

Results of Groundwater Monitoring for the 300 Area Process Trenches

Reporting Period: January – June 2005

A Letter Report Prepared by
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Richland, Washington

October 2005

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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This letter report has been prepared to provide the U.S. Department of Energy, U.S. Environmental Protection Agency, Washington State Department of Ecology, and Hanford Site contractors with updated groundwater monitoring information. It is not intended for general distribution beyond that audience.

INTRODUCTION

The 300 Area process trenches (316-5) are a *Resource Conservation and Recovery Act* (RCRA) treatment, storage, and/or disposal unit in the Hanford Facility RCRA Permit (Ecology 2000). From 1975 through 1994 the trenches received effluent discharges of dangerous mixed waste from fuel fabrication laboratories in the 300 Area. Groundwater monitoring at the 300 Area process trenches is conducted in accordance with Washington Administrative Code (WAC) 173-303-645(11), Corrective Action Program, and Part VI, Chapter 1 of the Hanford Facility RCRA Permit (Ecology 2000). The modified closure plan (DOE 1995), portions of which are incorporated into the Hanford Facility RCRA Permit, indicates that groundwater remediation is deferred to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) 300-FF-5 groundwater operable unit.

This report is one of a series of semiannual groundwater monitoring reports on the corrective action program at the 300 Area process trenches. It fulfills requirements of WAC 173-303-645(11)(g) to report on the effectiveness of the corrective action program. This report covers groundwater monitoring data collected during the period from January through June 2005.

OBJECTIVE

The objective of groundwater monitoring during the corrective action period is to demonstrate the effectiveness of the corrective action program by examining the trend of the constituents of interest to confirm that they are attenuating naturally, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit (ROD 1996). The 300 Area process trenches were closed under a modified closure/post-closure plan (DOE 1995) and continue to be in the groundwater corrective action program because groundwater contamination continues to exceed groundwater quality criteria (federal drinking water standards). Groundwater monitoring will continue for 30 years during the post-closure monitoring period.

RCRA GROUNDWATER-MONITORING PROGRAM

The groundwater-monitoring network for the 300 Area process trenches (Lindberg et al. 1995) includes four well pairs (see Figure 1). Each of the well pairs has one shallow and one deep well. The shallow wells are screened at the water table, and the deep wells are screened at the bottom of the unconfined aquifer (i.e., above the lacustrine and over-bank deposits of the Ringold Formation lower mud unit). One of the pairs is upgradient, and the other three pairs are downgradient. The constituents of interest are total uranium,¹ and the volatile organic compounds cis-1,2-dichloroethene (cis-DCE), trichloroethene (TCE), and tetrachloroethene. Sampling frequency is semiannual, but during each semiannual sampling period the wells are sampled four times (monthly intervals). As a result, the wells are sampled during the months of January, February, March, June, July, August, September, and December. Groundwater samples are analyzed for the contaminants of interest.

¹Note that source, special nuclear, and by-product materials, as defined in the *Atomic Energy Act* (AEA), are regulated at DOE facilities exclusively by DOE acting pursuant to its AEA authority. These materials are not subject to regulation by the state of Washington. All information contained herein and related to, or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. DOE asserts that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear and by-product materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

GROUNDWATER FLOW DIRECTION

Measurements of depth to groundwater in each network well were collected when the wells were sampled. The water table during the January to June 2005 sampling events was predominately in its normal (low river stage) configuration except for later in the reporting period when higher river volumes raised the river level. During low river stage periods the water table slopes to the southeast in the vicinity of the 300 Area process trenches with the result that groundwater flows mainly to the southeast, discharging to the Columbia River. During high river stages, the water table may slope away from the river causing a temporary reversed gradient in the vicinity of the 300 Area process trenches and bank storage of river water.

Figures 2 and 3 (uranium maps) show contours of the water table during December 2004 (prior to the reporting period) and June 2005, respectively. The December 2004 water-table contours suggest a southeastern groundwater flow direction in the vicinity of the process trenches (low river stage configuration). However, in June 2005 the water table configuration in the vicinity of the process trenches suggests a south to southwestern groundwater flow direction. Typically, low river stages occur during the winter and early spring months with high river stages occurring in the late spring. Groundwater response to river stage is described in detail in former semiannual reports on the RCRA 300 Area process trenches and in annual reports of the Groundwater Performance Assessment Project (e.g., Hartman et al. 2003, 2004, 2005).

