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NOV 16 2004

05-AMCP-0012

Ms. Jane A. Hedges
Cleanup Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99352

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Dear Ms. Hedges:

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FINAL STATUS
CORRECTIVE ACTION SEMIANNUAL REPORTS FOR JANUARY THROUGH JUNE 2004

The following reports are being transmitted for your information: "Results of Groundwater Monitoring for the 300 Area Process Trenches, Reporting Period: January - June 2004" (Attachment 1), and "Results of Groundwater Monitoring for the 183-H Solar Evaporation Basins, Reporting Period: January - June 2004" (Attachment 2). These reports are for the RCRA sites where groundwater is monitored under Final Status/Corrective Action programs and are submitted to fulfill the requirements of WAC 173-303-645(11)(g).

If you have questions, please contact me, or your staff may contact Mike Thompson, Office of the Assistant Manager for the Central Plateau, on (509) 373-0750.

Sincerely,


Matthew S. McCormick, Assistant Manager
for the Central Plateau

AMCP:KMT

Attachments

cc: See page 2

Ms. Jane A. Hedges
05-AMCP-0012

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cc w/attachs:

Administrative Record (D. A. Isom)
Environmental Portal

cc w/o attachs:

R. L. Biggerstaff, FHI
J. V. Borghese, FHI
M. J. Hartman, PNNL
R. J. Landon, BHI
J. W. Lindberg, PNNL
S. P. Luttrell, PNNL
A. G. Mishko, FHI
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Results of Groundwater Monitoring for the 300 Area Process Trenches

Reporting Period: January – June 2004

Report Date: September 2004

J. W. Lindberg

INTRODUCTION

The 300 Area process trenches (316-5) are a *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal unit in the Hanford Facility RCRA Permit (Ecology 2000). From 1975 through 1994 they 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 2004.

BACKGROUND

The objective of groundwater monitoring during the corrective action period was to demonstrate the effectiveness of the corrective action program by examining the trend of the constituents of interest to confirm that they were 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.

Prior to September 2001 groundwater monitoring at the 300 Area process trenches operated under a groundwater monitoring plan (Lindberg et al. 1995) that was originally designed for groundwater compliance. Sampling occurred eight times per year at eight network wells (Figure 1). Constituents of interest were uranium and volatile organic compounds (trichloroethene, cis-1,2-dichloroethene, and tetrachloroethene). As expected, groundwater samples showed that uranium and two volatile organic compounds (trichloroethene and cis-1,2-dichloroethene) exceeded specified contamination limits (Federal drinking water standards) prompting the groundwater monitoring program to move into correction action with a revised groundwater monitoring plan.

In September 2001 a revised groundwater-monitoring plan for corrective action (Lindberg and Chou 2001) was implemented for a two-year evaluation period. Changes over the previous plan included an update on the discussion of hydrogeology and conceptual model, a change in the number of network wells from 8 to 11 (Figure 1), and a revision of the statistical approach to the control chart method that tracks the contamination trends better than the previous plan with reduced costs. Based on the results of the two-year evaluation period, Ecology was to decide whether to continue, modify, or abandon the proposed approach in the revised plan. The last groundwater samples for this two-year evaluation period were collected in September 2003, and a report was prepared on the findings (Chou 2004) and transmitted

to Ecology. Ecology is reviewing the report, and monitoring has reverted to the previous monitoring plan (Lindberg, et al., 1995).

In early fiscal year 2004, DOE submitted a permit modification that proposed to revise the RCRA monitoring program for the 300 Area process trenches. The proposed monitoring program was to be integrated with CERCLA interim action monitoring, as allowed by Section II.K.7 of the Hanford Facility RCRA Permit. In this proposal, the groundwater monitoring plan would have retained eight wells in the network, eliminated radioactive constituents of interest but retained the non-radioactive constituents, reduced the sampling frequency to semiannual in all eight wells, eliminated statistical analysis, and reported on results in annual groundwater reports.

During the current reporting period, the Washington State Department of Ecology (Ecology) rejected the proposal to modify the RCRA monitoring program for the 300 Area process trenches. The rejection was based largely on their determination that the proposed modification did not meet one or more criteria for the type of modification (Class 2) that was presented. Secondly, Ecology considered that the modifications presented either did not meet the applicable groundwater protection standards of WAC 173-303-645 or were not accompanied by adequate explanation or information by which they could determine how groundwater protection standards would be met. Because Ecology rejected the proposal for modification of the RCRA monitoring program for the 300 Area process trenches, monitoring has continued under the previous groundwater monitoring plan (Lindberg et al., 1995).

RCRA GROUNDWATER-MONITORING PROGRAM

The groundwater-monitoring network for the 300 Area process trenches (Lindberg et al., 1995) included four well pairs (eight wells - 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 (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 concern are total uranium¹, and the volatile organic compounds cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene. Sampling frequency is semiannual, but during each semiannual sampling period the wells are sampled four times. As a result, the wells are sampled during the months of January, February, March, June, July, August, September, and December.

Uranium is not a listed dangerous waste constituent subject to regulation under RCRA. However, it continues to be monitored for the 300 Area process trenches because it is included in the monitoring plan referenced in the current Hanford Facility RCRA Permit.

WATER TABLE AND GROUNDWATER FLOW DIRECTIONS

Measurements of depth to groundwater in each network well were collected when the wells were sampled. In addition, water levels at other 300 Area wells were measured for the 300-FF-5 Operable Unit during December 2003 (the month preceding the reporting period) and June 2004 in order to make water

¹ Please note that source, special nuclear and by-product materials, as defined in the Atomic Energy Act of 1954 (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.

table maps of the whole 300 Area for those months. These data were used to construct larger scale water table maps (Figures 2 and 3) of just the northern portion of the 300 Area where the 300 Area process trenches are located.

The configuration of the water table in December 2003 (Figure 2) was relatively low for the year and shows the effects of areas of high hydraulic conductivity. One of these areas of high hydraulic conductivity trends west to east approximately through wells 399-1-17A and 399-1-16A. This area corresponds to a west-to-east-trending channel on the Ringold Formation-Hanford formation surface (Swanson et al. 1992) that most likely contains a preponderance of highly conductive gravels compared to the lower-permeability materials of the Ringold Formation below. During the previous three days prior to the December 2003 water level measurements, the river level at the 300 Area had been dropping, with a very low point of 104.6 meters above sea level the day before measurements. Well 399-1-16A, which is located within the highly conductive channel, had a recorded water level of 104.7 meters, only 0.1 meter above the river level of the previous day's low. Groundwater flow directions interpreted from this December 2003 water table map would indicate a general south to southeastward flow across the area in the southern portion of the process trenches where the gradient is high (near or in the channel). In the area of the northern portion of the process trenches the flow was southwestward to southward. As the highly conductive channel affects groundwater flow direction and rate it also affects the movements of groundwater contaminants as is explained in the next section.

The configuration of the water table six months later during June 2004 (Figure 3) showed the effects of a higher river stage. River levels during the previous few days before the water levels were measured were dropping slightly from approximately 106.5 to 105.5 meters. The water table was overall higher in elevation compared to the December 2003 configuration, and it had a relatively smooth gradient with an interpreted flow direction to the southeast. With the higher water table elevation, the effect of the highly conductive channel was reduced as the water table was elevated into the more conductive overlying Hanford formation in areas outside the channel.

