Plutonium Finishing Plant Resumption of Work

In June, workers loaded the last of 20 "super sacks" containing previously loaded demolition debris.

July 2018

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Overview

- Event Summary
- Root Cause Evaluation
- External Assessments
- Key Activities
- Resumption of Work Plan
- Enhanced Controls Overview
- Management Assessment
- Enhanced DOE Oversight

Event Summary

- Contamination discovered outside posted radiological boundaries on Dec. 15-19
- 281 workers requested bioassays
  - 270 non detectable (meaning zero dose)
  - 2 doses less than 1 millirem* (notionally less than .02 mrem/year)
  - 8 doses between 1 to 10 millirem* (notionally .02-.2 mrem/year)
  - 1 dose between 10-20 millirem* (notionally .2-.4 mrem/year)
- Dec. 2017 event followed June 2017 contamination spread
- DOE-RL and Regulators issued a stop work

*Doses assigned are the expected dose over 50 years and are below the Hanford administrative dose limit of 500 mrem/year for radiological workers.

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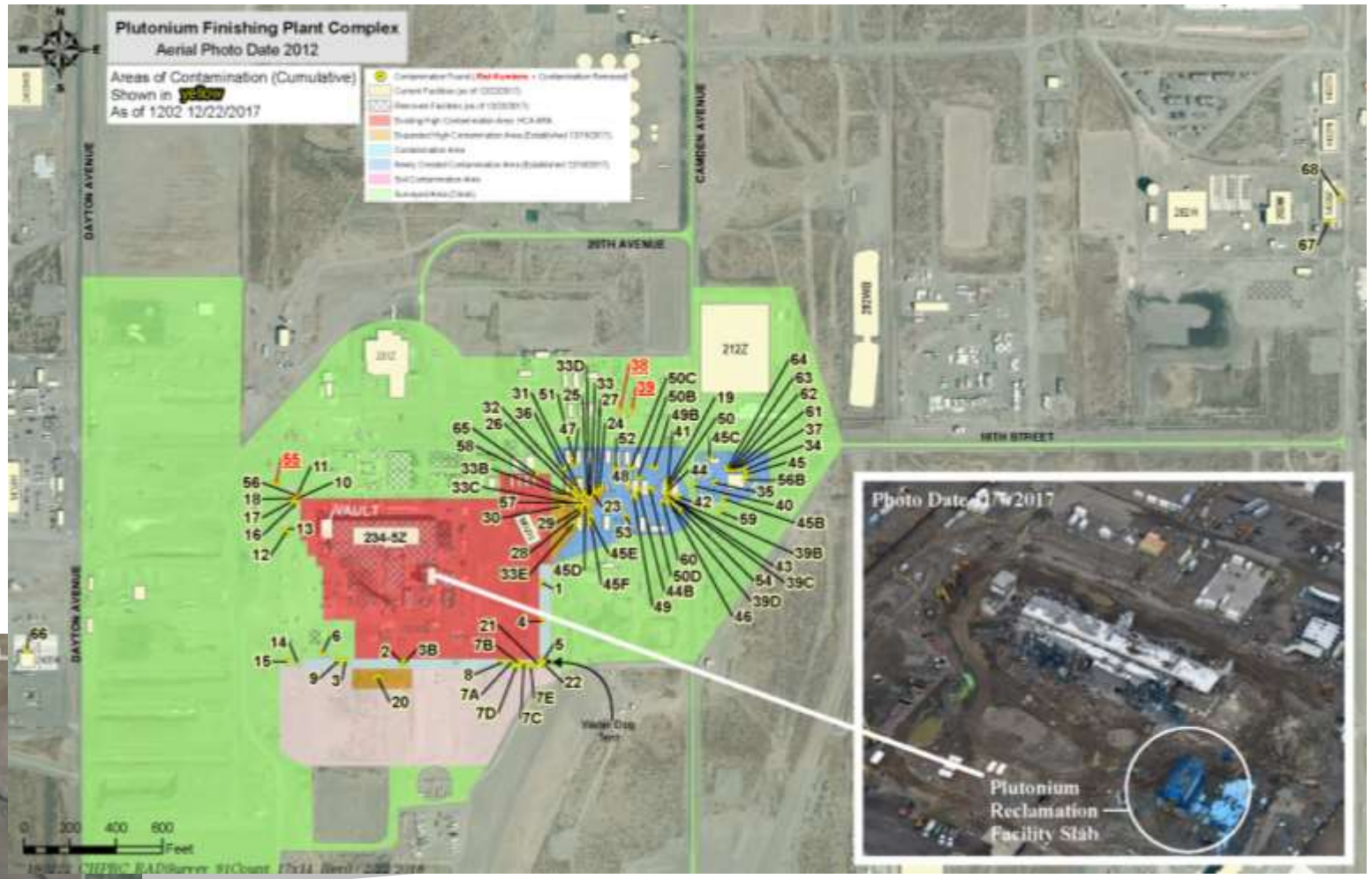

Contamination remained in close proximity to the PFP, located in the 200 West Area of the 586-square-mile Hanford Site.