GROUNDWATER CONTAMINANT TRENDS

This section discusses concentrations of uranium, cis-DCE, TCE, and tetrachloroethene (the contaminants of interest) in the well network during the reporting period. Table 1 lists the analytical results for each contaminant of concern in each well of the monitoring network.

Uranium. The uranium plume continues to cover a large portion of the 300 Area, and there was very little change throughout the reporting period (Figure 2 – December 2005, just prior to the reporting period and Figure 3 – June 2005, at the end of the reporting period).² The highest concentrations in the plume continue to be downgradient (southeast) of the process trenches and along the shore of the river as far south as well 399-3-9 (Figure 1). Another area of high uranium concentration is at well 399-3-11, which is downgradient from 307 trench. The 307 trench is another known source of uranium contamination. Concentrations of uranium at the three downgradient network wells (wells 399-1-10A, -16A, and -17A) remained relatively constant throughout the reporting period and have changed very little since 2001 (Figures 4, 5, and 6). The only exception to this relative stability in uranium concentration in the downgradient wells is the rise in uranium concentration at well 399-1-10A. A sudden rise and subsequent slower decrease in uranium concentrations at this well starting in 2003 correspond to excavation and cleanup work immediately upgradient of the well (at the 618-5 burial ground).

Uranium was detected in six of the eight network wells during the reporting period. However, uranium concentrations exceeded the drinking water standard (30 ug/L) only at the three downgradient network wells that are screened at the water table. The highest concentration reported was 70.8 ug/L at well 399-1-16A in a sample collected January 10, 2005.

² Note: Additional uranium data for the December 2004 and June 2005 maps were from wells sampled and analyzed for the 300-FF-5 Operable Unit. CERCLA and RCRA sampling and analysis are coordinated to avoid duplication of effort and to provide consistency for data interpretation purposes.

Cis-1,2-Dichloroethene. Cis-DCE was detected at two wells (399-1-16B, and 399-1-17B) in the 300 Area process trenches network during the reporting period. Both of these wells are screened in the lower portion of the unconfined aquifer. Only well 399-1-16B had concentrations of cis-DCE that exceeded the drinking water standard (70 ug/L). At well 399-1-16B the concentrations were 130, 170, 200, and 150 ug/L in January, February, March, and June 2005, respectively. The trend at well 399-1-16B (Figure 7) is variable, fluctuating between 95 and 200 ug/L, but overall appears to be neither decreasing nor increasing. At well 399-1-17B, another well screened at the base of the unconfined aquifer, the reported results were 2.6 to 2.7 ug/L during the reporting period.

Trichloroethene. TCE (drinking water standard 5 µg/L) was detected at three wells in the 300 Area process trenches network during the reporting period. The well with the highest reported concentration was well 399-1-16B (1.9 µg/L). This well is screened at the base of the unconfined aquifer, and the source is most likely the 300 Area process trenches. The historical trend at this well shows that TCE concentrations decreased since 1997, but have remained relatively stable since 2000. The source of TCE at the other two wells (399-1-16A and 399-1-17A, screened at the water table) is most likely offsite to the southwest. Concentrations of TCE from the offsite source to the southwest are all below 1.0 µg/L in 300 Area process trenches network wells

Tetrachloroethene. In recent years tetrachloroethene (5 µg/L drinking water standard) has occasionally been detected in the well network downgradient of the 300 Area process trenches. During the reporting period it was not detected at levels above the method detection limit (0.1 µg/L).

CONCLUSIONS

The objective of the groundwater monitoring plan is to examine the trend of the contaminants of concern to confirm that they are attenuating naturally. The overall concentration of uranium in network wells decreased during the years 1998 to 2001, but has been holding relatively stable since 2001. However, rising water-table conditions during high river stages mobilizes vadose zone uranium and temporarily increases concentrations of uranium in the aquifer (as reported in earlier semiannual reports). The concentration of cis-DCE appears to be holding steady at levels above the drinking water standard (70 ug/L) in one well (399-1-16B) and is not affected by river stage.

