ADDENDUM D
GROUNDWATER MONITORING

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GROUNDWATER MONITORING

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D GROUNDWATER MONITORING DURING POSTCLOSURE

Groundwater concentration limits have been exceeded for dangerous waste constituents in downgradient monitoring wells at 183-H Solar Evaporation Basins. WAC 173-303-645(11) requires that a corrective action program be established in the Permit to (1) address the contamination, and (2) monitor the effectiveness of the action (Rasmussen 1996c). This post-closure plan, along with a revised groundwater monitoring plan (Hartman 1997), describes current and future actions to satisfy this requirement.

Corrective action to address groundwater contamination in the 100-H Area, including contamination that has resulted from 183-H Solar Evaporation Basins, has been initiated as part of CERCLA remediation activities. An Interim Remedial Measure (IRM) to remove hexavalent chromium will begin extracting groundwater from wells located in the vicinity of the former 183-H in July 1997 (DOE-RL 1996b). The IRM pumping system will change local hydraulic gradients and the direction of groundwater flow.

Not all of the dangerous waste constituents attributable to 183-H Solar Evaporation Basins are specifically targeted by the IRM treatment system. The primary treatment target is chromium. However, nitrate and two nondangerous waste constituents, technetium-99 and uranium, are also likely to be retained on the ion exchange columns, although hexavalent chromium will be preferentially retained. The IRM corrective action is the first phase of groundwater remediation in the 100-H Area, with subsequent phases to be determined by the feasibility study process under CERCLA. A final ROD will be established using information gained during the IRM for chromium.

Figure 3.1 shows the locations of existing groundwater monitoring wells in the 100-H Area. Figure 3.2 illustrates the changes to groundwater flow that are expected to occur during IRM pumping operations. In general, flow direction will change from an easterly to a more northerly direction beneath the former 183-H Solar Evaporation Basins. Changes in water quality, as observed in monitoring wells influenced by the pumping operation, are also expected to occur. Figure 3.3 provides a recent interpretation showing the distribution of chromium contamination in the 100-H Area.

Because of the corrective action pumping operations, the list of "point of compliance" wells per WAC 173-303-645 requirements will change from the definition presented in the 183-H compliance monitoring plan (Hartman and Chou 1995). Also, the change in flow direction may result in variable concentrations for the dangerous waste indicators in the wells previously identified as points of compliance. Therefore, a revised groundwater monitoring plan has been prepared (Hartman 1997) that reflects corrective action monitoring requirements.

The following sections outline the requirements for groundwater monitoring during corrective action and present a sampling and analysis schedule for meeting the requirements. The sampling and analysis schedule for RCRA corrective action requirements becomes a condition of the revised Permit. Other sampling and analysis activities within the 100-H Area are also described for general information purposes only.

D.1 WAC 173-303-645(11)(d) Monitoring Requirements

The WAC 173-303-645(11) Corrective Action Program requires the establishment and implementation of a groundwater monitoring program that is capable of demonstrating the effectiveness of the corrective action. This requirement states two general objectives:

- The program may be based on the requirements for a compliance monitoring program under WAC 173-303-645(10) and must be as effective as that program in determining compliance with the groundwater protection standard under WAC 173-303-645(3). A compliance monitoring program that met the objectives of the groundwater protection standard was established and adopted within the Permit (Hartman and Chou 1995).
- Monitoring during corrective actions must be capable of determining the success of the corrective action program. A revised groundwater monitoring plan has been prepared to reflect corrective

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action requirements (Hartman 1997). Also, as part of the IRM to address chromium contamination, a performance monitoring program has been designed and implemented to evaluate the effectiveness of the pump-and-treat system (DOE-RL 1997).

The following sections demonstrate how the corrective action monitoring requirements in WAC 173-303-645(11) will be met in the 183-H Corrective Action Groundwater Monitoring Plan and 183-H Post-Closure Plan.

D.1.1 WAC 173-303-645(3) Groundwater Protection Standard

Washington Administrative Code 173-303-645(3) introduces the principal requirements that must be met to comply with the Dangerous Waste Regulations for releases from regulated units. It refers to WAC 173-303-645(4) Dangerous Constituents, WAC 173-303-645(5) Concentration Limits, WAC 173-303-645(6) Point of Compliance, and WAC 173-303-645(7) Compliance Period. The Groundwater Protection Standard for the regulated unit has been established by Ecology in the facility Permit.

D.1.1.1 WAC 173-303-645(4) Dangerous Constituents

Dangerous waste constituents were identified in the 183-H Compliance Monitoring Plan (Hartman and Chou 1995). They are hexavalent chromium, as represented by an analysis for total chromium using filtered samples, and nitrate.

