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Pacific Northwest
National Laboratory
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U.S. Department of Energy

Quarterly Groundwater Report for the Solid Waste Landfill October - December 2006

J. W. Lindberg

April 2007

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Richland, Washington 99352

Summary

This report provides information on groundwater monitoring at the Solid Waste Landfill during the quarterly time period October through December 2006. Conditions remain very similar to those reported in the previous quarterly report. Four background threshold values, two WAC 173-200 Groundwater Quality Criteria, and one WAC 246-290-310 maximum contaminant level were exceeded. The results that exceed applicable limits are consistent with the type of waste disposed to the landfill.

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1.0 Introduction

The Solid Waste Landfill (SWL) is co-located with the Nonradioactive Dangerous Waste Landfill (NRDWL) (see Figure 1) at the Central Landfill, which is ~5.5 kilometers southeast of the 200 East Area on the Hanford Site. Beginning in 1972, the Solid Waste Landfill received principally solid waste, including paper, construction debris, asbestos, and lunchroom waste. In addition to the solid waste, ~3,800,000 to 5,700,000 liters of sewage were disposed in trenches along the eastern and western sides of the Solid Waste Landfill between 1975 and 1987, and ~380,000 liters of Hanford Site bus-garage wash water were disposed in three short trenches along the western side of the site between 1986 and 1987 (Hartman 2000).

This report covers groundwater monitoring data from wells sampled during the period October through December 2006.

2.0 Groundwater Monitoring

The Solid Waste Landfill groundwater monitoring well network is sampled quarterly, usually in the months of November, February, May, and August in accordance with the Solid Waste Landfill groundwater monitoring plan (Lindberg and Chou 2000). Six of the nine wells in the network were successfully sampled in December 2006 for the October – December 2006 time period, but three were delayed beyond the end of the quarter. The delay was caused by sampling delays (such as work stoppages due to wild fire danger) from the previous quarter. The three delayed wells (699-24-33, 699-24-35, and 699-26-35A; see Figure 1) were successfully sampled in January 2007. Results of the six wells sampled in December 2006 are discussed in this report, whereas results for the three delayed wells will be discussed in the next quarterly report.

2.1 Groundwater Constituents and Concentration Limits

The Solid Waste Landfill is monitored pursuant to WAC 173-304 regulations for the following required groundwater constituents:[1]

- Temperature (20.7 degrees Celsius)
- Specific conductance (583 μS/cm)
- Field pH (6.68-7.84)
- Total organic carbon (2,240 μg/L)
- Chloride (7,820 μg/L)
- Nitrate (29,000 μg/L)

[1] Note: Reported groundwater results for these constituents are compared to background threshold values (in parentheses). The background threshold values are calculated from monitoring results from the two background (upgradient) wells, 699-24-35 and 699-26-35A.

- Nitrite (89 μg/L)
- Ammonium (90 μg/L)
- Sulfate (47,200 μg/L)
- Iron (160 μg/L - filtered)
- Zinc (42.3 μg/L - filtered)
- Manganese (10 μg/L - filtered)
- Coliform bacteria (1 colony/100 ml)
- Chemical oxygen demand (10,000 μg/L)

The following site-specific constituents are also analyzed in Solid Waste Landfill groundwater samples:

- Volatile organic compounds (known to be discharged to landfill as waste)
- Filtered arsenic (detected in leachate collection system)
- 1,4-dioxane (detected in leachate collection system)

2.2 Exceedances of Limits

The following constituents exceeded applicable background comparison threshold values or Washington State groundwater quality criteria (WAC 173-200-040 or WAC 246-290-310) during the reporting quarter and are discussed further in Section 2.3 (the limits are in parentheses).

Constituents Exceeding Background Threshold Values
Chemical oxygen demand (10,000 μg/L)
Coliform bacteria (1 colony per 100 ml)
Field pH (6.68 – 7.84)
Specific conductance (583 μS/cm)

Constituents Exceeding Groundwater Quality Criteria – (WAC 173-200)
Arsenic (0.05 μg/L)
Tetrachloroethene (0.8 μg/L)

Constituents Exceeding Washington *Maximum Contaminant Levels* (WAC 246-290-310)
Specific conductance (700 μS/cm)

2.3 Results

Chemical Oxygen Demand – Reported results for chemical oxygen demand at Solid Waste Landfill wells have been erratic, fluctuating from non-detect to values over 200,000 μg/L since the well network was installed in the 1980s. Higher results have occurred more often during the last few years. During the reporting quarter, results from five downgradient Solid Waste Landfill wells exceeded the background threshold value of 10,000 μg/L. The well with the highest reported value was well 699-22-35 with a result of 285,000 μg/L.

Coliform Bacteria – Coliform bacteria were detected in one downgradient well (699-23-34A) in the Solid Waste Landfill network during the reporting quarter. The result was 345 colonies per 100 ml, which exceeded the background threshold value of 1 colony per 100 ml. Coliform bacteria results have been sporadic in many Solid Waste Landfill wells, but the occurrence of background threshold value exceedances has been increasing in recent years.

Field pH – The background threshold range (6.68 to 7.84) was exceeded in one downgradient well during the reporting quarter. Well 699-23-34A had a pH value of 6.63, below the lower limit of the range. Low pH values have been reported at Solid Waste Landfill wells since the majority of the well network was installed in the 1980s.

