0082969

ORIGINAL

INFORMATION CLEARANCE FORM

LEB 8/24/2009

Date Received for Clearance Process (MM/DD/YYYY) 08/17/2009

A. Information Category

- ☐ Abstract
- ☐ Journal Article
- ☐ Summary
- ☐ Internet
- ☐ Visual Aid
- ☐ Software
- ☐ Full Paper
- ☒ Report
- ☐ Other

B. Document Number

SGW-41302 Revision 0 Reissue

C. Title

Description of Work for Aquifer Testing in Support of The 100-H Deep Chromium Investigation

D. Internet Address

E. Required Information (MANDATORY)

1. Is document potentially Classified? No

L. Craig Swanson LCSwanson

Manager Required (Print and Sign)

If Yes _____

ADC Required (Print and Sign)

2. Official Use Only	No	Exemption No.
3. Export controlled Information	No	OUO Exemption No. 3
4. UCNI	No	
5. Applied Technology	No	
6. Other (Specify)		

7. Does Information Contain the Following:
   a. New or Novel FH (Patentable) Subject Matter ? No
      If "Yes", OUO Exemption No. 3
      If "Yes", Disclosure No.:
   b. Commercial Proprietary Information Received in Confidence, Such as Proprietary and/or Inventions? No
   c. Corporate Privileged Information? No
      If "Yes", OUO Exemption No. 4
   d. Government Privileged Information? No
      If "Yes", Exemption NO. 5
   e. Copyrights? No
   f. Trademarks? No
8. Is Information Requiring submission to OSTI? No
9. Release Level? Public

F. Complete for a Journal Article

1. Title of Journal

G. Complete for a Presentation

1. Title for Conference or Meeting
2. Group Sponsoring
3. Date of Conference
4. City/State
5. Will Information be Published in Proceedings?No
6. Will material be Handed Out?No

H. Information Owner/Author/Requestor

R.B. Edrington Robert B Edrington

(Print and Sign)

Approval by Direct Report to FH President (Speech/Articles Only)

Responsible Manager

L.C. Swanson LCSwanson

(Print and Sign)

(Print and Sign)

I. Reviewers

	Print	Signature	Public Y/N (If N, complete J)
General Counsel	R.T. Swenson	Email Attached	Y/N
Office of External Affairs			Y/N
DOE			Y/N
OUO-SME	D.B. Erb	DBErb 8/12/09	Y/N
Clearance	GE Bratton	GEBratton	Y/N
Other			Y/N
Other			Y/N

J. Comments

Revised Introduction, Page 1-1, paragraph 2 to place the test in context with the CERCLA 5 Year review action item , for deep chromium in the RUM at 100-H.

Also revised Table 6-2 and Figure 9-1 to update the test schedule.

Information Clearance Approval

APPROVED FOR RELEASE OFFICIAL LEB 8/24/2009

08/24/2009 LEB

RECEIVED SEP 08 2009 EDMC

Page 1 of 1

A-6001-401

S

ORIGINAL 08/24/2009

CHPRC ADMINISTRATIVE DOCUMENT PROCESSING AND APPROVAL

DOCUMENT TITLE: DESCRIPTION OF WORK FOR AQUIFER TESTING IN SUPPORT OF THE 100-H DEEP CHROMIUM INVESTIGATION

OWNING ORGANIZATION/FACILITY: Soil & Groundwater Remediation Technical Reporting

Document Number: SGW-41302

Revision/Change Number: 0 (Reissue)

DOCUMENT TYPE *(Check Applicable)*

☐ Plan ☐ Report ☐ Study ☒ Description Document ☐ Other

DOCUMENT ACTION ◉ New ○ Revision ○ Cancellation

RESPONSIBLE CONTACTS

	Name	Phone Number
Author:	R. S. Edrington	373-3909
Manager:	L. C. Swanson	373-3807

DOCUMENT CONTROL

Is the document intended to be controlled within the Hanford Document Control System (HDCS)?	◉ Yes	○ No
Does document contain scientific and technical information intended for public use?	◉ Yes	○ No
Does document contain controlled-use information?	○ Yes	◉ No

("Yes" requires information clearance review in accordance with HNF-PRO-184)

DOCUMENT REVISION SUMMARY

NOTE: Provide a brief description or summary of the changes for the document listed.

REVIEWERS Others

Name *(print)*		Organization
W.R. Thackaberry	8-17-2009	Operations Assurance/ISMS
J.L. Smoot		Technical Reporting
C.J. Martin	Chris Martin	RCRA Monitoring/Reporting

APPROVAL SIGNATURES

Author:	8/17/09	RELEASE / ISSUE
Name: (Print) R.S. Edrington	Date	
Responsible Manager:	8/12/09	AUG 17 2009 (27)
Name: (Print) L.C. Swanson	Date	DATE: HANFORD RELEASE ID:
Other: Field Services and NF Monitoring	8/12/09	STA: 4
Name: (Print) J.A. Winterhalder	Date	
Other: Operations Assurance/ISMS		
Name: (Print) R.B. Barmettlor	Date 8/14/09	

Davis, Susan C

From: Swenson, Raymond T
Sent: Wednesday, August 12, 2009 1:00 PM
To: Davis, Susan C
Cc: Edrington, Robert S; Smoot, John L
Subject: RE: SGW-41302 for Approval

Please note: I will be on leave from Friday 8/14 through Friday 8/21. Please send any new documents needing clearance review to Kris Payne. I will not be able to delete or archive any emails from my BlackBerry, so a few large attachments will fill up my inbox and render me unable to send replies to any email, so do not even copy me on the documents you send to Kris.

Raymond Takashi Swenson
Senior Counsel

CH2M Hill Plateau Remediation Company
Richland, Washington
509-376-3511 Office
509-308-7456 BlackBerry
509-376-0334 Fax
Raymond_T_Swenson@rl.gov

This email may contain material that is confidential, privileged and/or attorney work product for the sole use of the intended recipient. Any review, reliance or distribution by others or forwarding without express permission is strictly prohibited. If you are not the intended recipient, please contact the sender and delete all copies.

From: Davis, Susan C
Sent: Wednesday, August 12, 2009 10:36 AM
To: Swenson, Raymond T
Cc: Edrington, Robert S; Smoot, John L; Davis, Susan C
Subject: SGW-41302 for Approval

Attached is a copy of SGW-41302 "Description of Work for the Aquifer Testing in Support of the 100-H Deep Chromium Investigation" for your review and approval. If you need a hard copy, please let me know and I will be happy to provide one for your use. When you are finished with the review just click the voting button that you approve and I will attach the e-mail message to the document. If you have any questions, I can be reached on the number listed below.

Susan Chris Davis 376-4422
Administrative Assistant, Supporting
Craig Swanson, Technical Reporting
Soil and Groundwater Remediation

"Beautiful young people are accidents of nature, but beautiful old people are works of art."

SGW-41302
Revision 0, REISSUE

Description of Work for Aquifer Testing in Support of the 100-H Deep Chromium Investigation

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

SGW-41302
Revision 0, REISSUE

Description of Work for Aquifer Testing in Support of the 100-H Deep Chromium Investigation

Document Type: DD Program/Project: SGW

R. S. Edrington
CH2M HILL Plateau Remediation Company

Date Published
August 2009

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington

LE Bratton 8/24/2009
Release Approval Date

Approved for Public Release;
Further Dissemination Unlimited

TRADEMARK DISCLAIMER

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy.

Printed in the United States of America

Contents

1 Introduction/Scope of Work 1-1

1.1 Test Purpose/Background 1-1

1.2 Test Location 1-2

1.3 Test Objectives 1-2

2 Background 2-1

2.1 Test Wells 2-1

2.2 Previous Investigations and Testing 2-1

3 Description of Work Activities 3-1

3.1 Test Requirements 3-1

3.1.1 Personnel Requirements 3-1

3.1.2 Equipment Requirements 3-2

3.1.3 Monitoring and Data Requirements 3-2

3.2 Pre-Test Design and Construction 3-2

3.2.1 Design and Construction Assumptions 3-3

3.3 Rebound Study 3-3

3.4 Step Drawdown Test 3-3

3.5 Constant-Rate Pumping Test 3-4

4 Waste Management 4-1

5 Procedure 5-1

6 Test Instructions and Data Collection 6-1

6.1 Data Collection 6-1

6.2 Pumping Test Instructions 6-2

6.2.1 Step Drawdown Test 6-2

6.2.2 Constant-Rate Pumping Test 6-3

6.3 Test Termination 6-3

7 Test Results and Reporting 7-1

8 Safety 8-1

9 Schedule 9-1

10 References 10-1

Appendices

A Test Well Construction Data ..... A-i

B Hydrogeological and Test Data ..... B-i

C Test Well Chromium Data ..... C-i

Figures

Figure 1-1. Location Map for 100-H Area Wells 1-3

Figure 9-1. Project Schedule 9-3

Tables

Table 3-1. Required Equipment 3-2

Table 6-1. Hydraulic Response Monitoring Wells 6-2

Table 6-2. Sample Schedule for Rebound Study 6-2

Table 6-3. Step Drawdown Test Flow Rates 6-3

Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
DOW	description of work
DWS	drinking water standard
OU	operable unit
ppb	parts per billion
RAO	remedial action objective
RUM	Ringold Upper Mud (Unit)
S&GRP	Soil and Groundwater Remediation Project

This page intentionally left blank.

1 Introduction/Scope of Work

This description of work (DOW) covers field characterization and testing that will be performed in the 100-H Area of the Hanford Site to address a milestone from the second *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) 5-year review. The 5-year review noted that groundwater samples from one deep well extending below the aquitard (i.e., the Ringold Upper Mud Unit [RUM]) exceeded both the groundwater standard of 48 parts per billion (ppb) (Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation 173-340 WAC*) and the federal DWS of 100 μg/L for hexavalent chromium. The extent of hexavalent chromium contamination in this zone is not well understood. Action #12-1 from the review is to "perform additional characterization of the aquifer below the initial aquitard."

This description of work describes aquifer testing and sampling that will be performed to satisfy (in part) this action from the CERCLA 5-year review. It is intended that together with the aquifer tests, well completions and sediment sampling work planned for the 100-D/100-H Areas remedial investigation/ feasibility study will satisfy the action completely. Testing will be conducted at three deeper 100-H Area wells that show elevated hexavalent chromium concentrations (199-H3-2C, 199-H4-12C, and 199-H4-15CS). Each of the subject test wells is part of a group of wells that are screened at different vertical intervals, either in the unconfined aquifer or at depth in the RUM. Testing will consist of pumping at a steady rate at each well for an extended period of time and monitoring changes in chromium concentrations. This data will help determine the extent and magnitude of deeper chromium contamination.

The 100-H Area pump-and-treat system will be shut down during testing to facilitate pumping and characterization work. This will provide an opportunity to perform rebound testing for the pump-and-treat interim remedial action. The remedial action objective (RAO) of 20 μg/L has been met at most of the extraction, monitoring, and compliance wells in this area. Hexavalent chromium and co-contaminant concentrations will be monitored during shutdown to determine if the concentrations remain low or increase above the RAO with natural, low river stage (non-pumping) conditions.

Data are presented in Appendix A (construction data), Appendix B (hydrogeological and test data), and Appendix C (test well chromium data).

1.1 Test Purpose/Background

The 100-HR-3 Operable Unit (OU) second CERCLA 5-year review set a milestone to conduct an investigation of deep chromium contamination in the sediments of the RUM, which underlies the unconfined aquifer in the 100-H Area. In response to the 5-year review, a set of aquifer tests (with time-series sampling) will be performed to gather data to answer several fundamental questions regarding the presence of the deep chromium. The current conceptual model for the 100-H Area unconfined aquifer is that the RUM is an aquitard layer underlying the unconfined aquifer and may contain permeable zones, stringers, or layers. These permeable zones (if they exist) would provide pathways for chromium to migrate deeper into the RUM under certain hydrologic conditions. Cross-cutting features such as clastic dikes have not been observed in the 100-H Area. The three test wells covered in this DOW (199-H3-2C, 199-H4-12C, and 199-H4-15CS) exhibit chromium contamination that may have been driven into the RUM by the high hydraulic head conditions resulting from discharges of cooling water from operation of H Reactor. The cooling water contained 1 to 2 mg/L of hexavalent chromium that was used for corrosion prevention. The resulting groundwater mound was 5 to 10 m (16.4 to 32.8 ft) above the natural water table in the vicinity of the reactor. Two alternate hypotheses for the introduction of chromium into the RUM are as follows: (1) chromium was introduced from the unconfined aquifer via the monitoring wells, either during drilling or as a result of poor well construction, which allowed hydraulic communication

between the aquifer and the RUM; or (2) chromium migrated across the Horn area in the RUM. The last hypothesis seems unlikely, as the data from RUM sampling in the Horn area shows limited levels of hexavalent chromium (below the protective level for the Columbia River [20 ppb], the standard from Ecology Publication 94-06 [48 ppb] and the Federal DWS [100 µg/L]). The purpose of the planned aquifer testing is to gather data that will help to refine the conceptual model for the source of deep contamination, evaluate the hydraulic properties of both the unconfined aquifer and the upper RUM, and indicate the extent of chromium contamination in the RUM. In order to conduct these aquifer tests, pump-and-treat extraction wells in the 100-H Area must be shut down prior to aquifer testing. The shutdown of pumping in the unconfined aquifer will allow the aquifer to recover to a natural (non-pumping) equilibrium state. The rebound study will also begin during the shutdown.

