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Assistant Secretary for Environmental Management

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APPROVAL PAGE

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ACRONYMS

AEA	*Atomic Energy Act of 1954*
ALARA	As Low As Reasonably Achievable
BHI	Bechtel Hanford, Inc.
Bgs	Below ground surface
BTR	Buyer's Technical Representative
CCU	Cold Creek Unit
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COCs	Contaminants of Concern
CP	Central Plateau
CY	Calendar Year
CFR	*Code of Federal Regulations*
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOW	Description of Work
DQO	Data Quality Objectives
EPA	Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
ERC	Environmental Restoration Contractor
FH	Fluor Hanford, Inc.
FWS	Field Work Supervisor
FY	Fiscal year
GAC	Granular Activated Carbon
Gpm	Gallons per minute
GPP	Groundwater Protection Project
HGET	Hanford General Employee Training
IDF	Integrated Disposal Facility
ILAW	Immobilized Low-Activity Waste
ISRM	In Situ Redox Manipulation
IRA	Interim Remedial Action
LLW	Low-Level Waste
MCL	Maximum Concentration Level
MLLW	Mixed Low-Level Waste
MTCA	Model Toxic Control Act
NTU	Nephelometric Turbidity Unit
OU	Operable Unit
PCB	polychlorinated biphenyls
PHMC	Project Hanford Management Contract
PTSF	Purgewater Transport Storage Facility
POC	Point of Contact
QMP	quality management plan
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	Radiological Control Technician
ROD	Record of Decision
RUM	Ringold Upper Mud unit
SSWMI	Site Specific Waste Management Instruction
SALDS	State approved land-disposal site
WAC	*Washington Administrative Code*
WMA	Waste Management Area

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
Inches	25.4	millimeters	millimeters	0.039	inches
Inches	2.54	centimeters	centimeters	0.394	inches
Feet	0.305	meters	meters	3.281	feet
Yards	0.914	meters	meters	1.094	yards
Miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
Acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
Ounces	28.35	grams	grams	0.035	ounces
Pounds	0.454	kilograms	kilograms	2.205	pounds
Ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
Teaspoons	5	milliliters	milliliters	0.033	fluid ounces
Tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
Cups	0.24	liters	liters	0.264	gallons
Pints	0.47	liters	cubic meters	35.315	cubic feet
Quarts	0.95	liters	cubic meters	1.308	cubic yards
Gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
Picocuries	37	millibecquerel	millibecquerel	0.027	picocuries

1.0 SCOPE OF WORK

This description of work (DOW) documents the requirements for two new wells to be drilled and constructed in fiscal year 2004 as part of the *Comprehensive Environmental Response Compensation, and Liability Act* (CERCLA) Program for the 100-KR-4 Operable Unit.

The two monitoring wells will be installed at 100-KR-4 (100-K Area). The locations of the wells are shown in Figure 1-1 and Figure 1-2. One of the wells (199-K-32/C4670) is a replacement well for a Bechtel Hanford, Inc. (BHI) decommissioned well, 199-K-33 (Figure 1-2). A summary of the monitoring wells is provided in Table 1-1.

Table 1-1 Well Summary

Summary of New Wells to be Drilled			
Well Name/ Well ID	**WMA or OU**	**Well Type**	**Comments**
199-K-131 / C4561	100-KR-4	Monitoring	
199-K-132 / C4670	100-KR-4	Monitoring	BHI Contract

Figure 1-1 100-KR-4 Site Plan View Map [Location of 199-K-131]

