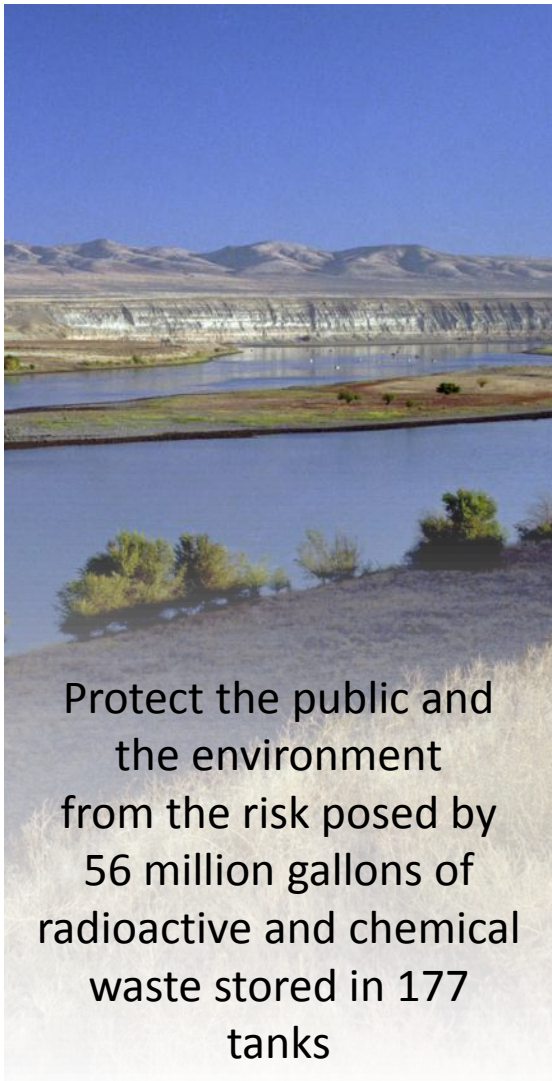
## **1- Retrieval Mission Overview**

## **2- Retrieval Project**

## **3- Retrieval Hazards and Controls**

## **4- Communications during Retrieval**

# River Protection Project Mission



Safely manage and retrieve waste from tanks and prepare the delivery system for the Waste Treatment Plant







# AY-102 Retrieval Mission Overview

## Hanford HLLW Tanks Challenges

- **1943-1964: 149 single-shell tanks constructed**
  - Up to 67 presumed to have leaked
- **1968-1986: 28 double-shell tanks constructed**
  - 1 leaking, waste contained within annulus

Disposition of **56** million gallons of radioactive and chemical waste



# AY-102 Retrieval Mission Overview

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## Hanford Tank Waste Challenges

### What is in the tanks?

- Waste temperatures range from 60°F to 160°F
- Highly caustic
- Moderate-to-high radioactivity
- No two tanks have the same waste contents
- Most waste produces some hydrogen

### Saltcake 23M gallons



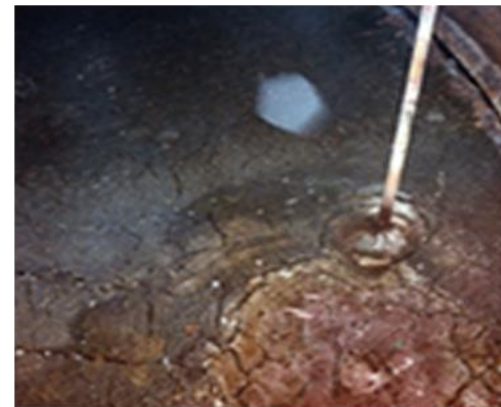
Mostly water-soluble salts; small amount of interstitial liquid

### Supernate 21M gallons

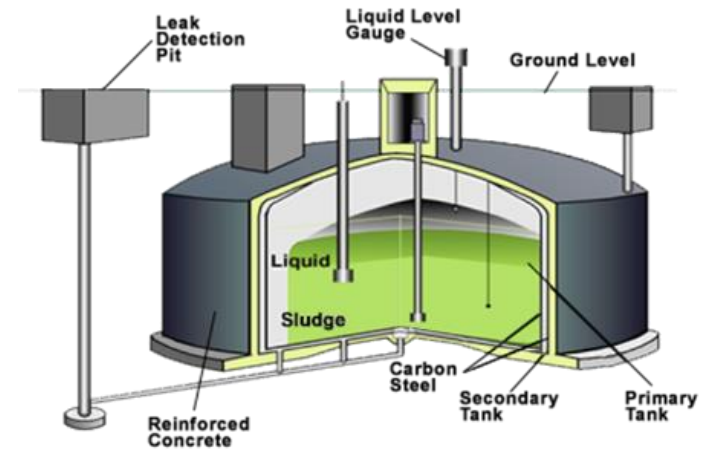


Any non-interstitial liquid in the tanks - similar to saltcake in composition

### Sludge 12M gallons



Water-insoluble metal oxides, significant amount of interstitial liquid - texture similar to peanut butter



