

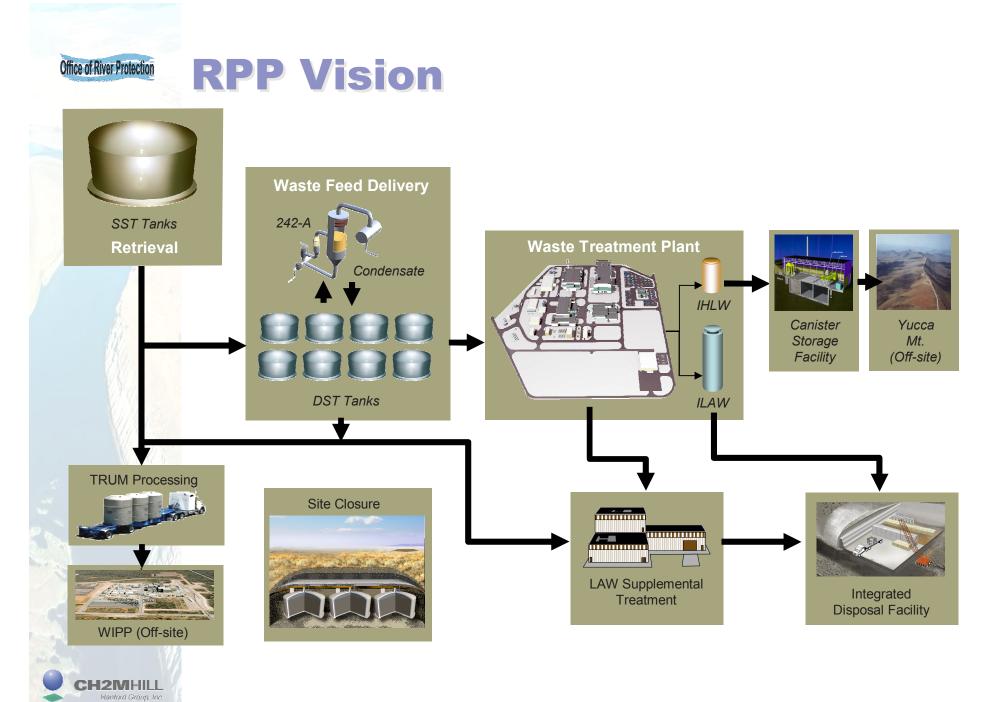
# Integration Disposal Facility and its Performance Assessment

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### **Purpose of IDF**

- Dispose of ILAW produced by WTP
- Dispose of ILAW produced by DBVS and potentially by Supplemental Treatment Plant
- Dispose of treated WTP secondary waste
- Dispose of other Hanford and DOE complex LLW and MLLW



# **History of ILAW/IDF**

- ILAW has evolved from grout to glass and its disposal from concrete vaults to engineered landfills
- 1996/1997 NRC consultation on DOE's proposed ILAW waste management plan
- ILAW waste management plan being implemented
- IDF started as disposal facility for WTP ILAW only
  - IDF mission was expanded in 2002 to include:
    - ILAW from DBVS and Supplemental Treatment Plant
    - Treated WTP secondary waste
    - Other Hanford and DOE complex LLW and MLLW

### **ILAW Criteria**

- Radionuclides have been removed to the maximum extent technically and economically practical
- Wastes are incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C [lowlevel waste] as set out in 10 CFR Part 61
- Wastes are to be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR 61, Subpart C are satisfied

