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Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
7295 Highway 94 South
St. Charles, Missouri 63304

September 24, 1991

ADDRESSEES:

QUARTERLY ENVIRONMENTAL DATA SUMMARY FOR THE SECOND QUARTER, 1991 FOR THE WELDON SPRING SITE REMEDIAL ACTION PROJECT

Enclosed for your information and use is a copy of the Quarterly Environmental Data Summary Report. The document summarizes the environmental monitoring data for the second quarter, highlights any potentially significant findings, and offers preliminary interpretations. Final interpretations will appear in the 1991 Annual Site Environmental Report.

The report concludes that no significant differences or changes in off-site exposures resulting from Weldon Spring Site contaminates have occurred during this reporting period.

If you have any questions please call Ken Lawver at (314)441-8978.

Sincerely,

Stephen H. McCracken
Project Manager
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Enclosure:
As stated

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QUARTERLY ENVIRONMENTAL DATA SUMMARY SECOND QUARTER 1991

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

SEPTEMBER 1991 **REV. 0**

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

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DOE/OR/21548-226

Weldon Spring Site Remedial Action Project

Quarterly Environmental Data Summary Second Quarter 1991

Revision 0

September 1991

Prepared by

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and
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7295 Highway 94 South
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for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
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ABSTRACT AND WELDON SPRING SITE QUARTERLY SELF ASSESSMENT SECOND QUARTER 1991

The purpose of this Quarterly Environmental Data Summary is to provide preliminary data acquired as part of the Weldon Spring Site Remedial Action Project (WSSRAP) environmental monitoring program. The document summarizes the environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1991 Annual Site Environmental Report.

This report includes data from environmental monitoring activities at the Weldon Spring site (WSS) during the second quarter of 1991. Groundwater, surface water, and air were sampled in order to monitor potential exposure pathways. Analytical parameters included radionuclides, nitroaromatic compounds, inorganic anions, and direct gamma exposure. The results are used to calculate exposure doses (where applicable) and assess the impact of the contaminants at the site on potentially exposed populations.

In summary, no significant differences were observed in off-site exposures during the second quarter of 1991 relative to exposures calculated in previous quarters. Contaminated groundwater did not affect private water supplies or the St. Charles County well field. Surface water containing elevated uranium activity continued to impact the Femme Osage Slough. Off-site gamma, radon and air particulate exposures remained indistinguishable from background. Off-site monitoring demonstrated that exposure levels at the Francis Howell High School, the Busch Wildlife Area Headquarters, and the Weldon Spring Training Area remain indistinguishable from background levels.

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1 INTRODUCTION

This document is the fifth in a series of documents designed to provide a summary of the findings from the routine environmental monitoring programs at the Weldon Spring Site Remedial Action Project (WSSRAP). These documents 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 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 observations made in previous reports. The full interpretation of these data (as well as data in other quarterly summaries) will be undertaken in the 1991 ASER. It is recommended that interested readers refer to previous Environmental Monitoring Plans (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 are 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). However, because of delays in data delivery from the analytical laboratories, some of the data that was expected to be included in this report are not yet available for reporting. The unavailability of data is due to a nationwide shortage in analytical services. The WSSRAP is taking corrective action to ensure more timely availability of data in the future. These data will be reported in the 1991 ASER. Sludges, soils, and biological specimens 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 1991 ASER. Included for the first time are QC data for the second quarter which are presented in tables throughout this document.

This information provides insight as to the performance of the laboratory and the quality of the data. This QC data is provided for information only. Final interpretation will be presented in the 1991 Annual Site Environmental Report (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

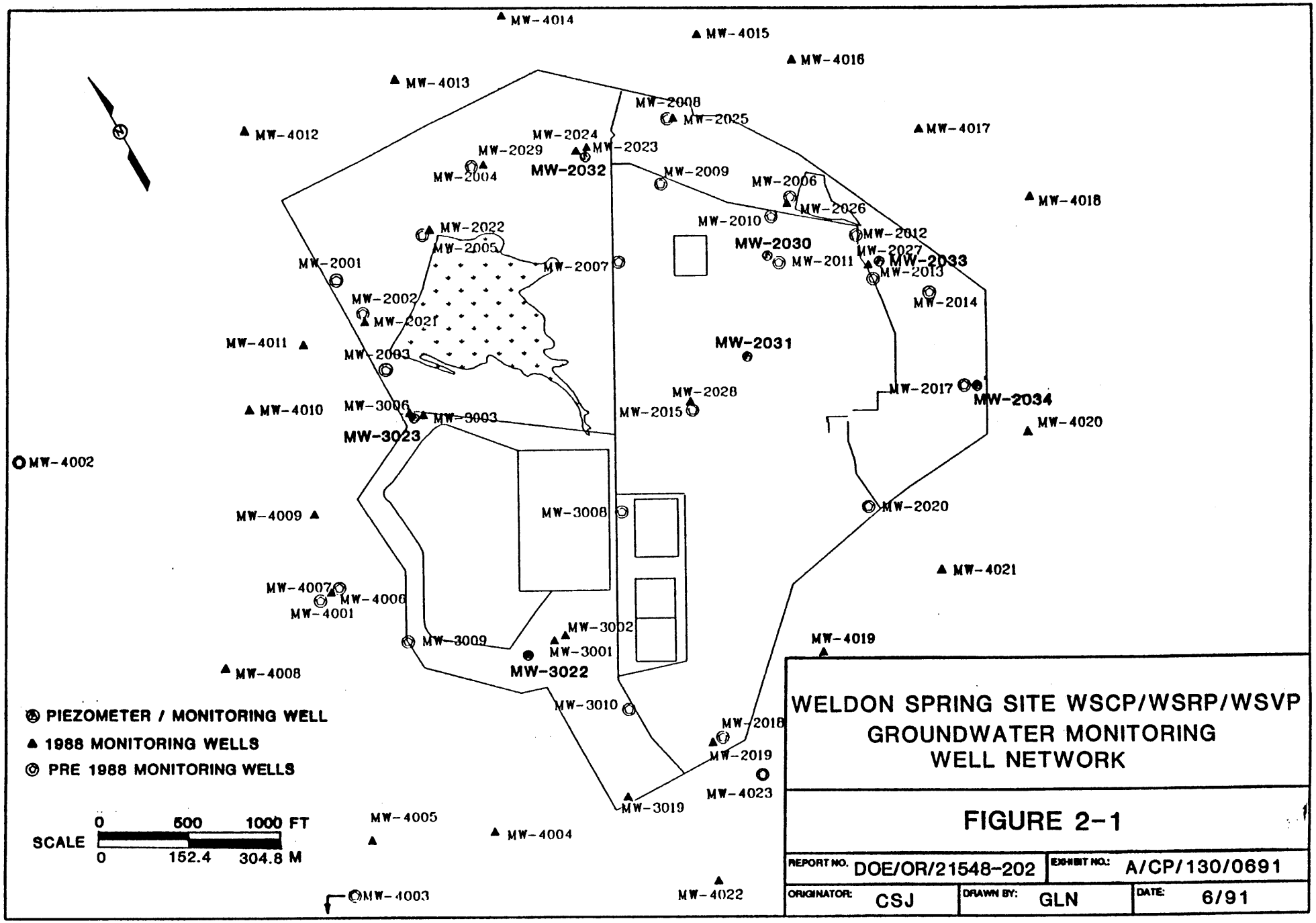
The groundwater at the chemical plant/raffinate pits/vicinity properties area is monitored on a semi-annual basis with the exception of MW-2001, MW-2002, MW-2003, MW-3003, MW-3006, MW-3008, MW-3009, MW-3023, MW-4012 and MW-4013 which are monitored quarterly. Monitoring well locations are shown in Figure 2-1. Data from the semiannual groundwater monitoring for the first half of 1991 are presented in this quarterly data summary, however, data from the quarterly monitored wells are presented in each QEDS.