Additional waste indicators used to define the contaminant plume attributable to 183-H are technetium-99 and uranium. Wastes from 183-H basins' leakage may have altered various other water quality parameters that are not regulated, but are useful for identifying and tracking contamination from 183-H Solar Evaporation Basins (e.g., specific conductance). Because fluoride was discovered to be elevated in the soil at the bottom of the excavation beneath the 183-H footprint (along with nitrate), fluoride will also be used as an indicator for 183-H contamination in groundwater.

All of the above constituents of interest will be monitored under the revised plan for corrective action groundwater monitoring (Hartman 1997).

D.1.1.2 WAC 173-303-645(5) Concentration Limits

Dangerous waste constituents from the regulated waste unit may not exceed concentration limits established by the Permit. Permit limits were defined previously in the 183-H Compliance Monitoring Plan (Hartman and Chou 1995). Concentration limits established for the 183-H groundwater plume were as follows:

Dangerous Waste Constituents:	
Chromium (total; filtered sample)	122 µg/L--local background; upgradient sources
Nitrate	45,000 µg/L--EPA MCL for drinking water
Other 183-H Waste Indicators:	
Technetium-99	900 pCi/L--EPA MCL for drinking water
Uranium (total; chemical analysis)	20 µg/L--EPA MCL--proposed

During the period of time that the IRM to address chromium is extracting groundwater, the corrective action monitoring described in the revised groundwater monitoring plan (Hartman 1997) will continue to evaluate new analytical results relative to these concentration limits. Additionally, fluoride results will be evaluated relative to previously established trends and to the EPA MCL for drinking water, which is 1,400 µg/L.

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D.1.1.3 WAC 173-303-645(6) Point of Compliance

"The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated unit." Operation of the IRM groundwater extraction network will alter the pattern of groundwater flow. Therefore, the relative positions (i.e.,. upgradient, downgradient) for some of the monitoring wells used to establish the point of compliance listed in the 183-H Compliance Monitoring plan (Hartman and Chou 1995) will change (Section 3.2).

A new list of wells has been defined to act as points of compliance while the IRM is operating. The new list was developed at a workshop held on March 5, 1997 using the EPA Data Quality Objectives process. The points of compliance identified at the workshop were subsequently approved by Ecology on April 22, 1997 via letter (Soper 1997b). The wells are identified in the revised groundwater monitoring plan for corrective action monitoring (Hartman 1997) (Section 3.2).

D.1.1.4 WAC 173-303-645(7) Compliance Period

The modified RCRA network and sampling schedule will be in effect during groundwater extraction operations that are conducted as part of the IRM for chromium. Based on the observed impact that the IRM has on groundwater flow patterns and water quality after operations begin, further modifications to the RCRA network may be appropriate during and following the IRM. This post-closure plan and the revised groundwater-monitoring plan for corrective action monitoring will be revised and incorporated into a permit modification, as necessary.

Following cessation of groundwater extraction operations under the IRM, RCRA monitoring under the final status monitoring plan (Hartman, 1997) will continue for a minimum of three consecutive years (WAC 173-303-645(7)(c)) to demonstrate that the groundwater protection standards of WAC 173-303-645(3) have been met. This monitoring will complement monitoring conducted to (1) evaluate the performance of the IRM and (2) support selection of a final remediation alternative.

D.1.2 WAC 173-303-645(8) General Groundwater Monitoring Requirements

The requirements described in WAC 173-303-645(8) will be met as described in the *183-H Corrective Action Monitoring Plan* (Hartman, 1997). Newly collected data will be reported quarterly and an evaluation of monitoring data will be reported in the Annual Groundwater Project Report for the Hanford Site (e.g., Hartman and Dresel 1997).

D.2 RCRA Corrective Action Groundwater Monitoring Schedule

The *183-H Compliance Monitoring Plan* (Hartman and Chou 1995) has been revised (Hartman 1997) to accommodate changes in (1) the groundwater flow pattern and (2) concentrations of selected waste indicators, which are brought on by pump-and-treat remediation activities. The EPA Data Quality Objectives process (EPA 1994) was followed to help design the revised sampling and analysis schedule. Representatives from RL, Ecology, and EPA reached consensus on objectives, wells to be sampled, constituents for analysis, sampling frequency, and water level measurements (Furman 1997).

The resulting schedule for the 183-H Solar Evaporation Basins RCRA network is presented in Table 3.1. This table identifies the wells being sampled, the frequency of sampling, and an analysis suite code for the previous RCRA compliance monitoring schedule and for the revised corrective action monitoring schedule. Table 3.2 provides a complete description of the constituent analysis suites. Information on sampling schedules under CERCLA is included in the Tables, to provide a complete description of all groundwater-monitoring activities being conducted in the vicinity of the former 183-H Solar Evaporation Basins.

