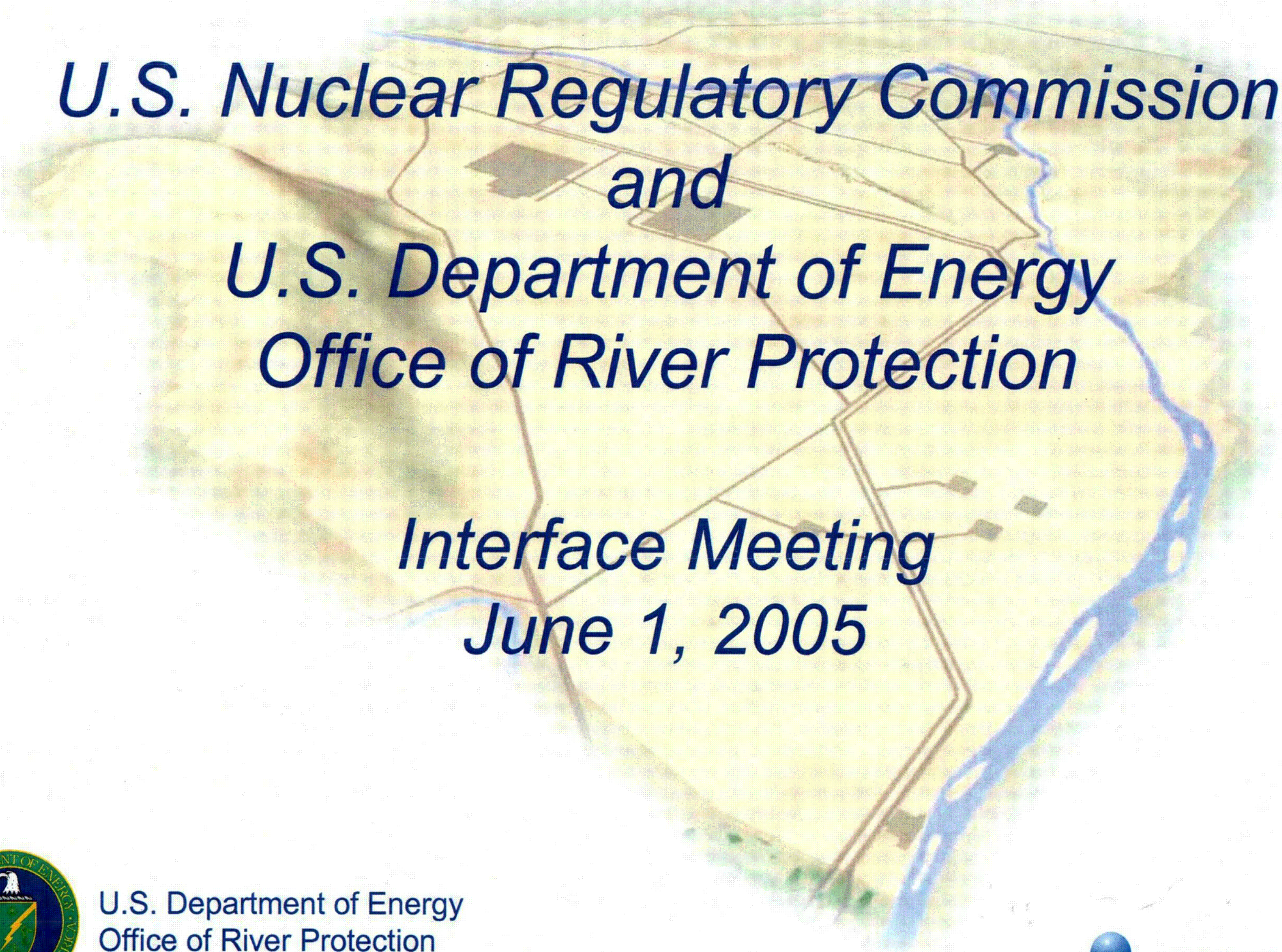

U.S. Nuclear Regulatory Commission
and
U.S. Department of Energy
Office of River Protection

Interface Meeting
June 1, 2005

U.S. Department of Energy
Office of River Protection

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Agenda

- Introductions
- ORP Draft Responses to NRC Request for Additional Information (RAI) on Single-Shell Tank (SST) C-106 Documents
- Preview of Hanford SST Performance Assessment (PA)
- Future Discussions