2.1.1 Nitroaromatic Results

Table 2-1 contains nitroaromatic data from samples collected from the quarterly and semi-annual monitored groundwater wells at the CP/RP/VP area. Nitroaromatic compounds were detected in 22 samples. However, the data continue to reflect levels historically found and documented in previous environmental reports.

2.1.2 Radiological Results

The radiological results for samples from quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-2. The upper bound for natural uranium background concentrations in groundwater at the WSCP/RP/VP has been determined to be 3.4 pCi/l. The EPA has not yet established drinking water standards for uranium; however, studies leading to proposed rulemaking are using uranium in the 10 pCi/l to 40 pCi/l range. The U.S. Department of Energy (DOE) has a health based derived concentration guideline (DCG) of 600 pCi/l in surface water effluent.



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

FIGURE 2-1

REPORT NO. DOE/OR/21548-202		EXHIBIT NO.: A/CP/130/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

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

SAMPLE ID	NB (µg/l) DL=0.03	1,3-DNB (µg/l) DL=0.09	2,4-DNT (µg/l) DL=0.03	2,6-DNT (µg/l) DL=0.01	2,4,6-TNT (µg/l) DL=0.03	1,3,5-TNB (µg/l) DL=0.03
GW-2001-Q191	ND	ND	0.073	0.049	ND	ND
GW-2002-Q191	ND	ND	0.063	0.34	ND	ND
GW-2003-Q191	ND	ND	0.15	0.65	ND	ND
GW-2004-040891	ND	ND	ND	ND	ND	ND
GW-2005-050791	ND	ND	0.066	0.11	ND	ND
GW-2006-040891	ND	ND	ND	2	ND	10
GW-2007-010991	ND	ND	ND	ND	ND	17.5
GW-2008-010791	ND	ND	0.05	0.89	ND	0.69
GW-2009-010891	ND	ND	ND	ND	ND	ND
GW-2010-010791	ND	0.14	0.6	0.93	0.44	0.19
GW-2011-010891	ND	ND	ND	ND	ND	ND
GW-2012-010891	ND	ND	ND	ND	ND	ND
GW-2013-030791	ND	0.18	0.7	15	0.85	5
GW-2014-022891	ND	ND	0.14	0.74	ND	2.8
GW-2015-010991	ND	ND	ND	ND	ND	ND
GW-2017-011591	ND	ND	ND	ND	ND	ND
GW-2018-011591	ND	ND	ND	ND	ND	ND
GW-2019-050991	ND	ND	ND	ND	ND	ND

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

SAMPLE ID	NB (µg/l) DL=0.03	1,3-DNB (µg/l) DL=0.09	2,4-DNT (µg/l) DL=0.03	2,6-DNT (µg/l) DL=0.01	2,4,6-TNT (µg/l) DL=0.03	1,3,5-TNB (µg/l) DL=0.03
GW-2020-052191	ND	ND	ND	ND	ND	ND
GW-2021-052191	ND	ND	ND	ND	ND	ND
GW-2022-050791	ND	ND	ND	ND	ND	ND
GW-2023-051491	ND	ND	ND	ND	ND	ND
GW-2024-052291	ND	ND	ND	ND	ND	ND
GW-2025-052291	ND	ND	ND	ND	ND	ND
GW-2026-052891	ND	ND	ND	ND	ND	ND
GW-2027-052891	ND	ND	ND	ND	ND	ND
GW-2028-050991	ND	ND	ND	ND	ND	ND
GW-2029-051391	ND	ND	ND	ND	ND	ND
GW-2030-050991	ND	ND	0.09	10	8.5	4.2
GW-2031-050291	ND	ND	ND	ND	ND	ND
GW-2032-053091	ND	ND	0.033	4.6	7.8	4
GW-2033-052991	ND	ND	0.09	9.3	1.1	2
GW-2034-060691	ND	ND	ND	ND	ND	ND
GW-3001-013191	ND	ND	0.44	0.25	ND	0.09
GW-3002-060491	ND	ND	ND	ND	ND	ND
GW-3003-031891	ND	ND	0.059	0.085	ND	ND

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

SAMPLE ID	NB (µg/l) DL=0.03	1,3-DNB (µg/l) DL=0.09	2,4-DNT (µg/l) DL=0.03	2,6-DNT (µg/l) DL=0.01	2,4,6-TNT (µg/l) DL=0.03	1,3,5-TNB (µg/l) DL=0.03
GW-3006-031991	ND	ND	ND	ND	ND	ND
GW-3008-Q191	ND	ND	0.08	0.16	ND	ND
GW-3009-Q191	ND	ND	ND	ND	ND	ND
GW-3010	ABANDONED 1991					
GW-3019-013091	ND	ND	ND	ND	ND	ND
GW-3022-060491	ND	ND	0.12	0.034	ND	ND
GW-3023-031991	ND	ND	2.6	4.5	ND	ND
GW-4001-010991	ND	ND	ND	ND	ND	43.3
GW-4002-011691	ND	ND	0.42	1.1	1.1	0.09
GW-4003-011691	ND	ND	ND	ND	ND	ND
GW-4004-021991	ND	ND	ND	ND	ND	ND
GW-4005-021991	ND	ND	ND	ND	ND	ND
GW-4005-050791	ND	ND	ND	ND	ND	ND
GW-4006-010991	ND	ND	ND	ND	ND	ND
GW-4007	NS	NS	NS	NS	NS	NS
GW-4008-011691	ND	ND	ND	ND	ND	ND
GW-4009-011791	ND	ND	ND	ND	ND	ND
GW-4010-050691	ND	ND	ND	ND	ND	ND