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The RCRA sampling and analysis schedule includes a network of four wells sampled annually. The wells are 199-H4-3, 199-H4-8, 199-H4-12A, and 199-H4-12C (Figure 3.1). (Wells 199-H4-8 and 199-H4-12A are also used as extraction wells for the pump-and-treat system.) Water samples will be analyzed for the constituents of concern previously identified for tracking contamination attributable to the 183-H Solar Evaporation Basins (nitrate, fluoride, chromium, uranium, and technetium-99). Additional analyses will be performed for alkalinity, other anions, and other metals, to aid in interpreting results. Field parameters (pH, temperature, specific conductance, and turbidity) will also be measured.

Minor modifications to the list of specific wells used and constituents analyzed may be appropriate to account for changing field conditions, IRM operational requirements, and changes identified during the data evaluation process. Recommendations for minor modifications will be presented for regulator approval outside of the permit modification process prior to implementation.

D.3 Groundwater Monitoring Under CERCLA

Groundwater underlying the former 183-H Solar Evaporation Basins is included in the 100-HR-3 Operable Unit. This groundwater operable unit contains the groundwater underlying the 100-D/DR Area, 100-H Area, and the 600 Area in between. Along the Columbia River, the boundary of the operable unit is generally accepted as the interface between groundwater discharging from the aquifer and river water. Samples of riverbank seepage and of pore water from riverbed sediment are used to monitor the interface.

D.3.1 100-HR-3 Remedial Investigation Monitoring

The remedial investigation was initially guided by a work plan (DOE-RL 1992) that directed a limited field investigation. A limited field investigation report, which includes a qualitative risk assessment, was prepared (DOE-RL 1994). A focused feasibility study was subsequently conducted that looked at various remediation alternatives to address chromium contamination, and to help decide whether interim remedial measures were warranted (DOE-RL 1995a). A proposed plan (DOE-RL 1995b) and Record-of-Decision (EPA 1996) were then prepared that described a pump-and-treat alternative to address chromium in the 100-HR-3 and 100-KR-4 Operable Units.

In addition to chromium, other groundwater constituents in the 100-H Area remain above EPA drinking water standards and/or Washington State cleanup levels (Peterson et al. 1996). Chemical constituents include aluminum, fluoride, iron, manganese, nitrate, and uranium. Radiological constituents include gross alpha, gross beta, strontium-90, and technetium-99. None of these constituents have been designated as contaminants of concern for interim remedial measures, by reason of human health or ecological risk.

Sampling under the remedial investigation is typically conducted annually, with some wells being monitored quarterly for selected constituents, and others being sampled once every two years. Biennial sampling is conducted where two wells monitor essentially the same conditions, but each well is sampled on alternate years. The schedule for remedial investigation monitoring well sampling for FY 1997 and FY 1998 is included in Table 3.1.

D.3.2 100-HR-3 Interim Remedial Measure Monitoring

A decision was made in 1996 to proceed with accelerated remediation activities to remove hexavalent chromium (Cr+6) from groundwater underlying the 100-HR-3 Operable Unit (DOE-RL 1995b; EPA 1996). The activities involve pumping groundwater from wells located near the river and removing chromium using an ion exchange resin (DOE-RL 1996a). In the 100-H Area, two additional inland wells were added to the extraction network to intercept chromium migrating into the 100-H Area from sources located to the west. The treated effluent will be reinjected into the unconfined aquifer at an upgradient inland location. Operation of the pump-and-treat system is scheduled to start in July 1997. As stated in the ROD (EPA 1996), the remedial action objectives for the pump-and-treat system include the following three components:

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- Protect aquatic receptors in the river bottom substrate from contaminants in groundwater entering the Columbia River (Note: The ROD identifies Cr+6 as the target contaminant)
- Protect human health by preventing exposure to contaminants in the groundwater
- Provide information that will lead to the final remedy.

The relevant standard for meeting these objectives during the IRM is the State of Washington's Ambient Water Quality Standard (AWQS) for Protection of Freshwater Aquatic Life for hexavalent chromium, which is 11 µg/L for chronic exposure (WAC 173-201A-040). The highest priority contaminated areas to be addressed initially by the remedial action are adjacent to riverbed substrate that is known to provide suitable habitat for salmon spawning. Some of these areas have been defined by direct observation of riverbed substrate and sediment pore water analysis (Hope and Peterson 1996a and 1996b).

In addition to chromium, other contaminants of concern in the 100-H Area that were identified in the ROD (EPA 1996) are nitrate, strontium-90, technetium-99, and uranium. With the exception of strontium-90, the ion exchange treatment system is expected to reduce concentrations of all these contaminants. Tritium may also be present in the extracted water; however, tritium concentrations in 100-H Area wells have decreased to below drinking water standards (Peterson et al. 1996).

