CH2MHILL
Plateau Remediation Company

Overview – 300 Area RI/FS Report and Proposed Plan (Draft A)

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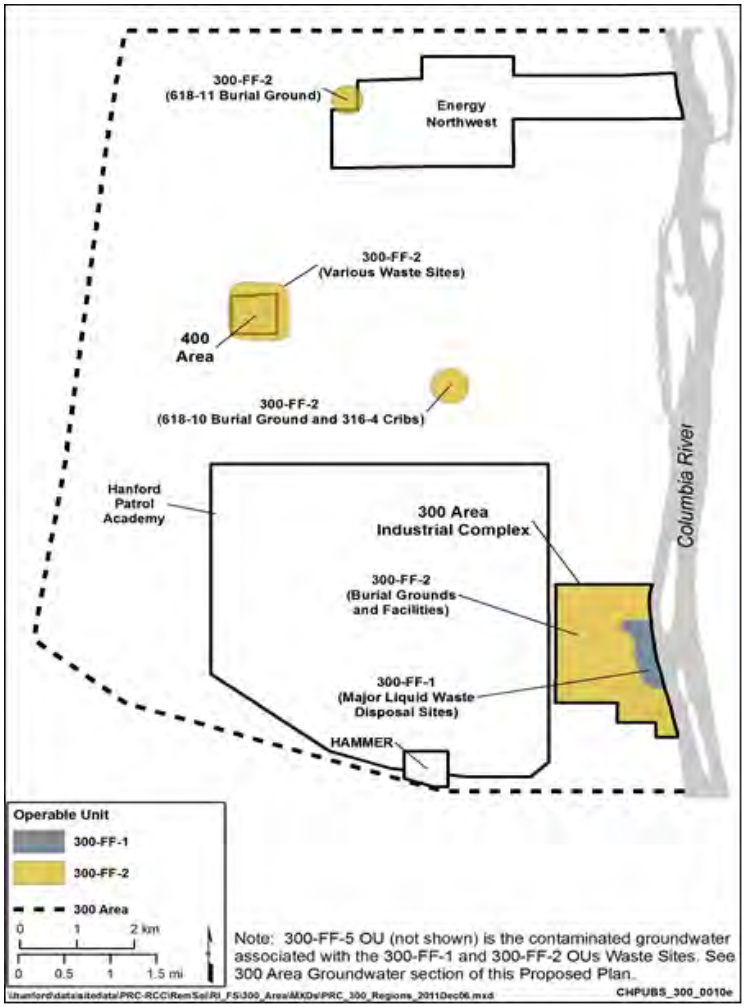
One Culture. One Team.

Agenda

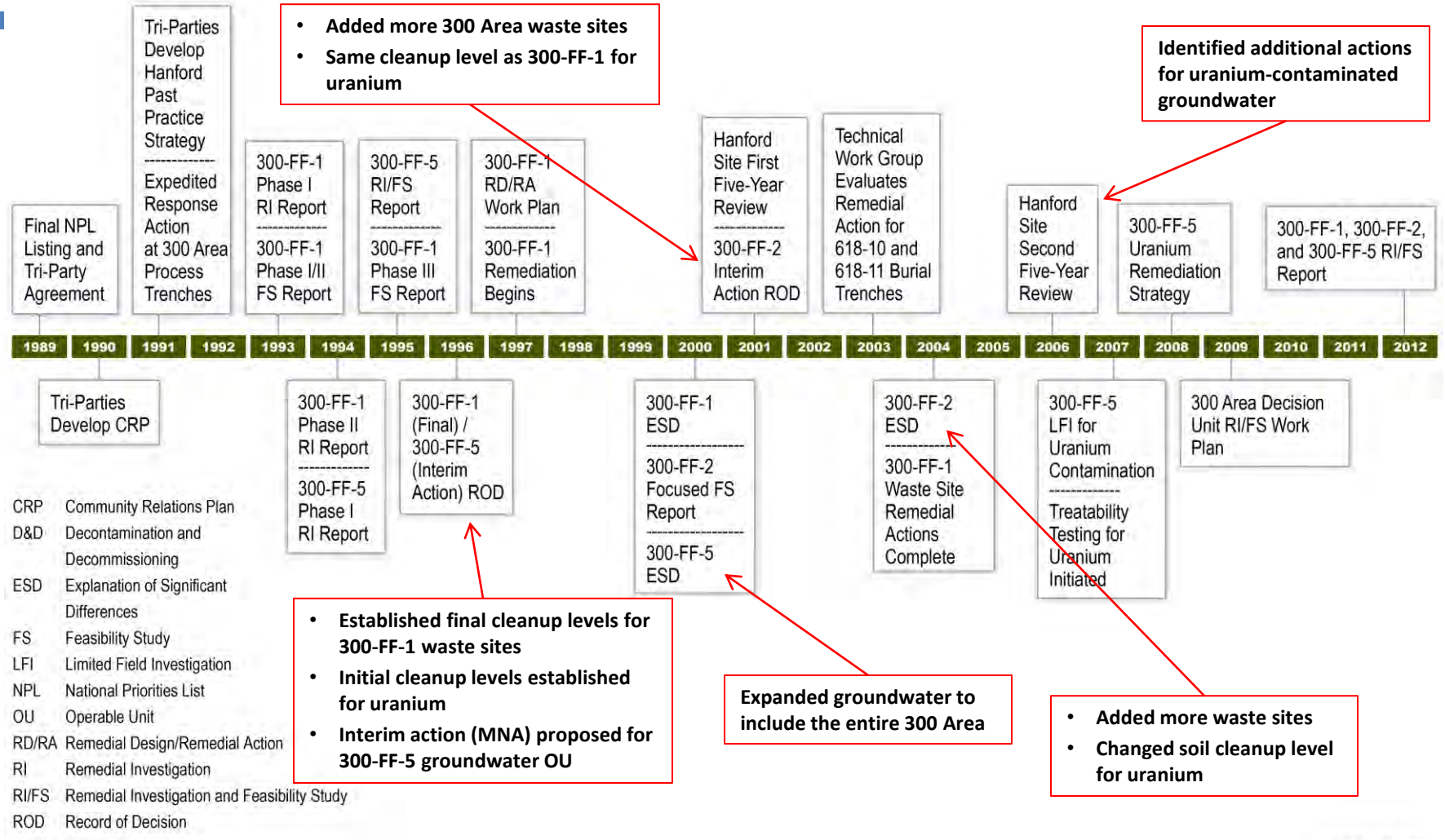
- Waste Site Summary
- Previous 300 Area Regulatory Documents
- CERCLA Five-Year Review
- Risk Assessment/Preliminary Remediation Goals
- Groundwater Conceptual Site Model
- Groundwater Modeling/Remediation Timeframe
- Remedial Alternatives
- Identification of Preferred Alternative
- Comparison to 100 Area Documents

300 Area Waste Site Summary

- 552 potential waste sites identified in 300 Area
  - 275 sites not accepted during waste site evaluation process
- 277 Waste Sites in 300-FF-1 and 300-FF-2 OUs
  - 122 wastes site recommended for no further action (final or interim closed)
  - 155 waste sites evaluated in feasibility study



Previous 300 Area Regulatory Documents



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300 Area – 2nd CERCLA Five-Year Review Report (November 2006)