# All ILAW waste form concentrations are well below class C limits

Comparison of ILAW Glass Radionuclide Concentrations with US NRC Class C Limits										
Radionuclide	Units	10 CFR §61.55	WTP Contract <sup>2</sup>	Projected Average Concentrations <sup>3</sup>						
				WTP ILAW	Demonstration	Bulk				
		Class C <sup>1</sup>		Glass	Bulk	Vitrification				
					Vitrification	<b>ILAW Glass</b>				
P					<b>ILAW Glass</b>					
Alpha emitting transuranic	ηCi/gram	100	Less than	16.8	0.60	17.9				
nuclides with half-life greater			Class C							
than five years			limits in							
<sup>241</sup> Pu	ηCi/gram	3,500	10CFR61.55	4.6	0.23	6.83				
<sup>242</sup> Cm	ηCi/gram	20,000		4.29E-02	2.22E-03	3.99E-02				
<sup>99</sup> Tc	Ci/m <sup>3</sup>	3		1.41E-04	1.47E-04	1.92E-04				
<sup>129</sup> I	Ci/m <sup>3</sup>	0.08		9.31E-08	1.54E-08	3.46E-07				
<sup>90</sup> Sr	Ci/m <sup>3</sup>	7,000	< 20	4.28E-03	1.98E-03	3.89E-03				
<sup>137</sup> Cs	Ci/m <sup>3</sup>	4,600	< 3	2.78E-04	7.90E-03	8.06E-03				

<sup>1</sup> Title 10 Code of Federal Regulations Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste*, §61.55 *Waste Classification* <sup>2</sup> U.S. Department of Energy Office of River Protection WTP Contract, Contract No. DE-AC27-01RV14136, Specification 2: *Immobilized Low Activity Waste Product*, requirement 2.2.2.8, *Radionuclide Concentration Limits* 

<sup>3</sup> RPP-RPT-23412, 2005, *Hanford Tank Waste Operations Simulator Model Data Package for the Development Run for the Refined Target Case*, Appendix C, CH2M Hill Hanford Group Inc., Richland Washington



# **Types of ILAW**

- Glass Produced in Waste Treatment Plant (WTP)
  - Baseline in Hanford Federal Facility Agreement and Consent Order
- Bulk Vitrified (BV) Waste Product
  - Demonstration Bulk Vitrification System (DBVS) (<= 50 packages)</li>
  - Supplemental LAW Treatment System (potentially ~1/2 of total ILAW)

# **ILAW Testing**

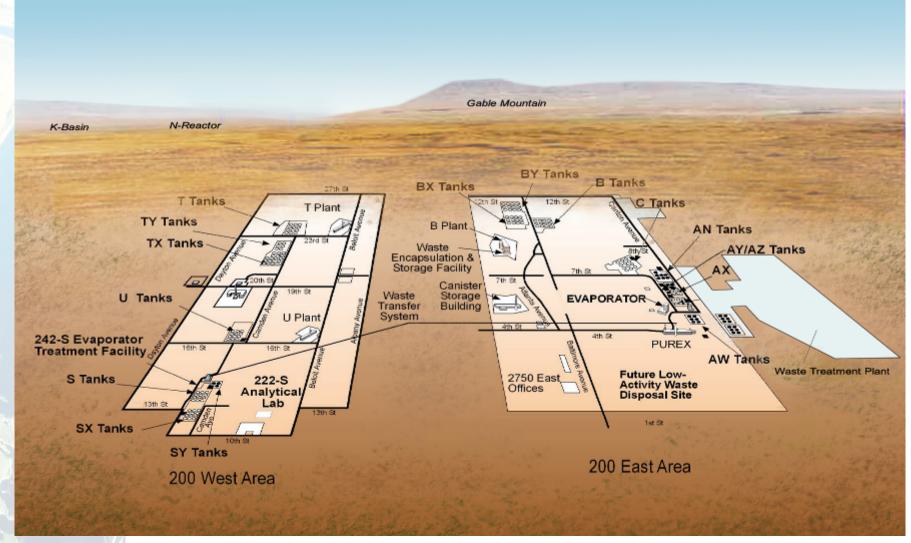
- Performance Assessment
  - PCT, VHT, SPFT, and PUF
  - Supports long-term modeling
  - Three compositions studied in 2005 IDF Performance Assessment (PA): LAWA44, LAWB45, LAWC22
- Waste Treatment Plant
  - Supports contract requirements as well as processing and optimization studies
- Bulk Vitrification
  - Supports development and demonstration