D.3.2.1 Data Quality Objectives for IRM Monitoring

Groundwater sampling and analysis activities associated with the IRM for chromium (DOE-RL 1997) serve two general purposes: (1) Performance monitoring to determine the effectiveness and efficiency of the extraction system, and (2) compliance monitoring to show how well the remediation is doing relative to target goals described in the ROD (EPA, 1996).

The objectives for performance monitoring are to collect water level and water quality data that are used to (1) optimize the performance of the groundwater extraction system; (2) document aquifer and chromium plume response to pumping and injection of treated effluent, and (3) obtain supplemental data to support selection of a final remediation alternative for the 100-HR-3 Operable Unit.

Objectives for compliance monitoring are described in the interim ROD (EPA, 1996), which states that monitoring will be conducted at near-river onshore locations that are above the river's high water line. Sampling will be conducted at multiple depth intervals at compliance locations. A dilution factor of 1:1 is allowed when demonstrating compliance with the WAC AWQS of 11 µg/L in riverbed sediment. That is, 22 µg/L at compliance locations is deemed equivalent to 11 µg/L at depths in riverbed substrate of up to 46 cm. Locations initially designated to serve as compliance monitoring points are wells 199-H4-4, 199-H4-5, 199-H4-49, 199-H4-63, and 199-H4-64.

D.3.2.2 IRM Monitoring Wells and Sampling Schedules

The groundwater monitoring wells used to support the interim remedial measures include extraction wells, injection wells, performance monitoring wells, and compliance monitoring wells. The wells are used to obtain water quality data and water level measurements. The schedules for sampling and analysis of these wells are described in Table 3.1 with the analysis listed in Table 3.2. The tables summarize the sampling and analysis schedules for the IRM network as it is planned for FY 1997 and FY 1998. These schedules are subject to change as the result of information gained during the IRM. The schedule for water level measurements is provided in Table 3.3.

D.4 Inspection, Maintenance, and Replacement of Wells

Each time a well is sampled by any of the Hanford Site groundwater monitoring programs, the wellhead, cap, protective posts, and concrete pad are inspected. If the samplers experience problems with dedicated sampling pumps, excessive turbidity in the sample, etc., these problems are noted and maintenance is scheduled.

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Periodic maintenance and rehabilitation are generally performed on Hanford Site monitoring wells at five-year intervals. This includes removing dedicated equipment, brushing the well bore, removing sediment accumulation, conducting a downhole video camera survey, responding to service difficulty reports, and reinstalling dedicated equipment. A comprehensive description of well maintenance, reconfiguration, and decommissioning is presented in Chapter 8 of the Hanford Site Annual Groundwater Monitoring Report for FY 1996 (Hartman and Dresel 1997).

