2.1 Introduction to the River Corridor

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The Columbia River flows through the northern Hanford Site before turning south toward the city of Richland. The region of the Site along the shoreline is known as the "River Corridor" (Figure 2.1-1). For purposes of cleanup, the River Corridor includes large inland areas of the Site known as the 100-IU-2 and 100-IU-6 Operable Units. However, most of the 100-IU-2/IU-6 source operable units overlie groundwater operable units associated with the Central Plateau. Therefore, in this document, the term River Corridor refers to the seven groundwater operable units and groundwater interest areas listed in the "at a glance" box.

River Corridor at a Glance

A total of 82 kilometers of Columbia River shoreline **River stage controlled by Priest Rapids Dam** **Hanford Reach National Monument established in 2000**		
100 Area	**300 Area and Outlying Regions**	**Former 1100 Area**
Five groundwater operable units: 100-BC-5, 100-KR-4, 100-NR-2, 100-HR-3[a], 100-FR-3	One groundwater operable unit: 300-FF-5 (includes 300 Area Industrial Complex, 618-10/316-4 and 618-11 facilities)	One former groundwater operable unit: 1100-EM-1
Nine nuclear reactors and associated facilities	Historically used for nuclear fuel fabrication	Historically used for vehicle maintenance and solid waste disposal
Inactive liquid waste cribs, ditches, trenches, retention basins, pipelines, and spills; four RCRA sites	Inactive liquid waste cribs, trenches, ponds, pipelines, and spills; one RCRA site	Former waste sites remediated
Interim waste site remediation >50% complete overall[b]	Interim waste site remediation >75% complete overall[b]	Final waste site remediation 100% complete
Interim groundwater remediation active for hexavalent chromium in 100-KR-4 and 100-HR-3, and strontium-90 and petroleum hydrocarbons in 100-NR-2	Monitored natural attenuation of uranium, organics, and tritium	Final groundwater remediation complete
RI/FS underway	RI/FS underway	Final ROD in place

a. The 100-HR-3 Operable Unit includes the 100-D and 100-H Areas.
b. Percent of waste sites that have been remediated or classified as not requiring remediation.

The following groundwater contaminants are present in the River Corridor:

- Hexavalent chromium concentrations exceed the 10 µg/L ambient water quality standard in the unconfined aquifer in each of the 100 Areas, in a confined aquifer in 100-HR-3, and in one confined well in 100-NR-2.
- Nitrate concentrations exceed the 45 mg/L drinking water standard in each of the 100 Areas except 100-BC-5. A nitrate plume from agricultural sources south of the Hanford Site affects groundwater in 1100-EM-1.
- Strontium-90 concentrations exceed the 8 pCi/L drinking water standard in each of the 100 Areas.
- Tritium concentrations exceed the 20,000 pCi/L drinking water standard in 100-BC-5, 100-KR-4, and an outlying region of 300-FF-5.
- Trichloroethene concentrations exceed the 5 µg/L drinking water standard in 100-FR-3 and 100-KR-4 and within a deeper, finer-grained sedimentary unit at 300-FF-5.
- Other contaminants include uranium in 300-FF-5, carbon-14 in 100-KR-4, and petroleum hydrocarbons in 100-NR-2.

2.1.1 Hydrogeology

The geologic units beneath the River Corridor are a subset of those that underlie the Hanford Site as a whole (Appendix E). The stratigraphy of the 100 Area is distinct from that of the 300 and 1100 Areas.

2.1.1.1 100 Area

Figure 2.1-2 illustrates the general stratigraphy and hydrogeologic units of the 100 Area.

The vadose zone comprises the sand and gravel of the Hanford formation and, in some locations, a portion of Ringold Formation unit E. The vadose zone can be less than a meter thick near the Columbia River to as much as 30 meters beneath inland portions of the River Corridor.

The unconfined aquifer consists of the sand and gravel of Ringold unit E in the western 100 Areas and the Hanford formation in the 100-H and 100-F Areas. This aquifer is thickest in the western portion of the region (up to 48 meters in 100-BC-5) and thinnest near the 100-H and 100-F Areas, where in some places it is less than 2 meters thick.

The base of the unconfined aquifer is one of a number of fine-grained units of the Ringold Formation informally known as the Ringold upper mud unit. It is important to note that the "Ringold upper mud" is not a distinct stratigraphic unit, and the uppermost mud in one region may not be continuous with the uppermost mud elsewhere. However, mud units are ubiquitous across the 100 Areas and effectively form the base of the regional, unconfined aquifer. The Ringold upper mud is dominated by layers of silt and clay; this fine-textured material functions as an aquitard that forms the bottom boundary of the unconfined aquifer. Below the contact with the unconfined aquifer, the unit contains numerous distinct layers of sand and gravel. These layers typically contain water and act as local confined aquifers. The Ringold upper mud unit appears to be absent to the west of 100-BC-5, where sandy gravel overlies basalt.

The unconfined aquifer beneath the River Corridor resides in sand and gravel sediments. Layers of silt and clay form the bottom of the unconfined aquifer.

A series of confined aquifers within and beneath the upper mud are present through most of the 100 Areas. Basalt aquitards and basalt-confined aquifers are present beneath the Ringold Formation. Few wells are screened in the deeper units.

2.1.1.2 300 and 1100 Areas

Beneath 300-FF-5 and 1100-EM-1, the vadose zone is entirely within the gravel and sand of the Hanford formation. The unconfined aquifer includes the lower portion of the Hanford formation. Beneath 300-FF-5, the undulating contact between the bottom of the saturated Hanford formation and the underlying Ringold unit E sediment reveals paleochannels that act as preferential pathways for groundwater flow. Saturated Hanford formation sediment is much more permeable than the underlying Ringold sediment.

The Ringold lower mud unit underlies unit E. Coarse-grained sediments of Ringold unit A underlie the lower mud in some areas; elsewhere the mud overlies basalt.

2.1.2 Groundwater Flow

Figure 2.1-3 presents the Hanford Site water table map for March 2011 with River Corridor data displayed. Figure 2.1-4 shows locations of monitoring wells. Detailed maps for each groundwater interest area are provided in subsequent sections of this report. Groundwater in the unconfined aquifer generally flows from upland areas in the west toward the regional discharge area north and east along the Columbia River, which forms a groundwater discharge boundary. Steep hydraulic gradients occur in the western, eastern, and northern regions of the Site. Shallow gradients occur southeast of 100-FR-3 and in a broad arc extending from west of 100-BC-5 toward the southeast between Gable Butte and Gable Mountain (Gable Gap), through the 200 East Area and into the central portion of the Site. The steep gradients in the west and east are associated with low-permeability sediment of the Ringold Formation at the water table,

while the low gradients are generally associated with highly permeable sand and gravel of the Hanford formation (Chapter 7.0 of PNNL-19702, *Hydrogeologic Model for the Gable Gap Area, Hanford Site*).