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Table 1. Results of Groundwater Analyses for 300 Area Process Trenches Contaminants of Interest During January to June 2005.

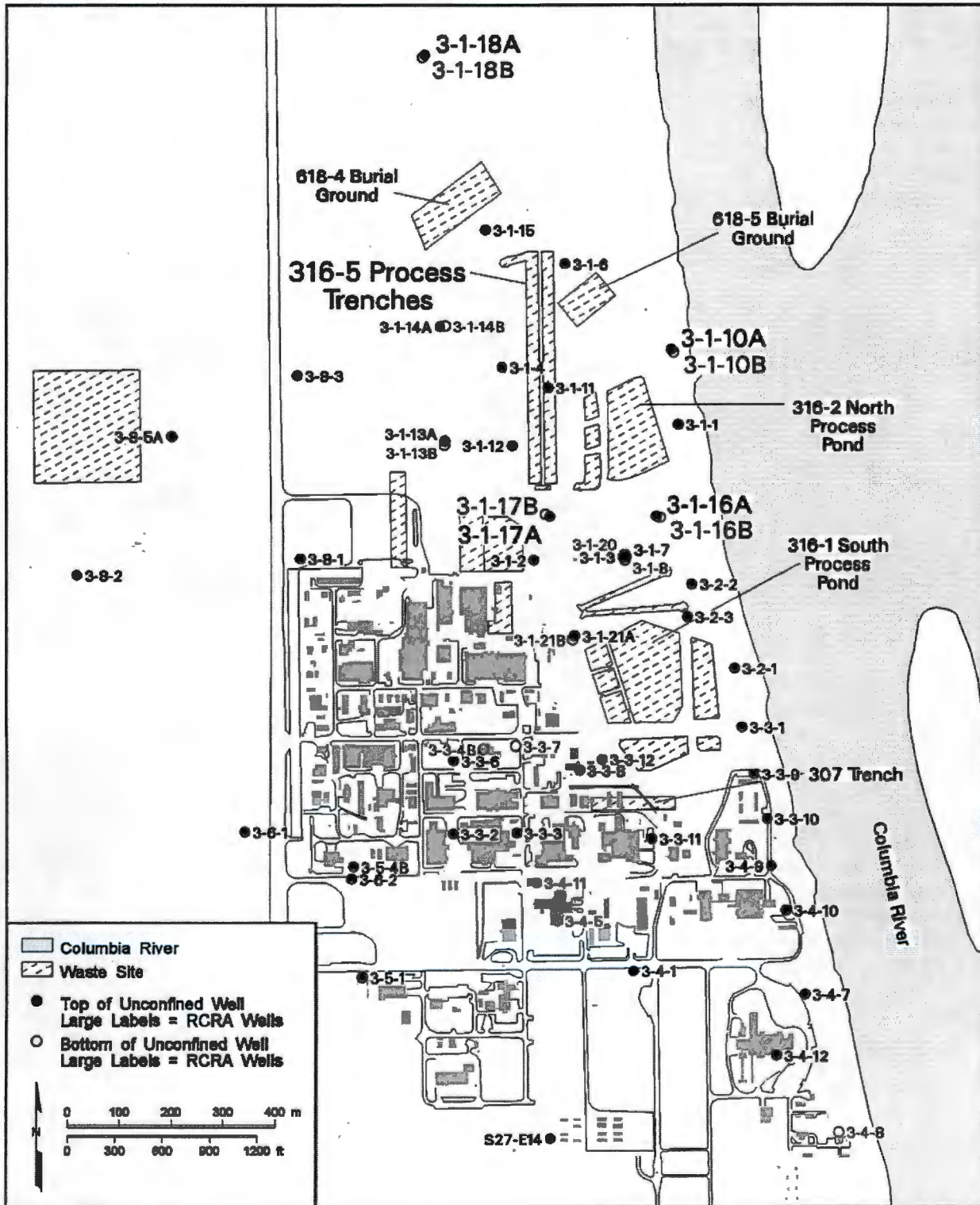
Well	Sample Date	cis-1,2-DCE, ug/L		Tetrachloroethene, ug/L		Trichloroethene, ug/L		Uranium, ug/L
399-1-10A	1/10/2005	0.27	U	0.08	U	0.13	U	48.2
399-1-10A	2/18/2005	0.27	UH	0.1	UNH	0.13	UH	46
399-1-10A	4/14/2005	0.27	U	0.1	U	0.13	U	45.3
399-1-10A	6/20/2005	0.27	U	0.1	U	0.13	U	41.1
399-1-10B	1/10/2005	0.27	U	0.08	U	0.13	U	0.0314
399-1-10B	2/18/2005	0.27	UH	0.1	UNH	0.13	UH	0.0245
399-1-10B	4/14/2005	0.27	U	0.1	U	0.13	U	0.049 U
399-1-10B	4/14/2005	0.27	U	0.1	U	0.13	U	0.0433 U
399-1-10B	6/15/2005	0.27	U	0.1	U	0.13	U	0.0271 U
399-1-16A	1/10/2005	0.27	U	0.08	U	0.44	J	70.8
399-1-16A	2/18/2005	0.27	U	0.1	U	0.54	J	62.3
399-1-16A	3/18/2005	0.7	J	0.1	U	0.38	J	63.4
399-1-16A	6/15/2005	0.27	U	0.1	U	0.46	J	54.2