Background

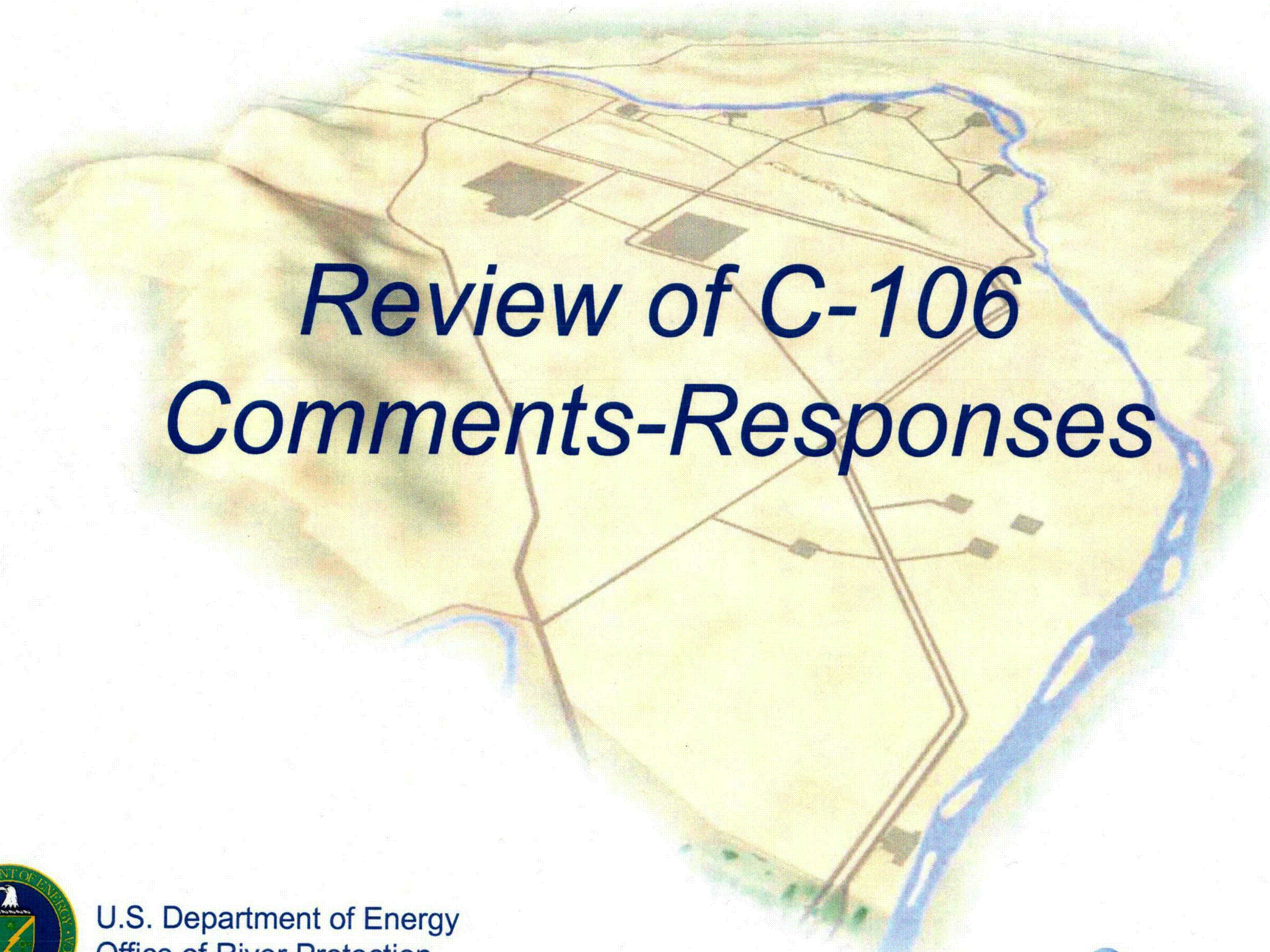
- ORP met with NRC on September 28, 2004 to discuss SST waste retrieval process and results from SST C-106 retrieval
- ORP submitted SST C-106 documents to NRC for review and comment on October 6, 2004
- NRC responded with RAI on January 19, 2005
- ORP meeting with NRC (June 1, 2005) to review draft DOE responses to the RAI on SST C-106

Review of Comments and Responses

- Discuss Responses
- NRC Feedback

Path Forward: Completion of SST C-106 Document Review

- ORP asking for feedback from NRC on draft RAI responses
- ORP will revise draft responses, as necessary, and formally transmit to NRC
- NRC completes review of SST C-106 documents



Review of C-106 Comments-Responses

U.S. Department of Energy
Office of River Protection

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Overview of Comments and Responses

- NRC comments on C-106 documents included:
  - 12 Specific Technical Comments
  - 4 Clarifying Comments

Comment 1: Provide Information on Selection of Oxalic Acid

- Information provided in the response to comment includes:
  - Scoping tests were performed on simulated sludge samples at PNNL (PNNL-14378, *Candidate Reagents for Dissolution of Hanford Site Tank Sludges*) with a wide range of dissolving agents.
    - The tests determined that while no single reagent was capable of dissolving all five of the major solid phases present in SST C-106 sludge, the best overall performers were oxalic acid and hydrofluoric acid.
    - Hydrofluoric Acid was rejected because of health and safety concerns and corrosion concerns.
  - Similar scoping studies performed at the Savannah River Site (SRS) with actual tank waste sludge (WSRC-TR-2003-00401, *Waste Tank Heel Chemical Cleaning Summary*) concluded that:
    - "The results of the evaluation conclusively support oxalic acid as the cleaning agent of choice..."
  - Caustic leaching (sodium hydroxide) was eliminated from consideration based on results of studies with actual SST C-106 sludge performed by PNNL (PNWD-3013, *C-106 High-Level Waste Solids: Washing/Leaching and Solubility Versus Temperature Studies*)
  - A description of chemical treatment of sludge and sludge dissolution data provided in *Laboratory Testing of Oxalic Acid Dissolution of Tank 241-C-106* (CH2M HILL Hanford Group, Inc., 2003).
- Copies of all cited studies provided on a CD accompanying the comment responses.

Comment 2: Provide a discussion on the effects of temperature on tank sludge dissolution

- Information provided in the response to comment includes:
  - The tests of oxalic acid dissolution of sludge conducted in the laboratory were at ambient temperature, about 23 °C (74 °F). The reactions were fairly rapid at that temperature – most of the dissolution occurred in the first day. The amount of sludge that dissolved was controlled by the chemical composition of the acid and the sludge, not by the temperature.
  - The acid used in SST C-106 was typically started at a warmer temperature than the laboratory tests, but less than 100 °F. Implementation of the chemical treatment procedure above this temperature was limited by the temperature controls for the tank. Given the tank temperature constraints, further investigation into the effects of temperature was impractical.

