INTERIM CHANGE NOTICE
(ICN)

A. Document No.: PNNL-13024 **Revision No.:** 2

Document Title: *RCRA Groundwater Monitoring Plan for Single-Shell Tank Waste Management Area C at the Hanford Site*

Document's Original Author: D. G. Horton and S. M Narbutovshih

Effective Date of ICN: 04/02 /03

Change Requested By: S. M. Narbutovshih/C. Chou

B. Action:
Make changes in the monitoring plan as described below in Section D. Attach this ICN to the front of the document just before the title page.

C. Effect of Change:
This ICN documents the deferral of statistical upgradient/downgradient comparisons for WMA C until conductivity stabilizes in upgradient well 299-E27-7 or a new upgradient well is installed and stable and upgradient values for specific conductance are obtained.

D. Reason for Change/Description of Change:

Reason for Change:

1)Recent direct flow measurements with the colloidal borescope indicated a southwesterly flow direction at the WMA C. With the southwest groundwater flow, well 299-W27-7 is the only upgradient well, and currently conductivity is rising sharply at this well. A critical mean for conductivity cannot be calculated using data from this well because four quarters of stable data are needed for a critical mean calculation and with changing conditions, these data are not available. Consequently, upgradient/downgradient comparisons will be deferred until conductivity stabilizes in well 299-E27-7 or a new upgradient well is installed and stable, upgradient values for conductivity are available.

Description of Change:

2) Mark through document Summary with a single line, initial, and date the change; then staple the attached Summary to the back of that page.

3) Attach pages 4.7 to 4.9 to the back of pages 4.7 to 4.9 to defer the statistical comparisons until conductivity stabilizes in well 299-E27-7 or a new upgradient well is installed and a baseline is established from the new well.

E. Document Management Decisions:

The original information release form is unavailable, thus, we do not know who approved the original document. For this ICN, Stuart Luttrell and Mary Hartman will sign approval.

The attached distribution list shows the current staff who will receive this ICN as it may vary from the distribution of the original document.

F. Task Manager Approval: (Stuart Luttrell) (Please Sign and Date) S. P. Luttrell 5/20/03

Type of Change: (Check one): ___ Minor _X_ Major

Qualitiy Engineer Approval : T. G. Walker Thomas H Walker Date: 5/21/03

Other Approval: M.J. Hartman Mary J Hartman Date: 20 May 03

Date: _____

SUMMARY

This document describes the groundwater monitoring plan for Waste Management Area (WMA) C located in the 200 East Area of the DOE Hanford Site. This plan is required under the Resource Conservation and Recovery Act (RCRA). The regulatory requirements can be found in WAC 173-303-400, and by reference, in 40 CFR 265.90 through 265.94. The plan objectives are to detect the facility's impact on the quality of groundwater beneath the site. Groundwater monitoring results have not indicated that leaks from single-shell tanks (SSTs) in WMA C have reached the upper most aquifer.

The groundwater monitoring network currently contains four RCRA-compliant wells used to monitor the uppermost 6 m (20 ft) of the unconfined aquifer. In addition, one pre-RCRA well is included as an upgradient well. The gradient of the water table is nearly flat causing ambiguities in the flow direction based on water levels alone. Recent direct flow measurements with the colloidal borescope indicated a southwesterly flow direction at the WMA C. With the southwest groundwater flow well 299-W27-7 is the only upgradient well, and currently specific conductance is rising sharply at this well. A critical mean for specific conductance cannot be calculated using data from this well because four quarters of stable data are needed for a critical mean calculation. Consequently, upgradient/downgradient comparisons will be deferred until specific conductance stabilizes in well 299-E27-7 or a new upgradient well is installed and four sets of stable data have been collected.

Currently, nitrate concentrations are elevated, but are below the drinking water standard, northeast (upgradient) and southeast of the 241-C Tank Farm boundary. Along with the nitrate is elevated sulfate, calcium and ^{99}Tc. Although ^{99}Tc levels northeast of the facility are currently above 200 pCi/L, levels are still elevated above 900 pCi/L south and southeast of the site as this contaminant plume moves through the area. Technetium-99 is tracked along with the nitrate because the nitrate to ^{99}Tc ratio can be diagnostic of tank-associated waste versus other nitrate sources. Although source delineation has not been determined, this contamination may be part of a regional plume moving into the area from a northeasterly direction.

The waste management area was monitored either monthly or bimonthly prior to and during sluicing activities to remove residual waste from a single-shell tank. Waste transfer activities have ceased, and beginning in FY 2001 sampling frequency reverted to a semiannual schedule. Groundwater samples will be analyzed for indicator parameters (pH, specific conductance, total organic carbon, total organic halides), anions, alkalinity, turbidity, ICP metals and site-specific constituents such as cyanide. Sample also are analyzed for radionuclides including ^{99}Tc, ^{137}Cs, ^{60}Co, ^{90}Sr, ^{129}I and tritium to support monitoring for the Atomic Energy Act of 1954 and to facilitate source delineation. Depths to groundwater are measured quarterly.

The current groundwater monitoring network at WMA C leaves nearly a third of the site unmonitored. Well 299-E27-7 remains an upgradient well, but well 299-E27-15 changes from a downgradient well to a marginally useful upgradient well. Well 299-E27-13 remains a downgradient well. Well 299-E27-12 may be too far west to be useful as either an upgradient or a downgradient well, while well 299-E27-14 is not upgradient but may be cross gradient. Because the current flow direction beneath WMA C is to the southwest, additional wells are planned for FY 2003.