Root Cause Evaluation

- **Root Cause 1:** Over-reliance on selective empirical data gathered during the course of, and following, demolition was used in making decisions on the rate and methods of demolition
- **Root Cause 2:** Risks and consequences associated with emerging and changing conditions were not adequately reviewed and evaluated.
- **Contributing Cause 1:** Previous success of the application of fixative was assumed to provide equivalent protection to containerized debris or covering the debris with soil.
- **Contributing Cause 2:** Radiological indicators near the PRF demolition site did not indicate the need to expand fixative applications or perform surveys in addition to the established monitoring plan.
- **Extraneous Conditions Adverse to Quality 1:** Prompt notification to management or the DOE-RL Facility Representative did not occur because personnel at the facility did not implement a proper procedure.
- **Extraneous Conditions Adverse to Quality 2:** PFP management did not adequately address all employee concerns and suggestions.

Corrective Action Input

PFP Root Cause Evaluation
44 corrective actions
37 pre-start actions (33 closed; 4 open)
7 post-start actions (4 closed; 3 open)

DOE Expert Panel Input

Worker Involvement

Plateau Remediation Contract Radiological Control Improvement Plan
13 corrective actions
10 pre-start actions (10 closed; 0 open)
3 post-start actions (3 closed; 0 open)

Plateau Remediation Contract Integrated Safety Management System Assessment
5 corrective actions
0 pre-start actions
5 post-start actions (1 closed; 4 open)

131 Corrective Actions

Department of Energy Office of Enterprise Assessments and Office of Environmental Management Site Observations
50 corrective actions
35 pre-start actions (33 closed; 2 open)
15 post-start actions (13 closed; 2 open)

Jacobs Radiological Control Independent Assessment
19 corrective actions
12 pre-start actions (12 closed; 0 open)
7 post-start actions (3 closed; 4 open)

88 of 94 Total Pre-Start Actions Completed

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Other Key Activities

- Revised Air Dispersion/Ground Deposition Models
  - Pacific Northwest National Laboratory
  - Lawrence Livermore National Laboratory
- Performed Option Engineering Analysis
  - Incorporated input from workers and DOE Expert Panel*
- Developed Enhanced Controls
  - Includes assumptions from air dispersion model)
- Developed Resumption of Work Plan
- Planned Management Assessment

The PFP Options Engineering Review Team meets.

*DOE Expert Panel included observers from regulatory agencies, the Hanford Atomic Metal Trades Council and the Building Trades.

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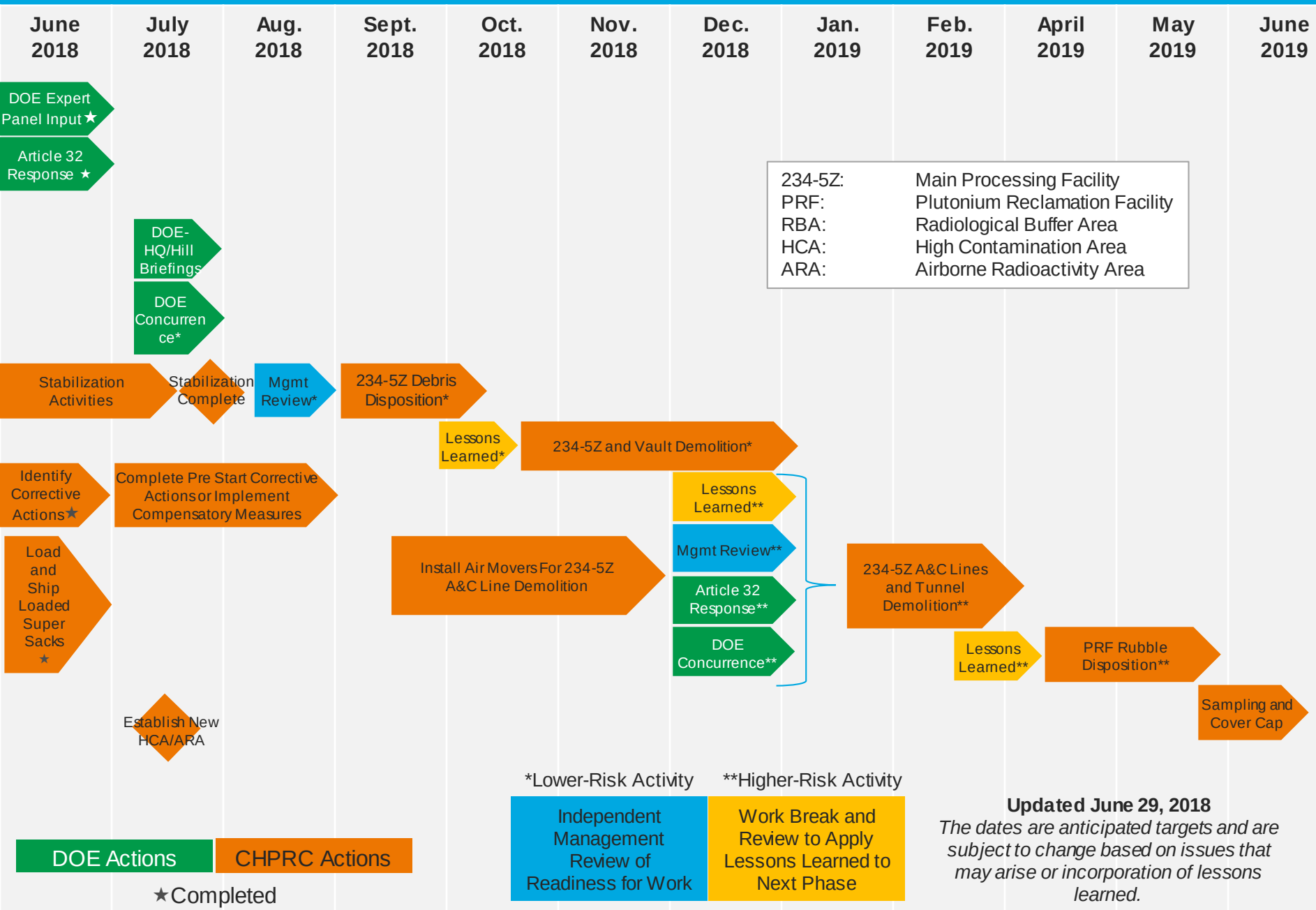
PFP Demolition Resumption