399-1-16B	1/10/2005	130	D	0.08	U	2		11.6
399-1-16B	2/18/2005	170	DH	0.1	UNH	1.6	H	11.7
399-1-16B	3/18/2005	200	D	0.1	U	2		14.3
399-1-16B	6/15/2005	150	D	0.1	U	1.9		14.8
399-1-17A	1/10/2005	0.27	U	0.08	U	0.25	J	57.8
399-1-17A	2/18/2005	0.27	U	0.1	U	0.2	J	40.7
399-1-17A	3/18/2005	0.27	U	0.1	U	0.24	J	42.9
399-1-17A	6/15/2005	0.27	U	0.1	U	0.16	J	53.3
399-1-17B	1/10/2005	1.7		0.08	U	0.13	U	0.00558 U
399-1-17B	2/18/2005	2.7		0.1	U	0.13	U	0.00555 U
399-1-17B	3/18/2005	2.1		0.1	U	0.13	U	0.00027 U
399-1-17B	6/20/2005	1.6		0.1	U	0.13	U	0.0146 U
399-1-18A	1/7/2005	0.27	U	0.08	U	0.13	U	5.41
399-1-18A	2/18/2005	0.27	U	0.1	U	0.13	U	5.72
399-1-18A	3/18/2005	0.27	U	0.1	U	0.13	U	5.66
399-1-18A	6/22/2005	0.27	U	0.1	U	0.13	U	5.8
399-1-18B	1/7/2005	0.27	U	0.08	U	0.13	U	0.00611 U
399-1-18B	2/18/2005	0.27	U	0.1	U	0.13	U	0.0111 U
399-1-18B	3/18/2005	0.27	U	0.1	U	0.13	U	0.00148 U
399-1-18B	6/22/2005	0.27	U	0.1	U	0.13	U	0 U
399-1-18B	6/22/2005	0.27	U	0.1	U	0.13	U	0.000469 U

