Appendix D

Supporting Information for Aquifer Sampling Tubes

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Appendix D -- Supporting Information for Aquifer Sampling Tubes

M. J. Hartman

Aquifer sampling tubes (also referred to as aquifer tubes) are small-diameter, polyethylene tubes that have been installed in the unconfined aquifer along the Hanford Reach of the Columbia River. Each site typically contains one to three tubes, with screened sampling ports at various depths in the aquifer. The tube sites cover the Hanford Site shoreline, from just upstream of the 100-B/C Area to downstream at the 300 Area. Sites are more closely spaced along some segments where higher density spatial resolution of contaminant plumes is needed.

D.1. Sampling Metrics for 2009

A total of 536 aquifer tubes were installed on the Hanford Site between 1997 and 2009. Each year, a subset of tubes is selected for sampling. The *Sampling and Analysis Plan for Aquifer Sampling Tubes* (DOE/RL-2000-59, Rev. 1) contains a list of tubes and constituents scheduled to be sampled in fiscal year (FY) 2009. The same list of tubes and constituents are being sampled in FY 2010. Sampling for FY 2009 was scheduled for October through December 2008, but much of the sampling was delayed into calendar year (CY) 2009. Sampling for FY 2010 began in October 2009; thus, many tubes were sampled more than once during the reporting period of October 2008 through December 2009, mostly during CY 2009. The sampling and analysis plan also summarizes the history of Hanford Site aquifer tube installation and describes tube site nomenclature.

At most aquifer tube sites, if specific conductance of the water is less than 160 µS/cm, the field data are recorded and water is not collected for laboratory analyses because the samples contain more river water than groundwater. These sampling trips are considered successful because they reflect representative conditions at the time. In some locations, notably 100-N Area, samples are collected for laboratory analyses even when specific conductance is low.

Sitewide, workers sampled 321 aquifer tubes in CY 2009. Many of the tubes were sampled more than once, for a total of 651 sampling trips. Table D-1 and Figure D-1 summarize the total number of tubes and clusters in each segment of shoreline, the number of tubes sampled, and the number of sampling trips in 2009. Table D-2 provides information on 2009 sampling dates and other supporting information (the aquifer tubes are listed in the table in order from upstream to downstream).

D.2. Sampling Dates and River Stage

The water in the Hanford Site's unconfined aquifer near the Columbia River represents a mixture of river water and groundwater. When the river stage is low in the fall of each year, aquifer tube samples typically contain the least amount of river water and contaminant concentrations are the highest. For this reason, aquifer tubes are usually sampled in the fall and winter. Figures D-2 through D-9 show the daily average river stage in 2009 (measured in each of the reactor areas and the 300 Area) and aquifer tube sample dates for 2009. The gauge in 100-F Area was not operating for the entire year, and there is no river stage gauge in the 200-PO-1 Operable Unit shoreline segment.

If the top of an aquifer tube is submerged when sampling is attempted, samplers plan to return another day when the river stage is lower. However, sampling in FY 2009 began late, and the rising river stage in the spring prevented eleven tubes from being sampled.

D.3. Sampling Results for 2009

Figure D-10 shows the maximum concentrations of four common groundwater contaminants in aquifer tubes at each shore segment in 2009. Aquifer tube results are discussed, as well as the groundwater concentrations, in the applicable chapters of this report. Aquifer tube data and monitoring well data are included in the electronic files that accompany this report.

D.4. Aquifer Tube Cross-Sections

Figures D-11 and D-12 provide cross-sections through aquifer tubes and near-shore wells in the 100-F Area, illustrating screen depths and geologic units. Figure D-13 is a similar cross-section for the 200-PO-1 Operable Unit shoreline segment. Cross-sections of the other shoreline segments are included in the applicable chapters of this report and illustrate 2009 concentrations of selected contaminants. The cross-sections were prepared using the following conventions:

- The diagrams show the elevation of the land surface at each aquifer tube site and the elevations of the aquifer tube screens. The screened intervals of selected near-river wells are projected onto the cross-sections for reference.
- The approximate range of river stage is based on the high and low daily average river stage from FY 2007 and FY 2008 using data from the automated water-level recorders at each reactor area and the 300 Area.
- Approximate contacts of major geologic units are shown in the figures. Aquifer tube installation methods do not allow for geologic logging. Therefore, the elevations are projected from geologic logs of near-shore monitoring wells, with the exception of the (1) 100-B Area segment (Hanford-Ringold contact estimated from Figure 8 in WHC-SD-EN-TI-133, *Geology of the 100-K Area, Hanford Site, South-Central Washington* [converted from feet NVGD29 to meters NAD88); (2) 100-K Area segment (no Hanford formation near shoreline based on WHC-SD-EN-TI-155, *Geology of the 100-B/C Area, Hanford Site, South-Central Washington*; and (3) 300 Area geology interpretations (from PNNL-17666, *Volatile Organic Compound Investigation Results, 300 Area, Hanford Site, Washington*). Because local geology can vary, these lines should be viewed as interpolations.
- Data included in the figures are from the date ranges noted. If more than one result is available for that date range, the maximum value is shown.

References

DOE/RL-2000-59, 2009, *Sampling and Analysis Plan for Aquifer Sampling Tubes*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

PNNL-17666, 2008, *Volatile Organic Compound Investigation Results, 300 Area, Hanford Site, Washington*, R. E. Peterson, B. A. Williams, and R. M. Smith, Pacific Northwest National Laboratory, Richland, Washington.

WHC-SD-EN-TI-133, 1993, *Geology of the 100-K Area, Hanford Site, South-Central Washington*, Rev. 0, J. W. Lindberg, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-TI-155, 1993, *Geology of the 100-BC Area, Hanford Site, South-Central Washington*, Rev. 0, J. W. Lindberg, Westinghouse Hanford Company, Richland, Washington.

Table D-1. Inventory of Hanford Site Aquifer Tubes as of December 31, 2009.

Segment	Total Tubes/ Sites*	Tubes Not in Service	Tubes Scheduled, CY 2009	Tubes Sampled, CY 2009	Sites Sampled, CY 2009	Tube Trips, CY 2009
100-B/C	44/18	1	26	26	14	50
100-K	70/28	0	57	57	25	93
100-N	73/37	10	47	45	24	147
100-D	93/36	7	72	69	30	161
100-H	95/39	7	62	52	26	75
100-F	81/29	15	32	32	16	60
200-PO-1	28/17	4	15	15	13	23
300 Area	52/25	2	29	25	12	42
Totals:	536/229	44	340	321	160	651

Notes:
* A tube site (cluster) contains one or more tube; multiple tubes monitor different depths.
CY = calendar year

Table D-2. Aquifer Tube Sampling Dates, Calendar Year 2009.