Comment 3: Provide information on Modified Sluicing Followed by New Vacuum Retrieval System

- Information provided in the response to comment includes:
  - The vacuum system has limited “reach” within the tank. By using sluicing, the solids are moved toward the location of the vacuum system to improve vacuum system efficiency. Without sluicing, the solids are too dispersed in the tank and the vacuum system cannot reach enough solids to achieve the desired end volume.

Comment 4: Provide justification for the removal goal used in the analysis of alternative removal technologies

- Information provided in the response to comment includes:
  - To ensure the residual waste volume in the tank is less than or equal to the 360 ft3 requirement, the removal volume goal was conservatively set at 160 ft3 based on the estimation error associated with the residual waste volume determination and the additional uncertainties associated with the waste retrieval technology performance.
  - Use of the 95% confidence interval for estimation of residual waste volume was established as the preferred method of reporting residual waste volume by Ecology.
- Copies of all cited studies provided on a CD accompanying the comment responses.

Comment 5: Provide an explanation of why the inventory of Cr increased

- Information provided in the response to comment includes:
  - The pre-retrieval inventory for chromium contains a typographical error (2.9E+00 kg) which will be corrected in the revised document.
  - 2.9E+2 or 290 kg reduced to 3.79 kg.

Comment 6: Provide an explanation of the use of "worst case" estimate of the efficacy of additional sluicing and acid dissolution operations to conclude the waste retrieval goal would not be met

- Information provided in the response to comment includes:
  - The "worst case" analysis was one of the bounding cases used for the full analysis of efficacy of further sluicing campaigns to remove waste from SST C-106.
  - The text will be modified to more fully explain the bounding conditions included in the analysis.
  - The conclusion of the analysis of an upper and lower bounding estimate of waste retrieval using additional sluicing concludes that : "This analysis shows that to approach the upper bound of estimated waste removal will require significant quantities of additional water and rapidly fill the available DST tanks storage capacity needed for all tank retrievals, and that approaching the lower bound of estimated waste retrieval will not be able to achieve the waste retrieval goal of 10.2 m3 (360 ft3)."

Comment 7: Justify the use of the industrial land use scenario as a basis for the calculation of ILCR and HI values of contaminants

- Information provided in the response to comment includes:
  - Industrial Scenario was used to ensure consistency with remediation taking place in the surrounding Central Plateau documented in:
    - Comprehensive Land Use Plan Environmental Impact Statement (EIS).
    - Advice from stakeholders and regulators when establishing the Central Plateau Risk Framework and provided to DOE in the form of advice from the Hanford Advisory Board (#132).
  - However, due to long time frames involved for release of tank residue, a residential scenario will be calculated for ILCR and HI and an All Pathways Farmer will be calculated for dose in a revision to the risk assessment.
- Copies of all cited studies provided on a CD accompanying the comment responses.

Comment 8: Information is needed to support the conclusion that all relevant contaminants were included in the risk analysis

- Information provided in the response to comment includes:
  - All contaminants that were detected by the laboratory in the post-retrieval sample were included in the risk assessment, provided that contaminant had either cancer slope factors (SF) or reference dose (RfD).
  - The screening process will be revised to include all detected and non-detected contaminants in the risk assessment unless there is a specific technical basis for excluding a non-detected contaminant from the analysis.
- A copy of the revised contaminant screening process being implemented with Ecology concurrence is attached to the comment responses.

Comment 9: Provide Information to support the conclusion that the residual inventory in C-106 reflects uncertainty in the composition of the residual waste

- Information provided in the response to comment includes:
  - Homogeneity of the remaining waste was due to the
    - physical mixing which distributed waste uniformly
    - chemical changes resulting from the dissolution reaction of the oxalic acid, which reduced the residuals to a stable form.
  - Formulae given in Variance Components (Searle et al. 1992) were used to estimate the mean concentration and for all analytes that had 50% or more of their reported values greater than the detection limit, the standard deviation.
- Copies of all cited studies provided on a CD accompanying the comment responses.

Comment 10: Clarify or delete the reference to consulting with NRC on near surface disposal

- Information provided in the response to comment includes:
  - DOE will delete from the document the unclear sentence that reads as follows: "DOE continues to consult with the NRC regarding issues associated with near surface disposal of radioactive waste."
  - DOE does provide NRC with updates to its LAW disposal PAs consistent with the 1997 agreement.

Comment 11: Use of the most optimistic value of a parameter requires justification

- Information provided in the response to comment includes:
  - An average inventory was calculated for each analyte based on the mean concentration, mean density, and the best estimates of waste volumes (including the volume of waste on the stiffener rings). An upper bound inventory was calculated to account for analytical uncertainty and uncertainties associated with the estimated waste volumes.
  - Two values of the waste associated with the stiffener rings were used: the nominal volume of waste on the stiffener rings (17.3 ft3) and the upper uncertainty value (17.3 + 3.0 = 20.3 ft3).

