**Department of Energy**
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JUN 7 2001

01-GWVZ-025

Ms. Jane Hedges
Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336

Dear Ms. Hedges:

RESULTS OF ASSESSMENT AT THE NON-RADIOACTIVE DANGEROUS WASTE LANDFILL (NRDWL)

NRDWL is a Resource Conservation and Recovery Act facility southeast of the 200 East Area, which has been monitored under an interim-status detection program (40 CFR 265.92). As discussed in the U.S. Department of Energy, Richland Operations Office, letter to you from me, "Notification of Specific Conductance Exceedance at the Non-Radioactive Dangerous Waste Landfill (NRDWL)," dated May 21, 2001 (01-GWVZ-023), the average result of quadruplicate samples from downgradient wells 699-25-34A and 699-25-34B exceeded the critical mean value for specific conductance in February and March 2001. The field measurements were in line with historical trends, so no verification sampling was required.

Specific conductance is an indicator parameter under interim-status regulations. Because levels in downgradient wells have been determined to be statistically different from background, the two following actions were required:

> "Within 15 days after notification under paragraph (d)(1) of this section, the owner or operator must develop and submit to the Regional Administrator a specific plan . . . for a groundwater quality assessment program at the facility. [40 CFR 265.93(d)(2)]; and
>
> . . . as soon as technically feasible . . . submit . . . a written report containing an assessment of the groundwater quality. [40 CFR 265.93(d)(5)."

The increased specific conductance is believed to be caused by increases in the concentrations of non-hazardous constituents (bicarbonate, sulfate, calcium, and magnesium) from the adjacent Solid Waste Landfill, as discussed in the attached report. We propose continuing detection monitoring at this site. The report is intended to serve as both the assessment plan and the assessment report, to fulfill both of the requirements listed above.

JUN 7 2001



If you want to discuss this matter further or require additional information, please contact Marvin J. Furman at (509) 373-9630.

Sincerely,

John G. Morse, Program Manager
Groundwater/Vadose Zone Project

GWVZ:MJF

Attachment

cc w/attach:
D. N. Goswami, Ecology
J. Price, Ecology

cc w/o attach:
C. J. Kemp, BHI
G. B. Mitchem, BHI
J. G. Woolard, BHI
J. V. Borghese, CHI
S. Leja, Ecology
J. W. Lindberg, PNNL
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M. D. Sweeney, PNNL

# SPECIFIC CONDUCTANCE OF GROUNDWATER AT THE NONRADIOACTIVE DANGEROUS WASTE LANDFILL

## Introduction

The Nonradioactive Dangerous Waste Landfill (NRDWL) is regulated under the Resource Conservation and Recovery Act of 1976 (RCRA). Located southeast of the 200 East Area (Figure 1), the facility received nonradioactive hazardous waste between 1975 and 1985. The Solid Waste Landfill is located adjacent to the NRDWL immediately toward the south-southwest (see Figure 2 for locations of the NRDWL and Solid Waste Landfill well networks).

Groundwater samples collected in February and March 2001 exceeded the critical mean value for specific conductance (600.7 μS/cm) in two downgradient wells (699-25-34A and 699-25-34B). As explained below, the exceedances do not indicate that the facility is contaminating groundwater with hazardous constituents. The high specific conductance is caused by nonhazardous constituents (such as bicarbonate, sulfate, calcium, and magnesium), probably from the adjacent Solid Waste Landfill.

## Effluent Characteristics

The wastes disposed of in the NRDWL fall into the following categories (Lindberg and Hartman 1999; Hodges 1993):

- Bulk organic waste: solvent waste, paints, paint thinners, and waste oil.
- Metal cleaner waste: primarily a mixture of sulfamic acid ($NH_2SO_3H$) and sodium bisulfate ($NaHSO_4$).
- Small-quantity laboratory chemicals: used and unused reagents and various laboratory formulations, primarily metallic salts, acids, bases, oxidizers, and organic chemicals.
- Asbestos: primarily building demolition material, which accounts for more than 50% by volume of all waste disposed in the landfill.
- Nonhazardous solid waste: office and lunchroom waste, construction and demolition debris, and septic tank sludge.

## Specific Conductance

Specific conductance has been rising steadily since before 1990 at the two wells where the critical mean was exceeded, as well as at the other three downgradient wells in the well network that are screened at the water table (699-26-34B, 699-26-33, and 699–25-34D; Figures 3 and 4). During the same time, downgradient wells at the Solid Waste Landfill also had steadily rising specific conductance, and the reported values there are higher overall than at the NRDWL (Figure 5).