GROUNDWATER CONTAMINANT TRENDS

This section discusses concentrations of uranium, cis-1,2-dichloroethene (cis-DCE), trichloroethene (TCE), and tetrachloroethene (the contaminants of concern) in network wells downgradient of the 300 Area process trenches during the reporting period. Table 1 lists the analytical results for each contaminant of concern in the network wells (4 well pairs) for the reporting period.

Uranium

Three of the downgradient wells of the network (399-1-10A, -16A, and -17A) continued to have reported values of uranium that exceed the drinking water standard (30 ug/L). These wells are screened at the water table. The well pair upgradient (399-1-18A and B) and the wells screened at the bottom of the unconfined aquifer (399-1-10B, -16B, and -17B) continued to have reported values of uranium concentration below the drinking water standard (See Figure 1 for well locations). The highest reported value was 79.8 ug/L at well 399-1-16A from a sample collected in March 2004.

Figures 4 and 5 show the concentration of uranium in wells screened at the water table during December 2003 and June 2004 (at the beginning and ending of the reporting period). Data from the network wells as well as from wells of the 300-FF-5 Operable Unit network were used to make the plume maps. The area at the southern end of the process trenches continues to be a source of uranium. The December view (Figure 4) shows that the highly conductive channel influences groundwater flow as the highest portions of the plume move away from the southern end of the process trenches and toward the river near well 399-1-16A. In June 2004 (Figure 5) the highest concentrations of the plume had moved

slightly southward in response to southeast groundwater flow. With the more elevated water table in June, groundwater flow was not affected as strongly by the channel because the uppermost portions of the aquifer are within the more conductive sediments of the Hanford formation.

Table 1. Results of Groundwater Analyses for 300 Area Process Trenches Contaminants of Concern During the Reporting Period January through June 2004.

Well	Sample Date	cis-1,2-DCE, ug/L	PCE, ug/L	TCE, ug/L	Uranium, ug/L
399-1-10A	1/29/2004	0.06 U	0.17 U	0.16 U	67.2
	2/26/2004	0.06 U	0.17 U	0.16 U	60
	3/5/2004	0.06 U	0.17 U	0.16 U	64.2
	6/21/2004	0.11 U	0.17 U	0.09 U	45.7
399-1-10B	1/29/2004	0.06 U	0.17 U	0.16 U	0.236
	2/21/2004	0.06 U	0.17 U	0.16 U	0.0817
	3/5/2004	0.06 U	0.17 U	0.16 U	0.499
	6/21/2004	0.11 U	0.17 U	0.09 U	0.0309
	6/21/2004	0.11 U	0.17 U	0.09 U	0.0514
399-1-16A	1/30/2004	0.14 J	0.17 U	0.33 J	74.2
	2/26/2004	0.42 J	0.17 U	0.51 J	71.1
	3/5/2004	0.13 J	0.17 U	0.29 J	79.8
	6/21/2004	0.11 U	0.17 U	0.37 J	58.1
399-1-16B	1/30/2004	150 D	1.7 UD	2 JD	9.8
	2/26/2004	150 D	0.17 U	2.2	13.9
	3/5/2004	120 D	0.17 U	1.9	12.9
	3/5/2004		0.17 U	2.4	9.51
399-1-17A	1/30/2004	0.25 J	0.17 U	0.23 J	47.2
	2/21/2004	0.06 U	0.17 U	0.32 J	43.8
	3/5/2004	0.22 J	0.17 U	0.29 J	45
	6/23/2004	0.11 U	0.17 U	0.2 J	52.7
399-1-17B	1/29/2004	1.8	0.17 U	0.16 U	0.138
	2/21/2004	2.9	0.17 U	0.16 U	0.00598 U
	3/5/2004	3	0.17 U	0.16 U	0.376
	6/22/2004	1.2	0.17 U	0.09 U	0.00705 U
399-1-18A	1/29/2004	0.06 U	0.17 U	0.16 U	5.97
	2/21/2004	0.06 U	0.17 U	0.16 U	5.69
	3/5/2004	0.06 U	0.17 U	0.16 U	6.83
	6/21/2004	0.11 U	0.17 U	0.09 U	5.45
399-1-18B	1/29/2004	0.06 U	0.17 U	0.16 U	0.027
	2/21/2004	0.06 U	0.17 U	0.16 U	0.00468 U
	3/5/2004	0.06 U	0.17 U	0.16 U	0.168
	6/21/2004	0.11 U	0.17 U	0.09 U	0.00495 U

D= sample diluted before analysis

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

N= spike recovery was outside control limits (?)

U= Below detection limit

Uranium concentrations in network wells continued to show slight downward trends. At well 399-1-10A the trend is still dropping from a temporary increase due to a local source (probably the 618-5 Burial Ground cleanup efforts) (Figure 6). At well 399-1-16A the concentration of uranium dropped significantly after 2002 but, although quite variable, has not reached the higher values prior to that time (Figure 7). The trend at 399-1-17A has been more stable since 2001, ranging from about 40 to 70 ug/L (Figure 8).

Cis-1,2-Dichloroethene

Cis-1,2-dichloroethene (cis-DCE) was detected at four wells in the 300 Area process trenches well network during the reporting period (399-1-16A and B, and 399-1-17A and B). Only well 399-1-16B had concentrations of cis-DCE that exceeded the drinking water standard (70 ug/L). The highest reported concentration was 150 ug/L at well 399-1-16B for both the January and February sampling events. The trend at well 399-1-16B (Figure 9) is variable, fluctuating between 120 and 170 ug/L, but overall appears to be neither decreasing nor increasing (Figure 9). Because the trend is not decreasing with time and the wells screened at the water table show little to no detectable cis-DCE, it is likely that there is a source of cis-DCE near the base of the unconfined aquifer upgradient of well 399-1-16B. The reason for the high concentrations detected at 399-1-16A and not at 399-1-17A is unknown. The original source was most likely the process trenches where cis-DCE was known to be discharged with the waste stream.

Trichloroethene

Trichloroethene (TCE) was detected at three wells in the 300 Area process trenches network during the reporting period, but the drinking water standard (5 ug/L) was not exceeded. The well with the highest reported concentration was well 399-1-16B with a result of 2.4 ug/L for a sample collected June 2004. Like cis-DCE, the process trenches are most likely the source of TCE lower in the aquifer. The historical trend at this well shows that TCE concentrations decreased after 1997, but have remained relatively stable since 2000.

Another source of trichloroethene entering the 300 Area is a plume from offsite sources to the southwest. That plume is confined to the upper portions of the unconfined aquifer where concentrations remain below 1 ug/L.

Tetrachloroethene

In recent years tetrachloroethene has occasionally been detected in the well network downgradient of the 300 Area process trenches. However, it was not detected in the well network during the reporting period.

CONCLUSIONS

The objective of RCRA groundwater monitoring is to examine the trends of the contaminants of concern to confirm that they are attenuating naturally. The overall concentration of uranium in network wells continues to decrease with time. Most of the decrease is seen in the maximum concentration values each year. The lower concentrations reported each year are not

decreasing as quickly. 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).