H= Laboratory holding time exceeded

J= Value is an estimate (close to detection limit)

N= Spike recovery was outside control limits

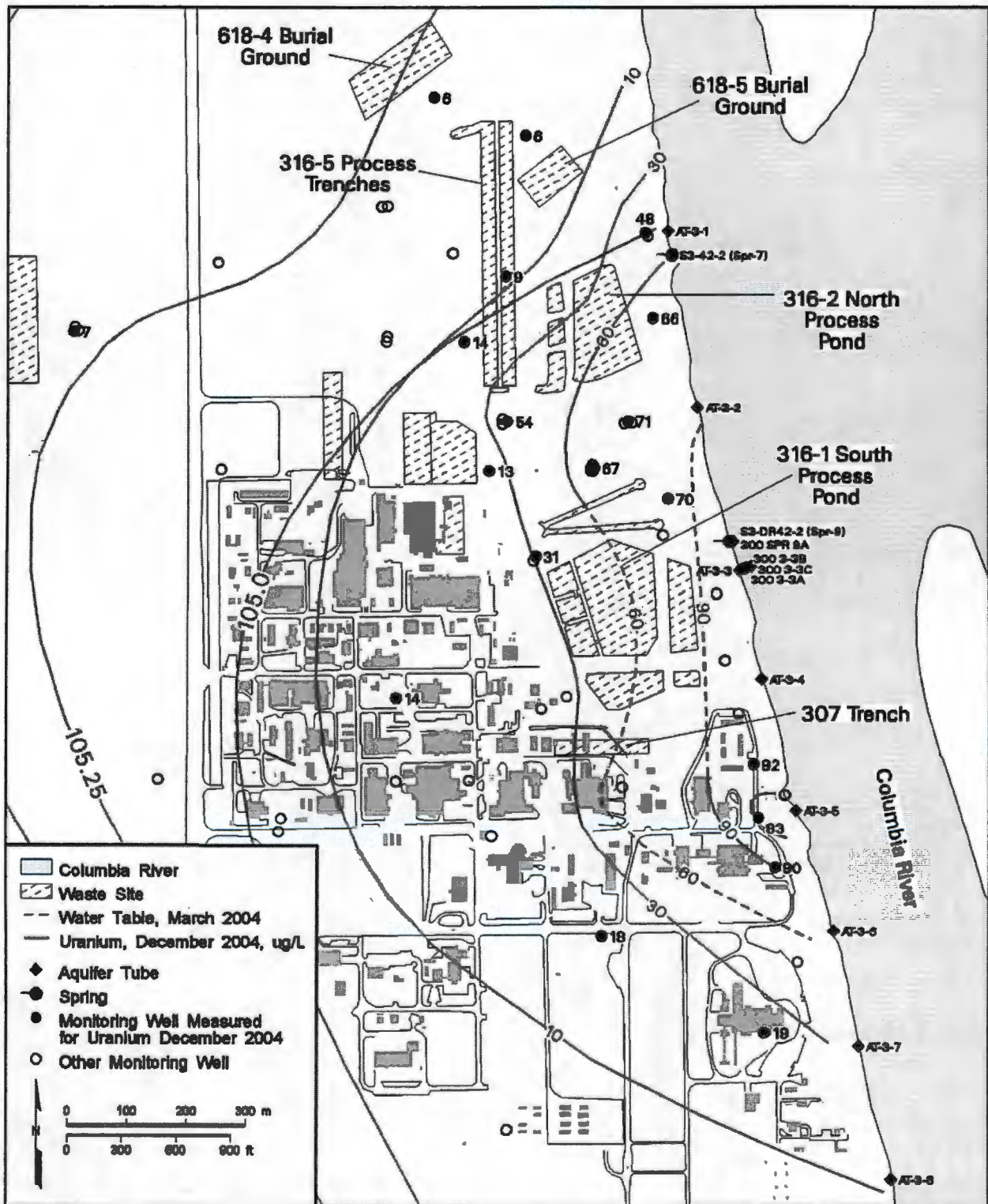
U= Below detection limit



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Figure 1. Locations of Wells in the 300 Area Process Trenches Monitoring Networks (from WHC-SD-EN-AP-185). The four well pairs of the 300 Area process trenches network have larger labels.

300 Area Uranium, December 2004



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Figure 2. Uranium Concentrations in the Upper Portion of the Unconfined Aquifer in December 2004.