Tube Name	Freq.	Sample Dates	Comments
100-B/C Segment			
01-M	A	2/19/2009	
		10/21/2009	
03-D	A	2/19/2009	
		10/20/2009	
AT-B-1-M	A	x	No yield 2/19/2009.
		10/20/2009	
AT-B-2-D	A	2/19/2009	
		10/20/2009	
04-D	A	2/19/2009	
		10/15/2009	
C6227	A	2/17/2009	
		10/15/2009	
C6228	A	2/17/2009	
		10/15/2009	
C6229	A	2/17/2009	
		10/15/2009	Replaced PVC 10/8/2009.
05-S	A	2/18/2009	
		10/21/2009	
05-M	A	2/18/2009	
		10/21/2009	
05-D	A	2/18/2009	
		10/21/2009	
AT-B-3-S	A	2/18/2009	
		10/21/2009	
AT-B-3-M	A	2/18/2009	
		10/21/2009	
AT-B-3-D	A	2/18/2009	
		10/21/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
06-S	A	2/18/2009	Slow water production.
		x	No yield 10/22/2009. Screen above water table.
06-M	A	2/18/2009	
		10/22/2009	
06-D	A	2/18/2009	
		10/22/2009	
C6230	A	2/18/2009	
		10/22/2009	
C6231	A	2/18/2009	
		10/22/2009	
C6232	A	2/18/2009	
		10/22/2009	
C6233	A	2/17/2009	
		10/23/2009	
C6234	A	2/17/2009	
		10/23/2009	
C6235	A	2/17/2009	
		10/23/2009	
AT-B-7-M	A	3/24/2009	
		10/26/2009	
AT-B-5-D	A	x	No yield 3/24/2009. Checked 4/2/2009 and flow okay.
		10/26/2009	
12-D	A	3/24/2009	
		10/26/2009	
100-K Segment			
14-D	A	4/17/2009	
		11/15/2009	
C6236	A	4/8/2009	
		11/15/2009	
C6237	A	4/8/2009	
		11/15/2009	
C6238	A	4/8/2009	
		11/15/2009	
AT-K-1-D	A	4/8/2009	
		11/1/2009	
17-D	A	3/18/2009	
		4/8/2009	Inadvertently scheduled twice in fiscal year 2009.
		11/15/2009	
C6239	A	4/9/2009	
		11/15/2009	
C6240	A	4/9/2009	
		11/15/2009	
C6241	A	4/9/2009	
		11/15/2009	
C6242	A	4/9/2009	
		11/18/2009	
C6243	A	4/9/2009	
		11/18/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6244	A	4/9/2009	
		11/18/2009	
AT-K-2-D	A	x	Not sampled fiscal year 2009
		11/1/2009	
C6245	A	4/9/2009	
		11/16/2009	
C6246	A	4/9/2009	
		11/16/2009	
C6247	A	4/9/2009	
		11/16/2009	
19-M	A	4/14/2009	
		11/17/2009	Tube brittle, end broke when putting the tubing on.
19-D	A	4/14/2009	
		11/17/2009	
AT-K-3-S	A	4/14/2009	Field readings only; SC low.
		11/17/2009	
AT-K-3-M	A	4/14/2009	
		11/17/2009	
AT-K-3-D	A	4/14/2009	
		11/1/2009	
C6248	A	x	Under water 4/16/2009.
		11/17/2009	Field readings only; SC low.
C6249	A	x	Under water 4/16/2009.
		11/17/2009	
C6250	A	x	Under water 4/16/2009.
		11/17/2009	
C6251	A	x	Under water 4/16/2009.
		11/21/2009	
C6252	A	x	Under water 4/16/2009.
		11/21/2009	
C6253	A	x	Under water 4/16/2009.
		11/21/2009	
21-S	A	4/16/2009	Field readings only; SC low.
		11/18/2009	Field readings only; SC low.
21-M	A	4/16/2009	Field readings only; SC low.
		11/18/2009	
C6254	A	x	Under water 4/16/2009.
		11/21/2009	
C6255	A	x	Under water 4/16/2009.
		11/21/2009	
C6256	A	x	Under water 4/16/2009.
		11/21/2009	
C6257	A	4/16/2009	
		11/21/2009	
C6258	A	4/16/2009	
		11/21/2009	
C6259	A	x	Under water 4/16/2009 and 4/17/2009.
		11/21/2009	
22-M	A	4/16/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
22-D	A	4/16/2009	
		11/21/2009	
AT-K-4-S	A	x	Under water 4/17/2009.
		11/23/2009	Field readings only; SC low.
AT-K-4-M	A	x	Under water 4/17/2009.
		11/23/2009	
23-M	A	x	Under water 4/17/2009.
		11/23/2009	Field readings only; SC low.
23-D	A	x	Under water 4/17/2009.
		11/23/2009	
C6260	A	x	Under water 4/17/2009.
		11/23/2009	
C6261	A	x	Under water 4/17/2009.
		11/23/2009	Field readings only; SC low.
AT-K-5-S	A	x	Under water 4/17/2009.
		11/23/2009	
AT-K-5-M	A	x	Under water 4/17/2009.
		11/23/2009	
AT-K-5-D	A	x	Under water 4/17/2009.
		11/23/2009	
DK-04-2	A	x	Under water 4/17/2009.
		11/21/2009	
25-D	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
AT-K-6-S	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
AT-K-6-M	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
AT-K-6-D	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
26-S	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
26-M	A	4/14/2009	Field readings only; SC low.
		11/21/2009	Field readings only; SC low.
26-D	A	4/14/2009	Field readings only; SC low.
		x	No yield 11/21/2009.
C6263	A	4/14/2009	
		11/21/2009	
C6264	A	4/14/2009	
		11/21/2009	
C6265	A	4/14/2009	
		11/21/2009	
100-N Segment			
C6317	A	3/11/2009	
C6318	A	3/11/2009	
C6319	A	3/11/2009	
C6320	A	1/11/2009	
		12/20/2009	
C6321	A	1/11/2009	
		12/20/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6352	A	x	Not sampled.
C6322	A	1/11/2009	
		12/20/2009	
C6132	Q	1/11/2009	Needs repair.
		4/8/2009	
		6/22/2009	
		9/17/2009	
		12/19/2009	
N116mArray-0A	Q/A	1/8/2009	
		4/1/2009	
		6/17/2009	Tube broken.
		9/17/2009	2 “OA” tubes, one marked “shallow” not sampled.
		12/17/2009	Sampled after apatite injections.
C6135	Q	1/11/2009	Needs repair.
		4/8/2009	
		6/22/2009	
		9/15/2009	
		12/17/2009	
N116mArray-1A	Q/A	1/8/2009	
		4/1/2009	
		6/17/2009	
		9/15/2009	
		12/17/2009	Sampled after apatite injections.
N116mArray-2A	Q/A	x	No yield 4/1/2009. Repaired, unclogged 4/2/2009.
		6/17/2009	Replaced label.
		x	Inaccessible 9/22/2009.
		12/17/2009	
N116mArray-3A	M/Q	x	No yield 2/11/2009.
		x	No yield 4/1/2009. Unclogged 4/2/2009.
		4/30/2009	
		5/13/2009	
		6/17/2009	
		x	Not sampled.
		8/20/2009	
		x	No yield 9/22/2009.
		x	Not scheduled October.
		x	Not scheduled November.
		12/29/2009	No yield 12/20/2009.
N116mArray-4A	M/Q	2/11/2009	
		4/2/2009	
		4/30/2009	
		x	No yield 5/13/2009.
		x	No yield 6/17/2009. Plugged?
		x	Not sampled July.
		8/20/2009	
		9/22/2009	
		x	Not scheduled October.
		x	Not scheduled November.
		12/20/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
NVP1-1	Q	x	Not found 1/2009.
		x	No yield 3/31/2009.
		x	No yield 6/17/2009. Above water?
		x	no yield 9/22/2009.
		x	No yield 12/19/2009.
NVP1-2	Q	x	Not found 1/2009.
		3/31/2009	
		6/17/2009	
		x	No yield 9/22/2009.
		x	No yield 12/19/2009 or 12/29/2009.
NVP1-3	Q	x	Not found 1/2009.
		3/31/2009	
		6/17/2009	
		x	No yield 9/22/2009.
		12/20/2009	
NVP1-4	Q	x	Not found 1/2009.
		3/31/2009	
		6/17/2009	
		x	No yield 10/5/2009.
		12/29/2009	
NVP1-5	Q	1/8/2009	
		3/31/2009	
		6/17/2009	
		10/5/2009	
		12/20/2009	
NVP2-116.3	Q	1/8/2009	
		4/1/2009	
		7/1/2009	
		x	No yield 10/5/2009.
		12/20/2009	
NVP2-116.0	M/Q	1/8/2009	
		2/11/2009	
		3/31/2009	
		4/30/2009	
		5/13/2009	
		6/22/2009	
		x	Not sampled July.
		8/20/2009	
		x	Insufficient yield 10/5/2009
		x	Not scheduled October.
		x	Not scheduled November.
		12/20/2009	
NVP2-115.7	Q	1/9/2009	
		4/1/2009	
		7/1/2009	
		10/6/2009	
		12/20/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
NVP2-115.4	Q	1/8/2009	
		4/1/2009	
		7/1/2009	
		10/5/2009	
		12/20/2009	
NVP2-115.1	Q	1/8/2009	
		4/1/2009	
		7/1/2009	
		10/5/2009	
		12/20/2009	
N116mArray-6A	M	2/11/2009	
		4/2/2009	Extended tubing.
		4/30/2009	
		5/13/2009	
		6/22/2009	
		x	Not sampled July.
		x	No yield 8/20/2009. Fixed 8/24/2009.
		9/22/2009	
		x	Not scheduled October.
		x	Not scheduled November.
		x	Scheduled but not attempted December.
N116mArray-7A	Q/A	4/2/2009	
		6/23/2009	
		9/22/2009	
		x	No yield 12/19/2009.
N116mArray-8A	Q/A	1/11/2009	Repaired.
		4/2/2009	
		6/23/2009	
		9/24/2009	
		12/19/2009	
N116mArray-8.5A	Q/A	x	Not sampled January.
		x	No yield 4/2/2009. Repaired 4/2/2009; good yield.
		6/23/2009	
		9/24/2009	
		x	No yield 12/19/2009.
N116mArray-9A	Q/A	1/11/2009	Repaired.
		4/2/2009	
		6/23/2009	Field parameters only.
		x	
		12/18/2009	
N116mArray-10A	Q/A	1/7/2009	
		4/2/2009	Upgraded and labeled.
		6/23/2009	
		9/24/2009	
		12/18/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
N116mArray-11A	Q/A	1/7/2009	
		4/7/2009	Slow yield.
		6/23/2009	
		9/24/2009	
		12/19/2009	
N116mArray-12A	Q/A	1/7/2009	
		4/7/2009	
		6/23/2009	
		x	Not sampled September.
		12/18/2009	
N116mArray-13A	Q/A	1/7/2009	
		4/7/2009	Slow yield.
		x	Plugged 6/23/2009.
		x	Not sampled September.
		x	No yield 12/18/2009 or 12/29/2009.
C6323	A	1/11/2009	
C6324	A	1/11/2009	
C6325	A	1/11/2009	
N116mArray-14A	Q	1/7/2009	
		4/7/2009	
		6/23/2009	
		9/24/2009	
		x	No yield 12/22/09 or 12/29/2009.
N116mArray-15A	Q	x	Not sampled January.
		4/7/2009	Spliced broken tube.
		6/23/2009	
		9/24/2009	
		12/29/2009	No yield 12/22/2009.
C6326	A	1/8/2009	
		12/22/2009	Broken tubing 12/20/2009; field parameters only 12/22/09.
C6327	A	1/8/2009	
		12/22/2009	Broken tubing 12/20/2009; field parameters only 12/22/09.
C6328	A	1/8/2009	
		12/22/2009	Broken tubing 12/20/2009.
C6329	A	3/19/2009	
		12/20/2009	
C6330	A	3/19/2009	
		12/20/2009	
C6331	A	3/19/2009	
		12/20/2009	
C6332	A	3/19/2009	
		12/20/2009	
C6333	A	3/19/2009	
		12/20/2009	
C6334	A	3/19/2009	
		12/20/2009	
100-D Segment			
DD-50-1	A	x	No yield 11/10/2009. Possible leak in tube.
DD-50-2	A	11/10/2009	No end cap on PVC pipe (repaired); well tube brittle and end broke when attaching tubing.