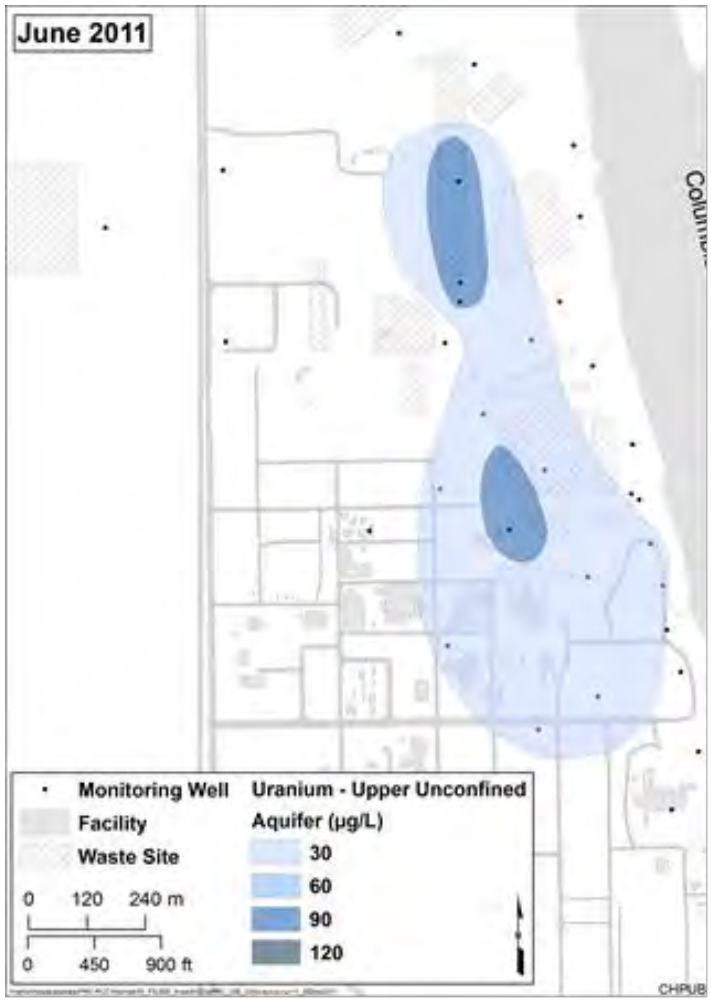
- The following issues/actions were identified for the 300 Area:
  - **Issue 19**. *Predicted attenuation of uranium contaminant concentrations in the groundwater under the 300 Area has not occurred. DOE is currently performing additional characterization and treatability testing in the evaluation of more aggressive remedial alternatives.*
  - **Action 19-1**. *Complete focused feasibility study for 300-FF-5 Operable Unit to provide better characterization of the uranium contamination, develop a conceptual model, validate ecological consequences and evaluate treatment alternatives. Concurrently test injection of polyphosphate into the aquifer to immobilize the uranium and reduce the concentration of dissolved uranium. These activities support a CERCLA proposed plan.*

Risk Assessment/PRGs

- Human Health: same approach used for 100-K RI/FS Document. Only difference is the introduction of an industrial worker exposure scenario and associated evaluations
- Ecological: same approach used for 100-K RI/FS Document
- PRGs: two sets are presented for industrial and unrestricted areas

Uranium Contaminated Groundwater 300 Area

300 Area Groundwater Concentrations - Uranium



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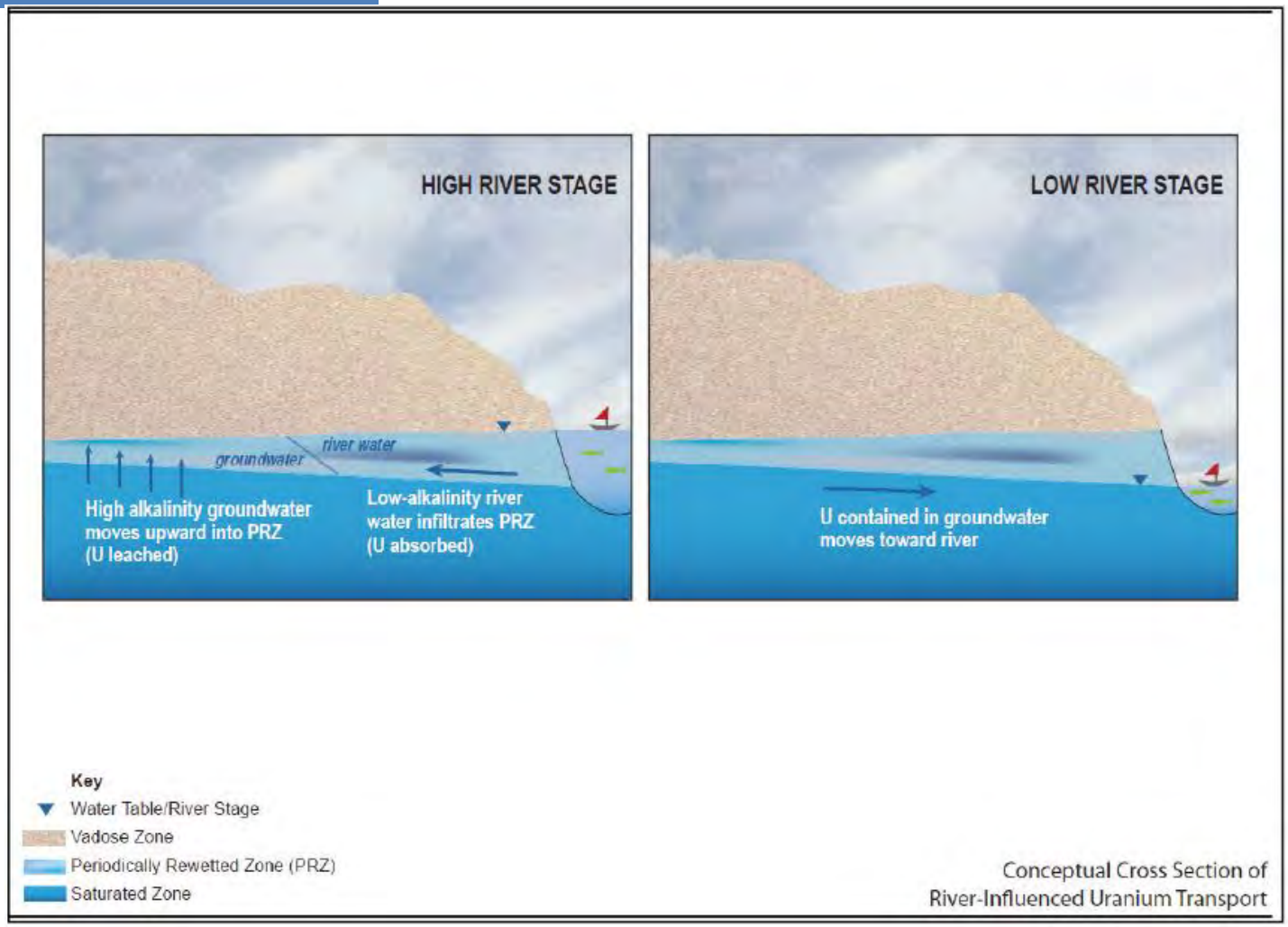
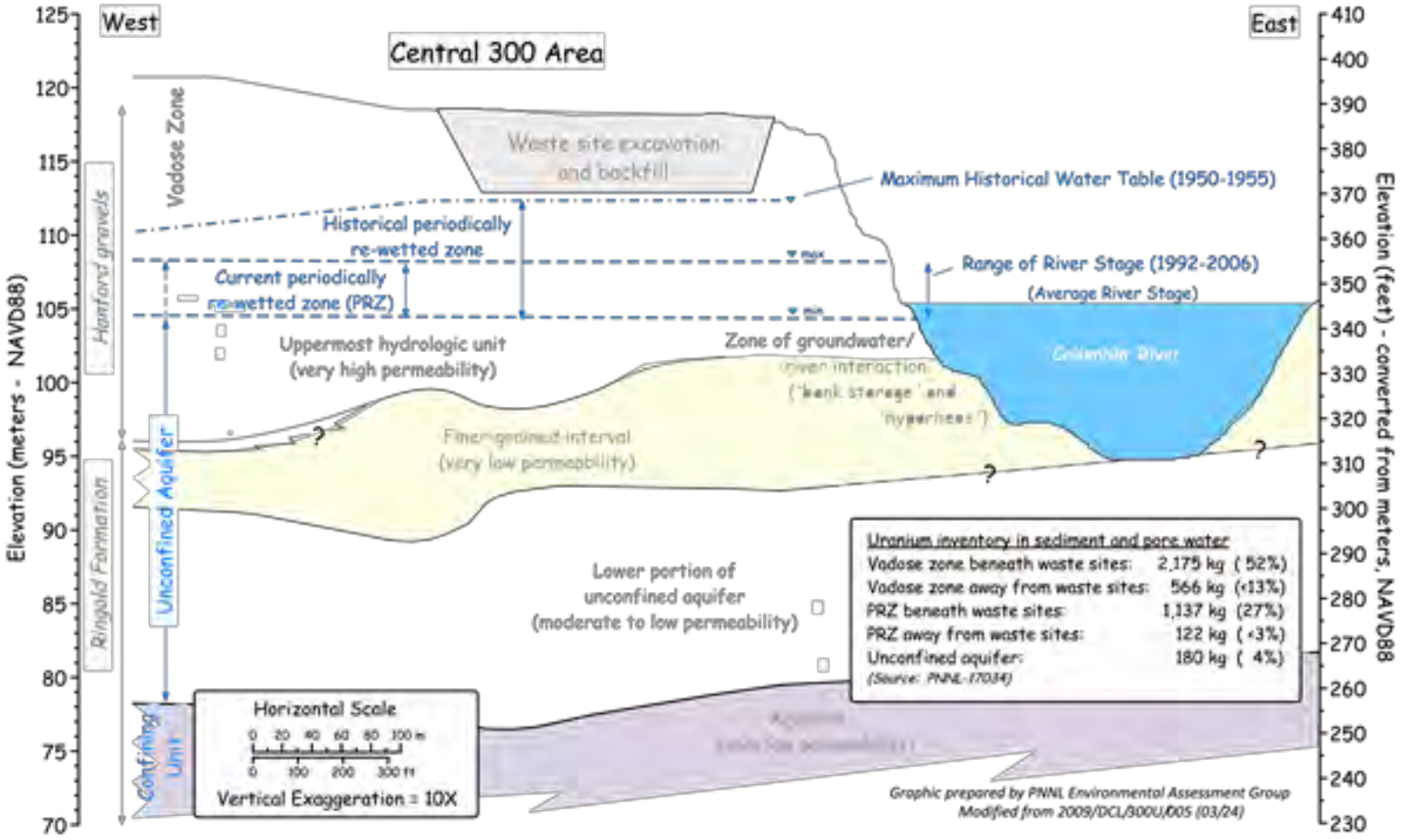
River-Influenced Uranium Transport