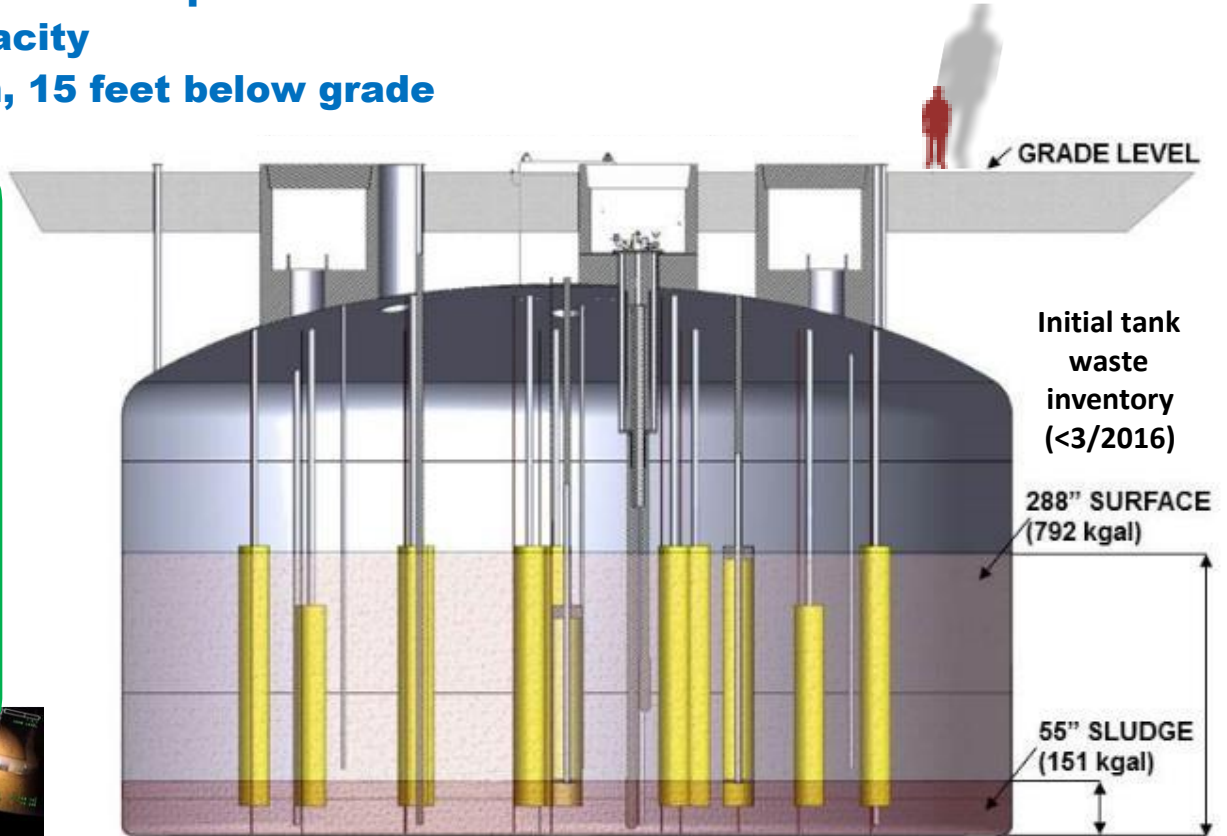
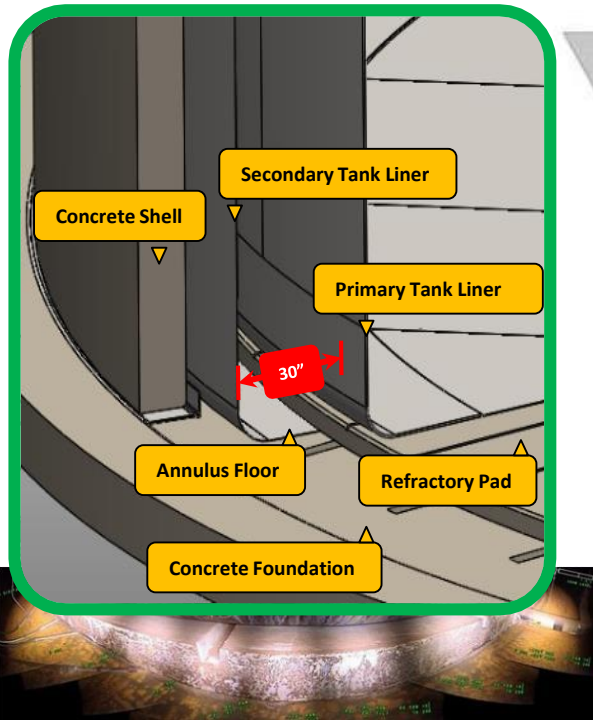


# AY-102 Retrieval Mission Overview

## Tank History and Features



- Wastes from historic B Plant operations and strontium/cesium extraction
- 1 million gallons capacity
- 75 feet x 30 feet high, 15 feet below grade



View of the primary tank only





# AY-102 Retrieval Mission Overview

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## Project Mission, Phases, and Key Milestones

- The October 2014 AY-102 Settlement Agreement between the Washington State Department of Ecology, DOE/ORP, and WRPS defines the project's recovery actions and associated deadlines
- **Mission:** Retrieve the primary tank waste to the point where the leak site(s) can be investigated, and a determination can be made to either repair, or close the tank

Project Phase & Scope	Status 11/2016	Schedule																
		FY14			FY15			FY16			FY17							
Retrieval System Design	100%																	
Equipment Procurement	100%																	
Construction & Installation	100%																	
Commissioning	100%																	
<i>SA-IIB3 - Ready to Pump by 3/4/16</i>	<i>100% on 3/3/2016</i>																	
Operations	Removed 95% vol.																	
AY-102 Supernatant removal	100% on 3/7																	
Sludge removal with Standard sluicers	100% on 5/2																	
Operations outage to switch to Extended Reach Sluicer configuration	100% on 11/9																	
Sludge removal with ERSS	Nov 2016 - Feb 2017																	
<i>SA-IIB5a - Waste removal completed by 3/4/17</i>	<i>Feb 2017</i>																	