North of Gable Butte and Gable Mountain, groundwater flow directions vary from northwest to east depending on location. Groundwater enters this region through the gaps between Gable Mountain, Gable Butte, and Umtanum Ridge, as well as from natural recharge. The Columbia River also recharges the unconfined aquifer west of 100-BC-5, even when the river stage is low. Water flowing north through Gable Gap fans out and flows toward the Columbia River. In each of the 100 Areas, the local groundwater flow is generally toward the Columbia River, although groundwater pump-and-treat systems in 100-KR-4 and 100-HR-3 alter this flow pattern locally.

An apparent groundwater mound exists ~2 kilometers north of Gable Mountain and is associated with low-permeability Ringold upper mud at the water table. This mound is contoured as part of the unconfined aquifer (Figure 2.1-3), but it could represent water perched on fine-grained sediment above the regional water table. Additional data would be needed to distinguish between these alternatives. Water-level elevations indicate that groundwater moving toward the east along the northern side of Gable Mountain flows around this apparent mound.

In the eastern portion of the Hanford Site, south of Gable Mountain and north of the 300 Area, groundwater flows due east toward the Columbia River. Groundwater flow converges on the 300 Area from the northwest, west, and southwest, then generally moves toward the southeast and discharges to the Columbia River (Section 3.1.2 of PNNL-15127, *Contaminants of Potential Concern in the 300-FF-5 Operable Unit: Expanded Annual Groundwater Report for Fiscal Year 2004*). The hydraulic gradient in the 300 Area is low because the aquifer is very permeable.

Groundwater flows from the unconfined aquifer into the Columbia River. When the river stage is high, flow temporarily reverses.

Daily, monthly, and seasonal changes in the Columbia River stage affect the flow of groundwater in the near-river environment. During periods of high river stage, the Columbia River temporarily recharges the adjacent aquifer all along the river (bank storage effects), whereas during periods of low or moderate river stage, groundwater discharges from the aquifer to the river. Concentrations of mobile and moderately-mobile contaminants like hexavalent chromium vary inversely with the river stage, as river water mixes with groundwater (top panel of Figure 2.1-5). For less mobile contaminants that sorb to sediment grains in the vadose zone, like strontium-90, the higher water table can mobilize contamination. This mobilization causes concentrations to vary directly with water levels (bottom panel of Figure 2.1-5[1]).

River stage changes create a mixing zone in the aquifer along the river. The extent of this zone varies, depending on the steepness of the hydraulic gradient and local geology. At any given time, water discharging from the aquifer to the river can comprise nearly all river water in bank storage, nearly all aquifer water, or some mixture depending on the recent history of river stage changes (PNNL-13674). The degree of mixing can be assessed by the specific conductance of the water, which reflects the concentrations of dissolved solids. The specific conductance of river water is typically 130 to 160 µS/cm, and of groundwater is 300 to 1,000 µS/cm, depending on location. Thus, specific conductance in the mixing zone varies inversely with river stage.

[1] The figure shows strontium-90 concentrations in well 199-N-67, where concentrations and sampling frequency create a clear seasonal trend. Water-level data are plotted for nearby well 199-N-2, because it contains an automated water-level system, and 199-N-67 does not.

Areas of groundwater upwelling have been identified adjacent to the shore and in the center of the river channel (WCH-380, Field Summary Report for Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington: Collection of Surface Water, Pore Water, and Sediment Samples for Characterization of Groundwater Upwelling).

2.1.3 Waste Disposal and Distribution of Contaminants

The operational histories of the six reactor areas have many common elements. Common features of the types of waste generated and their behaviors in the environment are summarized here. Summaries also are provided for the 300 and 1100 Areas. Table 2.1-1 provides references to RI/FS reports for the River Corridor units, which provide additional detail about waste sites.

2.1.3.1 100 Areas

Liquid and solid waste discharged during the reactor operational periods were the primary contaminant sources in the reactor areas. Contaminant sources in the 100 Areas included cooling water conditioning and handling facilities, underground piping, liquid and solid waste disposal sites, and unplanned releases (surface spills).

Low mobility contaminants, including many metals and radionuclides, sorbed to sediment grains in the vadose zone. These contaminants were found at the greatest concentrations within and near the areas of discharge. When little or no liquid effluent was discharged to a waste site, soil contamination remained in the shallow sediment. High volumes of liquid modestly expanded the depth of low-mobility contamination, dispersing these contaminants deeper in the vadose zone than where lower volumes of water were used.

Strontium-90 is a slightly mobile contaminant in the subsurface and tends to sorb to soil. It was present in numerous 100 Area waste sites, including burial grounds and liquid waste sites, principally from decontamination solutions and contaminated reactor coolant or fuel storage basin water. Strontium-90 migrated through the vadose zone beneath some liquid waste disposal sites and moved a limited distance vertically and horizontally in groundwater.

Mobile and moderately-mobile contaminants common to the 100 Area include tritium, nitrate, and hexavalent chromium. Large volumes of water containing these contaminants were discharged to the soil via trenches, cribs, and leaks from pipelines and retention basins. Wastewater was also released through outfall piping to the Columbia River. Large groundwater mounds developed beneath surface discharge sites and helped spread mobile contaminants in groundwater in a radial pattern during operations.

In the 100 Area, low mobility contaminants, including many metals and radionuclides, sorbed to sediment grains in the vadose zone. Mobile and moderately-mobile contaminants, like hexavalent chromium, migrated to groundwater.

Sodium dichromate was added to reactor cooling water as an anti-corrosion agent. Typical sodium dichromate concentrations in the cooling water during the early years of reactor operations were 2,000 µg/L (~700 µg/L as hexavalent chromium). They decreased to 1,000 µg/L in the mid-1960s, and then 500 µg/L (~170 µg/L as hexavalent chromium) in the last stages of operations.