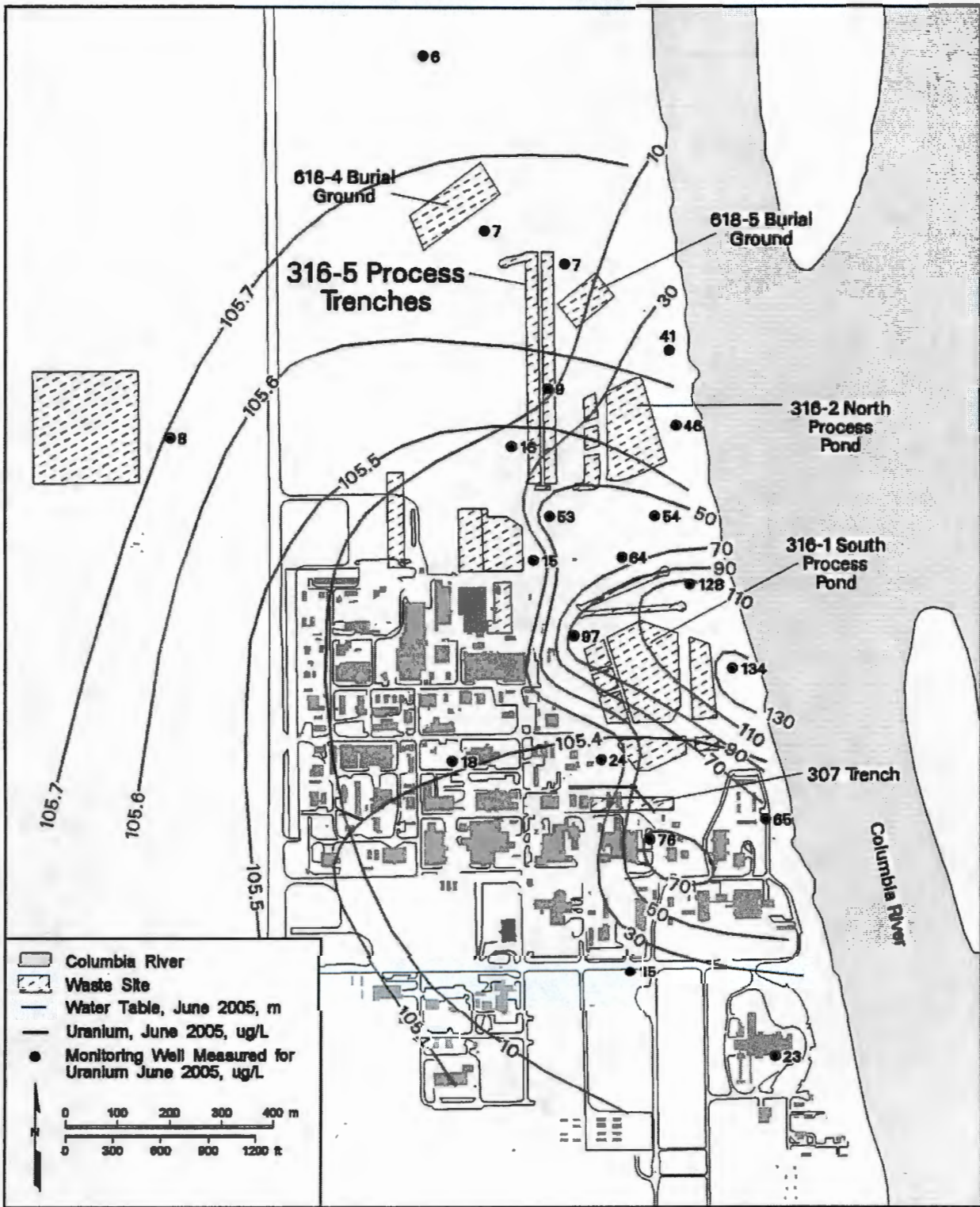


Figure 3. Uranium Concentrations in the Upper Portion of the Unconfined Aquifer in June 2005
 [Note: Water-table contours from depths to water measurements collected June 9, 2005.]