 Projected date  
 Deadline

# **AY-102 Recovery Project**

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**2- Retrieval Project**

**3- Retrieval Hazards and Controls**

**4- Communications during Retrieval**



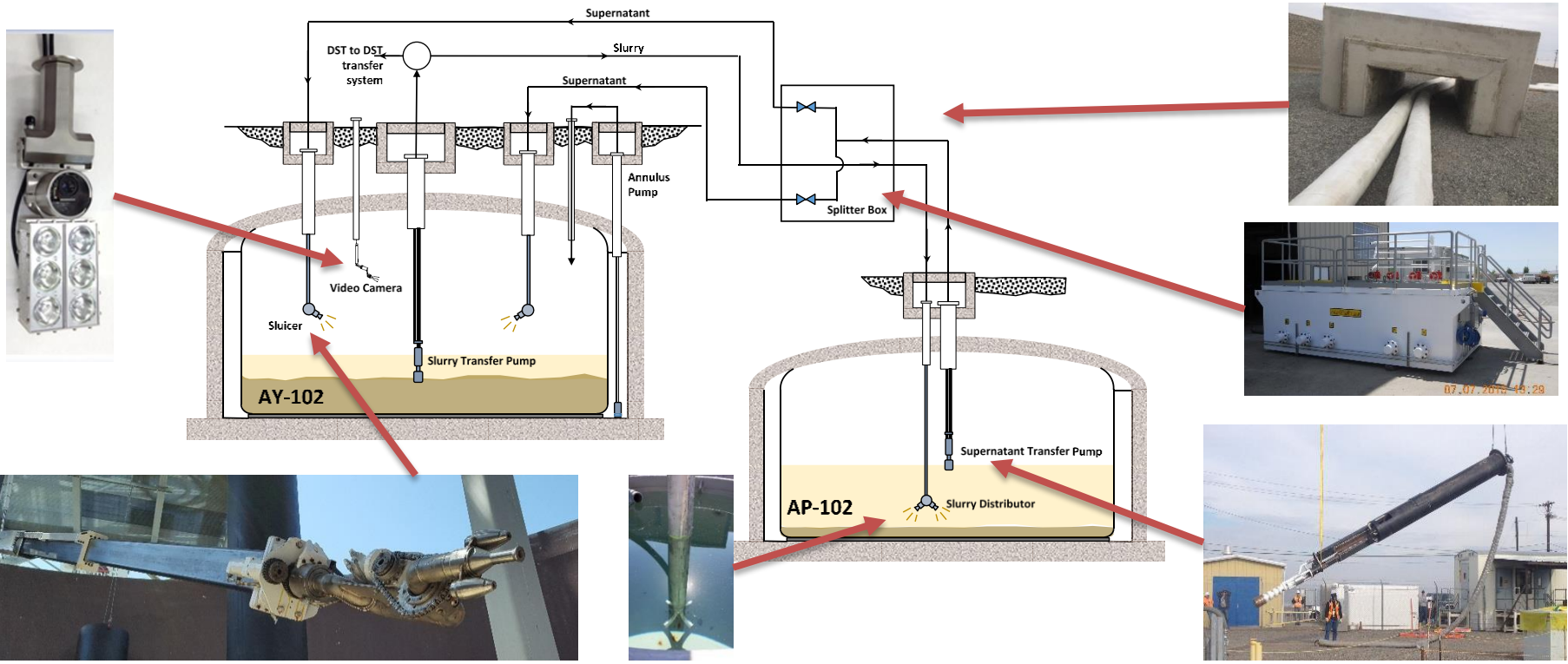


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# AY-102 Recovery Project Accomplishments

## Retrieval and Transfer Process

- 1<sup>st</sup> Technology: sluicing
  - Mobilize solids with sprayed liquid, pump slurry to a receiver tank
  - Decant supernatant and recycle supernatant for further sluicing
- 2<sup>nd</sup> Technology: high-pressure water
  - Breakdown residual hard heel waste in a slurry, pump slurry to receiver tank



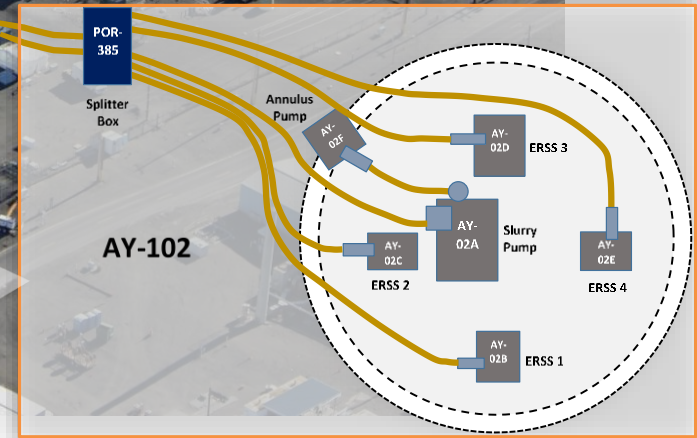
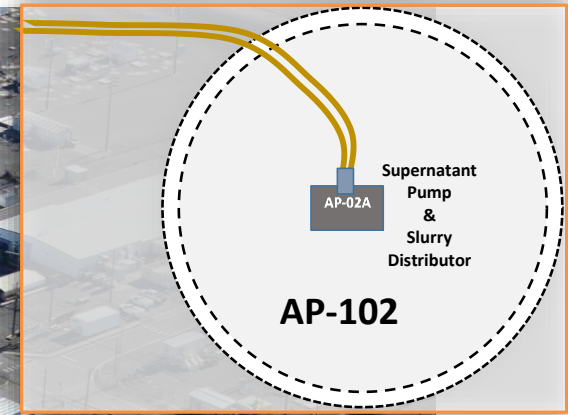
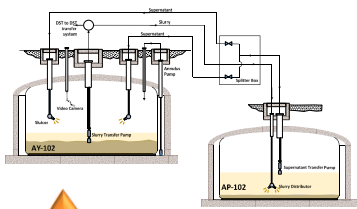
Revision 0 of December 1, 2016



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# AY-102 Recovery Project Accomplishments

## Retrieval and Transfer System Layout



Revision 0 of December 1, 2016



# AY-102 Recovery Project Accomplishments

## Retrieval and Transfer System Installation

- Removed 5 obsolete pumps from AY-102 and AP-102
- Upgraded 7 pits to receive new equipment
- Designed, fabricated, installed and tested 3 new pumps, 2 sluicers, and 2,000 feet of hose-in-hose transfer line