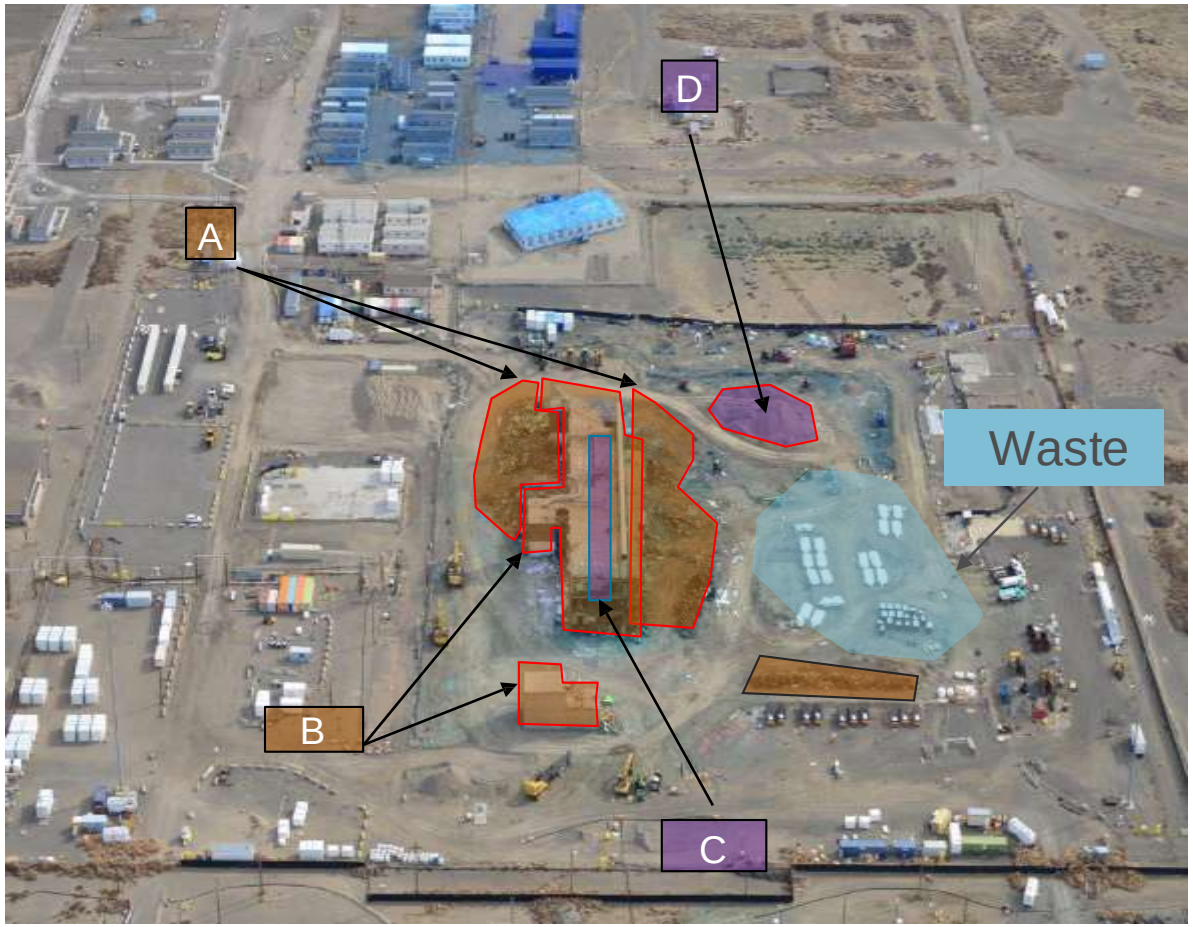


Updated June 29, 2018

The dates are anticipated targets and are subject to change based on issues that may arise or incorporation of lessons learned.

Strategy to Resume PFP Demolition
Lower- and Higher-Risk Approaches

Risk based on material-at-risk (MAR) and surface contamination configuration



Containerized Waste		
Super Sacks	60%	1835g
Other	30%	912g
Subtotal	***90%***	***2747g***

Lower-Risk Demolition		
A: 234-5Z Debris	<1%	5g
B: 234-5Z and Vault	<1%	5g
Higher-Risk Demolition		
C: 234-5Z A/C Lines and Tunnel	2%	64g
D: PRF Rubble Pile	8%	238g
Subtotal	***10%***	***312g***