#### Acronyms:

PCT: product consistency test

- VHT: vapor hydration test
- SPFT: single pass-flow thru test
- PUF: pressurized unsaturated flow test

### **Hanford's Central Plateau**





CHG0509-06 NRC Briefing (Fred Mann).8

#### Office of River Protection Facility Concept

- Double-lined landfill including leachate collection and removal, with secondary containment and leak detection system
- Phase 1 size will be approximately 442 meters wide, 158 meters long, up to 15 meters deep, with length increasing up to 555 meters at full build out
- Phase 1 will provide capacity for approximately 165,000 cubic meters, with capacity increasing up to 900,000 cubic meters at full build out
- Cell 1 will be for disposal of mixed low-level waste containing Resource Conservation and Recovery Act (RCRA) regulated components including Immobilized Low Activity Waste
- Cell 2 will be for disposal of low-level waste with no RCRA regulated components



# **Facility Concept (continued)**

- In addition to the regulatory required barriers to protect the environment, the following enhancements are included in the IDF design
  - A Geosynthetic Clay Liner (GCL) layer has been added to the required primary liner to provide a composite barrier [High Density Poly Ethylene (HDPE) and bentonite clay] throughout the landfill cell floor
  - A second GCL layer has been added to the required secondary liner to enhance the effectiveness of the composite barrier under leak detection sump
  - A third HDPE geomembrane liner has been added beneath the liquid collection area to provide a secondary leak detection system.

### Office of River Protection Proposed Operations

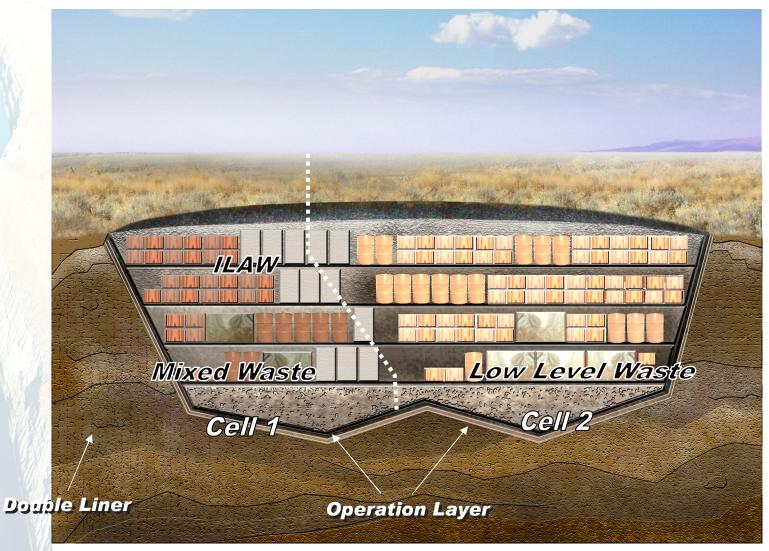
- Proposed operations will be similar to disposal activities currently performed on-site
- Waste to be disposed will be:
  - Certified by generator and verified by operator
  - Segregated and staged until wastes are accepted for disposal
  - Leachate will be:
    - Monitored, pumped as required, sampled, characterized, and transported to other treatment storage and disposal facilities for final disposition
  - Waste placement location will be recorded in order to facilitate retrieval in the unlikely event retrieval is required
  - Closure will include RCRA compliant cover