Equipment removal and pit upgrades in 2014 - 2015



Pump installations in November 2015

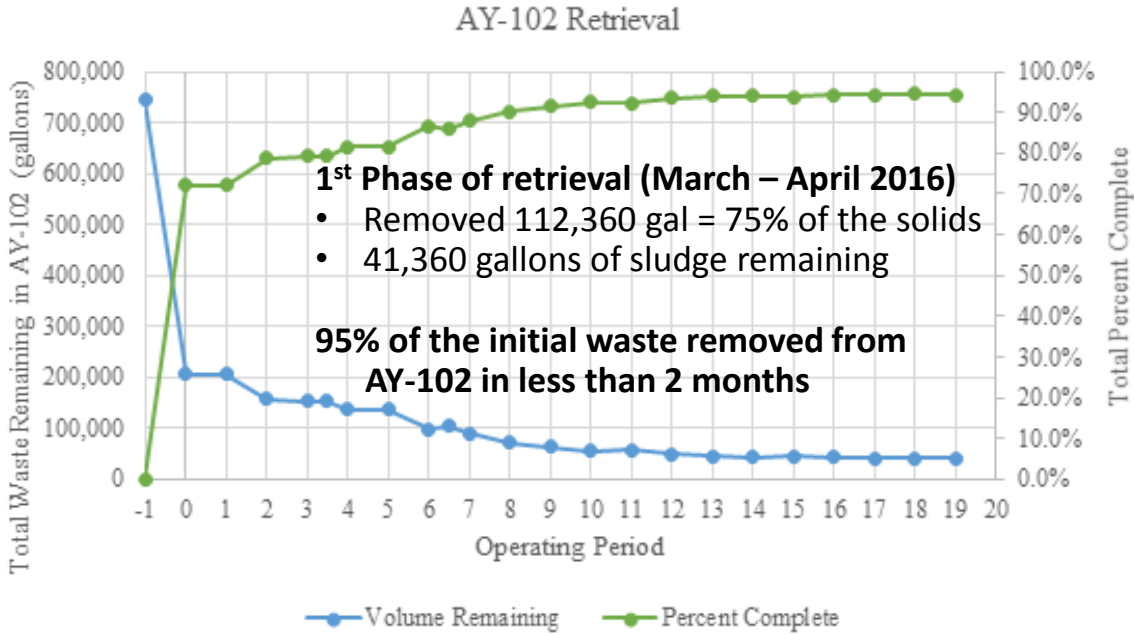


Equipment installation completed in January 2016



# AY-102 Recovery Project Accomplishments

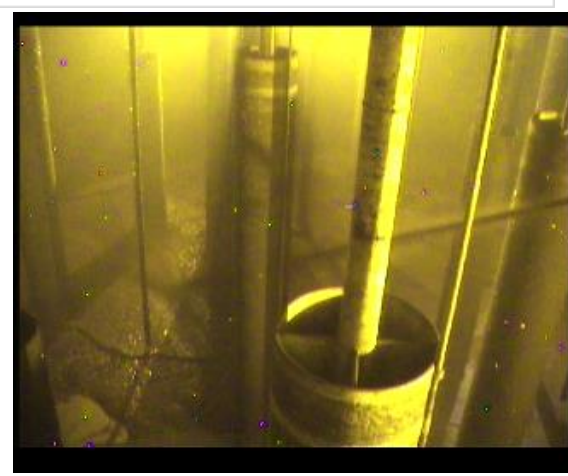
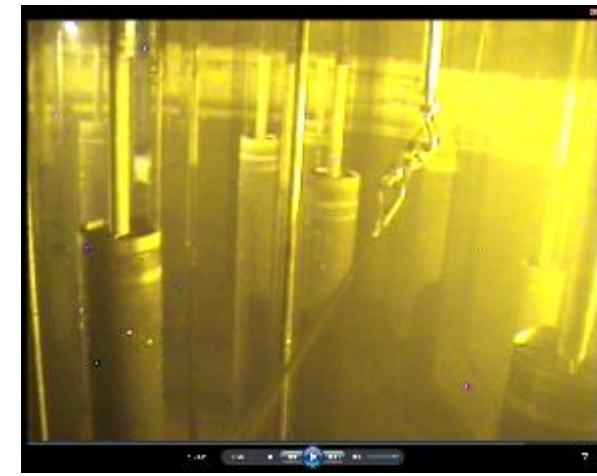
## Retrieval Operations: AY-102 Sludge Retrieval



March 2016



April 2016

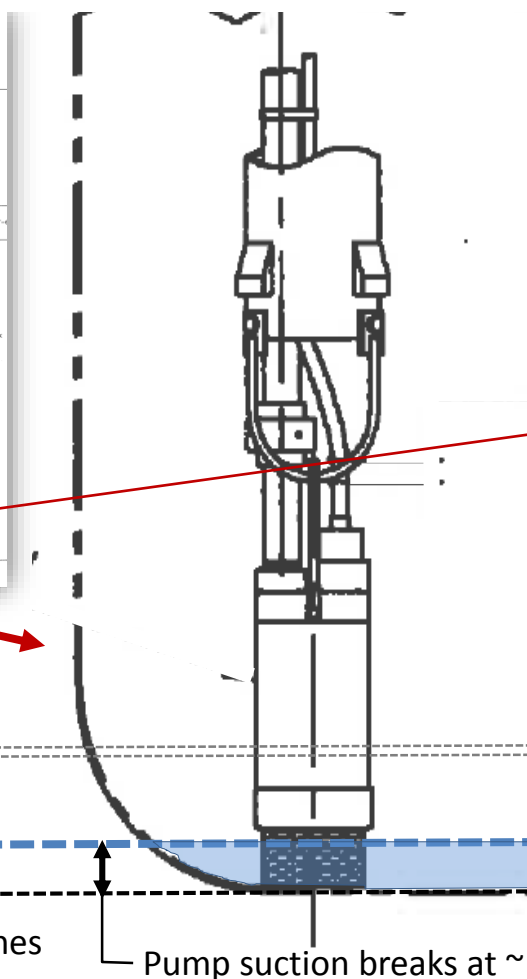
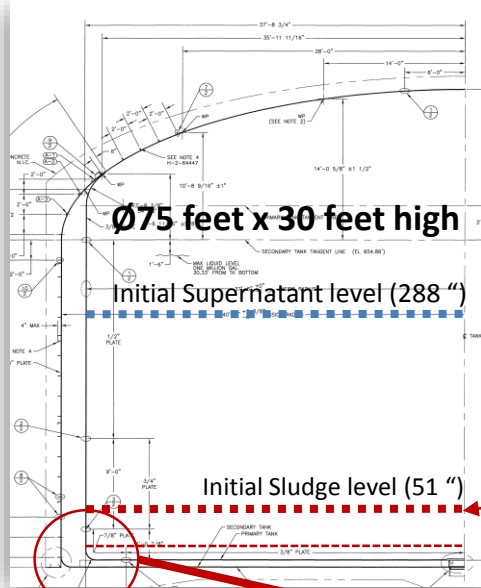