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

SAMPLE ID	NB (µg/l) DL=0.03	1,3-DNB (µg/l) DL=0.09	2,4-DNT (µg/l) DL=0.03	2,6-DNT (µg/l) DL=0.01	2,4,6-TNT (µg/l) DL=0.03	1,3,5-TNB (µg/l) DL=0.03
GW-4011-011791	ND	ND	ND	ND	ND	ND
GW-4012-Q191	ND	ND	ND	ND	ND	ND
GW-4013-Q191	ND	ND	0.049	1.1	0.55	34
GW-4014-061091	ND	ND	ND	0.028	ND	0.22
GW-4015-061791	ND	ND	0.031	1.3	ND	0.56
GW-4016-013191	ND	ND	ND	ND	ND	ND
GW-4017-013191	ND	ND	ND	ND	ND	ND
GW-4018-041791	ND	ND	ND	ND	ND	ND
GW-4019-041691	ND	ND	ND	ND	ND	ND
GW-4020-041691	ND	ND	ND	ND	ND	ND
GW-4021-041791	ND	ND	ND	ND	ND	ND
GW-4022-050791	ND	ND	ND	ND	ND	ND
GW-4023-041791	ND	ND	0.097	0.055	ND	0.13
GW-0000-060691	ND	ND	ND	ND	ND	ND
GW-2033-052991-BB	ND	ND	ND	ND	ND	ND
GW-2021-052191-FB	ND	ND	ND	ND	ND	ND

NS - NOT SAMPLED ND - NOT DETECTED
BB - BAILER BLANK FB - FIELD BLANK

TABLE 2-2 Second Quarter, Semiannaul Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP

SAMPLE ID	Nitrate (mg/l) DL=0.1	Sulfate (mg/l) DL=1.0	Uranium (pCi/l)
GW-2001-Q191	20.7	5.4	ND
GW-2001-Q291	19.6	5.8	NS
GW-2002-Q191	23	109	ND
GW-2002-Q291	18.9	122	NS
GW-2003-Q191	414	114	0.7
GW-2003-Q291	51.6	133	NS
GW-2004-040891	1	2.6	ND
GW-2005-050791	253	20.1	ND
GW-2006-040891	6	32.9	ND
GW-2007-010991	ND	11	2
GW-2008-010791	3.3	30.9	1.4
GW-2009-010891	5.5	10.6	1.4
GW-2010-010791	1.2	32.7	0.7
GW-2011-010891	2	107	4.8
GW-2012-010891	1.3	73.5	2
GW-2013-030791	1.2	18	2.7
GW-2014-022891	1.9	21	1.4
GW-2015-010991	0.3	102	4.1
GW-2017-011591	0.7	617	7.5
GW-2018-011591	0.6	6.5	1.4
GW-2019-050991	ND	30.7	1.4
GW-2020-052191	0.9	136.4	3.4
GW-2021-052191	ND	10.7	ND
GW-2022-050791	0.616	12.8	ND
GW-2023-051491	ND	16	ND
GW-2024-052291	ND	31.4	1.4
GW-2025-052291	ND	14.5	ND
GW-2026-052891	ND	14.5	0.7

TABLE 2-2 Second Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	Nitrate (mg/l) DL=0.1	Sulfate (mg/l) DL=1.0	Uranium (pCi/l)
GW-2027-052891	ND	10.5	ND
GW-2028-050991	ND	74.1	0.7
GW-2029-051391	ND	27.7	0.7
GW-2030-050991	1.3	28.5	12.2
GW-2031-050291	0.4	33.7	6.1
GW-2032-053091	79	10	2
GW-2033-052991	ND	0.9	ND
GW-2034-060691	ND	15.5	3.4
GW-3001-013191	336	20.9	4.1
GW-3002-060491	ND	636.7	1.4
GW-3003-Q191	4	149	19
GW-3003-Q291	806	255	NS
GW-3006-Q191	1	24.2	ND
GW-3006-Q291	ND	21.6	NS
GW-3008-Q191	1050	51.6	4.1
GW-3008-053091	1010	1030	NS
GW-3009-Q191	89	39.8	49.6
GW-3009-Q291	0.724	55.7	NS
GW-3010-	ABANDONED 1991		
GW-3019-013091	ND	4.7	8.2
GW-3022-060491	88	1.2	3.4
GW-3023-031991	275	558	7.5
GW-3023-Q291	389	268	NS
GW-4001-010991	43.3	62.5	3.4
GW-4002-011691	1.2	18.1	ND
GW-4003-011691	8.1	NA	ND
GW-4004-021991	0.8	20.2	ND

TABLE 2-2 Second Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	Nitrate (mg/l) DL=0.1	Sulfate (mg/l) DL=1.0	Uranium (pCi/l)
GW-4005-021991	1.9	17.9	6.8
GW-4005-050791	1.6	16.4	122.4
GW-4006-010991	5.3	25.5	1.2
GW-4007	NS	NS	NS
GW-4008-011691	ND	27.4	ND
GW-4009-011791	ND	20.9	2.7
GW-4010-050691	ND	24.9	0.7
GW-4010-070991	ND	25	NS
GW-4011-011791	23	45.4	4.8
GW-4012-Q191	ND	54	4.1
GW-4012-Q291	180	9140	NS
GW-4013-Q191	84.1	42	1.4
GW-4013-061091	75.8	35.2	NS
GW-4014-061091	1.55	25.9	ND
GW-4015-061791	2	7.3	NA
GW-4016-013191	ND	ND	5.4
GW-4017-013191	ND	9.83	2.7
GW-4018-041791	2.2	4.4	ND
GW-4019-041691	0.2	3.7	3.4
GW-4020-041691	ND	100	24.5
GW-4021-041791	ND	221	8.2
GW-4022-050791	0.1	43.7	ND
GW-4023-041791	0.2	46.4	ND
GW-0000-060691			ND
GW-4022-050791-DU			4.9
GW-2021-052191-FB	ND	ND	
GW-0000-053091-WB			ND

TABLE 2-2 Second Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	Nitrate (mg/l) DL=0.1	Sulfate (mg/l) DL=1.0	Uranium (pCi/l)
GW-2033-052991-BB			ND
GW-0000-052391-WB			2.04
GW-0000-061191			ND
GW-2033-052991-BB	ND	ND	
GW-0000-052891-WB			0.68

ND - NOT DETECTED
NS - NOT SAMPLED
NA - NOT AVAILABLE
DU - DUPLICATE
BB - BAILER BLANK
FB - FIELD BLANK
WB - WATER BLANK

The highest uranium level detected was 122.4 pCi/l from a sample obtained from Monitoring Well 4005. The other concentrations reported in Table 2-2 continue to indicate levels below the proposed drinking water standard for uranium.

2.1.3 Geochemical Results

Geochemical results for samples from quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-3. Geochemical parameters were added to the *Environmental Monitoring Plan* for the 1991 monitoring year.