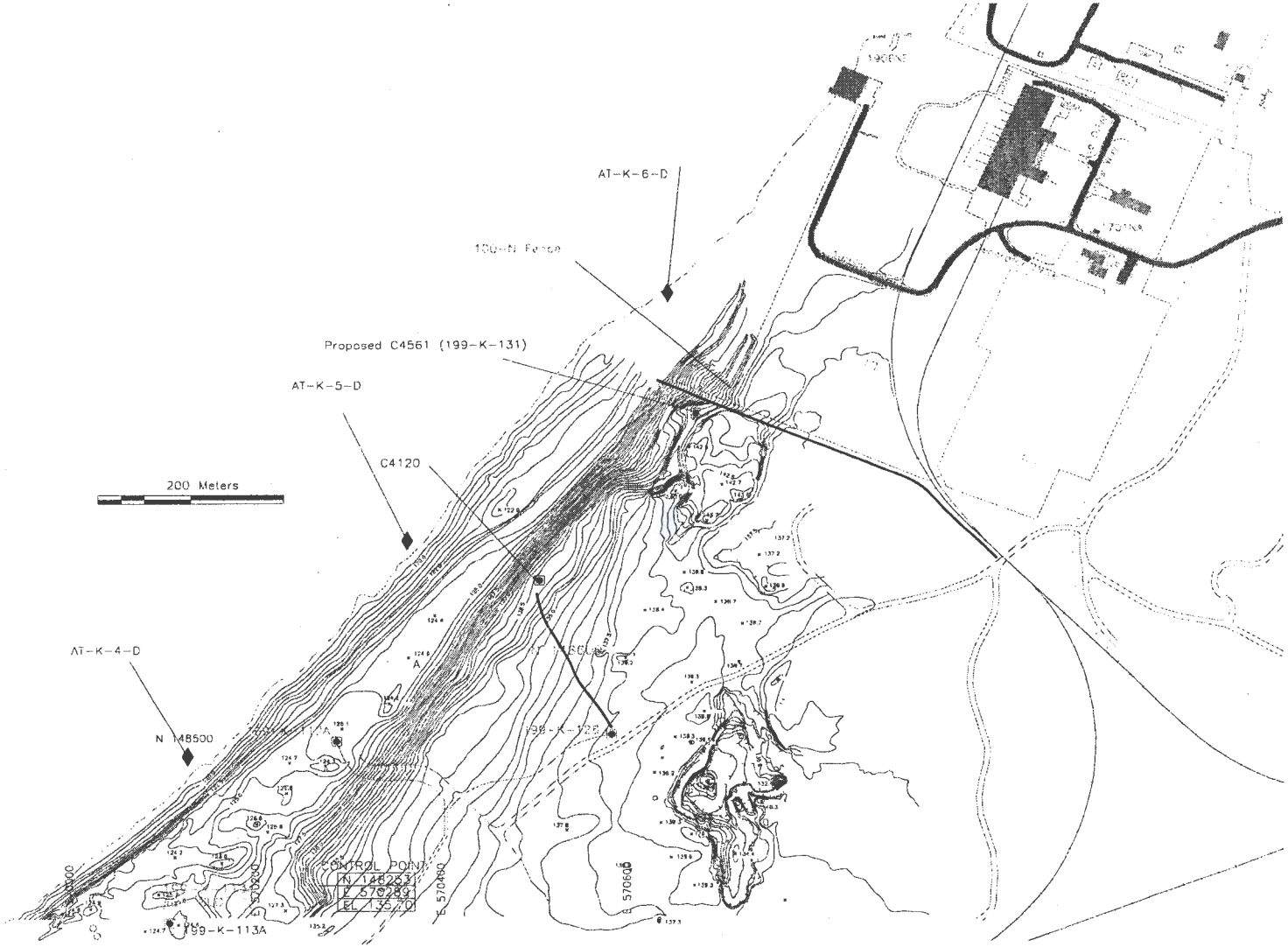
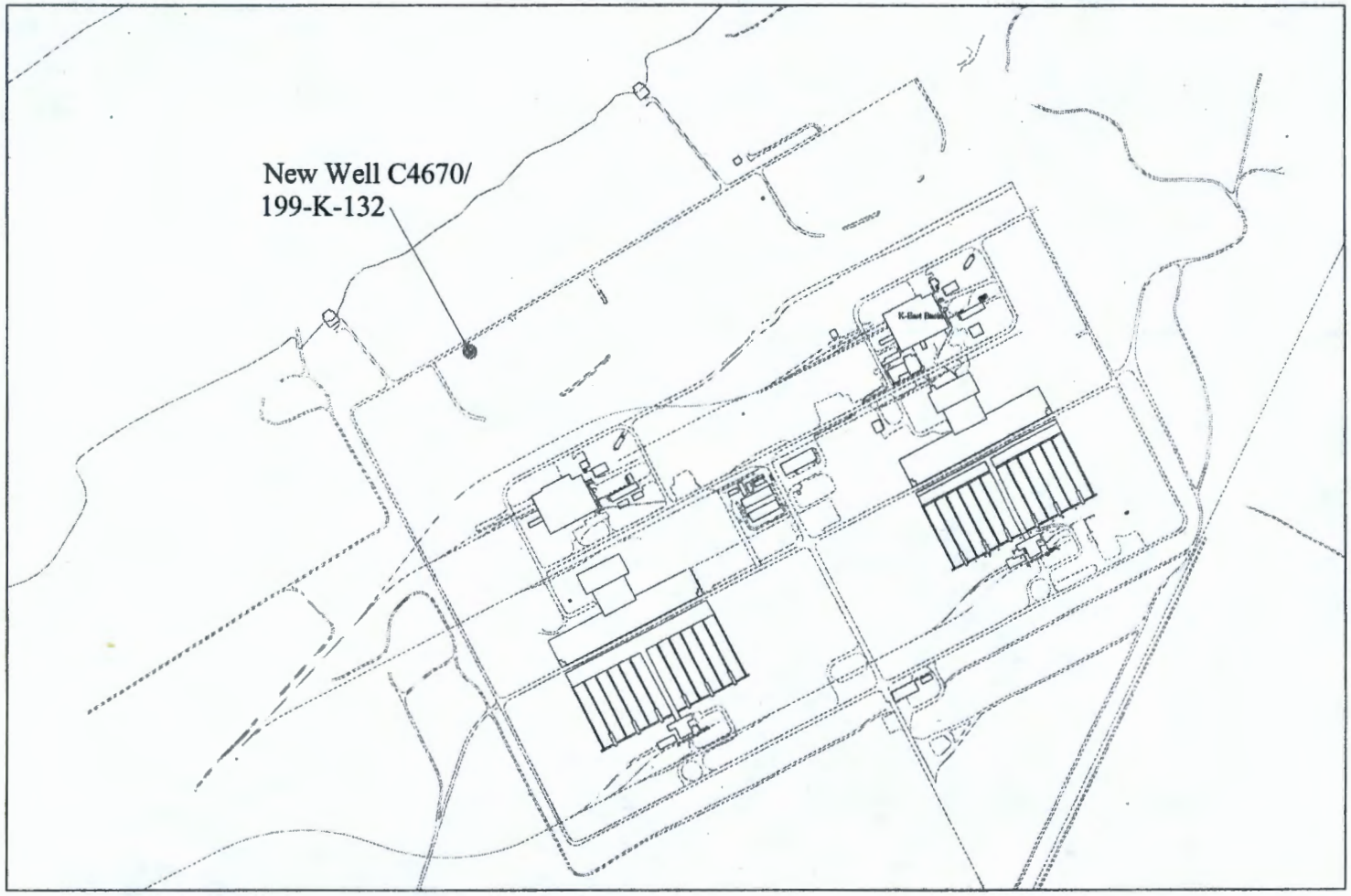