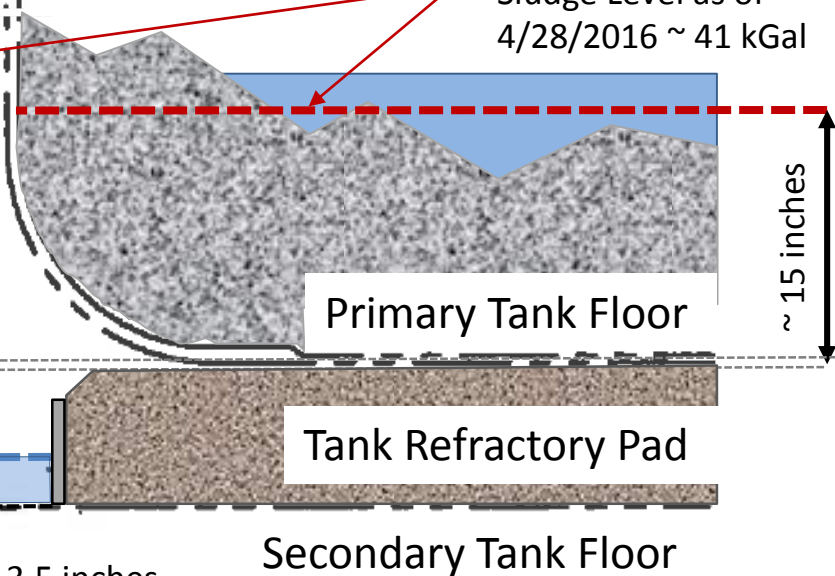
# AY-102 Recovery Project Accomplishments

## Anticipated/Planned Response to the Increased Leak in the Annulus

- On April 17, during sluicing operations, the leak increased and filled the annulus space with up to 8 inches of liquids. The annulus pump was operated to return the liquid to the primary tank
- The annulus pump is installed and available for continued pumping



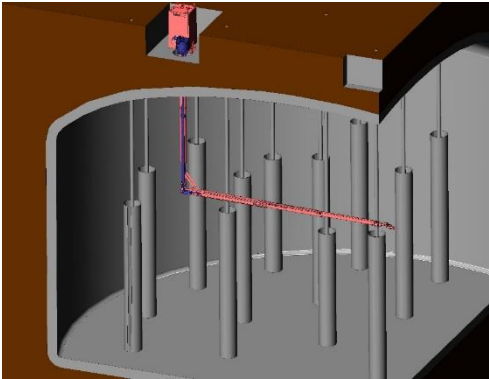
Average Residual Sludge Level as of 4/28/2016 ~ 41 kGal



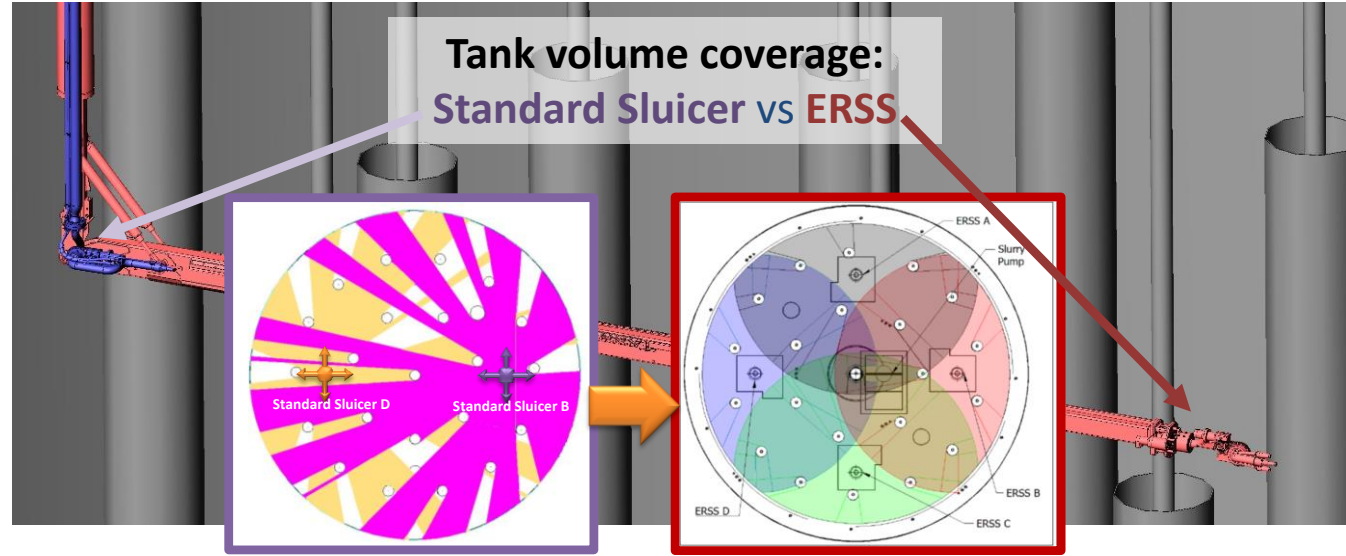


# AY-102 Recovery Project Path Forward

## Replacing Standard Sluicers with ERSS



Following first phase of retrieval, the retrieval system was reconfigured with four Extended Reach Sluicers



Full-scale mockup of the AY-102 primary tank at the Cold Test Facility with a prototype ERSS to train retrieval operators