Wells 199-H3-2C, 199-H4-12C, and 199-H4-15CS are existing monitoring wells that are screened in the upper portion of the RUM. Sample results from these wells (see Appendix C) have shown hexavalent chromium concentrations above the 20 µg/L RAO. All three wells will be evaluated for hydraulic connectivity, hydraulic productivity, and geochemical characteristics of chromium during an extended pumping test.

1.2 Test Location

The test wells consist of existing monitoring wells in the 100-H Area (Figure 1-1). These wells are each part of a three-well set, completed at increasing depths in the unconfined aquifer in the 100-H Area. There is a distance of approximately 7.3 m (24 ft) between each well (see Appendix A for exact distances between each well):

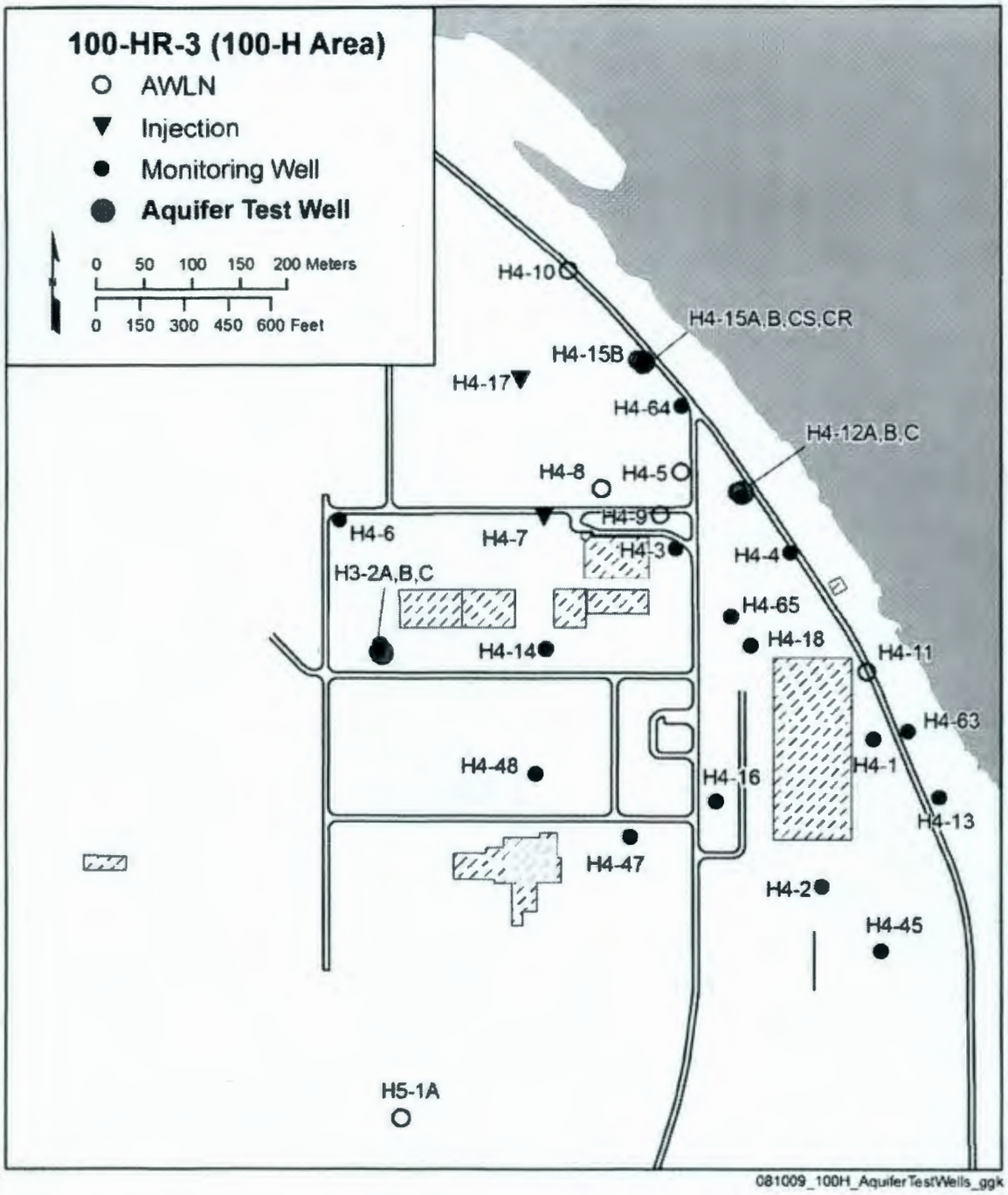
- Well set 199-H3-2A,199-H3-2B, and199-H3-2C
- Well set 199-H4-12A, 199-H4-12B, and 199-H4-12C
- Well set 199-H4-15A, 199-H4-15B, and 199-H4-15C.

Well 199-H4-15CS is part of nested piezometer well 199-H4-15C. Four 5.1 cm (2-in.) piezometers are located in the host well and are completed at increasing depths. Piezometer 199-H4-15CS is the shallowest completion screened in the upper portion of the RUM; 199-H4-15CP is the deepest completion and is a flowing artesian piezometer completed in the uppermost basalt unit. The higher head indicates an upward hydraulic gradient in this area and, therefore, an area of discharge for the deeper aquifer system to the upper aquifer and Columbia River. Construction data for each of the testing and closest monitoring wells are presented in Appendix A.

1.3 Test Objectives

The specific test objectives for this DOW are as follows:

- Evaluate the sustainable production of the subject wells using a constant-rate pumping test.
- Collect hydrologic (water-level) data to evaluate the degree of hydraulic connection between the RUM and the unconfined (upper) aquifer (natural or induced along the well casing).
- Collect groundwater samples at specified time intervals during testing to evaluate the extent and persistence of hexavalent chromium in the deeper zones. Use data collected to refine the current conceptual model for the 100-H Area unconfined aquifer and RUM in this area.
- Evaluate the concentration "rebound" in the unconfined aquifer of hexavalent chromium and the contaminants of concern during shutdown of the extraction wells (Table 6-1 in Chapter 6). The co-contaminants will be measured at the beginning, middle, and end of the test.



NOTE: The wells indicated in this figure are prefixed by "199-."

Figure 1-1. Location Map for 100-H Area Wells

This data will be used to refine the current conceptual model for the 100-H Area unconfined aquifer and the RUM in this area. The information will flow into the remedial investigation work plan and feasibility study that is being prepared concurrently with these activities, which will lead to a final Record of Decision for the 100-HR-3 OU.

To achieve the objectives, the activities for this DOW are divided into five phases:

- Phase 1: Perform pre-test design and configuration.
- Phase 2: Shut down all extraction wells in the 100-H Area (initiation of the rebound study and sampling as shown in Chapter 6, Table 6-2) and reconfigure the pump-and-treat system to handle the groundwater pumped during aquifer testing.
- Phase 3: Perform an initial step drawdown test at each test well. The data will provide the sustainable discharge rate for the long-term pumping test. Well 199-H4-15CS will be pumped into a tank and will not be connected to the pump-and-treat system because of pump-size limitations for a 5.1 cm (2-in.)-diameter piezometer.
- Phase 4: Conduct a long-term, constant-rate pumping test with concurrent sampling for hexavalent chromium concentrations.
- Phase 5: Complete the rebound study.

2 Background

This chapter provides additional information on the test wells and on previous investigations/testing at test wells 199-H3-2C, 199-H4-12C, and 199-H4-15CS.

2.1 Test Wells

The subject test wells (199-H3-2C, 199-H4-12C, and 199-H4-15CS) are completed in the RUM, which underlies the unconfined aquifer. Construction information for each of the test wells and the accompanying nearby monitoring wells is presented in Appendix A. Chapter 6 lists the wells that will be used to monitor hydraulic response (Table 6-1) and also the wells and schedule for sampling during the rebound study (Table 6-2).

2.2 Previous Investigations and Testing

Testing and hydrogeological data from previous investigations of the wells included in this DOW are presented in Appendix B. Previous testing was performed by Pacific Northwest National Laboratory after initial well construction in 1986. These wells are now included as part of the monitoring network for remediating the hexavalent chromium plume in the 100-H Area. The *Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units at the Hanford Site (Interim Remedial Action)* (EPA et al. 1996) was issued in 1996 and identifies pump-and-treat as the interim remedial action for removing hexavalent chromium from the aquifer.

This page intentionally left blank.

3 Description of Work Activities

This chapter presents a general description of the work activities, aquifer test methods, and sequence of work to be performed for this testing.

This DOW outlines the test setup and objectives and is to be used in conjunction with procedure GRP-EE-01-6.3, "Well Development and Testing." The first action is to conduct the step test to assess the condition of the wells before the constant-rate test. The results will be reviewed to assess the linearity of the specific capacity at various flow rates and make a determination if well redevelopment is required. Chapter 5 identifies the procedure requirements. Chapter 6 discusses the test instructions and data collection, and the test results and data reporting are discussed in Chapter 7.

3.1 Test Requirements

This section describes the personnel, equipment, monitoring, and data collection requirements for performing testing.

3.1.1 Personnel Requirements

Requirements for personnel performing the work activities are as follows:

- The 100-HR-3 project manager will assign a test coordinator and a technical lead.
- The test coordinator will act as the central point of contact for the activities in the field that are covered in this DOW.
- The test coordinator is responsible for ensuring that prerequisite conditions are met and for coordinating activities among the various organizations. The test coordinator, in conjunction with the technical lead, will provide clarification of requirements for each activity.
- The technical lead is responsible for data analysis, the final test report, and clarification of technical issues pertaining to the test requirements.
- The technical reporting group's hydrogeology team will be responsible for ensuring that water-level data are collected, as required by this DOW.
- Plant Forces are responsible for constructing the temporary tie-in to the 100-HR-3 pump-and-treat system.
- 100-HR-3 pump-and-treat operations is responsible for providing the necessary support to conduct testing and operational support of the pump-and-treat facility, as well as collecting samples, as required by this DOW.
- Soil and Groundwater Project (S&GRP) engineering is responsible for providing all design and construction support to perform this test.
- S&GRP well maintenance shall be available to install and remove sampling and test pumps as needed for both the step drawdown and constant-rate pumping tests.
- The technical reporting group's hydrogeology team will supply all temporary monitoring.
- S&GRP engineering will provide water-level data from operational wells collected by the 100-HR-3 pump-and-treat monitoring system.

3.1.2 Equipment Requirements

This section describes the equipment requirements for activities covered by this DOW. Table 3-1 lists the required equipment.

Table 3-1. Required Equipment

Activity	Testing Equipment	Monitoring Equipment
Rebound study	No testing equipment required for rebound study	Data loggers, transducers installed in all monitoring wells, and E-tape
Step test 15CS	Test pump (Grundfos Redi-Flo 2) with controller, purge tanks, and piping	Data loggers, and transducers installed in all monitoring wells and pumping well
Step test pump-and-treat	Test pumps and level monitors	Data loggers, transducers installed in all monitoring wells, and level probes pumping wells
Constant-rate test	Test pumps and level monitors	Data loggers and transducers installed in all monitoring wells

NOTES:

1. Grundfos® is a registered trademark of Grundfos Pumps Corporation, Olathe, Kansas.
2. Well 199-H4-15CS will be tested separately from the pump-and-treat system.

For the constant-rate pumping test, 100-HR-3 pump-and-treat operations will operate and monitor the pump-and-treat system, collecting all required data for the three test wells as described in this DOW.

3.1.3 Monitoring and Data Requirements

Testing and data recording shall be performed in accordance with procedure GRP-EE-01-6.3. A data collection schedule for monitoring and sampling for each test is presented in Section 6.1. Whenever possible, rebound study sampling will be coordinated with other scheduled routine sampling at the 100-HR-3 pump-and-treat system.

Routine 100-HR-3 pump-and-treat process data collection and monitoring will continue for the duration of testing. The 100-HR-3 pump-and-treat facility will continue to receive and treat extraction water from the 100-D Area extraction wells during testing. When possible, rebound study sampling will be coordinated with other scheduled sampling.

3.2 Pre-Test Design and Construction

The testing included in this DOW will use existing extraction pipelines, wherever possible, with the need to connect new piping to well 199-H3-2C. This will involve pre-test design, procurement, and construction activities. Modification will be considered temporary and controlled by the work package configuration management process. Prior to the startup of test activities, the following design and construction activities must be completed:

- Design and procure materials to connect the two test wells (199-H3-2C and 199-H4-12C) to the current pump-and-treat system at the 100-HR-3 OU
- Modify wells and install pumps and instrumentation

- Make any necessary programming changes to the pump-and-treat system in order to properly monitor and control testing
- Make changes to operation procedures to address test performance.