Historical process information suggests that small volumes of high-concentration solutions (up to 70 percent by weight) of sodium dichromate leaked or spilled in the 100 Areas, for example, during the transfer of sodium dichromate from rail cars to storage tanks. In some locations in 100-D and 100-K Areas, the current and historical concentrations of hexavalent chromium in groundwater exceed the concentrations found in reactor cooling water, indicating a high-concentration source. Residuals from the

high-concentration sodium dichromate solutions may remain in the vadose zone at some locations and may be a secondary source of groundwater contamination until the vadose zone is remediated.

After reactor operations and associated wastewater disposal ceased, the driving force for infiltration decreased. For an undetermined period, water in the vadose zone continued to drain beneath the waste sites, but at a much lower volume than during operations. Infiltration of rain and melted snow through the contaminated vadose zone carried some additional contamination to groundwater. During this period, short-lived radionuclides continued to decay. The groundwater mounds dissipated, and groundwater resumed natural flow directions.

DOE began interim remediation of 100 Area waste sites in the 1990s. Remediation generally included excavation to a depth of about 4.6 meters, which removed the most heavily contaminated sediment. Water was sprayed over the excavations to protect workers and the public from airborne, contaminated dust. Use of large volumes of dust suppression water has the potential to mobilize contaminants in the vadose zone, but the use of dust suppression water has not been quantified. Once the remediated waste sites are backfilled and revegetated, the plants consume the natural precipitation, limiting infiltration deep into the vadose zone. Most of the waste sites in 100-BC and 100-F have already been remediated and planted with native vegetation. Interim remediation of waste sites in 100-K, 100-N, 100-D, and 100-H is partially completed and scheduled to be finished by 2014.

Only one effluent discharge remains active in the 100 Area. Sanitary wastewater from 100-N Area and from septic tanks throughout the Hanford Site is discharged to the 100-N (124-N-10) sanitary sewage lagoon, approximately 1 kilometer southeast of the main 100-N Area.

2.1.3.2 300 and 1100 Areas

Sources of groundwater contamination in the 300 Area included routine disposal of liquid effluent associated with (1) fabrication of nuclear fuel assemblies, and (2) research involving the processing of irradiated fuel. The liquid waste was discharged to ponds and trenches designed for infiltration to the underlying soil. Periodic spills and accidental releases from various facilities also occurred. Nearly all of the principal liquid waste disposal facilities have been remediated. Groundwater contaminants in the 300 Area include uranium and volatile organic compounds.

Remaining sources of groundwater contamination beneath the 300 Area include the process sewer system and the 307 Process Trenches. Some release or remobilization of contamination may have occurred in more recent years because of continuing operations, excavation activities, removal of buildings, and processes potentially still active at some of the unremediated burial grounds (for example, formation of a tritium plume in groundwater at the outlying 618-11 subregion).

The 1100-EM-1 groundwater interest area encompasses a variety of onsite and neighboring offsite land uses. Numerous municipal, industrial, and agricultural activities may affect groundwater quality in this area. The areas comprising the Hanford Site's former 1100 Area have been converted to a variety of uses, including commercial activities, manufacturing, and equipment storage. Offsite facilities of particular interest with respect to groundwater include the following:

- The North Richland Well Field and recharge basins (a localized aquifer storage and recovery system)
- The Richland Sanitary Landfill
- AREVA's nuclear reactor fuel manufacturing facility
- Conagra Foods Lamb Weston processing plant

- The Horn Rapids off-road vehicle park
- Irrigated agricultural fields

2.1.4 Cleanup

The only groundwater operable unit in the River Corridor for which final cleanup decisions have been made is 1100-EM-1. The 1100-EM-1 Operable Unit was removed from the National Priorities List (40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List") in 1996. The selected remedy for groundwater was monitored natural attenuation of volatile organic compounds with continuation of institutional controls for groundwater and land use at the Horn Rapids Landfill (EPA/ROD/R10-93/063, *Declaration of the Record of Decision for the USDOE Hanford 1100 Area*).

In the early 1990s, DOE, EPA, and Ecology decided that enough was known about contaminated soil and groundwater in the Hanford Site's River Corridor to begin interim remediation with a focus on protecting the Columbia River. This decision led to an early start for cleanup of contaminated soil and groundwater in the River Corridor. Key components of the early cleanup included the following:

- Removing contaminated facilities and soil (waste sites) near the river, and sending the contaminated material to a large, lined landfill in the central Hanford Site
- Conducting active groundwater remediation in 100-KR-4, 100-NR-2, and 100-HR-3

The interim cleanup actions provided information about where contamination exists and how it moves through soil and groundwater. This approach helps to plan future cleanup activities.

So far, DOE has cleaned up more than 60 percent of the waste sites in the River Corridor, removing contaminated soils to an engineered landfill on the Central Plateau.

During 2011, remediation of waste sites under interim RODs continued. Interim remediation is nearly finished in 100-BC and 100-F and is under way at the other River Corridor units. Table 2.1-2 lists the status of waste site remediation.

Groundwater cleanup under interim RODs also continued in 2011. Figure 2.1-6 shows the locations of remediation systems for hexavalent chromium and strontium-90, and the mass of chromium removed by pump-and-treat systems in 100-KR-4 and 100-HR-3. Interim remediation of strontium-90 in 100-NR-2 focuses on immobilizing the contamination so it can decay in place. The goal of the interim groundwater remediation is to prevent or reduce the movement of contaminated groundwater into the Columbia River. As defined in the current interim action RODs, the remedial action goal for hexavalent chromium is 20 µg/L in compliance wells. The ambient water quality standard is 10 µg/L. The remedial action goal is based on the estimated 1:1 mixing of groundwater (and the associated hexavalent chromium) with infiltrated river water before the water is accessible to aquatic life in the river.

Interim cleanup of the River Corridor has achieved a great deal, but final decisions are yet to be made. CERCLA provides a process for making final decisions about the actions needed to complete cleanup:

- Gather information about the site
- Conduct risk characterization
- Identify cleanup goals

- Evaluate alternatives for cleanup and the associated cost to meet cleanup goals
- Select the cleanup option that fits best

In 2010 and 2011, DOE continued to gather information to support decisions about cleaning up the remainder of the contamination in soil and groundwater of the River Corridor.