2.1.4 Inorganic Anion Results

Inorganic anion results for the quarterly monitored WSCP/RP/VP wells are shown in Table 2-2. The results reflect levels historically found in these wells.

2.2 Weldon Spring Quarry

Chemical and radiological wastes at the quarry are of particular concern because of their proximity to the St. Charles County well field. The well field is located approximately 0.8 km (0.5 mile) to the south of the Weldon Spring quarry. Monitoring of contaminants in groundwater and the protection of the well field is a top WSSRAP priority.

Groundwater is currently being monitored in 48 wells in and around the quarry. Thirty-six monitoring wells installed by the U.S. Department of Energy (DOE) currently exist 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 are also included in the DOE's monitoring program. All monitoring well locations are shown in Figures 2-2 and 2-3. These wells draw water from both bedrock and alluvial aquifers.

Two separate groundwater monitoring programs have been developed for the quarry. The first program is a bimonthly sampling of all wells north of the Femme Osage Slough and MW-1010 and MW-1011. The second program is a quarterly sampling of all wells south of the Femme Osage Slough, excluding MW-1010 and -1011 but including the St. Charles

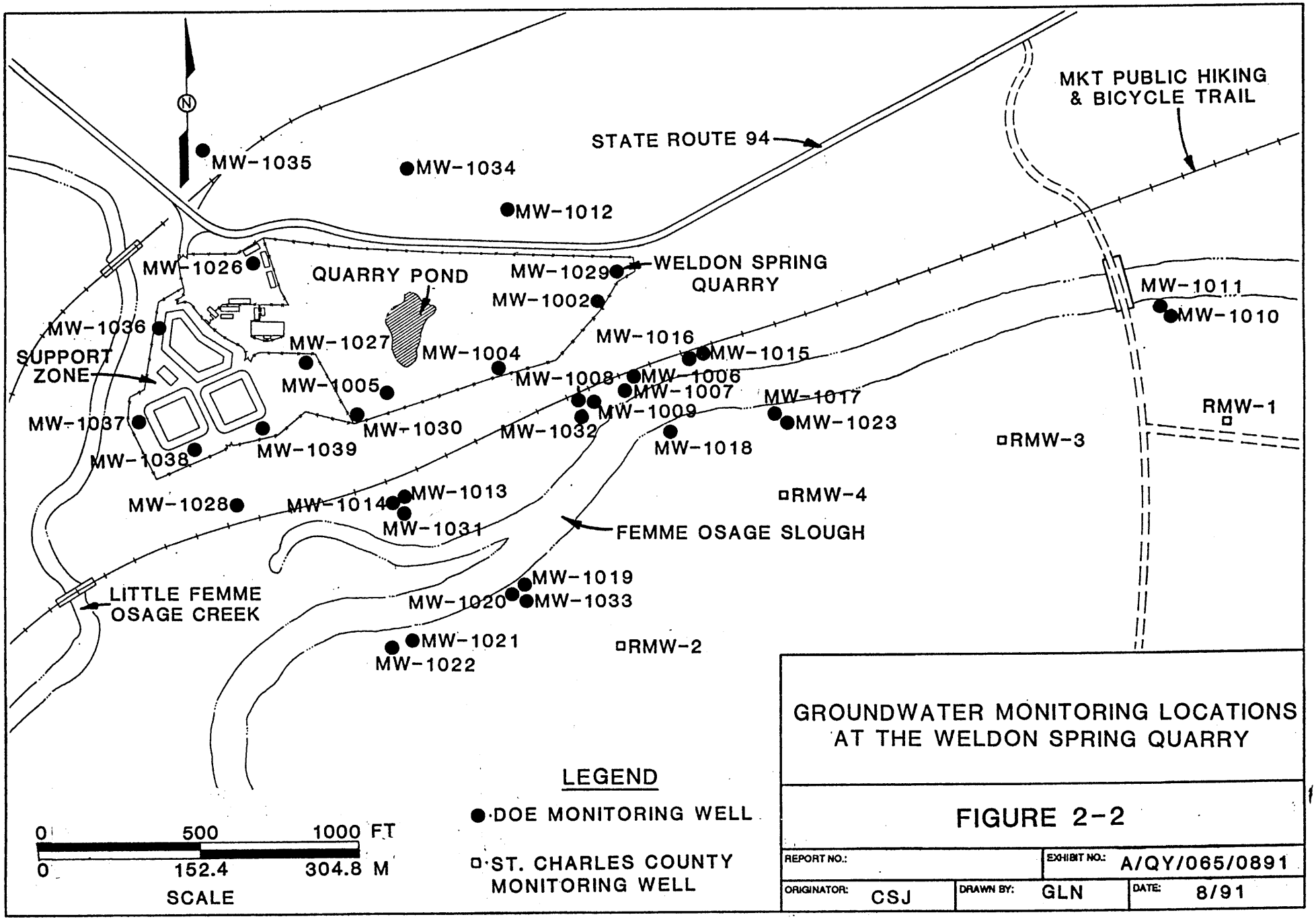
TABLE 2-3 Second Quarter Geochemical Data for Groundwater at the WSCP/RP/VP

	As (µg/l) DL=3.9	Ba (µg/l) DL=12.9	Ca (µg/l) DL=275.8	Cr (µg/l) DL=9.3	Co (µg/l)	Fe (µg/l) DL=37.2	Li (µg/l) DL=13	Mg (µg/l) DL=118.8	Mn (µg/l) DL=4.8	Ni (µg/l) DL=31.2
GW-2001-Q291	ND	189	NS	ND	ND	ND	ND	35700	ND	ND
GW-2002-Q291	ND	152	NS	ND	ND	ND	392	72100	ND	ND
GW-2003-Q291	ND	109	234000	ND	NA	41	405	85700	ND	ND
GW-3003-Q291	ND	157	231000	ND	NA	44	417	122000	85.6	ND
GW-3006-Q291	ND	133	50000	ND	NA	145	ND	40900	36.9	ND
GW-3008-Q291	ND	322	664000	ND	NA	ND	204	161000	ND	ND
GW-3009-Q291	ND	835	72100	ND	NA	ND	ND	43900	ND	52.4
GW-3023-Q291	ND	230	440000	55	NA	21700	729	108000	538	54.2
GW-4012-Q291	ND	77.1	47900	9.8	NA	115	ND	30300	9.1	ND
GW-4013-Q291	ND	148	123000	ND	NA	ND	58.1	45600	ND	99

TABLE 2-3 Second Quarter Geochemical Data for Groundwater at the WSCP/RP/VP (Continued)