REFERENCES

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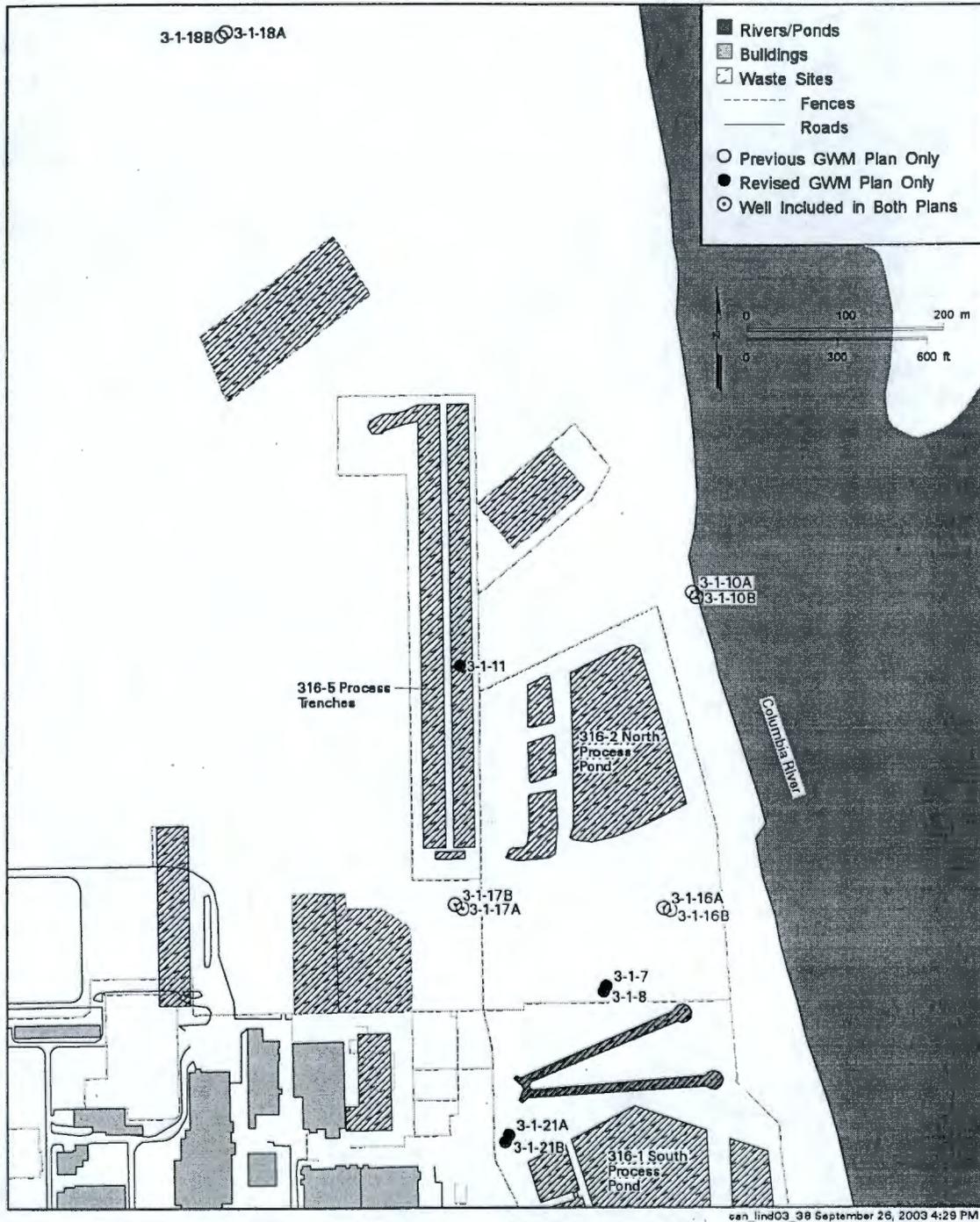


Figure 1. Locations of Wells in the previous and revised 300 Area Process Trenches Monitoring Networks (from WHC-SD-EN-AP-185 and PNNL-13645).

