

A wide landscape photograph showing a river winding through a valley at sunset. The sky is filled with vibrant orange and red clouds, and the foreground is covered in dry, scrubby vegetation.

**U.S. Department Of Energy
Office of River Protection**

**Joint Health, Safety and Environmental
Protection and Tank Waste Committees**

**Vic Callahan, Director
Nuclear Safety Division**

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

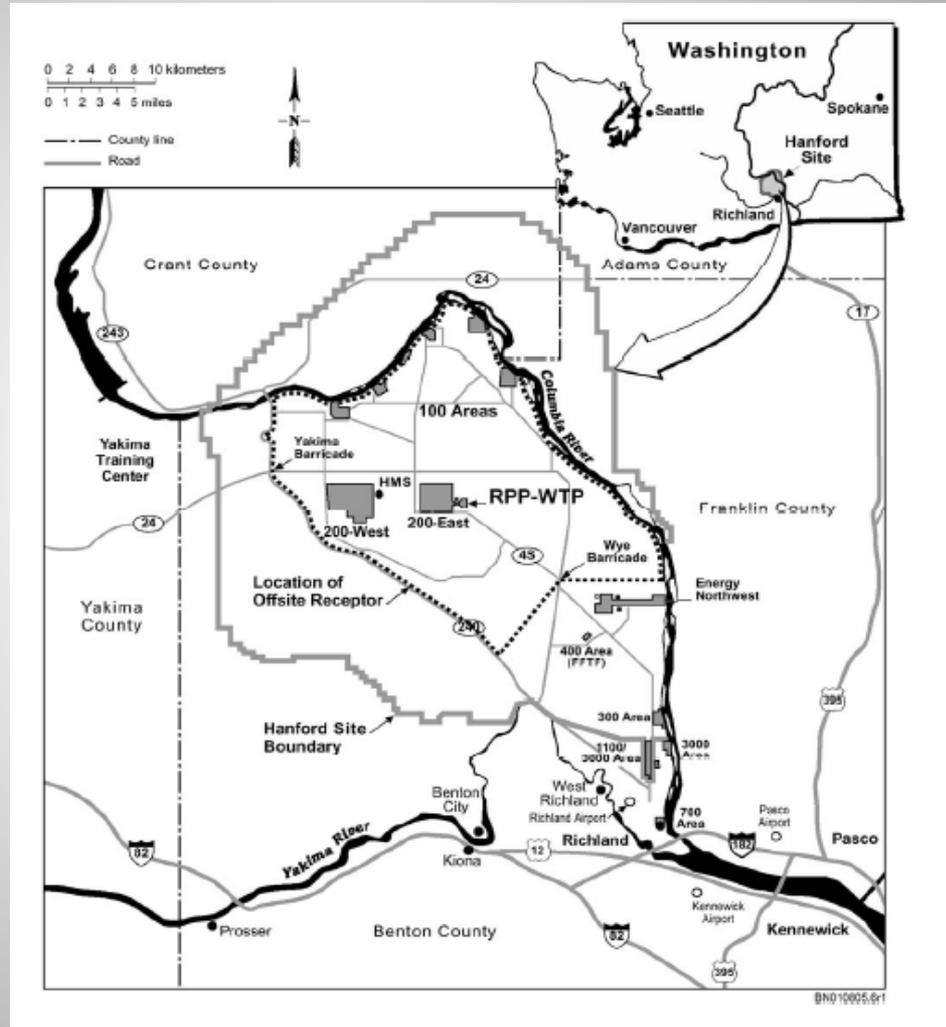
WTP PDSAs:

- *PDSA to Support Construction Authorization: General Information*
- *PDSA to Support Construction Authorization: PT Facility Specific Information*
- *PDSA to Support Construction Authorization: HLW Facility Specific Information*
- *PDSA to Support Construction Authorization: LAW Facility Specific Information*
- *PDSA to Support Construction Authorization: LAB Facility Specific Information*
- *PDSA to Support Construction Authorization: Balance of Facility Specific Information*

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

Background:

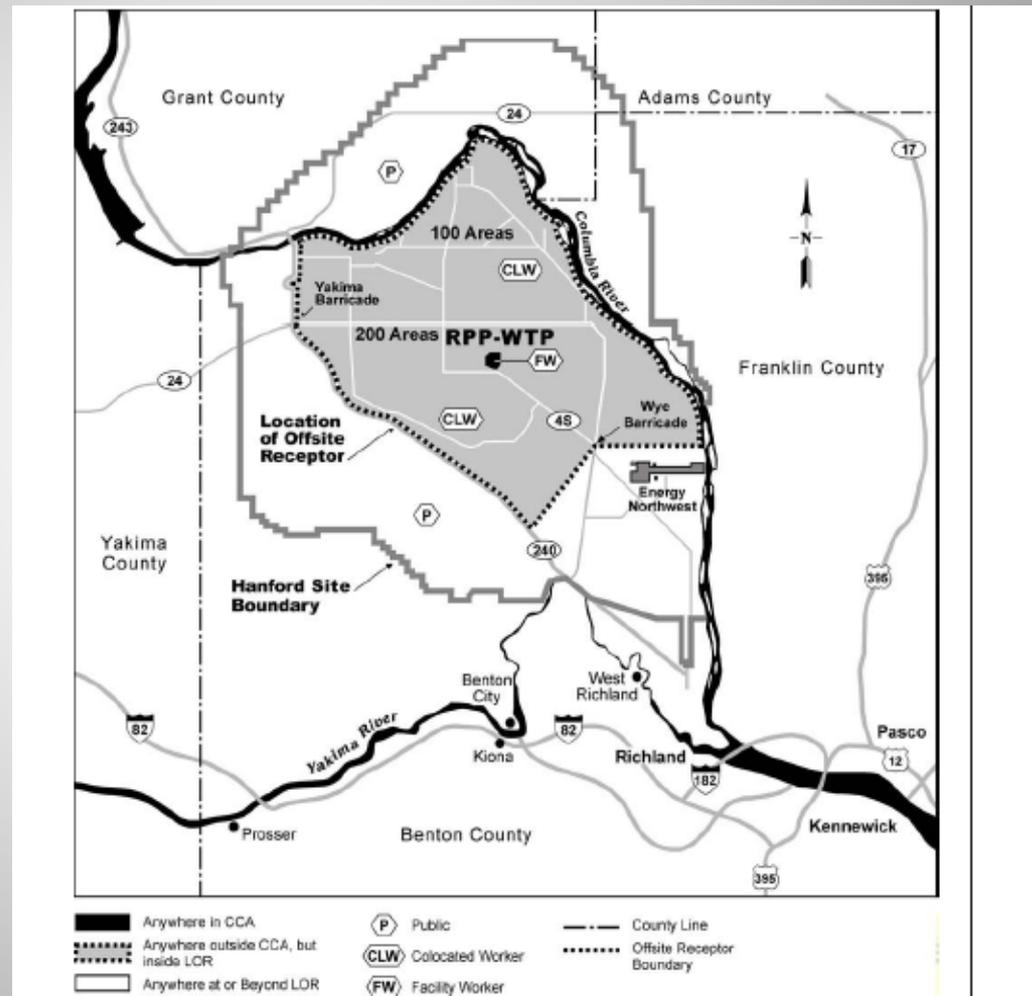
Hanford Site Map showing WTP and site boundaries



Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

Background:

WTP site map showing location of public, co-located, and facility workers



Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

General Information PDSA:

Chapter 1: Site Characteristics

Chapter 2: Facility Description

Chapter 3: Hazard and Accident Analyses

Chapter 4: Safety Structures, Systems, and Components

Chapter 5: Derivation of Technical Safety Requirements

Chapter 6: Prevention of Inadvertent Criticality

Chapter 7: Radiation Protection

Chapter 8: Hazardous Material Protection

Chapter 9: Waste Management

Chapter 10: Initial Testing, In-Service Surveillance, and Maintenance

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

General Information PDSA (cont):

Chapter 11: Operational Safety

Chapter 12: Procedures and Training

Chapter 13: Human Factors

Chapter 14: Quality Assurance

Chapter 15: Emergency Preparedness

Chapter 16: Deactivation and Decommissioning

Chapter 17: Management, Organization, and institutional Safety

Provisions

Chapter 18: Fire Protection

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

PT Facility PDSA:

Classified as a Hazard Category 2 Facility

Covers Chapters 2 – 5

PT Facility consists of 15 black cells (inaccessible areas after waste is introduced) and one hot cell (remote operations/remote change-out of equipment).