Remaining MAR	**3059g**

234-5Z=Main PFP Processing Facility
PRF=Plutonium Reclamation Facility

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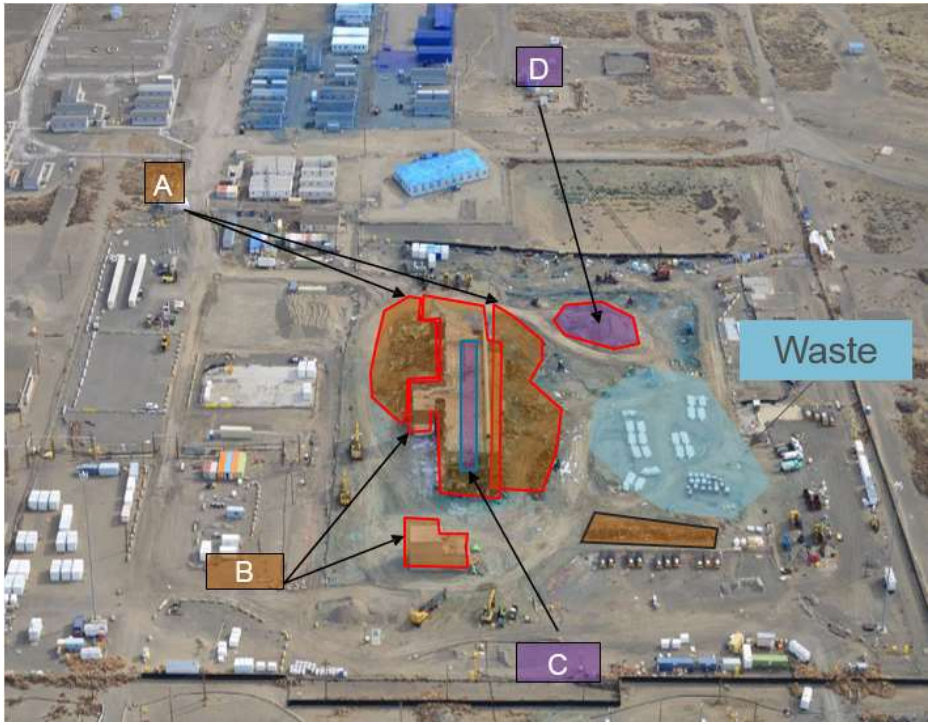
Summary of Selected Options



A: Disposition Debris from Main Processing Facility (234-5Z): Use enhanced controls identified from the Root Cause Evaluation and Jacobs' radiological control assessment to disposition debris created during pre-December 2017 demolition of lower-risk areas of Main Processing Facility (234-5Z)

B: Demolish Main Processing Facility (234-5Z) (Except Processing Lines) and Vault: Implement current zone-by-zone demolition strategy with additional controls developed from the pre-start corrective actions and Jacobs' radiological control assessment

C: Demolish Processing Lines (A&C) in Main Processing Facility (234-5Z) and Tunnel: Implement current zone-by-zone demolition strategy (supported with a structural engineering analysis) with additional controls, including ventilation on A&C processing lines and tunnel corridor, to enhance particulate control during demolition

D: Disposition Rubble Pile from Plutonium Reclamation Facility (PRF): Add water to the contamination-free soil that currently covers the PRF rubble pile, saturating the soil and preventing contamination migration; heavy equipment will remove the wet soil and rubble and place it in a container for shipment to the Environmental Restoration Disposal Facility

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Enhanced Controls for Lower- and Higher-Risk Scope

Control Set:	Pre–December 18	Enhanced Controls
Boundaries	Established from predicted airborne radioactivity and surface deposition models to encompass levels requiring posting and control	Significantly enlarged to ensure no contamination, even below posting limits, is found outside of boundaries
Survey Plan	45 cookie sheets surveyed once per working day Worker-performed personal surveys No access restriction for wind events	77 cookie sheets; surveys twice per working day and during demolition activities Automated personal contamination monitors Access restricted until post-wind event surveys are complete
Monitoring	14 continuous air monitors 22 air samplers; 3-day air sample turnaround time	14 continuous air monitors 35 air samplers (three elevated at 20 ft); 1-day air sample turnaround time Evaluating additional air samplers at radiological boundaries
Demolition Sequence	Parallel building demolitions	Sequential demolition from lower- to higher-risk Opportunity for worker involvement and incorporation of lessons learned between tasks
Fixatives	3 main fixatives • 50% Polymeric Barrier System (PBS) • Soil-Sement® • Envirotac II® (“Rhino Snot”)	Fixatives used per manufacturers’ specifications with technical evaluations to support; incorporated into work planning documents
Waste Packaging	Large piles accumulated during demolition Environmental Restoration Disposal Facility (ERDF) dozer operator using respiratory protection	Minimize pile accumulation; ensure fixative application Wider use of respiratory protection at ERDF, based on waste profile; multiple air samples and surveys taken near waste and downwind
Worker Engagement	Inconsistent face-to-face communication and worker involvement	Pauses incorporated into demolition sequence for worker involvement and review of lessons learned Employee involvement in Root Cause Evaluation, corrective action development, and option evaluation team for demolition resumption Weekly employee roundtables scheduled with project management
Work Package	Large work package with tasks	Smaller work packages with limited tasks Rigorous documented change management process (protects control set) Independent Hazard Review Board
Oversight	Hazard Review Board	Hazard Review Board, Senior Supervisory Watch and senior project mentors Roles, responsibilities, and participation criteria defined