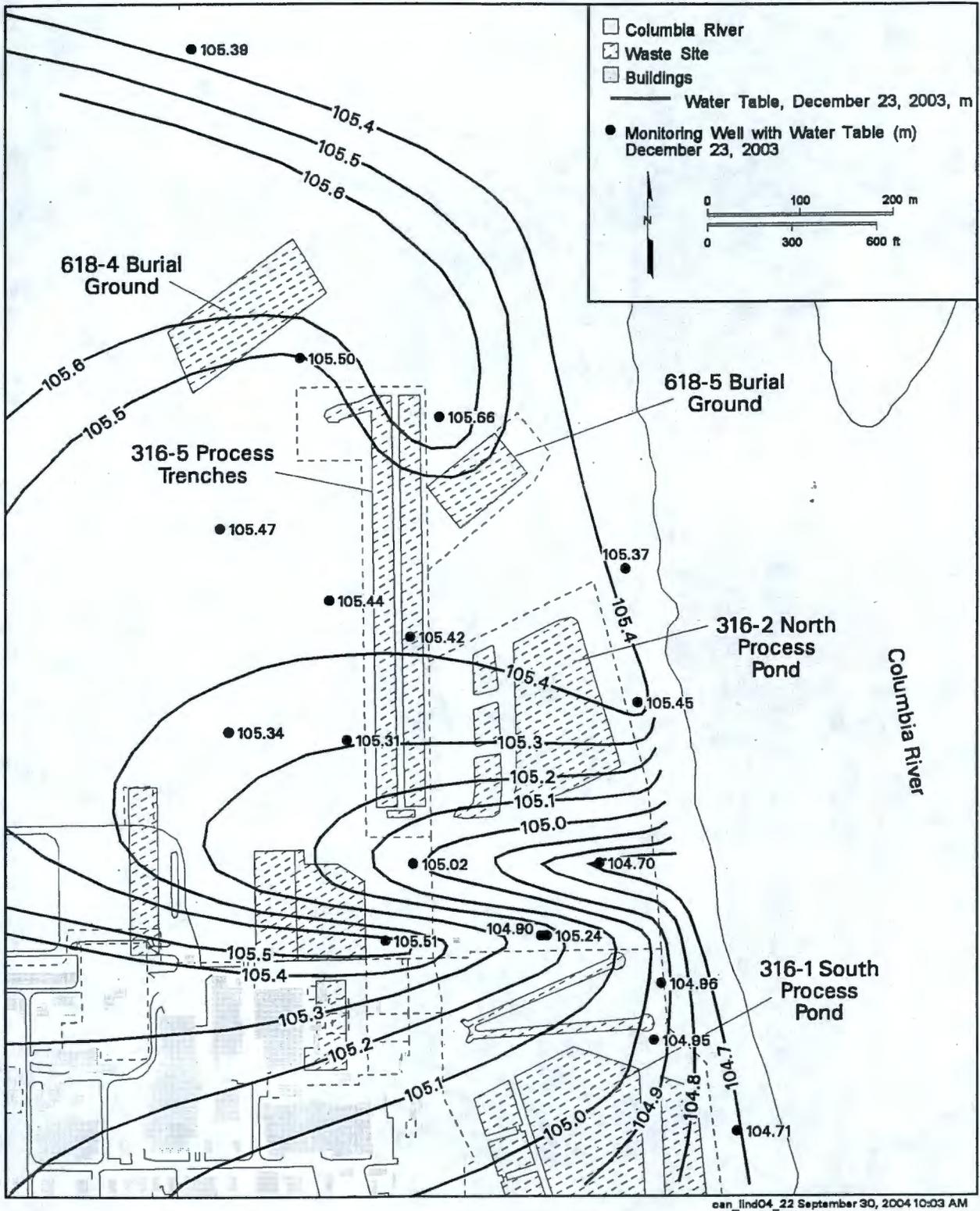
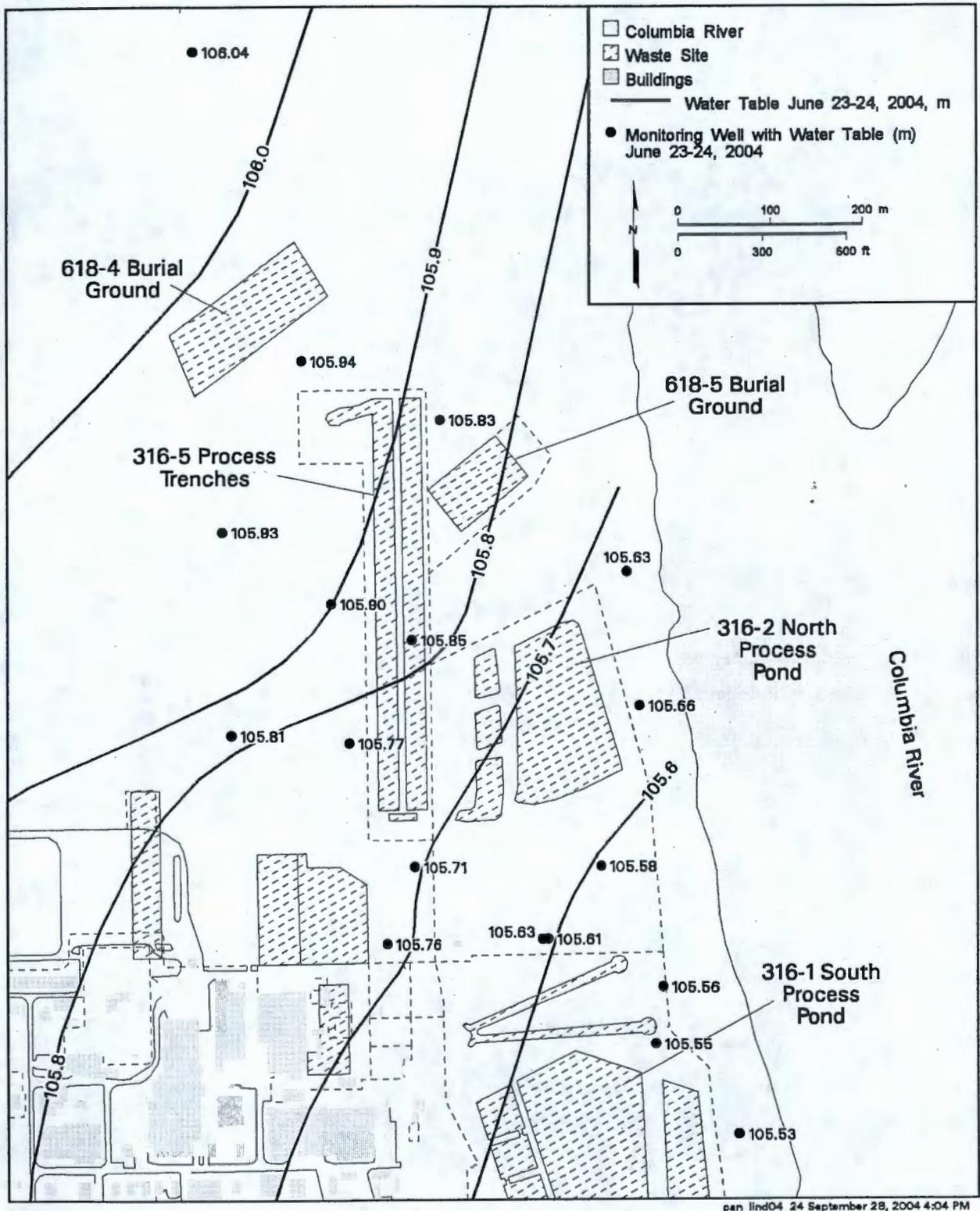


Figure 2. 300 Area Water Table on December 23, 2003.



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Figure 3 – 300 Area Water Table on June 23 and 24, 2004.

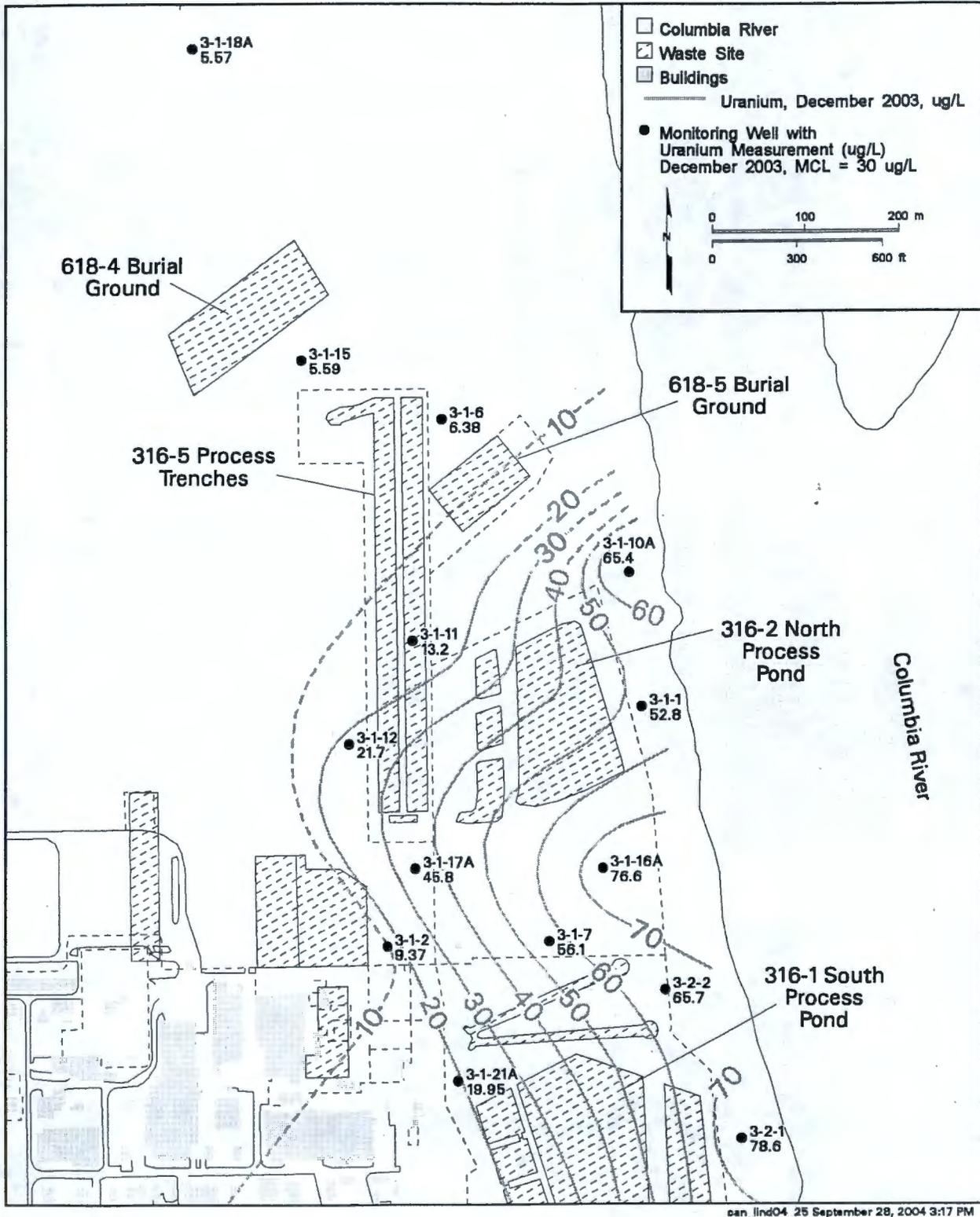


Figure 4 – Uranium Concentration in the Upper Portion of the Unconfined Aquifer in December 2003.