	K (µg/l) DL=360	Na (µg/l) DL=240	Sr (µg/l) DL=1.5	Nitrite (µg/l) DL=100	Bromide (µg/l) DL=200	Chloride (µg/l) DL=.001	Phosphorus, Total (µg/l) DL=50	Silica, Dissolved (µg/l) DL=1000	Alkalinity (mg/l) DL=1
GW-2001-Q291	1300	8000	8.9	ND	ND	6600	41.3	9420	332
GW-2002-Q291	8100	87800	306	ND	NA	821	44.6	10500	291
GW-2003-Q291	6940	96600	344	ND	832	8680	37.9	8130	283
GW-3003-Q291	8830	135000	538	193	1006	10800	58.1	6270	288
GW-3006-Q291	1290	15500	196	ND	330	1510	22.7	6810	382
GW-3008-Q291	2450	213000	1300	ND	362	15100	22.9	10900	250
GW-3009-Q291	1530	17500	164	ND	271.1	3400	17.6	6270	165
GW-3023-Q291	4430	213000	683	1020	321.3	15900	1150	5360	295
GW-4012-Q291	11200	32300	169	180	262	2800	104	9500	329
GW-4013-Q291	ND	27300	147	ND	884	5670	126	9650	321

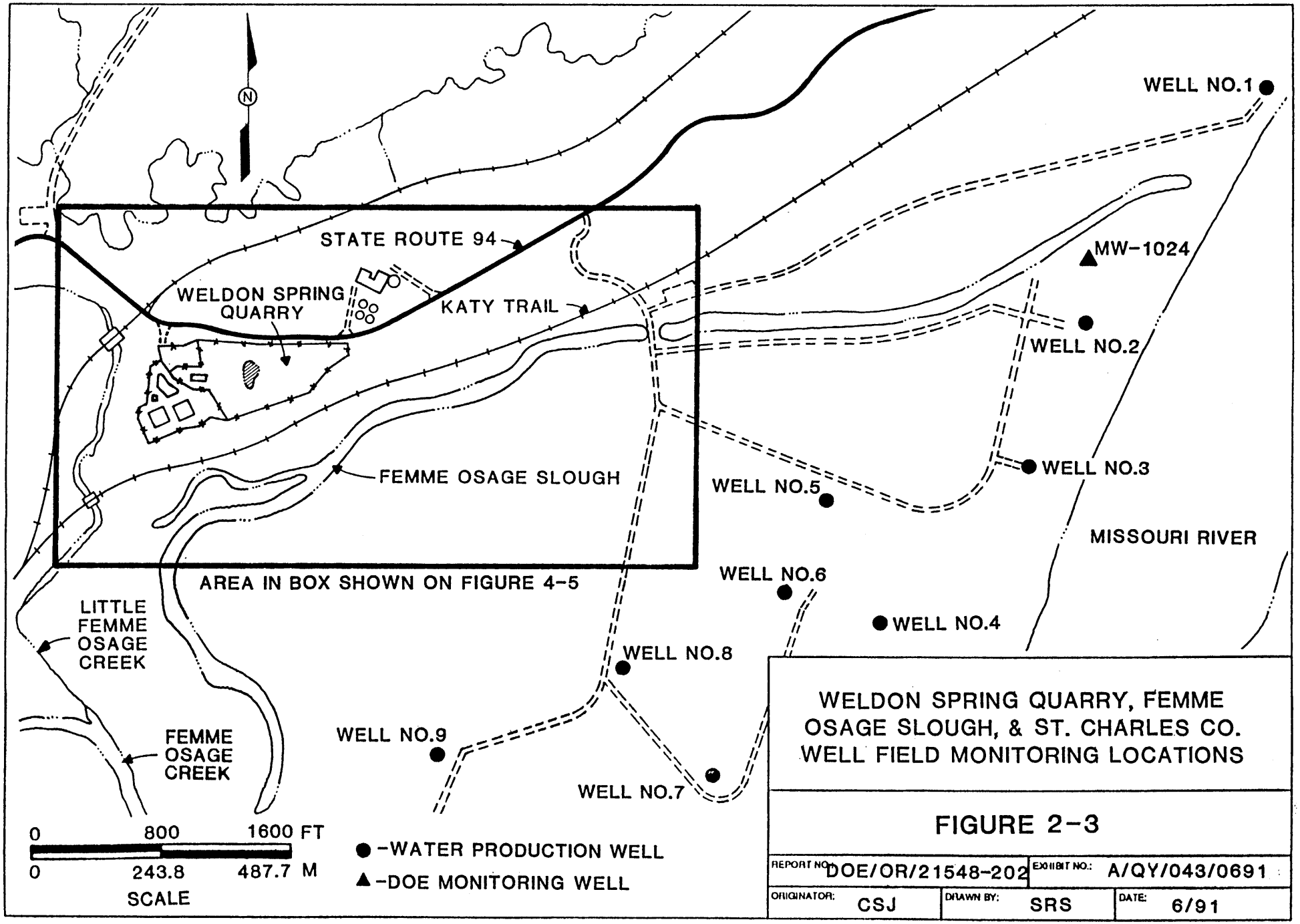
ND-Not Detected
NA-Not Available
NS-Not Sampled



GROUNDWATER MONITORING LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 2-2

REPORT NO.:		EXHIBIT NO.:	A/QY/065/0891
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 8/91	



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

FIGURE 2-3

REPORT NO. DOE/OR/21548-202		EXHIBIT NO.: A/QY/043/0691	
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91	

County well field. Both the raw and treated waters from the St. Charles County water treatment plant are also sampled.

2.2.1 Radiological Results

Radiological data are presented in Tables 2-4, 2-5, and 2-6 for samples collected on a bimonthly and quarterly bases. The results show typical fluctuations near the average levels in the WSQ area with no dramatic increases evident except in MW-1015 and MW-1016. The increases in these two wells from the first bimonthly to the second and third bimonthly sampling events are on a magnitude of 2 to 5 times. The wells will continue to be monitored closely.

2.2.2 Nitroaromatic Compounds Results

Analytical results for nitroaromatic compounds are presented in Tables 2-7, 2-8, and 2-9. No monitoring wells south of the Femme Osage Slough showed detectable concentrations of nitroaromatic compounds during the second quarter 1991. The distribution and magnitude of nitroaromatic contamination near the quarry remains unchanged with slight increases of 2,4,6-TNT and 1,3,5-TNB found in MW-1002, MW-1004, MW-1006, MW-1015, and MW-1016.

2.2.3 Inorganic Anions Results

Two inorganic anions--nitrate and sulfate--were measured in quarry wells. Tables 2–4, 2-5, and 2-6 display the analytical results for the second quarter of 1991, which are consistent with data reported in the previous environmental monitoring reports. The WSQ groundwater samples continue to indicate no significant groundwater contamination by nitrate. The groundwater samples continue to indicate background concentrations of sulfate in wells south of the Femme Osage Slough.