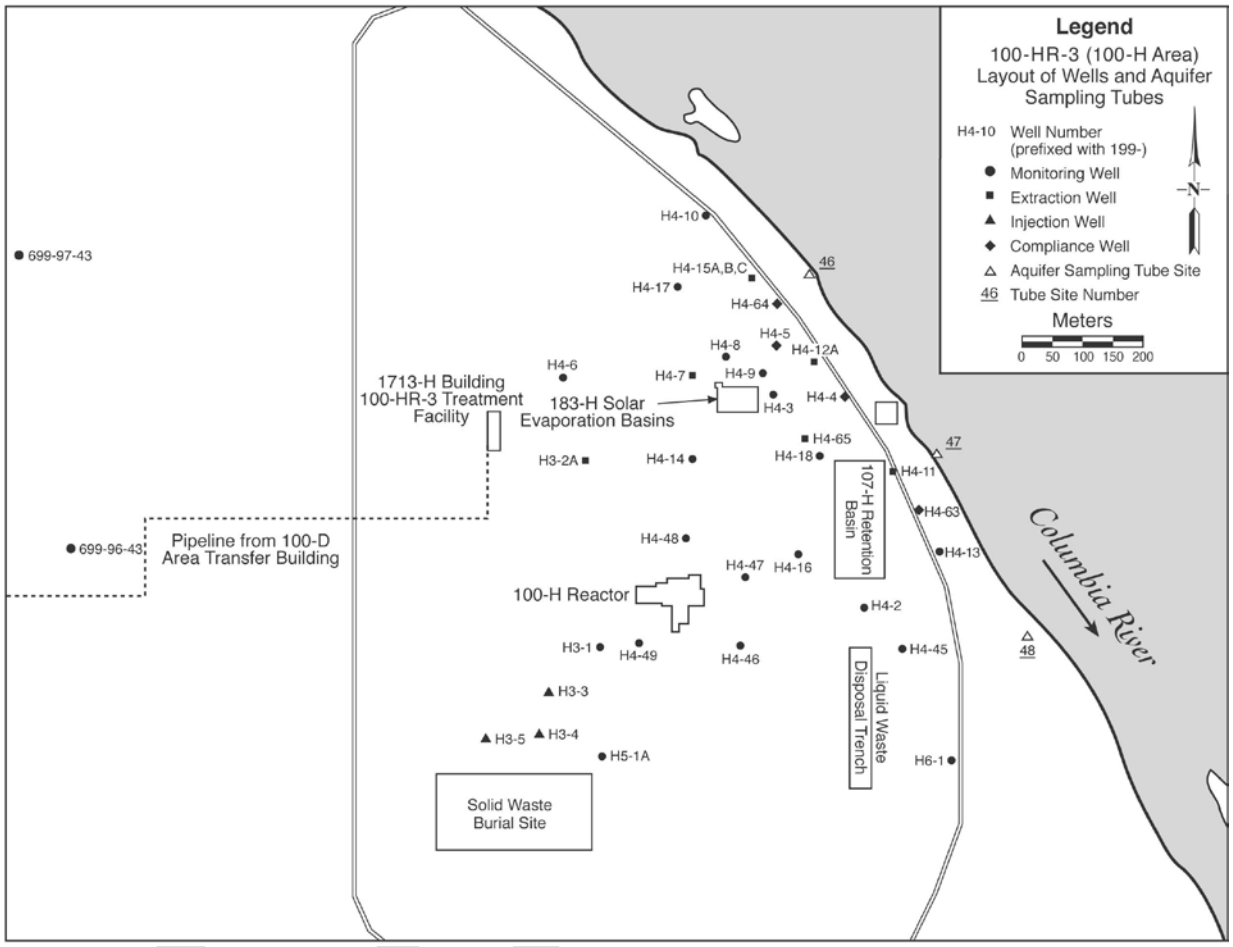

Figure 3.1. Location Map for 100-H Area Monitoring Wells

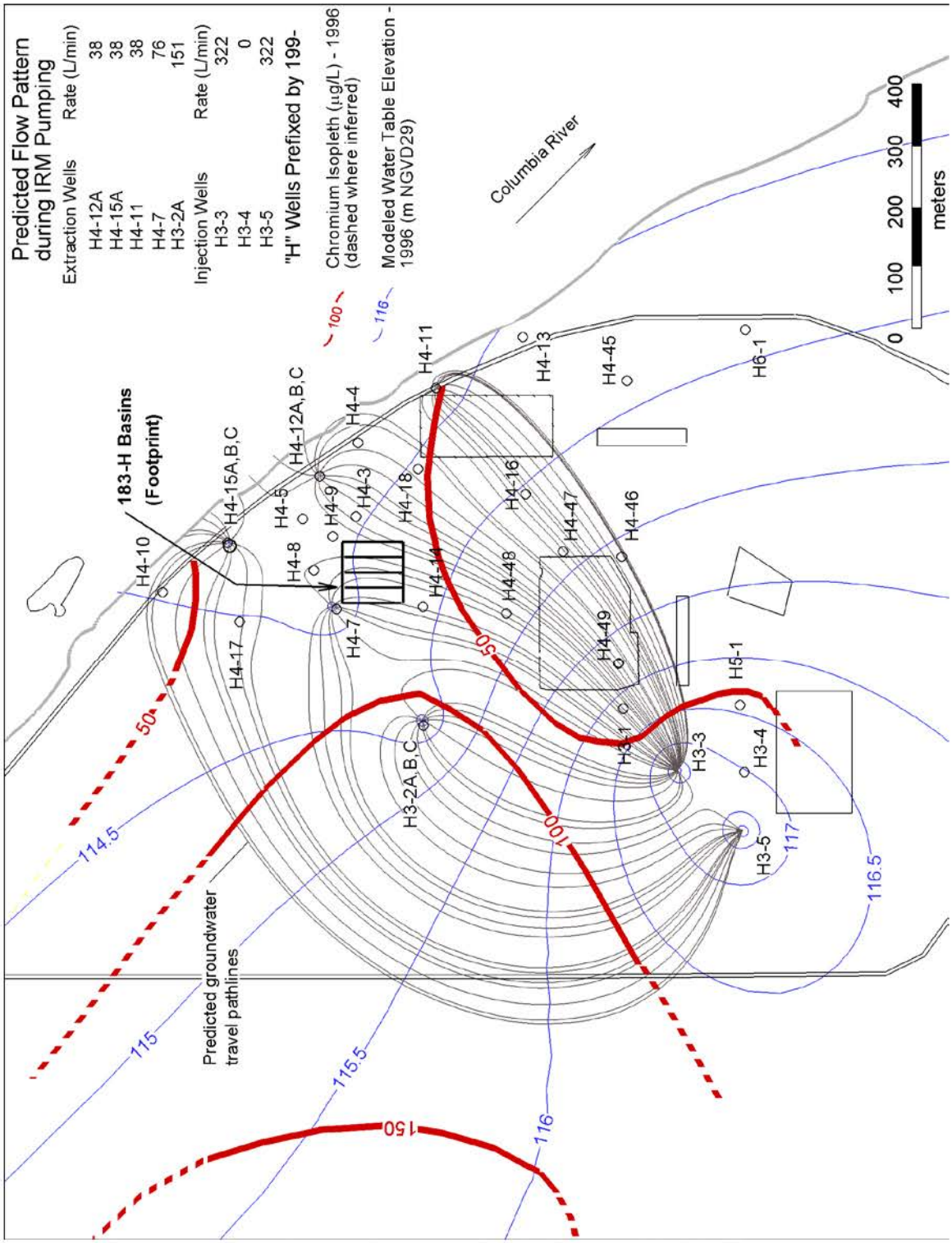

Figure 3.2. Predicted Groundwater Flow During Interim Remedial Measure

Figure KNT-H1 100-H Area Historic Chromium Disribution