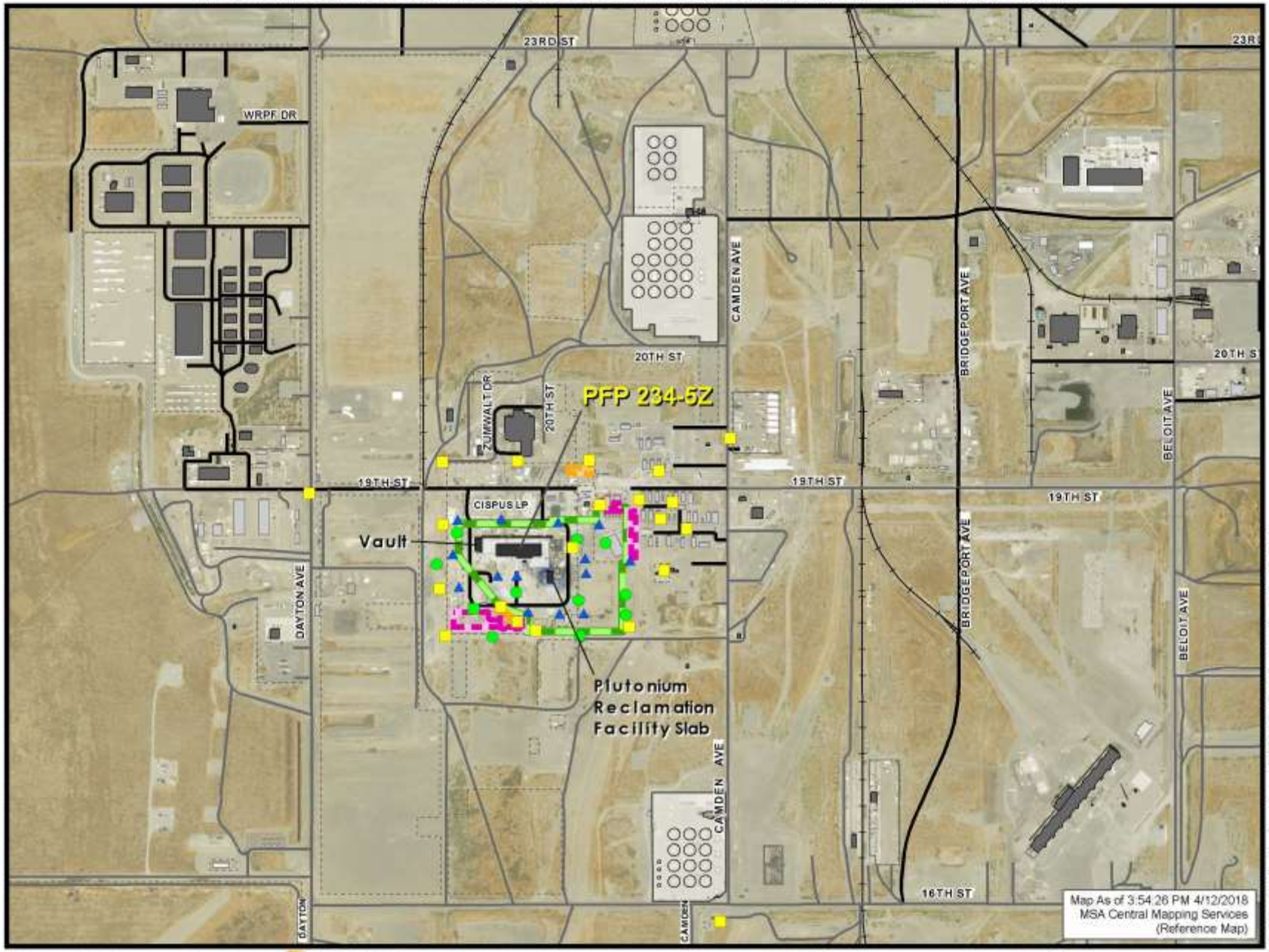
Monitoring and Response

	Continuous Air Monitors		Cookie Sheets		Fixed Air Samplers	
	Non-Demolition	**During Demolition**	**Non-Demolition**	**During Demolition**	**Non-Demolition**	**During Demolition**
Number/ Location[a]	• 14 total • 4 inner CAMs (closer to demolition) • (24 DAC-hr) • 10 outer CAMs (farther from demolition) (8 DAC-hr)	• Existing 14 CAMs • Up to two additional CAMs deployed near workdownwind of job site (80 DAC-hr)	77 total • 47 inside HCA and CA • 18 inside RBA • 12 outside work control zone	77 total • 47 inside HCA and CA • 18 inside RBA • 12 outside work control zone • Additional deployed downwind from job site, based on wind direction	35 total • 15 inside HCA and CA • 8 inside RBA • 3 inside work control zone • 9 outside work control zone	35 total • 15 inside HCA and CA • 8 inside RBA • 3 inside work control zone • 9 outside work control zone
Monitoring Frequency	• Visual once per shift • Filter paper changed daily or for cause (rate of rise noted)	• Continually observed by RCTs • Filter paper changed daily or for cause (rate of rise noted)	• Surveyed twice per day • Surveyed after wind events	• Near real-time surveys of cookie sheets downwind of demolition and within the demolition HCA, boundary of the HCA and CA	• Filter paper changed daily or for cause	• Filter paper changed daily or for cause
Turnaround Time	• Filter papers take 24 hr to analyze [b]	• Results every 15 minutes; can differentiate between alpha and background • Filter papers take 24 hr to analyze [b]	• Results real time	• Results real time	• Filter papers take 24 hr to analyze [b]	• Filter papers take 24 hr to analyze [b]
Action Level	• Upon alarm	• 50% of the chronic alarm set point	• >1,600 dpm/100 cm^2 inside HCA and CA • >20 dpm/100 cm^2 outside the CA • Any contamination above action levels assumed to be alpha; further analysis may determine it is radon	• >1,600 dpm/100 cm^2 inside HCA and CA • >20 dpm/100 cm^2 outside the CA • Any contamination above action levels assumed to be alpha; further analysis may determine it is radon	• 20,000 dpm	• 20,000 dpm
Response	• Exit area/notify management	• Notify FWS • Stop demolition • Apply additional water/fixative	• Notify Operations/RadCon Management • Perform sample analysis • Evaluate need for additional water/fixative • Evaluate need to revise posting	• Notify Operations/RadCon Management • Perform sample analysis • Evaluate need for additional water/fixative • Evaluate need to revise posting	• Notify RadCon Management • Evaluate need for timely sample analysis	• Notify RadCon Management • Evaluate need for timely sample analysis

