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CONTRACT NO. DE-AC05-86OR21548

# QUARTERLY ENVIRONMENTAL DATA SUMMARY - 2ND QUARTER 1992

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

**SEPTEMBER 1992** **REV. 0**

U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

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DOE/OR/21548-337

Weldon Spring Site Remedial Action Project

# Quarterly Environmental Data Summary - Second Quarter 1992

Revision 0

September 1992

Prepared by

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and
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for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

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## ABSTRACT

The purpose of this *Quarterly Environmental Data Summary* is to provide to the public preliminary data acquired as part of the Weldon Spring Site Remedial Action Project (WSSRAP) environmental monitoring program. The document summarizes the preliminary environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1992 annual site environmental report.

This report includes preliminary data from environmental monitoring activities at the Weldon Spring site (WSS) during the second quarter of 1992. Groundwater, surface water, and air samples were collected in order to monitor potential exposure pathways. Analytical parameters included radionuclides, nitroaromatic compounds, inorganic anions, and direct gamma exposure. The results are used to evaluate possible exposure scenarios and assess the impact of the contaminants at the site on potentially exposed populations.

In summary, off-site exposures during the second quarter of 1992 did not differ significantly from exposures calculated in previous quarters. Contaminated groundwater did not affect the St. Charles County well field.

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# 1 INTRODUCTION

This quarterly report summarizes the findings from the routine environmental monitoring programs at the Weldon Spring Site Remedial Action Project (WSSRAP). These reports supplement the annual site environmental report (ASER) by providing interested outside agencies and organizations with more frequent access to WSSRAP data. They provide data resulting from routine environmental sampling as described in the WSSRAP *Environmental Monitoring Plan* (EMP) (MKF and JEG 1992a) and a brief interpretation of that data.

It is the goal of this document to summarize and briefly discuss the data, highlighting data that differ significantly from historical observations. The full interpretation of these data (as well as data in other quarterly summaries) will be undertaken in the 1992 ASER. It is recommended that interested readers refer to previous EMPs, ASERs, and project documents for more information on existing site conditions, site history, transport mechanisms, and quantified contaminant levels. The monitoring scheme for every calendar year is established prior to that year in the annual EMP. Each sampling location to be monitored during the upcoming year is identified in the EMP and the schedule of analytical parameters is tabulated for easy reference. These reports may be obtained by visiting the WSSRAP reading room or contacting the WSSRAP Community Relations Manager at (314) 441-8086.

These quarterly reports are intended to include data from all quarterly environmental monitoring programs conducted at the WSSRAP including groundwater, surface water, National Pollutant Discharge Elimination System (NPDES), radon gas, gamma radiation, and air particulates (including asbestos and radioactive particulates). This document summarizes the preliminary environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1992 annual site environmental report. Because standard turnaround time to receive data from the laboratories is 45 days, not all second quarter data are available for reporting. These data will be reported in the 1992 ASER. Sludges and soils are not sampled on a routine basis; therefore, analytical results for these parameters are not included in this report. Trend analyses are being prepared from historical data for surface water, groundwater, and air pathways. These analyses will be presented in the 1992 ASER. Quality control (QC) data for the second quarter, and all other quarters, will also be presented in the 1992 ASER.

# 2 GROUNDWATER MONITORING

The groundwater is sampled regularly at both the Weldon Spring Chemical Plant/raffinate pits/vicinity properties (WSCP/RP/VP) and the Weldon Spring Quarry (WSQ). Due to differences in the environmental settings and sources of contaminants, separate monitoring schedules are followed. Therefore, results of groundwater monitoring at the WSCP/RP/VP and WSQ will be discussed separately.

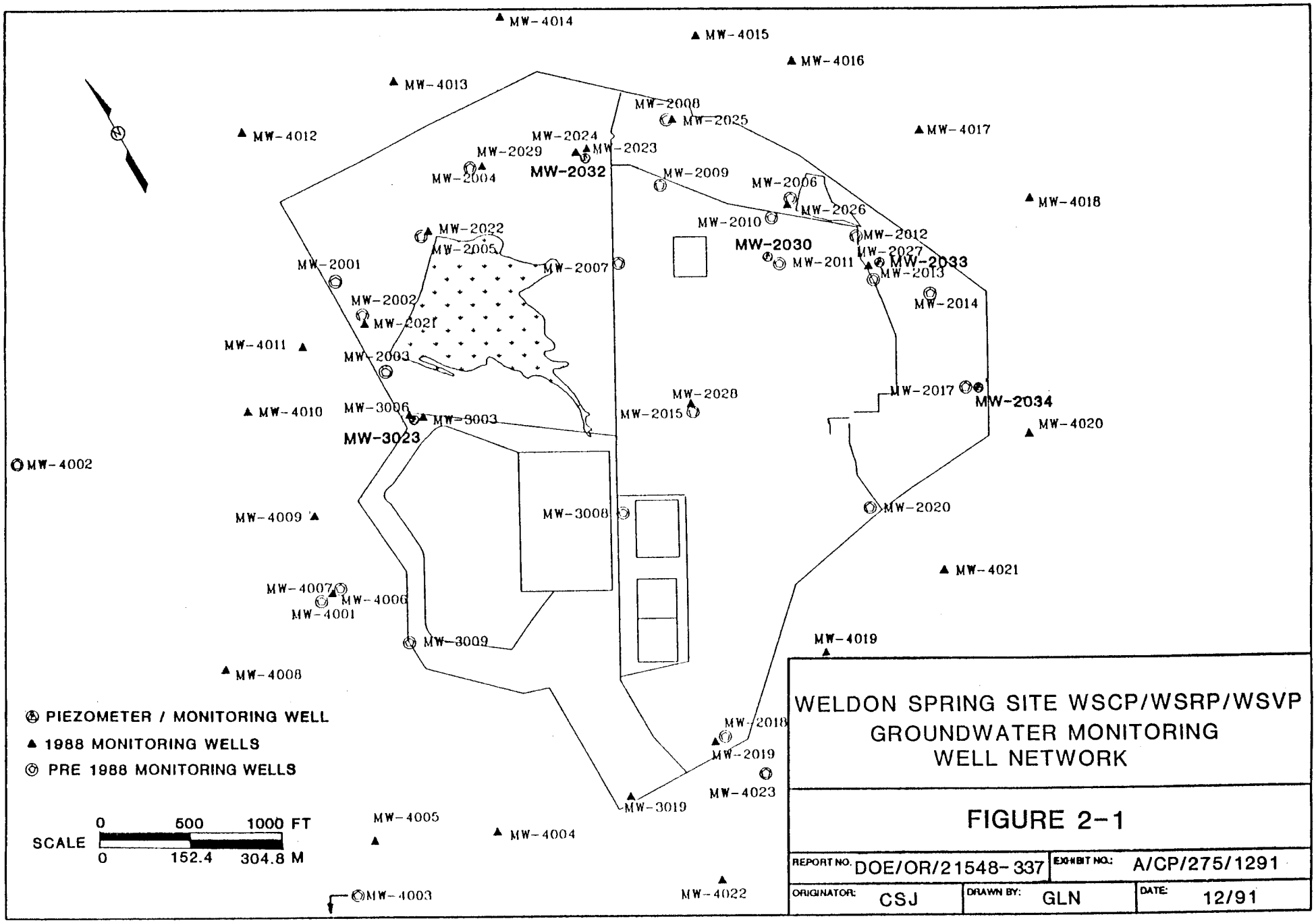
## 2.1 Chemical Plant/Raffinate Pits/Vicinity Properties

Groundwater at the chemical plant/raffinate pits/vicinity properties area is monitored on a quarterly or semiannual basis (specific to each well as prescribed in the 1992 EMP). Locations are given in Figure 2-1. The number of quarterly sampled wells has increased substantially; a complete list of wells scheduled for quarterly and semiannual sampling is given in the 1992 *Environmental Monitoring Plan* (EMP) (MKF and JEG 1992a). Total uranium, inorganic anions, and nitroaromatic compounds are measured during each monitoring period for both quarterly and semiannual wells. Other radiological parameters are measured annually during the first period for all wells. Geochemical parameters (metals and inorganic anions) are measured each period for the quarterly wells only.

### 2.1.1 Nitroaromatic Results

Table 2-1 contains nitroaromatic data from samples collected from the quarterly monitored groundwater wells. Nitroaromatic compounds were detected in 16 of the 32 locations for which data are currently available. Concentration levels for these compounds are within their historical range.

Table 2-2 contains nitroaromatic data from samples collected from the semiannually monitored groundwater wells. Nitroaromatic compounds were detected in 10 of the 19 wells for which data are available. Concentrations for these compounds are within their historical range.




WELDON SPRING SITE WSCP/WSRP/WSVP
GROUNDWATER MONITORING
WELL NETWORK

FIGURE 2-1

| | | | |
|---|---|---|---|
| REPORT NO. DOE/OR/21548-337 | | EXHIBIT NO.: A/CP/275/1291 | |
| ORIGINATOR: CSJ | DRAWN BY: GLN | DATE: 12/91 | |

TABLE 2-1 Second Quarter Nitroaromatic Results for Groundwater at the WSCP/RP/VP

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-2001-Q292 | ND | ND | 0.080 | 0.044 | ND | 0.040 |
| GW-2002-Q292 | ND | ND | 0.052 | 0.30 | ND | ND |
| GW-2003-Q292 | ND | ND | 0.18 | 0.66 | ND | ND |
| GW-2030-Q292 | ND | ND | 0.13 | 5.5 | 8.1 | 4.2 |
| GW-2032-Q292 | ND | ND | 0.12 | 4.0 | 2.2 | 0.30 |
| GW-2033-Q292 | ND | ND | 0.16 | 10 | 1.1 | 2.8 |
| GW-3003-Q292 | ND | ND | 0.031 | 0.079 | ND | ND |
| GW-3006-Q292 | ND | ND | ND | ND | ND | ND |
| GW-3008-Q292 | ND | ND | 0.097 | 0.24 | ND | ND |
| GW-3009-Q292 | ND | ND | 0.19 | 0.091 | ND | 0.17 |
| GW-3023-Q292 | ND | ND | 8.0 | 7.5 | 0.033 | ND |
| GW-4001-Q292 | ND | 0.098 | 3.0 | 5.0 | 1.6 | 65 |
| GW-4002-Q292 | ND | ND | ND | 0.034 | 0.044 | ND |
| GW-4003-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4004-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4005-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4006-Q292 | ND | ND | 0.10 | 3.60 | ND | 17 |
| GW-4007-Q292 | NA | NA | NA | NA | NA | NA |
| GW-4008-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4009-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4010-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4011-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4012-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4013-Q292 | ND | ND | 0.065 | 0.90 | 0.048 | 46 |
| GW-4014-Q292 | ND | ND | ND | 0.031 | ND | 0.23 |
| GW-4015-Q292 | NA | NA | NA | NA | NA | NA |
| GW-4016-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4017-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4018-Q292 | ND | ND | ND | ND | ND | ND |

TABLE 2-1 Second Quarter Nitroaromatic Results for Groundwater at the WSCP/RP/VP (Continued)

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-4019-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4020-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4021-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4022-Q292 | ND | ND | ND | ND | ND | ND |
| GW-4023-Q292 | ND | ND | 0.067 | 0.052 | ND | 0.17 |

NA - Not Available
ND - Not Detected

TABLE 2-2 Semiannual Nitroaromatic Results for Groundwater at the WSCP/RP/VP

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-2004-042392 | ND | ND | ND | ND | ND | ND |
| GW-2005-012392 | ND | ND | 0.076 | 0.12 | ND | ND |
| GW-2006-011692 | ND | ND | 0.14 | 1.20 | ND | 10.0 |
| GW-2007-011392 | ND | ND | ND | ND | ND | ND |
| GW-2008-S192 | ND | ND | 0.071 | 0.86 | ND | 0.41 |
| GW-2009-S192 | ND | ND | 0.070 | 0.270 | ND | ND |
| GW-2010-011692 | ND | ND | 0.080 | 0.47 | 0.28 | 0.14 |
| GW-2011-042292 | 0.040 | ND | 0.092 | 2.3 | ND | 0.76 |
| GW-2012-042292 | ND | ND | 0.081 | 1.1 | 0.64 | 2.0 |
| GW-2013-012392 | ND | ND | 0.26 | 5.80 | 0.58 | 3.80 |
| GW-2014-S192 | ND | ND | 0.13 | 0.98 | ND | 3.6 |
| GW-2015-011392 | ND | ND | ND | ND | ND | ND |
| GW-2017-S192 | ND | ND | ND | ND | ND | ND |
| GW-2018-S192 | ND | ND | ND | ND | ND | ND |
| GW-2019-S192 | ND | ND | ND | ND | ND | ND |
| GW-2020-S192 | ND | ND | 0.038 | ND | ND | ND |
| GW-2021-062392 | NA | NA | NA | NA | NA | NA |
| GW-2022-062392 | NA | NA | NA | NA | NA | NA |
| GW-2023-062392 | NA | NA | NA | NA | NA | NA |
| GW-2024-062392 | NA | NA | NA | NA | NA | NA |
| GW-2025-062992 | NA | NA | NA | NA | NA | NA |
| GW-2026-062292 | NA | NA | NA | NA | NA | NA |
| GW-2027-062292 | NA | NA | NA | NA | NA | NA |
| GW-2028-062292 | NA | NA | NA | NA | NA | NA |
| GW-2029-S192 | ND | ND | ND | ND | ND | ND |
| GW-2034-S192 | ND | ND | ND | ND | ND | ND |
| GW-3019-012392 | ND | ND | ND | ND | ND | ND |

NA - Not Available
ND - Not Detected

### 2.1.2 Radiological Results

Total uranium results for samples from the quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-3. The upper bound for natural uranium background concentration in groundwater at the WSCP/RP/VP has been determined to be 3.4 pCi/l (0.13 Bq/l) (MKF and JEG 1989). The U.S. Environmental Protection Agency (EPA) has not yet established a drinking water standard for uranium; however, the proposed maximum contaminant level (MCL) is 20 $\mu$g/l, which converts to 13.6 pCi/l (0.50 Bq/l) using a new site-specific conversion factor of 0.68 pCi/$\mu$g (assuming isotopic equilibrum). The increase to 13.6 pCi/l (0.50 Bq/l) from the previously reported value of 12 pCi/l (0.44 Bq/l) reflects improved quantification of the average U-234/U-238 activity ratios for uranium present at the Weldon Spring Site Remedial Action Project (WSSRAP). The U.S. Department of Energy (DOE) has a health-based, derived concentration guideline (DCG) of 600 pCi/l (22.2 Bq/l) in surface water effluent.

Uranium concentrations remained within historical ranges at most locations for which data are presently available. A higher than previously detected value was recorded for MW-2030. This higher value was only slightly elevated above previously high levels, and may be related to higher values for certain metals (see discussion in Section 2.1.4). At present, insufficient data are available to determine whether this value is part of an upward trend or merely an extreme within the normal range of variation for this well.

Table 2-4 contains uranium data from samples collected from the semiannually monitored groundwater wells. Uranium concentrations in these wells are within their historical range.

Additional radiological parameters are measured for groundwater at all WSCP/RP/VP wells during the second quarter. The results of these analyses are given in Table 2-5. Historically, concentration levels for these parameters have been below the detection limits. In general, the increase in detectable values for 1992 predominantly reflects improved analytical sensitivity rather than high concentration levels for these parameters; exceptions are Th-230 and both radium isotopes. The elevated Th-230 values are thought to be an artifact of analytical interferences. The source of the slightly higher radium concentrations is unclear and is currently under investigation. All locations having apparently elevated Th-230, Ra-226, or Ra-228 values have been scheduled for resampling during the third quarter to confirm these results.