Both upgradient wells in the NRDWL well network (699-26-34A and 699-26-35A) have a slight rising trend for specific conductance in a similar manner as the downgradient wells (Figure 6), but wells farther upgradient (699-28-40, 699-24-46, 699-32-43, and 699-33-42) do not show this rising trend.

## Major Ions

Groundwater beneath the NRDWL and SWL is dominantly calcium-bicarbonate type. The spider diagrams in Figure 7 plot concentrations of major ions, expressed in meq/L, on six axes. Data

from February 1999 are shown because that is the most recent date for which a full data set including alkalinity was analyzed. Each of the wells shows the same general chemistry, with the SWL wells having higher concentrations of calcium and bicarbonate.

The rise in specific conductance over time in wells of the NRDWL well network is similar to the rise in concentration of alkalinity (bicarbonate), calcium, magnesium, and sulfate in the same wells. As examples, figure 8 shows the increases of these constituents in well 699-25-34A. The rise in concentrations of these constituents is responsible for the corresponding rise in specific conductance. No hazardous constituents are associated with the increase. Nitrate and fluoride have decreased slightly. Sodium, a component of metal cleaner waste disposed of at the NRDWL, is stable at 24 to 26 mg/L. The absence of an increasing trend in sodium indicates that it is not causing the increase in specific conductance.

Wells at the Solid Waste Landfill also have elevated levels of alkalinity, calcium, magnesium, and sulfate. However, the levels are generally higher at the Solid Waste Landfill than they are at the NRDWL (Figure 9). The elevated concentrations of alkalinity and specific conductance at the Solid Waste Landfill are reported to be the result of increased levels of carbonate or bicarbonate in the groundwater. In turn, the increased carbonate concentration is the result of high carbon dioxide concentrations in the vadose zone as observed by Evans et al. (1989) and Jacques (1993). The elevated carbon dioxide concentrations in the vadose zone apparently result from the breakdown of sewage beneath the Solid Waste Landfill under oxidizing conditions. The major effect of this process is an increase in the hardness of the groundwater (calcium carbonate; DOE 1994), which is also responsible for raising the specific conductance (Hodges, 1994; Evans et al., 1989; and Jacques, 1993).

**Conclusions and Recommendations**

Specific conductance in two downgradient wells exceeded the critical mean value in February and March 2001. The source of high specific conductance is primarily calcium, bicarbonate, magnesium, and sulfate, which are all nonhazardous constituents. The source of these constituents was probably the Solid Waste Landfill which is adjacent to the NRDWL. Specific conductance at the Solid Waste Landfill generally is higher than at the NRDWL, and there is a known mechanism for the rise in specific conductance (breakdown of sewage causing elevated carbon dioxide levels in the vadose zone).

There are no identified hazardous waste constituents associated with the elevated levels of specific conductance. Therefore the NRDWL should remain in detection monitoring as described in the existing groundwater monitoring plan (Lindberg and Hartman, 1999).

**References**

DOE. 1994. *Corrective Action Plan for the Hanford Site Solid Waste Landfill.* DOE-RL-94-143, U.S. Department of Energy, Richland, Washington.

Evans, J.C., R.M. Fruland, D.W. Glover, and C. Veverka. 1989. *Final Report: Soil-Gas Survey at the Solid Waste Landfill.* PNL-7147, Pacific Northwest National Laboratory, Richland, Washington.

Hodges, F.N. 1993. "Nonradioactive Dangerous Waste Landfill." Section 18 in *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1992*. DOE/RL-93-09, U.S. Department of Energy, Richland, Washington.

Hodges, F.N. 1994. "Solid Waste Landfill." Section 5.3 in *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1993*. DOE/RL-93-88, U.S. Department of Energy, Richland, Washington.

Jacques, I.D. 1993. *Nonradioactive Dangerous Waste Landfill Soil-Gas Survey: Final Data Report*. WHC-SD-EN-TI-199, Westinghouse Hanford Company, Richland, Washington.

Lindberg, J.W. and M.J. Hartman. 1999. *Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill*. PNNL-12227, Pacific Northwest National Laboratory, Richland, Washington.