Figure 1-2 100-KR-4 Site Plan View Map [Location of 199-K-132]



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2.0 BACKGROUND

This section discusses previous work activities and regulatory decisions associated with the 100-KR-4 OU. General summaries of hydrogeology, contaminants of interest, and conceptual models of relevant factors associated with the planned work activities are presented for each area.

2.1 REMEDIAL ACTION GOALS AND PREVIOUS WORK ACTIVITIES

2.1.1 100-KR-4 OU (100-K)

The 100-KR-4 groundwater OU includes the K Reactor area and adjacent portions of the 600 Area. An interim remedial action was initiated to address ecological risks to the Columbia River posed by hexavalent chromium in groundwater. The goal of the interim remedial action is to prevent discharge of hexavalent chromium at levels above those considered protective of aquatic life in the Columbia River and riverbed sediments. The installation of these two wells will replace a well decommissioned by remedial action activities (199-K-132) and enhance groundwater monitoring at the northeast boundary of the chromium plume (199-K-131).

2.2 SITE GEOLOGY/HYDROGEOLOGY

100-K Areas

The Hanford formation consists of clast-supported, unconsolidated sandy gravels to gravelly sands, with occasional intercalated silt and sand stringers. The Hanford formation varies in thickness from approximately 10 to 40 ft, generally thinning toward the river. The contact between the Hanford formation and Ringold Unit E is identified based on decreased basaltic clast fraction, iron oxide staining, and cementation. The contact is unconformable and varies in elevation across the site (Sump 2001)).

The Ringold Unit E consists primarily of coarse-grained sands and gravels with a varying degree of cementation. Beneath the Ringold Unit E lies the Ringold Upper Mud (RUM), which is a paleosol/overbank deposit consisting of a sandy to clayey silt with minor lenses of sand. The contact with the RUM is approximately 90 to 100 ft below ground surface (bgs) across the area.

Holocene deposits in the 100-K Area are limited to river gravels and overbank silty sands that create a thin veneer (<16 ft). The river deposits are found in and immediately adjacent to the Columbia River, while the overbank deposits are found in small topographic depressions adjacent to the river. Eolian deposits are limited to a thin veneer of sediment on the surface. The Holocene deposits are not extensive. Nearly the entire surface of the 100-K Area (with the exception of some locations along the steeply pitching riverbanks) has been disturbed by grading or excavation. Fill materials are largely composed of native materials. The extent of fill is greatest near the riverbank terrace at berms established adjacent to K Reactor support facilities. Based on a review of borehole logs from existing wells, Holocene and/or fill materials are thin (generally less than 3 ft in thickness) (Sump 2001).