TABLE 2-3 Second Quarter Uranium and Inorganic Anion Results for Groundwater at the WSCP/RP/VP

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| GW-2001-Q292 | 22.0 | 8.09 | 0.82 |
| GW-2002-Q292 | 181 | 89.8 | ND |
| GW-2003-Q292 | 266 | 106 | 1.2 |
| GW-2030-Q292 | 1.20 | 41.6 | 16 |
| GW-2032-Q292 | 86.0 | 53.2 | 9.9 |
| GW-2033-Q292 | 0.96 | 24.2 | 1.0 |
| GW-3003-Q292 | 252 | 181 | 2.3 |
| GW-3006-Q292 | 0.44 | 22.0 | 1.4 |
| GW-3008-Q292 | 644 | 77.2 | 3.40 |
| GW-3009-Q292 | 3250 | 85.3 | 59.0 |
| GW-3023-Q292 | 316 | 343 | NA |
| GW-4001-Q292 | ND | 67.3 | 1.4 |
| GW-4002-Q292 | 0.98 | 15.4 | 1.4 |
| GW-4003-Q292 | 0.60 | 33.6 | NA |
| GW-4004-Q292 | 1.00 | 19.7 | NA |
| GW-4005-Q292 | 2.00 | 24.7 | NA |
| GW-4006-Q292 | 4.20 | 28.0 | ND |
| GW-4007-Q292 | 0.98 | 12.9 | 1.5 |
| GW-4008-Q292 | 0.17 | 14.0 | 1.10 |
| GW-4009-Q292 | 0.19 | 13.9 | 3.30 |
| GW-4010-Q292 | 0.13 | 22.0 | 3.40 |
| GW-4011-Q292 | 37.1 | 53.8 | 4.50 |
| GW-4012-Q292 | 1180 | 47.9 | 2.90 |
| GW-4013-Q292 | 85.6 | 45.1 | 1.10 |
| GW-4014-Q292 | 1.10 | 25.5 | ND |
| GW-4015-Q292 | 2.90 | 16.9 | NA |
| GW-4016-Q292 | ND | 14.9 | NA |
| GW-4017-Q292 | 0.45 | 6.20 | NA |

TABLE 2-3 Second Quarter Uranium and Inorganic Anion Results for Groundwater at the WSCP/RP/VP (Continued)

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| GW-4018-Q292 | 2.00 | 6.70 | ND |
| GW-4019-Q292 | 0.40 | 6.40 | NA |
| GW-4020-Q292 | 0.34 | 134 | 14.0 |
| GW-4021-Q292 | ND | 255 | 4.10 |
| GW-4022-Q292 | 0.41 | 29.0 | NA |
| GW-4023-Q292 | 3.60 | 68.5 | 1.10 |

ND - Not Detected
NA - Not Available

TABLE 2-4 Semiannual Uranium and Inorganic Anion Results for Groundwater at the WSCP/RP/VP

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| GW-2004-042392 | 0.78 | 1.80 | 0.3 |
| GW-2005-012392 | 69.8 | 26.4 | ND |
| GW-2006-011692 | 6.20 | 34.8 | ND |
| GW-2007-011392 | 0.20 | 15.3 | 0.605 |
| GW-2008-S192 | 3.29 | 40.0 | ND |
| GW-2009-S192 | 1.60 | 105 | 2.10 |
| GW-2010-011692 | 1.30 | 32.5 | ND |
| GW-2011-042292 | 5.50 | 12.8 | 0.4 |
| GW-2012-042292 | 0.71 | 78.1 | 0.3 |
| GW-2013-012392 | 1.10 | 15.3 | ND |
| GW-2014-S192 | 1.00 | 33.6 | 0.2 |
| GW-2015-011392 | 0.52 | 96.2 | 1.30 |
| GW-2017-S192 | 0.11 | 754 | 5.3 |
| GW-2018-S192 | 0.24 | 9.19 | NA |
| GW-2019-S192 | ND | 42.4 | NA |
| GW-2020-S192 | 0.52 | 130 | NA |
| GW-2021-S192 | 0.20 | 13.0 | ND |
| GW-2022-S192 | 0.25 | 14.2 | ND |
| GW-2023-S192 | 0.46 | 15.5 | ND |
| GW-2024-S192 | 0.22 | 30.0 | ND |
| GW-2025-062992 | NA | NA | NA |
| GW-2026-S192 | ND | 14.4 | ND |
| GW-2027-S192 | ND | 7.40 | 2.5 |
| GW-2028-S192 | ND | 121 | ND |
| GW-2029-S192 | 0.12 | 23.4 | 2.2 |
| GW-2034-S192 | 0.18 | 623 | 9.6 |
| GW-3019-012392 | ND | 7.00 | ND |

ND - Not Detected
NA - Not Available

TABLE 2-5 Semiannual Radiological Results for Groundwater at the WSCP/RP/VP

| Sample ID | Th-228 (pCi/l) | Th-230 (pCi/l) | Th-232 (pCi/l) | Ra-226 (pCi/l) | Ra-228 (pCi/l) | Po-210 (pCi/l) | Pb-210 (pCi/l) | Ac-227 (pCi/l) |
|---|---|---|---|---|---|---|---|---|
| GW-2004-042392 | ND | 0.6 | ND | 0.2 | ND | NS | NS | NS |
| GW-2005-012392 | NA | NA | NA | NA | NA | NA | NA | NA |
| GW-2006-011692 | ND | 3.07 | ND | ND | 17.1 | ND | ND | ND |
| GW-2007-011392 | ND | 4.87 | ND | ND | ND | ND | ND | ND |
| GW-2008-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2009-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2010-011692 | ND | 4.90 | ND | ND | ND | 5.17 | ND | ND |
| GW-2011-042292 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2012-042292 | ND | 0.2 | ND | ND | ND | NS | NS | NS |
| GW-2013-012392 | ND | 2.89 | ND | ND | ND | ND | ND | ND |
| GW-2014-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2015-011392 | ND | 1.75 | ND | ND | ND | ND | ND | ND |
| GW-2017-S192 | ND | ND | ND | 0.2 | ND | NS | NS | NS |
| GW-2018-S192 | NA | NA | NA | NA | NA | NA | NA | NA |
| GW-2019-S192 | NA | NA | NA | NA | NA | NA | NA | NA |
| GW-2020-S192 | NA | NA | NA | NA | NA | NA | NA | NA |
| GW-2021-S192 | ND | 1.15 | ND | ND | ND | NS | NS | NS |
| GW-2022-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2023-S192 | ND | 1.99 | 0.302 | ND | ND | NS | NS | NS |
| GW-2024-S192 | ND | ND | 0.666 | ND | ND | NS | NS | NS |
| GW-2025-062992 | NA | NA | NA | NA | NA | NA | NA | NA |
| GW-2026-S192 | 0.819 | 2.18 | 1.23 | ND | ND | NS | NS | NS |
| GW-2027-S192 | 0.297 | 0.779 | 0.223 | ND | ND | NS | NS | NS |
| GW-2028-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2029-S192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-2034-051192 | ND | ND | ND | ND | ND | NS | NS | NS |
| GW-3019-012392 | ND | 3.50 | ND | ND | ND | ND | ND | ND |

ND - Not Detected
NA - Not Available
NS - Not Sampled

### 2.1.3 Sulfate and Nitrate Results

Sulfate and nitrate concentrations are measured during each monitoring period. Results from the quarterly monitored wells are shown in Table 2-3. Second quarter results are within historical ranges with the exception of the nitrate value for MW-4012. The source of this elevation is being investigated. Sulfate and nitrate results from semiannually monitored wells are shown in Table 2-4. These concentrations are within their historical range.

### 2.1.4 Geochemical Results: Metals and Inorganic Anions

Table 2-6 contains the second quarter geochemical data (metals and inorganic anions) for quarterly monitored wells at the WSCP/RP/VP area. In 1992, the WSSRAP increased both the number of wells and the frequency of sampling for geochemical parameters. For the majority of the wells, concentrations for the second quarter of 1992 are consistent with previously measured values. However, notable exceptions were observed for the MW-203X wells, MW-3023, MW-4017, and MW-4022; which contained high levels of aluminum, iron, manganese, and moderately elevated lead. These wells were filtered before preservation and analysis. The failure to filter these samples resulted in metals being leached from the suspended solid material upon preservation. This leaching may also be responsible for the high uranium observed in MW-2030. Future samples from these wells will be filtered prior to preservation.

## 2.2 Weldon Spring Quarry

Groundwater at the WSQ has become radiologically and chemically contaminated as a result of contact with, or migration from, wastes present in the WSQ. Monitoring of the groundwater at, and near, the WSQ is of particular concern because of the proximity of the St. Charles County well field. The well field is located approximately 0.8 km (0.5 mi) to the south of the WSQ. Monitoring of contaminants in groundwater and the protection of the well field is a top priority at the WSSRAP.

Groundwater is currently being monitored at 48 wells located in and around the quarry area. Thirty-six monitoring wells installed by the DOE are currently utilized in or near the quarry. Four monitoring wells were installed by St. Charles County in 1986 and are currently included in the DOE's monitoring program. Eight St. Charles County municipal wells, and the treated and untreated water from the St. Charles County water treatment plant, are also

TABLE 2-6 Quarterly Geochemical Results for Groundwater at the WSCP/RP/VP

| Sample ID | Arsenic (µg/l) | Barium (µg/l) | Calcium (µg/l) | Chromium (µg/l) | Iron (µg/l) | Lithium (µg/l) | Magnesium (µg/l) | Manganese (µg/l) | Nickel (µg/l) | Lead (µg/l) | Silver (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GW-2001-Q292 | ND | 233 | 93800 | ND | ND | ND | 45400 | ND | ND | ND | ND |
| GW-2002-Q292 | ND | 148 | 218000 | ND | ND | 303 | 63100 | ND | ND | ND | ND |
| GW-2003-Q292 | ND | 175 | 279000 | ND | ND | 480 | 107000 | ND | ND | ND | ND |
| GW-2030-Q292 | ND | 187 | 123000 | ND | 1420 | ND | 20100 | 47.4 | ND | 8.59 | ND |
| GW-2032-Q292 | ND | 440 | 188000 | 11.1 | 13500 | 35.4 | 54200 | 814 | 27.6 | 18.8 | ND |
| GW-2033-Q292 | ND | 172 | 238000 | ND | 3830 | ND | 18900 | 304 | ND | 26.0 | ND |
| GW-3003-Q292 | ND | 140 | 221000 | ND | ND | 465 | 130000 | 3.29 | ND | ND | ND |
| GW-3006-Q292 | 2.60 | 134 | 61100 | ND | 123 | ND | 49400 | 34.4 | ND | ND | ND |
| GW-3008-Q292 | ND | 214 | 503000 | ND | ND | 246 | 145000 | ND | ND | 3.20 | ND |
| GW-3009-Q292 | ND | 856 | 104000 | ND | 19.4 | ND | 62500 | 8.90 | 44.8 | ND | ND |
| GW-3023-Q292 | ND | 86.5 | 329000 | ND | 1530 | 794 | 75100 | 32.0 | ND | 12.0 | ND |
| GW-4001-Q292 | ND | 90.4 | 90600 | ND | ND | ND | 33700 | 2.29 | ND | ND | ND |
| GW-4002-Q292 | ND | 118 | 45600 | ND | 42.5 | ND | 31800 | 3.39 | ND | ND | ND |
| GW-4003-Q292 | ND | 163 | 50700 | ND | ND | ND | 30700 | 2.00 | ND | 2.50 | ND |
| GW-4004-Q292 | ND | 83.3 | 30200 | ND | ND | ND | 28000 | ND | ND | ND | ND |
| GW-4005-Q292 | ND | 130 | 64600 | ND | ND | 30.5 | 40200 | ND | ND | ND | ND |
| GW-4006-Q292 | ND | 161 | 46300 | ND | ND | ND | 20600 | ND | ND | ND | ND |
| GW-4007-Q292 | ND | 91.0 | 32000 | ND | ND | ND | 22200 | 52.3 | ND | 3.70 | ND |
| GW-4008-Q292 | ND | 105 | 37800 | ND | ND | ND | 31800 | 16.9 | ND | ND | ND |

TABLE 2-6 Quarterly Geochemical Results for Groundwater at the WSCP/RP/VP (Continued)

| Sample ID | Arsenic (µg/l) | Barium (µg/l) | Calcium (µg/l) | Chromium (µg/l) | Iron (µg/l) | Lithium (µg/l) | Magnesium (µg/l) | Manganese (µg/l) | Nickel (µg/l) | Lead (µg/l) | Silver (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GW-4009-Q292 | ND | 53.5 | 32400 | ND | ND | 38.2 | 21100 | ND | ND | ND | ND |
| GW-4010-Q292 | ND | 74.1 | 50900 | ND | 40.5 | ND | 37000 | ND | ND | 12.8 | ND |
| GW-4011-Q292 | 2.00 | 88.5 | 46600 | ND | ND | ND | 27100 | 2.00 | ND | ND | ND |
| GW-4012-Q292 | ND | 53.9 | 32100 | 54.4 | 22.2 | 42.4 | 33800 | ND | ND | ND | ND |
| GW-4013-Q292 | ND | 136 | 134000 | ND | ND | 51.4 | 48600 | ND | ND | ND | ND |
| GW-4014-Q292 | ND | 102 | 57700 | ND | 66.3 | ND | 40900 | 39.8 | ND | ND | ND |
| GW-4015-Q292 | ND | 221 | 55900 | ND | ND | 35.4 | 28500 | ND | ND | ND | ND |
| GW-4016-Q292 | ND | 269 | 46000 | ND | ND | ND | 31100 | 75.8 | ND | ND | ND |
| GW-4017-Q292 | ND | 179 | 58800 | 13.2 | 1200 | ND | 38100 | 93.6 | ND | 18.3 | ND |
| GW-4018-Q292 | ND | 225 | 106000 | ND | ND | ND | 58800 | ND | ND | 6.79 | ND |
| GW-4019-Q292 | ND | 206 | 36800 | ND | ND | ND | 42600 | ND | ND | ND | ND |
| GW-4020-Q292 | ND | 89.1 | 94000 | 15.8 | ND | ND | 58400 | 110 | ND | 2.50 | ND |
| GW-4021-Q292 | ND | 38.3 | 121000 | ND | 21.7 | ND | 117000 | 10.6 | ND | ND | ND |
| GW-4022-Q292 | 4.00 | 344 | 96400 | 87.8 | 42400 | 32.9 | 46400 | 1540 | 151 | 40.0 | 9.10 |
| GW-4023-Q292 | ND | 82.4 | 86500 | ND | ND | ND | 35800 | ND | ND | ND | ND |

TABLE 2-6 Quarterly Geochemical Results for Groundwater at the WSCP/RP/VP (Continued)

| Sample ID | Potassium (µg/l) | Sodium (µg/l) | Strontium (µg/l) | Nitrite (mg/l) | Bromide (mg/l) | Chloride (mg/l) | Phosphorus Total (mg/l) | Silica, Dissolved (mg/l) | Alkalinity (mg/l) | Aluminum (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|
| GW-2001-Q292 | 1080 | 9370 | 1080 | ND | ND | 5.50 | 0.07 | 7.70 | 280 | ND |
| GW-2002-Q292 | 6000 | 81800 | 287 | ND | ND | 7.90 | 0.05 | 16.0 | 310 | ND |
| GW-2003-Q292 | 6710 | 121000 | 533 | ND | ND | 9.19 | 0.03 | 11.0 | 265 | ND |
| GW-2030-Q292 | 4040 | 46000 | 172 | ND | ND | 30.7 | 0.10 | 10.7 | 470 | 650 |
| GW-2032-Q292 | 3640 | 62700 | 352 | 0.12 | ND | 16.2 | 0.46 | 11.1 | 410 | 6050 |
| GW-2033-Q292 | 2510 | 83300 | 178 | ND | 0.42 | 5.40 | 0.36 | 14.0 | 540 | 1130 |
| GW-3003-Q292 | 9060 | 145000 | 575 | ND | ND | 10.1 | 0.10 | 10.3 | 334 | ND |
| GW-3006-Q292 | ND | 17500 | 219 | ND | ND | 1.30 | 0.14 | 11.9 | 392 | ND |
| GW-3008-Q292 | 2680 | 210000 | 1400 | ND | ND | 17.6 | ND | 10.1 | 200 | ND |
| GW-3009-Q292 | 1870 | 24800 | 214 | 0.34 | ND | 4.50 | 0.04 | 10.0 | 190 | ND |
| GW-3023-Q292 | 3510 | 214000 | 615 | 0.89 | ND | 17.7 | 0.13 | 11.8 | 260 | 674 |
| GW-4001-Q292 | ND | 23300 | 90.1 | ND | 2.50 | 7.09 | 0.08 | 11.6 | 220 | ND |
| GW-4002-Q292 | ND | 4890 | 82.9 | ND | ND | 1.30 | 0.17 | 9.00 | 226 | ND |
| GW-4003-Q292 | 941 | 7950 | 94.2 | ND | ND | 6.09 | 0.10 | 10.1 | 270 | ND |
| GW-4004-Q292 | ND | 6670 | 79.0 | ND | ND | 3.39 | 0.11 | 4.40 | 180 | ND |
| GW-4005-Q292 | 6430 | 62200 | 308 | ND | 1.60 | 7.70 | 0.08 | 7.30 | 210 | ND |
| GW-4006-Q292 | ND | 6990 | 60.9 | ND | 0.57 | 2.00 | 0.23 | 9.50 | 170 | ND |
| GW-4007-Q292 | 1500 | 15200 | 91.5 | 0.01 | ND | 0.88 | 0.11 | 9.80 | 200 | ND |
| GW-4008-Q292 | ND | 3330 | 104 | ND | ND | 0.98 | 0.05 | 8.30 | 225 | ND |