2.2.4 Metals Results

A selected group of quarry wells located south of the Femme Osage Slough were sampled for cadmium, lead, and mercury in addition to arsenic and barium. Analytical results for these metals are presented in Tables 2-10, 2-11, and 2-12. Results from the

TABLE 2-4 Second Bimonthly (March/April) Inorganic Anions and Radiological Results in Groundwater for the Weldon Spring Quarry

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-1002-050191	ND	38.7	NA
GW-1004-050191	0.15	68.1	NA
GW-1005-050191	ND	248.2	NA
GW-1006-043091	1.27	424	2992
GW-1007-043091	ND	26.6	312.8
GW-1008-043091	ND	243	3536
GW-1009-043091	ND	318.8	8.8
GW-1012-042991	1.5	60.7	NA
GW-1013-043091	ND	97.2	884
GW-1014-043091	ND	137.5	1224
GW-1015-050291	2.81	386	1088
GW-1016-050291	0.765	217	353.6
GW-1026-042591	ND	10.8	ND
GW-1027-042591	ND	112	605.2
GW-1028-043091	ND	58.4	ND
GW-1029-050191	1.02	183.8	NA
GW-1030-050691	0.104	91	ND
GW-1031-050291	ND	53.5	40.8
GW-1032-050891	ND	207.6	340
GW-0000-060691-WB	1.62	ND	
GW-0000-050791-WD-DU			ND

ND - NOT DETECTED
NA - NOT AVAILABLE
WB - WATER BLANK
DU - DUPLICATE

TABLE 2-5 Third Bimonthly (May/June) Inorganic Anions and Radiological Results in Groundwater for the Weldon Spring Quarry

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-1002-060691	NS	NS	0.068
GW-1002-061091	1.29	52.8	NS
GW-1004-060391	0.12	261	4964.0
GW-1005-060391	ND	176	2108.0
GW-1006-060591	0.57	580.0	2516.0
GW-1007-060591	ND	ND	46.2
GW-1008-060591	ND	236.0	3604.0
GW-1009-060591	ND	208.0	ND
*GW-1010-061191	NS	NS	ND
*GW-1011-061191	NS	NS	13.6
GW-1012-061291	NA	NA	4.1
GW-1013-060591	ND	133.0	952.0
GW-1014-060591	ND	134.0	1224.0
GW-1015-061091	2.19	327	503.2
GW-1016-060691	NS	NS	1319.2
GW-1016-061091	0.295	259	NS
GW-1026-052391	NA	NA	ND
GW-1027-052391	NA	NA	408.0
GW-1028-052391	NA	NA	2.0
GW-1029-060391	ND	75.1	ND
GW-1030-061791	NA	NA	6.0
GW-1031-061191	NA	NA	32.6
GW-1032-050891	NA	NA	421.6
GW-1032-060691	NA	NA	414.8
GW-1032-061091	ND	208	NA
GW-1033-061291	NA	NA	2.0
GW-1034-062091	1.14	92.1	ND
GW-1035-062091	ND	44.8	ND

TABLE 2-5 Third Bimonthly (May/June) Inorganic Anions and Radiological Results in Groundwater for the Weldon Spring Quarry (Continued)

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-1036-061391	ND	59.0	NA
GW-1037-062791	0.126	13.9	17.0
GW-1038-062691	ND	35.5	1.4
GW-1039-062691	ND	28.7	1.4

NA - NOT AVAILABLE
NS - NOT SAMPLED
ND - NOT DETECTED
* - SPECIAL SAMPLING EVENT

TABLE 2-6 Second Quarter Inorganic Anions and Radiological Results for the WSQ

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)	Gross Alpha (pCi/l)
GW-1010-Q291	ND	ND	ND	NS
GW-1011-Q291	ND	15.6	2.7	NS
GW-1017-Q291	ND	10	ND	NS
GW-1018-Q291	ND	NA	ND	NS
GW-1019-Q291	ND	29	ND	NS
GW-1020-Q291	ND	50	1.36	NS
GW-1021-Q291	ND	20.8	ND	NS
GW-1022-Q291	ND	54.5	ND	NS
GW-1023-Q291	ND	1	ND	NS
GW-1024-Q291	ND	ND	ND	0 +/- 4
GW-RMW1-Q291	ND	22.8	ND	1 +/- 5
GW-RMW2-Q291	ND	31.7	4.8	5 +/- 5
GW-RMW3-Q291	ND	37.2	4.8	2 +/- 6
GW-RMW4-Q291	0.7	34.2	ND	3 +/- 5
GW-RAWW-Q291	NS	NS	ND	1 +/- 4
GW-FINW-Q291	NS	NS	ND	-1 +/- 2
GW-PW02-Q291	NS	NS	ND	0 +/- 4
GW-PW03-Q291	NS	NS	ND	0 +/- 4
GW-PW04-Q291	NS	NS	ND	-1 +/- 4
GW-PW05-Q291	NS	NS	ND	1 +/- 4
GW-PW06-Q291	NS	NS	ND	0 +/- 5
GW-PW07-Q291	NS	NS	ND	-3 +/- 5
GW-PW08-Q291	NS	NS	ND	-1 +/- 5

ND - NOT DETECTED
NS - NOT SAMPLED
NA - NOT AVAILABLE

TABLE 2-7 Second Bimonthly (March/April) Nitroaromatic Data for Groundwater at the Weldon Spring Quarry

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-1002-050191*	ND	0.18	ND	11.0	27	160
GW-1004-050191*	ND	ND	2.8	7.3	19.0	8.0
GW-1005-050191*	ND	ND	0.14	0.059	ND	ND
GW-1006-043091	ND	ND	0.09	4.1	28.0	130.0
GW-1007-043091	ND	ND	ND	ND	ND	ND
GW-1008-043091	ND	ND	ND	0.092	0.16	ND
GW-1009-043091	ND	ND	ND	ND	ND	ND
GW-1012-042991	ND	ND	ND	ND	ND	ND
GW-1013-043091	ND	ND	0.17	0.047	ND	ND
GW-1014-043091	ND	ND	ND	ND	ND	ND
GW-1015-050291*	ND	ND	ND	0.75	18.0	160.0
GW-1016-050291*	ND	ND	ND	0.13	2.2	16.0
GW-1028-043091	ND	ND	ND	ND	ND	ND
GW-1029-050191*	ND	ND	ND	ND	ND	ND
GW-1030-050691*	ND	ND	0.046	0.012	ND	ND
GW-1031-050291*	ND	ND	ND	ND	ND	ND
GW-1032-Q291	ND	ND	0.060	0.049	ND	ND

* - Sampled in May NA - NOT ANALYZED ND - NOT DETECTED

TABLE 2-8 Third Bimonthly (May/June) Nitroaromatic Data for Groundwater at the Weldon Spring Quarry