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
DD-50-3	A	11/10/2009	
DD-50-4	A	11/10/2009	
DD-49-1	A	4/8/2009	
		11/10/2009	
DD-49-2	A	4/8/2009	
		11/10/2009	
DD-49-3	A	4/8/2009	
		11/10/2009	
DD-49-4	A	4/8/2009	
		11/10/2009	
C6266	Q	2/10/2009	
		5/6/2009	
		9/9/2009	
		11/10/2009	
C6267	Q	2/10/2009	
		5/6/2009	
		9/9/2009	
		11/10/2009	
C6268	Q/A	2/10/2009	
		5/6/2009	
		9/9/2009	
		11/10/2009	
C6269	Q	2/10/2009	Field readings only. Low SC.
		5/6/2009	
		9/9/2009	
C6269	Q	11/10/2009	
		2/10/2009	
		5/6/2009	
		9/9/2009	
C6270	Q	11/10/2009	
		2/10/2009	
		5/6/2009	
		8/27/2009	
		11/10/2009	
DD-44-3	Q/A	2/6/2009	Field readings only. Low SC.
		5/6/2009	
		9/10/2009	
		11/11/2009	
DD-44-4	Q/A	2/6/2009	
		5/6/2009	
		9/10/2009	
		11/11/2009	
DD-43-2	Q	1/22/2009	Field readings only. Low SC.
		5/6/2009	Field readings only. Low SC.
		9/10/2009	
		11/11/2009	Field readings only. Low SC.
DD-43-3	Q/A	1/22/2009	
		5/6/2009	
		x	Not sampled September.
		11/11/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
DD-42-2	Q	1/22/2009	Field readings only. Low SC.
		x	No yield 5/6/2009.
		x	No yield 9/9/2009.
		11/11/2009	Field readings only. Low SC.
DD-42-3	Q	1/22/2009	
		5/6/2009	
		9/10/2009	Field readings only. Low SC.
		11/11/2009	
DD-42-4	Q/A	1/22/2009	
		5/6/2009	
		9/10/2009	
		11/11/2009	
DD-41-1	Q	1/22/2009	Field readings only. Low SC.
		5/4/2009	Field readings only. Low SC.
		9/9/2009	
		11/11/2009	Field readings only. Low SC.
DD-41-2	Q/A	1/22/2009	
		5/4/2009	
		9/9/2009	
		x	No flow 11/11/2009. Replaced fitting (all tubes at DD-41).
DD-41-3	Q	1/22/2009	
		5/4/2009	
		9/10/2009	
		11/11/2009	
REDOX-4-3.0	Q	2/6/2009	
		5/4/2009	
		7/16/2009	
		11/11/2009	
REDOX-4-6.0	Q/A	2/6/2009	
		5/4/2009	
		7/16/2009	
		11/11/2009	
REDOX-3-3.3	Q	1/19/2009	
		5/4/2009	
		7/16/2009	
		x	Not sampled 11/2009; paperwork error.
REDOX-3-4.6	Q/A	1/19/2009	
		5/4/2009	
		7/16/2009	
		11/12/2009	
DD-39-1	Q	2/12/2009	High turbidity, possibly ice in sample.
		x	Not sampled May.
		x	Not sampled September.
		11/12/2009	
DD-39-2	Q	1/15/2009	
		2/12/2009	High turbidity, possibly because of ice in sample.
		5/4/2009	
		8/27/2009	
		11/12/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
DD-39-3	Q/A	1/19/2009	
		2/12/2009	Field parameters only; SC low. Tubing had disconnected. Repaired 2/19/2009.
		5/4/2009	
		8/27/2009	
		11/12/2009	Low yield.
REDOX-2-3.0	Q	1/19/2009	
		5/4/2009	
		7/16/2009	
		11/12/2009	
REDOX-2-6.0	Q/A	1/19/2009	
		5/4/2009	
		7/16/2009	
		11/12/2009	
REDOX-1-3.3	Q	x	Not sampled January.
		5/4/2009	
		7/16/2009	
		11/12/2009	
REDOX-1-6.0	Q/A	x	Not sampled January.
		5/4/2009	
		7/16/2009	
		11/12/2009	
AT-D-1-S	A	11/13/2009	Field parameters only.
AT-D-1-M	A	11/13/2009	Field parameters only.
AT-D-1-D	A	11/13/2009	
C6272	A	4/7/2009	
		11/13/2009	Field parameters only; SC low.
35-S	A	11/13/2009	Field parameters only; SC low.
35-M	A	x	No yield 11/13/2009.
35-D	A	x	No yield 11/13/2009.
AT-D-4-S	A	11/13/2009	Field parameters only.
AT-D-4-M	A	11/13/2009	Field parameters only.
AT-D-4-D	A	11/13/2009	
AT-D-2-S	A	11/13/2009	
AT-D-2-M	A	11/13/2009	
36-S	A	11/13/2009	
36-M	A	11/13/2009	
36-D	A	11/13/2009	PVC missing.
AT-D-3-S	A	11/14/2009	
AT-D-3-M	A	11/14/2009	
AT-D-3-D	A	11/14/2009	PVC missing.
C6275	A	4/7/2009	
		11/14/2009	
38-M	A	11/14/2009	
38-D	A	11/14/2009	Field parameters only.
DD-17-2	A	2/24/2009	
		11/14/2009	
DD-17-3	A	2/24/2009	
		11/14/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6278	A	4/7/2009	
		11/14/2009	
DD-16-3	A	2/24/2009	
		x	No yield 11/14/2009. Replaced fitting.
DD-16-4	A	2/24/2009	
		x	Very low yield 11/14/2009; no sample. Replaced fitting.
DD-15-2	A	2/12/2009	
		11/14/2009	
DD-15-3	A	2/12/2009	
		11/14/2009	
DD-15-4	A	2/12/2009	
		11/14/2009	
DD-12-2	A	4/7/2009	Field parameters only; SC low.
		11/14/2009	Field parameters only; SC low.
DD-12-4	A	4/7/2009	Field parameters only; SC low.
		11/14/2009	
AT-D-5-M	A	11/14/2009	Field parameters only; SC low.
AT-D-5-D	A	11/14/2009	Field parameters only; SC low.
DD-06-2	A	2/25/2009	
		11/14/2009	
DD-06-3	A	2/25/2009	
		11/14/2009	
C6281	A	4/7/2009	Field parameters only; SC low.
		11/14/2009	
C6282	A	4/7/2009	
		11/23/2009	
100-H Segment			
C6284	A	3/30/2009	
		11/2/2009	
C6285	A	3/30/2009	
		11/2/2009	
C6286	A	3/30/2009	
		11/2/2009	
C5632	A	2/26/2009	
C5633	A	x	No yield 2/26/2009.
C5634	A	x	No yield 2/26/2009.
C5635	A	2/26/2009	Field parameters only; SC low.
C5636	A	2/26/2009	
C5637	A	2/26/2009	
C5638	A	2/26/2009	
43-M	A	11/2/2009	
C6287	A	3/3/2009	
		11/2/2009	
C6288	A	3/3/2009	
		11/2/2009	
C5641	A	3/3/2009	
C5644	A	3/3/2009	
		x	Not sampled 11/2009.
44-M	A	11/2/2009	
44-D	A	x	No yield 11/2/2009.

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C5673	A	x	No yield 3/5/2009.
C5674	A	3/5/2009	
C5676	A	3/5/2009	
C5677	A	3/5/2009	
C5678	A	x	No yield 3/5/2009.
C5679	A	3/5/2009	
C5680	A	3/5/2009	Low yield.
C5681	A	3/5/2009	
45-S	A	x	11/2009 sampling delayed until 1/2010.
45-M	A	x	11/2009 sampling delayed until 1/2010.
45-D	A	x	11/2009 sampling delayed until 1/2010.
C5682	A	x	No yield 1/8/2010.
C6290	A	3/10/2009	
		11/3/2009	Replaced PVC.
C6291	A	x	No yield 3/10/2009.
		11/3/2009	Replaced PVC.
C6293	A	3/10/2009	
		11/3/2009	
AT-H-1-S	A	11/3/2009	
AT-H-1-M	A	11/3/2009	PVC missing,
AT-H-1-D	A	11/3/2009	PVC missing,
AT-H-2-S	A	11/3/2009	PVC missing; field parameters only.
AT-H-2-M	A	11/3/2009	Field parameters only.
AT-H-2-D	A	11/3/2009	PVC missing.
AT-H-3-S	A	11/3/2009	
AT-H-3-D	A	11/3/2009	PVC missing.
47-M	A	3/12/2009	
		11/3/2009	
47-D	A	3/12/2009	
		11/3/2009	
C6296	A	3/10/2009	
		11/4/2009	
C6297	A	3/10/2009	
C6297	A	11/4/2009	
48-S	A	11/4/2009	
48-M	A	11/4/2009	
C6299	A	3/10/2009	
		11/4/2009	Field parameters only; SC low.
C6300	A	3/10/2009	
		11/4/2009	PVC missing.
C6301	A	3/10/2009	
		11/4/2009	PVC missing. Tube chewed off.
49-D	A	3/12/2009	
		11/4/2009	
50-S	A	x	No yield 3/12/2009; screen above water table.
		x	No yield 11/4/2009; screen above water table.
50-M	A	3/12/2009	
		11/4/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
51-S	A	3/17/2009	
		11/4/2009	
51-M	A	3/17/2009	
		11/4/2009	
51-D	A	3/17/2009	
		11/4/2009	
52-S	A	3/17/2009	
		11/4/2009	
52-M	A	3/17/2009	
		11/4/2009	
52-D	A	3/17/2009	
		11/4/2009	
54-S	A	3/17/2009	
		11/4/2009	
54-M	A	x	No water 3/17/2009; broken. Repaired 3/26/2009.
		11/4/2009	
54-D	A	3/17/2009	
		11/4/2009	
100-F Segment			
62-M	A	4/15/2009	
		11/5/2009	
C6302	A	3/30/2009	
		11/5/2009	
C6303	A	3/31/2009	Under water 3/30/2009.
		11/5/2009	
64-S	A	x	No yield 3/12/2009; frozen?
		11/5/2009	
64-M	A	x	No yield 3/12/2009; frozen?
		11/5/2009	
64-D	A	3/12/2009	
		11/5/2009	
C6305	A	3/30/2009	
		11/5/2009	
C6306	A	3/31/2009	Under water 3/30/2009.
		11/5/2009	
C6307	A	3/31/2009	Under water 3/30/2009.
		11/5/2009	
C6308	A	3/30/2009	
		11/5/2009	
C6309	A	3/30/2009	
		11/5/2009	
C6311	A	3/31/2009	Under water 3/30/2009.
		11/5/2009	
C6312	A	3/31/2009	Under water 3/30/2009.
		11/5/2009	
C6314	A	3/31/2009	
		11/5/2009	Tubing was black.
C6315	A	3/31/2009	
		11/5/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6316	A	3/31/2009	
		11/5/2009	
AT-F-1-S	A	4/2/2009	
		11/5/2009	
AT-F-1-M	A	4/2/2009	
		11/5/2009	
AT-F-1-D	A	4/2/2009	
		11/5/2009	
66-S	A	3/12/2009	Field parameters only; SC low.
		11/5/2009	Field parameters only; SC low.
66-M	A	3/12/2009	Field parameters only; SC low.
		11/5/2009	Field parameters only; SC low.
66-D	A	3/12/2009	
		11/5/2009	
67-S	A	3/17/2009	Field parameters only; SC low.
		11/5/2009	Field parameters only; SC low.
67-M	A	3/17/2009	
		12/30/2009	Resampled 12/30/09 for full analyte list.
68-S	A	3/17/2009	Field parameters only; SC low.
		11/6/2009	Field parameters only; SC low.
68-M	A	3/17/2009	Field parameters only; SC low.
		11/6/2009	Field parameters only; SC low.
68-D	A	3/17/2009	Field parameters only; SC low. Repaired 3/26/2009.
		11/6/2009	
AT-F-2-M	A	4/2/2009	
		x	11/2009 sampling delayed until 2010.
74-D	A	4/2/2009	
		11/6/2009	
75-D	A	x	Not found 4/2/2009. Later located and flagged.
		11/6/2009	
76-D	A	4/2/2009	
		11/9/2009	
77-D	A	4/2/2009	
		11/9/2009	
200-PO-1 Segment			
85-D	A	2/18/2009	
		11/30/2009	Field parameters only; SC low.
86-D	A	2/18/2009	PVC slightly melted.
		x	No yield 11/30/2009.
C6383	A	3/26/2009	Field parameters only; SC low.
		12/1/2009	Field parameters only; SC low.
C6384	A	3/26/2009	
		12/1/2009	
C6353	A	2/19/2009	
		x	Under water 12/1/2009.
C6356	A	2/19/2009	
		x	Under water 12/1/2009.
C6359	A	2/19/2009	
		x	Under water 12/1/2009.