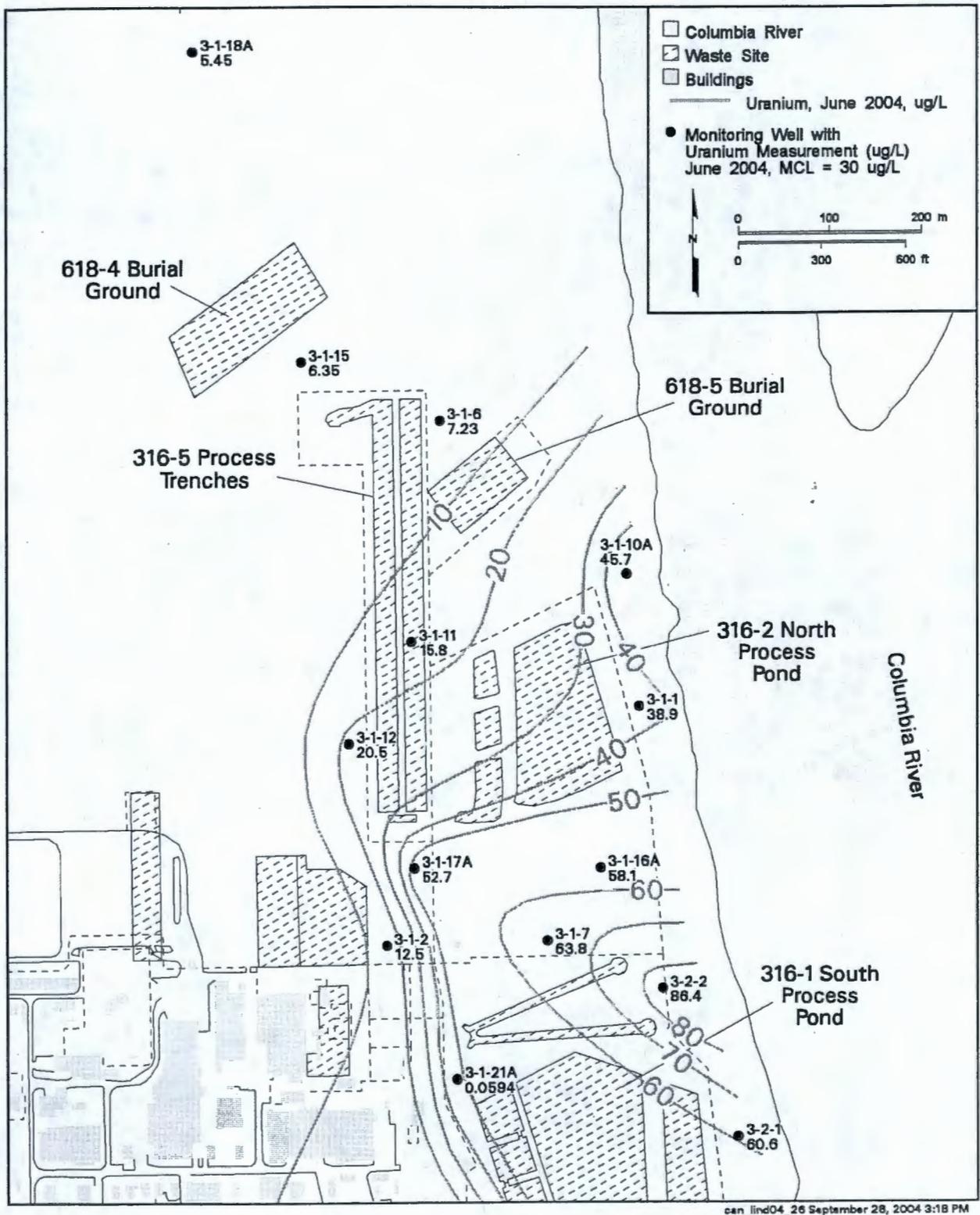


Figure 5 – Uranium Concentration in the Upper Portion of the Unconfined Aquifer in June 2004.

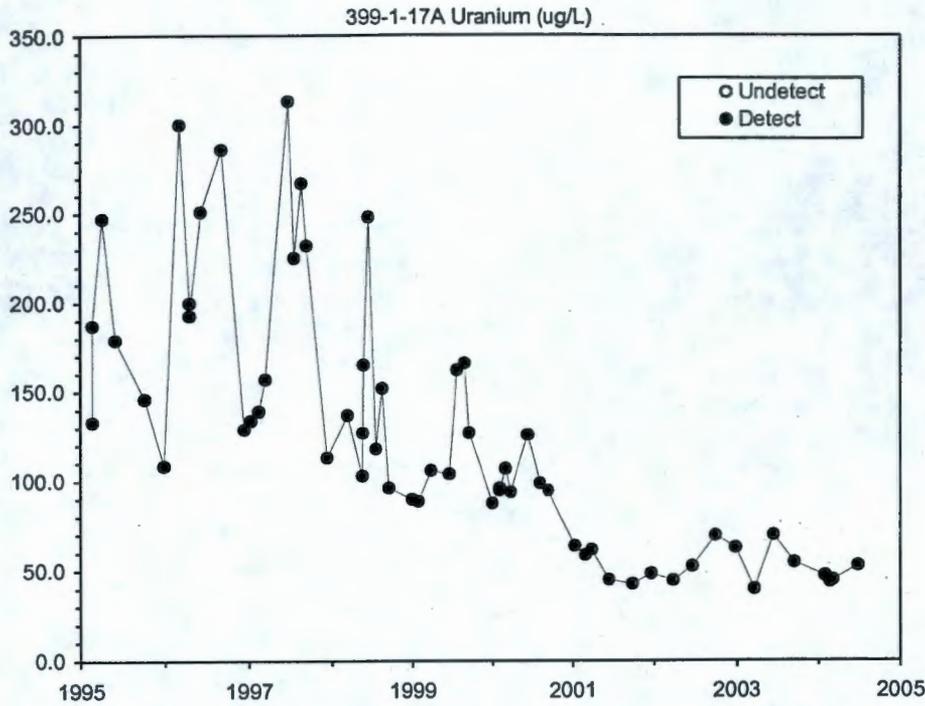


Figure 8 – Uranium Concentration in Well 399-1-17A.