3.2.1 Design and Construction Assumptions

Assumptions for the design and construction work performed under this DOW are listed below:

- Existing extraction wells in the 100-H Area feeding the 100-H Area transfer building and the 100-HR-3 process building will be shut down for the entire duration of the RUM test. The RUM test consists of a step drawdown test and constant-rate pumping test.
- 100-HR-3 pump-and-treat operations will continue to pump groundwater from the 100-D Area and from the test wells for the duration of testing.
- Existing extraction well piping, wiring, and instrumentation will be used to the maximum practical extent for testing.
- New extraction well pumps will be installed in the test wells to reduce pre- and post-test operational downtime.
- The power supply, wiring, and piping for wells 199-H4-12A and 199-H4-15A can be used for wells 199-H4-12C and 199-H4-15CS, respectively.
- Groundwater from well 199-H3-2C will be piped to the 100-HR-3 process building by tying into the existing piping for well 199-H4-64. High-density polyethylene pipe and electrical cable routing to achieve this will not interfere with Washington Closure Hanford excavation areas.
- The operating parameters for the test wells are within the existing 100-HR-3 pump-and-treat control system capabilities.
- The test duration is 30 days. Because modifications will affect configuration baseline drawings, configuration management will use the facility modification package process.

3.3 Rebound Study

The rebound study will be a component of the shutdown and recovery of the unconfined aquifer, with accompanying sampling for chromium and other co-contaminants the 100-HR-3 wells, as listed in Table 6-2. Wells will be sampled (see Table 6-2) during the rebound study. The change in chromium concentrations over a 3-month period will be evaluated and reported in the aquifer test report. No additional testing equipment will be required for the rebound study. When the rebound study is completed, the 100-HR-3 pump-and-treat system will be restored to its pre-test configuration and restarted, as indicated in the project schedule (Chapter 9, Figure 9-1). The final report will provide an evaluation of the need for further action (in terms of the deep hexavalent chromium contamination and/or contaminants of potential concern in the RUM) and will propose a path forward (if any is warranted).

3.4 Step Drawdown Test

A step drawdown test will be performed to determine the sustainable pumping rate for the long-term, constant-rate test. The objective is to determine the maximum pumping rate that will not exceed a drawdown of greater than 50 percent of the available water. The following activities will be performed during the test:

1. Prior to startup of the step drawdown test, all 100-H Area extraction wells will be shut down, and the groundwater in the unconfined aquifer will be allowed to recover to an equilibrium state (approximately 1 month).
2. Water-level monitoring will be set up to gather baseline data in selected wells prior to test startup.
3. The step drawdown test will be performed at each test well (see Chapter 6). Note that wells 199-H3-2C and 199-H4-12C will be pumping to the 100-HR-3 pump-and-treat facility, whereas well 199-H4-15CS will be pumped to onsite tanks and will be monitored locally.
4. Groundwater samples will be collected for chromium analysis at the intervals specified in Section 6.1.
5. After the step drawdown test is completed, analysis will be performed and the optimal pumping rate will be calculated for each test well.

The purgewater for well 199-H4-15CS will be pumped into temporary onsite storage tanks. Upon completion of testing, the temporary tanks will be pumped until empty into purge trucks. The purgewater will then be transferred to either the pump-and-treat facility or the ModuTanks[1].

3.5 Constant-Rate Pumping Test

The constant-rate pumping test will be performed after groundwater levels in the wells have recovered from the step drawdown test and the optimal pumping rates for each well have been calculated. The constant-rate pumping test will be performed as described in Chapter 6. The following general sequence of actions will be performed during the test:

1. Hold a pre-test coordination meeting the day prior to beginning the test, which will include a site walkdown and final detail discussion with all involved in the test startup
2. Start the constant-rate pump test
3. Pump at constant rate for 30 days (or 8 hours, in the case of well 199-H4-15CS), collect water-level data, and perform sampling (Section 6.1)
4. Collect groundwater samples for chromium analysis at the intervals specified in Section 6.1.
5. Terminate pumping upon reaching one of the test termination conditions (Section 6.3)
6. Continue to collect water-level data and samples during the recovery period (Section 6.1).

1 ModuTank is a trademark of ModuTank Inc., Long Island City, New York.

4 Waste Management

All waste materials will be managed as investigation-derived waste in accordance with the *Interim Action Waste Management Plan for the 100-HR-3 and 100-KR-4 Operable Units* (DOE/RL-97-01). All purgewater produced during the step drawdown and constant-rate tests will be handled through the 100-HR-3 pump-and-treat system in accordance with DOE/RL-97-01, the *Environmental Restoration Program Strategy for Management of Investigation Derived Waste* (DOE-RL et al. 1999), and the *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington* (90-ERB-040).

This page intentionally left blank.

5 Procedure

Field work will be conducted in accordance with existing CH2M HILL Plateau Remediation Company procedures and protocols, and in accordance with this DOW.

Testing and data recording shall be performed in accordance with procedure GRP-EE-01-6.3 and as specified in this DOW. Equipment used for water-level measurements will be checked for proper functioning in accordance with procedure GRP-EE-01-7.4, "Requirements for Use of Field Equipment." Chromium sampling will be performed in accordance with procedures GRP-FS-04-G-001, "Chromium Analysis of Water Samples at Pump and Treat Facilities," and GRP-FS-04-H-100-001, "100-HR-3 Pump-and-Treat Operating Procedure," as appropriate.

This page intentionally left blank.

6 Test Instructions and Data Collection

This chapter outlines the data collection requirements and test instructions for the step drawdown and constant-rate pumping tests. Testing will be used to characterize chromium occurrence and persistence in Ringold sediments. It is not anticipated that the testing will lead to termination of interim action remediation in the upper aquifer.

6.1 Data Collection

Water-level data specified in this DOW will be collected by the operations monitoring system for the test wells, by both temporary field monitoring equipment and the automated water-level network at both the near-, mid-, and far-field monitoring wells (Table 6-1). The automated water-level network wells will also be used to collect data to correct river influence effects and to analyze hydraulic response during the rebound study.

All field activities will be recorded (to the nearest minute) in an appropriate field activity report or operations logbook. All depth-to-water measurements shall include the reference point of each measurement (i.e., top of the casing or the ground surface). All measurements shall be recorded in feet (to the nearest hundredth of a foot).

Chromium samples for wells 199-H3-2C and 199-H4-12C will be collected from sample ports as routine operations samples (as specified in procedure GRP-FS-04-G-001) at the following schedule (for the step test and the first day of the constant-rate test): at test start (within the first 5 minutes); at 15 minutes, 30 minutes, 45 minutes, 60 minutes, 2 hours, 4 hours, and 8 hours; and then once per day for the remainder of the test period for the constant-rate test (i.e., for 30 days), with a final sample taken just prior to the shutdown of pumping.

Samples collected at well 199-H4-15CS during the step drawdown and constant-rate tests will be collected at the well head by the site geologist, with both tests on the same schedule as listed above for the step test and the first 8 hours of the constant-rate test. Chromium will be measured in the field with a test kit. Additional laboratory samples will be taken at 30 minutes, 8 hours, 10 days, and 20 days. The 8-hour sample for both the step and constant-rate tests will be taken in duplicate, with one of the samples sent for laboratory analysis. One sample per week during the test will also be taken in duplicate, with one of the samples sent for laboratory analysis. Table 6-2 presents the sample schedule for the rebound study.

During both the step drawdown tests and constant-rate tests, field parameter samples will be collected along with the chromium sample:

- Turbidity (in nephelometric turbidity units)
- Specific conductivity (in µS/cm)
- Temperature (in degrees Celsius)
- pH.

In addition to field parameters, the test conditions should be recorded at the time of each sample, including flow rate, drawdown, and time since pumping started.

Table 6-1. Hydraulic Response Monitoring Wells

Near-Field Wells	Mid-Field Wells	Far-Field Wells	Comments
199-H3-2A,B	199-H4-64, *199-H4-5,*	*199-H4-10, 199-H4-8*	199-H4-17 monitored as an injection well
199-H4-12A,B	199-H4-65, 199-H4-18, 199-H4-9	199-H4-18, 199-H4-11, 199-H4-63	199-H4-7 monitored as an injection well
199-H4-15A,B,CR	199-H4-6,199-H4-14, 199-H4-48	199-H4-16, 199-H4-2, 199-H4-13, 199-H4-45, *199-H5-1A*	

NOTE: Wells in italics are temporarily installed monitoring wells for this test only. Well 199-H5-1A is an automated water-level network station and will be used as a background well.

Table 6-2. Sample Schedule for Rebound Study

Well	Constituents	Well Type	Sample Date
199-H4-12A, 199-H4-15A, 199-H4-3, 199-H4-4, 199-H4-63, 199-H4-64,	Hexavalent chromium, Tc-99, U, total Sr, tritium, alkalinity, reduction-oxidation, ICP metals (list 3), and IC anions (list 1)	Extraction	8/27, 9/8, 9/22, 10/5, 10/19, 10/29, 11/12
199-H4-14, 199-H4-18	Hexavalent chromium, Tc-99, U, total Sr, tritium, alkalinity, reduction-oxidation, ICP metals (list 3), and IC anions (list 1)	Injection	8/27, 9/8, 9/22, 10/5, 10/19, 10/29, 11/12
199-H4-5, 199-H4-9, 199-H4-12B, 199-H4-13, 199-H4-15B, 199-H4-65	Hexavalent chromium, Tc-99, U, total Sr, tritium, alkalinity, reduction-oxidation, ICP metals (list 3), and IC anions (list 1)	Near-field	8/27, 9/8, 9/22, 10/5, 10/19, 10/29, 11/12
199-H3-2A,B, 199-H4-6, 199-H4-8	Hexavalent chromium, Tc-99, U, total Sr, tritium, alkalinity, reduction-oxidation, ICP metals (list 3), and IC anions (list 1)	Mid-field	8/27, 9/8, 9/22, 10/5, 10/19, 10/29, 11/12
199-H4-16, 199-H4-10, 199-H4-45, 199-H4-48	Hexavalent chromium,, Tc-99, U, total Sr, tritium, alkalinity, reduction-oxidation, ICP metals (list 3), and IC anions (list 1)	Far-field	8/27, 9/22, 10/19, 11/12

NOTE: Wells not covered by other projects will be sampled specifically for the rebound study, as listed above.

IC = ion chromatography

ICP = inductively coupled plasma

6.2 Pumping Test Instructions

6.2.1 Step Drawdown Test

A step drawdown test is typically conducted prior to a constant-rate pumping test to obtain information to help design the full test, determine well efficiencies, and estimate sustainable well production. This test will be conducted as outlined in procedure GRP-EE-01-6.3. The steps and pumping rates are shown in Table 6-3. Step drawdown testing will consist of a minimum of three steps, but testing may use all

five steps presented in Table 6-3. Each step will be performed for the same time interval (typically 2 hours), which will be determined by the technical lead and test coordinator because the test is performed based on the response of each individual well.

Table 6-3. Step Drawdown Test Flow Rates

Well	Step 1	Step 2	Step 3	Step 4[a]	Step 5[a]
199-H3-2C	10	20	30	40	50
199-H4-12C	5	10	15	20	25
199-H4-15CS	2	4	6	8	10

NOTE: Test flow rates shown in each step are in gallons per minute (gpm).

a. Optional steps if needed, as determined during testing by technical lead

6.2.2 Constant-Rate Pumping Test

After the target rate has been determined by the technical lead, the constant-rate pumping test will be performed at the established target flow rate. The constant-rate pumping will be conducted in accordance with procedure GRP-EE-01-6.3 and should, at a minimum, follow these steps:

1. Coordinate starting the pumps and simultaneously initiate data collection at a logarithmic rate. Adjust the pump rate as quickly as possible to the target rate established by the technical lead.
2. Maintain and monitor the flow rates and well-level data collection to ensure that flow rates remain constant and drawdown does not exceed 50 percent of available head. If necessary, the flow rate can be reduced to ensure that the test well does not draw below the 50 percent level. Record any changes in flow rate and the time when the change occurred.
3. Sample the field parameters at the start of testing and then proceed as outlined in Section 6.1.
4. Maintain constant-rate pumping until a test termination condition is reached (Section 6.3).
5. Upon reaching a test termination condition, shut off the pumps and simultaneously initiate the recovery test.
6. Record the recovery data for a minimum of one week, or as directed by the technical lead.

6.3 Test Termination

The conditions at which pumping shall be terminated are as follows:

- A constant rate of flow can no longer be maintained (which is unlikely for wells 199-H3-2C and 199-H4-12C).
- The ability of the pump-and-treat system to contain or process the test purgewater has been compromised.
- An unsafe field condition exists.
- Test equipment failure that would, if pumping continued, produce one of the above conditions.
- The test duration has been met (i.e., 30 days).