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6362	A	2/24/2009	
		11/15/2009	
C6365	A	2/24/2009	
		11/15/2009	
C6368	A	2/19/2009	
		x	Under water 11/15/2009 and 12/3/2009.
C6371	A	3/25/2009	
		x	Under water 12/3/2009; PVC cover added 2/1/2010.
C6374	A	3/25/2009	
		11/30/2009	Field parameters only, per sampling and analysis plan.
C6375	A	3/25/2009	
		11/30/2009	
C6378	A	3/26/2009	
C6380	A	3/26/2009	
		12/2/2009	
300 Area Segment			
AT-3-1-S	A	x	Not sampled until 1/2010.
AT-3-1-M	SA	3/25/2009	
AT-3-1-D(1)	A	x	Not sampled until 1/2010.
AT-3-2-S	A	11/19/2009	
AT-3-2-M	SA	3/25/2009	
		11/19/2009	
C6341	SA	3/25/2009	
		x	No yield 11/9/2009; moved screen up 11/23/2009.
C6342	SA	3/25/2009	
		11/9/2009	
C6343	SA	3/25/2009	
		11/9/2009	
AT-3-3-S	SA	3/25/2009	
		12/3/2009	Configured for high river sampling 11/23/2009. Field parameters only 12/3/2009; SC low.
AT-3-3-M	SA	3/25/2009	
		12/3/2009	Configured for high-river sampling 11/23/2009.
AT-3-3-D	SA	3/25/2009	Low yield.
		12/3/2009	Configured for high-river sampling 11/23/2009.
C6344	SA	3/25/2009	
		x	Not sampled until 1/2010.
AT-3-4-S	SA	3/17/2009	
		11/19/2009	
AT-3-4-M	SA	3/17/2009	
		11/19/2009	
AT-3-4-D	SA	3/17/2009	
		x	No yield 11/19/2009.
C6347	SA	3/17/2009	
		11/9/2009	
C6348	SA	3/17/2009	
		11/9/2009	
AT-3-5-S	SA	3/17/2009	
		11/19/2009	

Table D-2. (Cont.)

Tube Name	Freq.	Sample Dates	Comments
C6350	SA	x	
		11/9/2009	
C6351	SA	3/17/2009	
		11/9/2009	
AT-3-6-S	SA	3/24/2009	
		11/25/2009	
AT-3-6-M	A	11/25/2009	
AT-3-6-D	SA	3/24/2009	
		11/25/2009	
AT-3-7-S	A	x	No yield 11/25/2009.
AT-3-7-M	SA	3/24/2009	
		11/25/2009	
AT-3-7-D	SA	3/24/2009	
		11/25/2009	
AT-3-8-S	SA	3/24/2009	
		11/25/2009	
AT-3-8-M	A	11/25/2009	
AT-3-8-D	A	x	Tube removed.

Notes:
Aquifer tubes are listed in order, upstream to downstream. Color bands group individual tubes at a tube site (cluster). Frequency as listed in DOE/RL-2000-59, Rev. 1, *Sampling and Analysis Plan for Aquifer Sampling Tubes*.

A = annually
SA = semiannually
Q = quarterly
PVC = protective polyvinylchloride casing
SC = specific conductance
x = not sampled

Figure D-1. Aquifer Tube Sampling by Area, 2009.

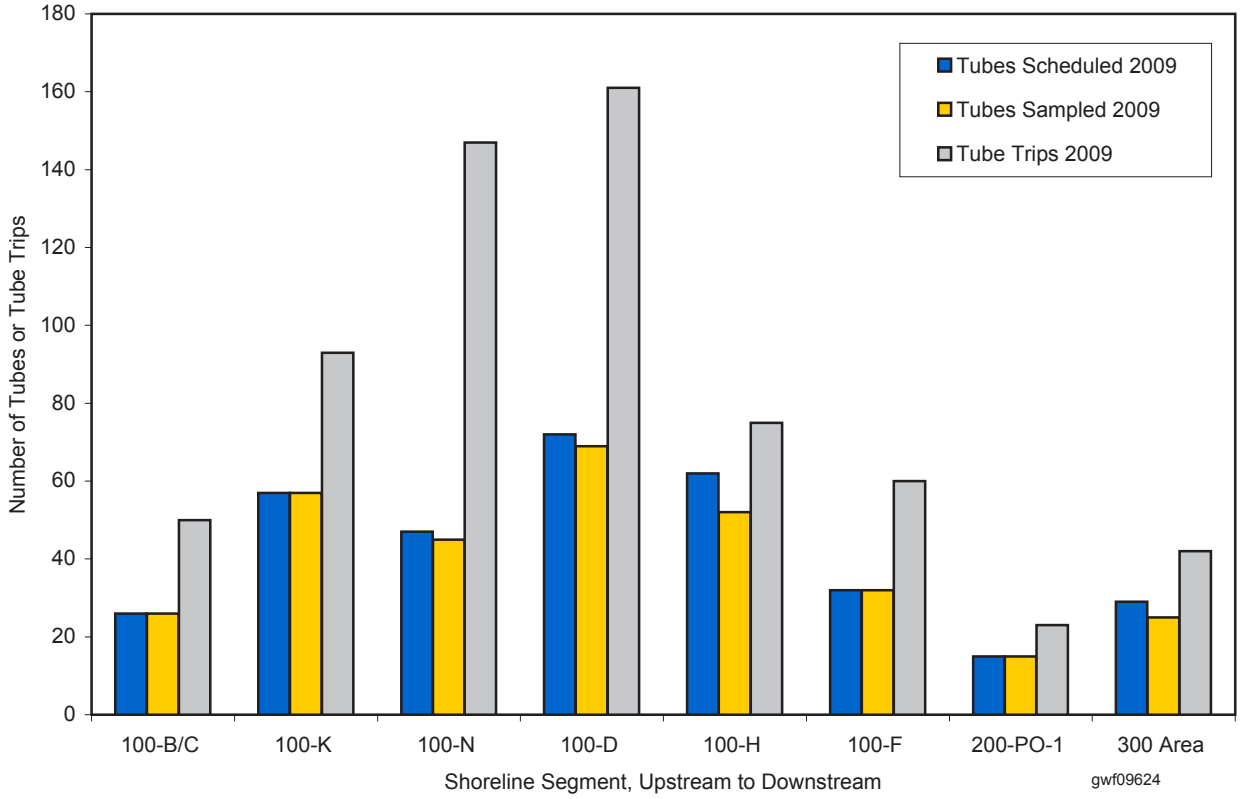

Figure D-2. 100-B/C Area River Stage and Aquifer Tube Sampling Dates, 2009.