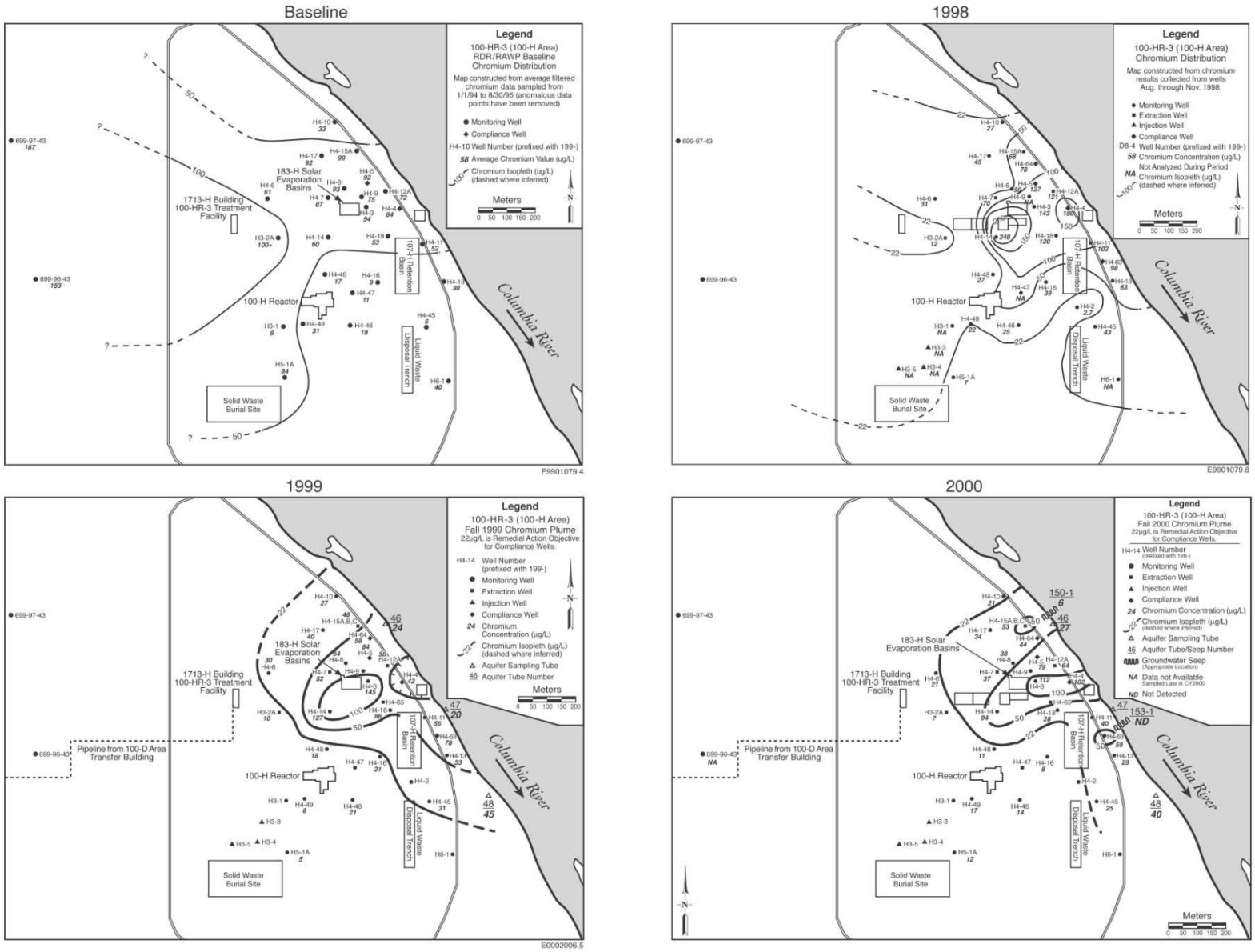

Figure 3.3. Chromium Contamination in the 100-H Area

Table 3.1. Sampling and Analysis Schedule for 183-H Solar Evaporation Basins RCRA Corrective Action & CERCLA Remedial Investigation Monitoring