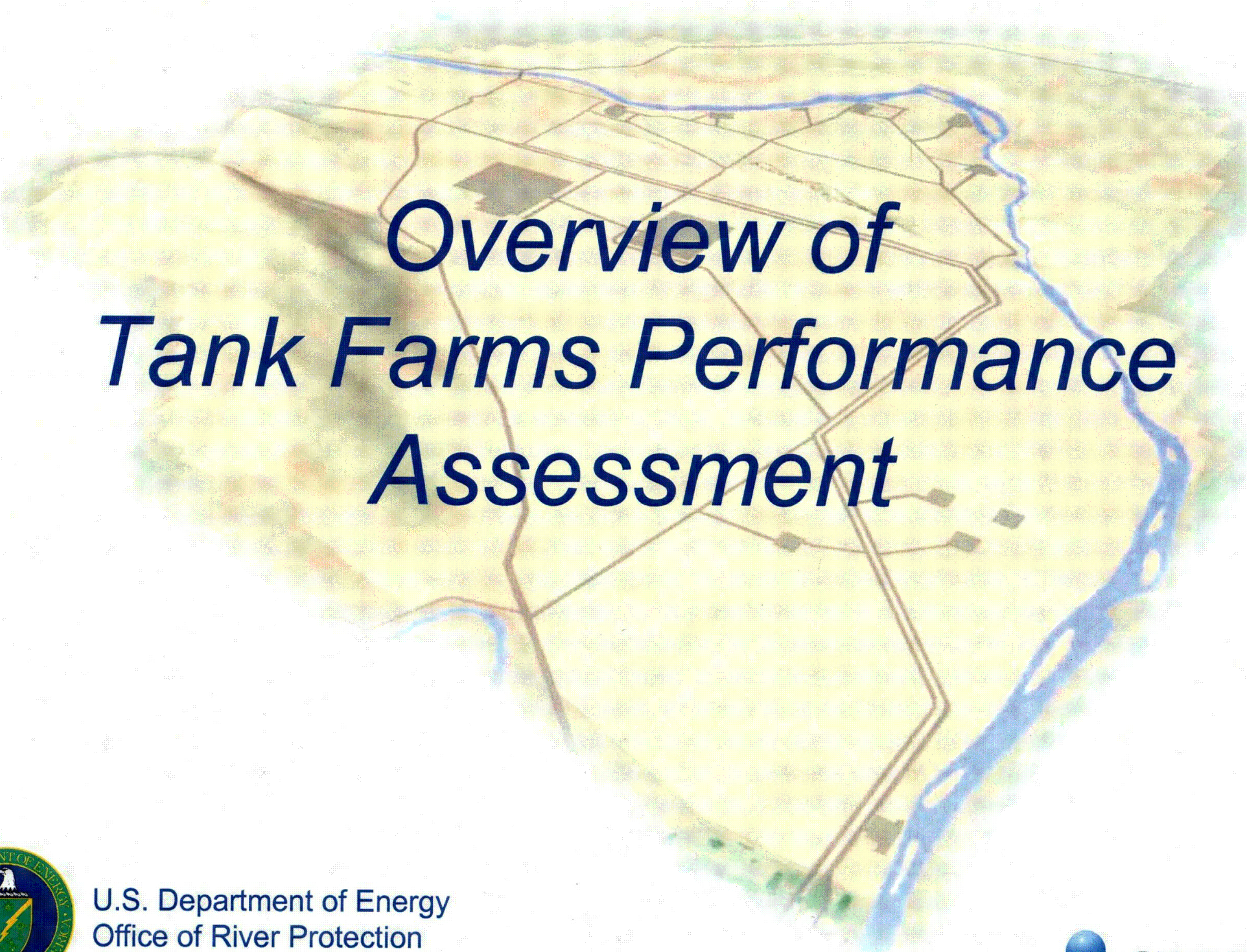
Comment 12: Explain why the ICR values for the scenarios noted have a different ratio than the ratio for the all-pathways radiological dose in groundwater

- Information provided in the response to comment includes:
  - The doses (mrem) are the total dose the first year after irrigation starts. The ILCR is the total risk for either 30 years (All Pathways) or 70 years (Native American).
  - The 30 year average dose for the All Pathways Farmer is shown in Appendix G (Rittmann, 2004), 8.73E-3 mrem/yr per pCi/L. The calculated 70 year average dose for the Native American is 2.50E-2 mrem/yr per pCi/L. The ratio of these two doses is 2.86. Scaling up by the ratio of averaging periods gives 6.67.

Responses to Four Clarifying Comments

- Corrections to the documents have been identified for each of the four (4) clarifying comments.
  - The figure on p. ES-3 will be modified to correct the risk curve to correspond with the data presented in Table 11 and Figure 11.
  - Figure 5 is in error and will be revised to reflect the text on page 2-27 and values in Table 8.
  - RPP-20577, p. 4-4 will be modified to read: "The cost per cubic foot of waste retrieved for the four additional evaluated alternatives would range from $35,000/ft3 to $84,000/ft3 or a factor of seven to 16 times greater than experienced for the 2003 retrieval campaign."
  - "List of Terms" will be modified to read "distribution coefficient".