The unconfined aquifer resides entirely within the Ringold Unit E and is bounded at the base by the less permeable RUM unit. Depth to water ranges from 19 to 69 ft bgs in existing pump-and-treat wells.

2.3 CONCEPTUAL MODEL

100-KR-4 OU (100-K Area)
The 116-K-2 Trench received a variety of reactor effluents from 1955 to 1971. In addition to reactor coolant water, coolant water containing debris from fuel element failures, shielding water from fuel storage basins, and decontamination solutions were also discharged to the trench. Hexavalent chromium groundwater contamination found in the 100-KR-4 OU is primarily from seepage through the bottom of the 116-K-2 Trench. Because of the high volume of liquid effluent discharged to the trench, a mounding effect was created in the water table, allowing contaminants to spread upgradient and downgradient from the trench relative to the general sitewide groundwater flow toward the river. At least four unplanned surface releases were documented when the north side of the trench failed due to overfilling. This released contaminated reactor effluent to the surface soil column. Each of these releases occurred in the eastern portion of the trench (BHI-01559). The water table underlying the 116-K-2 Trench is approximately 50 to 65 ft bgs. The contact between the Ringold Unit E and the Hanford formation is approximately 20 ft to 28 ft bgs, based on nearby wells. The Hanford formation typically has a much higher transmissivity than the Ringold Formation; thus, it is possible that contaminants from the trench may have migrated laterally more rapidly away from the site when mounding brought the water table up into the Hanford formation. A zone of underground radiological contamination has been identified and is posted around the trench; however, no radiological activity above background was documented during the drilling of well199-K-119A (BHI-01559).

2.4 CONTAMINANTS OF CONCERN

Contaminants of Concern (COC) associated with drilling waste generated during the installation of these two wells will be discussed separately based on relation to the saturated zone (groundwater vs. vadose zone) and on the individual locations of each well relative to known waste sites. Groundwater COCs will be applied to the wells based on a summary of historical chemical data. COCs for waste sampling will be addressed in the waste Data Quality Objective (DQO) documents.

2.4.1 Vadose Zone Contaminants of Concern

100-KR-4 OU (100-K Area)
Radiological and chemical contamination is not expected due to the up-gradient placement of monitoring well 199-K-131 (C4651) from the 116-K-2 Trench during vadose zone drilling activities. This monitoring well is also not located immediately adjacent to any known unplanned releases. The well site has been assessed as low radiological risk by radiological control engineers. Geophysical logging of decommissioned well 199-K-33, approximately 100 feet east of 199-K-132, showed no subsurface radiological contamination. BHI prepared waste profile documents for the vadose zone soils, and no hazardous constituents were identified. 199-K-132 (C4670) was assessed as low radiological risk, however as a precaution, full time RCT support will be provided for the first 25 feet of drilling.

2.4.2 Groundwater Contaminants of Concern

100-KR-4 OU (100-K Area)

Hexavalent chromium, strontium-90, tritium, carbon-14, and nitrates are contaminants of concern for the 100-KR-4 OU within the groundwater next to the 116-K-2 Trench (near C4561), however due to the up-gradient location of C4651 these contaminants are not expected to be of significant concentration and may not be present at all. Groundwater at the site of 199-K-132 (C4670) shows low levels of chromium (~8 to 20 mg/L), tritium (<2000pCi/L), Trichlorethane (~10 ug/L) and potentially low levels of strontium 90 and carbon 14 (PNNL 2004).

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3.0 DESCRIPTION OF WORK ACTIVITIES

The planning and construction of the wells will be conducted under this description of work (DOW) and will adhere to the guidelines and requirements presented in Fluor Hanford (FH) procedure GRP-EE-02-14.1, "Drilling, Remediating, and Decommissioning Resource Protection Wells, and Geotechnical Soil Borings." A completed drilling planning form will be submitted to Fluor Hanford Geoscience Support prior to initiation of field activities. Wells will conform to resource protection well standards as defined in WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

3.1 WELL SITE PREPARATION

100-KR-4 OU (100-K Area)
The monitoring wells, C4561 (199-K-131) and C4670 (199-K-132), will require gravel drill pad construction as well as additional gravel access-road construction.

3.2 DRILLING

The drilling activities for both monitoring wells are presently evaluated at low radiological risk, based on previous drilling and sampling in nearby areas. The level of radiological support is currently planned for daily AM/PM checks for all active boreholes. Drilling activities at each well site will be documented by the assigned field geologist(s) on field activity report (FAR) sheets. The geologist will observe material from the borehole and prepare a borehole log as specified in the FH procedure GRP-EE-01-7.0, "Geologic Logging."