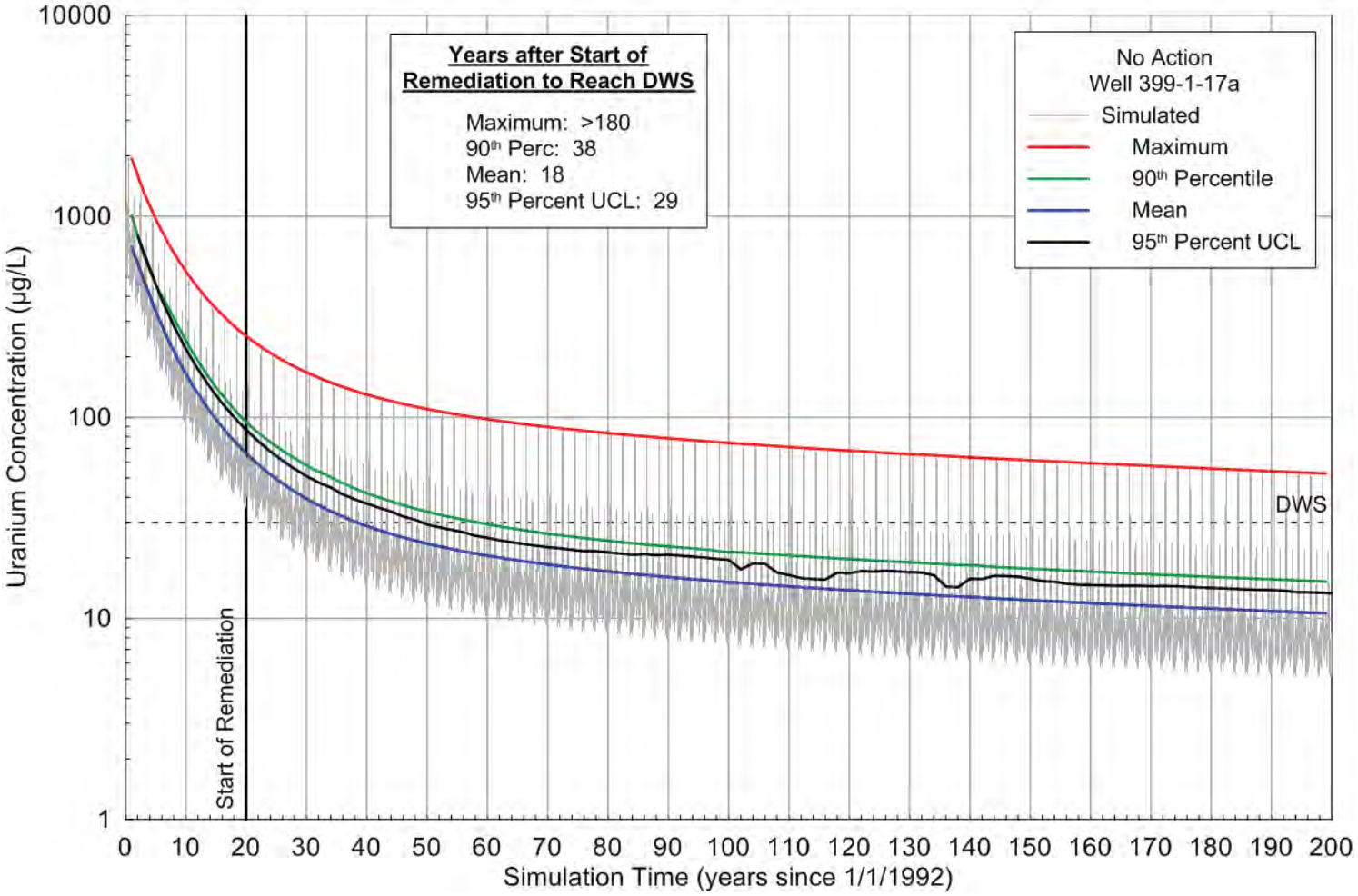


Conceptual Cross Section of River-Influenced Uranium Transport

Uranium Inventory Estimate



Estimated Time to Cleanup Uranium in 300 Area – No Action



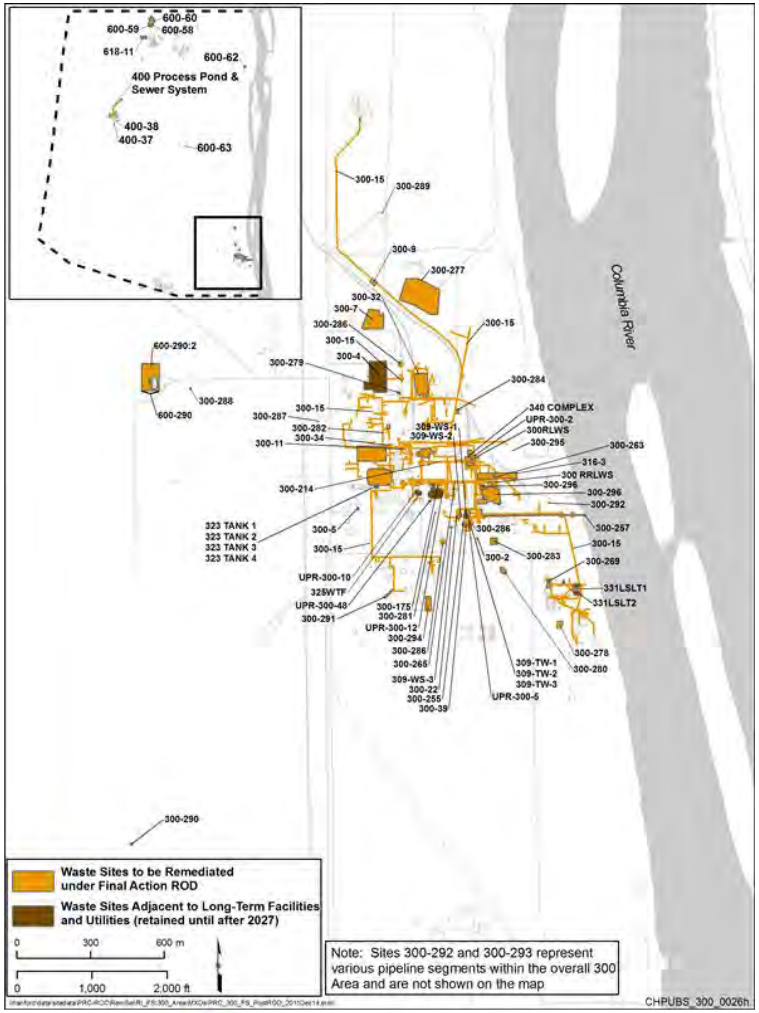
Remedial Alternatives

- **Alternative 1-**No Action
- **Alternative 2-**RTD and Groundwater Monitoring
- **Alternative 3-**RTD, Uranium Sequestration, and Groundwater Monitoring
- **Alternative 4-**RTD, Uranium Sequestration, Focused Deep RTD, and Groundwater Monitoring
- **Alternative 5-**Expanded RTD and Groundwater Monitoring

Alternative 2—RTD and Groundwater Monitoring

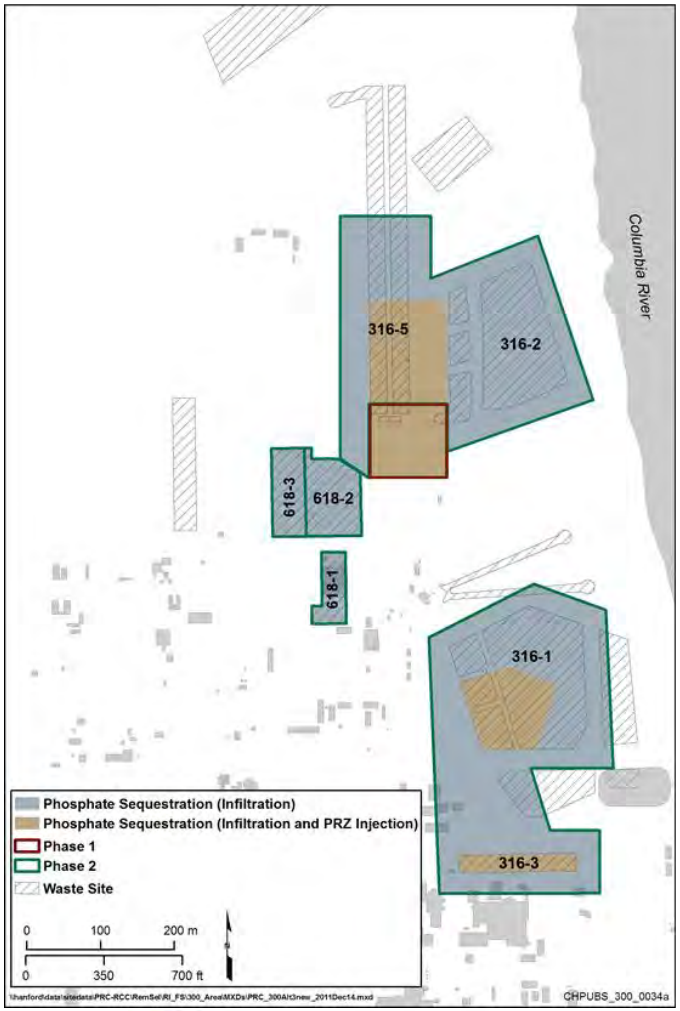
- Complete on-going remediation under 300-FF-2
- RTD
  - Waste sites to 15 ft[1]
  - Pipelines to 15 ft[1]
  - Pipeline (300-15) that transported majority of uranium to disposal sites
- MNA for tritium in groundwater
- Groundwater monitoring for uranium, TCE, cis-1,2-DCE, chromium, and nitrate
- Institutional controls

[1] Protection of human health and ecological receptors from direct exposure



Alternative 3—RTD, Uranium Sequestration and Groundwater Monitoring

- RTD. Same as Alternative 2
- Uranium sequestration through both surface and deep application
  - Phased implementation with performance criteria and timeframes
- MNA for tritium in groundwater
- Groundwater monitoring for uranium, TCE, cis-1,2-DCE, chromium, and nitrate
- Institutional controls



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Phased Implementation for Alternative 3

- Phased implementation due to inconclusive results of delivering phosphate to contamination based on previous field tests
  - Aquifer tests impacted by fast groundwater flow velocities (address by timing of application)
  - Surface infiltration tests impacted by low permeability soils (address by both surface and deep application)