TABLE 2-6 Quarterly Geochemical Results for Groundwater at the WSCP/RP/VP (Continued)

| Sample ID | Potassium (µg/l) | Sodium (µg/l) | Strontium (µg/l) | Nitrite (mg/l) | Bromide (mg/l) | Chloride (mg/l) | Phosphorus Total (mg/l) | Silica, Dissolved (mg/l) | Alkalinity (mg/l) | Aluminum (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|
| GW-4009-Q292 | 27300 | 18400 | 146 | ND | ND | 0.84 | 0.16 | 9.50 | 230 | ND |
| GW-4010-Q292 | 1510 | 11400 | 137 | ND | 0.98 | 2.40 | 0.07 | 10.6 | 295 | ND |
| GW-4011-Q292 | 1290 | 7490 | 139 | ND | ND | 5.90 | 0.30 | 12.8 | 270 | ND |
| GW-4012-Q292 | 41300 | 44600 | 107 | ND | ND | 10.0 | 0.08 | 10.7 | 300 | ND |
| GW-4013-Q292 | 6630 | 33000 | 145 | ND | ND | 6.50 | 0.06 | 10.8 | 300 | ND |
| GW-4014-Q292 | 1620 | 6050 | 150 | ND | ND | 2.60 | ND | 10.0 | 285 | ND |
| GW-4015-Q292 | 1470 | 7680 | 64.6 | ND | ND | ND | 0.06 | 10.0 | 250 | ND |
| GW-4016-Q292 | 1500 | 8680 | 96.5 | ND | ND | 1.10 | 0.05 | 10.4 | 230 | ND |
| GW-4017-Q292 | 3210 | 10300 | 119 | ND | ND | 1.60 | 0.14 | 10.9 | 340 | 235 |
| GW-4018-Q292 | 3280 | 8870 | 119 | ND | ND | 16.7 | 0.03 | 9.50 | 430 | ND |
| GW-4019-Q292 | 947 | 8770 | 180 | ND | 1.39 | 2.50 | ND | 9.09 | 280 | ND |
| GW-4020-Q292 | 5780 | 23600 | 217 | ND | 1.39 | 15.9 | 0.07 | 10.3 | 390 | ND |
| GW-4021-Q292 | 1130 | 15300 | 219 | ND | ND | 1.20 | 0.04 | 9.00 | 510 | ND |
| GW-4022-Q292 | 3120 | 11800 | 284 | ND | ND | 5.29 | 0.89 | 13.3 | 380 | 26000 |
| GW-4023-Q292 | ND | 55300 | 153 | ND | 0.64 | 12.4 | 0.02 | 15.7 | 400 | ND |

ND - Not Detected

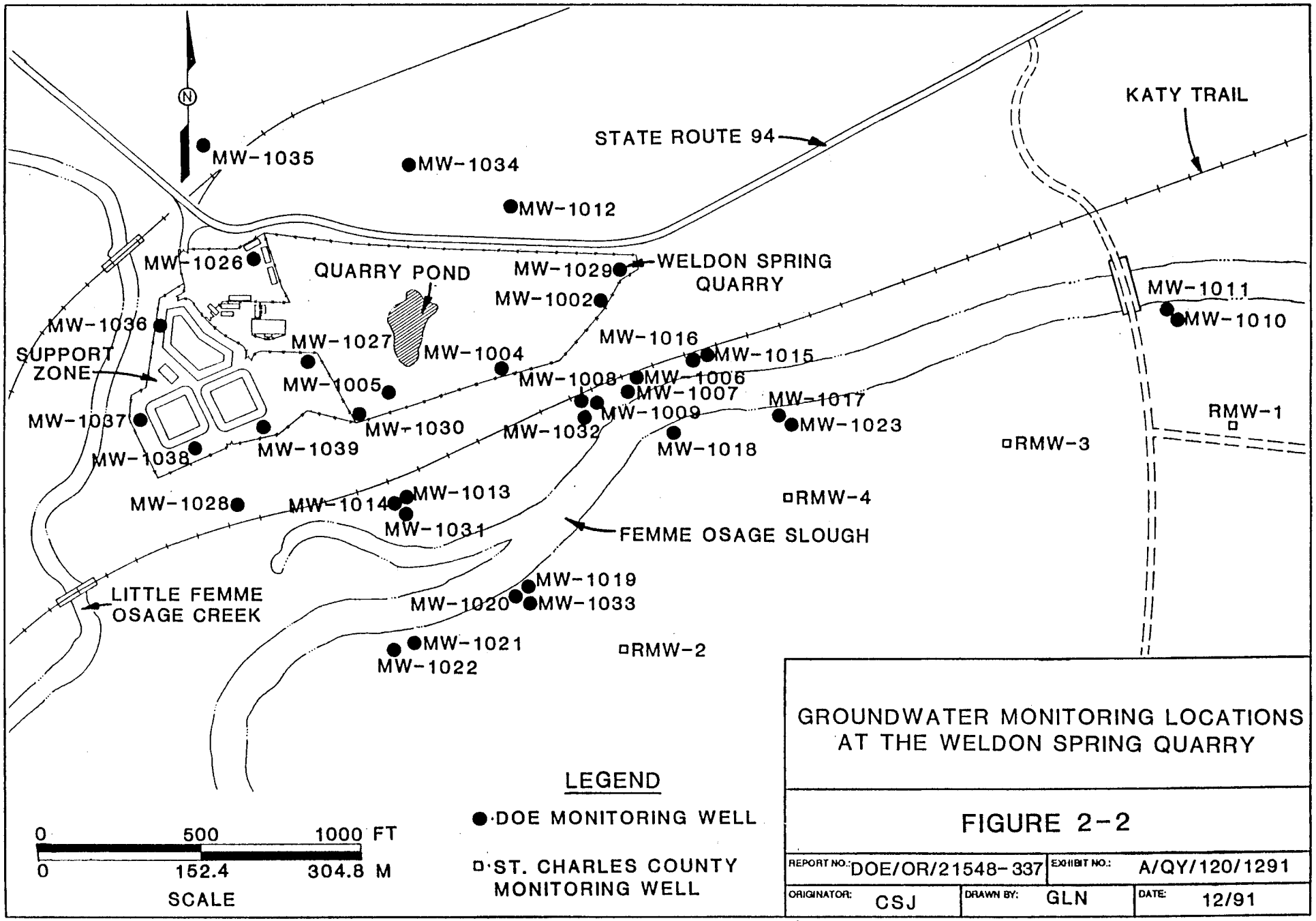
monitored for the presence of these contaminants. All monitoring well locations are shown in Figures 2-2 and 2-3. These wells monitor groundwater in both the bedrock and alluvial aquifers associated with the WSQ.

Two separate groundwater monitoring programs have been developed for the WSQ area. The first program is a bimonthly sampling of all wells north of the Femme Osage Slough and MW-1010 and MW-1011 located south of the slough. In addition, wells MW-1035, MW-1036, MW-1037, MW-1038, and MW-1039 will be sampled bimonthly until operation of the Weldon Spring Quarry water treatment plant is initiated. The second program is the quarterly sampling of all wells south of the Femme Osage Slough, excluding MW-1010 and MW-1011, but including the St. Charles County well field. Both the raw and treated waters from the St. Charles County water treatment plant are sampled quarterly.

### 2.2.1 Radiological Results

Radiological data are presented in Tables 2-7 through 2-9 for samples collected for the second and third bimonthly periods and second quarter. The results show typical fluctuations near the average levels in the WSQ area with the exception of MW-1007 and MW-1032. The uranium concentrations in MW-1007 exceeded the historic average and validation has been requested to determine whether this is a real value for uranium at this location. Results for the third bimonthly period returned to within historic ranges for this sampling location. The uranium concentration in MW-1032 exceeded the historic average and continued monitoring will be performed to determine whether this is a trend. Detectable concentrations of uranium were indicated from RMW-series wells and the St. Charles County production wells. These levels are within historic averages and representative of background levels.

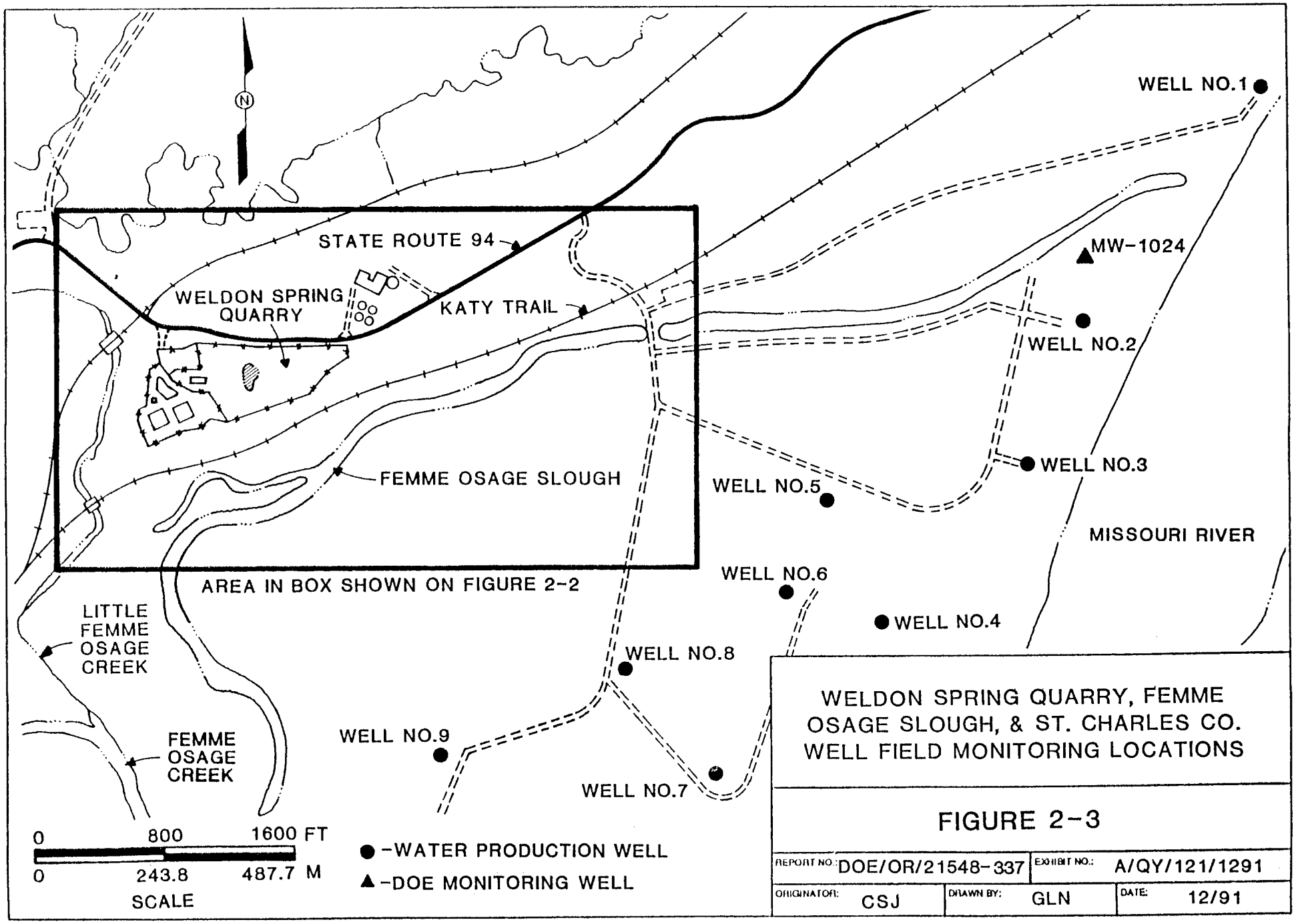
The monitoring wells north of the Femme Osage Slough are sampled annually for the radiological species of radium, thorium, gross alpha, and gross beta. The results of these samples analyses are presented in Table 2-10. Calendar year 1992 is the first routine sampling of these wells for radiological species other than urnaium since 1989. Wells within the WSQ boundary show elevated levels of both gross alpha and gross beta, and are consistent with the quarry pond (SW-1008) concentrations which are the source of impact. Monitoring wells MW-1013 through MW-1016, located south of the quarry, also show elevated levels. The concentrations in the remainder of the wells are consistent with background values of waters in or near the WSQ.




GROUNDWATER MONITORING LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 2-2

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/QY/120/1291 | |
| ORIGINATOR: CSJ | DRAWN BY: GLN | DATE: 12/91 | |




WELDON SPRING QUARRY, FEMME OSAGE SLOUGH, & ST. CHARLES CO. WELL FIELD MONITORING LOCATIONS

FIGURE 2-3

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/QY/121/1291 | |
| ORIGINATOR: CSJ | DRAWN BY: GLN | DATE: 12/91 | |

TABLE 2-7 Second Bimonthly (March/April) Uranium and Inorganic Anion Results for Groundwater at the WSQ

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| GW-1002-B292 | 1.60 | 67.4 | 1.2 |
| GW-1004-B292 | 0.11 | 296 | 5300 |
| GW-1005-B292 | ND | 140 | 1900 |
| GW-1006-B292 | 0.28 | 146 | 3200 |
| GW-1007-B292 | ND | 307 | 1700 |
| GW-1008-B292 | 0.310 | 216 | 5600 |
| GW-1009-B292 | ND | 288 | 4.4 |
| GW-1010-B292 | 0.010 | ND | 3.54 |
| GW-1011-B292 | ND | 30.6 | 11 |
| GW-1012-B292 | 0.68 | 179 | 2.7 |
| GW-1013-B292 | 0.14 | 103 | 800 |
| GW-1014-B292 | ND | 114 | 920 |
| GW-1015-B292 | 1.50 | 313 | 1400 |
| GW-1016-B292 | 0.93 | 266 | 640 |
| GW-1026-B292 | 0.140 | 0.670 | 0.68 |
| GW-1027-B292 | 0.280 | 89.3 | 619 |
| GW-1028-B292 | ND | 70.4 | 0.3 |
| GW-1029-B292 | ND | 77.4 | 2.2 |
| GW-1030-B292 | ND | 96.9 | 11 |
| GW-1031-B292 | ND | 41.5 | 17 |
| GW-1032-B292 | ND | 258 | 1300 |
| GW-1034-B292 | ND | 86.9 | 1.6 |
| GW-1035-B292 | 0.27 | 38.8 | 2.4 |
| GW-1036-B292 | 0.10 | 58.6 | 8.5 |
| GW-1037-B292 | 0.14 | 10.5 | 2.8 |
| GW-1038-B292 | ND | 47.1 | 2.8 |
| GW-1039-B292 | ND | 61.5 | 4.3 |

ND - Not Detected
NA - Not Available

TABLE 2-8 Third Bimonthly (May/June) Uranium and Inorganic Anion Results for Groundwater at the WSQ

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| GW-1002-B392 | 2.10 | 77.2 | 2.0 |
| GW-1004-B392 | 0.38 | 430 | 5900 |
| GW-1005-B392 | ND | 143 | 1600 |
| GW-1006-B392 | NA | NA | 3500 |
| GW-1007-B392 | NA | NA | 400 |
| GW-1008-B392 | ND | 252 | 4100 |
| GW-1009-B392 | ND | 289 | 4.7 |
| GW-1010-B392 | ND | ND | ND |
| GW-1011-B392 | ND | 39 | 17.0 |
| GW-1012-B392 | 0.84 | 58.4 | 3.1 |
| GW-1013-B392 | NA | NA | 880 |
| GW-1014-B392 | NA | NA | 1100 |
| GW-1015-B392 | 1.00 | 346 | 1500 |
| GW-1016-B392 | 0.57 | 246 | 670 |
| GW-1026-B392 | ND | 1.00 | 0.5 |
| GW-1027-B392 | 0.31 | 99.4 | 640 |
| GW-1028-B392 | NA | NA | ND |
| GW-1029-B392 | 0.42 | 75.7 | 2.1 |
| GW-1030-B392 | 8.19 | 98.7 | 6.0 |
| GW-1031-B392 | NA | NA | 28 |
| GW-1032-B392 | ND | 272 | 1700 |
| GW-1034-B392 | 1.10 | 79.1 | 1.6 |
| GW-1035-B392 | 0.10 | 39.1 | 0.3 |
| GW-1036-B392 | 0.17 | 52.6 | 5.1 |
| GW-1037-B392 | 0.10 | 9.80 | 0.68 |
| GW-1038-B392 | ND | 45.6 | 2.7 |
| GW-1039-B392 | 0.13 | 49.0 | 0.68 |

ND - Not Detected
NA - Not Available

TABLE 2-9 Second Quarter Uranium, Gross Alpha and Inorganic Anion Results for Groundwater at the WSQ

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) | Gross Alpha (pCi/l) |
|---|---|---|---|---|
| GW-1017-Q292 | ND | 0.60 | ND | NR |
| GW-1018-Q292 | ND | 50.7 | 0.2 | NR |
| GW-1019-Q292 | ND | 1.10 | ND | NR |
| GW-1020-Q292 | ND | 43.9 | 0.2 | NR |
| GW-1021-Q292 | ND | ND | 1.4 | NR |
| GW-1022-Q292 | ND | ND | 1.2 | NR |
| GW-1023-Q292 | ND | 9.30 | 0.3 | NR |
| GW-1024-Q292 | ND | ND | ND | 18 |
| GW-1033-Q292 | ND | 10.0 | 2.1 | NR |
| GW-RMW1-Q292 | ND | 23.0 | 0.68 | 3.3 |
| GW-RMW2-Q292 | ND | 58.4 | 5.6 | 4.9 |
| GW-RMW3-Q292 | ND | 7.29 | 0.4 | 2.3 |
| GW-RMW4-Q292 | 0.79 | 34.8 | 2.4 | ND |
| GW-PW02-Q292 | NA | NA | 0.95 | ND |
| GW-PW03-Q292 | NA | NA | 0.68 | ND |
| GW-PW04-Q292 | NA | NA | 0.2 | ND |
| GW-PW05-Q292 | NA | NA | 0.4 | ND |
| GW-PW06-Q292 | NA | NA | ND | ND |
| GW-PW07-Q292 | NA | NA | ND | 3.7 |
| GW-PW08-Q292 | NA | NA | 0.5 | ND |
| GW-PW09-Q292 | NA | NA | 1.2 | 4.8 |
| GW-RAWW-Q292 | NA | NA | 0.4 | ND |
| GW-FINW-Q292 | NA | NA | 0.4 | 1.1 |