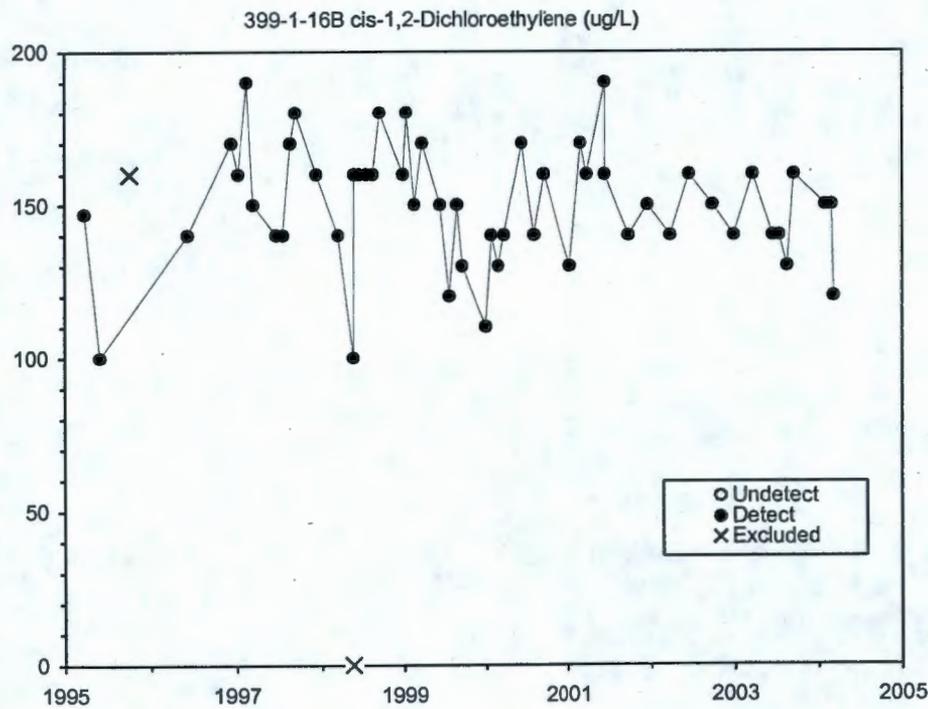


Figure 9 – Cis-1,2-Dichloroethylene in Well 399-1-16B.

Results of Groundwater Monitoring for the 183-H Solar Evaporation Basins

Reporting Period: January-June 2004

Report Date: September 2004

M.J. Hartman

INTRODUCTION

The 183-H solar evaporation basins were located in the 100 H Area of the Hanford Site, and have been demolished and backfilled. The basins were a treatment, storage, or disposal unit under the *Resource Conservation and Recovery Act of 1976* (RCRA) in the Hanford Facility RCRA Permit (Ecology 2000). Groundwater is monitored in accordance with Washington Administrative Code (WAC) 173-303-645(11), Corrective Action Program, and Part VI, Chapter 2 of the Hanford Facility RCRA Permit (Ecology 2004). The waste discharged to the basins originated in the 300 Area fuel fabrication facility and included solutions of chromic, hydrofluoric, nitric, and sulfuric acids that had been neutralized. The waste solutions contained various metallic and radioactive constituents (e.g., chromium, technetium-99, uranium¹). Between 1985 and 1996, remaining waste was removed, the facility was demolished, and the underlying contaminated soil was removed and replaced with clean fill.

This is one of a series of reports on corrective action monitoring at the 183-H basins. It addresses requirement of WAC 173-303-645(11)(g) to report twice each year on the effectiveness of the corrective action program. This report covers the period from January through June 2004.

The regulations in WAC 173-303-645(11) require corrective action activities to reduce contaminant concentrations in groundwater. The postclosure plan (DOE-RL 1997a), which was incorporated into Part VI of the Hanford Facility RCRA Permit in February 1998, deferred further actions at the 183-H basins to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) interim action for the 100-HR-3 Operable Unit. The postclosure plan also requires monitoring to be conducted as described in the final status RCRA groundwater monitoring plan

¹ Please note that source, special nuclear and by-product materials, as defined in the Atomic Energy Act of 1954 (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.

(Hartman 1997). That plan included four contaminants of interest for groundwater: chromium, nitrate, technetium-99, and uranium. Of these, only chromium is a listed dangerous waste constituent subject to regulation under RCRA. However, all four constituents continue to be monitored because they are included by reference in the Hanford Facility RCRA Permit.

DOE recently submitted a permit modification that proposes a revision of the RCRA monitoring program for the 183-H Basins, but the modification was rejected. DOE contends the proposed modification will meet groundwater monitoring requirements. Discussions with Ecology will be held and a revised monitoring program will be proposed in the next semiannual period.

INTERIM REMEDIAL MEASURE

The interim remedial action applies to the 100-HR-3 groundwater operable unit, which is under the authority of a CERCLA record of decision. Groundwater is pumped from up to five extraction wells, located west, north, and east of the 183-H Basins (Figure 1). The effluent is treated to remove chromium and injected back into the aquifer in upgradient wells. The objective of the interim remedial measure is to reduce the amount of chromium entering the Columbia River, where it is a potential hazard to the ecosystem.

Groundwater is sampled to monitor the effectiveness of the interim remedial measure and to monitor the entire 100-HR-3 Operable Unit (DOE-RL 1997b). This CERCLA monitoring is coordinated with RCRA monitoring.

The pump-and-treat system may be shut down when concentrations of hexavalent chromium are below 22 µg/L in wells specified in the record of decision, and data indicate that the concentration will remain below that value. The system may also be shut down if it proves ineffective or if a better treatment technique is found. The most recent operable unit report, covering calendar year 2003, concluded that chromium concentrations in groundwater are not consistently below 22 µg/L in compliance wells (DOE-RL 2004).

RCRA GROUNDWATER MONITORING PROGRAM

Four wells located in the 183-H chromium plume are monitored for corrective action program requirements (Figure 1). Three of the wells are completed at the top of the uppermost aquifer (Hanford formation): wells 199-H4-7 and 199-H4-12A are extraction wells, and well 199-H4-3 is a monitoring well that has historically shown the highest levels of chromium, nitrate, technetium-99, and uranium from the 183-H basins. Well 199-H4-12C is located adjacent to 199-H4-12A and is completed deeper in the Ringold Formation. This well consistently has elevated concentrations of chromium without 183-H co-contaminants.

Wells are sampled annually for RCRA, generally in November. Late fall is typically a period when river stage is low and the samples reflect nearly pure groundwater

instead of a mixture of groundwater and river water held in bank storage. Therefore, contaminant concentrations in November are usually among the highest of the year.

CONTAMINANT TRENDS

This section discusses concentrations of chromium, nitrate, technetium-99, and uranium in groundwater. No RCRA sampling was scheduled for the reporting period, but two of the wells (extraction wells 199-H4-12A and 199-H4-7) were sampled for the purposes of the CERCLA interim action. All available data are presented in Table 1 and pertinent results are discussed below. Figures 2 through 5 show data trends for the two wells sampled.

Concentrations of 183-H contaminants declined in well 199-H4-12A during the reporting period, reflecting dilution from high river stage in June 2004. In well 199-H4-7, contaminant levels have been generally steady in the past several years.

Table 1. Groundwater Monitoring Data for 183-H Basins Monitoring Wells, January-June 2004.