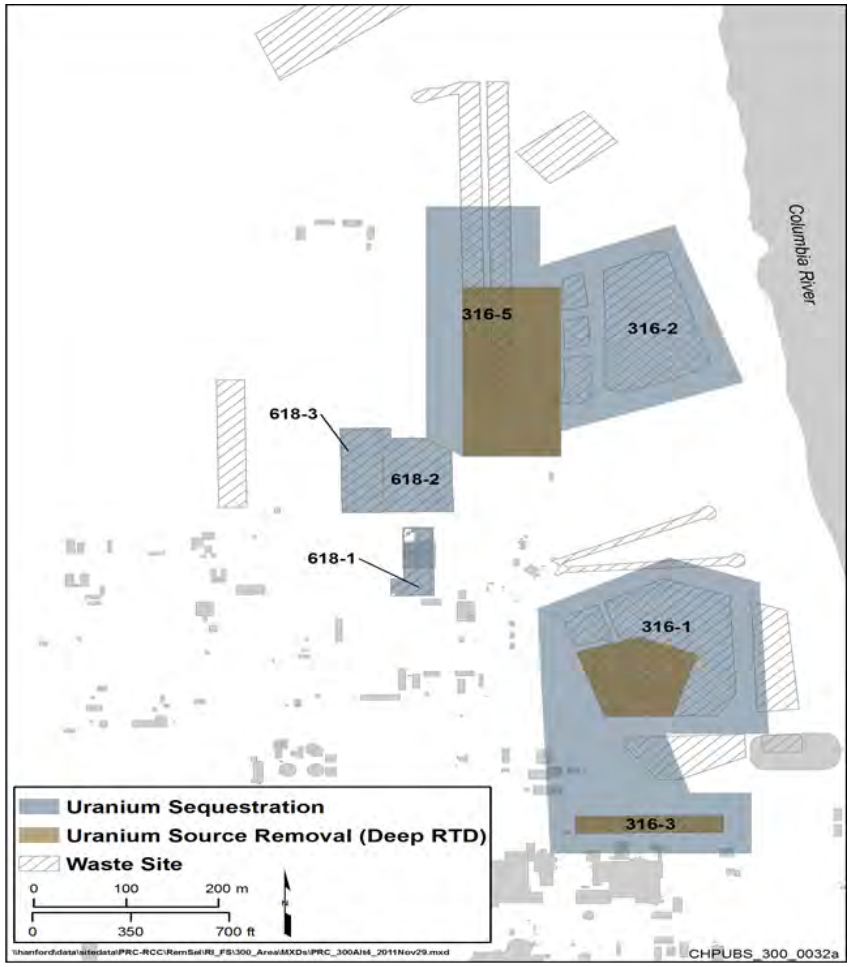
***Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 540-R-98-031)**

- Phased approach is appropriate where complex ground-water contamination problems are present (e.g., U geochemistry)
- Phased response actions can be implemented by a single action that is implemented in more than one phase (in one decision document)

- Phase 1 will determine if technology is viable to sequester uranium in the vadose zone/PRZ that will reduce mass flux to the groundwater, allowing groundwater concentrations to decrease below the DWS
  - Estimated timeframe for Phase 1 is four years. During first two years, vadose zone and PRZ soil samples will be collected for uranium extraction tests (before and after phosphate application) with a goal of demonstrating 50% reduction in mobile uranium. Groundwater monitoring will be performed over the four year period to confirm effectiveness of the techology.
- If successful, then fully implement. Otherwise, continue with groundwater monitoring identified under Alternative 2.

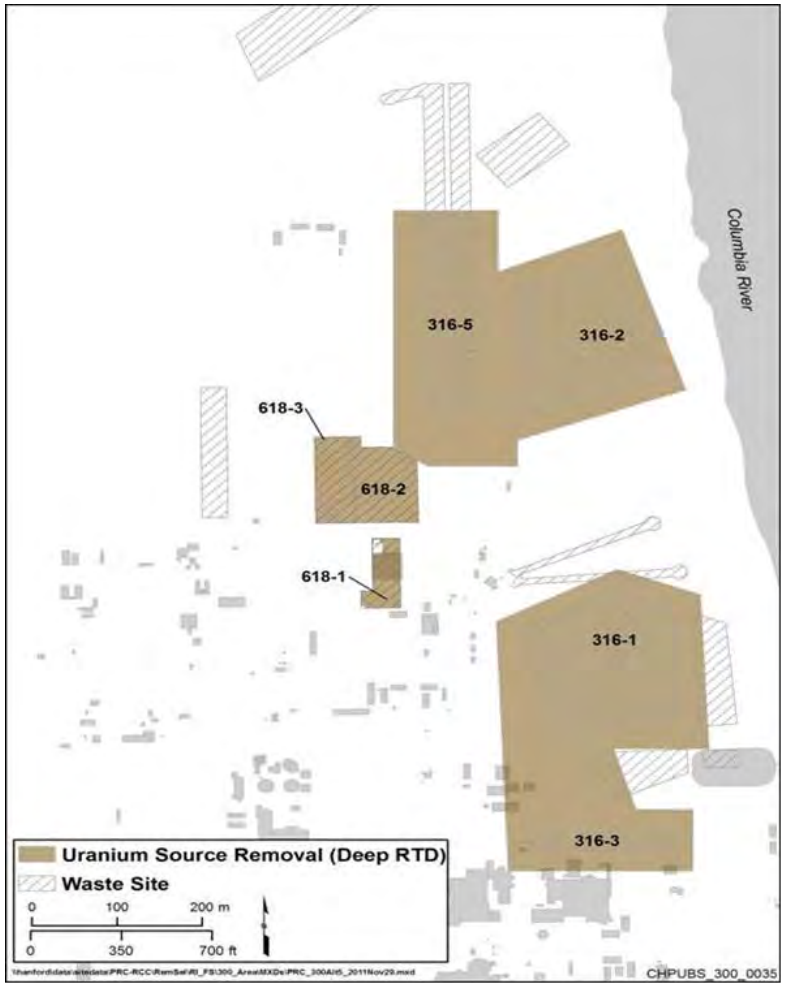
Alternative 4—RTD, Uranium Sequestration, Focused Deep RTD for Uranium and Groundwater Monitoring

- RTD. Same as Alternative 2
- Focused deep RTD for waste sites with higher uranium mass
- Uranium sequestration through both surface infiltration
- MNA for tritium in groundwater
- Groundwater monitoring for uranium, TCE, cis-1,2-DCE, chromium, and nitrate
- Institutional controls



Alternative 5—RTD, Expanded RTD for Uranium and Groundwater Monitoring

- RTD. Same as Alternative 2
- Expanded deep RTD for waste sites with higher uranium mass
- MNA for tritium in groundwater
- Groundwater monitoring for uranium, TCE, cis-1,2-DCE, chromium, and nitrate
- Institutional controls



Comparison of Alternatives

CERCLA Criteria	Remedial Alternatives 1	2	3	4	5
Threshold Criteria					
Protection of human health/environment	No	Yes	Yes	Yes	Yes
Compliance with ARARs	No	Yes	Yes	Yes	Yes
Balancing Criteria					
Long-term effectiveness and permanence	Not Evaluated	○	○	○	◎
Reduction of toxicity, mobility, or volume through treatment	Not Evaluated	●	◎	◎	●
Short-term effectiveness and time to achieve RAOs	Not Evaluated	●	◎	○	○
Implementability	Not Evaluated	◎	◎	◎	○
Estimated Time to Clean Up (years)		38	18	12	10
NPV Cost (million)					
- Waste Site Treatment*	$0	$296	$400	$545	$1,155
- Groundwater	$0	$5	$13	$11	$3
Total NPV Cost (million)	$0	$301	$413	$556	$1,158
Modifying Criteria					
State acceptance	To be determined				
Community acceptance	To be determined				

◎ = Expected to perform very well against the criterion with no apparent disadvantage or uncertainty

○ = Expected to perform moderately well against the criterion but with some disadvantages or uncertainty

● = Expected to perform poorly against the criterion and may have disadvantages or uncertainty

*Does not include the cost for construction of an additional ERDF Super Cell at $27.1 million each.