The drilling contractor will be responsible for complying with well drilling and construction criteria defined in the WAC 173-160. The drill rig and all down-hole equipment will be pressure washed between wells to minimize remnant contaminants. The final total depth of the wells will be determined by the field geologist and may change depending on the hydrogeologic conditions encountered. The Well Construction Summary provided in Table 3-1 provides the expected total drill depths at each monitoring well location.

3.3 CONSTRUCTION

A proposed well construction summary is presented in Table 3-1. Figure 3-1 show the proposed well design.

100-KR-4 Monitoring Wells
The monitoring wells in the 100-KR-4 OU (C4561 and C4670) will be drilled to approximately 30 feet below the static water level or to the lower mud, if present. Well construction will consist of 15.2-cm (6-in.) diameter stainless steel screens and casings. Well screens will be 25 feet in length and 0.020-in (20 slot) continuous wire wrap. A 3-ft stainless steel sump will be placed below each of the screens. If the bottom of the screen is not placed at the bottom of the borehole, the borehole will be backfilled with silica sand to the bottom of the placed screen. The filter pack will be 10-20 mesh silica sand placed from total depth (TD) to 5 ft above the top of the screen. A minimum of 5 feet of bentonite pellets will then be placed immediately on top of the filter pack. Cement grout will be placed from the top of the bentonite up to ground surface.

Surface protection for each well shall be installed in accordance with WAC 173-160-420 and GPR-EE-02-14.1, "Drilling, Remediating, and Decommissioning Resource Protection Wells, and Geotechnical Soil Borings." With the following modifications:

- The protective casing of the monitoring wells shall rise approximately 0.9 m (3 ft) above the concrete pad. The concrete pad will be 1.2 m by 1.2 m (4 ft by 4 ft) by 15.2 cm (6 in.) thick, and reinforced with 6-in. by 6-in. W1.4 welded wire fabric as a minimum.

- A brass survey marker with the well name and ID number inscribed shall be installed on the north side of the pad. Protective posts shall be set in concrete to allow sufficient access for operational and maintenance activities. Posts shall be primed and painted yellow (ANSI Z53.1) and meet the requirements of WAC 173-160-420(12)(a) with one additional removable post (four posts per well pad).

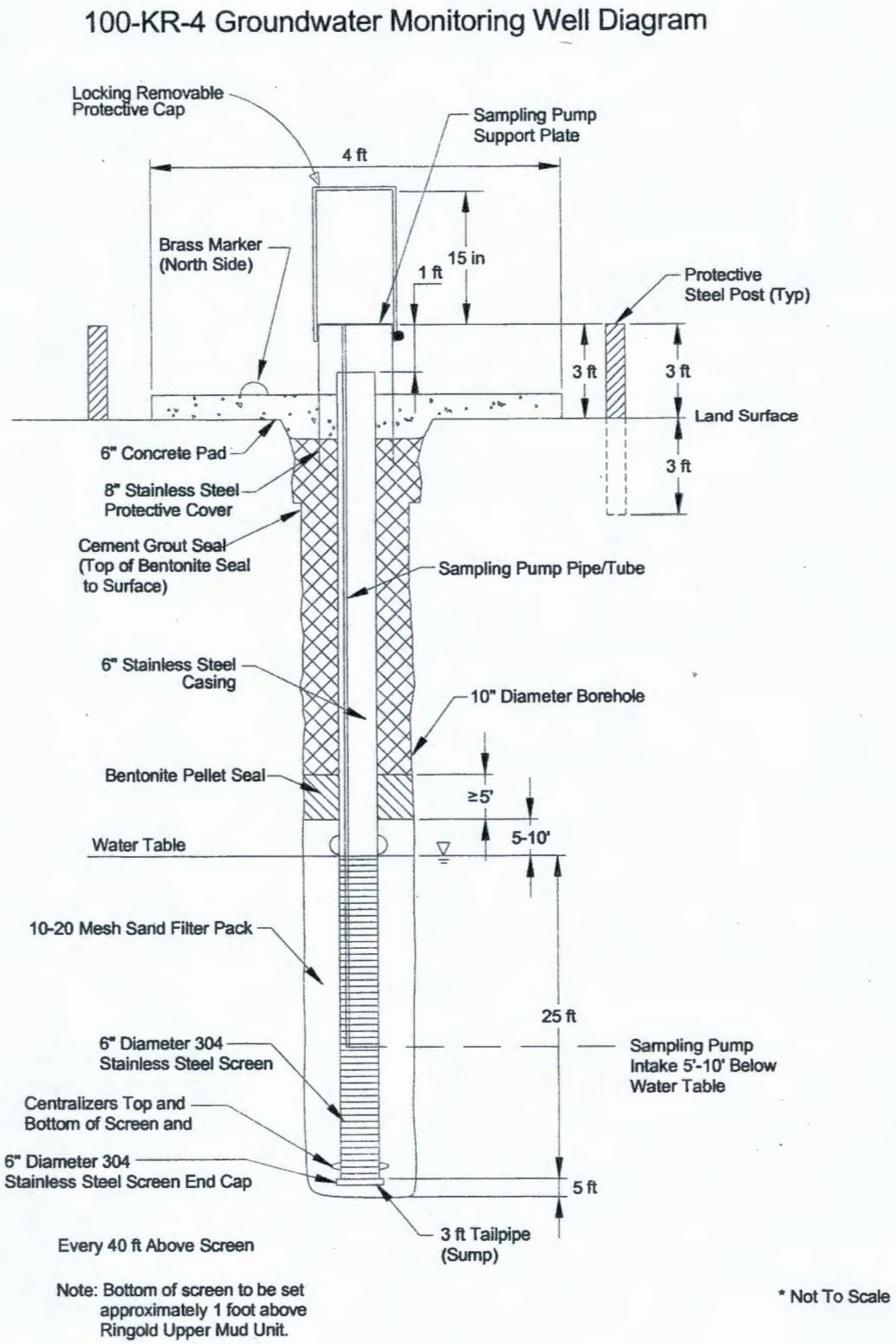
Well sampling pumps will be installed in all monitoring wells.