This process is known as a remedial investigation/feasibility study (RI/FS). The preferred alternatives for cleanup will be described in a proposed plan and the decision will be documented in a ROD. The Tri-Parties developed a strategy to make final decisions for the River Corridor under CERCLA. Part of the strategy was to split the region into smaller pieces of work that were more manageable. Final cleanup decisions are being developed for (1) 100-BC, (2) 100-K, (3) 100-N, (4) 100-D and 100-H, (5) 100-F and 100-IU-2/IU-6, and (6) 300 Area. Final decisions for each of these areas will address contaminated soil, solid waste burial grounds, and groundwater. The objective for all of these decisions is to protect human health and the environment.

The *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan* (DOE/RL-2008-46) summarized how cleanup of the River Corridor is managed. From 2009 through 2011, DOE issued a series of addenda and sampling and analysis plans for each of the River Corridor units (Table 2.1-1) and conducted CERCLA investigations. These investigations included, for example, characterizing the vadose zone beneath some of the interim remediated waste sites to confirm whether cleanup was adequate. Interim cleanup was done to meet interim cleanup levels and the RI/FS process is identifying technically sound cleanup levels. Accordingly, some sites may require additional remediation before they are finally closed. Remedial investigation activities also included installing additional groundwater monitoring wells, refining the knowledge of contaminant distribution in three dimensions, and providing more information on groundwater flow and hydraulic properties to support computer models. The models are used to predict future behavior of contaminants in soil and groundwater. RI/FS reports are being prepared for release in 2012 and 2013 (Table 2.1-1).

Target TPA milestones have been established to ensure that the impact of hexavalent chromium and other contaminants to the Columbia River and groundwater are remediated in a timely manner. The following milestones are directly applicable to the 100 Area OUs:

- **Milestone M-016-110-TO1 (December 31, 2012):** DOE shall take actions necessary to contain or remediate hexavalent chromium groundwater plumes in each of the 100 Area NPL [National Priority List] Operable Units such that ambient water quality standards for hexavalent chromium are achieved in the hyporheic zone[2] and river column water.
- **Milestone M-016-110-TO2 (December 31, 2020):** DOE shall take actions necessary to remediate hexavalent chromium groundwater plumes such that hexavalent chromium will meet drinking water standards in each of the 100 Area NPL Operable Units.
- **Milestone M-016-110-TO3 (December 31, 2016):** DOE shall take actions to contain the strontium-90 plume at 100-NR-2 Operable Unit such that the default ambient water quality standard (8 pCi/L) is achieved in the hyporheic zone and river water column.

[2] The hyporheic zone is a shallow region adjacent to a stream bed where there is mixing of groundwater and surface water.

- **Milestone M-016-110-TO4 (December 31, 2016):** DOE shall implement remedial actions selected in all 100 Area Records of Decision for Groundwater Operable Units so that no contamination above drinking water standards enters the Columbia River unless otherwise specified in a CERCLA decision.
- **Milestone M-016-110-TO5 (December 31, 2015):** DOE will have a remedy in place designed to meet Federal Drinking Water Standards for uranium throughout the groundwater plume in the 300-FF-5 Operable Unit unless otherwise specified in a CERCLA decision document.

Hexavalent Chromium

- ***Hexavalent chromium is a common contaminant in 100 Area groundwater and is of concern because of its potential effects on salmon, other aquatic life, and human health.***
- ***DOE's goal is to remediate hexavalent chromium to the ambient water quality standard of 10 µg/L.***
- ***The state groundwater cleanup level is 48 µg/L. The drinking water standard for total chromium is 100 µg/L.***
- ***For the 100-KR-4 and 100-HR-3 Operable Units, an interim remedial action goal is set at 20 µg/L in near-river compliance wells. This gives an allowance for a 1 to 1 attenuation factor to meet the ambient water quality standard in the river environment.***
- ***Water samples may be analyzed specifically for hexavalent chromium or for total chromium, the latter of which includes the weakly soluble trivalent form. It should be noted that dissolved chromium in Hanford Site groundwater is virtually all in the hexavalent form.***

2.1.5 Aquifer Tubes

Aquifer tubes are small-diameter, flexible tubes with a screen on one end. The tubes are installed in the aquifer along the Columbia River shoreline at selected depths to provide a network of sampling points that allow characterization of water quality within the zone of groundwater and river water interaction. Appendix C provides additional information about aquifer tubes.

Groundwater is monitored in aquifer tubes to provide supporting data for the following purposes:

- Data indicate the minimum concentrations of contaminants in groundwater approaching the Columbia River. Because of mixing, undiluted groundwater concentrations may be higher.
- Long-term declines in contaminant concentrations could indicate movement of the plume, discharge of the plume to the river, dispersion, or the influence of an upgradient remediation system.
- Increasing concentrations may indicate plume movement or mobilization of contaminants.
- Data from aquifer tubes help determine locations for additional monitoring and remediation.

When interpreting these data, the following limitations are considered:

- Concentrations in aquifer tubes and seeps may vary with the Columbia River stage. Dilution of contaminants by mixing with river water can result in lower concentrations, though the amount (mass) of that contaminant is not decreased. The same is true for near-river wells.
- Because aquifer tubes have much shorter screens than monitoring wells (15 centimeters), the data may not be directly comparable to data from near-river wells.
- Aquifer tube and seep data are currently not used as groundwater monitoring compliance points.

Table 2.1-1. River Corridor Remedial Investigation/Feasibility Study Documents

Groundwater Interest Area	Source OUs Included in Document	Document Title	Published
100-BC-5	100-BC-1 and 100-BC-2	*Remedial Investigation/Feasibility Study for 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units*, DOE/RL-2010-96, Draft A (in progress)	2012*
		Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-44, Rev. 0	2010
		Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 3: 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units, DOE/RL-2008-46-ADD3, Rev. 0	2010
100-KR-4	100-KR-1 and 100-KR-2	*Remedial Investigation/Feasibility Study for the 100-KR-1, 100-KR-2, and 100-KR-4 Operable Units*, DOE/RL-2010-97, Draft A	2011
		Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study, DOE/RL-2009-41, Rev. 0	2009
		Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 2: 100-KR-1, 100-KR-2, and 100-KR-4 Operable Units, DOE/RL-2008-46-ADD2, Rev. 0	2010
100-NR-2	100-NR-1	*Sampling and Analysis Plan for the 100-NR-1 and 100-NR-2 Operable Units Remedial Investigation/Feasibility Study*, DOE/RL-2009-42, Rev. 0	2010
		Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 5:100-NR-1 and 100-NR-2 Operable Units, DOE/RL-2008-46-ADD5, Rev. 0	2011
100-HR-3	100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2	*Remedial Investigation/Feasibility Study for 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units*, DOE/RL-2010-95, Draft A	2012*
		Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-40, Rev. 0	2010
		Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 1: 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units, DOE/RL-2008-46-ADD1, Rev. 0	2010