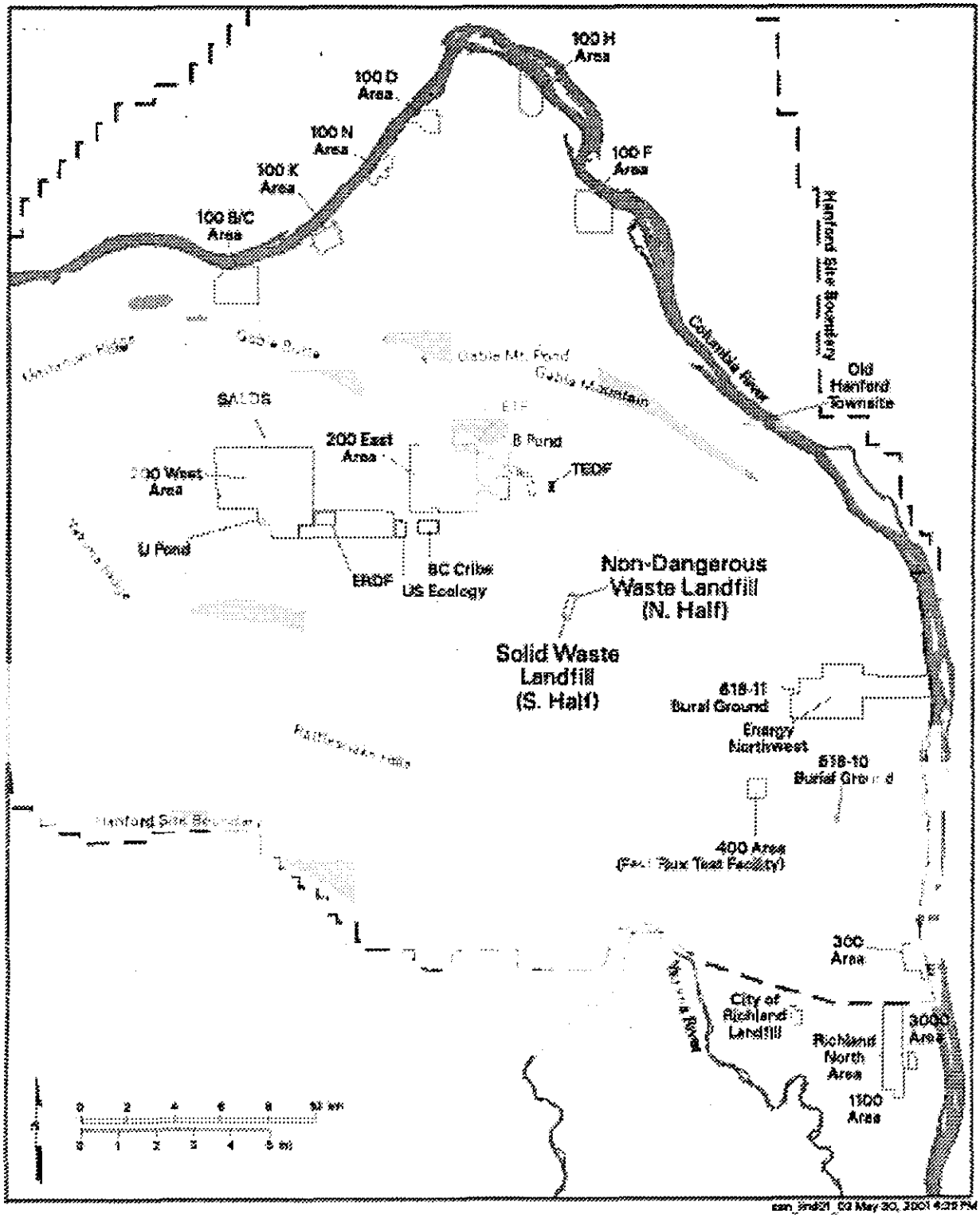



Figure 1. Location of Nonradioactive Dangerous Waste Landfill.