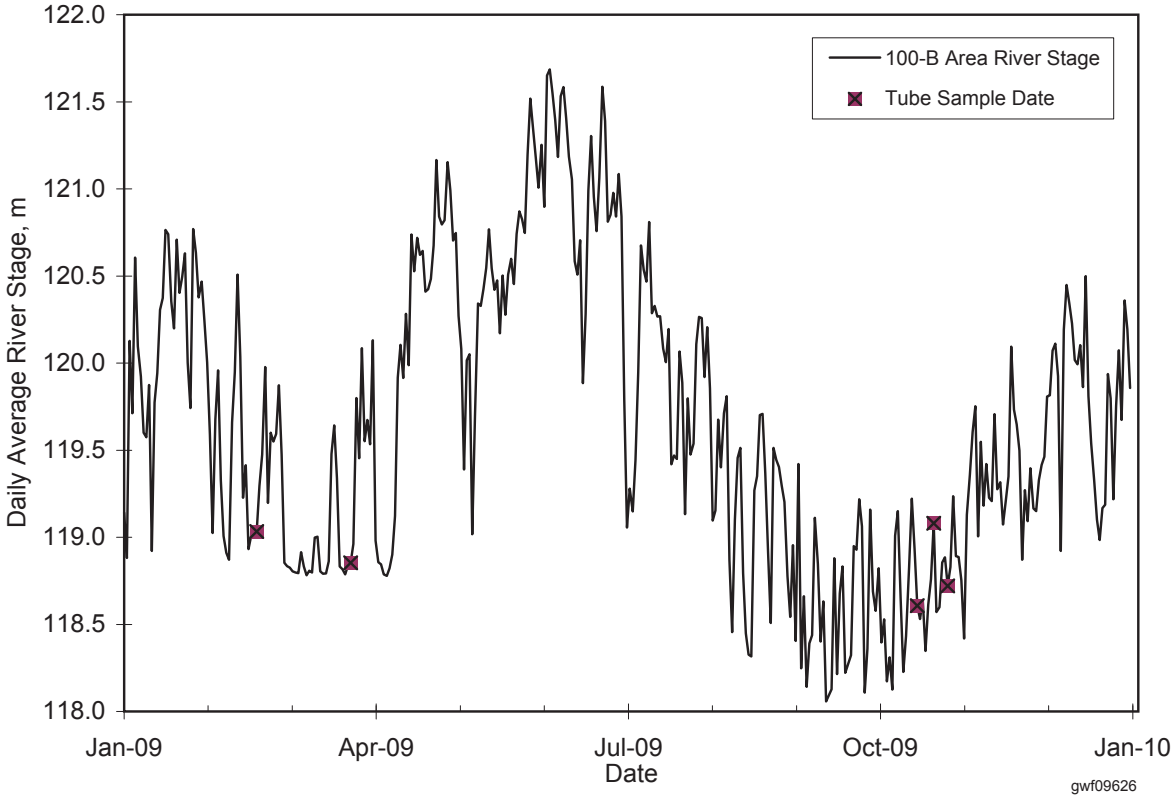

Figure D-3. 100-K Area River Stage and Aquifer Tube Sampling Dates, 2009.

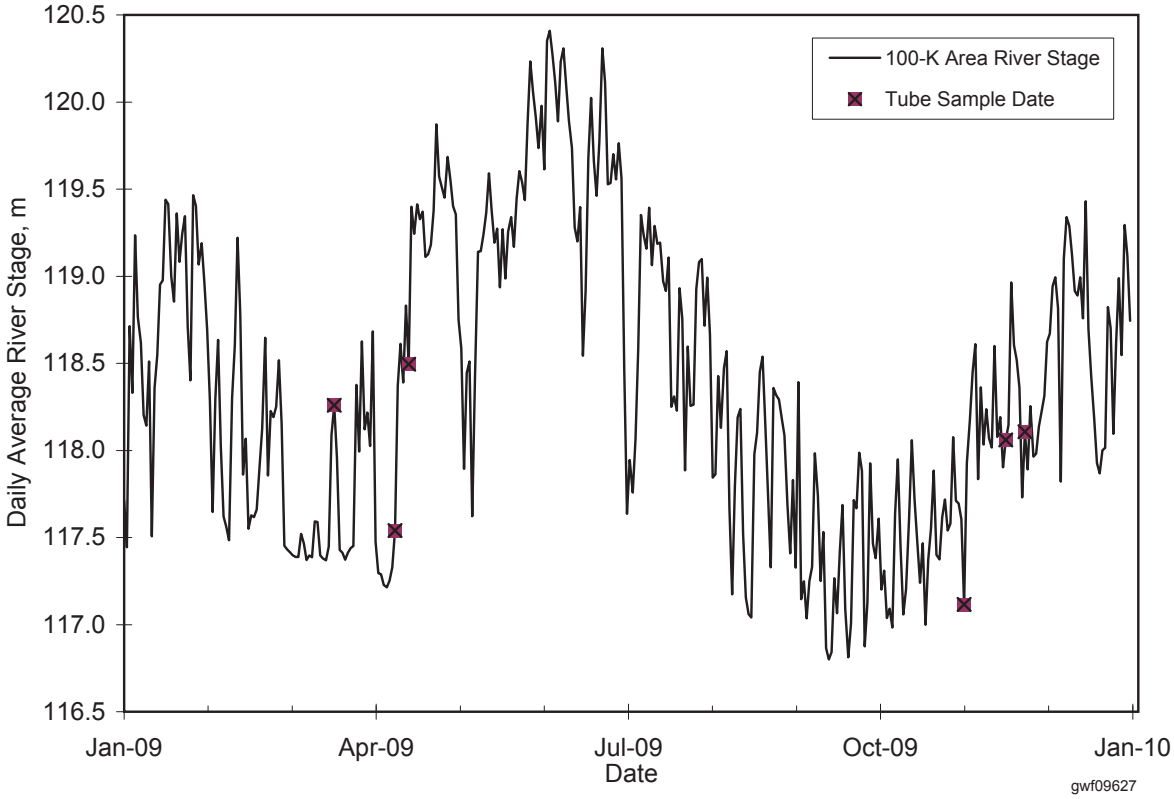

Figure D-4. 100-N Area River Stage and Aquifer Tube Sampling Dates, 2009.

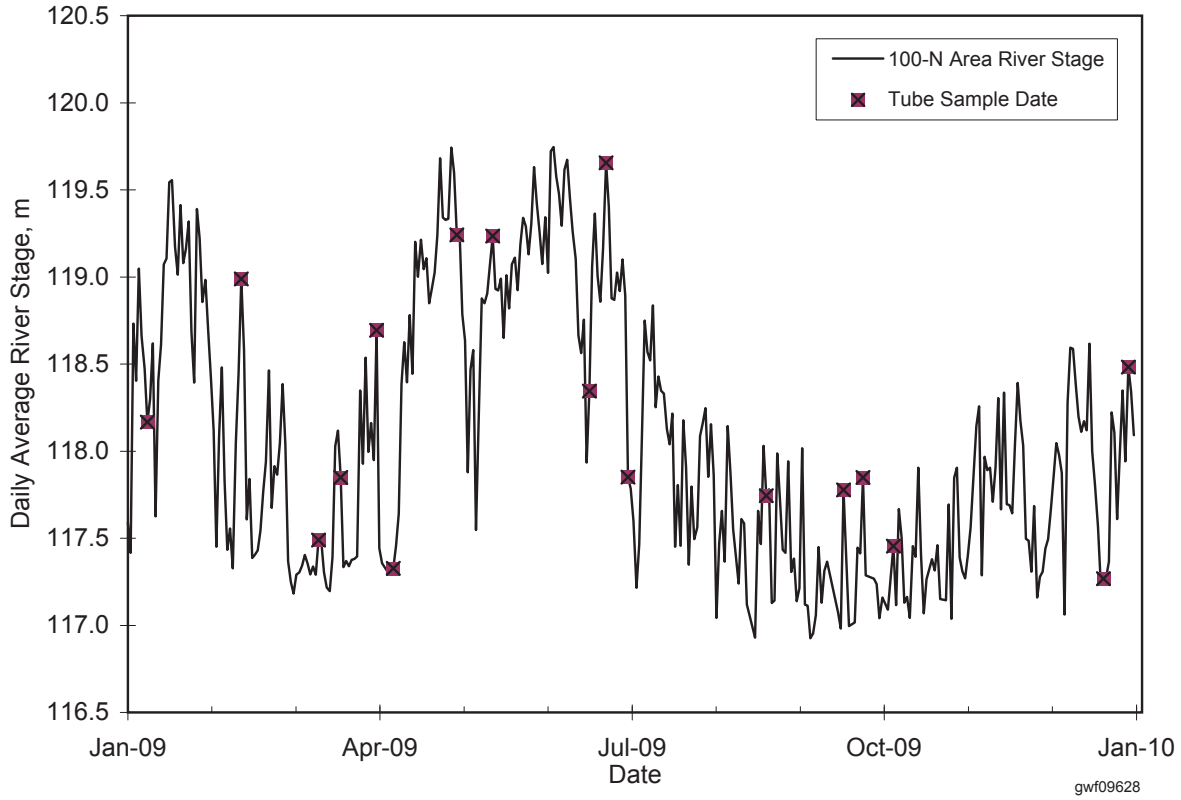

Figure D-5. 100-D Area River Stage and Aquifer Tube Sampling Dates, 2009.

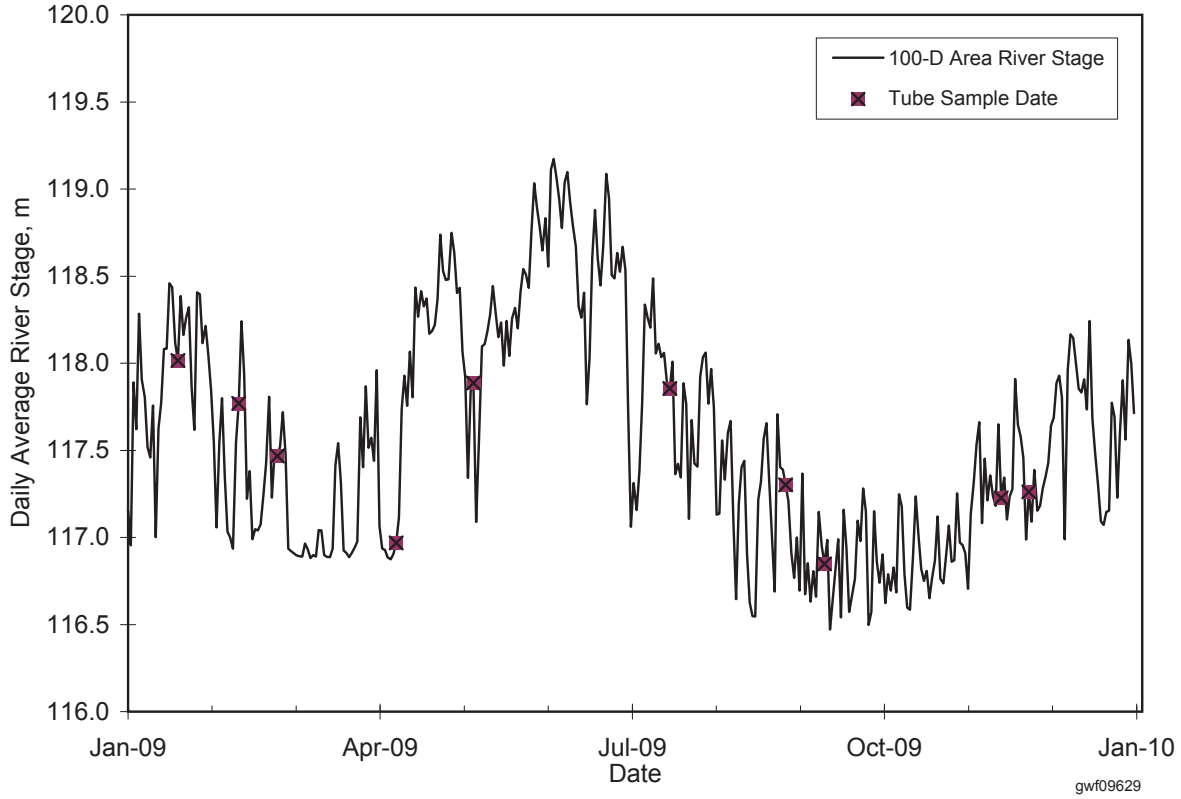

Figure D-6. 100-H Area River Stage and Aquifer Tube Sampling Dates, 2009.