Table 3-1 Proposed Well Construction

Well Name and Well # (Use)	Est. Depth to Water (ft)	Est. Drill Depth (ft)	Est. Screen Interval (ft)	Est. Filter Pack Interval (ft)	Bentonite Interval (ft)	Cement Seal Interval (ft)
199-K-131 C4561 (Monitoring)	57 +/- 5	85	57 – 82	52 – 85	47 –52	0 – 47
199-K-132 C4670 (Monitoring)	48 +/- 5	78	48 –73	43 – 78	38 – 43	0 – 38

Note:
Est. Depth to water taken from data from previously drilled monitoring wells in their respective areas.
Est. Drill Depth = required or requested depth below static water table + 5 ft
TBD: to be determined

Figure 3-1 Well Design for 199-K-131 and 199-K-132.



3.4 SAMPLING ACTIVITIES

The geologist will observe the cuttings generated during drilling and shall prepare a borehole log in accordance with the FH procedure GPR-EE-01-7.0, "Geologic Logging." The five monitoring wells have short screened intervals, and will require only two split-spoon samples for grain size analysis. Efforts will be made to collect representative samples of finer grained intervals below the water table. The sieve analysis information will be used to verify well screen slot size and filter pack selection.

The 100-K Area monitoring wells will not be geophysically logged. A sampling summary can be located in Table 3-2.

The collection of waste designation samples are addressed in section 4.0 Waste Management.

Table 3-2 Sampling Summary

Well No.	Est. Water Level (ft)	Split Spoon Samples	Lithologic Grab Samples	Groundwater Samples	Geophysical Logging
199-K-131	57 +/- 5	2 in aquifer	2 vadose (37 ft and 52ft bls) and one 5 ft below WT	NA	NA
199-K-132	48 +/- 5	2 in aquifer	NA	NA	NA

3.5 WELL DEVELOPMENT

All wells will require extensive surging and pumping for development. The project hydrologist or site geologist will determine when development is complete per criteria in FH procedure GPR-EE-01-6.3, "Well Development and Testing." The objectives of well development are to settle the filter pack, prevent uncontrolled infiltration of fines, maximize well response to changes in hydraulic head, and to maximize production rates. Dual block surging will be performed to settle filter pack and conduct initial development.

Final development will consist of pumping down the well 50 to 70% of available screen to remove silt and clay particles, minimize turbidity of the extracted water, and to measure the initial response of the aquifer to pumping. Well surging will be performed as needed (including 'rawhiding', airlifting, etc.) to maximize well yield and assist with sediment removal. During pumping, water samples will be collected for analysis of turbidity, temperature, pH, and specific conductance using field instruments. Development will continue until the well produces clear water (<5 nephelometric turbidity units (NTU)) and the temperature, pH, and conductivity have stabilized (at least three consecutive measurements within 10% of each other). The development should be performed in two stages, as the well screens are greater than 6 m (20 ft) in length.

Additionally, the wells must be pumped for a long enough period of time to estimate sustainable pumping rate data. A development pump with the capacity of pumping approximately 25 gallons per minute (gpm) is estimated to complete the final development and achieve desired drawdown levels in the monitoring wells. Well development shall occur within one week of well screen/casing installation per well.