Well	Sample Date	Hexavalent Chromium, ug/L	Nitrate, mg/L	Tc-99, pCi/L	Uranium, ug/L
199-H4-7	2/24/2004	10			
199-H4-7	6/15/2004	20			
199-H4-7	6/15/2004	17	50.5	35	2.86
199-H4-12A	2/24/2004	70			
199-H4-12A	6/15/2004	8			
199-H4-12A	6/15/2004	6	4.47	Undetected	0.64

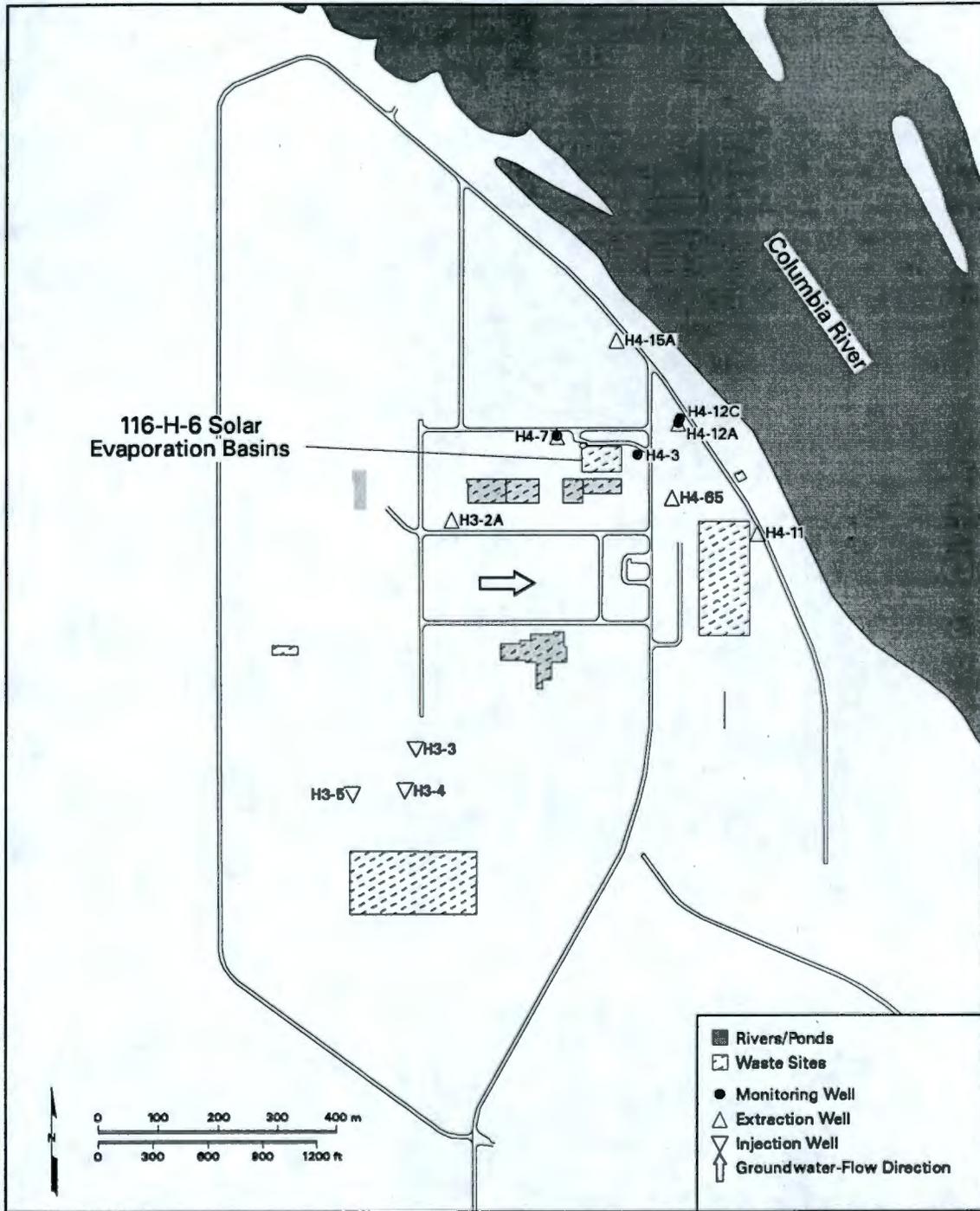
CONCLUSIONS

The current objective of RCRA corrective action monitoring is simply to track trends, not to determine the effectiveness of the interim remedial action. DOE has recently submitted a permit modification that includes a revision of the RCRA monitoring program for the 183-H basins. Until the modification is approved, the current RCRA monitoring plan (Hartman 1997) remains adequate for the objective of tracking trends during the period of the interim remedial action.

The four RCRA wells will be sampled for the constituents of interest in November 2004.

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Figure 1. Monitoring Well Locations for 183-H (116-H-6) Basins.

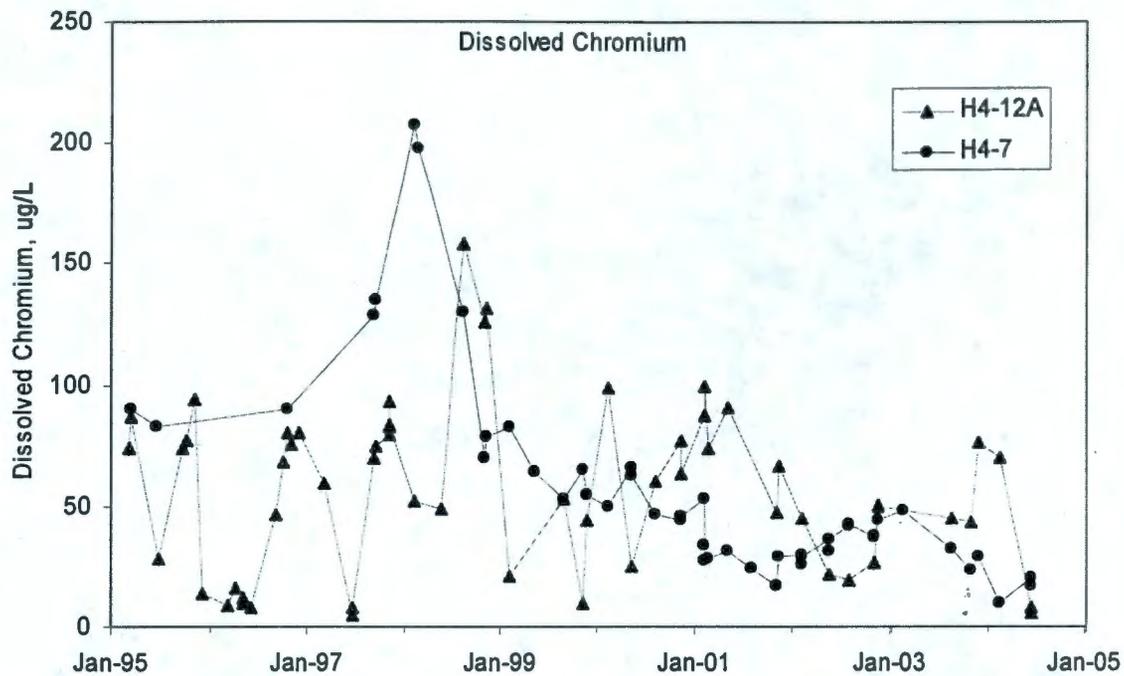


Figure 2. Dissolved Chromium in Extraction Wells 199-H4-12A and 199-H4-7.