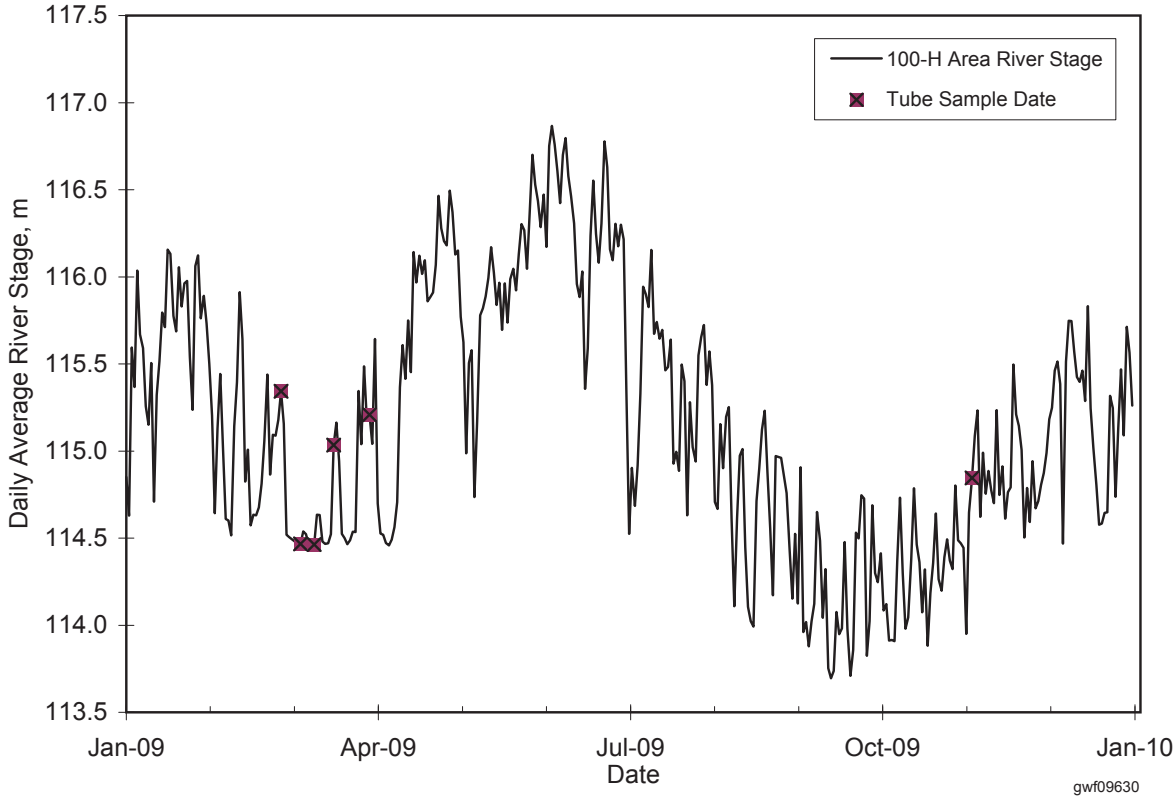

Figure D-7. 100-F Area Aquifer Tube Sampling Dates for 2009 and 100-H Area River Stage.

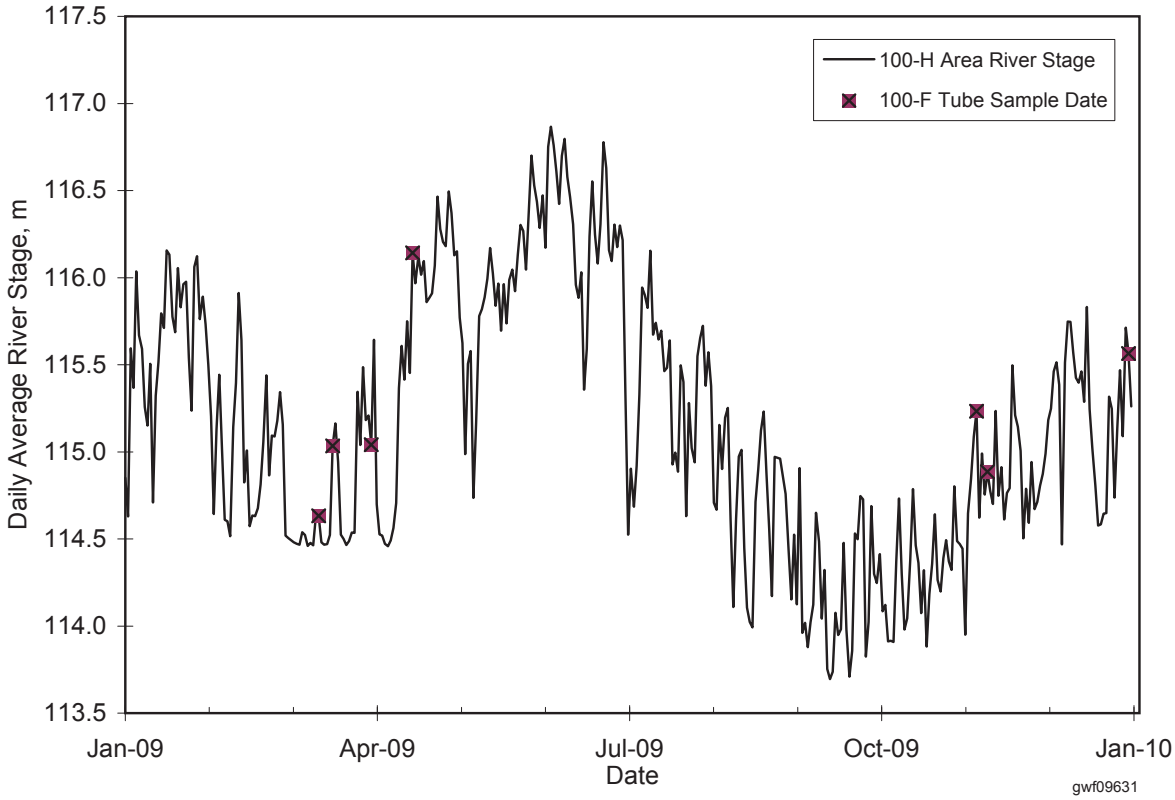

Figure D-8. 200-PO-1 Operable Unit Aquifer Tube Sampling Dates for 2009 and 300 Area River Stage.

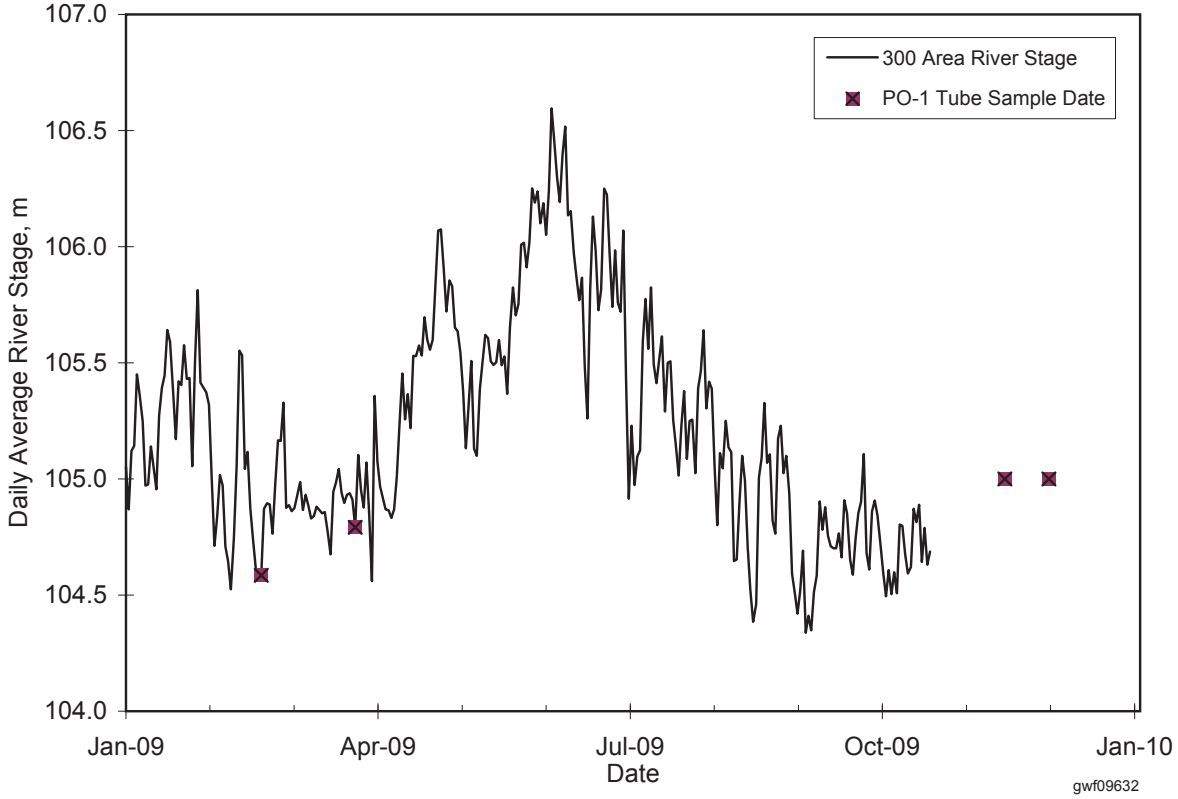

Figure D-9. 300 Area River Stage and Aquifer Tube Sampling Dates.