Pumping may continue at the other test wells if termination conditions exist at only one of the test wells. The test coordinator or technical lead must be contacted any time one of the above conditions is encountered.

7 Test Results and Reporting

The data collected during testing will be compiled and reported by the hydrogeology team via technical memorandum to the technical lead. The test report will include processed data, well information, hydrographs, a summary table, and any test conditions that would affect the test results. The technical lead will analyze the data and then report the results via an S&GRP test report, which will be transmitted to the 100-HR-3 project manager/OU lead. The test report will include the results of the aquifer testing and rebound study, the analysis and interpretation of the testing results (in the context of the test objectives, as described in Section 1.1), and any recommendations for further actions.

The data from the test results will be used to evaluate the different conceptual models for the distribution of chromium in the RUM. Little persistence in chromium values would suggest that the deep chromium presence is due to issues with well construction. Intermediate persistence would tend to suggest that the chromium is related to a finite areal extent, which is related to groundwater mounding during reactor operations. Strong persistence would tend to suggest that contaminated water is migrating across the Horn area in the sand lenses in the RUM and feeding into the pumped zone over a large distance.

Subsequently, the rebound portion of the test will also be used to examine changes in chromium concentrations after cessation of pumping. This data will help evaluate longer term effects of deep chromium on the unconfined aquifer and ultimately the Columbia River. The rebound study will support any decision on future pumping and remedial actions.

This page intentionally left blank.

8 Safety

All personnel performing field work associated with this test and covered by this DOW will have completed the following, at a minimum:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Site Worker training (29 *Code of Federal Regulations* [CFR] 1910.120, "Occupational Safety and Health Standards," "Hazardous Waste Operations and Emergency Response")
- Hanford General Employee Training
- General Employee Radiation Training.

All work will be performed in accordance with the following standard procedures:

- GRP-EE-01-6.3, "Well Development and Testing"
- GRP-FS-04-G-001, "Chromium Analysis of Water Samples at Pump and Treat Facilities"
- GRP-FS-04-H-100-001, "100-HR-3 Pump-and-Treat Operating Procedure."

This page intentionally left blank.

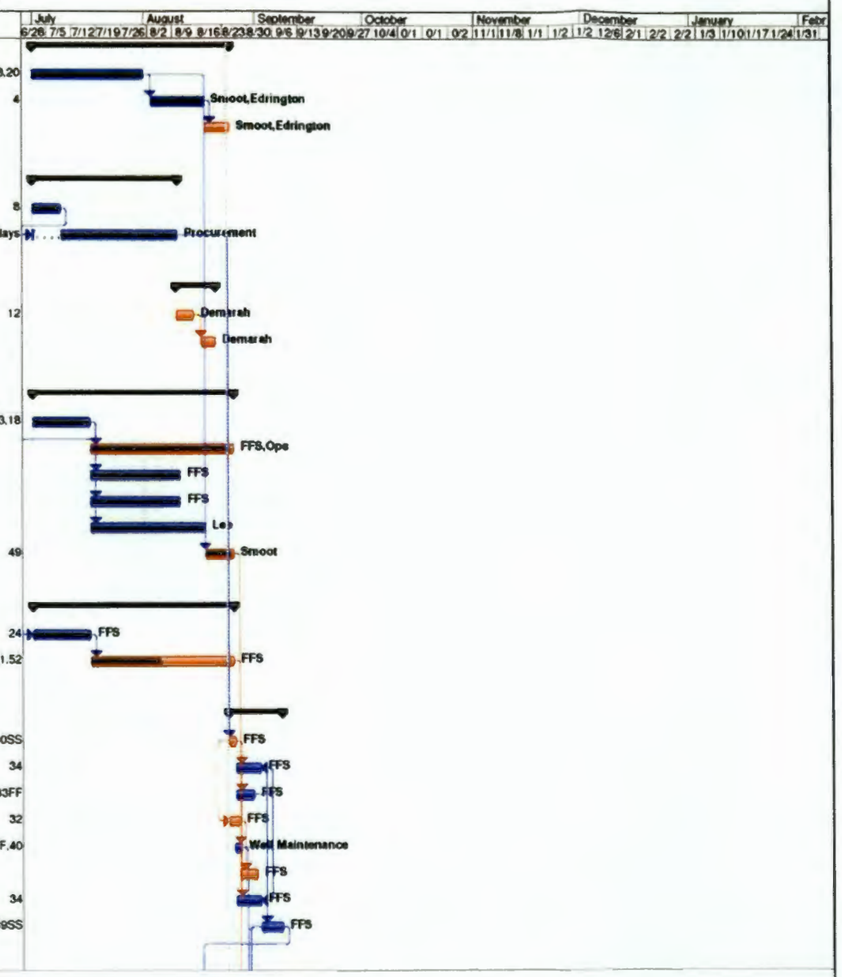
9 Schedule

The project schedule is presented in Figure 9-1.

This page intentionally left blank.

HR-3 RUM TEST

ID	ID	% Complete	Task Name	Duration	Start	Finish	Predecessors	Successors
1	1	88%	**Description of Work**	**34 days**	**Wed 7/1/09**	**Mon 8/24/09**		
2	2	100%	Draft DOW	20 days	Wed 7/1/09	Fri 7/31/09		3,20
3	3	100%	Issue DOW, Rev. 0	10 days	Mon 8/3/09	Mon 8/17/09	2	4
4	4	0%	Prepare DOW, Rev. 1	4 days	Tue 8/18/09	Mon 8/24/09	3	
5	5							
6	6	100%	**Prepare SOW/Issue Subcontracts**	**24.3 days**	**Wed 7/1/09**	**Mon 8/10/09**		
7	7	100%	Prepare SOW	5 days	Wed 7/1/09	Wed 7/8/09		8
8	8	100%	Award Contract	20 days	Wed 7/1/09	Mon 8/10/09	7	27FS+9 days
9	9							
10	10	0%	**Radiological Assessment Package**	**9 days**	**Mon 8/10/09**	**Thu 8/20/09**		
11	11	0%	Prepare Rad Assessment Package	5 days	Mon 8/10/09	Fri 8/14/09		12
12	12	0%	Approve Rad Assessment Package	4 days	Mon 8/17/09	Thu 8/20/09	11	
13	13							
14	14	98%	**Other Planning Documents**	**35 days**	**Wed 7/1/09**	**Tue 8/25/09**		
15	15	100%	Issue FMP	10 days	Wed 7/1/09	Thu 7/16/09		16,17,19,23,18
16	16	95%	Prepare and Issue CWAE	25 days	Fri 7/17/09	Tue 8/25/09	15	
17	17	100%	Prepare and Issue CWP	15 days	Fri 7/17/09	Mon 8/10/09	15	
18	18	100%	Prepare JSA	15 days	Fri 7/17/09	Mon 8/10/09	15	
19	19	100%	Prepare and Approve Excavation Permit	20 days	Fri 7/17/09	Mon 8/17/09	15	
20	20	80%	Prepare SAF	5 days	Tue 8/18/09	Tue 8/25/09	2	49
21	21							
22	22	64%	**Long Lead Procurement**	**35 days**	**Wed 7/1/09**	**Tue 8/25/09**		
23	23	100%	Identify Lead Items	10 days	Wed 7/1/09	Thu 7/16/09	15	24
24	24	50%	Procure Long Lead Items	25 days	Fri 7/17/09	Tue 8/25/09	23	31,52
25	25							
26	26	0%	**Construction**	**9 days**	**Mon 8/24/09**	**Tue 9/8/09**		
27	27	0%	Mobilize	2 days	Mon 8/24/09	Wed 8/26/09	8FS+9 days	28,29,33,30SS
28	28	0%	Install HDPE Piping	5 days	Wed 8/26/09	Wed 9/2/09	27,29FF,31FF	34
29	29	0%	Complete Road Crossing	3 days	Wed 8/26/09	Mon 8/31/09	27	28FF,33FF
30	30	0%	Fabricate Extraction Well Racks	3 days	Mon 8/24/09	Thu 8/27/09	27SS	32
31	31	0%	Install Pump and Level Transducers in Wells	2 days	Wed 8/26/09	Thu 8/27/09	24	28FF,33FF,40
32	32	0%	Install Well Racks	3 days	Thu 8/27/09	Tue 9/1/09	30	
33	33	0%	Route and Connect Power and Control conductors	5 days	Wed 8/26/09	Wed 9/2/09	27,29FF,31FF	34
34	34	0%	Complete Construction	2 days	Wed 9/2/09	Tue 9/8/09	28,33	S-10 days,38SS,39SS
35	35							



Project: HR-3 RUM Test
Date: Mon 8/24/09

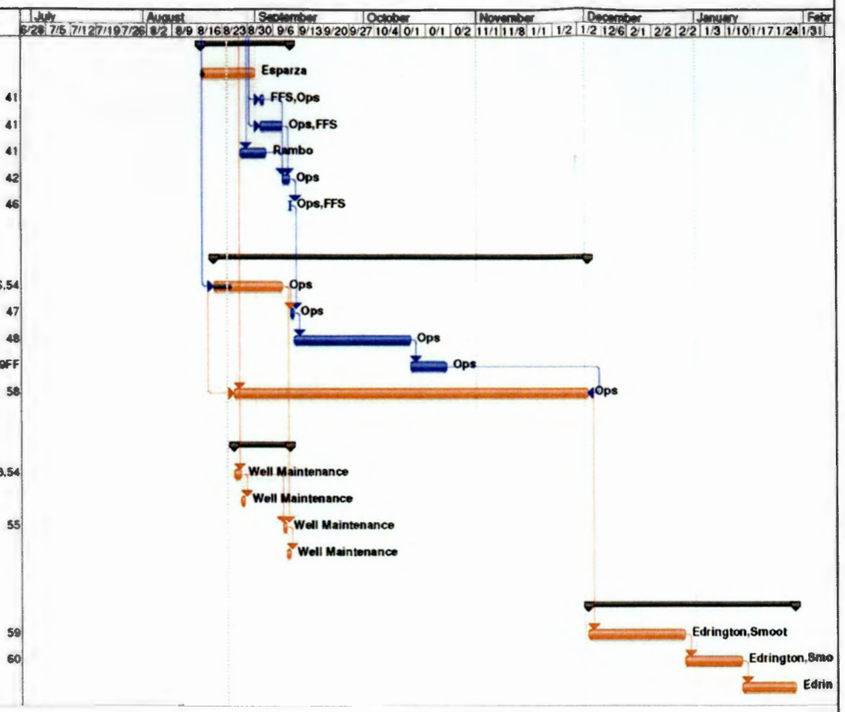
Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

Page 1

Figure 9-1. Project Schedule

HR-3 RUM TEST

ID	ID	% Complete	Task Name	Duration	Start	Finish	Predecessors	Successors
36	36	5%	**Acceptance Testing**	**15.8 days**	**Mon 8/17/09**	**Thu 9/10/09**		
37	37	10%	Prepare Work Package	10 days	Mon 8/17/09	Mon 8/31/09		
38	38	0%	In-Service Leak Tests	1 day	Wed 9/2/09	Thu 9/3/09	34SS	41
39	39	0%	Instrumentation Checks	2 days	Wed 9/2/09	Tue 9/8/09	34SS	41
40	40	0%	Software Set-up	5 days	Fri 8/28/09	Thu 9/3/09	31	41
41	41	0%	Controlled Demonstration Test	2 days	Tue 9/8/09	Thu 9/10/09	39,38,40	42
42	42	0%	Complete Turnover Walkdown	0.5 days	Thu 9/10/09	Thu 9/10/09	41	46
43	43							
44	44	2%	**Aquifer Test**	**62.7 days**	**Thu 8/20/09**	**Tue 12/1/09**		
45	45	10%	Shutdown HR-3 Pump and Treat for Recovery	10 days	Thu 8/20/09	Tue 9/8/09	34FS-10 days	46,49SS,54
46	46	0%	Perform Step Test	1 day	Thu 9/10/09	Fri 9/11/09	45,42	47
47	47	0%	Perform Constant Rate Test	20 days	Fri 9/11/09	Tue 10/13/09	46	48
48	48	0%	Recovery	7 days	Tue 10/13/09	Fri 10/23/09	47	49FF
49	49	0%	Sampling	60 days	Wed 8/26/09	Tue 12/1/09	45SS,48FF,20	58
50	50							
51	51	0%	**199-H4-15CS Aquifer Test**	**9.3 days**	**Wed 8/26/09**	**Thu 9/10/09**		
52	52	0%	Install Pump and level monitoring equipment in Well	2 days	Wed 8/26/09	Thu 8/27/09	24	53,54
53	53	0%	Provide temporary power	1 day	Fri 8/28/09	Fri 8/28/09	52	
54	54	0%	Perform Step Test	1 day	Tue 9/8/09	Wed 9/9/09	45,52	55
55	55	0%	Perform 8 hour Constant Rate Test	1 day	Wed 9/9/09	Thu 9/10/09	54	
56	56							
57	57	0%	**Test Report**	**35 days**	**Wed 12/2/09**	**Thu 1/28/10**		
58	58	0%	Analyze Data	15 days	Wed 12/2/09	Mon 12/28/09	49	59
59	59	0%	Draft Report	10 days	Tue 12/29/09	Wed 1/13/10	58	60
60	60	0%	Issue Final Report	10 days	Thu 1/14/10	Thu 1/28/10	59	



Project: HR-3 RUM Test
Date: Mon 8/24/09

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

Page 2

Figure 9-1. Project Schedule

10 References

29 CFR 1910.120, "Occupational Safety and Health Standards," "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*. http://edocket.access.gpo.gov/cfr_2008/julqtr/pdf/29cfr1910.120.pdf

90-ERB-040, 1990, *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington*, letter dated July 19, 1990, to P. T. Day (U.S. Environmental Protection Agency) and T. L. Nord (Washington State Department of Ecology) from R. D. Izatt, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq. http://www.epa.gov/superfund/policy/cercla.htm

DOE/RL-97-01, 2005, *Interim Action Waste Management Plan for the 100-HR-3 and 100-KR-4 Operable Units*, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington. http://www5.hanford.gov/arpir/?content=findpage&AKey=DA01311800

DOE-RL, Ecology, and EPA, 1999, *Environmental Restoration Program Strategy for Management of Investigation Derived Waste*, U.S. Department of Energy (Richland Operations Office), Washington State Department of Ecology, and U.S. Environmental Protection Agency, Richland, Washington. http://www5.hanford.gov/arpir/?content=findpage&AKey=D199081095

Ecology Publication 94-06, 2003, *Model Toxics Control Act Cleanup Regulation 173-340 WAC*, as revised, Washington State Department of Ecology, Olympia, Washington.