ND - Not Detected
NA - Not Available
NR - Not Required

TABLE 2-10 Second Bimonthly (March/April) Radiological Results for Groundwater at the WSQ

| Sample ID | Th-228 (pCi/l) | Th-230 (pCi/l) | Th-232 (pCi/l) | Ra-226 (pCi/l) | Ra-228 (pCi/l) | Gross Alpha (pCi/l) | Gross Beta (pCi/l) |
|---|---|---|---|---|---|---|---|
| GW-1002-B292 | ND | 0.2 | ND | ND | ND | 7 | 12 |
| GW-1004-B292 | ND | ND | ND | 0.3 | ND | 3700 | 2840 |
| GW-1005-B292 | ND | 1.0 | ND | ND | ND | 1480 | 1070 |
| GW-1006-B292 | ND | ND | ND | 0.4 | ND | 4300 | 2230 |
| GW-1007-B292 | ND | 0.3 | ND | 0.6 | ND | 2300 | 1320 |
| GW-1008-B292 | ND | ND | ND | ND | ND | 6000 | 3400 |
| GW-1009-B292 | ND | ND | ND | 0.2 | ND | 15 | 11 |
| GW-1010-B292 | ND | ND | ND | 0.4 | 2.1 | ND | 6.4 |
| GW-1011-B292 | ND | ND | ND | 0.2 | ND | 22 | 22 |
| GW-1012-B292 | ND | 0.3 | ND | 0.3 | ND | 23 | 13 |
| GW-1013-B292 | ND | ND | ND | 0.7 | ND | 1100 | 610 |
| GW-1014-B292 | ND | ND | ND | ND | ND | 600 | 510 |
| GW-1015-B292 | ND | 1.5 | ND | 0.3 | ND | 1400 | 810 |
| GW-1016-B292 | ND | ND | ND | ND | ND | 480 | 300 |
| GW-1026-B292 | ND | ND | ND | 0.20 | ND | 25 | 18 |
| GW-1027-B292 | ND | ND | ND | ND | 1.10 | 680 | 280 |
| GW-1028-B292 | ND | ND | ND | 0.3 | ND | 6.8 | 13 |
| GW-1029-B292 | ND | ND | ND | ND | ND | 13 | 12 |
| GW-1030-B292 | 1.2 | 2.2 | 0.8 | 4.8 | 2.7 | 98 | 190 |
| GW-1031-B292 | ND | ND | ND | 0.2 | ND | 22 | 13 |
| GW-1032-B292 | ND | ND | ND | 0.5 | 1.1 | 860 | 780 |
| GW-1034-B292 | ND | 1.6 | ND | 0.2 | ND | 3.1 | 5.8 |
| GW-1035-B292 | ND | ND | ND | 0.4 | ND | ND | 5.9 |
| GW-1036-B292 | ND | ND | ND | 0.2 | ND | 8.5 | 9.6 |
| GW-1037-B292 | ND | 0.2 | ND | 0.3 | ND | 3.9 | 5.9 |
| GW-1038-B292 | ND | ND | ND | 0.2 | ND | ND | 8.1 |
| GW-1039-B292 | ND | ND | ND | ND | 0.9 | 5.0 | 8.7 |

ND - Not Detected
NA - Not Available

### 2.2.2 Nitroaromatic Compounds Results

Analytical results for the second and third bimonthly period, and the second quarter for nitroaromatic compounds, are presented in Tables 2-11 through 2-13. No monitoring wells south of the Femme Osage Slough showed detectable concentrations of nitroaromatic compounds during the second quarter of 1992. Elevated levels of nitroaromatic compounds were detected in rim wells MW-1002 and MW-1004 and alluvial monitoring well MW-1007. The distribution and magnitude of nitroaromatic contamination in the remainder of the wells near the quarry remain consistent with historical levels.

### 2.2.3 Inorganic Anions Results

Two inorganic anions, nitrate and sulfate, are sampled in all of the wells monitored at the WSQ. The analytical results for the second and third bimonthly period, and for the first quarter, are presented in Tables 2-7 through 2-9. An elevated level of sulfate was detected in alluvial monitoring well MW-1007 and an elevated level of nitrate was detected in rim well MW-1030. The results for the remainder of the monitoring wells are consistent with data reported in the previous environmental monitoring reports. The WSQ groundwater samples continue to indicate no significant nitrate contamination of the groundwater. The results indicate that elevated sulfate levels are present in groundwater within the WSQ and north of the Femme Osage Slough.

### 2.2.4 Metals Results

All wells in the WSQ monitoring program are sampled for arsenic and barium. The results for the second and third bimonthly periods, and the second quarter, are presented in Tables 2-14 through 2-16. Arsenic levels were consistent with historical values for groundwater in the vicinity of the WSQ. Elevated arsenic levels were reported for bedrock monitoring well MW-1028. Barium levels have remained elevated in the wells in the vicinity of the Femme Osage Slough. Elevated barium levels were indicated for rim monitoring wells MW-1002 and MW-1004.

TABLE 2-11 Second Bimonthly (March/April) Nitroaromatic Results for Groundwater at the WSQ

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-1002-B292 | ND | 0.36 | 0.13 | 27.0 | 85.0 | 480 |
| GW-1004-B292 | ND | ND | 3.20 | 6.60 | 22.0 | 6.00 |
| GW-1005-B292 | ND | ND | 0.10 | 0.040 | ND | ND |
| GW-1006-B292 | ND | ND | 0.30 | 3.20 | 10.0 | 62.0 |
| GW-1007-B292 | ND | ND | ND | 0.21 | 0.56 | 0.18 |
| GW-1008-B292 | ND | ND | ND | 0.24 | 0.80 | 0.15 |
| GW-1009-B292 | ND | ND | ND | ND | ND | ND |
| GW-1010-B292 | ND | ND | ND | ND | ND | ND |
| GW-1011-B292 | ND | ND | ND | ND | ND | ND |
| GW-1012-B292 | ND | ND | ND | ND | ND | ND |
| GW-1013-B292 | ND | ND | 0.063 | 0.024 | ND | ND |
| GW-1014-B292 | ND | ND | ND | ND | ND | ND |
| GW-1015-B292 | ND | ND | 0.054 | 0.75 | 27.0 | 240 |
| GW-1016-B292 | ND | ND | ND | 0.22 | 5.40 | 32.0 |
| GW-1026-B292 | ND | ND | ND | ND | ND | ND |
| GW-1027-B292 | ND | ND | 0.42 | 3.10 | 9.00 | 0.066 |
| GW-1028-B292 | ND | ND | ND | ND | ND | ND |
| GW-1029-B292 | ND | ND | ND | ND | ND | ND |
| GW-1030-B292 | ND | ND | 0.044 | ND | ND | ND |
| GW-1031-B292 | ND | ND | ND | ND | ND | ND |
| GW-1032-B292 | ND | ND | 0.088 | 0.088 | ND | ND |
| GW-1034-B292 | ND | ND | ND | ND | ND | ND |
| GW-1035-B292 | ND | ND | ND | ND | ND | ND |
| GW-1036-B292 | ND | ND | ND | ND | ND | ND |
| GW-1037-B292 | ND | ND | ND | ND | ND | ND |
| GW-1038-B292 | ND | ND | ND | ND | ND | ND |
| GW-1039-B292 | ND | ND | ND | ND | ND | ND |

NA - Not Available
ND - Not Detected

TABLE 2-12 Third Bimonthly (May/June) Nitroaromatic Results for Groundwater at the WSQ

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-1002-B392 | ND | 0.35 | 0.12 | 23 | 90 | 600 |
| GW-1004-B392 | ND | ND | 3.8 | 7.4 | 25 | 8.5 |
| GW-1005-B392 | ND | ND | 0.086 | 0.031 | ND | ND |
| GW-1006-B392 | ND | ND | 0.17 | 3.6 | 12 | 70 |
| GW-1007-B392 | ND | ND | ND | ND | ND | ND |
| GW-1008-B392 | ND | ND | ND | 0.078 | ND | ND |
| GW-1009-B392 | ND | ND | ND | ND | ND | ND |
| GW-1010-B392 | ND | ND | ND | ND | ND | ND |
| GW-1011-B392 | ND | ND | ND | ND | ND | ND |
| GW-1012-B392 | ND | ND | ND | ND | ND | ND |
| GW-1013-B392 | ND | ND | 0.053 | 0.016 | ND | ND |
| GW-1014-B392 | ND | ND | ND | ND | ND | ND |
| GW-1015-B392 | ND | ND | 0.055 | 0.80 | 24 | 190 |
| GW-1016-B392 | ND | ND | ND | 0.21 | 4.5 | 24 |
| GW-1026-B392 | ND | ND | ND | ND | ND | ND |
| GW-1027-B392 | ND | ND | 0.62 | 2.4 | 17 | 0.065 |
| GW-1028-B392 | ND | ND | ND | ND | ND | ND |
| GW-1029-B392 | ND | ND | ND | ND | ND | ND |
| GW-1030-B392 | ND | ND | 0.049 | ND | ND | ND |
| GW-1031-B392 | ND | ND | ND | ND | ND | ND |
| GW-1032-B392 | ND | ND | 0.20 | 0.12 | ND | ND |
| GW-1034-B392 | ND | ND | ND | ND | ND | ND |
| GW-1035-B392 | ND | ND | ND | ND | ND | ND |
| GW-1036-B392 | ND | ND | ND | ND | ND | ND |
| GW-1037-B392 | ND | ND | ND | ND | ND | ND |
| GW-1038-B392 | ND | ND | ND | ND | ND | ND |
| GW-1039-B392 | ND | ND | ND | ND | ND | ND |

NA - Not Available
ND - Not Detected

TABLE 2-13 Second Quarter Nitroaromatic Results for Groundwater at the WSQ

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| GW-1017-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1018-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1019-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1020-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1021-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1022-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1023-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1024-Q292 | ND | ND | ND | ND | ND | ND |
| GW-1033-Q292 | ND | ND | ND | ND | ND | ND |
| GW-RMW1-Q292 | ND | ND | ND | ND | ND | ND |
| GW-RMW2-Q292 | ND | ND | ND | ND | ND | ND |
| GW-RMW3-Q292 | ND | ND | ND | ND | ND | ND |
| GW-RMW4-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW02-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW03-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW04-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW05-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW06-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW07-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW08-Q292 | ND | ND | ND | ND | ND | ND |
| GW-PW09-Q292 | ND | ND | ND | ND | ND | ND |
| GW-RAWW-Q292 | ND | ND | ND | ND | ND | ND |
| GW-FINW-Q292 | ND | ND | ND | ND | ND | ND |

NA - Not Available
ND - Not Detected

TABLE 2-14 Second Bimonthly (March/April) Metal Results for Groundwater at the WSQ

| Sample ID | Arsenic (µg/l) | Barium (µg/l) |
|---|---|---|
| GW-1002-B292 | ND | 37.8 |
| GW-1004-B292 | ND | 140 |
| GW-1005-B292 | ND | 56.7 |
| GW-1006-B292 | ND | 42.5 |
| GW-1007-B292 | 10.6 | 249 |
| GW-1008-B292 | ND | 48.8 |
| GW-1009-B292 | 3.89 | 364 |
| GW-1010-B292 | 88.0 | 110 |
| GW-1011-B292 | ND | 288 |
| GW-1012-B292 | ND | 122 |
| GW-1013-B292 | 3.39 | 140 |
| GW-1014-B292 | ND | 194 |
| GW-1015-B292 | ND | 105 |
| GW-1016-B292 | ND | 127 |
| GW-1026-B292 | 22.3 | 409 |
| GW-1027-B292 | ND | 107 |
| GW-1028-B292 | 6.29 | 300 |
| GW-1029-B292 | ND | 109 |
| GW-1030-B292 | 4.40 | 340 |
| GW-1031-B292 | ND | 95.5 |
| GW-1032-B292 | ND | 96.8 |
| GW-1034-B292 | ND | 167 |
| GW-1035-B292 | ND | 225 |
| GW-1036-B292 | ND | 300 |
| GW-1037-B292 | ND | 626 |
| GW-1038-B292 | ND | 242 |
| GW-1039-B292 | ND | 479 |

ND - Not Detected
NA - Not Available

TABLE 2-15 Third Bimonthly (May/June) Metal Results for Groundwater at the WSQ

| Sample ID | Arsenic (µg/l) | Barium (µg/l) |
|---|---|---|
| GW-1002-B392 | ND | 142 |
| GW-1004-B392 | ND | 44.8 |
| GW-1005-B392 | ND | 51.8 |
| GW-1006-B392 | NA | NA |
| GW-1007-B392 | NA | NA |
| GW-1008-B392 | ND | 49.1 |
| GW-1009-B392 | ND | 344 |
| GW-1010-B392 | 88.5 | 362 |
| GW-1011-B392 | ND | 188 |
| GW-1012-B392 | ND | 123 |
| GW-1013-B392 | NA | NA |
| GW-1014-B392 | NA | NA |
| GW-1015-B392 | ND | 117 |
| GW-1016-B392 | ND | 139 |
| GW-1026-B392 | 22.1 | 381 |
| GW-1027-B392 | ND | 98.1 |
| GW-1028-B392 | NA | NA |
| GW-1029-B392 | ND | 119 |
| GW-1030-B392 | 5.20 | 353 |
| GW-1031-B392 | NA | NA |
| GW-1032-B392 | ND | 89.9 |
| GW-1034-B392 | ND | 169 |
| GW-1035-B392 | ND | 223 |
| GW-1036-B392 | ND | 281 |
| GW-1037-B392 | ND | 615 |
| GW-1038-B392 | 2.39 | 222 |
| GW-1039-B392 | ND | 461 |

ND - Not Detected
NA - Not Available

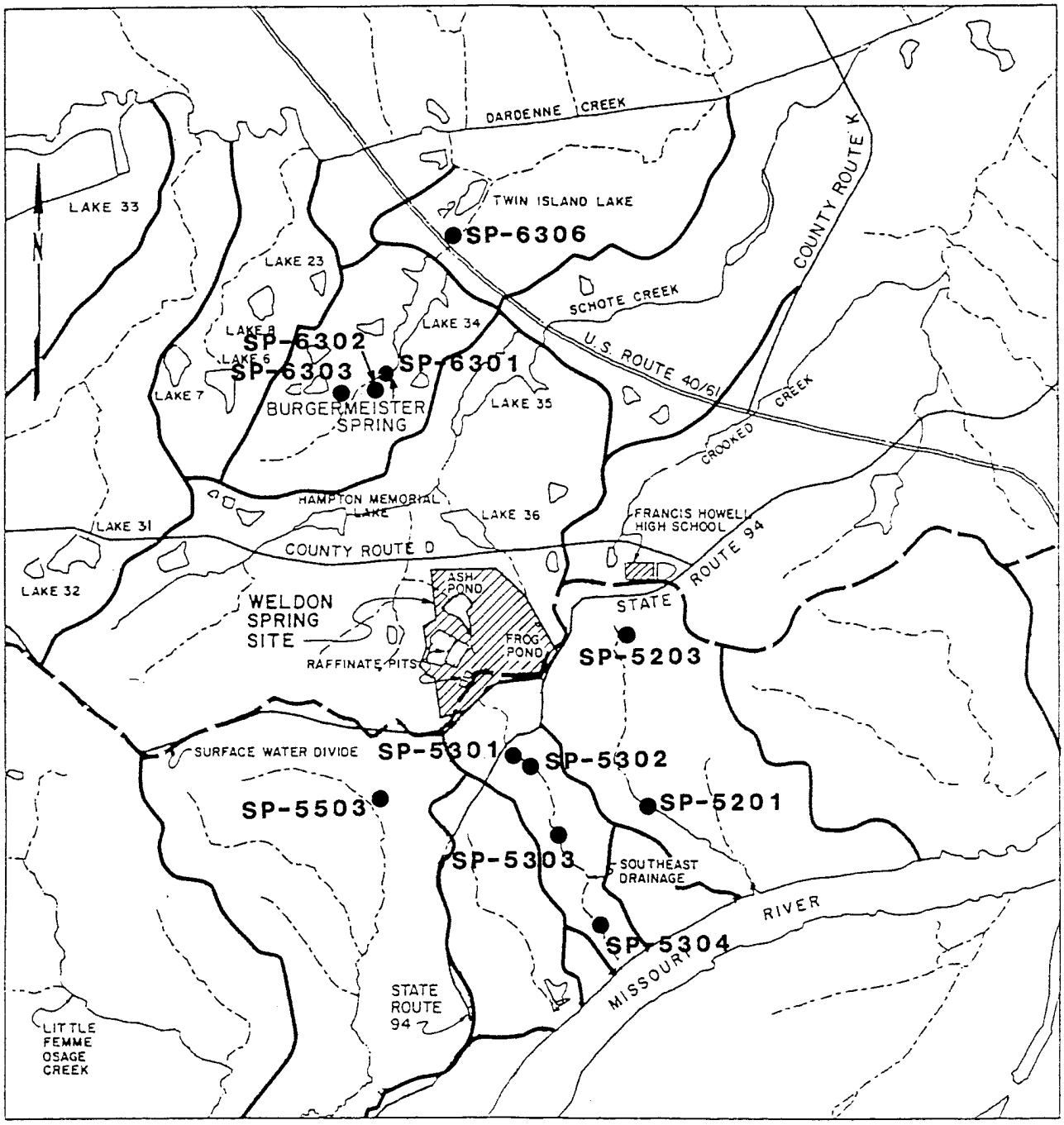
TABLE 2-16 Second Quarter Metal Results for Groundwater at the WSQ

| Sample ID | Arsenic (µg/l) | Barium (µg/l) |
|---|---|---|
| GW-1017-Q292 | 128 | 996 |
| GW-1018-Q292 | 102 | 633 |
| GW-1019-Q292 | 71.5 | 818 |
| GW-1020-Q292 | 32.5 | 412 |
| GW-1021-Q292 | 71.2 | 849 |
| GW-1022-Q292 | 146 | 531 |
| GW-1023-Q292 | 55.3 | 293 |
| GW-1024-Q292 | 10.5 | 134 |
| GW-1033-Q292 | ND | 320 |
| GW-RMW1-Q292 | 7.00 | 481 |
| GW-RMW2-Q292 | 13.0 | 237 |
| GW-RMW3-Q292 | 34.3 | 646 |
| GW-RMW4-Q292 | 6.79 | 165 |
| GW-PW02-Q292 | ND | 335 |
| GW-PW03-Q292 | ND | 313 |
| GW-PW04-Q292 | ND | 287 |
| GW-PW05-Q292 | ND | 355 |
| GW-PW06-Q292 | ND | 334 |
| GW-PW07-Q292 | 2.29 | 476 |
| GW-PW08-Q292 | 3.39 | 446 |
| GW-PW09-Q292 | 3.50 | 485 |
| GW-RAWW-Q292 | ND | 369 |
| GW-FINW-Q292 | ND | 103 |

ND - Not Detected
NA - Not Available

## 2.3 Springs

Five springs around the Weldon Spring site (WSS) were sampled during the first quarter (see Figure 2-4). Previous spring monitoring indicated that waters from six perennial springs and one wet-weather spring are measurably influenced by site-related contaminants. These springs include SP-5301 through SP-5304, SP-6301, SP-6302, and SP-6306. SP-6301 and SP-6306 were to be sampled during high and low flow periods. High flow samples were not attained during second quarter, but will be collected during 3rd quarter. Unavailable analytical results will be reported in the 1992 annual site environmental report (ASER). During second quarter, spring samples were analyzed for radiological, inorganic anions, and nitroaromatics (see Table 2-17).