Overview of Tank Farms Performance Assessment



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Purpose of Meeting

- Briefing on the PA draft document contents, Chapters 1 through 3
- Facilitate a preliminary review of the technical approach taken in the PA
- Receive NRC feedback (if possible) prior to the final PA
- Accelerate review of the final document
  - Expected ready for external review by NRC, State of Washington, EPA in late 2005

Role in Decision Making

- NRC consultation as required by the Tri-Party Agreement
- Provides estimate of dose/risk for all source terms to support risk informed decisions
- Provides performance information to support the completion of retrieval
- Support RCRA closure permit modifications
- Support CERCLA remediation decisions
- Fulfill the substantive requirements of DOE Order 435.1

Approval Process for Full PA

- Produced by the Tank Farm Contractor
- Approved and Released by DOE
- NRC Consultation as per DOE 435.1
- Ecology approves portions of the PA that are subject to its RCRA authority
- EPA would be involved to support Ecology to determine that closure "is proceeding in a manner not inconsistent ... under CERCLA remedial authority" Appendix I, Sec 3.1 HFFACO

Document Outline
Single Shell Tank System Performance Assessment

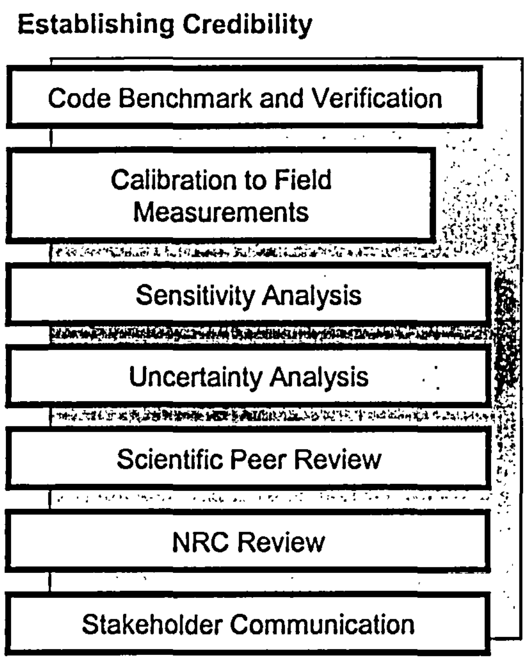
Provided for Preliminary Review

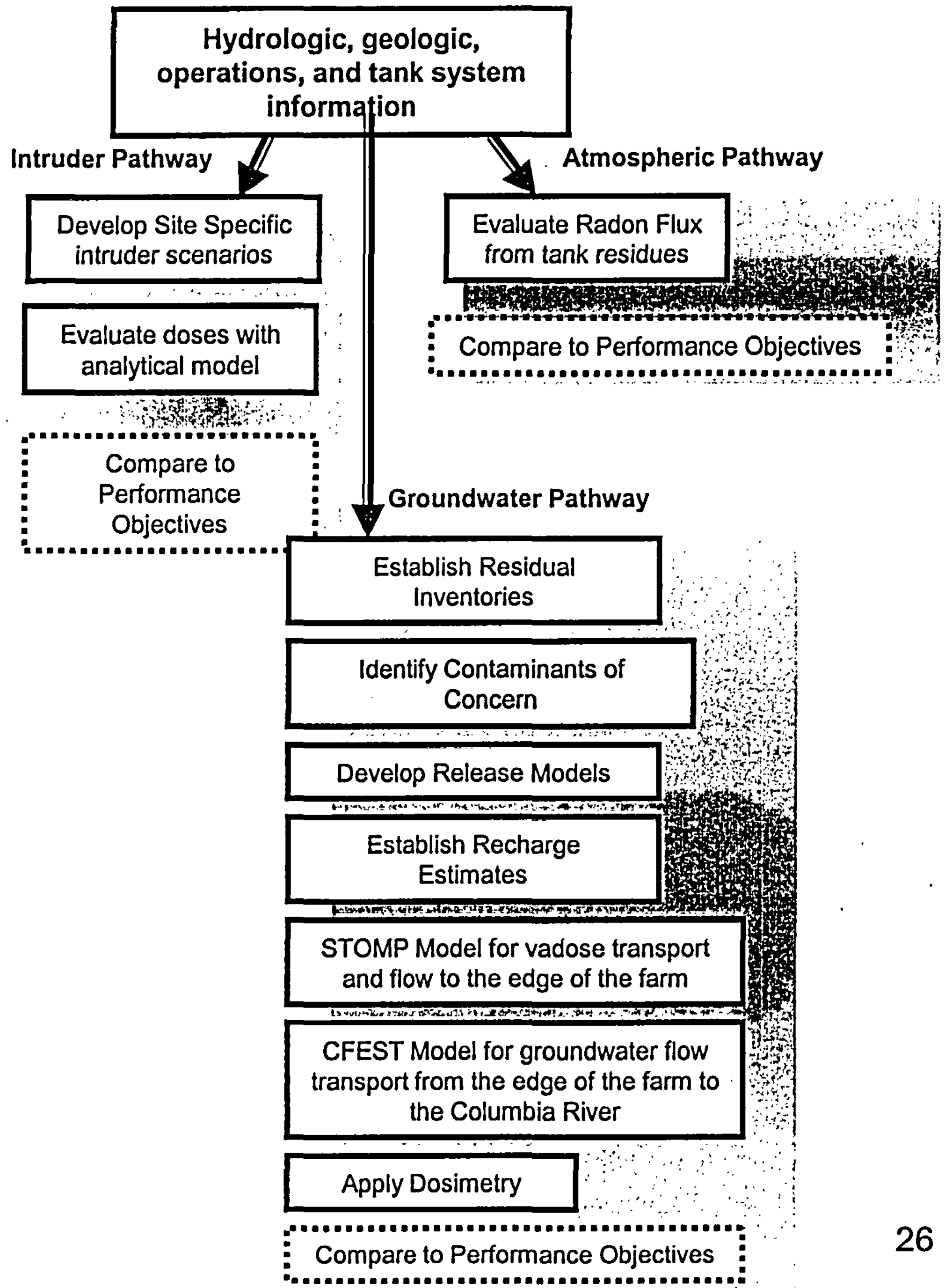
- Chapter 1
  - Purpose, Approach and Methods
- Chapter 2
  - General Data on Site and Specific Data on Each Waste Management Area (Tank Farm)
- Chapter 3
  - Conceptual Model and Sensitivity Analysis
- Chapter 4 thru 6
  - Analytical Results
- Chapter 7
  - Summary and Conclusions
- Appendices
  - A thru G contain detailed supporting information