EPA, Ecology, and DOE, 1996, *Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units at the Hanford Site (Interim Remedial Action)*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.

GRP-EE-01-6.3, "Well Development and Testing," CH2M HILL Plateau Remediation Company, Richland, Washington.

GRP-EE-017.4, "Requirements for Use of Field Equipment," CH2M HILL Plateau Remediation Company, Richland, Washington.

GRP-FS-04-G-001, "Chromium Analysis of Water Samples at Pump and Treat Facilities," CH2M HILL Plateau Remediation Company, Richland, Washington.

GRP-FS-04-H-100-001, "100-HR-3 Pump-and-Treat Operating Procedure," CH2M HILL Plateau Remediation Company, Richland, Washington.

This page intentionally left blank.

Appendix A

Test Well Construction Data

This page intentionally left blank.

100-HR-3 Aquifer Test Well Construction Data

Well Name	Well #	Elevation	Elevation	Stickup	Borehole		Casing	Slot	D-T-B toc	Well Bottom	Top of Screen		Bottom of Screen	
		(Brass cap)	(TOC)	(toc)	Depth (ft)	Dia. (ft)	I.D. (ft)	Size	(ft bgs)	Elev. (m)	(ft bgs)	Elev. (m)	(ft bgs)	Elev. (m)
199-H3-2A	A4611	128.054	128.321	0.267	56	0.92	0.510	20	51.0	112.509	36	117.081	51	112.509
199-H3-2B	A4612	128.015	128.716	0.701	58	0.92	0.510	20	55.0	111.251	50	112.775	55	111.251
199-H3-2C	A4613	128.022	128.662	0.640	155	1.08	0.510	10	17.6	122.651	100	97.542	110	94.494
199-H4-12A	A4616	126.454	126.775	0.321	48	0.92	0.510	20	48.0	111.824	33	116.396	47.5	111.976
199-H4-12B	A4617	126.461	127.223	0.762	51	0.92	0.510	20	50.0	111.221	45	112.745	50	111.221
199-H4-12C	A4618	126.342	127.226	0.884	220	0.92	0.510	10	82.0	101.348	72	104.396	82	101.348
199-H4-15A	A4621	124.631	124.927	0.296	46	0.92	0.510	20	13.4	120.541	27	116.401	42	111.829
199-H4-15B	A4622	124.541	125.212	0.671	44	0.92	0.510	20	42.0	111.739	37	113.263	42	111.739
199-H4-15CS	A4625	124.791	125.37	0.579	330	0.92	0.177	20	80.0	100.407	78	101.016	80	100.407

bgs = below ground surface
D-T-B = depth to bottom
I.D. = inner diameter
toc = top of casing

100-HR-3 Aquifer Test Well Distance Chart

Well	Northing	Easting	H3-2B	H3-2C	H4-12B	H4-12C	H4-15B	H4-15CS	H3-2A	H4-12A	H4-15A
H3-2B	152757.164	577628.271	**0.00**	7.84	409.24	416.57	406.27	412.03	7.99	411.42	404.93
H3-2C	152750.3	577632.07	7.84	**0.00**	408.54	415.83	408.91	414.57	7.46	410.58	407.43
H4-12B	152918.47	578004.39	409.24	408.54	**0.00**	7.51	175.74	171.40	415.44	7.46	168.01
H4-12C	152919.812	578011.772	416.57	415.83	7.51	**0.00**	179.19	174.59	422.74	7.55	171.46
H4-15B	153059.548	577899.598	406.27	408.91	175.74	179.19	**0.00**	8.09	414.00	183.19	7.73
H4-15CS	153059.98	577907.68	412.03	414.57	171.40	174.59	8.09	**0.00**	419.74	178.83	7.38
H3-2A	152750.068	577624.608	7.99	7.46	415.44	422.74	414.00	419.74	**0.00**	417.53	412.62
H4-12A	152912.73	578009.15	411.42	410.58	7.46	7.55	183.19	178.83	417.53	**0.00**	175.46
H4-15A	153053.42	577904.31	404.93	407.43	168.01	171.46	7.73	7.38	412.62	175.46	**0.00**

NOTE: "199-" is the well prefix.

Well 199-H3-2C

Well 199-H4-12C

Well 199-H4-15CS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel
Drilling Fluid Used: Water	Additives Used: Not documented
Driller's Name: D. Garcia	WA State Lic Nr: 1143
Drilling Company: Onwego Drilling	Company Location: Kennewick, WA
Date Started: 15Oct86	Date Complete: 04Nov86

WELL NUMBER: 199-H3-2A A4611 TEMPORARY WELL NO: 1H-TC3A

Hanford Coordinates: N/S N 96,019 E/W W 40,117

State NAd83 N 152,750.07m E 577,624.61m

Coordinates: N 501,217 E 2,254,962

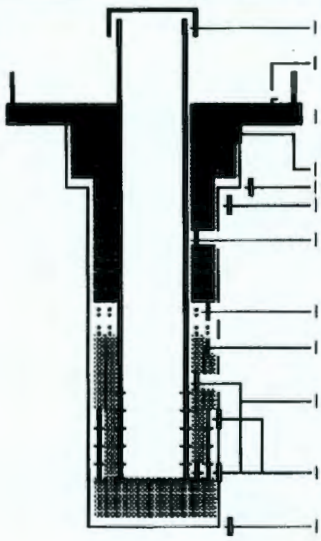
Start Card #: Not documented T____ R____ S____

Elevation Ground surface (ft): 416.62 Brass cap

Depth to water: 41.0-ft Nov86
(Ground surface) 40.9-ft 12Sep94

GENERALIZED STRATIGRAPHY Log — Geologist's

0-4: Not documented
4-10: GRAVEL with SAND
10-54: Sandy GRAVEL
54-56: Sandy GRAVEL with CLAY and CALICHE



- Elevation of reference point: [418.37-ft] (top of casing)
- Height of reference point above ground surface [1.75-ft]
- Depth of surface seal [0-4.5 ft]
  Type of surface seal, Concrete 4-ft x 4-ft x 6-in surface pad extending 4.5-ft into annulus
- 15-in nominal hole, 0-10-ft
- 11-in nominal hole, 10-56-ft
- 6-in ID stainless steel casing, +1.75-36.0-ft
- Volclay tablets, 26.5-30.0-ft
- 10-20-mesh silica sand, 30.0-56.0-ft
- 6-in T304 stainless steel screen, 36.0-51.0-ft, #20-slot
- 10-in stainless steel telescoping screen, 41.0-51.0-ft, #40-slot
- Borehole drilled depth: [56.0-ft]

Drawing By: RKL/1-H3-02A.ASB
Date : 15Nov94
Reference : HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: D. Garcia
Drilling Company: Oswego Drilling
Date Started: 04Nov86

Sample Method: Drive barrel
Additives Used: Not documented
WA State Lic Nr: 1143
Company Location: Kennewick, WA
Date Complete: 14Nov86

WELL NUMBER: 199-H3-2B
TEMPORARY WELL NO: 1H-TC3B
Hanford Coordinates: N/S N 96,041 E/W W 40,106
State Coordinates: N 501,240 E 2,254,975
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 416.1 Estimated

Depth to water: 40.5-ft Nov86
(Ground surface) 37.7-ft Jul91

GENERALIZED STRATIGRAPHY Log — Geologist's

0-4: Not documented
4-9: Silty sandy GRAVEL
9-14: GRAVEL with SAND
14-24: Silty GRAVEL
24-54: Sandy GRAVEL
54-57: SAND
57-58: Silty SAND

Elevation of reference point: (top of casing) [418.42-ft]
Height of reference point above ground surface [2.3-ft]
Depth of surface seal [0-5.0-ft]
Type of surface seal: Concrete 4 ft x 4 ft x 6 in surface pad 4 equidistant protective posts
I.D. of surface casing: (if present) [Removed] 14-in
15-in nominal Surface hole to 10 ft
I.D. of riser pipe: [6-in]
Type of riser pipe: Stainless steel
Diameter of borehole: [11-in nom]
Diameter of surface hole: [15-in nom]
Type of filler: Granular bentonite
Depth top of seal: [35.0-ft]
Type of seal: Volclay pellets
Depth top of sand pack: [45.0-ft]
10-20 silica sand
Depth top of screen: [50.0-ft]
6-in. 20-slot 304 stainless steel
Depth bottom of screen: [55.0-ft]
Depth bottom of borehole: [58.0-ft]

Drawing By: RKL/1#H3#02B.ASB Date:
Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: D. Garcia
Drilling Company: Orwego Drilling
Date Started: 12Aug86

Sample Method: Drive barrel
Additives Used: Not documented
WA State Lic Nr: 1143
Company Location: Kennewick, WA
Date Complete: 15Dec86

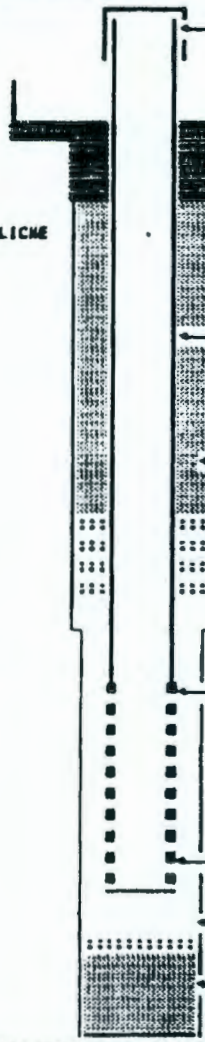
WELL NUMBER: 199-H3-2C
TEMPORARY WELL NO: 1H-TC3C
Hanford Coordinates: N/S N 96,019 E/W W 40,092
State Coordinates: N 501,218 E 2,254,987
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 416.1 Estimated

Depth to water: 41.0-ft Dec86
(Ground surface) 37.9-ft Jul91

GENERALIZED STRATIGRAPHY Log — Geologist's

0-5: Not documented
5-55: Sandy GRAVEL
55-60: Ringold Fm.
60-65: Clayey SAND GRAVEL
65-75: Silty SAND with CLAY & CALICHE
75-85: Clayey sandy SILT
85-100: Sandy SILT
100-110: Clayey silty SAND
110-120: Gravelly silty SAND
120-155: Clayey silty SAND

NOTE:
Hole was drilled open hole below 99-ft.