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-1002-061091	ND	0.16	ND	8.6	21.0	140.0
GW-1004-060391	ND	ND	2.6	5.8	14	5.4
GW-1005-060391	ND	ND	0.13	0.054	ND	ND
GW-1006-060591	ND	ND	ND	2.1	15.0	45.0
GW-1007-060591	ND	ND	ND	ND	ND	ND
GW-1008-060591	ND	ND	ND	0.088	0.094	ND
GW-1009-060591	ND	ND	ND	ND	ND	ND
GW-1010-061191	ND	ND	ND	ND	ND	ND
GW-1011-061191	ND	ND	ND	ND	ND	ND
GW-1012-061291	ND	ND	ND	ND	ND	ND
GW-1013-060591	ND	ND	0.066	0.019	ND	ND
GW-1014-060591	ND	ND	ND	ND	ND	ND
GW-1015-061091	ND	ND	ND	0.16	4.0	30.0
GW-1016-061091	ND	ND	ND	1.0	26.0	220.0
GW-1026-052391	ND	ND	ND	ND	ND	ND
GW-1027-052391	ND	ND	8.5	6.9	6.2	0.032
GW-1028-052391	ND	ND	ND	ND	ND	ND
GW-1029-060391	ND	ND	ND	ND	ND	ND
GW-1030-061791	ND	ND	0.038	ND	ND	ND

TABLE 2-8 Third Bimonthly (May/June) Nitroaromatic Data for Groundwater at the Weldon Spring Quarry (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-1031-061191	ND	ND	ND	ND	ND	ND
GW-1032-061091	ND	ND	0.52	0.27	0.48	0.053
GW-1033-061291	ND	ND	ND	ND	ND	ND
GW-1034-062091	ND	ND	ND	ND	ND	ND
GW-1035-062091	ND	ND	ND	ND	ND	ND
GW-1036-061391	ND	ND	ND	ND	ND	ND
GW-1037-062791	ND	ND	ND	ND	ND	ND
GW-1038-062691	ND	ND	ND	ND	ND	ND
GW-1039-062691	ND	ND	ND	ND	ND	ND

ND - NOT DETECTED

TABLE 2-9 Second Quarter Nitroaromatic Data for Groundwater at the Weldon Spring Quarry

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-1010-Q291	ND	ND	ND	ND	ND	ND
GW-1011-Q291	ND	ND	ND	ND	ND	ND
GW-1017-Q291	ND	ND	ND	ND	ND	ND
GW-1018-Q291	ND	ND	ND	ND	ND	ND
GW-1019-Q291	ND	ND	ND	ND	ND	ND
GW-1020-Q291	ND	ND	ND	ND	ND	ND
GW-1021-Q291	ND	ND	ND	ND	ND	ND
GW-1022-Q291	ND	ND	ND	ND	ND	ND
GW-1023-Q291	ND	ND	ND	ND	ND	ND
GW-1024-Q291	ND	ND	ND	ND	ND	ND
GW-RMW1-Q291	*	*	*	*	*	*
GW-RMW2-Q291	ND	ND	ND	ND	ND	ND
GW-RMW3-Q291	ND	ND	ND	ND	ND	ND
GW-RMW4-Q291	ND	ND	ND	ND	ND	ND
GW-RAWW-Q291	ND	ND	ND	ND	ND	ND
GW-FINW-Q291	ND	ND	ND	ND	ND	ND
GW-PW02-Q291	ND	ND	ND	ND	ND	ND
GW-PW03-Q291	ND	ND	ND	ND	ND	ND
GW-PW04-Q291	ND	ND	ND	ND	ND	ND

TABLE 2-9 Second Quarter Nitroaromatic Data for Groundwater at the Weldon Spring Quarry (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-PW05-Q291	ND	ND	ND	ND	ND	ND
GW-PW06-Q291	ND	ND	ND	ND	ND	ND
GW-PW07-Q291	ND	ND	ND	ND	ND	ND
GW-PW08-Q291	ND	ND	ND	ND	ND	ND
GW-PW09-Q291	ND	ND	ND	ND	ND	ND

ND - NOT DETECTED
* - NOT ANALYZED

TABLE 2-10 Second Bimonthly (March/April) Results for Metals in Groundwater at the Weldon Spring Quarry

	Arsenic (µg/l)	Barium (µg/l)
GW-1002-050191*	ND	42.9
GW-1004-050191*	ND	62.1
GW-1005-050191*	ND	96.1
GW-1006-043091	5.9	42.3
GW-1007-043091	9.1	408
GW-1008-043091	ND	31
GW-1009-043091	3.6	303
GW-1012-042991	ND	135
GW-1013-043091	2.6	119
GW-1014-043091	ND	94.5
GW-1015-050291*	ND	118
GW-1016-050291*	ND	135
GW-1026-042591	23.1	375
GW-1027-042591	ND	137
GW-1028-043091	3.8	282
GW-1029-050191*	ND	150
GW-1030-050691*	ND	134
GW-1031-050291*	ND	110
GW-1032-050891*	ND	126

ND - NOT DETECTED
* - May sampling event

TABLE 2-11 Third Bimonthly (May/June) Results for Metals in Groundwater at the Weldon Spring Quarry

	Arsenic (µg/l)	Barium (µg/l)
GW-1002-061091	ND	130
GW-1004-060391	ND	38.1
GW-1005-060391	ND	62.1
GW-1006-060591	ND	33.0
GW-1007-060591	17.6	435.0
GW-1008-060591	ND	40.7
GW-1009-060591	2.57	394.0
GW-1012	NA	NA
GW-1013-060591	ND	131.0
GW-1014-060591	ND	117.0
GW-1015-061091	ND	127
GW-1016-061091	ND	109
GW-1026	NA	NA
GW-1027	NA	NA
GW-1028	NA	NA
GW-1029-060391	ND	100
GW-1030	NA	NA
GW-1031	NA	NA
GW-1032-061091	6.7	133
GW-1033	NA	NA
GW-1034-062091	ND	106
GW-1035-062091	ND	198
GW-1036-061391	ND	315
GW-1037-062791	62.5	3130
GW-1038-062691	ND	230
GW-1039-062691	5.17	595

ND - NOT DETECTED
NA - NOT AVAILABLE

TABLE 2-12 Second Quarter Results for Metals in Groundwater at the Weldon Spring Quarry