The site geologist will monitor aquifer response and monitor recovery time.

Installation of all pumps will be performed by the contractor. A grundfoss Redi-Flo3 will be installed in each well.

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4.0 WASTE MANAGEMENT

All purgewater generated during drilling, sampling, and well development activities will be transported by the drilling contractor in a purgewater truck supplied by Fluor Hanford.

199-K-131

Waste generated by installation of well C4561 (drill cuttings, purgewater, decon waste, miscellaneous waste) shall be managed in accordance with the CP-14014, *Data Quality Objective Report for Dispositioning Waste Material Installation of One Extraction Well and One Monitoring Well at 100-KR-4 Operable Unit Pump-and-Treat System* and the Waste Packaging Instruction as well as the strategy documented in the DOE/RL-97-01 Rev.3, *Interim Action Waste Management Plan for the 100-HR-3 and 100-KR-4 Operable Units*. Although CP-14014 was completed for other wells in the 100-KR-4 OU additional review of the C4561 vadose and saturated zone determined that CP-14014 was valid for waste generated during the installation of C4561. The review determined that the wells installed for CP14014 were proximal and upgradient of C4561. The interim action waste management plan establishes the requirements for the management and disposal of waste associated with the interim actions as stipulated in the *Declaration of Decision for the 100-HR-3 and 100-KR-4 Operable Units*.

Site specific information on waste management will be presented in follow up Waste Packaging Instruction. Vadose and saturated zone miscellaneous waste will be placed in containers and disposed based on field screening results as stated in CP-14014. Vadose zone soils will be placed on plastic and periodically surveyed. If vadose soil surveys detect contamination the soil will be sampled and analyzed prior to disposition, otherwise the soil will be released to the ground surface in accordance with CP-14014. The saturated zone cuttings will be periodically surveyed and containerized. The purgewater which carries mobile contaminates will be decanted and transported to the Purgewater Transport Storage Facility (PTSF). If saturated surveys detected contamination the saturated soils the soils will be sampled and analyzed prior to disposition, otherwise the soil will be released to the ground surface in accordance with CP-14014.

199-K-132

Waste (with the exception of purgewater or decon wastes) generated by the installation of well C4670 (drill cuttings, miscellaneous waste) shall be managed by Bechtel Hanford through their waste management procedures as specified in BHI-EE-10, *Waste Management Plan*.

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5.0 QUALITY ASSURANCE

Fluor Hanford issued HNF-MP-599, Quality Assurance Program Description, which describes how FH implements the Quality Assurance requirements conveyed in DOE O 414.1A and 10 CFR 830.121. HNF-MP-599 also shows how the *Hanford Federal Facility Agreement and Consent Order* and HASQARD apply to Environmental QA Program Plans. Project management requirements are also detailed in HNF-RD-14988, *Project Management Requirements*. A project specific Quality Assurance Program plan for the Groundwater Remediation Project (GRP) scope is presented in HNF-20635, *Groundwater Remediation Project Quality Assurance Project Plan (GRP-QA-001)*. Other quality assurance documents include the *Field Sampling Quality Assurance Program Plan* and *Onsite Measurement Quality Assurance Program Plan.*

All work performed under this description of work will be performed in compliance with HNF-MP-599, HNF-20635, or subsequent and equivalent FH Quality program plans.

All operations including drilling, sampling and well completion/ decommissioning, testing and associated documentation are subject to surveillance by FH, FH's authorizing agent and/or owner. This surveillance shall in no way relieve the contractor of any contractual responsibilities. Note: the term "surveillance" as used here may include inspection, survey, and/or assessment. The drilling contractor will implement a quality assurance program as submitted and approved under the drilling master agreement.

Technical procedures are listed in section 7.2 of this document, "Technical Procedures/Specifications."

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6.0 SCHEDULE

Drilling operations for the two new monitoring wells is scheduled to begin after September 6, 2004. The wells shall be completed no later than September 30, 2004.

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7.0 GENERAL REQUIREMENTS

Field work for the wells will be conducted in accordance with existing FH procedures and protocols and the specifications of this DOW. The applicable procedures are discussed in the following sections.