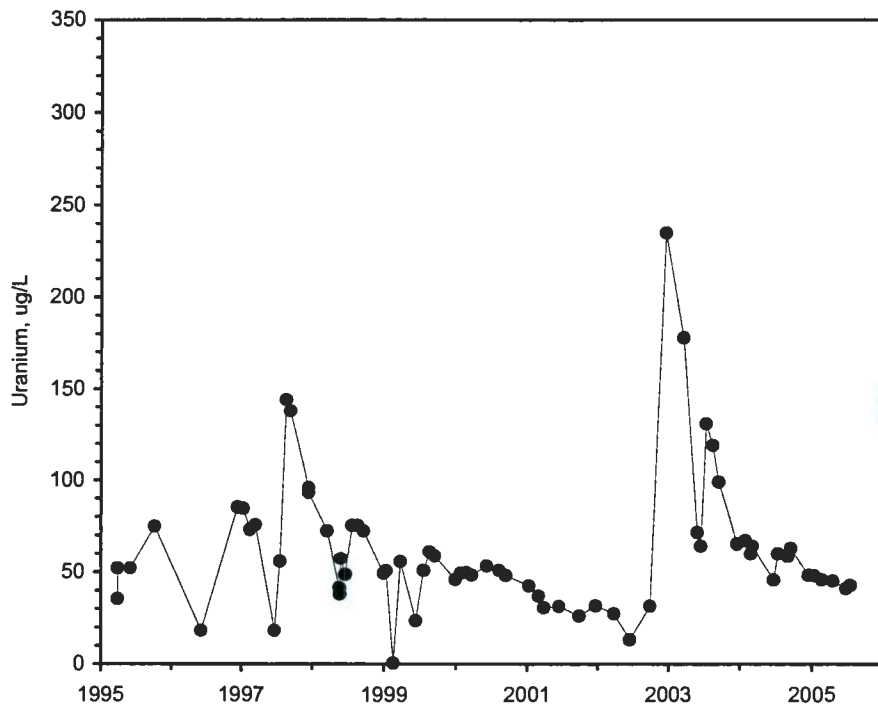


Figure 4. Uranium Concentrations in Well 399-1-10A

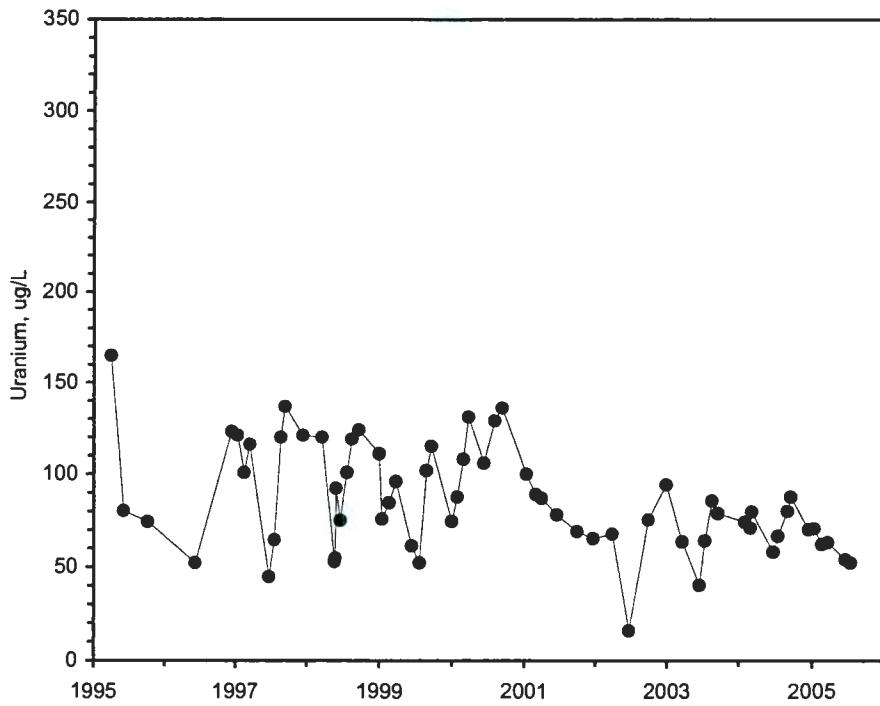


Figure 5. Uranium Concentrations in Well 399-1-16A