Specific Conductance – The background threshold value (583 µS/cm) was exceeded at all six of the downgradient wells sampled during the reporting quarter. The Washington State maximum contaminant level (see WAC 246-290-310) for specific conductance (700 µS/cm) was also exceeded at three of the six downgradient wells. The highest result was 829 µS/cm at well 699-22-35. The overall trend in the majority of Solid Waste Landfill wells has been stable to slightly decreasing since 2005.

Arsenic – Arsenic was detected at one downgradient network well (699-23-34B) with a result of 2.5 µg/L, which is typical for this well. The result exceeds the WAC 173-200-040 limit of (0.05 µg/L), yet is very close to the detection level for the analysis method.

Tetrachloroethene – Two downgradient wells had tetrachloroethene results greater than the WAC 173-200-040 limit of 0.8 µg/L during the reporting quarter. The higher of the two was 0.89 µg/L at well 699-23-34A. The other elevated result was 0.85 µg/L at well 699-24-34A. The general trend for tetrachloroethene concentrations at these two wells has been steady to decreasing since 2001.

3.0 Conclusions

The analytical results during the reporting quarter are typical of earlier results and are consistent with the type of waste disposed in the landfill including sewage material and chlorinated hydrocarbons from either the sewage or the 1100 Area heavy equipment garage and bus shop. Volatile organic compounds such as tetrachloroethene continued decreasing slightly in concentration. Chemical oxygen demand and coliform bacteria continued to be elevated sporadically in response to the sewage disposed at the site. Specific conductance remains steady to slightly decreasing at Solid Waste Landfill wells. Field measurements of pH in downgradient wells continued to be lower than wells upgradient of the site.

4.0 References

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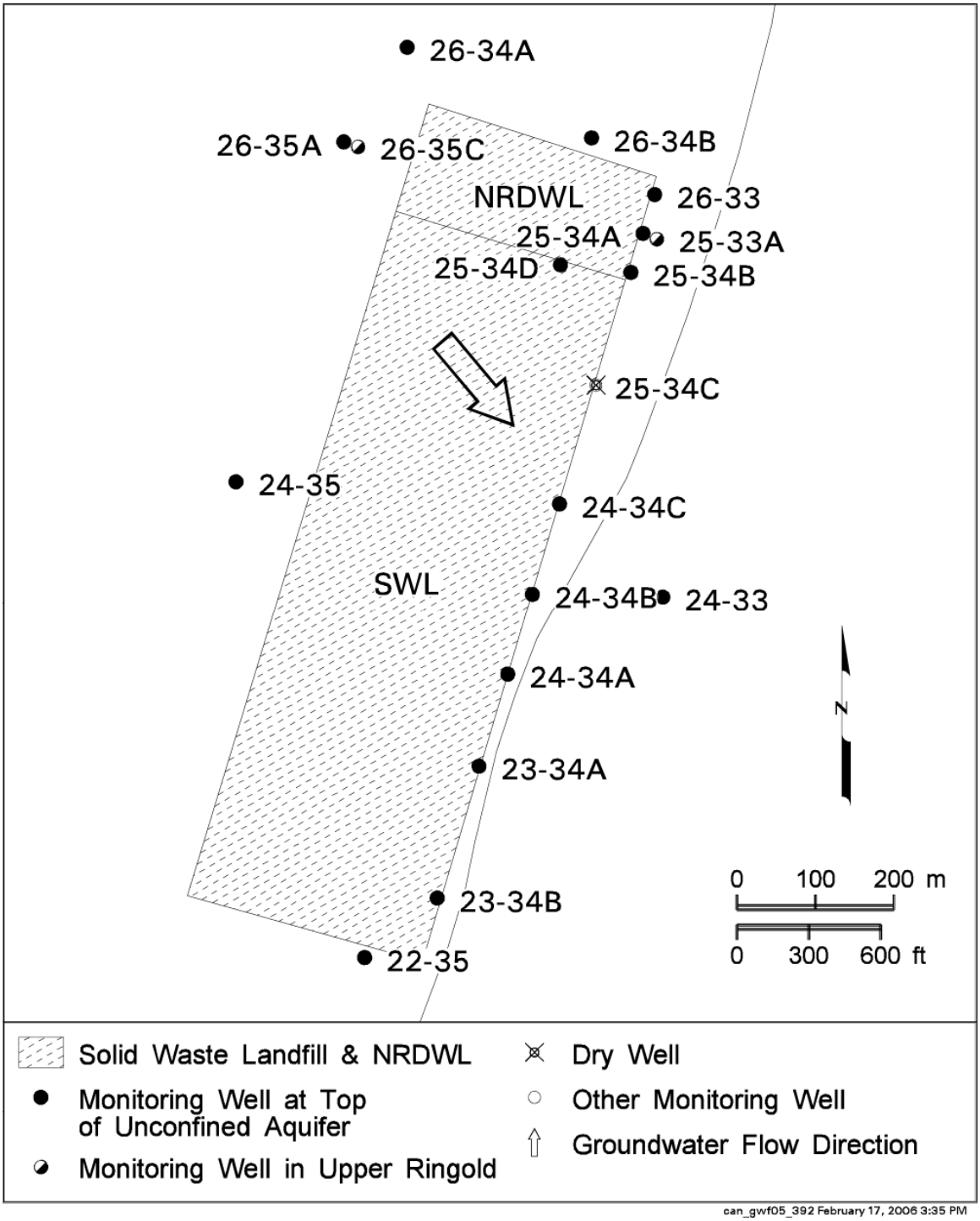

Figure 1. Monitoring Wells at the Solid Waste Landfill and Nonradioactive Dangerous Waste Landfill.

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