7.1 SAFETY AND HEALTH

All personnel working at the drilling sites addressed by this plan will gave completed, at a minimum, an Occupational Safety and Health Administration Act 40-hour Hazardous Waste Site Worker training program (29 CFR 1910.120). Hanford General Employee Training (HGET) is required for access to the 100 and 200 Areas. Radiation Worker II training required. Work will be performed in accordance with the following procedures:

- HNF-5173, PHMC Radiological Control Manual

- Site specific plans, as applicable:
  - Health and safety plans
  - Radiological evaluation/radiation work permits
  - Activity hazard analysis/job safety analysis
  - Site Specific Waste Management Instructions

- HNF-IP procedures

- CP Radiological Control Procedures

7.2 TECHNICAL PROCEDURES/SPECIFICATIONS

This section identifies technical procedures/specifications applicable to field activities performed under this description of work. Activities associated with the drilling and installation of these wells and management of waste generated by these activities will adhere to, at a minimum, the following FH procedures and requirements:

HNF-PRO-10863, "Notebooks and Logbooks"

GPR-EE-01-1.11, "Purgewater Management"

GPR-EE-01-3.0, "Chain of Custody"

GPR-EE-01-3.1, "Sample Packaging and Shipping"

GPR-EE-01-4.0, "Soil and Sediment Sampling"

GPR-EE-01-6.2, "Field Cleaning and/or Decontamination of GeoProbe® and Drilling Equipment"

GPR-EE-01-7.0, "Geologic Logging"

GPR-EE-02-14.1, "Drilling, Remediating, and Decommissioning Resource Protection Wells, and Geotechnical Soil Borings"

Blue-Sheeted BHI-EE-10, Waste Management Plan, and FH waste management procedures HNF-PRO-15333, HNF-PRO-15334, HNF-PRO-15335, HNF-EP-0063, and HNF-EP-0064 as required.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells"

8.0 PROJECT DOCUMENTATION

Documentation requirements for these activities are separated into scoping documents, field activity documents, and reporting documents. The following documents will be prepared to support the well drilling activity:

- Scoping Documents
  - Description of Work (this document)
  - Data Quality Objective summary report
  - Drilling specifications/subcontractor scope of work (procurement package)
  - Excavation Permit
  - Additional waste management documents as required.

- Field Documentation
  - Well Drilling/Decommissioning Planning form
  - Daily Field Activity Reports
  - Sample collection, custody, and shipment documentation for waste samples
  - Well logs (borehole lithologic and completion)
  - Field Logbook
  - Well Construction summary report
  - Well Summary sheet
  - Field Cleaning and/or Decontamination sheets
  - Well Development and Test data sheets
  - Sieve Analysis sheets
  - Well Survey Data Report
  - Well Acceptance Report

- Reporting Documents
  - Field documentation will be transmitted to FH Geoscience Support for incorporation into the well database
  - Borehole Summary Report

The records produced for this project will undergo technical and management review in accordance with FH practices and procedures. The required reviewers will be identified prior to document completion, and the review time will be established as soon as practical.

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9.0 REFERENCES

29 CFR 1910.120, "*Hazardous Waste Operations and Emergency Response*," Code of Federal Regulations, as amended.

BHI-EE-10, *Waste Management Plan*, Bechtel Hanford, Inc., Richland, WA.

DOE-RL, 1990, *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington*, (Letter No. 90-ERB-040, to P.T. Day, U.S. Environmental Protection Agency, and T.L. Nord, Washington State Department of Ecology, July 19, 1990), U.S. Department of Energy, Richland, WA.

DOE-RL, 2000, *Interim Action Waste Management Plan for 100-HR-3 and 100-KR-4 Operable Units*, DOE/RL-97-01, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, WA.

EPA, 1996, *Declaration of Decision for the 100-HR-3 and 100-KR-4 Operable Units*, U.S. Environmental Protection Agency, Region 10, Seattle, WA.

Groundwater Protection Program Procedures:

GPR-EE-01-6.2, "Field Cleaning and/or Decontamination if GeoProbe® and Drilling Equipment"
GPR-EE-01-7.0, "Geologic Logging"
GPR-EE-02-14.1, "Drilling, Remediating, and Decommissioning Resource Protection Wells, and Geotechnical Soil Borings"
GPR-EE-05-1.17, "Determination of Hexavalent Chromium in Water, Wastewater, and Soils Utilizing the Hach DR/2000 and DR/2010 Spectrophotometers"

PNNL, 2004, *Hanford Site Groundwater Monitoring for Fiscal Year 2003*, PNNL 14548, Pacific Northwest National Laboratory, Richland, WA

RCW 70.105, "*Hazardous Waste Management*," Revised *Code of Washington*, as amended.

Sump, C.A., 2001, *Description of Work for the Installation of Two Wells at the 100-KR-4 Pump and Treat Remediation System, FY 2002 CERCLA Design Upgrades*, BHI-01559, Bechtel Hanford, Inc. Richland, WA.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells"

Walker, L.D., 2003, *Description of Work for the Installation of Groundwater Wells at 100-HR-3, 200-ZP-1, and 200-UP-1 Operable Units*, WMP-18046, Rev.0, Fluor Hanford, Inc. Richland, WA.

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