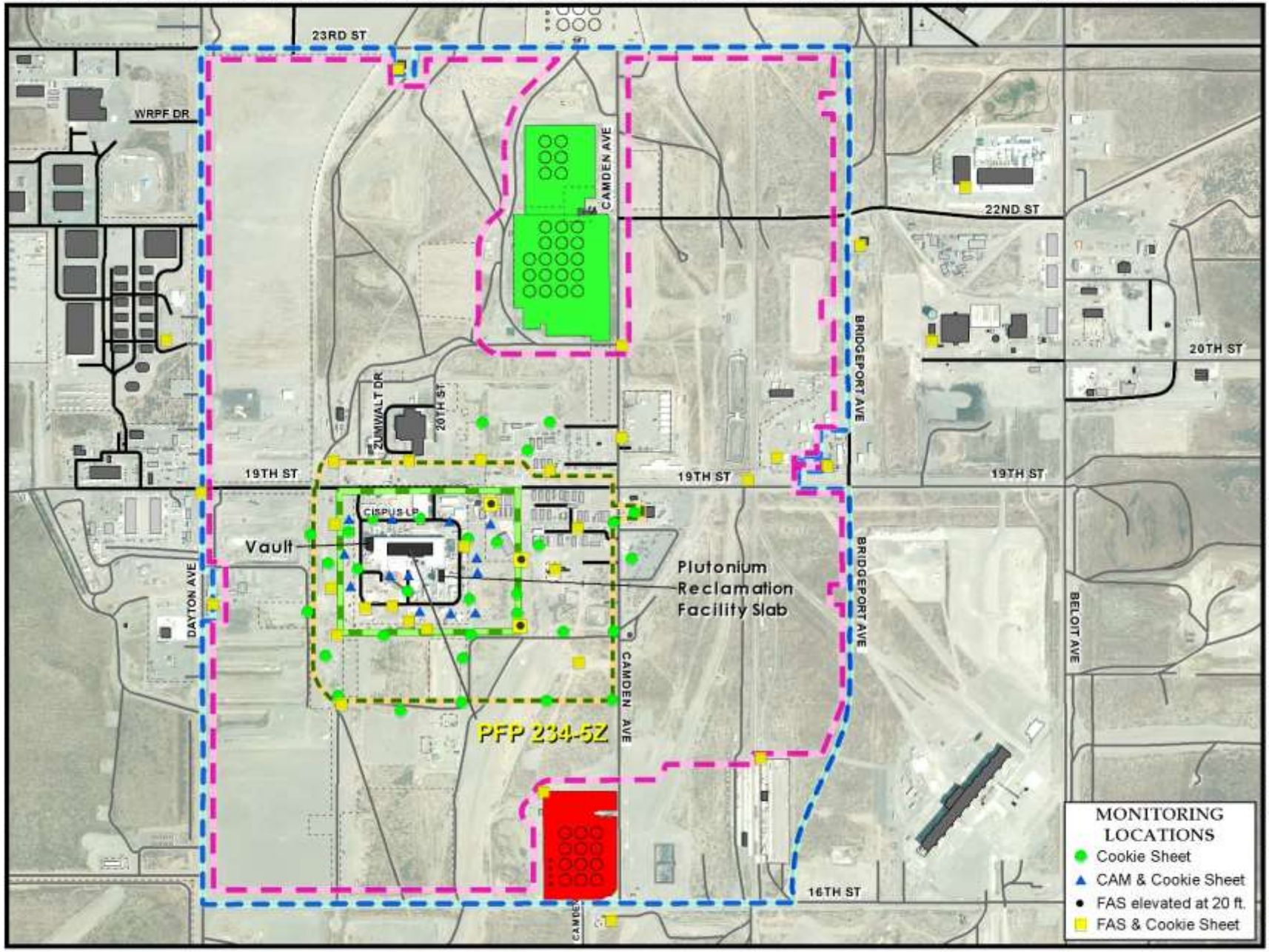
a. Numbers and location may change based on further analysis.
b. Filter paper on CAMs and air samplers at ARA boundaries and downwind are counted every 24 hours, which is required for filter paper analysis for additional CAMs and air samplers as needed due to equipment and employee resources.