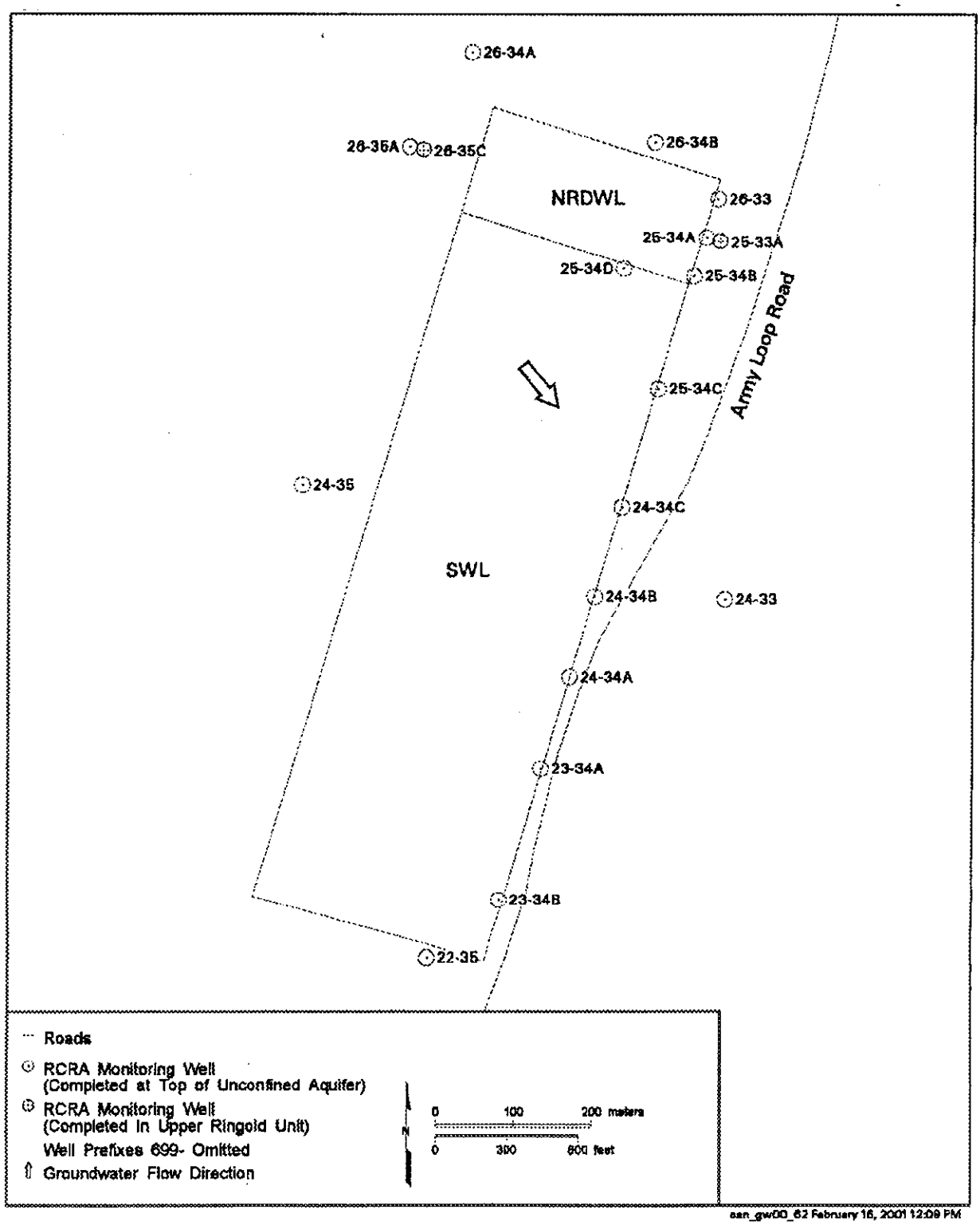
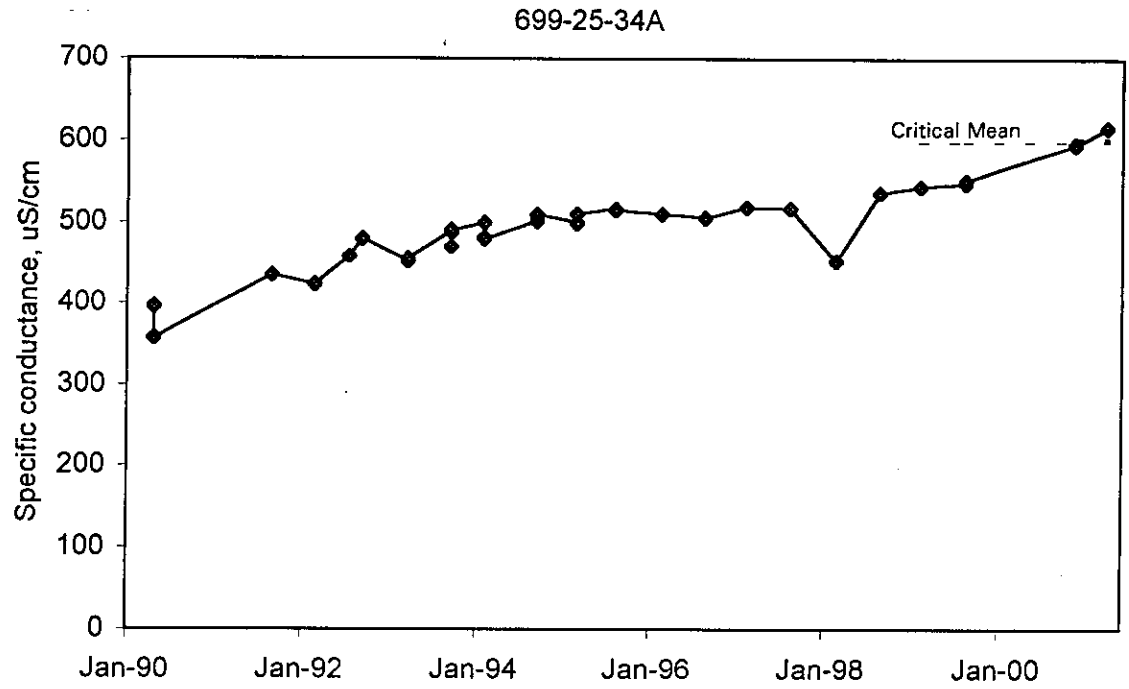