# **AY-102 Recovery Project**

**1- Retrieval Mission Overview**

**2- Retrieval Project**

**3- Retrieval Hazards and Controls**

**4- Communications during Retrieval**



# AY-102 Retrieval Hazards and Controls

## Project Safety Record

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- 0.5M hours of work over 3 years
- 24 months of field work
- 2 months of retrieval operations
- More than 30,000 farm entries
- 5 first aid cases, and 11 AOP-15

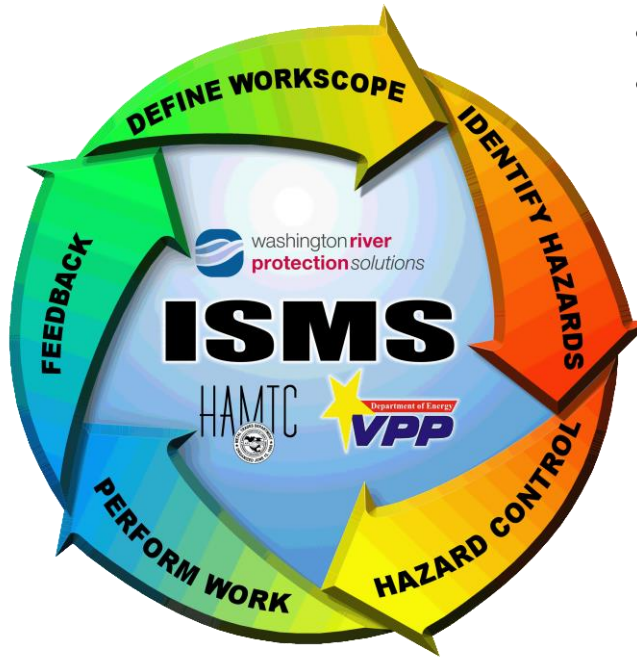


# AY-102 Retrieval Hazards and Controls

## Integrated Safety Management

### Feedback

- Communication plan
- Daily report
- Safety Startup
- Weekly president's message
- Pre-job briefings
- Additional hazards identified by workers



### Perform Work

- Transfer procedure
- Plan-166
- RWP
- IH sampling and monitoring Plan
- Safety professional oversight

### Hazard Control

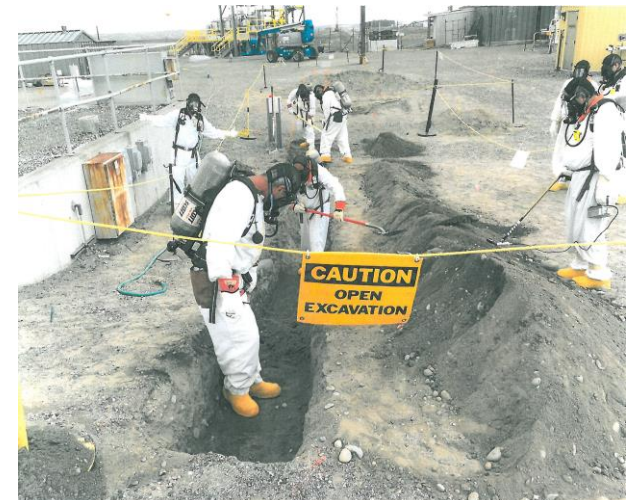
- JHA
- Engineered controls
- Administrative controls
- PPE

### Define Work Scope for AY-102

- Install retrieval and transfer system
- Perform retrieval operations

### Identify Hazards

- Industrial hazards
- Nuclear hazards
- Radiological hazards
- Chemical hazards







# AY-102 Retrieval Hazards and Controls

## Industrial Safety



- Highly congested work space
- Restrictive PPE
- Winter weather



Focus on slips, trips, and falls



### Prevention of waste leaks and misroutes during retrieval

- Containment in tanks and transfer lines
- Valve line-up controls
  - Transfer procedure (TO-270-925)
  - Rounds/checklists
  - Material balance



TSR Compliance					
Over-Ground Transfer from 241-AY-102 to 241-AP-102 and Sluicing of Tank 241-AY-102					
Checklist 2 - 241-AY-102 to 241-AP-102 Transfer Valving					
Section A				Date:	Sheet 1 of 3
Valve Description	Valve Position	Tamper Seal Number <sup>2</sup>	Operator Initials	Independent Verifier Initials	
Splitter Box POR385-WT-DB-001					
POR385-WT-V-106	OPEN				
POR385-WT-V-107	OPEN				
POR385-WT-V-118	CLOSED				
POR385-WT-V-119	CLOSED				
POR385-WT-V-108	OPEN				
POR385-WT-V-109	OPEN				
POR385-WT-V-121 <sup>2</sup>	CLOSED				
POR385-WT-V-110 <sup>2</sup>	CLOSED				
POR385-WT-V-111 <sup>2</sup>	CLOSED				
POR385-WT-V-113 <sup>2</sup>	CLOSED				
POR385-WT-V-112 <sup>2</sup>	CLOSED				
POR385-WT-V-120	CLOSED				
POR385-WT-V-114	OPEN				
POR385-WT-V-115	OPEN				
POR385-WT-V-116	OPEN				
POR385-WT-V-117	OPEN				
SLURRY LINE CONFIRM OPEN ROUTE	FROM NOZZLE A TO NOZZLE F				
SUPERNATE LINE CONFIRM OPEN ROUTE	FROM NOZZLE G TO NOZZLE B and/or D				
POR385-WT-MOV-101 <sup>1(4)</sup>	<input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED				
POR385-WT-MOV-103 <sup>1(4)</sup>	<input type="checkbox"/> OPEN <input type="checkbox"/> CLOSED				
POR385-WT-MOV-102	CLOSED				
POR385-WT-MOV-104	CLOSED				
<b>ENSURE</b> a NOTICE In Use tag is installed on each access gatepoint or each valve as directed by the OE.					
(1) Physically disconnects raw water by two Safety Significant valves. (AC 5.8.6)					
(2) Physically disconnects sump pump by two safety significant waste transfer isolation valves. (SAC 5.8.6)					
(3) N/A if no Tamper Seal installed.					
(4) At least one (1) MOV should be open.					
(Continued on Next Sheet)					
Type	Document No.	Rev/Mod	Release Date	Page	
CONTINUOUS	TO-270-925	A-17	07/26/2016	105 of 151	