Table 2.1-1. River Corridor Remedial Investigation/Feasibility Study Documents

Groundwater Interest Area	Source OUs Included in Document	Document Title	Published
100-FR-3	100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6	*Remedial Investigation/Feasibility Study for 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*, DOE/RL-2010-98, Draft A (in progress)	2012*
		Sampling and Analysis Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units Remedial Investigation/Feasibility Study, DOE/RL-2009-43, Rev. 0	2010
		Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 4: 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units, DOE/RL-2008-46-ADD4, Rev. 0 REISSUE	2010
300-FF-5	300-FF-1 and 300-FF-2	*Remedial Investigation/Feasibility Study for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable Units*, DOE/RL 2010-99, Draft A	2011
		300 Area Remedial Investigation/Feasibility Study Work Plan for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable Units, DOE/RL-2009-30, Rev. 0	2010
1100-EM-1	None	*Draft Remedial Investigation/Feasibility Study for the 1100-EM-1 Operable Unit*, Hanford, DOE/RL-92-67, Draft C	1993

*Anticipated publication date

Table 2.1-2. Waste Site Remediation in the River Corridor[a]

Operable Unit Area	Number of Waste Sites Identified	Number of Waste Sites Completed[b]	Percent Completed
100-BC	150	136	91
100-K	168	52	31
100-N	190	57	30
100-D/H	342	154	45
100-F	157	134	85
300 Area	567	429	76
1100-EM-1	30	30	100
100-IU-2/IU-6[c]	250	136	54
River Corridor Total	1,854	1,128	61

a. Approximate numbers as of 2011; subject to change.

b. Waste sites with status of closed, interim closed, no action, not accepted, or rejected.

c. The 100-IU-2 and 100-IU-6 source operable units encompass a large portion of the Hanford Site's 600 Area.