● · SPRING

0 3200 6400 FT

0 975.4 1950.7 M

SCALE

SPRINGS IN THE VICINITY OF THE WSS

FIGURE 2-4

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/VP/040/0592 | |
| ORIGINATOR: MGT | DRAWN BY: GLN | DATE: 5/92 | |

# TABLE 2-17 Second Quarter Results in Springs Near the Weldon Spring Site

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| SP-6301-Q292-H | NS | NS | NS | NS | NS | NS |
| SP-6301-Q292-L | ND | ND | 0.042 | 0.61 | 0.27 | 0.045 |
| 8SP-6306-Q292-H | NS | NS | NS | NS | NS | NS |
| SP-6306-Q292-L | ND | ND | ND | ND | ND | ND |
| SP-5303-Q292 | NA | NA | NA | NA | NA | NA |
| SP-5304-Q292 | DRY | | | | | |
| SP-5201-Q292 | NA | NA | NA | NA | NA | NA |

| Sample ID | Th-228 (pCi/l) | Th-230 (pCi/l) | Th-232 (pCi/l) | Ra-226 (pCi/l) | Ra-228 (pCi/l) | Uranium (pCi/l) |
|---|---|---|---|---|---|---|
| SP-6301-Q292-H | NS | NS | NS | NS | NS | NS |
| SP-6301-Q292-L | ND | ND | ND | ND | ND | 90 |
| SP-6306-Q292-H | NS | NS | NS | NS | NS | NS |
| SP-6306-Q292-L | NA | NA | NA | NA | NA | NA |
| SP-5303-Q292 | NA | NA | NA | NA | NA | NA |
| SP-5304-Q292 | DRY | | | | | |
| SP-5201-Q292 | NA | NA | NA | NA | NA | NA |

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) |
|---|---|---|
| SP-6301-Q292 | NS | NS |
| SP-6301-Q292-L | 47.6 | 51.3 |
| SP-6306-Q292 | NS | NS |
| SP-6306-Q292-L | 0.18 | 8.90 |
| SP-5303-Q292 | NA | NA |
| SP-5304-Q292 | DRY | |
| SP-5201-Q292 | NA | NA |

ND - Not Detected
NA - Not Available
NS - Not Sampled

# 3 SURFACE WATER MONITORING

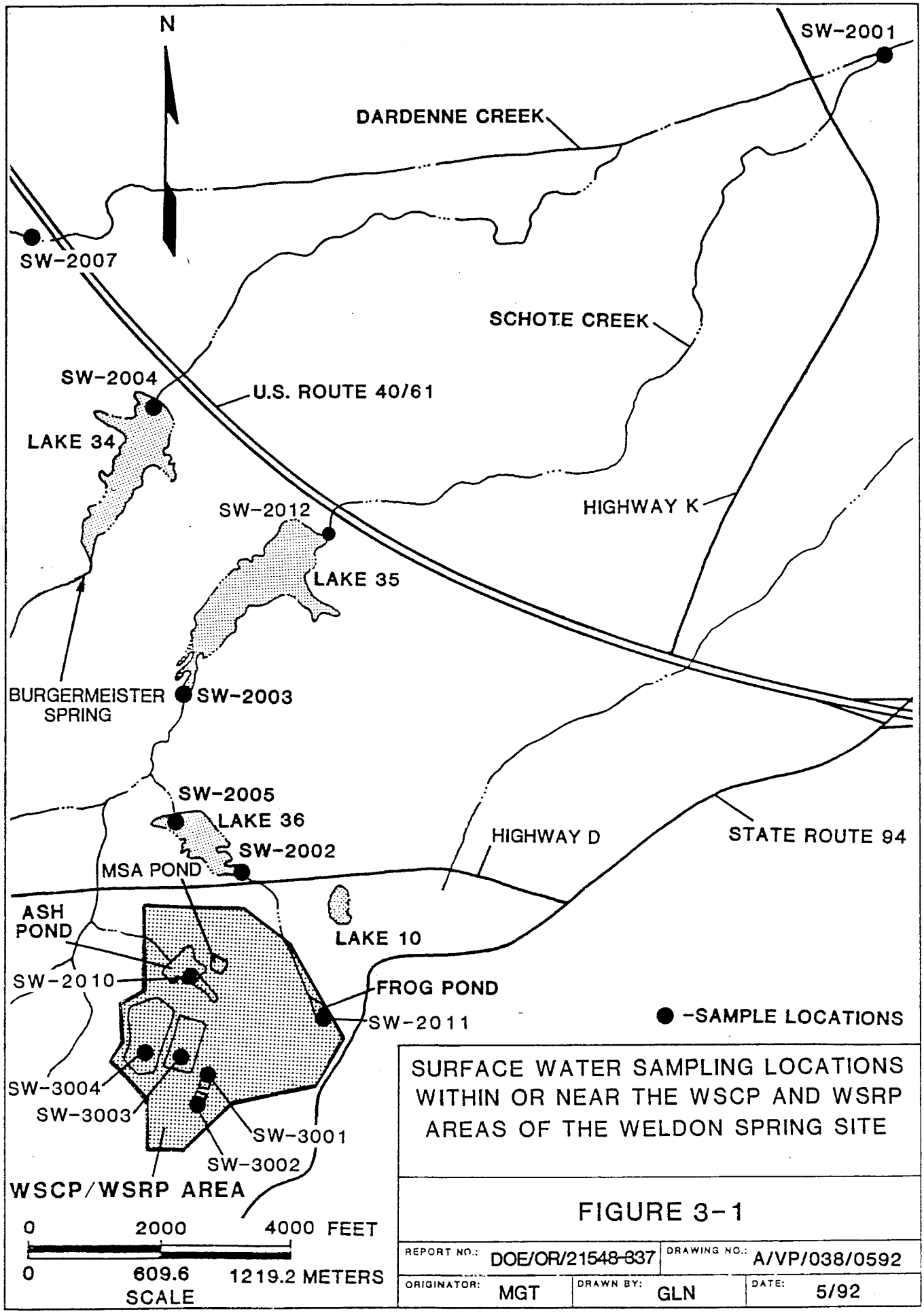
Routine samples were collected during the second quarter of 1992 from both on-site and off-site surface water locations. All surface water samples were analyzed without filtering, unless a specific comparison of dissolved versus total contaminant concentrations was desired. Some analytical results are not available at this time; however, they will be presented in the 1992 annual site environmental report (ASER).

## 3.1 Chemical Plant/Raffinate Pits/Vicinity Properties

During the first quarter, surface water samples were collected from 14 of the 15 surface water sampling locations shown in Figure 3-1 and analyzed for uranium and metals. Monitoring point SW-2016, not shown in Figure 3-1, is located at the intersection of Dardenne Creek and County Highway N. This is now the furthest location downstream at which to measure contaminant levels in Dardenne Creek after it has received the Schote Creek contribution. The results, presented in Tables 3-1 and 3-2, indicated that conditions at sampling locations remain consistent with historical values. The nitrate value for SW-2005 is considered suspect and full validation has been requested.

## 3.2 Weldon Spring Quarry

Monitoring locations SW-1001, SW-1002, and SW-1014 (Figure 3-2) monitor the Little Femme Osage Creek at points upstream and downstream of the Weldon Spring quarry (WSQ). Six sampling locations, SW-1003 through SW-1005, SW1007, SW-1009, and SW-1010, are distributed along the Femme Osage Slough in the vicinity of the WSQ. These locations within the slough were chosen to provide the most representative data of potentially impacted areas from the quarry contamination. Location SW-1008 monitors the ponded water within the WSQ and provides a rough deterination of the concentrations of the various contaminants in the WSQ pond, which may migrate to groundwater. Locations SW-1011 through SW-1013 (Figure 3-3) and SW-1015 (Howard Bend) were added to the monitoring program to provide baseline water quality data for the Missouri River at points both upstream and downstream from the WSQ and the Southeast Drainage (5300) easement.




SURFACE WATER SAMPLING LOCATIONS WITHIN OR NEAR THE WSCP AND WSRP AREAS OF THE WELDON SPRING SITE

FIGURE 3-1

| REPORT NO.: DOE/OR/21548-837 | DRAWING NO.: A/VP/038/0592 | |
|---|---|---|
| ORIGINATOR: MGT | DRAWN BY: GLN | DATE: 5/92 |

TABLE 3-1 Second Quarter Uranium and Inorganic Anion Results for Surface Water at the WSCP/RP/VP

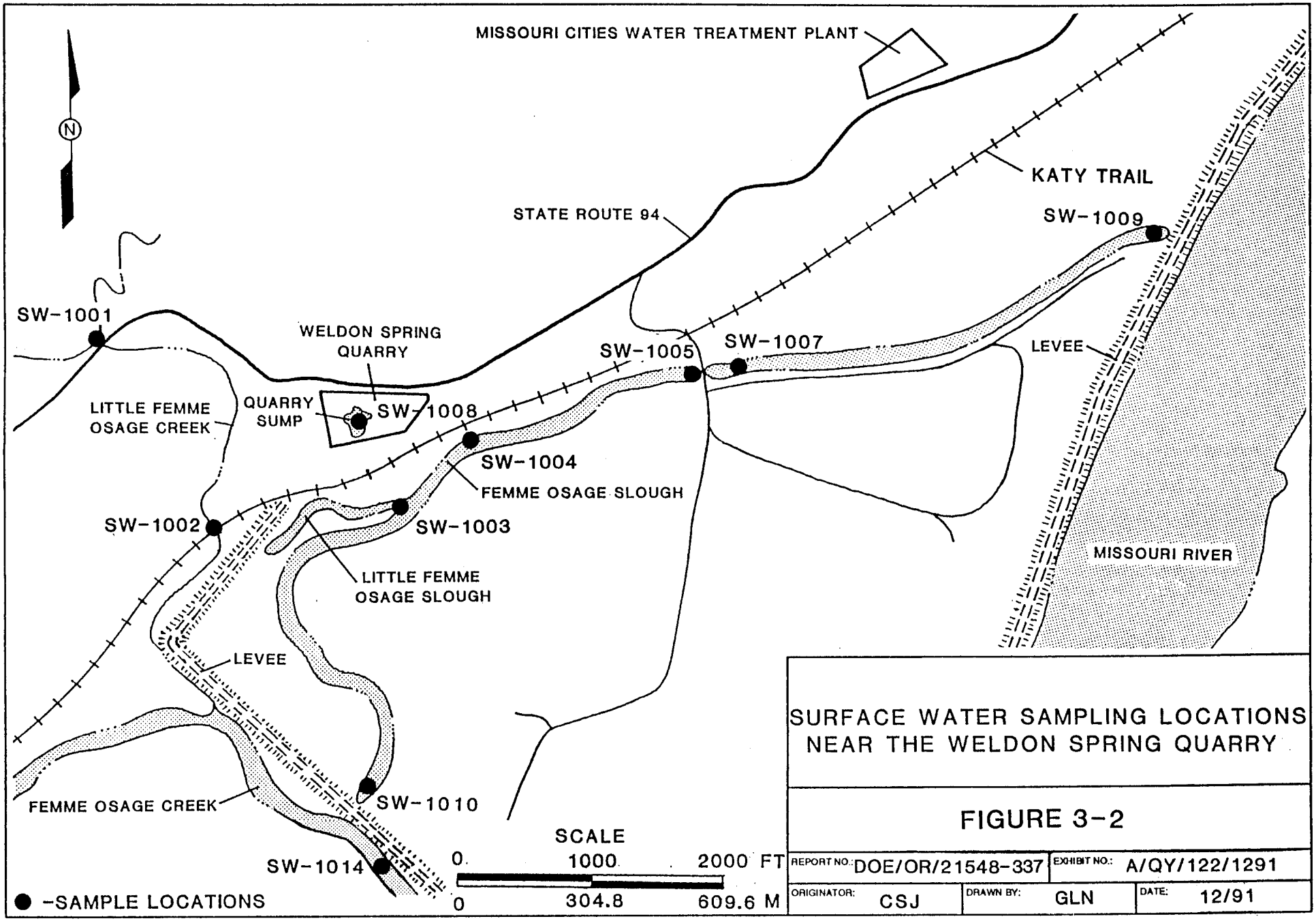
| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| SW-2001-Q292 | 0.76 | 40.6 | 1.70 |
| SW-2002-Q292 | 0.17 | 34.4 | 56.0 |
| SW-2003-Q292 | 0.50 | 17.4 | 13.0 |
| SW-2004-Q292 | 1.20 | 22.4 | 11.0 |
| SW-2005-Q292 | 1300 | 28.9 | 35 |
| SW-2007-Q292 | NA | NA | 2.0 |
| SW-2010-Q292 | NA | NA | NA |
| SW-2011-Q292 | 0.38 | 57.1 | 280 |
| SW-2012-Q292 | Dry | | |
| SW-2016-Q292 | 1.00 | 48.6 | 1.80 |
| SW-3001-Q292 | NA | NA | NA |
| SW-3002-Q292 | NA | NA | NA |
| SW-3003-Q292 | NA | NA | NA |
| SW-3004-Q292 | NA | NA | NA |
| SW-5311-Q292 | NA | NA | NA |

ND - Not Detected
NA - Not Available

TABLE 3-2 Second Quarter Results for Metals in Surface Water at the WSCP/RP/VP

| Sample ID | Arsenic (µg/l) | Barium (mg/l) | Beryllium (µg/l) | Cadmium (µg/l) | Chromium (µg/l) | Lead (µg/l) | Mercury (µg/l) | Antimony (µg/l) | Selenium (µg/l) | Silver (µg/l) | Thallium (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW-2001-Q292 | ND | 110 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-2002-Q292 | ND | 76.4 | 1.39 | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-2003-Q292 | ND | 60.7 | 1.39 | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-2004-Q292 | ND | 78.0 | 1.39 | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-2005-Q292 | ND | 72.4 | 2.39 | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-2007-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-2010-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-2011-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-2012-Q292 | Dry | | | | | | | | | | |
| SW-2016-Q292 | ND | 134 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SW-3001-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-3002-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-3003-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-3004-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SW-5311-Q292 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