Elevation of reference point: (418.22-ft) (top of casing)
Height of reference point above ground surface (2.1-ft)
Depth of surface seal (0-4.5-ft)
Type of surface seal: Concrete 4 ft x 4 ft x 6 in surface pad 4 equidistant protective posts
I.D. of surface casing: (NA) (If present)
I.D. of riser pipe: (6-in)
Type of riser pipe: Stainless steel
Diameter of borehole: (13-in nom)
Type of filler: Granular bentonite, 4.5-36-ft Bentonite slurry, 36-83-ft
Depth top of seal: (83.0-ft)
Type of seal: Volclay pellets
Depth top of sand pack: (88.5-ft) 10-20, 20-30, 20-40 silica sand
Depth top of screen: (100.0-ft) 6-in, 10-slot 304 stainless steel
Depth bottom of screen: (110.0-ft)
Depth bottom of sand pack: (115.5-ft)
Bentonite pellets, 115.5-117.5-ft
Bentonite slurry, 117.5-155.0-ft
Depth bottom of borehole: (155.0-ft)

Drawing By: RKL/1#W3#02C.ASB Date:

Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

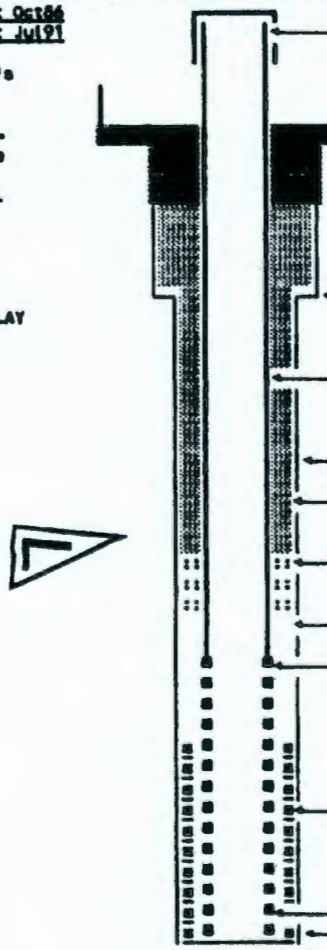
Drilling Method: Cable tool	Sample Method: Hard tool Drive barrel
Drilling Fluid Used: Water	Additives Used: Not documented
Driller's Name: D. Ludtke	WA State Lic Nr: 1333
Drilling Company: Oregon Drilling	Company Location: Kennewick, WA
Date Started: 27Oct86	Date Complete: 04Nov86

WELL NUMBER: 199-H4-12A	TEMPORARY WELL NO: 1H-TC1A
Hanford Coordinates: N/S N 96,549	E/W W 38,854
State Coordinates: N 501,751	E 2,256,223
Start Card #: Not documented	T___ R___ S___
Elevation Ground surface (ft): 411.0 Estimated	

Depth to water: 38.5-ft Oct86
(Ground surface) 39.2-ft Jul91

GENERALIZED STRATIGRAPHY Log — Geologist's

0-5: Gravelly silty fine to very fine SAND
5-11: Silty sandy GRAVEL
11-34: Sandy GRAVEL
34-35: GRAVEL with SAND
35-40: Sandy GRAVEL
40-45: Gravelly SAND
45-51: Sandy GRAVEL
51-52: Ringold, brown CLAY and CALICHE



- Elevation of reference point: (413.50-ft) (top of casing)
- Height of reference point above ground surface: (2.5-ft)
- Depth of surface seal: (0-4.5-ft)
  Type of surface seal: Concrete 4 ft x 4 ft x 6 in surface pad 4 equidistant protective posts
- I.D. of surface casing: (Removed) (If present)
- Surface hole to 10 ft
- I.D. of riser pipe: (6-in)
  Type of riser pipe: Stainless steel
- Diameter of borehole: (11-in nom)
  Diameter of surface hole: (15-in nom)
- Type of filler: 8-20 mesh granular bentonite
- Depth top of seal: (26.0-ft)
  Type of seal: 1/4-in Volclay tablets
- Depth top of sand pack: (28.0-ft) 10-20 mesh silica sand
- Depth top of screen: (33.0-ft) 6-in, 20-slot 304 stainless steel
- 10-in telescoping screen 37.5-47.5-ft, #40-slot
- Depth bottom of screen: (48.0-ft)
- Depth bottom of borehole: (48.0-ft)

Drawing By: RKL/1HN4#12A.ASB Date:___

Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: D. Ludtke
Drilling Company: Omega Drilling
Date Started: 27Oct86

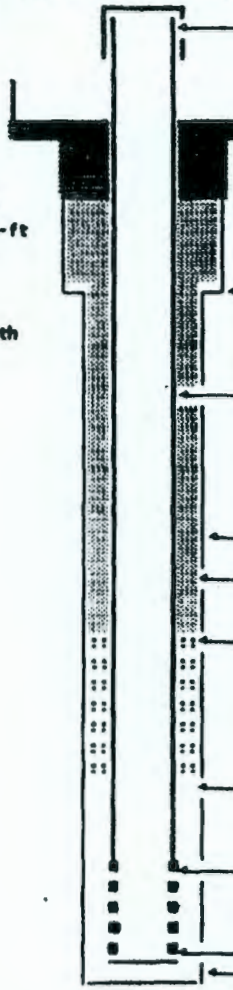
Sample Hard tool Method: Drive barrel
Additives Used: Not documented
WA State Lic Nr: 1333
Company Location: Kennewick, WA
Date Complete: 11Nov86

WELL NUMBER: 199-N4-128
TEMPORARY WELL NO: 1N-TC18
Hanford Coordinates: N/S N 96,568 E/W W 38,869
State Coordinates: N 501,770 E 2,256,208
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 411.0 Estimated

Depth to water: 37.0-ft Nov86
(Ground surface) 35.2-ft Jul91

GENERALIZED Geologist's STRATIGRAPHY Log

0-5: Silty, sandy GRAVEL
5-29: Sandy GRAVEL
29-38.5: Sandy GRAVEL with $CaCO_3$ cemented between grains
6-in med. SAND unit at 36-ft
38.5-42: Cemented sandy GRAVEL, decayed organics
42-49: Gravelly SAND
49-50.5: SAND
50.5-51: Ringold - silty SAND with CLAY and CALICHE



Elevation of reference point: (413.52-ft)
(top of casing)
Height of reference point above ground surface (2.5-ft)
Depth of surface seal (0-5.0-ft)
Type of surface seal: Concrete 5 ft x 5 ft x 6 in surface and 4 equidistant protective posts
I.D. of surface casing: 14-in (Removed)
(if present)
Surface hole to 10 ft 15-in nominal
I.D. of riser pipe: (6-in)
Type of riser pipe: Stainless steel
Diameter of borehole: (11-in nom)
Diameter of surface hole: (15-in nom)
Type of filler: 8-20 mesh granular bentonite
Depth top of seal: (32.0-ft)
Type of seal: 1/4-in Volclay tablets
Depth top of sand pack: (40.0-ft)
10-20 mesh silica sand
Depth top of screen: (45.0-ft)
6-in, #20-slot 304 stainless steel
Depth bottom of screen: (50.0-ft)
Depth bottom of borehole: (51.0-ft)

Drawing By: RKL/1N46128.ASB Date:
Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

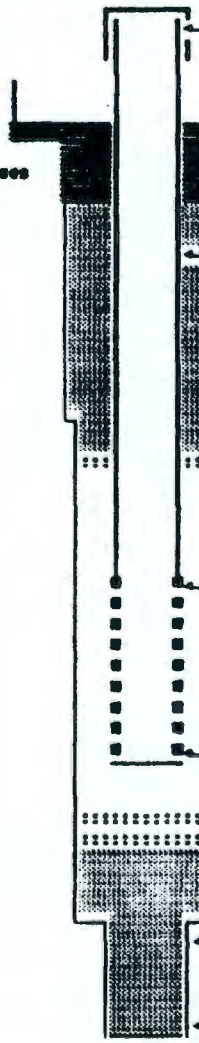
Drilling Method: Cable tool	Sample Method: Drive barrel	WELL NUMBER: 199-H4-12C	TEMPORARY WELL NO: 1H-TC1C
Drilling Fluid Used: Water	Additives Used: Not documented	Hanford Coordinates: N/S N 96,573	E/W W 38,845
Driller's Name: L. Bultema	WA State Lic Nr: 0066	State Coordinates: N 501,775	E 2,256,232
Drilling Company: Oregon Drilling	Company Location: Kennewick, WA	Start Card #: Not documented	T ___ R ___ S ___
Date Started: 12Aug86	Date Complete: 03Oct86	Elevation Ground surface (ft): 410.6 Estimated	

Depth to water: 38.2-ft Oct86
(Ground surface) 31.8-ft Jul91

GENERALIZED Geologist's STRATIGRAPHY Log

0-5: Sandy GRAVEL
5-10: Sandy GRAVEL with SILT lenses
10-49: Sandy GRAVEL
49-54: Silty, sandy GRAVEL
54-59: Silty GRAVEL
59-74: Gravelly SILT
74-79: Gravelly, clayey SILT
79-84: Gravelly SILT
84-92: Silty SAND
92-99: Silty SAND with CALICHE
99-175: Silty SAND with CLAY and CALICHE
175-179: Clayey SAND
179-194: Clayey SILT
194-209: Sandy SILT with CLAY
209-219: Silty SAND with CLAY
219-220: Silty SAND

NOTE:
Hole was drilled open hole below 174-ft.



- Elevation of reference point: (413.52-ft) (top of casing)
- Height of reference point above ground surface (2.9-ft)
- Depth of surface seal (0-5.0-ft)
  Type of surface seal: Concrete 4 ft x 4 ft x 6 in surface pad 4 equidistant protective posts
- I.D. of riser pipe: (6-in)
  Type of riser pipe: 304 stainless steel
- Borehole diameter, 5-60-ft: (13-in nom)
- Type of filler: Granular bentonite, 5-28.5-ft; Bentonite slurry, 28.5-61-ft
- Depth top of seal: (61.0-ft)
  Type of seal: Volclay pellets
- Depth top of sand pack: (62.0-ft)
  10-20, 20-30, 20-40 mesh silica sand
- Borehole diameter, 60-174-ft (11-in nom)
- Depth top of screen: (72.0-ft)
  6-in #10-slot 304 stainless steel
- Depth bottom of screen: (82.0-ft)
- Depth bottom of sand pack: (87.0-ft)
- Bentonite pellets, 87.0-92.0-ft
  Bentonite slurry, 92.0-220.0-ft
- Borehole diameter, 174-220 ft (6-in)
- Depth bottom of borehole: (220.0-ft)

Drawing By: RKL/1HH4#12C.ASB Date: ___

Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY A4621

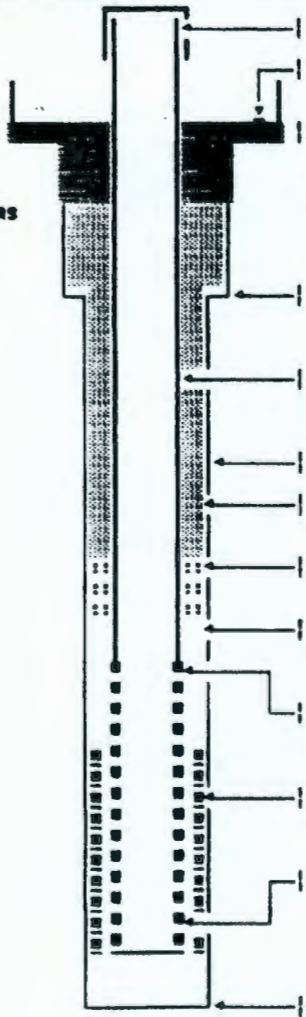
Drilling Method: Cable tool	Sample Method: Hard tool Drive barrel
Drilling Fluid Used: Water	Additives Used: Not documented
Driller's Name: K. Olson	WA State Lic Nr: 1217
Drilling Company: Omega Drilling	Company Location: Kennewick, WA
Date Started: 28Oct86	Date Complete: 11Nov86

WELL NUMBER: 199-H4-15A	TEMPORARY WELL NO: 1H-TC2A
Hanford Coordinates: N/S N 97,012	E/W W 39,197
State Coordinates: N 502,213	E 2,255,879
Start Card #: Not documented	T___ R___ S___
Elevation Ground surface (ft): 405.0 Estimated	

Depth to water: 32.8-ft Nov86
(Ground surface) 29.0-ft Jul91

GENERALIZED Geologist's STRATIGRAPHY Log

0-2: SAND & GRAVEL
2-5: SAND
5-14: SAND, GRAVEL & BOULDERS
14-19: GRAVEL with SAND & BOULDERS
19-46: Sandy GRAVEL
Ringold Fm. at 44-ft



Elevation of reference point: (top of casing) [407.21-ft]

Height of reference point above ground surface [2.2-ft]

Depth of surface seal [0-5.0-ft]

Type of surface seal: Concrete
4 ft x 4 ft x 6 in surface pad
4 equidistant protective posts

I.D. of surface casing: (If present) 14-in [Removed]

Surface hole to 10 ft
15-in nominal diameter

I.D. of riser pipe: [6-in]
Type of riser pipe:
Stainless steel

Diameter of borehole: [11-in nom]

Type of filler:
8-20 mesh granular bentonite

Depth top of seal: [17.0-ft]
Type of seal:
1/4-in Volclay tablets

Depth top of sand pack: [22.0-ft]
10-20 mesh silica sand

Depth top of screen: [27.0-ft]
6-in, 20-slot
304 stainless steel

10-in telescoping screen
32-42-ft, #40-slot

Depth bottom of screen: [42.0-ft]

Depth bottom of borehole: [46.0-ft]

Drawing By: RKL/1HN4#15A.ASB Date:

Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: K. Olson
Drilling Company: Omwego Drilling
Date Started: 11Nov86