Well/Location Identifier	Facility Monitored/Purpose	RCRA:		CERCLA Remediation Activities:		
		183-H: Compliance (Pre-IRM[1])	183-H: Corrective Action [2]	RI/FS[3] Round 11: FY 97	Outlook[3] Round 12: FY 98	IRM Monitor Plan[4]
199-H3-1	Reactor building				BA(98)-2	
199-H3-2A	D-plume migration/ IRM extraction well	SA-1		A-2	A-2	SA-3 Q-Cr
199-H3-2C (deep conditions)	D-plume migration/ vertical distribution				BA(98)-2	
199-H4-3	183-H basins/IRM performance	SA-1	A-1	BA(97)-2		SA-Cr
199-H4-4	183-H basins/IRM compliance	SA-1		A-2	A-2	M-Cr
199-H4-5	183-H basins/IRM compliance				BA(98)-2	M-Cr
199-H4-6	D-plume migration/ IRM performance	SA-1		BA(97)-2		SA-Cr
199-H4-8	183-H basins/IRM extraction		A-1			SA-3 Q-Cr
199-H4-8	183-H basins/IRM performance			BA(97)-2		SA-Cr
199-H4-9	183-H basins	SA-1			BA(98)-2	
199-H4-10	D-plume migration/ IRM performance			A-2	A-2	SA-Cr
199-H4-11	Retention basins/ IRM extraction					SA-3 Q-Cr
199-H4-12A	183-H basins/ IRM extraction	SA-1	A-1			SA-3 Q-Cr
199-H4-12B	183-H basins/ IRM performance					SA-Cr
199-H4-12C (deep conditions)	183-H basins/ IRM performance	SA-1	A-1	A-2	A-2	SA-Cr
199-H4-13	Retention basins/ IRM performance			A-2	A-2	SA-Cr
199-H4-14	190-H coolant prep/ IRM performance			BA(97)-2		SA-Cr
199-H4-15A	D-plume migration/ IRM extraction					SA-3 Q-Cr
199-H4-15B	D-plume migration/ IRM performance					SA-Cr
199-H4-15CS (deep conditions)	D-plume migration/ IRM performance					SA-Cr
199-H4-16	Reactor building/ IRM performance			BA(97)-2		SA-Cr
199-H4-17	D-plume migration/ IRM performance			BA(97)-2		SA-Cr
199-H4-18	183-H basins/ IRM performance	SA-1		A-2	A-2	SA-Cr
199-H4-45	Liquid waste disposal trench/ IRM			A-2	A-2	SA-Cr

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Well/Location Identifier	Facility Monitored/Purpose	RCRA:		CERCLA Remediation Activities:		
		183-H: Compliance (Pre-IRM[1])	183-H: Corrective Action [2]	RI/FS[3] Round 11: FY 97	Outlook[3] Round 12: FY 98	IRM Monitor Plan[4]
	performance					
199-H4-46	Reactor building/ IRM performance			BA(97)-2		SA-Cr
199-H4-47	Reactor building				BA(98)-2	
199-H4-48	Reactor building/ IRM performance				BA(98)-2	SA-Cr
199-H4-49	Reactor building/ IRM compliance				BA(98)-2	SA-Cr
199-H5-1A	118-H-1 solid waste burial/IRM performance				BA(98)-2	SA-Cr
199-H6-1	Liquid waste disposal trench			A-2	A-2	
199-H4-63 (new well FY97)	IRM compliance					M-Cr
199-H4-64 (new well FY97)	IRM compliance					M-Cr
699-96-43	D-plume migration/ background			BA(97)-2		
699-97-43	D-plume migration/ background				BA(98)-2	

Sampling code abbreviations: 'BA' = biennial (next year), 'A' = annual, 'SA' = semiannual, 'Q' = quarterly, and 'M' = monthly. The '-1, -2, -3' suffixes define the analysis suite (Table 3.2). 'Q-Cr' indicates quarterly screening for chromium, Sr-90, etc. '(+Tc-99) ' indicates constituent added to basic suite listed in Table 3.2.