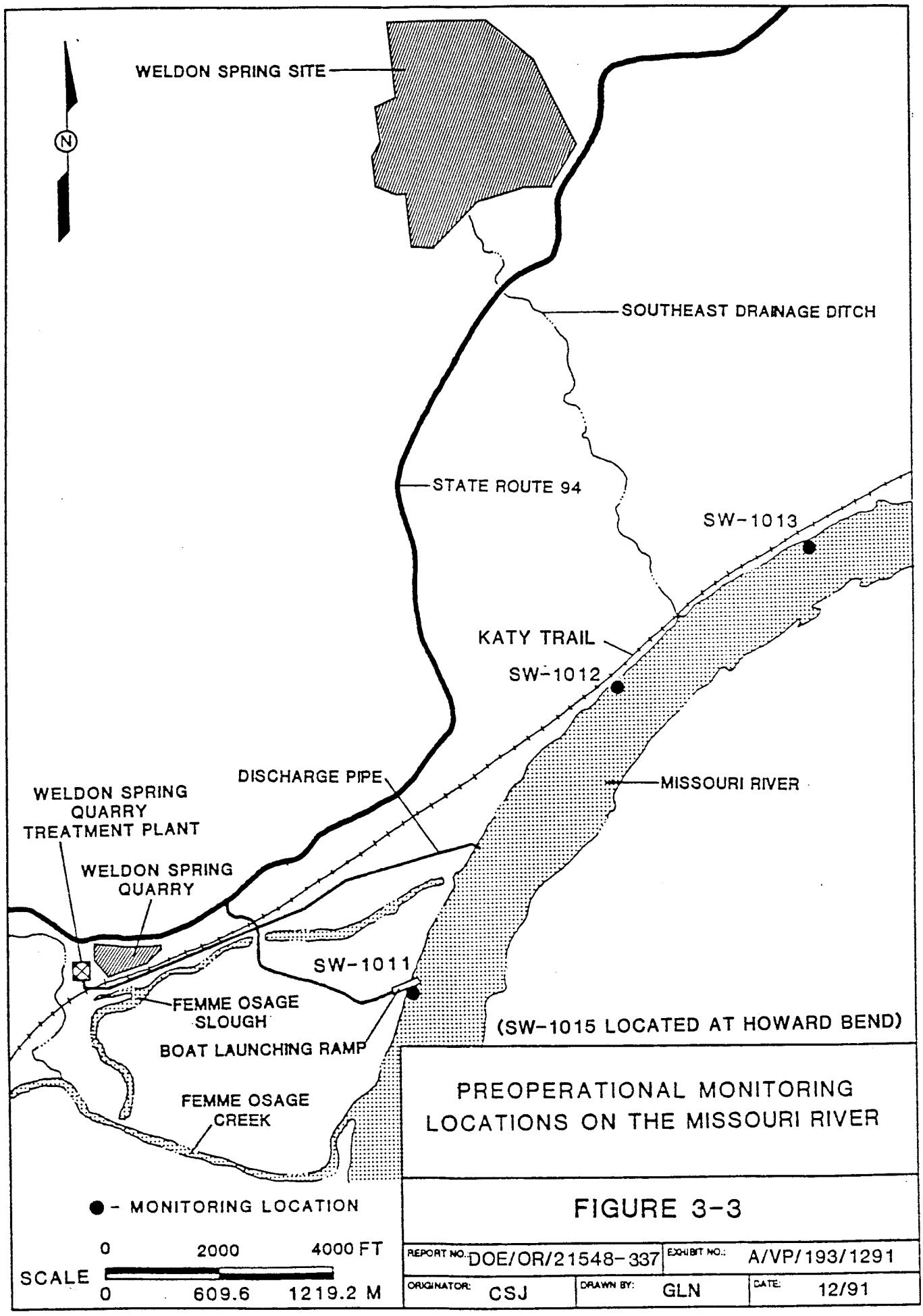
ND - Not Detected
NA - Not Available




SURFACE WATER SAMPLING LOCATIONS NEAR THE WELDON SPRING QUARRY

FIGURE 3-2

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/QY/122/1291 | |
| ORIGINATOR: CSJ | DRAWN BY: GLN | DATE: 12/91 | |




PREOPERATIONAL MONITORING LOCATIONS ON THE MISSOURI RIVER

FIGURE 3-3

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: | A/VP/193/1291 |
| ORIGINATOR: CSJ | DRAWN BY: GLN | DATE: | 12/91 |

### 3.2.1 Radiological Results

Surface water samples were collected for radiological analyses from the 13 locations shown in Figures 3-2 and 3-3. The uranium results for the second and third bimonthly periods are presented in Tables 3-4 and 3-5. Second and third bimonthly uranium concentrations for the sampling locations in the Femme Osage Slough and Little Femme Osage Creek remain within historical ranges. The highest measured uranium concentration of 1200 pCi/l (44.4 Bq/l) was detected at the quarry pond (SW-1008) and is within the historical range. In addition, the surface water locations were sampled for the radiological species of radium and thorium, gross alpha, and gross beta during the second bimonthly period. The results are presented in Table 3-3.

### 3.2.2 Nitroaromatic Compounds Results

Analytical results for nitroaromatic compounds during the second bimonthly period, are presented in Table 3-6. No nitroaromatic analyses have been performed at these sampling locations since 1989. Elevated levels of 2,4-dinitrotoluene (DNT), 2,6-DNT, and 2,4,6-trinitrotoluene (TNT) have been detected at the SW-1001 location. This location has been established as background for the WSQ. Additional sampling will be performed to determine the presence of a trend and the possible upstream source of impact.

### 3.2.3 Inorganic Anion Results

Surface water samples were collected from the sampling locations in the second bimonthly period for nitrate and sulfate analysis. Inorganic anions have not been analyzed at these locations since 1988 except for SW-1008 and SW-1011 through SW-1013. The results for this bimonthly period are within or below historic levels and background for nitrate and sulfate.

### 3.2.4 Weldon Spring Quarry Pond Results

A summary of the analytical results for the third bimonthly sampling period is presented in Table 3-7. This sampling location is summarized separately to characterize the surface waters in the WSQ which may migrate and effect groundwater. The results for this bimonthly period are within historic ranges for all parameters analyzed.

TABLE 3-3 Second Bimonthly (March/April) Radiological Results in Surface Water at the WSQ

| Sample ID | Th-228 (pCi/l) | Th-230 (pCi/l) | Th-232 (pCi/l) | Ra-226 (pCi/l) | Ra-228 (pCi/l) | Gross Alpha (pCi/l) | Gross Beta (pCi/l) |
|---|---|---|---|---|---|---|---|
| SW-1001-B292 | ND | 4.8 | ND | 0.2 | ND | ND | 8.9 |
| SW-1002-B292 | ND | ND | ND | ND | ND | ND | ND |
| SW-1003-B292 | ND | 2.2 | ND | ND | ND | 77 | 72 |
| SW-1004-B292 | ND | 2.1 | ND | 0.4 | 1.4 | 180 | 140 |
| SW-1005-B292 | ND | 1.5 | ND | 0.2 | ND | 30 | 28 |
| SW-1007-B292 | ND | 0.3 | ND | ND | 1.3 | 17 | 14 |
| SW-1008-B292 | NA | NA | NA | NA | NA | NA | NA |
| SW-1009-B292 | ND | ND | ND | 0.6 | ND | 12 | 19 |
| SW-1010-B292 | ND | ND | ND | ND | ND | ND | ND |
| SW-1011-B292 | 0.6 | 1.6 | 0.6 | 1.1 | 2.6 | 10 | 14 |
| SW-1012-B292 | ND | ND | ND | ND | ND | ND | ND |
| SW-1013-B292 | ND | ND | ND | ND | ND | ND | ND |
| SW-1014-B292 | ND | ND | ND | ND | ND | ND | ND |

ND - Not Detected
NA - Not Available

TABLE 3-4 Second Bimonthly (March/April) Uranium and Inorganic Anion Results in Surface Water at the WSQ

| Sample ID | Nitrate (mg/l) | Sulfate (mg/l) | Uranium (pCi/l) |
|---|---|---|---|
| SW-1001-B292 | 0.590 | 27.0 | 0.82 |
| SW-1002-B292 | 0.170 | 50.1 | 5.03 |
| SW-1003-B292 | ND | 86.2 | 110 |
| SW-1004-B292 | ND | 70.7 | 300 |
| SW-1005-B292 | ND | 63.1 | 42 |
| SW-1007-B292 | ND | 44.5 | 16 |
| SW-1008-050192 | ND | 76.9 | NA |
| SW-1009-B292 | ND | 47.0 | 18 |
| SW-1010-B292 | 0.140 | 39.3 | 54.5 |
| SW-1011-B292 | 1.39 | 80.1 | 8.5 |
| SW-1012-B292 | 2.00 | 85.9 | 5.85 |
| SW-1013-B292 | 1.70 | 87.5 | 5.51 |
| SW-1014-B292 | 0.800 | 30.6 | 4.08 |

ND - Not Detected
NA - Not Available

TABLE 3-5 Third Bimonthly (May/June) Uranium Results in Surface Water at the WSQ

| Sample ID | Uranium (pCi/l) |
|---|---|
| SW-1001-B392 | ND |
| SW-1002-B392 | ND |
| SW-1003-B392 | 46.0 |
| SW-1004-B392 | 73.0 |
| SW-1005-B392 | 26 |
| SW-1007-B392 | 7.6 |
| SW-1008-B392 | 1200 |
| SW-1009-B392 | 6.1 |
| SW-1010-B392 | 43 |
| SW-1011-B392 | 3.30 |
| SW-1012-B392 | 1.8 |
| SW-1013-B392 | 5.0 |
| SW-1014-B392 | 3.8 |

ND - Not Detected

TABLE 3-6 Second Bimonthly (March/April) Nitroaromatic Results in Surface Water at the WSQ

| Sample ID | NB (µg/l) | 1,3-DNB (µg/l) | 2,4-DNT (µg/l) | 2,6-DNT (µg/l) | 2,4,6-TNT (µg/l) | 1,3,5-TNB (µg/l) |
|---|---|---|---|---|---|---|
| SW-1001-B292 | ND | ND | 0.37 | 0.014 | 0.067 | ND |
| SW-1002-B292 | ND | ND | ND | ND | ND | ND |
| SW-1003-B292 | ND | ND | ND | ND | ND | ND |
| SW-1004-B292 | ND | ND | ND | ND | ND | ND |
| SW-1005-B292 | ND | ND | ND | ND | ND | ND |
| SW-1007-B292 | ND | ND | ND | ND | ND | ND |
| SW-1008-B292 | NA | NA | NA | NA | NA | NA |
| SW-1009-B292 | ND | ND | ND | ND | ND | ND |
| SW-1010-B292 | ND | ND | ND | ND | ND | ND |
| SW-1011-B292 | ND | ND | ND | ND | ND | ND |
| SW-1012-B292 | ND | ND | ND | ND | ND | ND |
| SW-1013-B292 | ND | ND | ND | ND | ND | ND |
| SW-1014-B292 | ND | ND | ND | ND | ND | ND |

NA - Not Available
ND - Not Detected

TABLE 3-7 Third Bimonthly (May/June) Results for SW-1008

| Parameter | Concentration | Units |
|---|---|---|
| Ra-226 | 0.8 | pCi/l |
| Ra-228 | ND | pCi/l |
| Th-230 | 0.2 | pCi/l |
| Th-232 | ND | pCi/l |
| Gross Alpha | 1650 | pCi/l |
| Gross Beta | 690 | pCi/l |
| Uranium | 1200 | pCi/l |
| Nitrate | ND | mg/l |
| Sulfate | 71.5 | mg/l |
| Nitrobenzene | ND | µg/l |
| 1,3-DNB | ND | µg/l |
| 2,4-DNT | 0.30 | µg/l |
| 2,6-DNT | 0.016 | µg/l |
| 2,4,6-TNT | ND | µg/l |
| 1,3,5-TNB | ND | µg/l |

# 4 EFFLUENT MONITORING

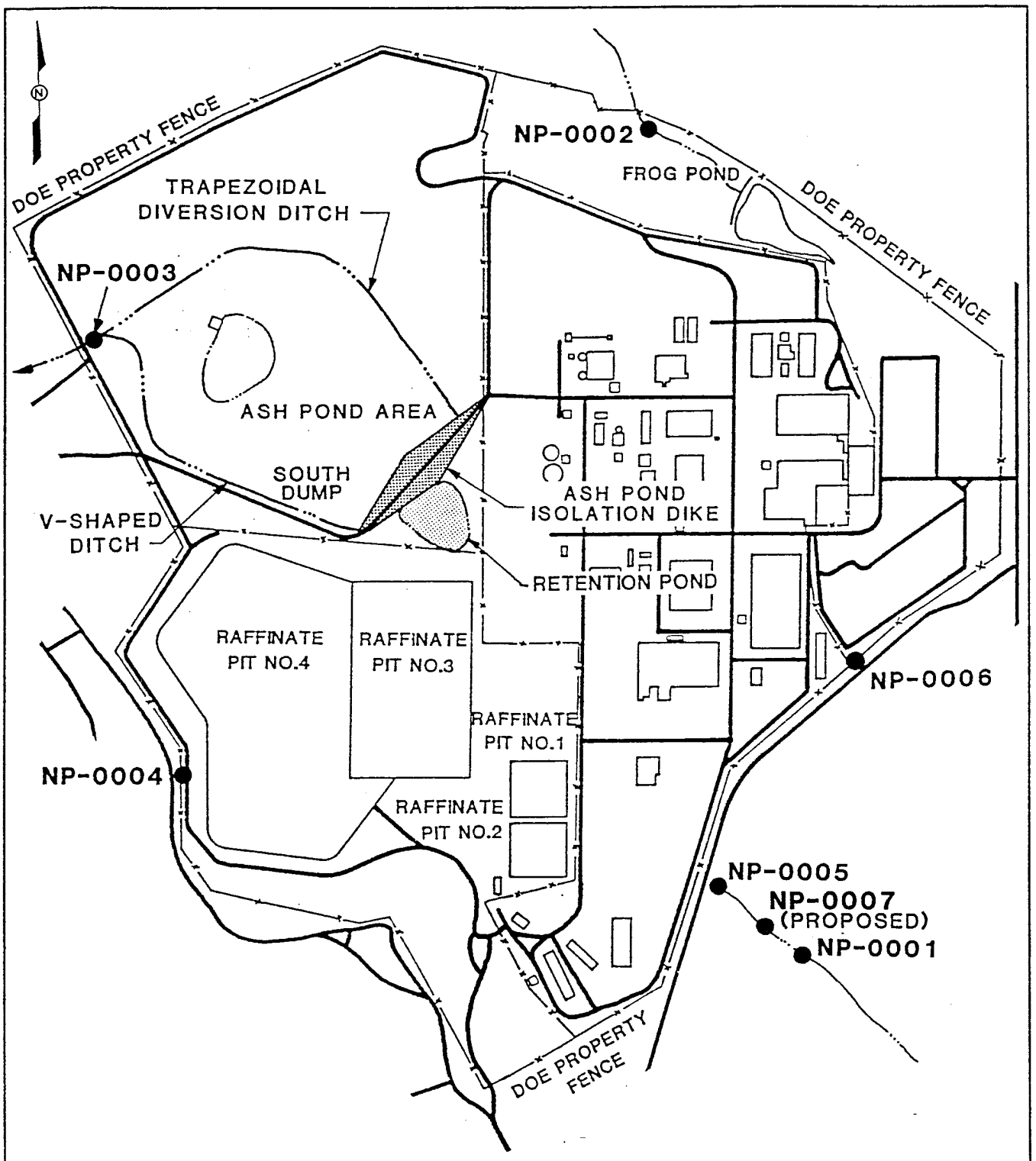
The National Pollutant Discharge Elimination System (NPDES) permit process is authorized by Section 402(a)(1) of the *Clean Water Act of 1977*. The authority to issue permits is delegated to the State of Missouri by the U.S. Environmental Protection Agency (EPA). The State of Missouri has issued four NPDES permits to the U.S. Department of Energy (DOE) allowing the discharge of stormwater hydrostatic test water, and treated wastewater to waters of the state. The permits require that samples of the wastewater be collected periodically and the results reported to the Missouri Department of Natural Resources. The following sections contain the analytical results for samples collected during April, May, and June of 1992.

## 4.1 National Pollutant Discharge Elimination System Data Review

Effluent samples were collected and analyzed in compliance with the Weldon Spring site NPDES permits. Permit No. MO-0107701 was issued on October 1, 1990, and currently addresses the five storm water and two wastewater discharges shown in Figure 4-1. Outfalls NP-0001 through NP-0005 represent storm water discharges; Outfall NP–0006 represents the treated wastewater discharge associated with the administration building sanitary wastewater treatment plant; and Outfall NP-0007 represents the site water treatment plant, which is under construction, but not yet completed. There was no discharge from Outfall NP-0007. Outfalls NP-0006 and NP-0007 have effluent limitations. The five storm water outfalls have "monitoring only" requirements. A lack of flow due to inadequate precipitation prevented the collection of samples from outfalls NP-0003 and NP-0005 during the month of June. NP-0004 also had no discharge during the second quarter, and therefore was not sampled. Second quarter 1992 analytical data for each outfall are presented in Table 4-1.

A lack of flow due to inadequate precipitation prevented the collection of samples from outfalls NP-0003 and NP-0005 during the month of June. NP-0004 also had no discharge during the second quarter, and therfore was not sampled.

Permit No. MO-0108987 was issued on May 5, 1989, for Outfall NP-1001 of the Weldon Spring Quarry water treatment plant. The plant construction is not complete and no discharge took place during the second quarter of 1992.