Alignment with Previous Performance Assessments

- The SST PA is a refinement of past Performance Assessments for Single Shell Tank Farms
- The use of the PA to also address Washington State regulatory concerns is defined in Appendix I of the TPA

PA Analysis Components





Relationship Between the SST PA and Post Retrieval Risk Assessments

SST PA

Methodology, Technical Basis, Base Case, Sensitivity Results, Conclusions, & Recommendations

- WMA C
- WMA A-AX
- WMA B-BX-BY
- WMA S-SX
- WMA U
- WMA T
- WMA TX-TY

Tank Risk Assessment

(primarily updated simulation results focusing on a component and using post-retrieval in tank sample data)

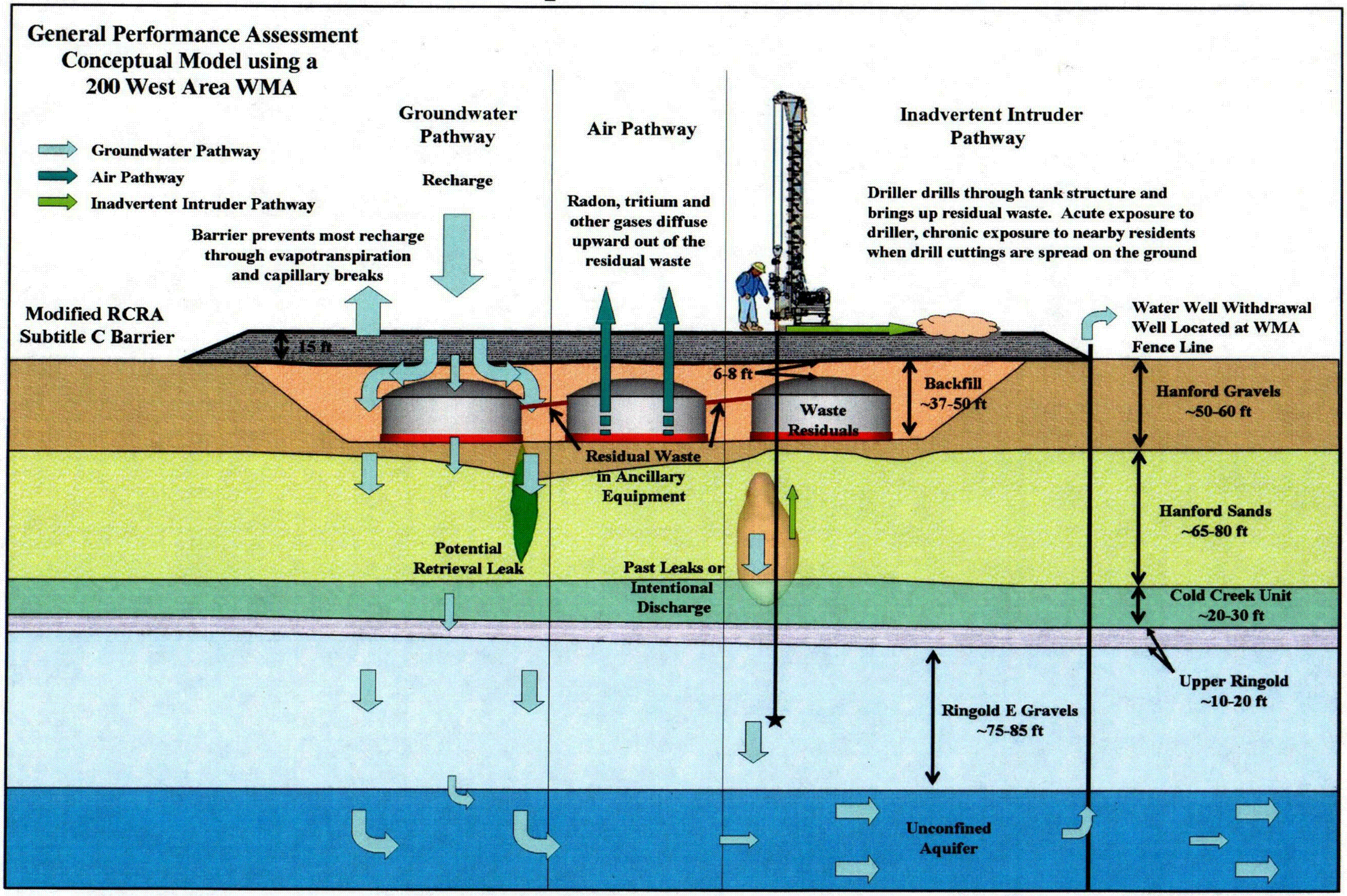
Uses all the BBI Data (radiological and non radiological)