Figure 2.1-1. Hanford Site River Corridor Regions

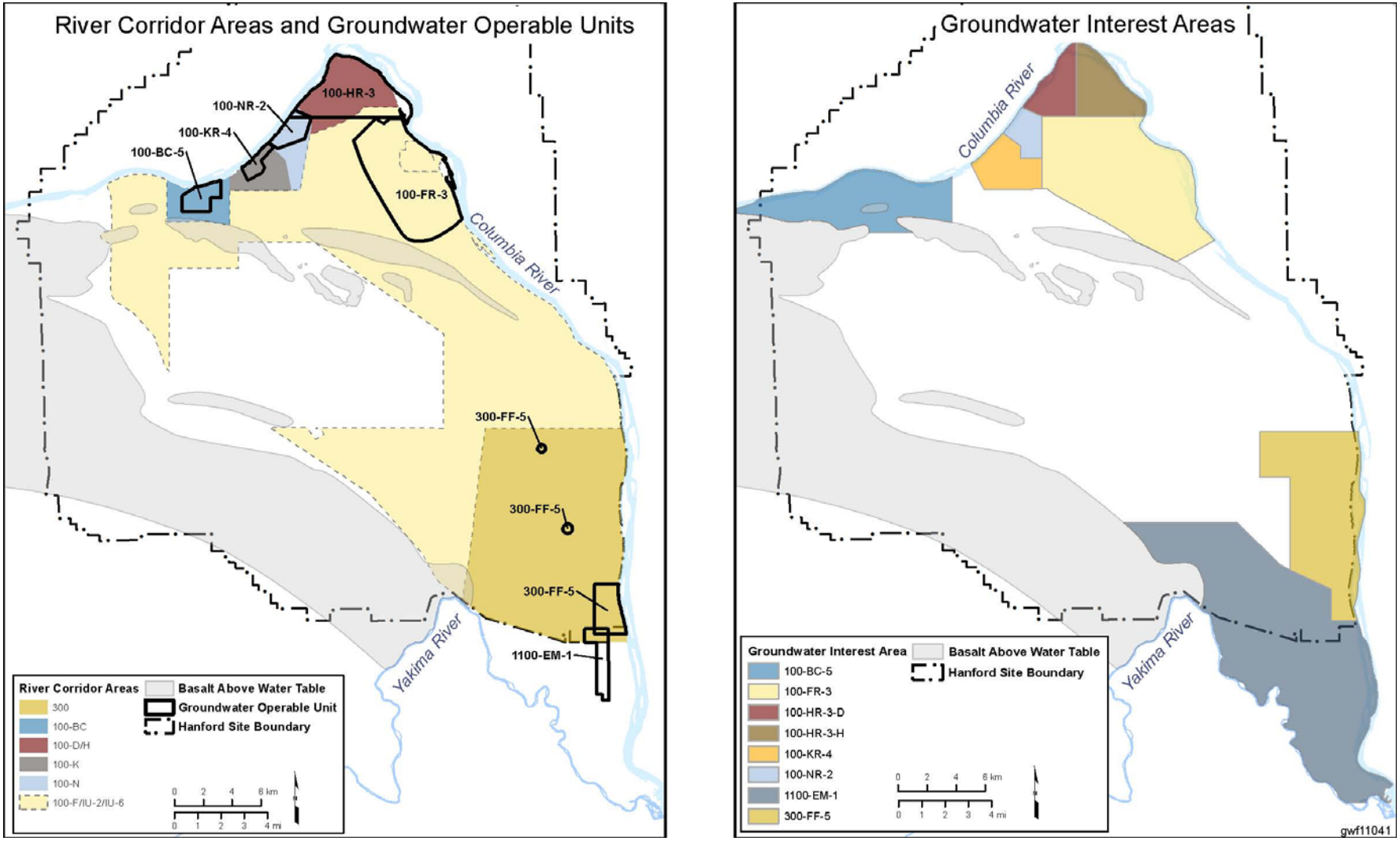

Figure 2.1-2. Generalized Hydrogeology of the 100 Area

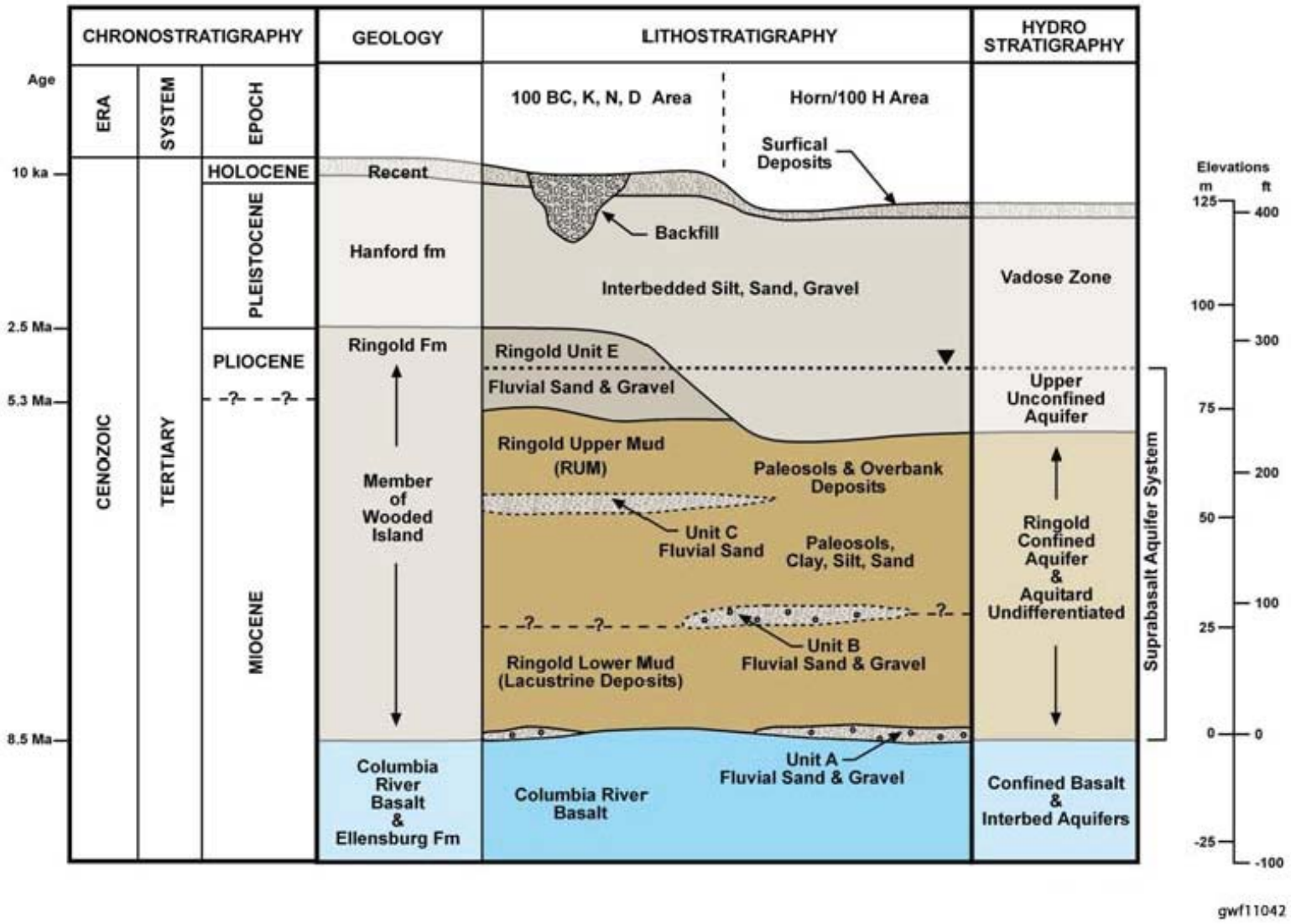

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Figure 2.1-3. Hanford Site Water Table, March 2011