NPDES SURFACE WATER SAMPLING LOCATIONS AT THE WSCP/RP

FIGURE 4-1

SCALE 0 500 1000 FT
0 152.4 304.8 M

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/CP/050/0592 | |
| ORIGINATOR: TW | DRAWN BY: GLN | DATE: 5/92 | |

# TABLE 4-1 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006

Outfall NP-0001 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | SET. SOLIDS | NITRATE | pH | LITHIUM | GROSS ALPHA | TOTAL URANIUM | |
|---|---|---|---|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | ml/l/hr | mg/l | pH units | mg/l | pCi/l | mg/l | pCi/l |
| April 20 | 99,500 | 15.0 | ND (0.1) | 0.50 | 6.01 | ND (0.1) | 410 | 0.663 | 450 |

Outfall NP-0002 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | SET. SOLIDS | NITRATE | pH | LITHIUM | GROSS ALPHA | TOTAL URANIUM | |
|---|---|---|---|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | ml/l/hr | mg/l | pH units | mg/l | pCi/l | mg/l | pCi/l |
| April 20 | 787,000 | 38.0 | ND (0.1) | 1.10 | 6.0 | ND (0.1) | 140 | 0.151 | 103 |
| May 13 | 73,200 | 48.0 | ND (0.1) | 0.41 | 7.28 | ND (0.1) | 220 | 0.222 | 151 |
| June 4 | 25,400 | 16.0 | ND (0.1) | 0.47 | 7.54 | ND (0.023) | 190 | 0.255 | 173 |

Outfall NP-0003 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | SET. SOLIDS | NITRATE | pH | LITHIUM | GROSS ALPHA | TOTAL URANIUM | |
|---|---|---|---|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | ml/l/hr | mg/l | pH units | mg/l | pCi/l | mg/l | pCi/l |
| April 20 | 740,600* | 40.0 | ND (0.1) | 3.39 | 6.04 | ND (0.1) | 540 | 0.799 | 543 |
| May 13 | 17,568* | 10.0 | ND (0.1) | 0.21 | 7.61 | ND (0.1) | 280 | 0.392 | 267 |

# TABLE 4-1 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006 (Continued)

Outfall NP-0004 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | SET. SOLIDS | NITRATE | pH | LITHIUM | GROSS ALPHA | TOTAL URANIUM | |
|---|---|---|---|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | ml/l/hr | mg/l | pH units | mg/l | pCi/l | mg/l | pCi/l |
| No Discharge | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Outfall NP-0005 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | SET. SOLIDS | NITRATE | pH | LITHIUM | GROSS ALPHA | TOTAL URANIUM | |
|---|---|---|---|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | ml/l/hr | mg/l | pH units | mg/l | pCi/l | mg/l | pCi/l |
| April 20 | 174,500* | 129 | ND (0.1) | 18.6 | 6.08 | ND (0.1) | 350 | 0.526 | 358 |
| May 13 | 3,312* | 35 | ND (0.1) | 0.31 | 8.01 | ND (0.1) | 460 | 0.749 | 509 |

Outfall NP-0006 NPDES data for Q2 1992

| DATE SAMPLED | FLOW | SUSP. SOLIDS | BOD | FECAL COLIFORMS | pH |
|---|---|---|---|---|---|
| UNITS | GPD** | mg/l | mg/l | Colonies/100 ml | pH units |
| April 3 | 5400 | 8.0 | 1.0 | ND (1.0) | 6.5 |
| May 7 | 3,000 | 7.0 | 1.0 | ND (1.0) | 7.0 |
| June 5 | 5,000 | 7.0 | 1.0 | ND (1.0) | 7.0 |

* Indicates an updated flow value which differs from that found in the second quarter 1992 Discharge Monitoring Report.
** Indicates flow rate at time of sample collection.
ND Not detected, detection limit is in parentheses.
-- Indicates analysis not done on this parameter.

Table 4-2 Results of NPDES Monitoring for Permit MO-G680001

| Date Sampled | Flow* | Oil and Grease | Susp. Solids | pH |
|---|---|---|---|---|
| Units | Gallons | mg/l | mg/l | |
| April 24 | 66,500 | ND (5.0) | ND (5.0) | 6.74 |
| April 28 | 178,500 | ND (5.0) | 28.0 | 6.14 |
| April 29 | 178,500 | ND (5.0) | 16.0 | 6.82 |
| April 30 | 178,500 | ND (5.0) | 5.0 | 6.97 |
| June 17 | * | ND (5.0) | 8.0 | 6.71 |
| June 19 | * | ND (5.0) | 10.0 | 8.67 |
| June 22 | 500,000 | ND (5.0) | 9.0 | 6.99 |
| June 26 | 750,000 | 6.29 | 5.0 | 8.84 |
| June 29 | 4,000 | ND (5.0) | ND (5.0) | 7.92 |

* The June 22 flow value represents the total amount of water discharged from June 17 through June 22, 1992.

NPDES permit No. MO-G680001 was issued on December 19, 1991. This permit is for discharge of uncontaminated water used for new tank and hydrostatic basin testing at the quarry water treatment plant. Second quarter 1992 analytical data are presented in Table 4-2.

NPDES permit No. MO-G680002 was issued on February 7, 1992. This permit is for discharge of uncontaminated water used for new tank and hydrostatic basin testing at the site water treatment plant. There was no discharge under this permit for the second quarter of 1992.

### 4.1.1 Radiological Analysis

Gross alpha and uranium analyses corresponded well with past data. The storm water outfalls had the following ranges of uranium concentrations. The process sewer outfall NP-0001, had only one sample value of 450 pCi/l (0.663 mg/l). Frog Pond outfall, NP-0002, had values from 103 pCi/l (0.151 mg/l) to 173 pCi/l (0.255 mg/l). The Ash Pond outfall, NP-0003, had values of 543 pCi/l (0.799 mg/l) and 267 pCi/l (0.392 mg/l). There was no discharge from NP-0004 during the second quarter. The Southeast Drainage outfall, NP-0005, had values of 358 pCi/l (0.526 mg/l) and 509 pCi/l (0.749 mg/l).

In addition to the required radiological monitoring, gross beta was quantified for most samples. The one sample collected from NP-0001 had a gross beta count of 150 pCi/l (5.55 Bq/l). Two samples from NP-0002 were analyzed for gross beta. The sample collected on April 20 had a gross beta count of 29 pCi/l (1.07 Bq/l), and the sample collected on May 13 had a gross beta count of 61 pCi/l (2.26 Bq/l). The gross beta concentrations for NP-0003 were 190 pCi/l (7.03 Bq/l) for the April 20 sample, and 49 pCi/l (1.81 Bq/l) for the May 13 sample. The gross beta concentrations for NP-0005 were 160 pCi/l (5.92 Bq/l) for the April 20 sample, and 55 pCi/l (2.04 Bq/l) for the May 13 sample.

### 4.1.2 Other Analysis

Other analyses for NP-0001 through NP-0005 include physical analyses (settleable solids and total suspended solids) and chemical analyses (nitrate, pH, and lithium). Second quarter 1992 values correspond well with past values for all parameters.

The permit for the discharge from the administration building treatment plant at outfall NP-0006 has effluent limitations and a requirement to monitor once per quarter. Flow must be

measured once a month. The Subcontractor monitors the effluent once a month to assess plant performance, thus generating two additional sample analyses a quarter. The NPDES permit specifies effluent limitations for biochemical oxygen demand (BOD), total suspended solids (TSS), pH, and fecal coliform at this outfall. The limits for BOD are 10 mg/l monthly average and 15 mg/l weekly average; for TSS, 15 mg/l monthly average and 20 mg/l weekly average; for fecal coliform, 400 colonies per 100 ml monthly average and 1,000 colonies per 100 ml daily maximum. The Subcontractor is continuing to make operational changes to improve plant performance. In addition, the plans to add a flow equalization system are complete. The equalization of flow should greatly improve the operation of the plant. An application for a construction permit, as well as the plans and specifications, were submitted to the Missouri Department of Natural Resources. When the construction permit is issued, construction will begin. Until the flow equalization is added, the treatment plant will be monitored more frequently than would normally be required.

Hydrostatic test water pumped from the quarry water treatment plant basins was in compliance with permitted limits (Table 4-2). Analytical data are shown in Table 4-2.

# 5 AIR MONITORING

## 5.1 Radon Gas

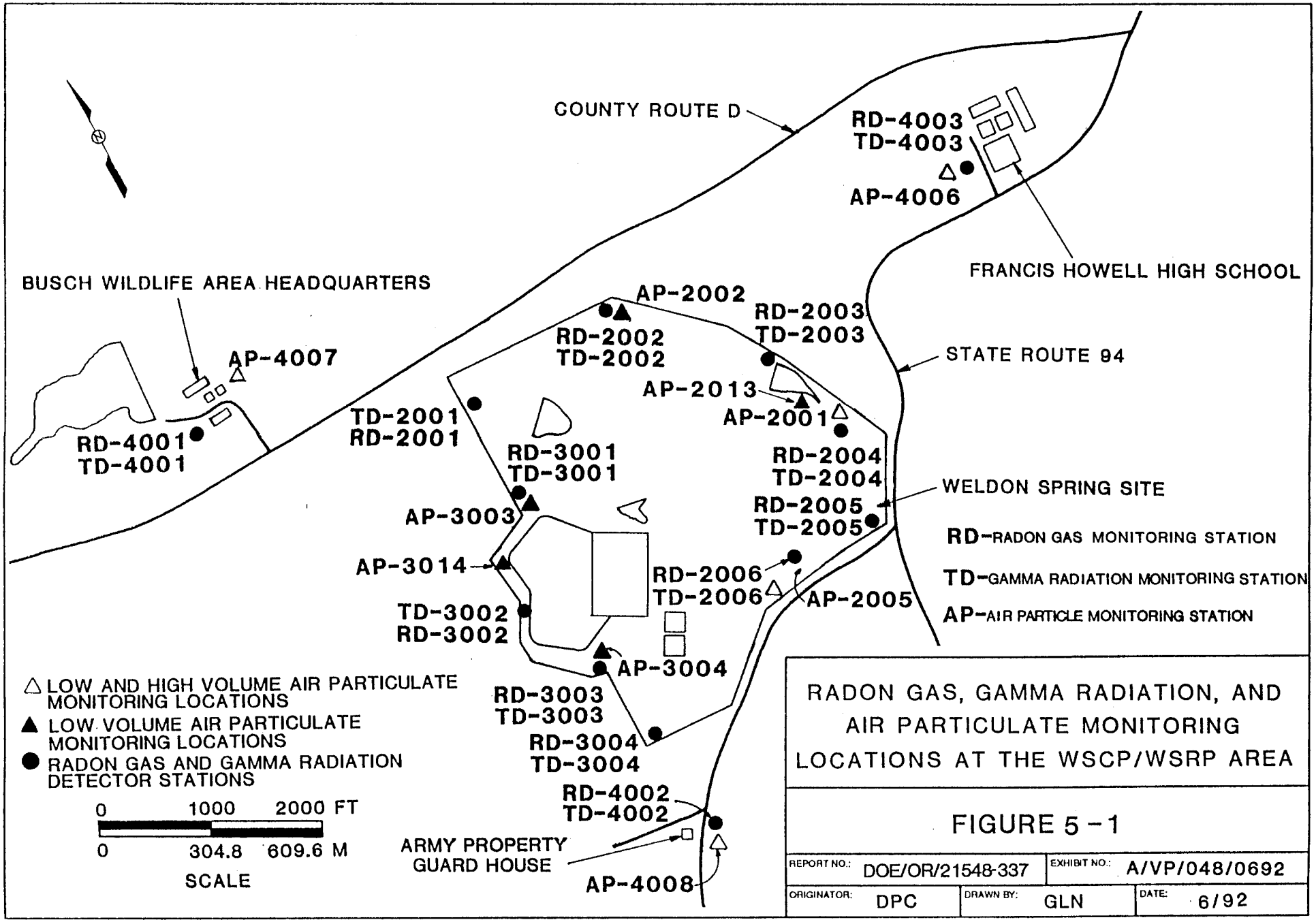
The radon gas monitoring program utilizes a pair of alpha track radon detectors at each of the 25 permanent locations; each detector is exchanged quarterly. These detectors are deployed at six locations at the Weldon Spring Chemical Plant, eight locations at the Weldon Spring Quarry, four locations at the Weldon Spring raffinate pits, and at seven off-site locations. Radon monitoring locations are shown in Figures 5-1, 5-2, and 5-3. On-site detectors are distributed around the perimeter fences to ensure adequate detection of radon dispersing from the properties under various atmospheric conditions. Locations RD-4001, RD-4004, RD-4005, RD-4006, and RD-4007 monitor background levels near the site.

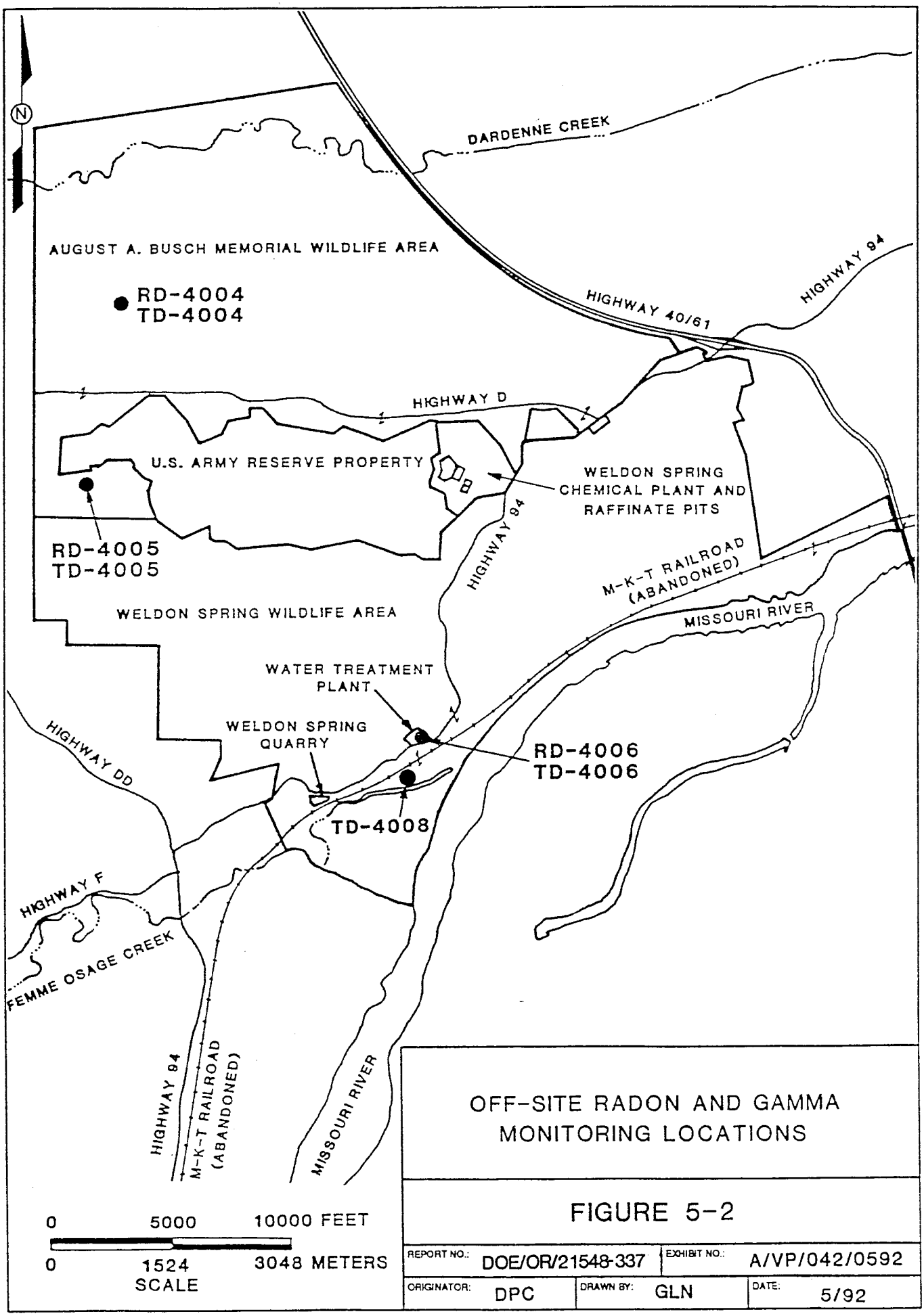
Beginning this quarter, a new type of alpha track monitor was used for radon monitoring. The new detector is the new Type F track etch detector. This replaces the Radtrack monitor used for radon monitoring during the first quarter of 1992. The change was made because the Radtrack monitor is designed for indoor monitoring, while the Type F is better suited for outdoor monitoring. The detection mechanism in both these monitors is identical, consisting of a track etch detector.

Table 5-1 summarizes the second quarter 1992 radon concentrations detected at all site perimeter and off-site monitoring locations. Also contained in the third column of Table 5-1 is a comparison of the measured concentration with the Federally permitted radon concentration (for unrestricted areas) of 3 pCi/l (111 $Bq/m^3$) above background as authorized by U.S. Department of Energy (DOE) Order 5400.5.

An average ambient background concentration was determined by calculating the arithmetic average for the five background locations. This data yielded an average ambient background radon concentration of 0.25 pCi/l (9.25 $Bq/m^3$) for the first quarter of 1992. This concentration was then subtracted from the concentration for each monitoring station, and compared to the DOE guideline of 3 pCi/l (111 $Bq/m^3$) above background.