### Engineered Controls

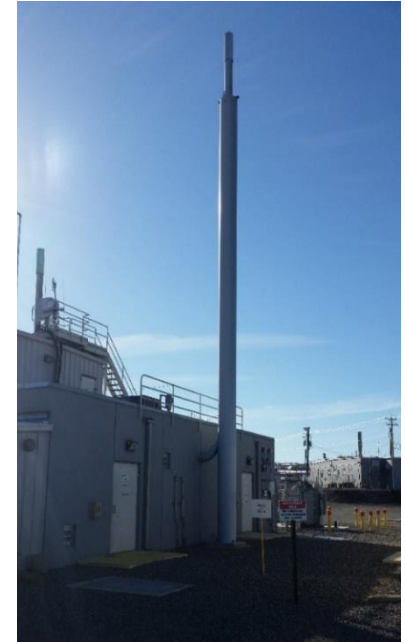
- Waste contained in tanks, transfer lines, and closed pits
- Shielding on pits and transfer lines
- Remotely controlled operations from control trailer outside of the farm
- Active ventilation with HEPA filtration of primary tank and annulus space

### Administrative Controls

- Worker training, RWP
- Restricted access to farms and waste-transfer zones
- RCT/HPT coverage of all construction and operations activities
- Continuous monitoring of potential waste leak along transfer route

### PPE

- Anti-contamination clothing and respiratory protection



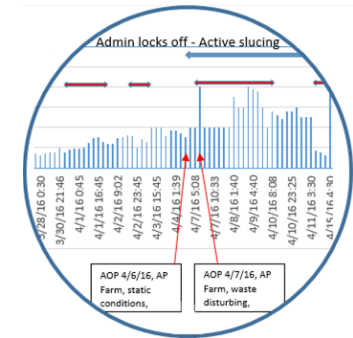


# AY-102 Retrieval Hazards and Controls

## Chemical – Tank Vapors



LOCATION	TOTAL READINGS	Total NH <sub>3</sub> Readings	NH <sub>3</sub> Readings > Detection	Total VOC Readings	VOC Readings > Detection	Total Hg Readings	Total Hg Readings > Detection
702 AZ	1088	371	1	370	10	347	223
AP FARM	276	93	0	93	3	90	39
AY/AZ/AX FARM	1796	841	6	829	32	126	83
NON-FARM	2593	886	6	887	53	820	358



LOCATION	NH <sub>3</sub> > AL	Peak NH <sub>3</sub>	VOC > AL	Peak VOC	Hg > AL	Peak Hg
702 AZ	0	2 ppm	0	0.050 ppm	0	658 ng/m <sup>3</sup>
AP FARM	0	0 ppm	0	0.510 ppm	0	74 ng/m <sup>3</sup>
AY/AZ/AX FARM	0	4 ppm	0	0.700 ppm	0	1067 ng/m <sup>3</sup>
NON-FARM	0	2.1 ppm	2	2.2 ppm	0	50 ng/m <sup>3</sup>
Action Limit	12 ppm		2 ppm		12500 ng/m <sup>3</sup>	

~ 5,800 data points collected and analyzed during 1<sup>st</sup> Phase of retrieval (March 11 - May 8, 2016)

### Direct Reading Instruments measurements:

- > 85% under detection limit
- Two peak readings above the action limit for VOCs were observed near the 702-AZ control room
- Both readings were responded to and sweeps indicated all levels were below the action limit

### VCZ ( Vapor Control Zone)

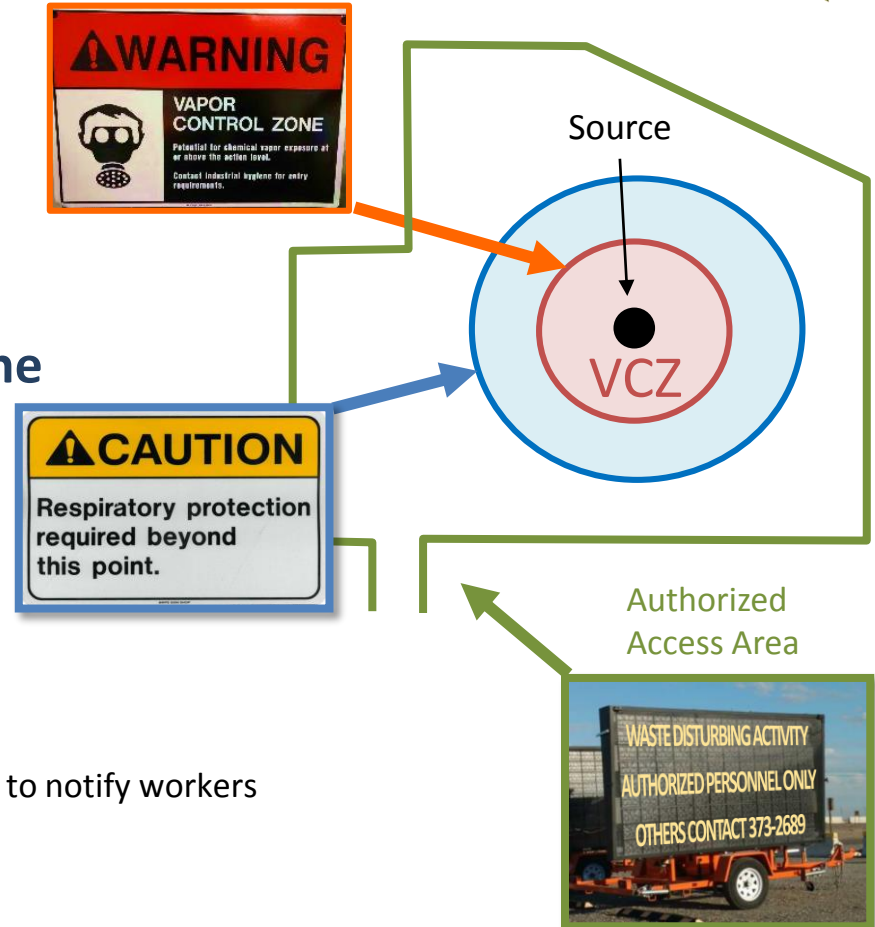
- Boundary established during retrieval
- Based on minimum requirement on the Action Level and source configuration (stacks)
- Supplied air **required upon entry**
- Posted with stanchion, chain and signs
- IHT monitoring required upon entry and for down posting (if necessary)