Footnotes (References):
1. *183-H Compliance* (183-H compliance groundwater monitoring plan - Hartman and Chou, 1995)
2. *183-H Corrective Action* (183-H corrective action groundwater monitoring plan - Hartman, 1997)
3. *RI/FS Round #11 and #12 Outlook* reflect Tri-Party Agreement Change Control Form #107, November 1996
4. *IRM Monitoring Plan* is for post-July 1997 (IRM Monitoring Plan [DOE-RL 1997])

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Table 3.2. Analysis Suite Codes for 183-H RCRA Corrective Action & CERCLA Remedial Investigation Monitoring

Analysis/ Parameter	Constituent Code #1 (RCRA: FY97/98)[1]	Constituent Code #2 (RI Round 11&12--FY97/98)[2]	Constituent Code #3 (IRM--FY97/98)[3]
Metals by routine ICP (SW 846 6010B/C, SW 846 6020, or EPA/600/R-94/111, 200.8 - Target Analyte List Note: Filtered and unfiltered samples for all metal analyses, except ROM collects filtered samples only	Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc	Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc	
Metals: Other (Chromium, hexavalent: SW-846 7196A; ; Laboratory Specific Uranium Method)	Uranium		Chromium, hexavalent Uranium
Anions by IC (EPA/600/R-93/100, 300.0)	Chloride Fluoride Nitrate Sulfate	Chloride Fluoride Nitrate Sulfate	Nitrate
Radionuclide screening: (Laboratory Specific Methods)	Activity scan[4]	Gross alpha Gross beta Activity scan[4]	
Specific radionuclides: (Laboratory Specific Methods)	Technetium-99	Tritium	Strontium-89/90 Technetium-99 Tritium
Miscellaneous parameters: (Standard Methods 2320; EPA/600/4-79/020, 310.1 & 310.2)	Alkalinity		
Field parameters:	pH Specific conductance Temperature Turbidity	pH Specific conductance Temperature Turbidity	pH Specific conductance Temperature Turbidity

Footnotes (References):

1. Code #1 is based on 183-H compliance groundwater monitoring plan (Hartman and Chou, 1995);
2. Code #2 is based on Tri-Party Agreement Change Control Form #107, November 1996
3. Code #3 is from IRM Monitoring Plan (DOE-RL 1997)
4. Selected wells only

Abbreviations: ICP = inductively coupled plasma; IC = ion chromatography

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Table 3.3. CERCLA Interim Remedial Measure Groundwater Well Network:

Well Number	Intended Use	Operations Period-- July 1997 to end of IRM:			
		Hourly Water Levels[1]	Steel Tape Measure[2]	Hexavalent Chromium[3]	Co-contaminants[4]
199-H3-2A	Extraction well	Transducer	Monthly	Quarterly	Semiannual
199-H4-8	Extraction well	Transducer	Monthly	Quarterly	Semiannual
199-H4-11	Extraction well	Transducer	Monthly	Quarterly	Semiannual
199-H4-12A	Extraction well	Transducer	Monthly	Quarterly	Semiannual
199-H4-15A	Extraction well	Transducer	Monthly	Quarterly	Semiannual
199-H3-3	Injection well	Transducer	Monthly		
199-H3-4	Injection well	Transducer	Monthly		
199-H3-5	Injection well	Transducer	Monthly		
199-H4-3	Performance monitoring		Quarterly	Semiannual	
199-H4-6	Performance monitoring		Quarterly	Semiannual	
199-H4-8	Performance monitoring	Transducer	Monthly	Semiannual	
199-H4-10	Performance monitoring	Transducer	Monthly	Semiannual	
199-H4-12B	Performance monitoring	Transducer	Monthly	Semiannual	
199-H4-12C	Performance monitoring		Quarterly	Semiannual	
199-H4-13	Performance monitoring		Quarterly	Semiannual	
199-H4-14	Performance monitoring		Quarterly	Semiannual	
199-H4-15B	Performance monitoring	Transducer	Monthly	Semiannual	
199-H4-15CS	Performance monitoring		Quarterly	Semiannual	
199-H4-16	Performance monitoring		Quarterly	Semiannual	
199-H4-17	Performance monitoring		Quarterly	Semiannual	
199-H4-18	Performance monitoring		Quarterly	Semiannual	
199-H4-45	Performance monitoring		Quarterly	Semiannual	
199-H4-46	Performance monitoring		Quarterly	Semiannual	
199-H4-48	Performance monitoring		Quarterly	Semiannual	
199-H4-49	Performance monitoring		Quarterly	Semiannual	
199-H5-1A	Performance monitoring		Quarterly	Semiannual	
199-H4-4	Compliance monitoring	Transducer	Monthly	Monthly	Annual
199-H4-5	Compliance monitoring	Transducer	Monthly	Monthly	Annual
199-H4-63	Compliance monitoring	Transducer	Monthly	Monthly	Annual
199-H4-64	Compliance monitoring	Transducer	Monthly	Monthly	Annual

Footnotes:
[1] Hourly measurements using pressure transducers and data loggers
[2] Routine steel tape measurements; monthly measurements to calibrate pressure transducers
[3] Hexavalent chromium using Hach methodology, ERC Mobile Laboratory
[4] Co-contaminants: Nitrate, strontium-90, technetium-99, tritium, and uranium
[3 & 4] Field measurements for pH, specific conductance, temperature, and turbidity during all sampling

Source: DOE-RL 1997

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