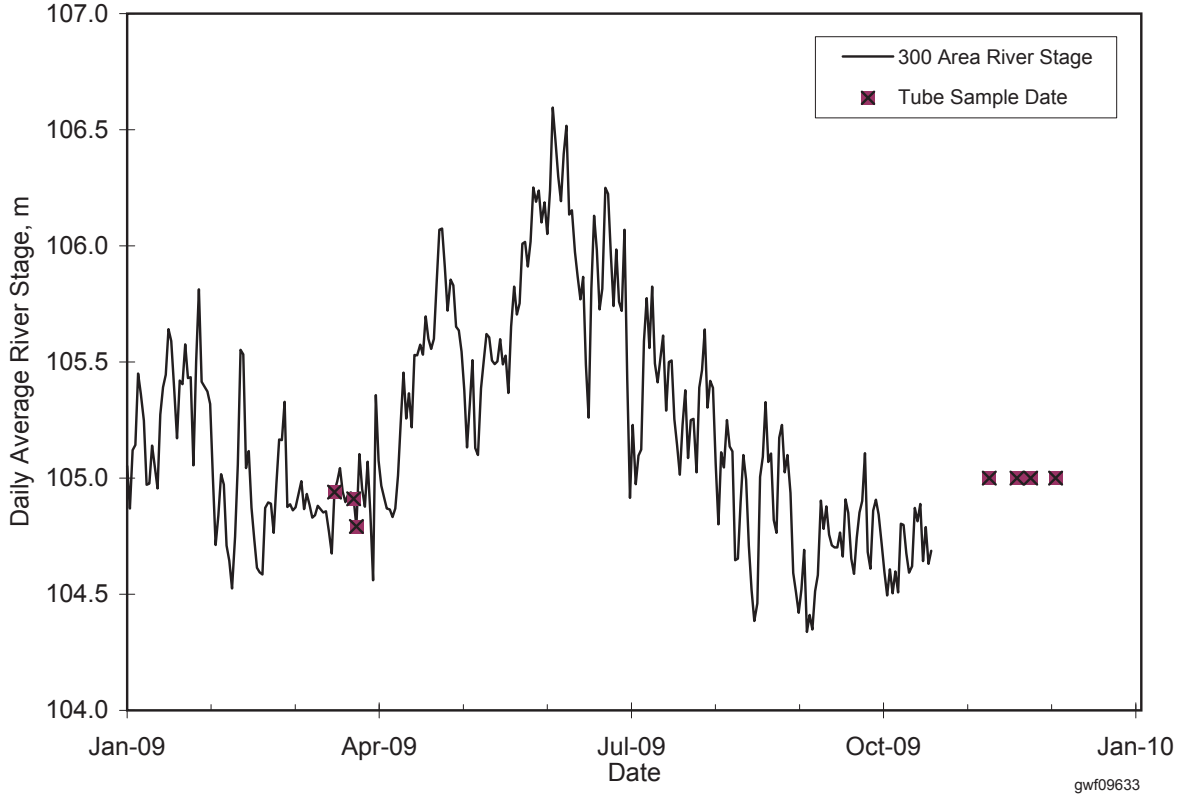

Figure D-10. Maximum Concentrations of Four Contaminants in Aquifer Tubes in Each Operable Unit, 2009.

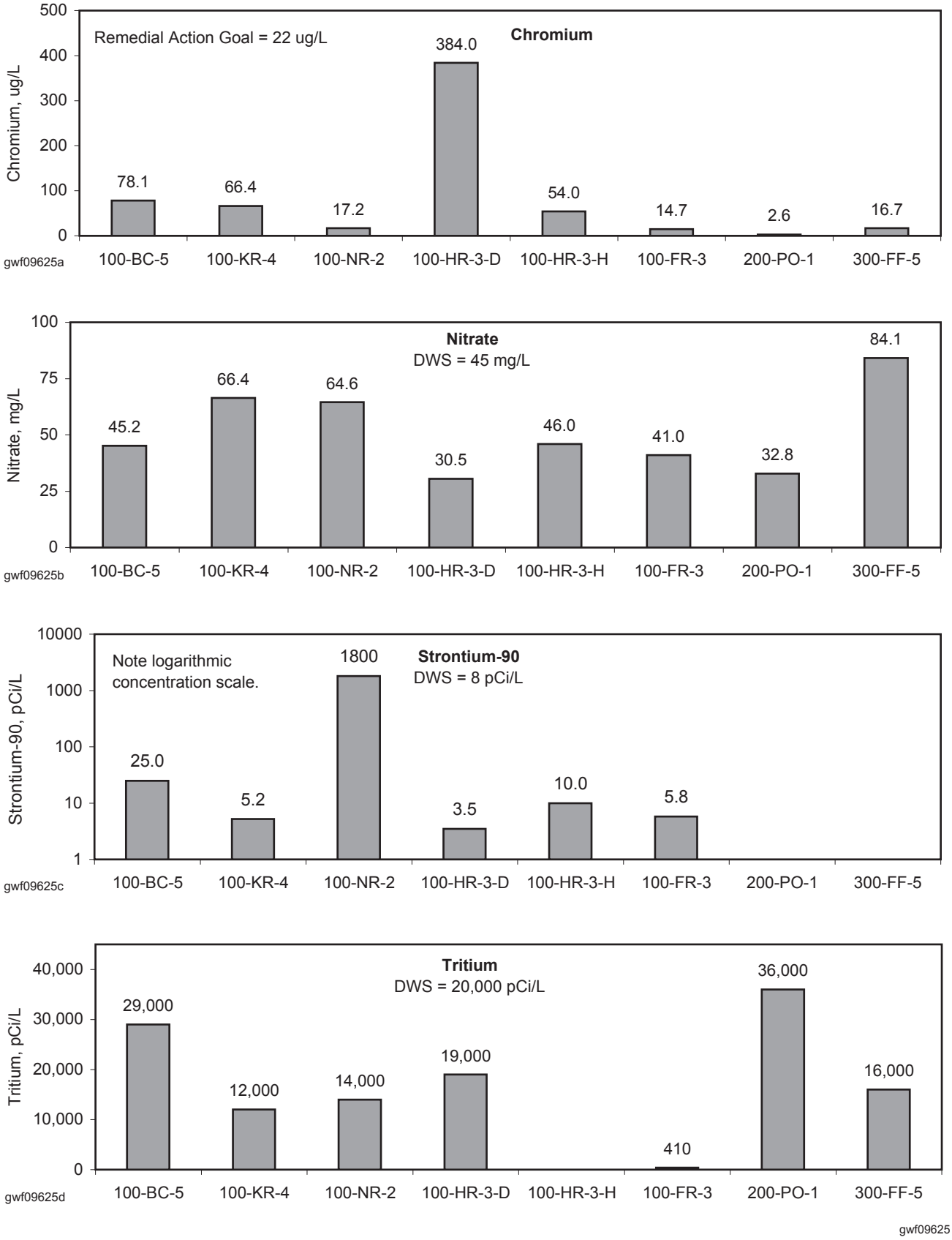

Figure D-11. Cross-Section of Screen Elevations in Aquifer Tubes and Near-Shore Wells in 100-F Area, Upstream.