# Office of River Protection IDF Landfill Concept





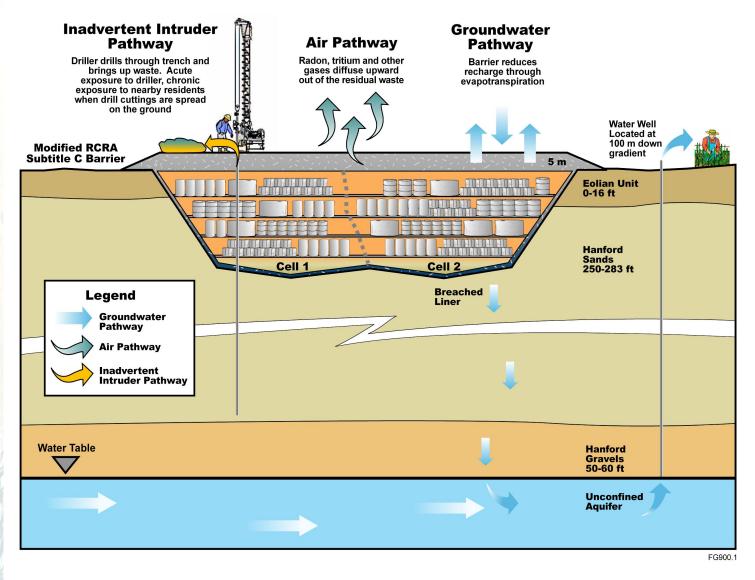
# **Key Performance Objectives**

- General public protection (rural farming with a cow) 25 mrem EDE/yr
- Inadvertent Intruder (driller and farming scenarios) 500/100 mrem EDE/yr
- Groundwater protection (beta/gamma drinking water dose for 2 liters/day) – 4 mrem/yr
- Air and surface water protection
- Chemical performance objectives
- Performance Objectives for the Hanford ILAW PA HNF-EP-0826

# Conceptual Models for Various Pathways Analyzed in PA

Office of River Protection

H2MHILL



CHG0509-06 NRC Briefing (Fred Mann).15

#### **Office of River Protection** IDF Inventory for Key Contaminants (a)

Ne.	Tank Waste (HTWOS)					Approved Generators (SWIFT)			Potential Generators (HSW EIS/TID)	
Contaminant	WTP ILAW glass	Spent LAW Melters	Spent HLW Melters	BV Product	ILAW Secondary Waste	Cat 1	Cat 3	MLLW	LLW	MLLW
<sup>99</sup> Tc	1.1E+04	2.2E+01	1.2E+01	1.2E+04	2.3E+02	5.3E-01	3.0E+00	6.1E+00	1.0E+00	5.1E+01
<sup>129</sup> I	7.1E+00	1.6E-02	7.7E-03	2.1E+01	1.3E+01	1.1E-02	6.9E-03	1.0E-01	2.5E-02	2.7E-04
<sup>237</sup> Np+D <sup>(b)</sup>	2.0E+01	2.8E-02	1.4E-01	2.3E+01	9.3E-02	7.6E-02	1.2E-02	1.1E-02	2.2E-01	7.9E+00
<sup>238</sup> U+D <sup>(b)</sup>	3.9E+00	7.7E-03	1.0E+00	2.7E+00	2.3E-02	2.7E-01	2.7E+00	6.1E-01	3.5E+01	9.9E+01
Cr	2.9E+05	5.1E+02	3.0E+02	1.9E+05	1.7E+02	NA	NA	7.7E+03	NA	1.0E+04
NO <sub>3</sub> -	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E+06	NA	NA	2.6E+05	NA	3.3E+05

<sup>(a)</sup> Units for inventories provided in this Table. Radionuclide contaminant inventories are in units of Ci decayed to January 1, 2005; chemical contaminant inventories are in units of kg include the mass associated with radionuclides

<sup>(b)</sup> Short-lived progeny in equilibrium with parent



#### **Office of River Protection** Major Uncertainties/Sensitivities

- Inventory (particularly uncertainties in treatment flow sheets)
- Waste form release rate (particularly from grout)
- Recharge
- Sediment retardation
- The largest uncertainties are associated with decisions (e.g. such as waste form, surface barrier design) which are not yet made, rather than from knowledge of the natural system