Plans to develop and implement an improved monitoring network are discussed in Section 4.2.3. Direct measurements of groundwater flow direction and flow rate within the screened intervals of WMA C monitoring wells were made to help evaluate the monitoring network. Based on a general groundwater flow direction to the southwest, a modified network should provide nearly complete coverage of the WMA even as the flow shifts back to pre-Hanford conditions.

4.2.1 Dangerous Waste Constituents

It is required under 40 CFR 265.94(a)(2) and WAC 173-313-400 that indicator parameters (i.e., pH, conductivity, total organic carbon, total organic halogen) be monitored to provide a reliable indication of the presence of dangerous constituents in groundwater. The site-specific constituents for WMA C were determined based on:

- types and concentrations of dangerous waste constituents in the stored wastes
- mobility, stability, and persistence of dangerous waste constituents in the unsaturated zone beneath WMA C
- detectability of waste constituents in the groundwater
- concentrations or values of the monitoring parameters or constituents in the groundwater background chemistry

The site-specific sampling needs and issues at WMA C are presented in the following section. The sampling and analysis plan (SAP), consisting of the field sampling plan (FSP) and the quality assurance project plan (QAPP), are provided in Appendix D.

Groundwater Sampling Parameters

According to 40 CFR 265.92, and by reference WAC 173-303-400(3), the owner/operator of an interim-status hazardous waste facility must establish initial background concentrations for the contamination indicator parameters of pH, conductivity, total organic carbon, and total organic halogens. Background values for WMA C were determined first in 1992 and updated as needed to reflect current site conditions. The averaged replicate t-test is the statistical method used to determine whether significant differences occur in the concentration of indicator parameters from downgradient wells compared to the initial background concentrations from upgradient wells (NWWA 1986).

Details of the statistical method are given in Appendix D. The groundwater monitoring network currently contains four RCRA-compliant wells used to monitor the uppermost 20 ft (6 m) of the unconfined aquifer. In addition one pre-RCRA well is included as an upgradient well. The gradient of the water table is nearly flat, which in the past has caused ambiguity in flow direction. After corrections were made for slightly crooked wells based on downhole gyroscopic surveys, the gradient of the water

table provides a southwesterly flow direction. Recent direct flow measurements with the colloidal borescope also indicated a southwesterly flow direction at the WMA C. With the southwest groundwater flow, well 299-W27-7 is the only upgradient well, and currently conductivity is rising sharply at this well. A critical mean for conductivity cannot be calculated using data from this well because four quarters of stable data are needed for a critical mean calculation. Consequently, upgradient/downgradient comparisons will be deferred until conductivity stabilizes in well 299-E27-7 or a new upgradient well is installed and a baseline is established from the new well.

A table of indicator parameters along with site-specific constituents is presented in Table 4.2 in conformance with 40 CFR Part 265, Subpart F. Indicator parameters will be evaluated semi-annually when conductivity stabilizes in well 299-E27-7 or a new upgradient well is installed and four sets of stable data have been obtained. The sampling frequency of each site-specific constituent is provided.

The analysis for anions captures the values for nitrate, nitrite, sulfate, and chloride, which are the main mobile anionic species found in these tanks. The metals analysis provides concentrations for sodium, calcium, iron, chromium, and potassium, the main mobile cations found in tank waste. The organics listed in tank waste with the greatest concentrations are glycolate, DBP, EDTA, HEDTA, and butanol. The analysis for total organic carbon is performed in quadruplicates to monitor for these organics. Cyanide is included in the constituent list because it was in the waste streams routed to 241-C Tank Farm that resulted from in-tank scavenging conducted in the 244-CR vault. The pH, conductivity, total organic carbon and total organic halides are indicator parameters required by regulations. Phenols, which are not significant constituents of tank waste, will be analyzed annually as required by regulation.

Table 4.2. Indicator Parameters, Site-Specific Dangerous Waste Constituents, and Sampling Frequencies [(a)]

Contaminant Indicator Parameters	**Sampling Frequency**
pH	Semiannual
Conductivity	Semiannual
Total Organic Carbon	Semi-annual, Quadruplicates
Total Organic Halogens	Semi-annual, Quadruplicates
Site Specific Constituents [(b)]	**Sampling Frequency**
Alkalinity	Semiannual
Anions	Semiannual
Cyanide	Semiannual
Phenols	Annual
ICP Metals (filtered)	Semiannual
(a) By special request from the Washington State Department of Ecology, sampling for some constituents is performed quarterly. (b) Additional constituents may be added if warranted by changing groundwater conditions.	

Radionuclides are excluded from regulation under RCRA, however, selected radionuclides are analyzed to meet requirements of the Atomic Energy Act of 1954 and to facilitate source delineation of dangerous waste constituents, if detected. These are included in this plan for completeness. Radionuclides that are monitored and the sampling frequency are provided in Table 4.3. The results of these analyses will be used in the evaluation of potential non-RCRA regulated impacts on groundwater quality. The primary radionuclides are tritium, ^{99}Tc, ^{125}Sb, ^{60}Co, ^{90}Sr and ^{137}Cs. Of these tritium and ^{99}Tc are the most mobile species. Various uranium isotopes are monitored with a total uranium analysis.

Table 4.3. Radionuclides and Sampling Frequencies

Radionuclides	**Sampling Frequency**
Low-level gamma Scan [(a)]	Semiannual
Gross Alpha	Semiannual
Gross Beta	Semiannual
Technetium-99	Semiannual
Total Uranium	Annual
Tritium	Semiannual
Iodine-129	Annual
Strontium-90	Annual
(a) Gamma scan includes ^{60}Co, ^{125}Sb, and ^{137}Cs.	

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