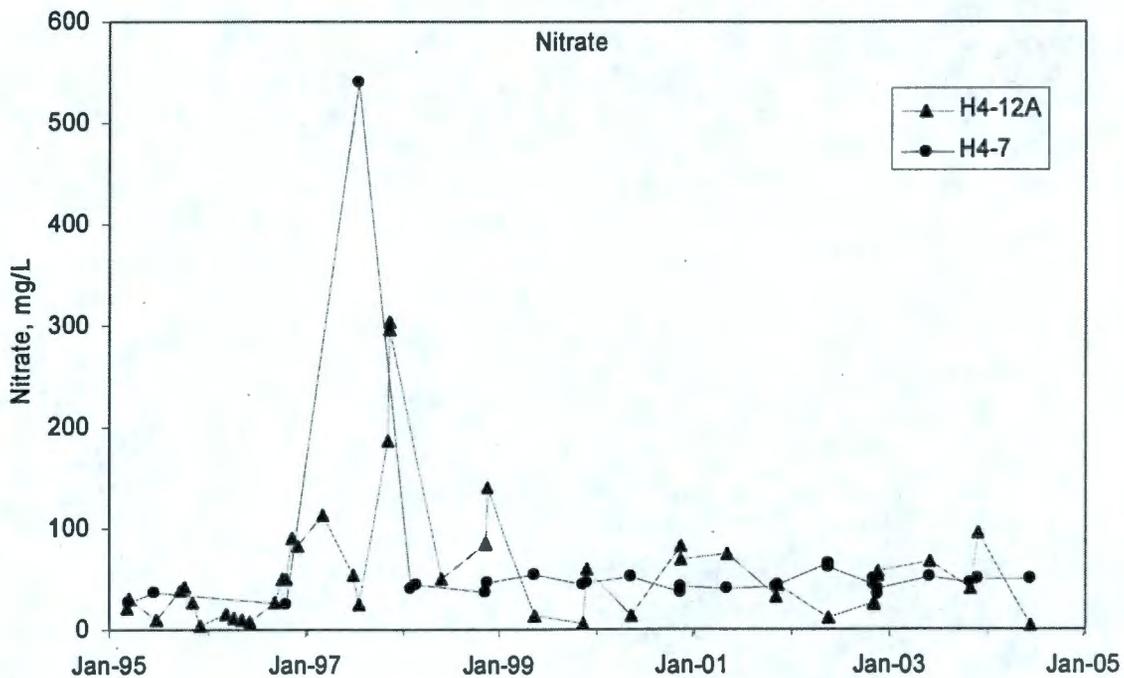


Figure 3. Nitrate in Extraction Wells 199-H4-12A and 199-H4-7.

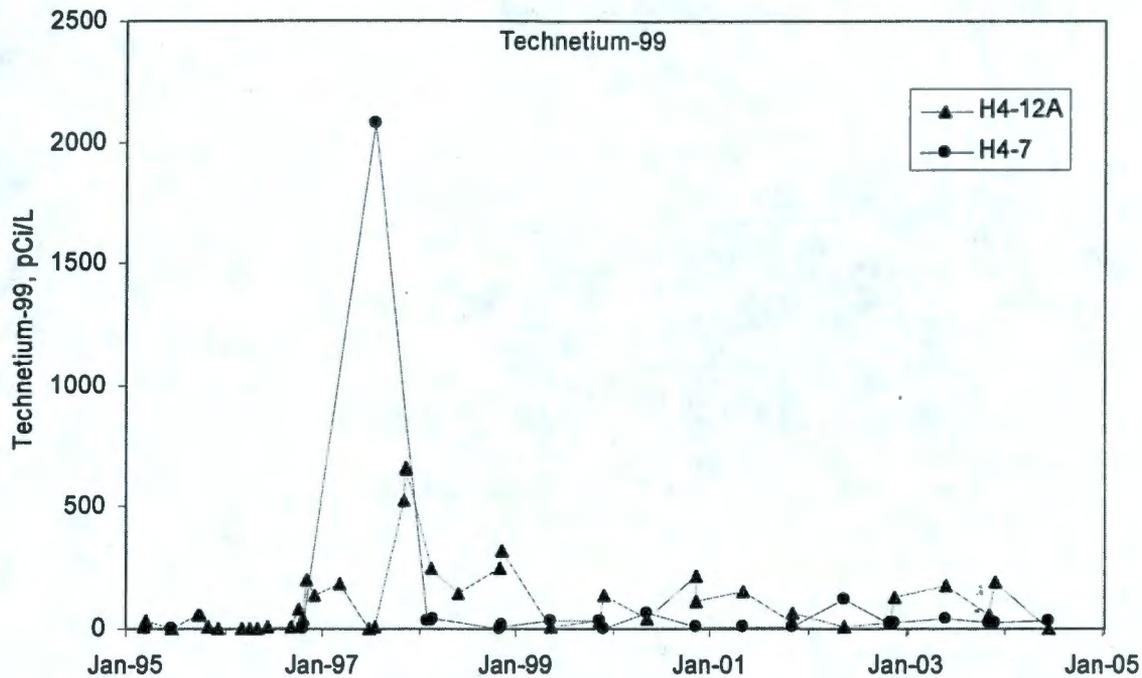


Figure 4. Technetium-99 in Extraction Wells 199-H4-12A and 199-H4-7.

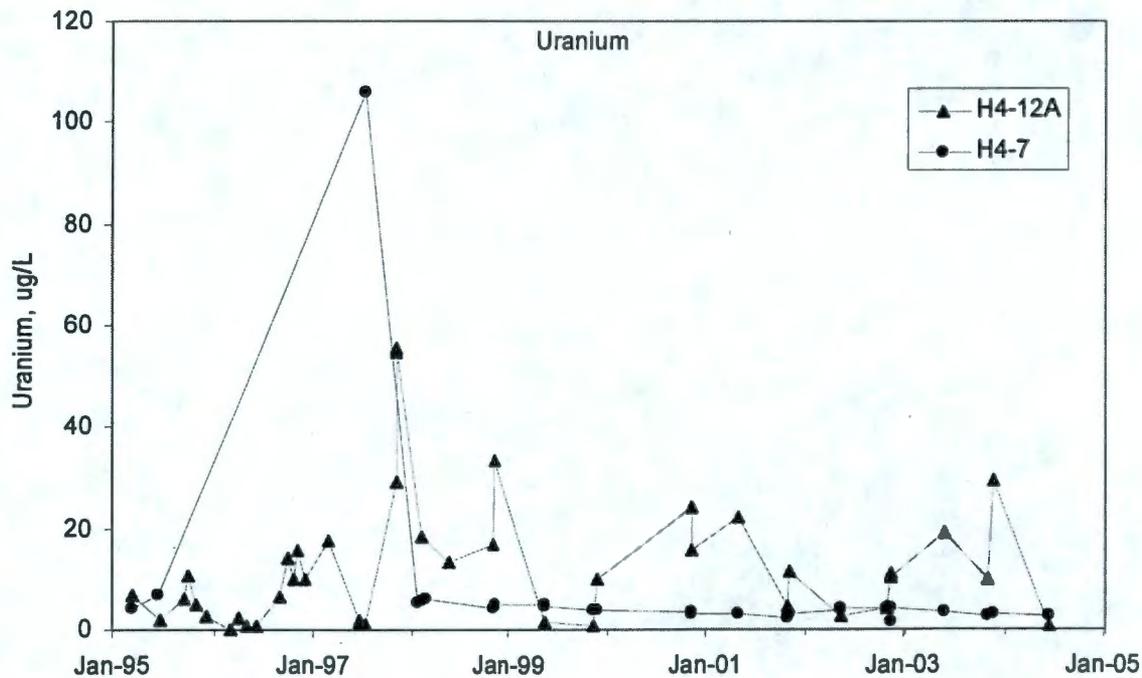


Figure 5. Uranium in Extraction Wells 199-H4-12A and 199-H4-7.