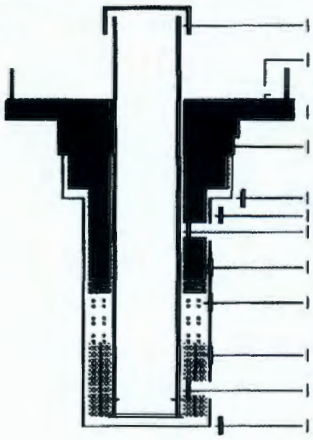
Sample Hard tool Method: Drive barrel
Additives Used: Not documented
WA State Lic Nr: 1217
Company Location: Kennewick, WA
Date Complete: 19Nov86

WELL NUMBER: 199-H4-15B A4622
TEMPORARY WELL NO: 1H-TC2B
Hanford Coordinates: N/S N 97,032 E/W W 39,212
State NAD83 N 153,059.55m E 577,899.60m
Coordinates: N 502,233 E 2,255,864
Start Card #: Not documented T___ R___ S___
Elevation Ground surface: 404.7-ft Estimated

Depth to water: 30.0-ft Nov86
(Ground surface) 32.7-ft 12Sep94

GENERALIZED Geologist's STRATIGRAPHY Log

0-5: SAND & GRAVEL (Backfill included)
5-14: GRAVEL with SAND
14-39: Sandy GRAVEL
39-43: Gravelly SAND
43-44: Silty SAND with CLAY (Top of Ringold measured at 43-ft)



Elevation of reference point: [406.92-ft] (top of casing)
Height of reference point above ground surface [2.2-ft]
Depth of surface seal [0-5.0-ft]
Type of surface seal, 4-ft by 4-ft concrete pad extending 5-ft into annulus
15-in nominal hole, 0-10-ft
11-in nominal hole, 10-44-ft
6-in ID stainless steel casing, +2.2-37-ft
8-20-mesh granular bentonite, 5-25-ft
½-in Volclay tablets, 25-32-ft
10-20 mesh silica sand, 32-44-ft
6-in T304 stainless steel screen, 37-42-ft, #20-slot
Borehole drilled depth: [44.0-ft]

Drawing By: RKL/1-H4-15B.ASB
Date : 23Nov94
Reference : HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool/ Drive barrel
Drilling Fluid Used: Water	Additives Used: Not documented
Driller's Name: K. Olson	WA State Lic Nr: ND
Drilling Company: Omwego Drilling	Company Location: Kennewick, WA
Date Started: 12Aug86	Date Complete: 16Dec86

WELL NUMBER: 199-H4-15C A5689 TEMPORARY WELL NO: 1H-TC2C

Hanford Coordinates: N/S N 97,034 E/W W 39,186

State NAD83 N 153,059.98m E 577,907.68m

Coordinates: N 501,775 E 2,256,232

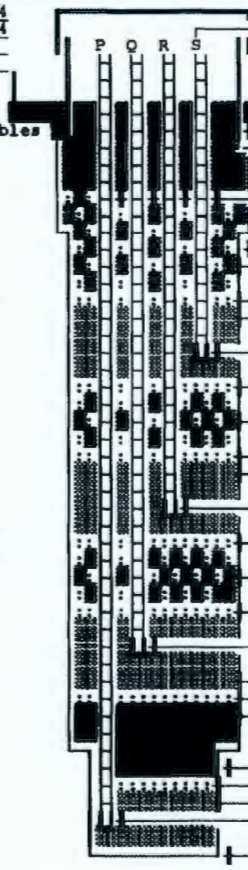
Start Card #: Not documented T____ R____ S____

Elevation Ground surface: 405.5-ft Estimated

Depth to water: (Top casing) S=33.8-ft 12Sep94; R=31.4-ft 12Sep94; P=Flowing; Q=Top of casing

GENERALIZED STRATIGRAPHY
Geologist's Log

0-35: Sandy GRAVEL, basaltic pebbles with fine to medium sand
35-55: Silty, sandy GRAVEL, top of Ringold at 46 ft
55-60: Silty GRAVEL
60-65: Gravelly SILT
65-75: Gravelly, clayey SILT
75-80: Gravelly SILT
80-100: Silty SAND
100-125: CLAY and CALICHE
125-150: Clayey SILT with SAND and CALICHE
150-170: Silty SAND with CLAY
170-190: Silty SAND with CLAY and CALICHE
190-195: Silty SAND with CLAY
195-202: Clayey, sandy SILT
202-207: Fine SAND with SILT and CALICHE
207-212: Fine SAND
212-295: CLAY
295-296: Silty CLAY with SAND
296-305: CLAY
305-314: Silty CLAY with CALICHE
314-322: BASALT (dark grey)
322-330: BASALT (dark brown with yellow brown/rust clay)



- Elevation of reference point: [407.44-ft] (top of casing, S tube)
- Height of reference point above ground surface [1.9-ft]
- Depth of surface seal [0-5.0-ft]
- Type of surface seal: Concrete
- Concrete 4-ft x 4-ft x 6-in surface pad extending 5-ft into annulus
- 10-in ID carbon steel casing, +1.9--0.5-ft
- 2-in ID stainless steel piezometers
- Granular bentonite, 5-24.5-ft
- 13-in nominal hole, 0-55-ft
- 11-in nominal hole, 55-316.5-ft
- Bentonite slurry, 24.5-70-ft
- Bentonite Volclay pellets, 70-75-ft
- 10-20-mesh silica sand, 75-83-ft
- 2-in #20-slot T304 SS screen, 78-80-ft
- Bentonite Volclay pellets, 83-90.5-ft
- Bentonite slurry, 90.5-186-ft
- Bentonite Volclay pellets, 186-191-ft
- 10-20-mesh silica sand, 191-197-ft
- 2-in #20-slot T304 SS screen, 194-196-ft
- Bentonite Volclay pellets, 197-200-ft
- Bentonite slurry, 200-287-ft
- Bentonite Volclay pellets, 287-292-ft
- 2-in #20-slot T304 SS screen, 295-297-ft
- 10-20-mesh silica sand, 292-299-ft
- Bentonite Volclay pellets 299-301-ft
- Cement grout, 301-320.5-ft
- 8-in nominal hole, 316.5-330-ft
- Bentonite Volclay pellets, 320.5-321-ft
- 10-20-mesh silica sand, 321-330-ft
- 2-in #20-slot T304 SS screen, 325-327-ft
- Borehole drilled depth: [330.0-ft]

Drawing By: RKL/1-H4-15C.ASB
Date : 23Nov94
Reference : HANFORD WELLS

Appendix B

Hydrogeological and Test Data

This page intentionally left blank.

100-HR-3 Aquifer Test Well Hydrogeologic Data

Well Name	Pre-Test SWL (ft)	Pre-Test Elev. (m)	Available Head	Saturated Screen	Top of RUM Depth	Top of RUM Elev.	Aquifer Thickness m	Aquifer Thickness ft	Aquifer Description in Screened Interval
199-H3-2A	38.58	116.562	13.30	13.30	55	111.290	5.272	17.30	Sandy gravel
199-H3-2B	39.76	116.597	17.54	5.00	56	110.946	5.651	18.54	Sandy gravel transition into sand
199-H3-2C	39.45	116.638	72.65	10.00	55	111.258	5.380	17.65	Clayey silty sand
199-H4-12A	35.68	12.87	12.87	12.87	51	110.909	4.991	16.37	Sandy gravel, to gravelly sand, to sandy gravel
199-H4-12B	34.80	116.616	17.70	5.00	50.5	111.069	5.547	18.20	Sandy gravel transition into sand
199-H4-12C	34.78	116.625	50.12	10.00	50	111.102	5.523	18.12	Gravelly silt (top 2 in.) to gravelly clayey silt (5 in.)
199-H4-15A	27.36	116.588	15.61	15.00	44	111.220	5.368	17.61	Sandy gravel
199-H4-15B	28.08	116.653	16.12	5.00	44	111.130	5.523	18.12	Sandy gravel to gravelly sand
199-H4-15CS	28.49	116.686	53.41	2.00	43	111.684	5.002	16.41	Gravelly silt

RUM = Ringold Upper Mud (Unit)

SWL = static water level

100-H Area Well Development Summary Table

Well Name	Test Date	D-T-W (ft toc)	D-T-B (ft toc)	Intake (ft toc)	Available Water (ft)	Pump Rate (gpm)	Draw-down (ft)	Test Length (min.)	Specific Capacity	Final Turbidity (NTU)	Comments
199-H3-2A production test	12/5/95	42.51	52.7	47.77	5.26	265	1.8	10	147.22	N/R	Production test ran only10 min. due to purge water capacity issues oat this pump rate. Data collected from the FARs.
199-H3-2B Re-Dev	8/18/95	42.6	57.8	44.30	1.7	1.5	2.5	<60	0.60	4.09	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.
199-H3-2C Re-Dev	8/21/95	42.62	112.2	97.00	54.38	4.5	2.33	≈180	1.93	3.04	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.
199-H4-12A Re-Dev	8/25/95	39.7	51.7	42.30	2.6	4.5	0.2	<60	22.50	4.27	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.
199-H4-1A production test	11/9/95	39.81	50.7	N/R	N/R	30	5.1	82	5.88	N/R	Production testing. Wells 4H-12B (0.246 ft drawdown) and 4H-12C (0.091 ft drawdown) were monitored during the test. Electronic test data are not available. Information was collected from FARs.
199-H4-12B Re-Dev	8/25/95	39.7	53.2	42.30	2.6	4.5	1.25	<90	3.60	4.32	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.
199-H4-12C Re-Dev	9/7/95	40.88	85.4	47.35	6.47	4.5	2.21	<150	2.04	4.97	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.
199-H4-15A Re-Dev	10/9/95	34.46	44	37.35	2.89	4.5	N/R	<60	N/R	4.62	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.

100-H Area Well Development Summary Table

Well Name	Test Date	D-T-W (ft toc)	D-T-B (ft toc)	Intake (ft toc)	Available Water (ft)	Pump Rate (gpm)	Draw-down (ft)	Test Length (min.)	Specific Capacity	Final Turbidity (NTU)	Comments
199-H4-15A production test	11/9/95	33.31	44.02	N/R	N/R	46	2.54	50	18.11	N/R	Production testing. Data collected from the FARs and previous summary data sheets.
199-H4-15B Re-Dev	10/6/95	34.12	44.5	35.45	1.33	2.5	1.33	<60	1.88	4.88	Redevelopment was conducted under well services with a Hydrostar. Data collected from the FARs.

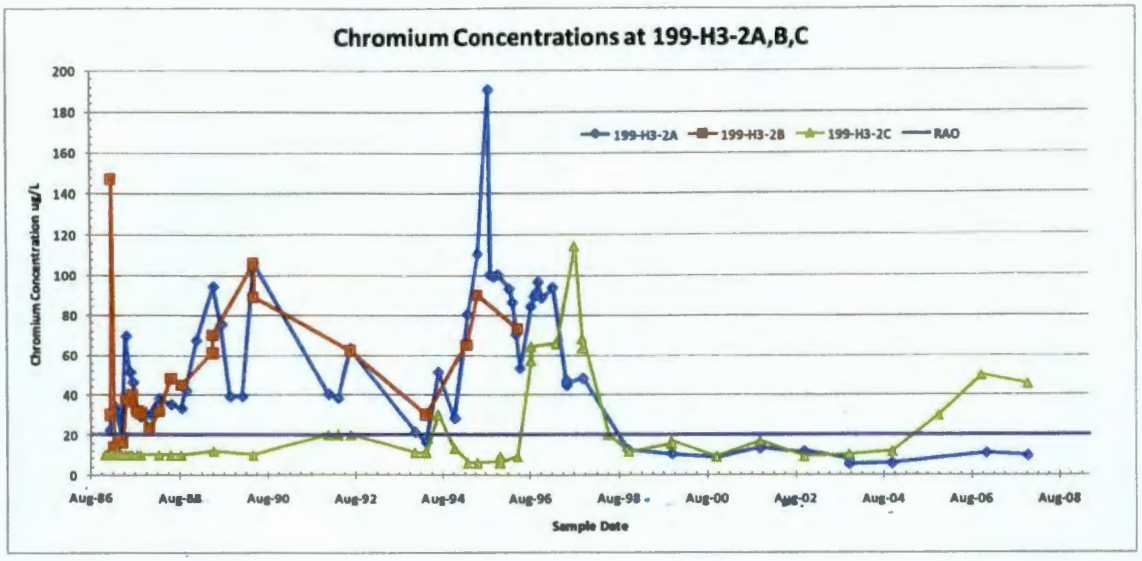
D-T-B = depth to bottom
D-T-W = depth to water
FAR = field activity report
gpm = gallons per minute
NTU = nephelometric turbidity unit
TOC = top of casing

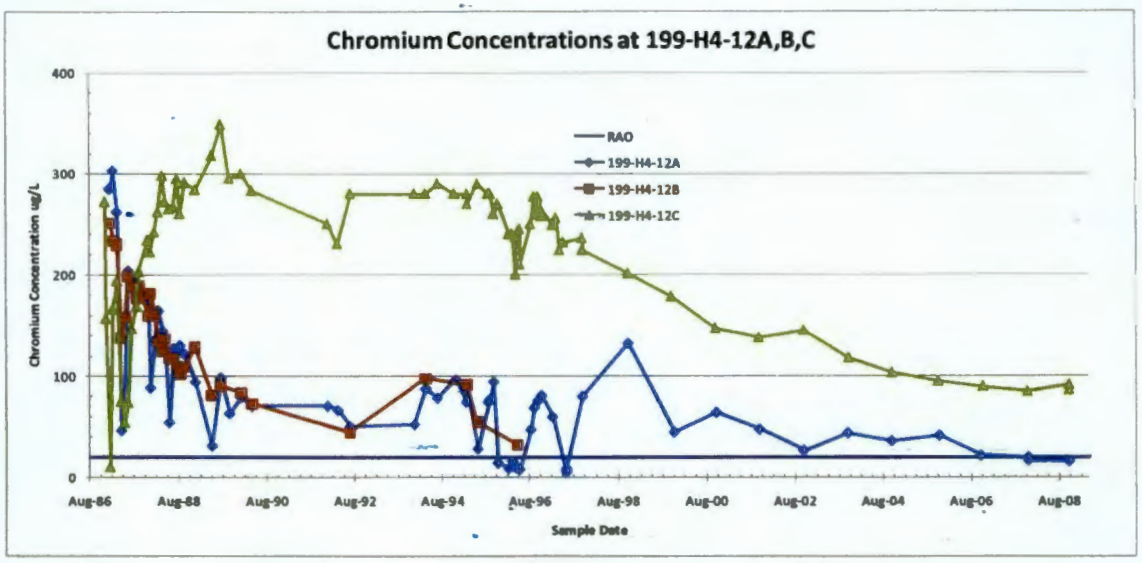
This page intentionally left blank.