Alternatives

Alternative 1-No Action

Alternative 2-RTD and Groundwater Monitoring

Alternative 3-RTD, Uranium Sequestration, and Groundwater Monitoring

Alternative 4-RTD, Uranium Sequestration, Focused Deep RTD, and Groundwater Monitoring

Alternative 5-RTD, Expanded RTD for Uranium and Groundwater Monitoring

Preferred Alternative

Alternative 3—RTD, Uranium Sequestration and Groundwater Monitoring

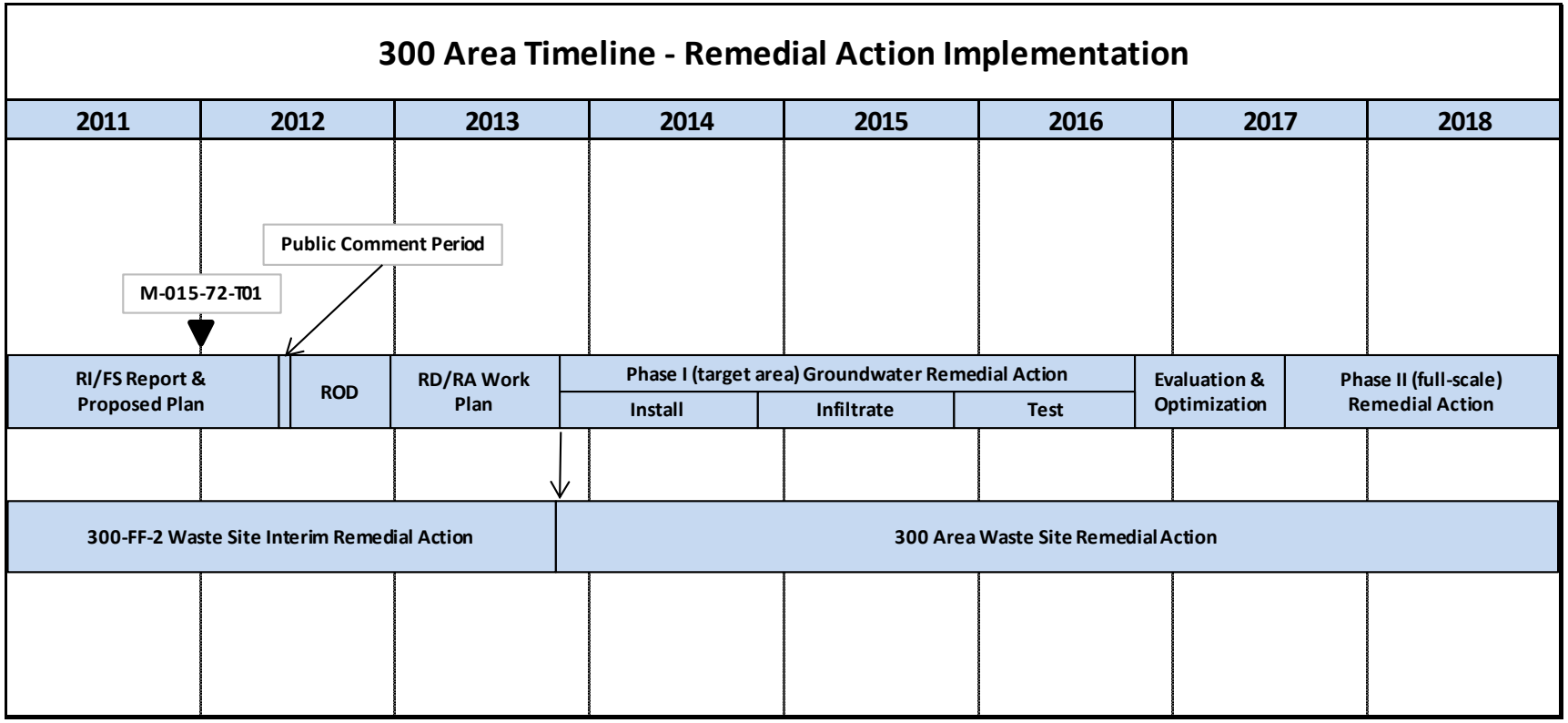
- Complete remediation under 300-FF-2 IROD (43 waste sites)
- RTD to 15 ft[1] (62 waste sites)
- Deep RTD for groundwater protection (4 waste sites)
- Uranium sequestration (6 waste sites)
  - Phased implementation
- Consolidated sites (40 waste sites)