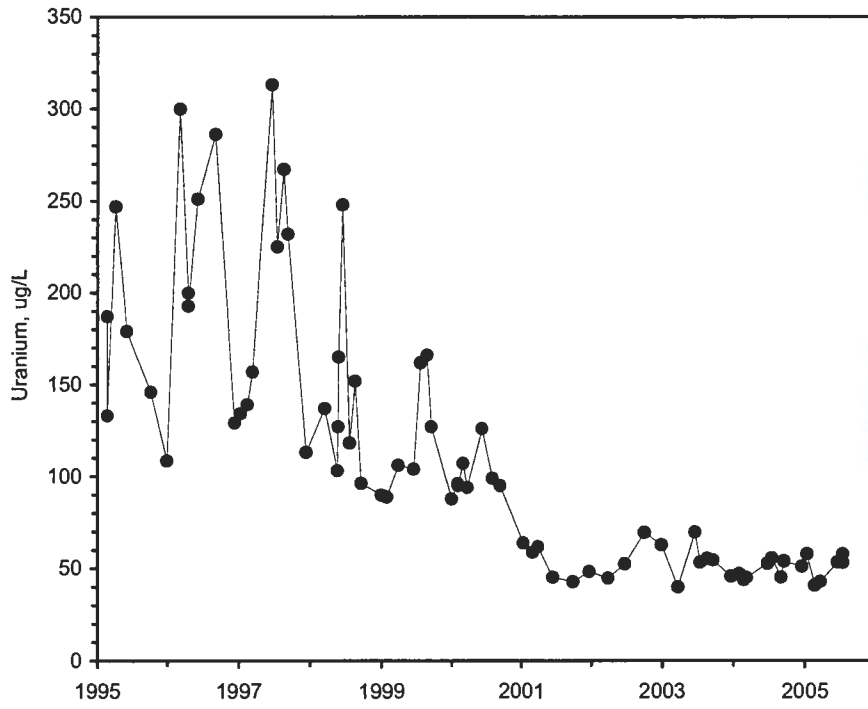


Figure 6. Uranium Concentrations in Well 399-1-17A

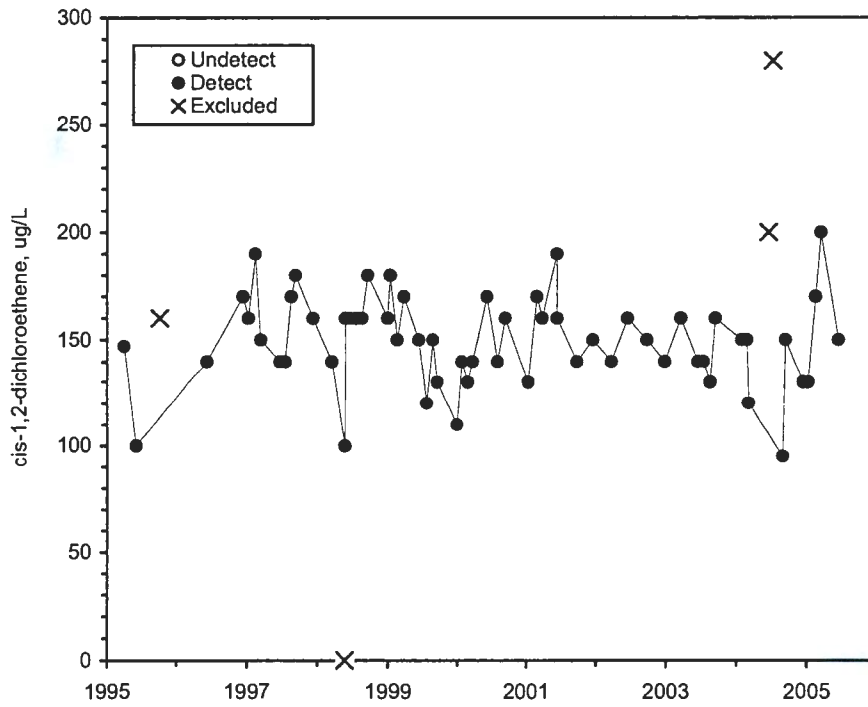


Figure 7. Cis-1,2-Dichloroethene Concentrations in Well 399-1-16B