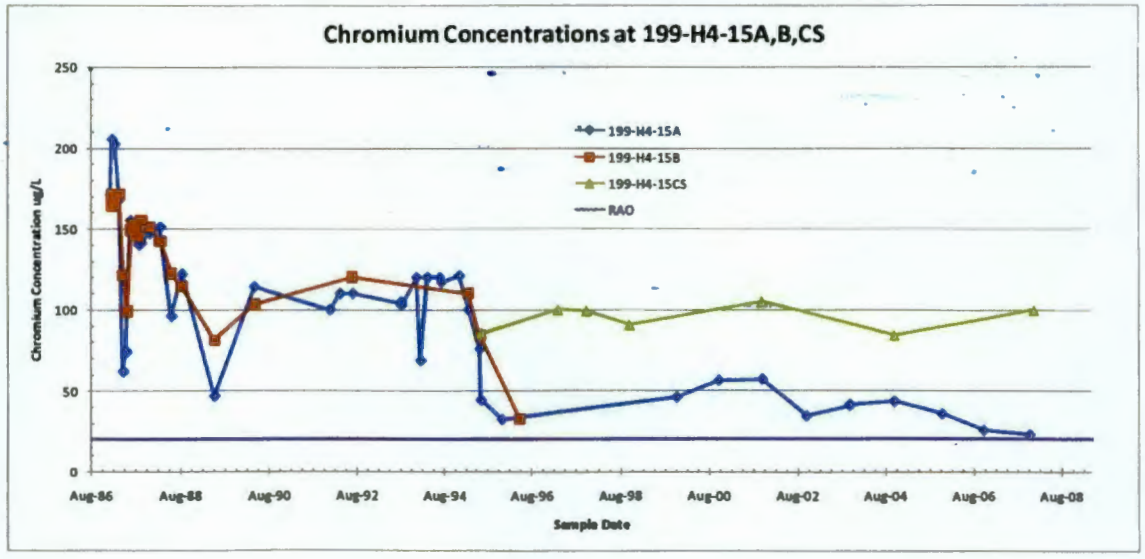
Appendix C

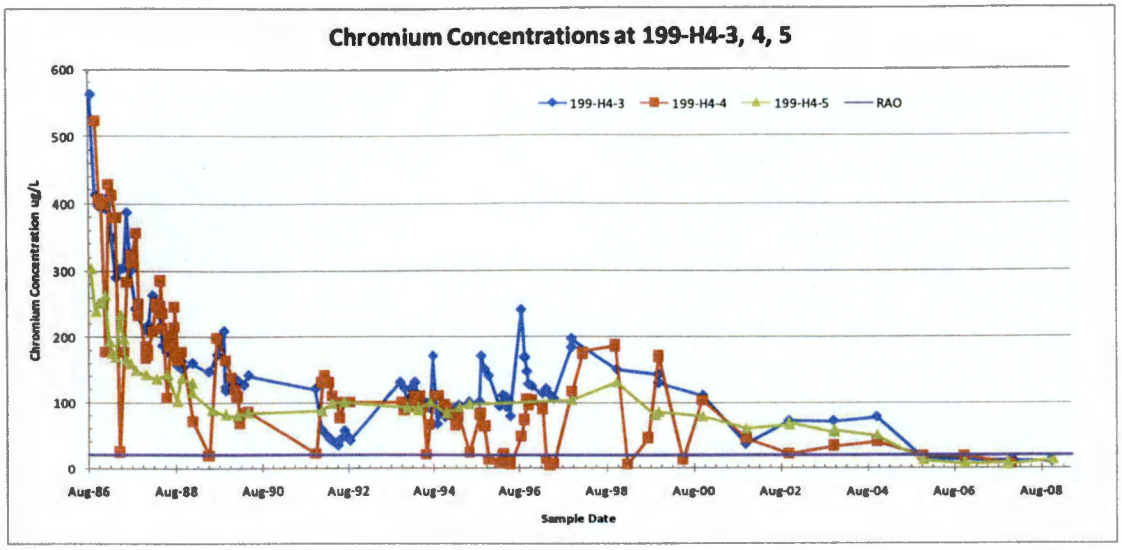
Test Well Chromium Data

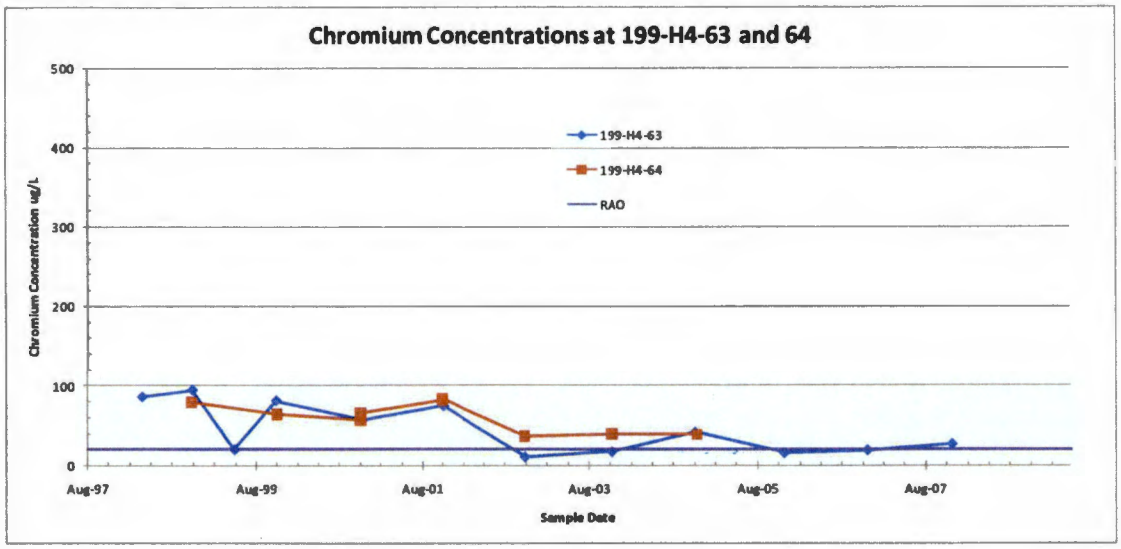
This page intentionally left blank.

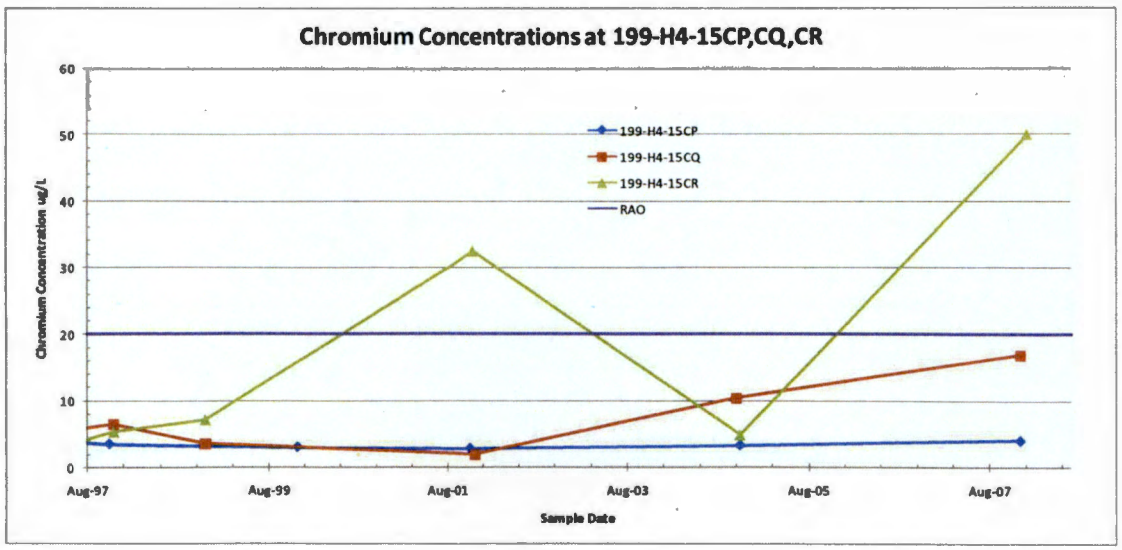

Chromium Concentrations at 199-H3-2A,B,C
Chromium Concentration ug/L
Sample Date
199-H3-2A
199-H3-2B
199-H3-2C
RAO
0
20
40
60
80
100
120
140
160
180
200
Aug-86
Aug-88
Aug-90
Aug-92
Aug-94
Aug-96
Aug-98
Aug-00
Aug-02
Aug-04
Aug-06
Aug-08


Chromium Concentrations at 199-H4-12A,B,C
Chromium Concentration ug/L
Sample Date
RAO
199-H4-12A
199-H4-12B
199-H4-12C
0
100
200
300
400
Aug-86
Aug-88
Aug-90
Aug-92
Aug-94
Aug-96
Aug-98
Aug-00
Aug-02
Aug-04
Aug-06
Aug-08


Chromium Concentrations at 199-H4-15A,B,CS
Chromium Concentration ug/L
Sample Date
199-H4-15A
199-H4-15B
199-H4-15CS
RAO
0
50
100
150
200
250
Aug-86
Aug-88
Aug-90
Aug-92
Aug-94
Aug-96
Aug-98
Aug-00
Aug-02
Aug-04
Aug-06
Aug-08


Chromium Concentrations at 199-H4-3, 4, 5
199-H4-3
199-H4-4
199-H4-5
RAO
Chromium Concentration ug/L
600
500
400
300
200
100
0
Aug-86
Aug-88
Aug-90
Aug-92
Aug-94
Aug-96
Aug-98
Aug-00
Aug-02
Aug-04
Aug-06
Aug-08
Sample Date


Chromium Concentrations at 199-H4-63 and 64
199-H4-63
199-H4-64
RAO
Chromium Concentration ug/L
500
400
300
200
100
0
Aug-97
Aug-99
Aug-01
Aug-03
Aug-05
Aug-07
Sample Date


Chromium Concentrations at 199-H4-15CP,CQ,CR
199-H4-15CP
199-H4-15CQ
199-H4-15CR
RAO
Chromium Concentration ug/L
60
50
40
30
20
10
0
Aug-97
Aug-99
Aug-01
Aug-03
Aug-05
Aug-07
Sample Date

Distribution

Onsite

2	U.S. Department of Energy, Richland Operations Office	
	J. P. Hanson	A5-11
	DOE Public Reading Room	H2-53
8	CH2M HILL Plateau Remediation Company	
	R. S. Edrington	R3-50
	S. L. Kooiker	R3-19
	J. G. Riddelle	R3-50
	D. J. Shrimpton	R3-60
	J. L. Smoot	R3-50
	L. C. Swanson	R3-50
	W. R. Thackaberry	R3-60
	J. A. Winterhalder	R3-60
1	Pacific Northwest National Laboratory	
	Hanford Technical Library	P8-55
2	Lockheed Martin Enterprise Solutions & Services	
	Administrative Record	H6-08
	Document Clearance	H6-08

This page intentionally left blank.