### Supplemental Respiratory Protection Zone

- Setup to conservatively provide protection beyond VCZ boundary,
- Based on discussions with HAMTC
- Supplied air **required upon entry**
- Posted with stanchion, chain and signs
- IHT monitoring required for down posting and upon request

### Authorized Access Area

- Administrative **Restricted Access** boundary established to notify workers of the potential for increased odors
- Posted with reader boards
- Authorization granted by briefing
- Central Shift Manager access authorization for all non pre-approved personnel
- No PPE required, voluntary upgrade will be supported
- Unless directly involved with work activities, you are not to locate in proximity to the VCZs, Supplemental Zones, and Tank Farm boundaries



# AY-102 Retrieval Hazards and Controls

## Chemical Vapors: IH Strategy



Hierarchy of Controls	Control
<b>Eliminate the Hazard</b>	Retrieval to be performed on backshifts and weekends only*. Access restricted to "Authorized Personnel Only" during retrieval*.
<b>Engineered Systems</b>	Retrieval operations only when AY/AZ and AP Farms ventilation operating. AY-102 Annulus exhauster off. Ventilation cross-tie installed between annulus space and primary tank to provide ventilation path thru primary tank exhauster.
<b>Administrative Controls</b>	Establish Vapor Control Zones (VCZ) and Supplemental Protection Zones* IH monitoring and sampling. AOP-15 response to reported unusual vapor odors/worker vapor exposure symptoms.
<b>PPE</b>	Supplied-air respirators required in AY and AP farms, VCZ's, and supplemental zones*.

CONTROLS	
PA System speaker locations	
Warning Sign *	
Reader board *	
Turnaround locations *	
AreaRAE locations (*past AOP-15 locations and/or AreaRAEs to be left out when retrieval is shut down ** required when performing annulus pumping *** only required when the annulus exhauster is operating)	
Vapor Control Zones	
Pilot Scale Vapor Monitoring and Detection System	
Supplemental zone with required respiratory protection *	
Local weather monitoring system	

**LEGEND**

- Location of exhauster
- "Caution: Respiratory Protection Required Beyond this Point"
- Transfer Route with Waste Transfer Zone
- Authorized Access

NORTH

**Note:**

\* Controls implemented specifically for the AY-102 Retrieval operations, as a result of discussions with HAMTC, in response to the HAMTC demands communicated in the Letter, D.E. Molnaa, HAMTC, to M. A. Lindholm, WRPS, and K. Smith, ORP, "Tank Farm Vapors and Worker Safety", 1602400, dated June 20, 2016.



# AY-102 Retrieval Hazards and Controls

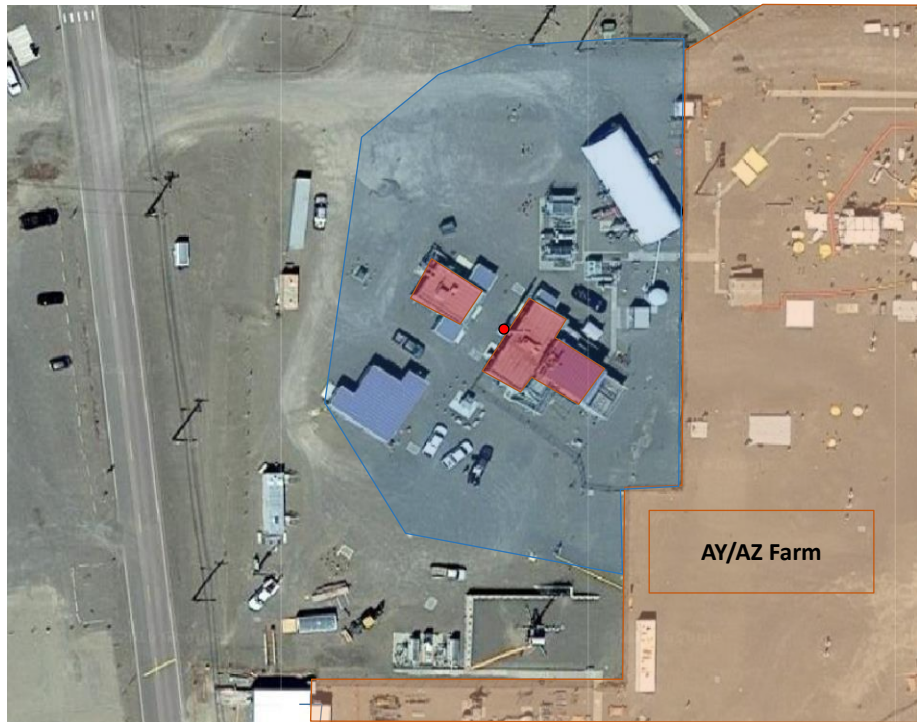
## Chemical Vapors: IH Strategy

### Aerial view of the AY-102 Retrieval Vapor Control Zones and Supplemental Respiratory Protection Zones

Supplemental zone with  
required respiratory  
protection

VCZ

● Stacks



# **AY-102 Recovery Project**

**1- Retrieval Mission Overview**

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**4- Communications during Retrieval**

- Pre-retrieval briefings with workforce, site contractors, and other stakeholders
- Communications during retrieval:
  - In the field
    - Area postings
    - Reader boards
  - SOEN messages
  - Project status reports
  - WRPS Employee Messages
  - *Solutions* weekly newsletter
  - *Hanfordvapors.com* website







**We're ready to  
complete the mission!**

**Thank you for your  
time and attention!**