23 Bounding Unmitigated Design Basis Accidents (Vessel Spills, Sprays, Leaks, PJM Overblows, Hydrogen Explosions in Vessels, PJMs, Seismic Events (Spills, Explosions) Hydrogen Explosion in Vessel and Seismic Hydrogen Explosion accidents exceed Public Evaluation Guidelines requiring safety-class controls.

C5 Ventilation System and Hydrogen Mitigation System for high solids process vessels are classified safety-class.

Control Strategy for Spray Leaks:

Accident currently analyzed below challenging Public Evaluation Guideline, but because of uncertainties in the spray leak methodology, WTP has adopted the current safety control strategy:

C5 Ventilation is credited as the safety class control.

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PT Facility PDSA - Spray Leaks (cont):

Process piping classified as safety-significant (SS), defense-in-depth

Additionally, ORP has told the WTP Contractor to evaluate additional controls that will limit the duration and volume of spray leaks to ensure the bounding environmental conditions of the HEPA filters are protected.

Seismic Design:

PT Facility designed to withstand seismic design basis event.

High active process vessels are currently classified as safety class

All process piping in black cells regardless of classification will be analyzed to the highest seismic category (SC-I).

21 pump suction isolation valves located in hot cell to isolate process vessels to be shut in the event of a seismic design basis event.

Hot cell piping in the form of replaceable jumpers are classified SS.

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High Level Waste Facility (HLW) PDSA:

Classified as a Hazard Category 2 Facility

Covers Chapters 2-5

HLW concentrate from PT Facility is delivered to melter feed preparation vessels where blending with glass formers to form a blended feed slurry.

This slurry is fed to a melter and converted into molten glass. The glass is then poured into cylindrical canisters, allowed to cool, sealed, and decontaminated for shipping.

Worst Accident: Hydrogen explosion in melter feed preparation vessel exceeds public evaluation guideline.

C5 Ventilation System and Hydrogen Mitigation System for melter feed preparation and feed vessels are classified safety-class.

HLW is designed to withstand seismic design basis event.

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

Low Activity Waste Facility (LAW) PDSA:

Currently classified as a Hazard Category 3 Facility:

Covers Chapters 2-5

No accidents have radiological consequences above guidelines.

Melter offgas event and carbon bed fire (secondary offgas system) are the toxicological design basis accidents for LAW affecting the Co-Located and Facility Worker. These accidents are mitigated by elevated exhaust stack, melter feed termination, melter offgas system exhausters, and confinement function of secondary offgas system components.

Secondary offgas system components are classified as safety-significant .

Preliminary Documented Safety Analysis (PDSA) for the Waste Treatment and Immobilization Plant (WTP)

LAB Facility PDSA:

Classified as a Hazard Category 3 Facility

Covers Chapters 2-5

Accidents are Facility fire and seismic event. Affected receptor: facility worker.

The Lab hotcell and C5 effluent vessel are classified as safety-significant.

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Safety Basis Maintenance:

Over time design changes affecting safety systems have not aligned with the PDSAs resulting in misalignment between design and nuclear safety. All facilities are affected. Revised Material-at-Risk (MAR) values have not been updated in DBE scenarios and, therefore, not updated in the PDSAs. Design changes were not thoroughly evaluated and properly documented leading to improper change control. PT facility has the most identified misalignments to date. Unresolved technical issues have complicated the ability to confirm designs such that there is a low assurance that the stated safety functions of safety SSCs in the PDSAs may perform as intended.

Path Forward: PDSA Reconstitution

LAW/LAB/BOF – DSA development in progress including facility specific hazard analysis eventually leading to accident analysis and control selection. Chapter 2 (facility description) is currently in draft form and being edited.

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Safety Basis Maintenance: Path Forward (cont):

Safety Basis Configuration Management Process (USQ) will be implemented in the near future for all facilities.

HLW will start a PDSA update this year with alignment between design and nuclear safety complete by the end of the 2013.

PT facility Reconstitution - Reconstitution efforts are planned once re-baseline efforts are complete. No definite plans at this point.