[1] Protection of human health and ecological receptors from direct exposure

Comparison to other River Corridor RI/FS Decisions

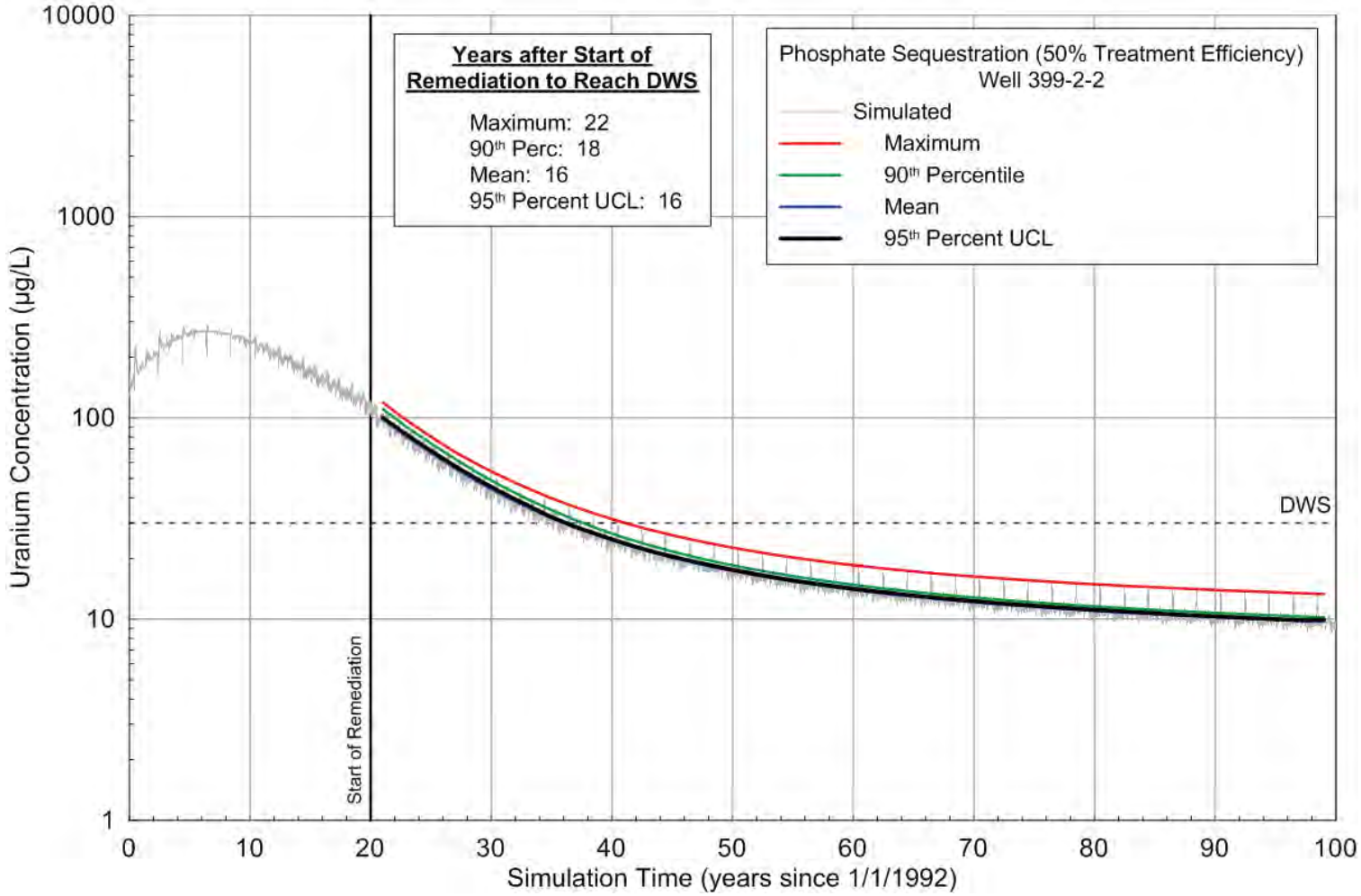
- Industrial land use is well defined and established in decisions to date
- Primary contaminant of concern is uranium vs. chromium
  - Conceptual site model has been greatly enhanced/refined
  - Understanding of transport mechanisms has been significantly improved (e.g. river/groundwater/PRZ interactions)
- Remedial technologies have been demonstrated to be effective at Hanford
  - Phased approach will demonstrate delivery methods