Uses all lab data available to replace BBI data, where possible

Organizing Principles

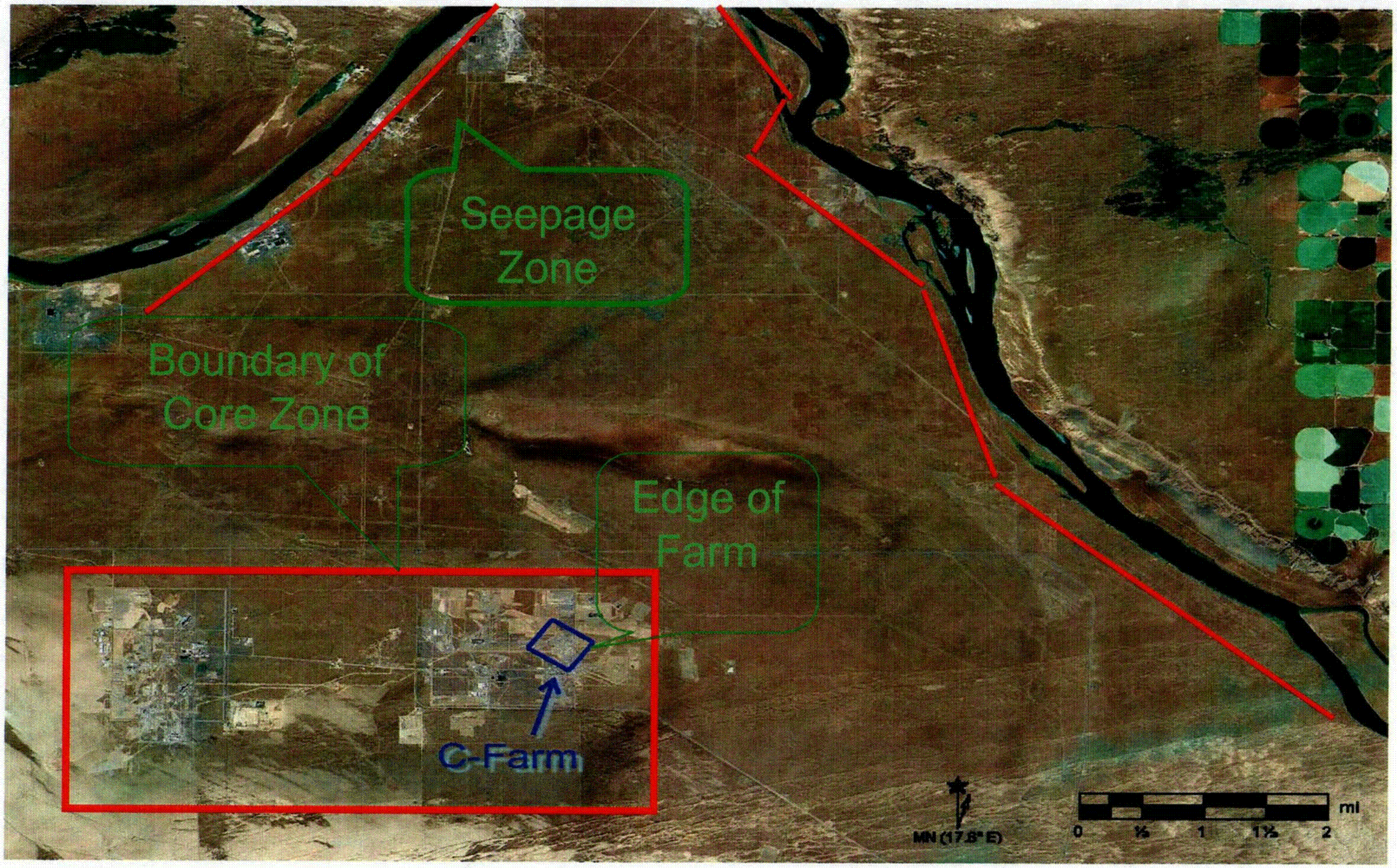
- Defense in Depth philosophy
  - Identification of engineered barriers and geologic features
- Analysis of controlling engineered components, and site features and processes
- Examination of alternative scenarios to the base case to address the robustness of the disposal system to meet performance objectives

Conceptual Model*



*Assumes landfill closure is the selected alternative in the final Tank Closure EIS/Record of Decision, presented for illustrative purposes only.

Approximate Locations for Points of Calculation Length of Simulation –10,000 years



Each individual facility boundary is not shown.

General Performance Objectives for Tank Closure[a]

Protection of General Public and Workers [b, c, d]	
All-pathways dose from only this facility	25 mrem in a year [c,p]
All-pathways dose including other Hanford Site sources	100 mrem in a year [e]
Chemical Carcinogens (Incremental Lifetime Cancer Risk)	10^{-5} [f]
Non cancer-causing chemicals (hazard index)	1[f]
Protection of an Inadvertent Intruder [e,g,o]	
Acute exposure	500 mrem
Continuous exposure	100 mrem in a year
Protection of Groundwater Resources [b, c, d, h, j]	
Alpha emitters	
^{226}Ra plus ^{228}Ra	5 pCi/ℓ
All others (excluding uranium)	15 pCi/ℓ
Beta and photon emitters	4 mrem in a year
Protection of Surface Water Resources [b, k]	
Alpha emitters	
^{226}Ra plus ^{228}Ra	0.3 pCi/ℓ [m]
All others (excluding uranium)	15 pCi/ℓ [m]
Beta and photon emitters	1 mrem in a year [m]
Protection of Air Resource [b, n]	
Radon (flux through surface)	20 pCi m^{-2} s^{-1}
All other radionuclides	10 mrem in a year