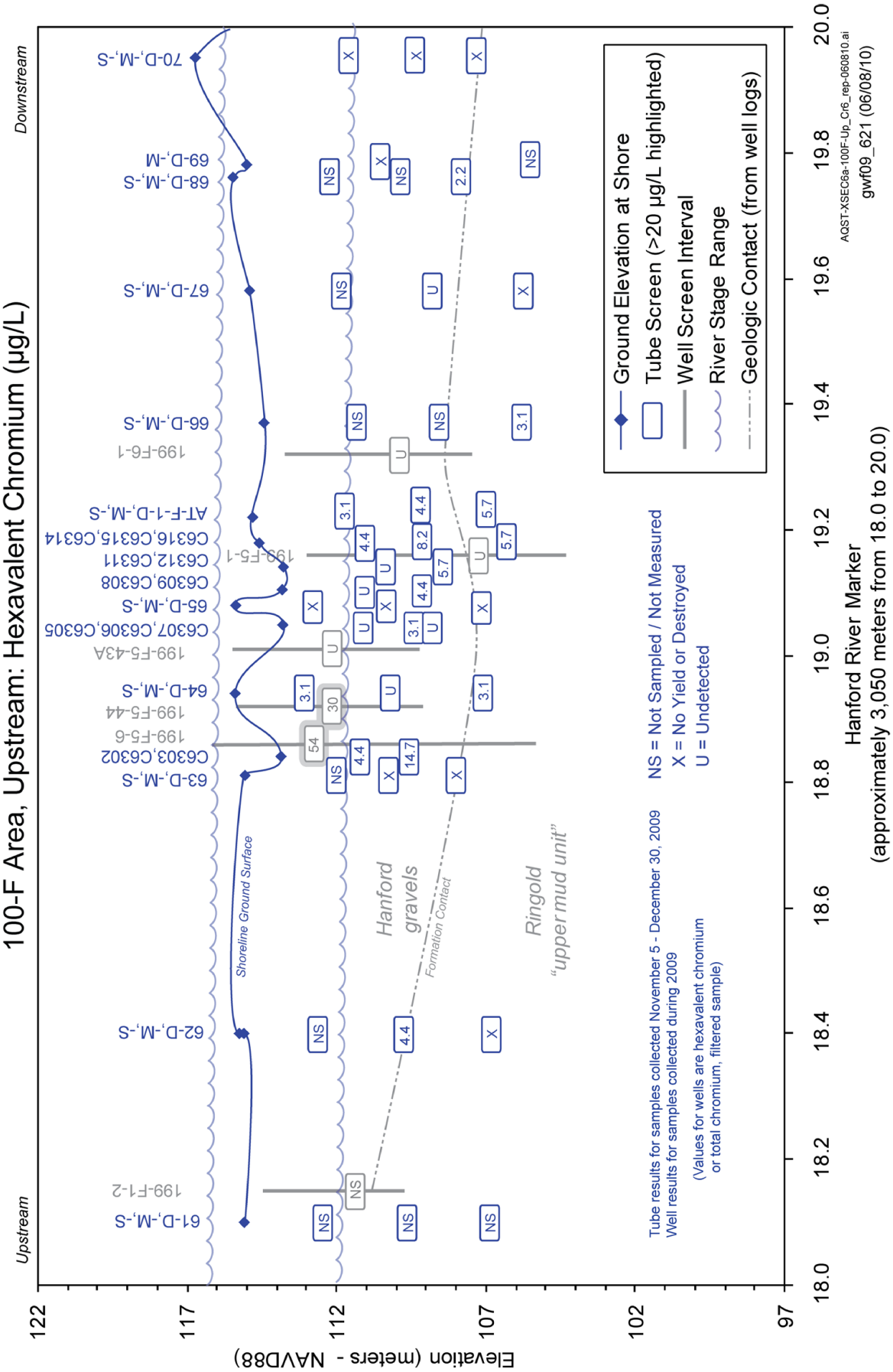

Figure D-12. Cross-Section of Screen Elevations in Aquifer Tubes and Near-Shore Wells in 100-F Area, Downstream.

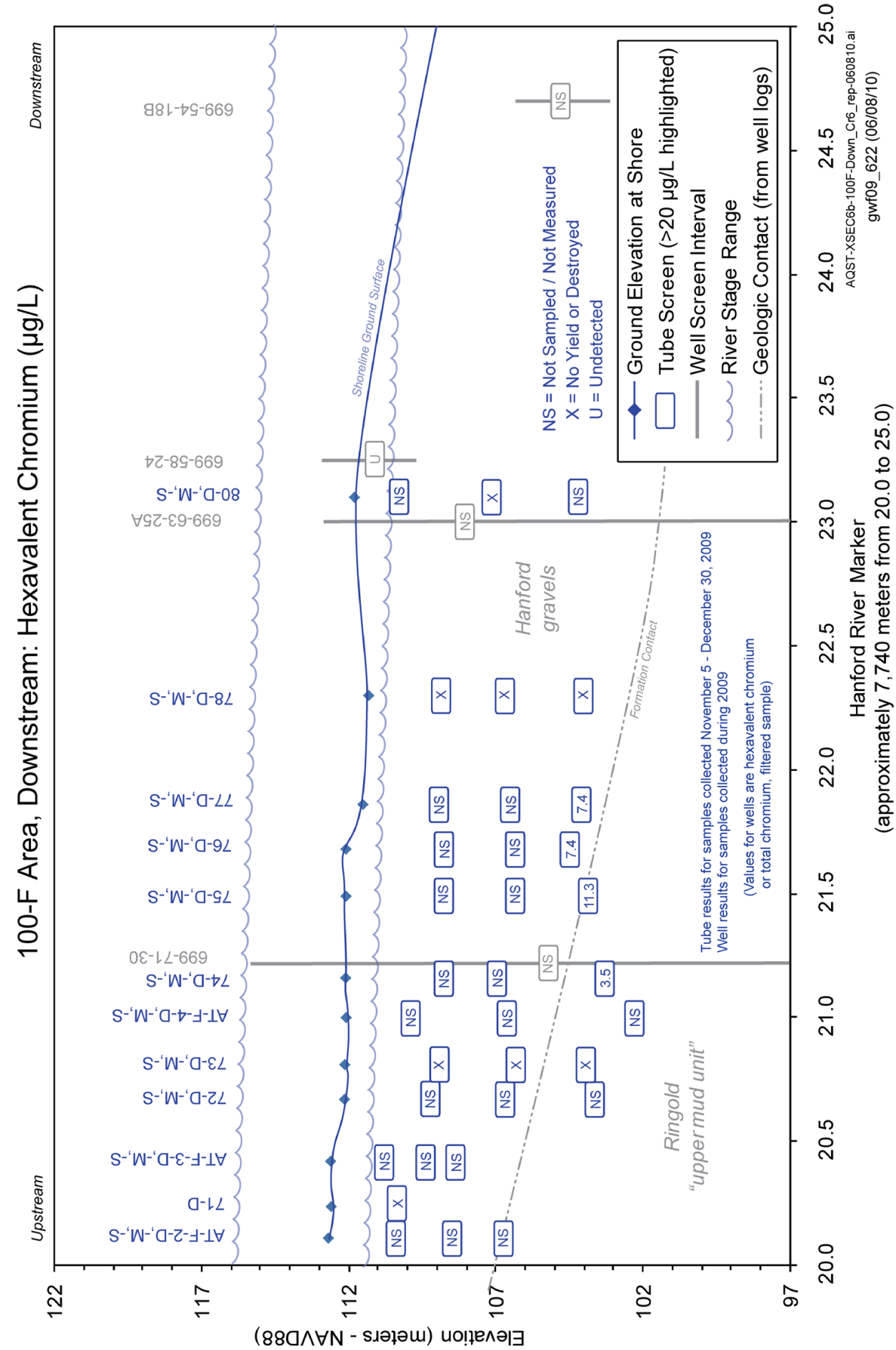
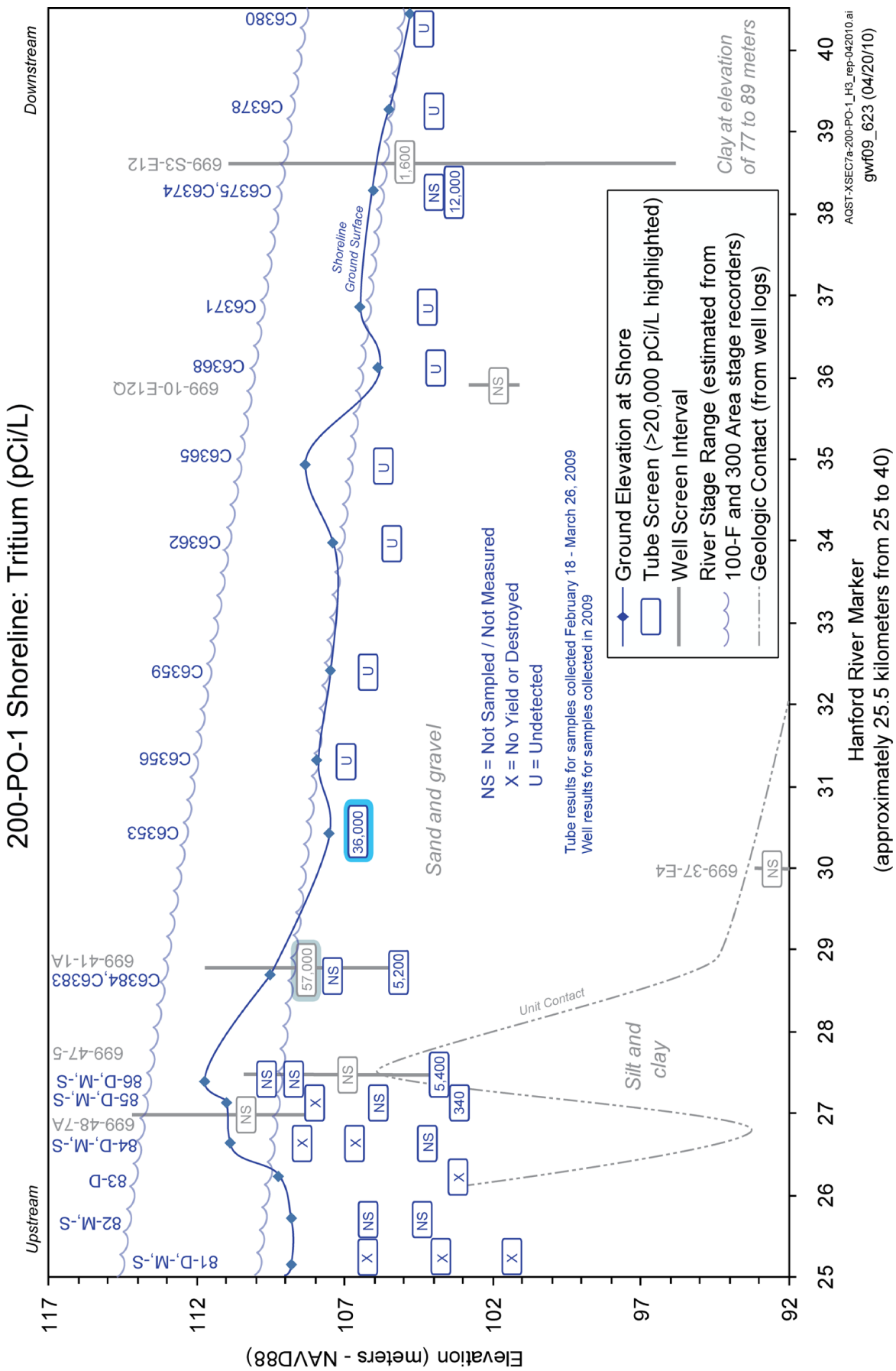
Figure D-13. Cross-Section of Screen Elevations in Aquifer Tubes and Near-Shore Wells in 200-PO-1 Operable Unit.