Figure 2. Groundwater Monitoring Wells for Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill.



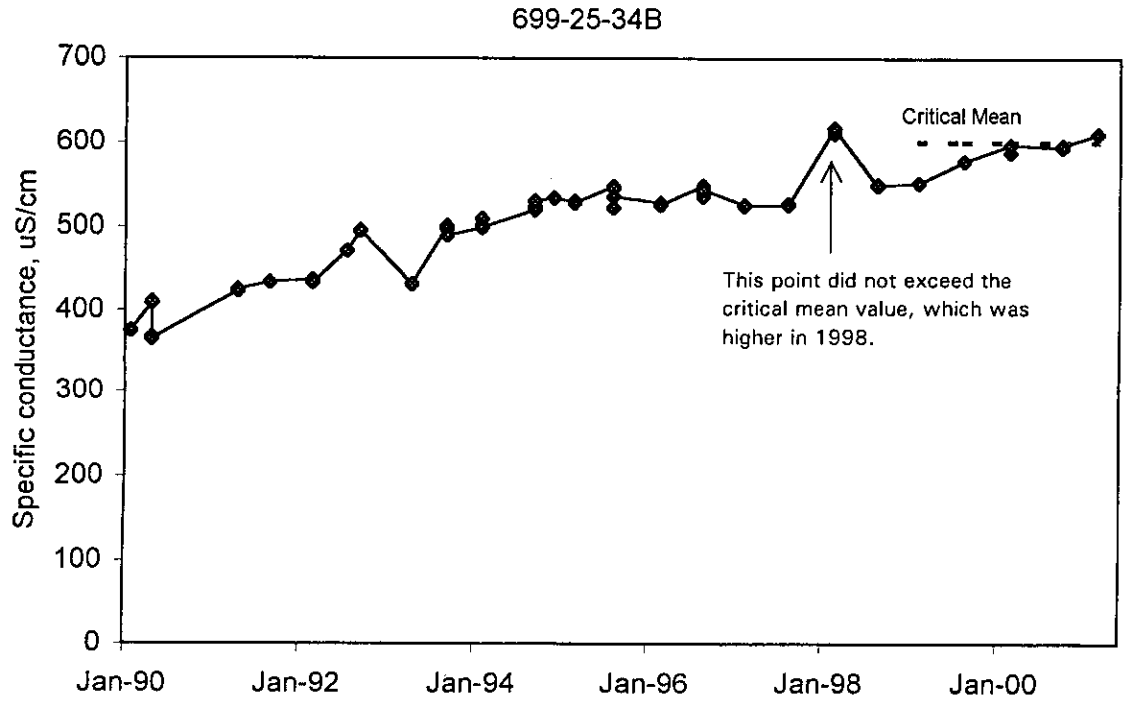




Figure 3. Specific Conductance in Wells Exceeding Critical Mean Value.

Subject Code/Keyword: OU/8960
Written Response Required: No
Due Date: N/A
Closes MGR Action #: N/A
MGR Due Date: N/A
Closes CCC Action #: N/A
OU: NRDWL
Project: YES

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Sincerely,

John G. Morse, Program Manager
Groundwater/Vadose Zone Project

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Attachment

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JG Morse, GWVZ
MJ Furman, GWVZ
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Record Note: None.

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| Date > | 6/6/01 | 6/5/01 | 6/7/01 | | | |

(Please return to Cindy Anderson 6-6559 A5-16/Fed/574 FAX 6-0306)

Document No. 28270