ARA = airborne radioactivity area
CA = contamination area
CAM = continuous air monitor
RCT = radiological control technician

MONITORING LOCATIONS BEFORE DECEMBER 2017



CURRENT RADIOLOGICAL BUFFER AREA AND ACCESS CONTROL BOUNDARY (UPDATED 6/5/18)



Conduct Of Operations

Change Management Process	Hazard Review Board (HRB)	Senior Supervisory Watch (SSW)
PFP Manager/Deputy Project Manager oversight Recommended changes evaluated against based assumptions and documents developed during planning phase Changes may include: • Hazard Review Board • Corrective Action Review Board • RadCon Change Management Program • Executive Safety Review Board Changes made to the work instructions (statement of scope through restoration/end state) must follow the change process outlined in PRC-PRO-WKM-12115, *Work Management*	Comprised of a senior manager chairperson and subject matter experts independent of PFP Evaluates work documents for hazard controls Ensures the work team understands the scope of the work and controls All changes, modifications, and revisions to the HRB-approved work packages must be approved by the HRB or HRB chairperson	Interoffice memorandum CHPRC-1801076, *Updated Plutonium Finishing Plant Senior Supervisory Watch*, provides a clear set of expectations for SSW oversight, feedback to the project, and documentation SSW pool: • 26 senior managers and subject matter experts • 17 of the 26 are outside of PFP SSW activities may include: • Movement and disposition of waste containers • Debris/rubble size reduction and load out • Demolition • Work conducted outside regular working hours. Assigned SSWs and the project manager will sign an expectation of understanding on SSW duties PFP-specific SSW checklist facilitates consistency and documentation of SSW observations for review and submission to the Management Observation Process

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Employee Engagement

- Held 54 briefings with approximately 1,800 workers since January 2018
- Weekly roundtable discussions held with PFP employees and project leadership
  - Questions and concerns tracked to resolution; responses provided to employees
- Intranet site available for project briefings, recent communications and recently asked questions/answers
- Worked with Mission Support Alliance to improve employee communications related to bioassay and dose consequences
- Incorporated Building Trades' input to enhanced Environmental Restoration Disposal Facility controls
- Hanford Atomic Metal Trades Council will be involved with Management Review
  - Memorandum of Agreement for an independent review with Stoneturn
- Routine monthly, weekly and daily meetings

PFP radiological control supervisor holds a discussion with his team about emergency response activities

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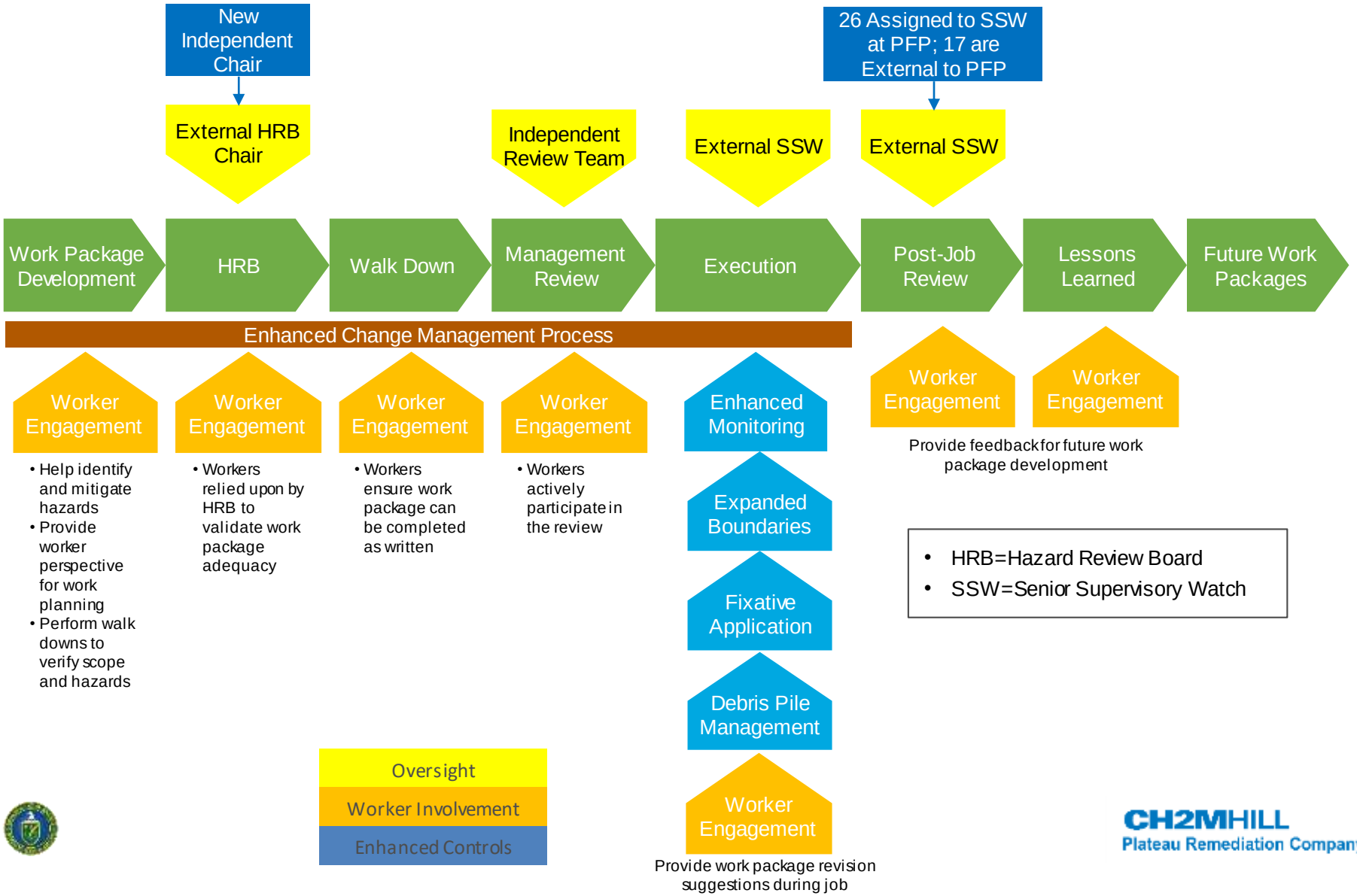
Incorporation of Enhanced Controls into Work Planning