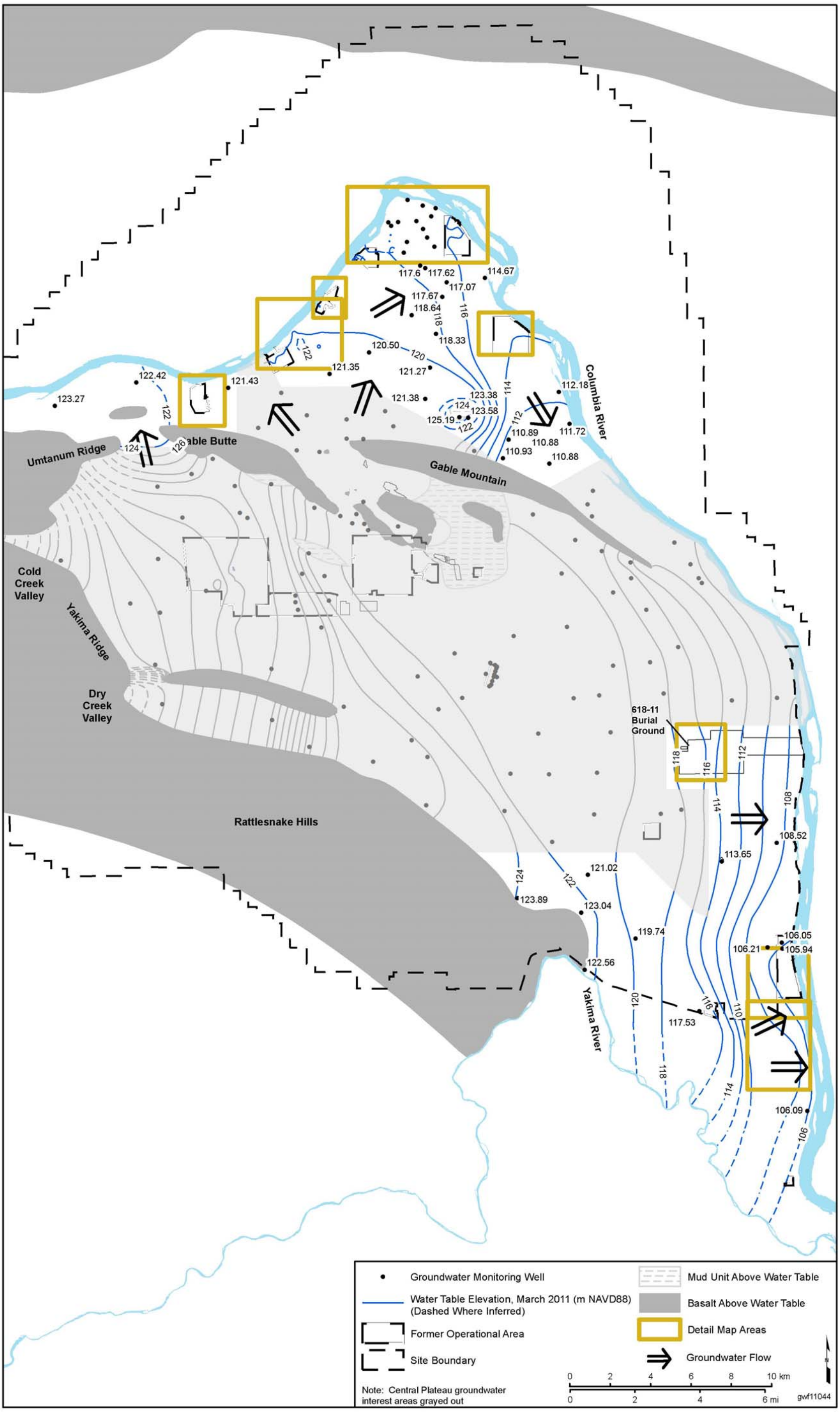

Figure 2.1-4. Groundwater Monitoring Wells on the Hanford Site

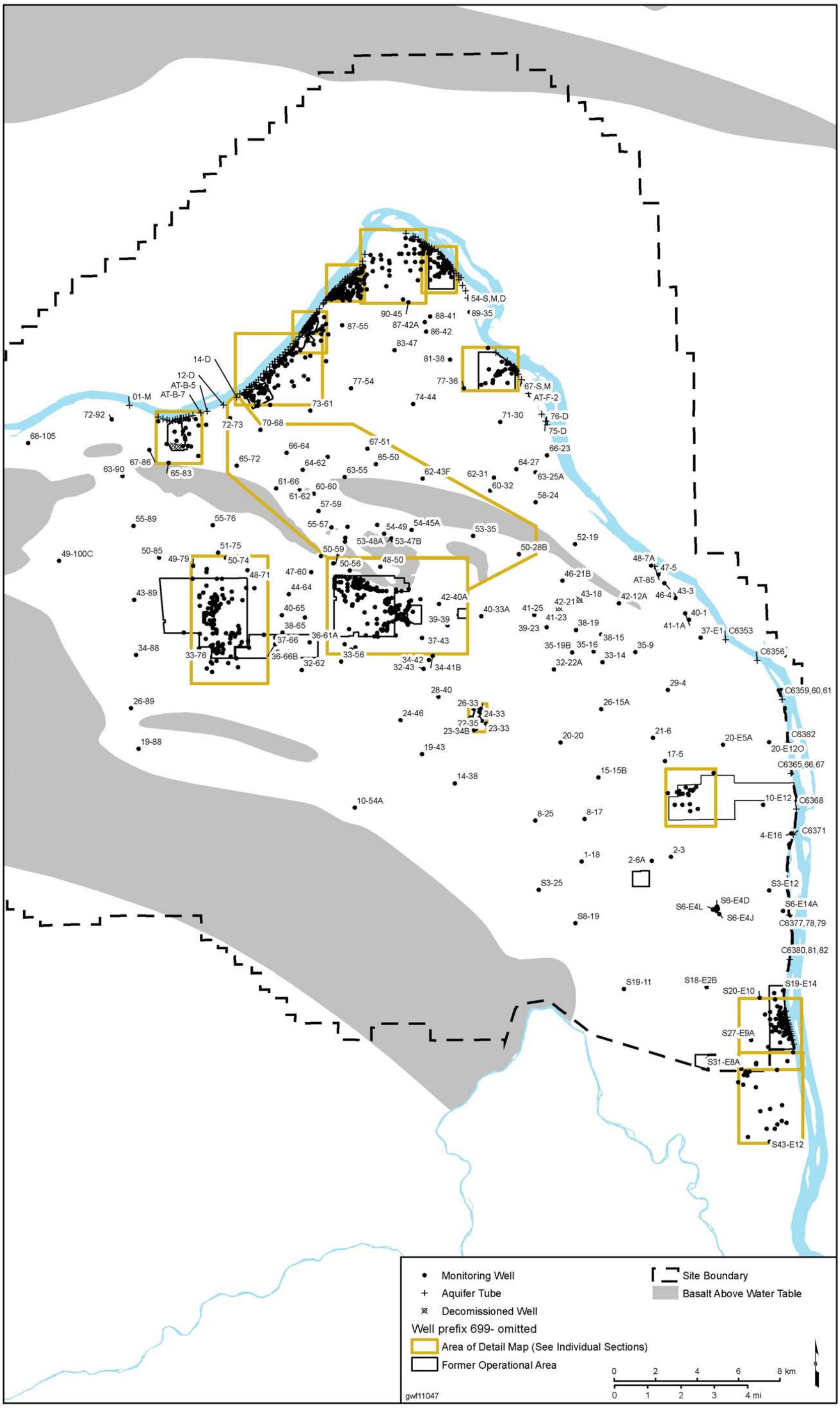

Figure 2.1-5. Examples of Effects of Water Table Variation on Contaminant Concentrations in Near-River Wells