Radon concentrations at the site and quarry perimeters and at off-site locations for the first quarter of 1992 were within the typical range expected during periods of normal precipitation. During the second quarter, the radon concentrations measured with the new type

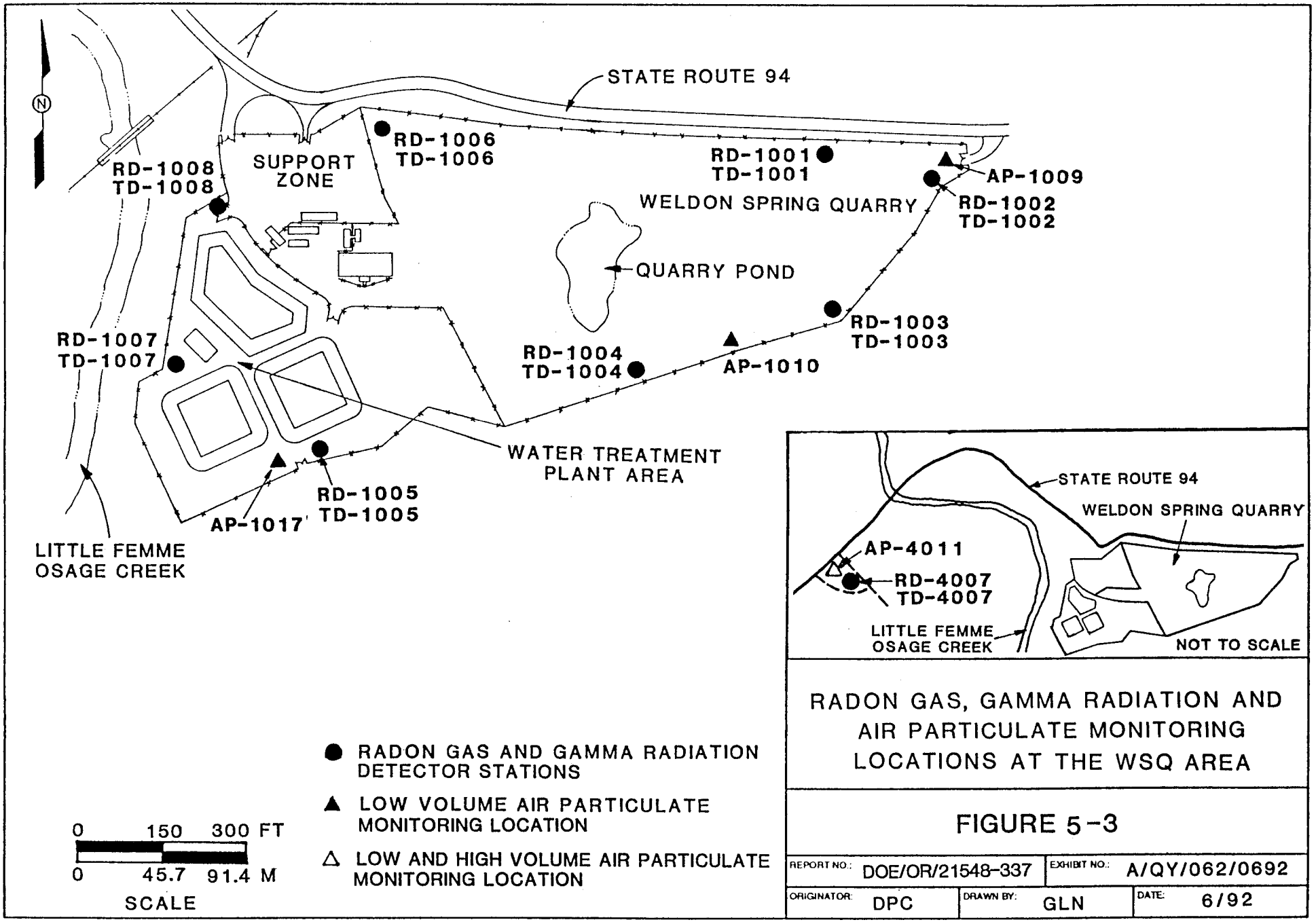

COUNTY ROUTE D
RD-4003
TD-4003
AP-4006
FRANCIS HOWELL HIGH SCHOOL
BUSCH WILDLIFE AREA HEADQUARTERS
AP-4007
RD-4001
TD-4001
AP-2002
RD-2002
TD-2002
RD-2003
TD-2003
STATE ROUTE 94
AP-2013
AP-2001
TD-2001
RD-2001
RD-3001
TD-3001
RD-2004
TD-2004
WELDON SPRING SITE
RD-2005
TD-2005
AP-3003
AP-3014
RD-2006
TD-2006
AP-2005
TD-3002
RD-3002
AP-3004
RD-3003
TD-3003
RD-3004
TD-3004
RD-4002
TD-4002
ARMY PROPERTY
GUARD HOUSE
AP-4008
RD-RADON GAS MONITORING STATION
TD-GAMMA RADIATION MONITORING STATION
AP-AIR PARTICLE MONITORING STATION
LOW AND HIGH VOLUME AIR PARTICULATE MONITORING LOCATIONS
LOW VOLUME AIR PARTICULATE MONITORING LOCATIONS
RADON GAS AND GAMMA RADIATION DETECTOR STATIONS
0 1000 2000 FT
0 304.8 609.6 M
SCALE
RADON GAS, GAMMA RADIATION, AND AIR PARTICULATE MONITORING LOCATIONS AT THE WSCP/WSRP AREA
FIGURE 5-1
REPORT NO.: DOE/OR/21548-337
EXHIBIT NO.: A/VP/048/0692
ORIGINATOR: DPC
DRAWN BY: GLN
DATE: 6/92




OFF-SITE RADON AND GAMMA MONITORING LOCATIONS

FIGURE 5-2

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/VP/042/0592 | |
| ORIGINATOR: DPC | DRAWN BY: GLN | DATE: 5/92 | |




RADON GAS, GAMMA RADIATION AND AIR PARTICULATE MONITORING LOCATIONS AT THE WSQ AREA

FIGURE 5-3

| | | | |
|---|---|---|---|
| REPORT NO.: DOE/OR/21548-337 | | EXHIBIT NO.: A/QY/062/0692 | |
| ORIGINATOR: DPC | DRAWN BY: GLN | DATE: 6/92 | |

TABLE 5-1 Second Quarter 1992 Track Etch Radon Monitoring Results[a]

| Location ID | 2nd Quarter pCi/l | Percent of Guideline [b] |
|---|---|---|
| WSQ | | |
| RD-1001 | 1.31 | 33 |
| RD-1002 | 1.4 | 38 |
| RD-1003 | 0.5 | 7 |
| RD-1004 | 0.3 | 2 |
| RD-1005 | 0.4 | 3 |
| RD-1006 | 0.3 | 2 |
| RD-1007 | 0.3 | 0 |
| RD-1008 | 0.3 | 0 |
| WSCP | | |
| RD-2001 | 0.4 | 3 |
| RD-2002 | 0.2 | 0 |
| RD-2003 | 0.3 | 2 |
| RD-2004 | 0.3 | 2 |
| RD-2005 | 0.2 | 0 |
| RD-2006 | 0.2 | 0 |
| WSRP | | |
| RD-3001 | 0.3 | 1 |
| RD-3002 | 0.4 | 5 |
| RD-3003 | 0.5 | 7 |
| RD-3004 | 0.4 | 3 |

TABLE 5-1 Second Quarter 1992 Track Etch Radon Monitoring Results[a] (Continued)

| Location ID | 2nd Quarter pCi/l | Percent of Guideline [b] |
|---|---|---|
| OFF-SITE | | |
| RD-4001* | 0.2 | |
| RD-4002 | 0.2 | 0 |
| RD-4003 | 0.2 | 0 |
| RD-4004* | 0.3 | |
| RD-4005* | 0.3 | |
| RD-4006* | 0.3 | |
| RD-4007* | 0.2 | |

(a) Results include natural background.

(b) Percent of guideline calculated by taking the quarterly average minus the average of the background stations divided by the DOE concentration guideline for Rn-222 which is 3 pCi/l (111 Bq/m$^3$)(Annual average above background) for uncontrolled areas.

* Denotes Background Station.

of detectors were also within the typical range expected during periods of normal precipitation. The quarterly radon concentrations at the Weldon Spring Chemical Plant/raffinate pit (WSCP/RP) area averaged 0.3 pCi/l (11.8 Bq/m$^3$), while the quarterly radon concentrations at the Weldon Spring Quarry (WSQ) averaged 0.6 pCi/l (22.2 Bq/m$^3$). The quarterly radon concentrations (background included) ranged from 0.03 pCi/l (1.11 Bq/m$^3$) to 1.2 pCi/l (44.4 Bq/m$^3$).

Radon concentrations found at the quarry are higher than concentrations measured at other locations, because the radium concentrations in quarry wastes are typically much higher than in other areas. Also, the quarry is a large depression with side walls ranging from 3 m to 15 m (10 ft to 50 ft) high, which tends to trap emanating radon within the quarry and raise the concentrations along the quarry perimeter.

## 5.2 Gamma Radiation Exposure

To monitor exposure from gamma radiation, environmental thermoluminescent dosimeters (TLDs) were deployed at 26 locations. The gamma monitoring station locations are identified in Figures 5-1, 5-2, and 5-3 with a prefix TD-.

Table 5-2 summarizes the second quarter results of total gamma radiation monitoring at the 18 Weldon Spring site (WSS) perimeter monitoring stations, Francis Howell High School, the Weldon Spring Army Reserve Training Area, and at the six background monitoring stations.

The Weldon Spring Site Remedial Action Project (WSSRAP) is in the process of changing TLD vendors. To facilitate this change, duplicate TLDs, one from the existing vendor and one from the new vendor, were deployed at four monitoring locations during this quarter. This changeover will be effective starting with the third quarter 1992.

The average gamma radiation measured at the 26 locations during the second quarter of 1992 (30.2 mrem) was about twice that measured in the second quarter of 1991 (15.5 mrem). Based upon the readings of the control TLD (which read 14.8 mrem for the second quarter 1991, and 37 mrem for the second quarter 1992), we believe that the elevated TLD results were due either to irradiation of dosimeters after shipment to the vendor or to vendor processing problems. Also, the results of the new dosimeters that were deployed as duplicates at four locations were comparable with historical data. This further supports the contention that the elevated readings were not attributable to actual increases in environmental gamma radiation levels in the second quarter 1992. The arithmetic average of the dose measured at the five background locations is 31 mrem. This dose is not significantly different than what was seen at other locations monitored. Thus it may be concluded that the elevated readings measured at the site and quarry were not the result of work activities performed at the site. The cause of the elevated results is still under investigation. The final results will be reported in the 1992 ASER.

## 5.3 Radioactive Air Particulates

Fourteen low volume air particulate samplers monitor the Weldon Spring site continuously. Five of these (AP-2001, AP-2002, AP-3003, AP-3004, and AP-2005) are located around the Weldon Spring Chemical Plant (WSCP) perimeter and two are located around the quarry perimeter. There are three sensitive monitoring stations, AP-4006, AP-4008, and

TABLE 5-2 Second Quarter 1992 Environmental TLD Monitoring Results[a]

| Location ID | 2nd Quarter mrem |
|---|---|
| WSQ | |
| TD-1001 | 34 |
| TD-1002 | 29 |
| TD-1003 | 35 |
| TD-1004 | 29 |
| TD-1005 | 28 |
| TD-1006 | 30 |
| TD-1007 | 30 |
| TD-1008 | 33 |
| WSCP | |
| TD-2001 | 30 |
| TD-2002 | 30 |
| TD-2003 | 30 |
| TD-2004 | 32 |
| TD-2005 | 29 |
| TD-2006 | 30 |
| WSRP | |
| TD-3001 | 37 |
| TD-3002 | 25 |
| TD-3003 | 31 |
| TD-3004 | 29 |
| OFF-SITE | |
| TD-4001* | 32 |
| TD-4002 | 23 |
| TD-4003 | 25 |
| TD-4004* | 32 |

TABLE 5-2 Second Quarter 1992 Environmental TLD Monitoring Results[a] (Continued)

| Location ID | 2nd Quarter mrem |
|---|---|
| TD-4005* | 30 |
| TD-4006* | 29 |
| TD-4007* | 32 |
| TD-4008* | 32 |

(a) Results include natural background.
\- Denotes loss of TLD.
* Denotes background station.

AP-4011, located off-site at the Francis Howell high School, the Army Reserve property, and near a residential site west of the quarry, respectively. Three new monitoring stations were added during the second quarter. Two monitoring stations, AP-2013 and AP-3014, were installed at the WSCP perimeter. The other new station, AP-1017, was installed at the WSQ perimeter. The monitoring station at the August A. Busch Wildlife Area (ABWA) (AP-4007) is used to monitor background levels in the vicinity of the WSCP. The air particulate monitoring stations are shown in Figure 5-1 and 5-3.

The background sampling station AP-4007, is approximately 0.8 km (0.5 mile) from the WSCP perimeter in a northwestern direction. The terrain between the WSCP and this sampling station is hilly and forested, providing a significant physical barrier to airborne particulates originating from the WSCP/RP area.

Table 5-3 summarizes the quarterly average concentrations and the standard deviations for the 11 air monitoring locations. The quarterly average concentration for each monitoring location was calculated by averaging all weekly air particulate analysis results including results lower than the instruments lower limit of detection (LLD). The corresponding standard deviation for each monitoring location was also calculated using all weekly air particulate analysis results. Due to maintenance and installation of new samplers, all samplers were not operating the entire 13 weeks, as indicated in the fourth column of Table 5-3. The WSSRAP has deployed high volume air samplers at critical receptor locations. The critical receptor locations include the Francis Howell High School, the Missouri Department of the Army

# TABLE 5-3 Second Quarter 1992 Radiological Air Particulate Monitoring Results

| Monitor Identification Number | Quarterly AVG. CONCENTRATION (μCi/ml) | STANDARD DEVIATION (μCi/ml) | NUMBER OF WEEKS COLLECTED | NUMBER OF VALUES ABOVE LLD |
|---|---|---|---|---|
| AP-2001 | 1.31E-15 | 2.57E-16 | 13 | 9 |
| AP-2002 | 1.50E-15 | 6.47E-16 | 13 | 12 |
| AP-3003 | 1.09E-15 | 4.54E-16 | 12 | 10 |
| AP-3004 | 1.29E-15 | 7.75E-16 | 13 | 10 |
| AP-2005 | 1.34E-15 | 5.39E-16 | 13 | 11 |
| AP-4006 | 1.16E-15 | 4.08E-16 | 13 | 13 |
| AP-4007 | 1.33E-15 | 4.87E-16 | 13 | 13 |
| AP-4008 | 1.04E-15 | 4.25E-16 | 12 | 11 |
| AP-1009 | 1.48E-15 | 6.57E-16 | 13 | 12 |
| AP-1010 | 1.28E-15 | 7.66E-16 | 12 | 9 |
| AP-4011 | 1.23E-15 | 3.75E-16 | 13 | 12 |
| AP-2013 | 1.03E-15 | 4.45E-16 | 13 | 12 |
| AP-3014 | 1.99E-15 | 4.86E-16 | 3 | 3 |
| AP-1017 | 1.05E-15 | 1.35E-16 | 2 | 2 |

* Indicates background monitor station.
To convert μCi/ml to Bq/m$^3$, multiply by 3.7E10.

Reserve property, the WSSRAP administration building, and the residential area west of the quarry. These high volume samplers are used in accordance with the *Plan for Monitoring Radionuclide Emissions Other Than Radon at the Weldon Spring Site Critical Receptors* (MKF and JEG 1992b). The high volume monitoring results will be presented in the 1992 annual site environmental report.

The second quarter average long-lived gross alpha concentrations ranged from $1.03 \times 10^{-15}$ $\mu$Ci/ml to $1.99 \times 10^{-15}$ $\mu$Ci/ml for perimeter and off site locations. The average background concentration measured at AP-4007 was $1.33 \times 10^{-15}$ $\mu$Ci/ml.

## 5.4 Asbestos

No environmental asbestos monitoring was conducted during the second quarter of 1992. As outlined in the *Environmental Monitoring Plan* (MKF and JEG 1992a), environmental asbestos monitoring is required to be performed only during asbestos removal activities. Since there were no asbestos removal operations during the second quarter of 1992, there was no need to perform environmental asbestos monitoring.

# 6 REFERENCES

MK-Ferguson Company and Jacobs Engineering Group, 1989. *Phase II Groundwater Quality Assessment for the Weldon Spring Site, Chemical Plant, Raffinate Pits and Surrounding Vicinity Properties*, Rev. 0. DOE/OR/21548-078. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. September.

MK-Ferguson Company and Jacobs Engineering Group, 1992a. *Environmental Monitoring Plan*, Rev. 1. DOE/OR/21548-237. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. January.

MK-Ferguson Company and Jacobs Engineering Group, 1992b. *Plan for Monitoring Radionuclide Emissions Other Than Radon at the Weldon Spring Site Critical Receptors*, Rev. 1. DOE/OR/21548-127. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project. St. Charles, MO.

DOE Orders

5400.5 *Radiation Protection of the Public and the Environment*

Procedures

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