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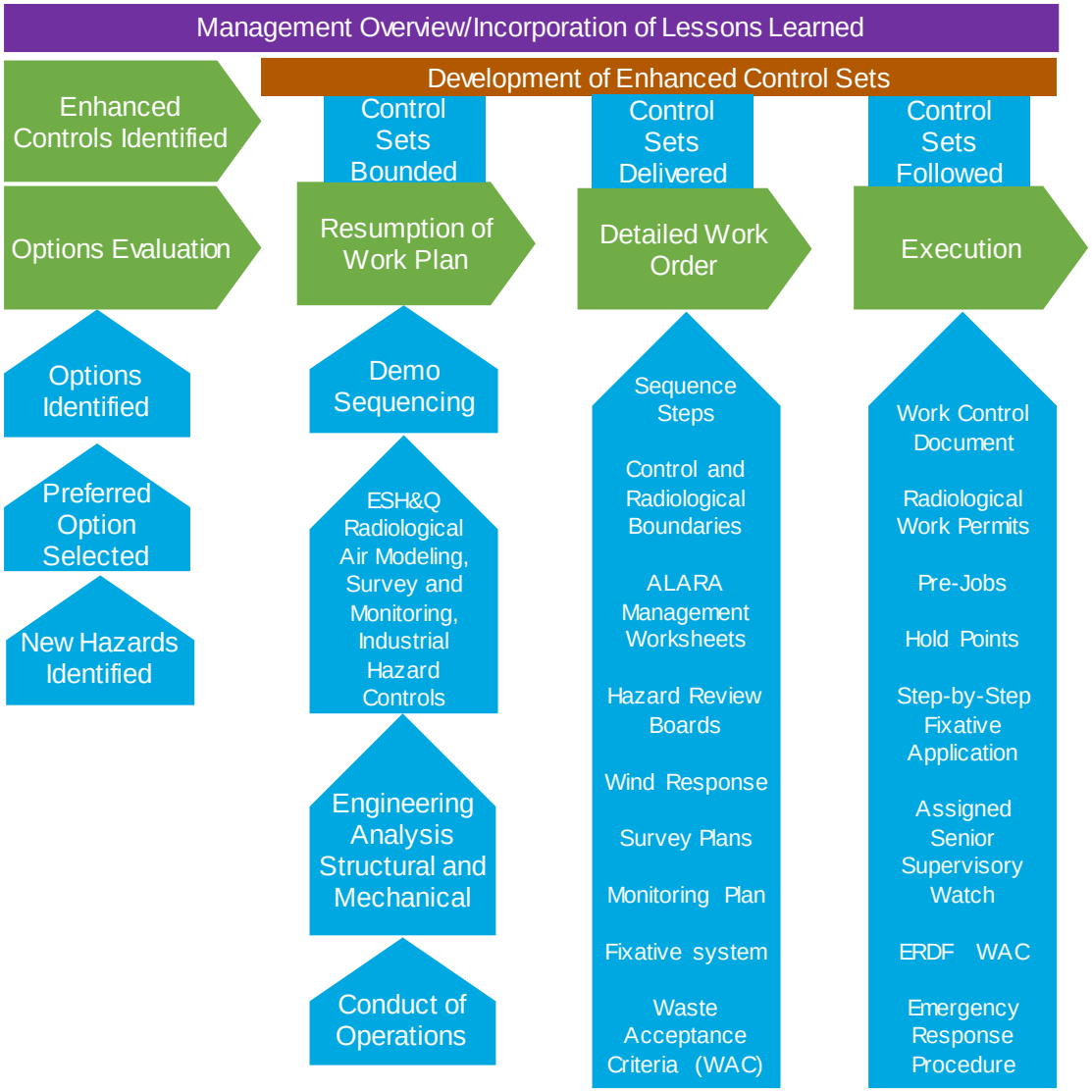
Resumption of Work Plan

Required Contributing Factors for Successful Implementation



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Management Review Process
Prior to Receiving DOE Authorization for Resumption

- Independent review of readiness to resume demolition
- Nominally five team members with expertise in conduct of operations, radiological control
- One week of documentation review
- One week of field work, including mock-up demonstration and emergency drill
- Any deficiencies will be categorized as pre-start or post-start
- DOE on-site team

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Enhanced Department of Energy Oversight

	Pre–December 18	Enhanced Oversight
Staffing	2 assigned Facility Representatives (FR) 1 RadCon SME	2 assigned FRs + 1 FR in training 2 RadCon SME's DOE Office of Environmental Management (EM HQ) and Office of Enterprise Assessment (EA) supplemental oversight of contractor and DOE oversight personnel
Notifications	High-level notification criteria (ORPS)	Detailed/low-level notification criteria (supplemental PFP notifications)
Controls	Air dispersion model assumptions not protected	Oversight personnel trained to treat air dispersion model assumptions analogous to Technical Safety Requirement-level controls in the authorization basis
Status Reports	Periodic general reports to DOE senior management	Weekly detailed reports on PFP to DOE senior management
Readiness Verification	Oversight of contractor's Operational Readiness Review provided in 2016 prior to demolition	Team of seven personnel including EM HQ and external consultants providing independent verification of the effective implementation all pre-start corrective actions
Oversight Process Verification	Periodic self-assessments of federal oversight processes and training	EA conducted an assessment of RL oversight processes and training in June 2018. No findings and several good practices identified.

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