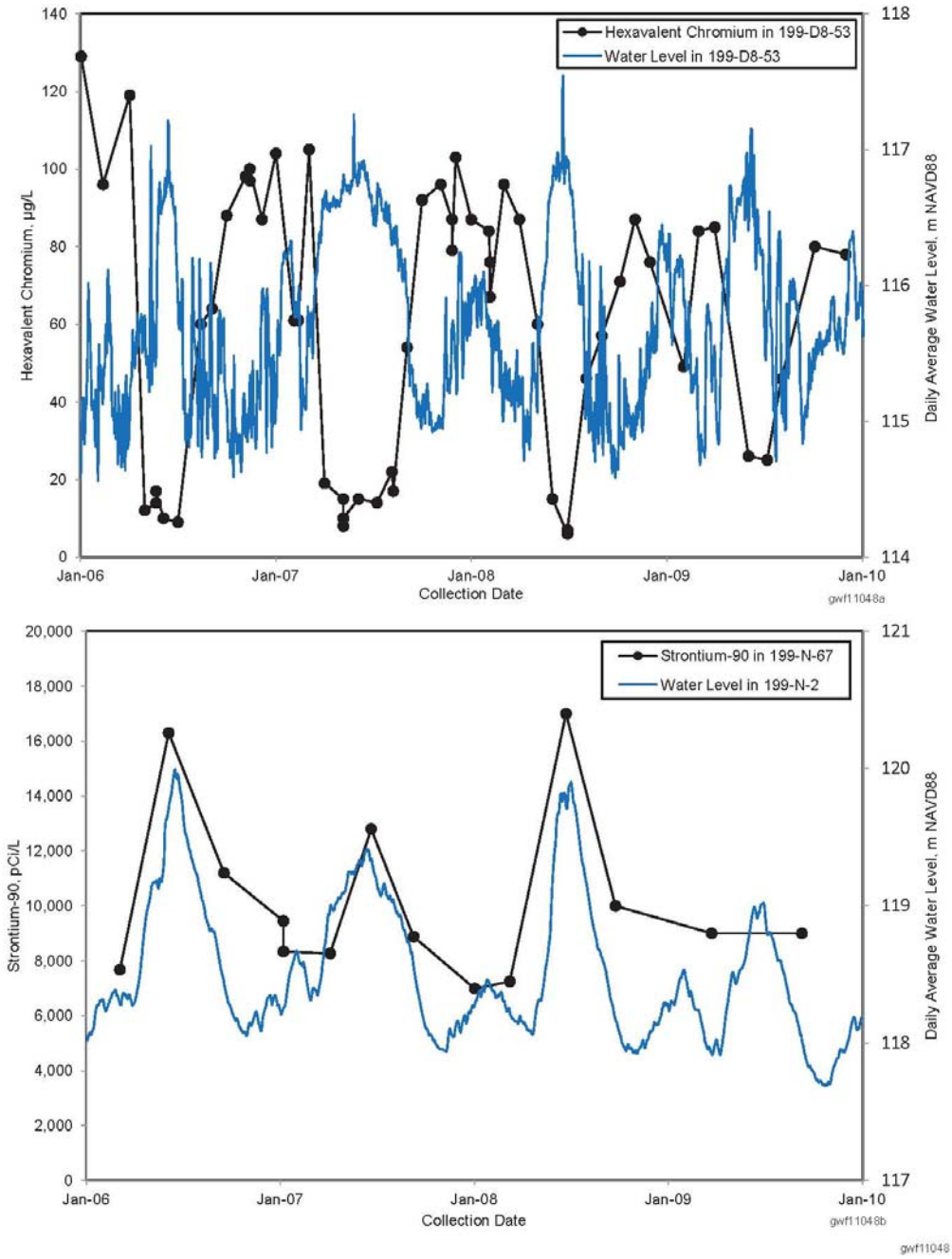
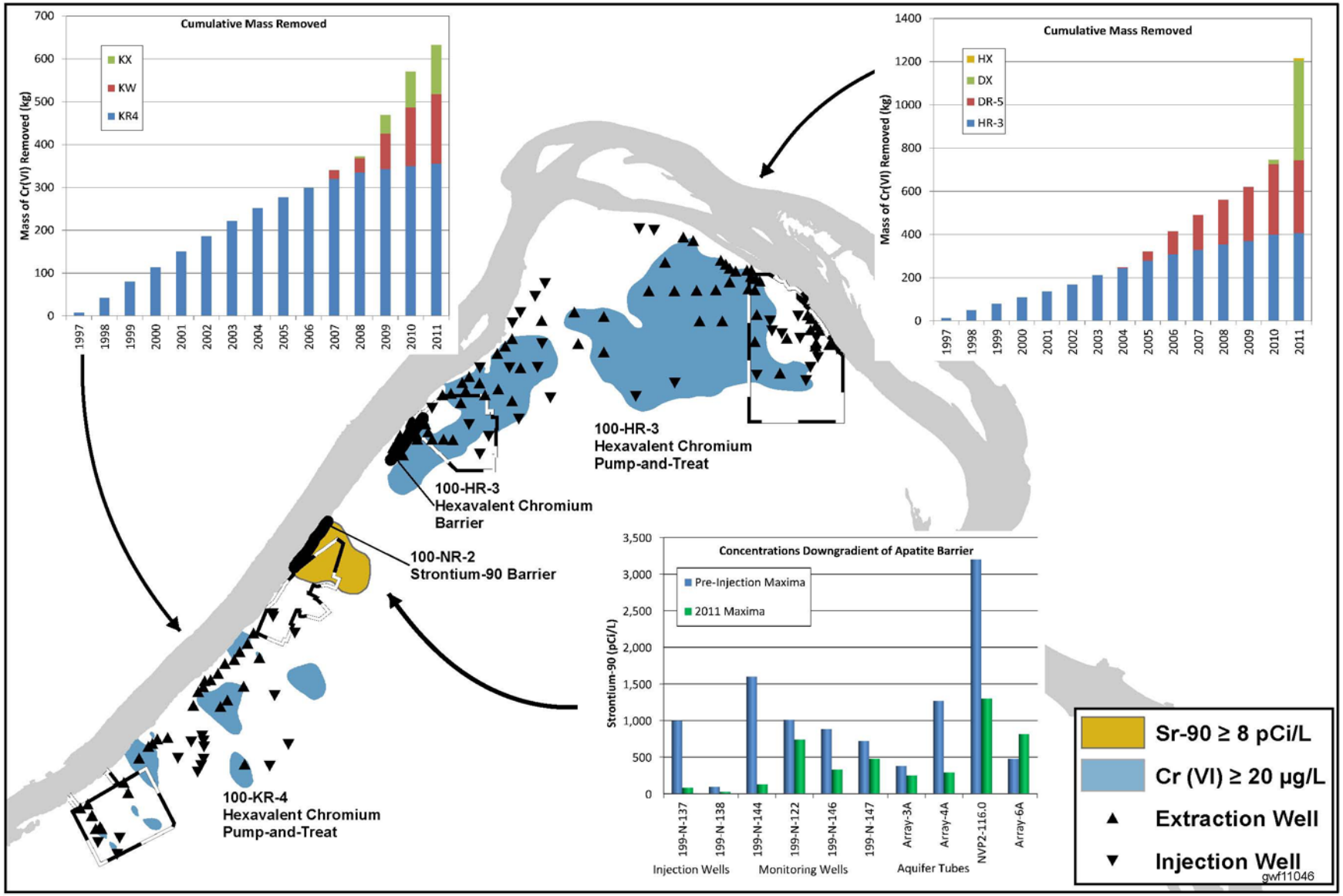
Figure 2.1-6. Interim Groundwater Remediation in the 100 Area