[a] All doses are calculated as effective dose equivalents. Values given are in addition to any existing amounts or background.
[b] Evaluated for 1,000 years, but calculated to the time of peak or 10,000 years, whichever is longer.
[c] Groundwater use starts at the time when groundwater contaminated by historical Hanford Site operations (e.g., before the year 2000) is estimated to be potable.
[d] Evaluated at the point of maximal exposure, but no closer than the fence line of the waste management area in which the tank farm belongs. Also calculated at the edge of the 200 Area Core Zone and just before groundwater enters the Columbia River.
[e] DOE Order 435.1, *Radioactive Waste Management* (DOE 1999a).
[f] Washington State Model Toxics Control Act (WAC 173-340), as applicable.
[g] Evaluated for 500 years, but calculated from 100 to 1,000 years.
[h] All concentrations are in water taken from a well.
[j] National Primary Drinking Water Regulations (40 CFR 141), as applicable.
[k] Evaluated at well at the edge of the Columbia River, no mixing with the river is assumed.
[m] Washington State Surface Water Standards (WAC 173-201A), as applicable.
[n] National Emission Standards for Hazardous Air Pollutants (40 CFR 61H and 40 CFR 61Q).
[o] 10 CFR 20 Standards for the Protection Against Radiation
[p] 10CFR 61 Licensing Requirements for Land Disposal of Radioactive Waste

Assumed Base Case Scenarios

Future Land Use and Time Frame Assumptions Base Case Analysis		
Time Frame	**Scenario**	**Comment**
2000 – 2032	DOE Cleanup/Closure Activities	Current conditions
2032 – 2332	Industrial Land Use, No Groundwater Use	The combination of active and passive institutional controls assumed effective for a period of 300-500 years after closure. Other time periods will be evaluated in sensitivity analyses.
2332 – 12032	Industrial Land Use, Groundwater Use	Drilling may occur after 300 yrs. No waste exhumation occurs.
2532	Inadvertent Intruder, Rural Pasture Use	Passive institutional controls are assumed to end in 2532 and intrusion into the waste site occurs, bringing waste to the surface.

Active and passive institutional controls are under discussion within DOE and the NRC, and the values given are for discussion purposes only at this time.

Assumed Alternative Land Use Scenarios

Alternative Land Use Scenarios	
Receptor	**Location**
Future Alternative Plausible Exposure Scenarios	
Residential	Edge of the Waste Management Area after 300 years
All pathway farmer	Edge of the Waste Management Area after 300 years
DOE Order 435.1 Inadvertent Intruder Exposure Scenarios	
Intruder into the Waste Site	Onsite ground maximum[1]
Post Intrusion: Suburban Gardener, Commercial Farmer	Onsite ground maximum[1]

Notes:
1 - Ground maximum is defined as within the closed waste management area.

Sensitivity Analysis Infiltration Assumptions

Groundwater Pathway – Partial Summary of Base Case Parameters and Expected Ranges				
Natural and Engineered Barriers/Features	**Feature/Process**	**Base Case**	**Sensitivity Analysis**	
			Minimum	**Maximum**
Surface	Infiltration	An infiltration rate of 100 mm/yr for the base case during tank farm operation up to 2032 **(Fayer, 2004, Wittriech, 1998)**	40 mm/yr	140 mm/yr
	Infiltration	An infiltration rate of 0.5 mm/yr for the base case for the barrier from 2032 to 2532. **(Fayer, 2004, Ward and Fayer, 1995)**	0.1 mm/yr	1.0 mm/yr
	Infiltration	An infiltration rate of 1.0 mm/yr for the base case for the barrier from 2532 to 12,032	0.5	3 mm/yr – 200 East 4 mm/yr -200 West **(GOSPL, 2004)**

Additional Sensitivity Analyses to Determine the Impact of an Alternative not Considered in the Base Case on the Performance of the System

Sensitivity Analyses

Sensitivity Analysis -- "What if" Conditions for the Examination of the Level of Protectiveness Provided by the Base Case for the Protection of Groundwater (2 pages)		
Barrier/Feature	**Alternative**	**Condition**
Surface Cover	1	What is impact of closing the farm before 2032?
	2	What is the impact of closing the farms after 2032?
	3	What is the impact of an interim barrier by 2010 over major leaks?
	4	What is the impact of episodic infiltration?
	5	What if the barrier subsides?
	6	What if irrigated farming occurs after the end of active institutional control?
	7	What if the barrier fails at the end of passive controls?
	8	What if the barrier fails prior to the end of passive controls?
Grouted Tank/ Structure	9	What if the 100-series tanks leak more than the assumed 8000 gallons/tank?
	10	What if retrieval leaks occur at the 200-series tanks, regardless of the use of dry retrieval methods?
	11	What if the grout does not provide the level of encapsulation expected?
	12	What if more tank waste residue is left than expected?
	13	What if a water line breaks over a past spill prior to tank stabilization?
	14	What if the tanks behave like a "bath tub" and collect water, which then releases suddenly?

Sensitivity Analysis

Alternatives to the Base Case or "What if" Conditions for the Examination of the Level of Protectiveness Provided by the Base Case for the Protection of Groundwater (2 pages)		
Barrier/Feature	**Alternative**	**Condition**
Vadose Zone	15	What if potential preferential paths were missed during characterization?
	16	What if the groundwater level does not decline as projected?
	17	What if the depths of past leaks were underestimated?
	18	What if past leak contamination was underestimated?
	19	What if remediation of up to 50% of past leaks were possible?
Unconfined Aquifer	20	What if the plume moves faster in the aquifer than predicted?

Proposed Process

- ORP will provide the NRC with draft Chapters 1 through 3 today (electronic copy)

- NRC to provide informal feedback in 1-2 months

- ORP will submit the final document to NRC in late 2005

Future Discussions

- SST Performance Assessment
- Modification or Replacement of ORP-NRC Interagency Agreement
- NRC Site Visit to Hanford