300 Area Timeline

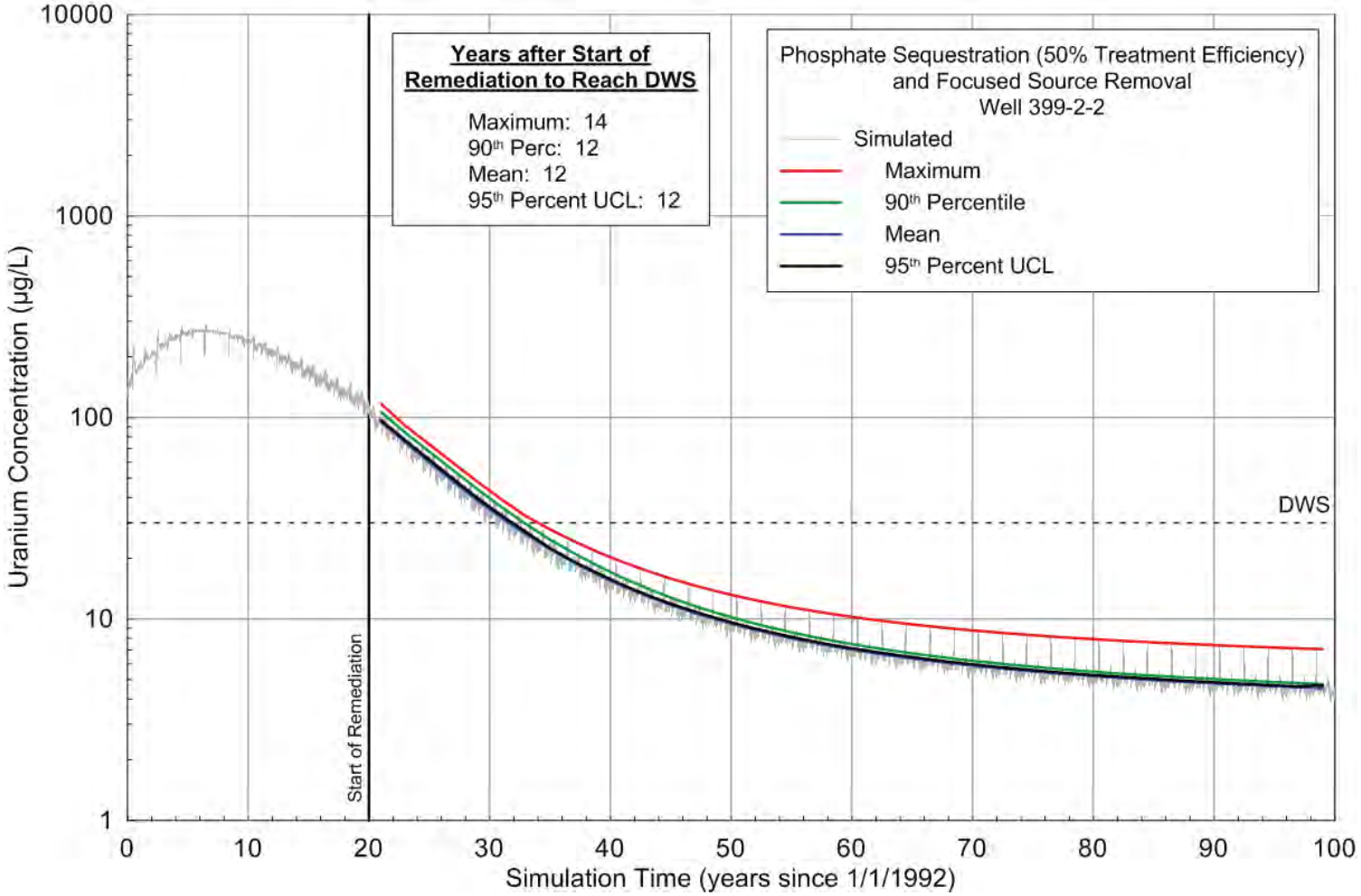


Backup Slides

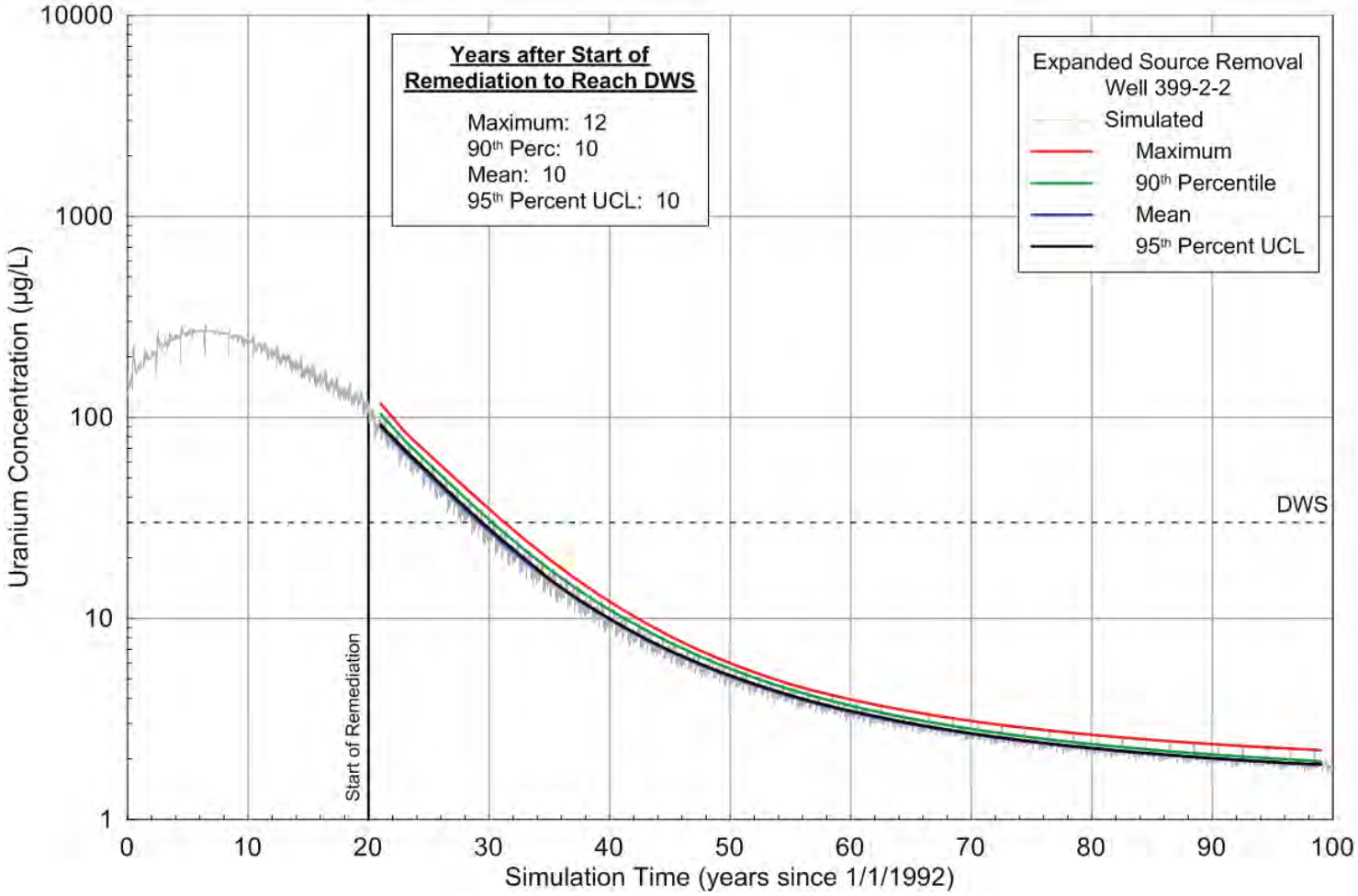
Estimated Time to Cleanup – Alternative 3



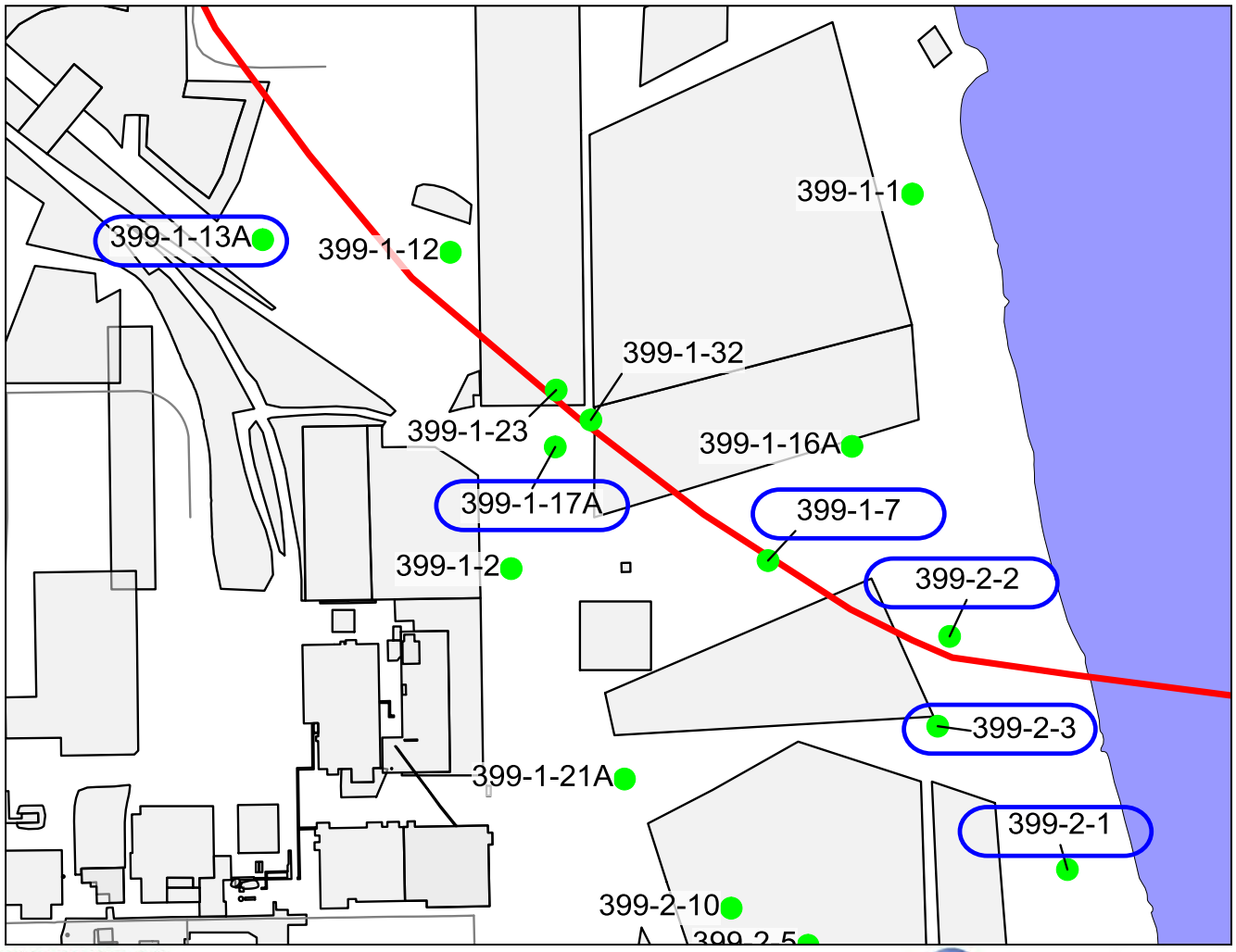
Estimated Time to Cleanup – Alternative 4



Estimated Time to Cleanup – Alternative 5



Wells Used for Uranium Modeling



Uranium Modeling Approach

- Detailed CSM for uranium sorption/desorption as a function of transient groundwater alkalinity, which is directly related to river stage.
- Two-year data set is used to gain insight into likely behavior of uranium in the short and long terms (up to about 200 years).
- An approach is developed to quantify exposure point concentration for uranium in the groundwater aquifer:
  - 90^{th} percentile and 95^{th} UCL on mean groundwater concentration in space and time.
  - Measures along the transect of highest observed U concentrations in groundwater.
  - Uses the same 24-month basis used for modeling fate and transport of uranium.