	Arsenic (µg/l)	Barium (µg/l)	Cadmium (µg/l)	Lead (µg/l)	Mercury (µg/l)
GW-1010-Q291	84.9	331	NS	NS	NS
GW-1011-Q291	ND	263	NS	NS	NS
GW-1017-Q291	149	1030	NS	NS	NS
GW-1018-Q291	112	597	NS	NS	NS
GW-1019-Q291	71.4	710	NS	NS	NS
GW-1020-Q291	13.7	418	NS	NS	NS
GW-1021-Q291	72.3	745	NS	NS	NS
GW-1022-Q291	117	455	NS	NS	NS
GW-1023-Q291	3.7	320	NS	NS	NS
GW-1024-Q291	6.2	436	NS	NS	NS
GW-RMW1-Q291	6.4	510	NS	NS	NS
GW-RMW2-Q291	14.2	206	NS	NS	NS
GW-RMW3-Q291	34.5	505	NS	NS	NS
GW-RMW4-Q291	5.7	145	NS	NS	NS
GW-RAWW-Q291	ND	295	NS	NS	NS
GW-FINW-Q291	ND	71.4	NS	NS	NS
GW-PW02-Q291	ND	268	NS	NS	NS
GW-PW03-Q291	ND	239	NS	NS	NS
GW-PW04-Q291	ND	244	NS	NS	NS
GW-PW05-Q291	ND	334	NS	NS	NS
GW-PW06-Q291	4	376	NS	NS	NS
GW-PW07-Q291	ND	530	NS	NS	NS
GW-PW08-Q291	4.9	392	NS	NS	NS
GW-PW09-Q291	ND	297	ND	ND	ND

ND - NOT DETECTED
NS - NOT SAMPLED

second and third bimonthly and second quarter analyses of arsenic and barium continue to indicate elevated concentrations in selected wells. The highest levels reported are 149 μg/l for arsenic in MW-1017 and 1,030 μg/l for barium also detected in MW-1017.

3 SURFACE WATER MONITORING

Routine samples were collected during the second quarter of 1991 from both on-site and off-site surface water and spring 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 1991 ASER.

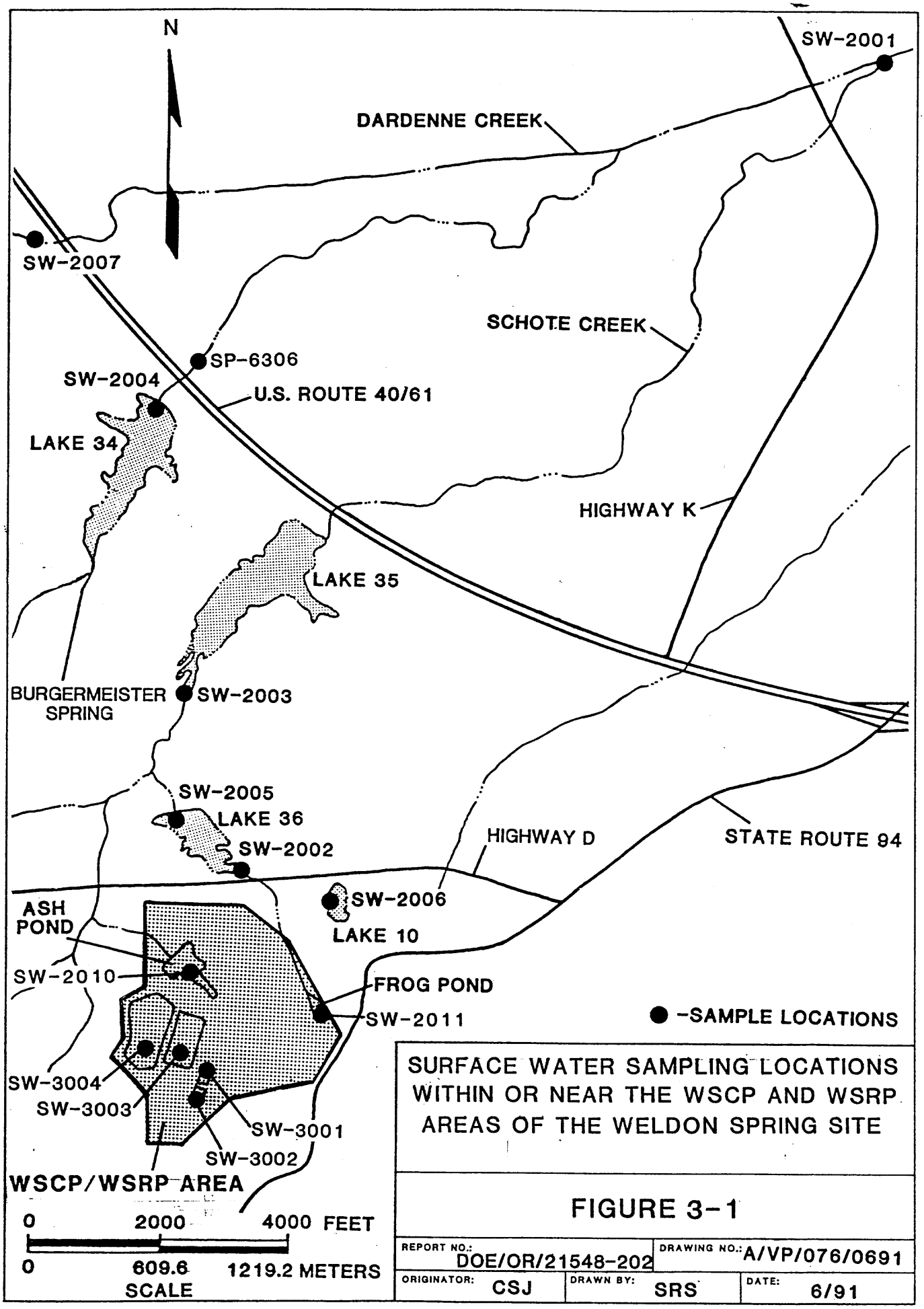
3.1 Chemical Plant/Raffinate Pits/Vicinity Properties

During the second quarter, surface water samples were collected from the 13 surface water sampling locations shown in Figure 3-1 and analyzed for uranium. The results, presented in Table 3-1, indicate that conditions remain similar to values measured historically.

3.2 Weldon Spring Quarry

Surface water samples were collected from the 10 locations shown in Figure 3-2 and three locations in Figure 3-3. Samples were analyzed for uranium, arsenic, and barium and the results are presented in Table 3-2. However, only the uranium results are available at this time. The results of all samples indicate no apparent changes in environmental conditions, although as seen in the previous first quarter, the uranium levels within the slough remain slightly elevated. The highest measured level was 312 pCi/l detected at sampling location SW-1004.

The second quarter uranium values measured in the Missouri River were almost the same as the values detected during the previous quarter. Historically, the levels of uranium at these locations have fluctuated (due to either natural fluctuations or analytical variability) such that uranium concentrations have been higher at upstream locations than downstream, and vice versa. The U.S. Department of Energy (DOE) has increased monitoring of the Missouri River prior to the operation of the Weldon Spring Site Remedial Action Project (WSSRAP) quarry water treatment plant to ascertain the preoperational (background) levels in the river. In addition, the National Pollution Discharge Elimination System (NPDES) permit for the quarry water treatment plant requires additional monitoring of the river. This



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

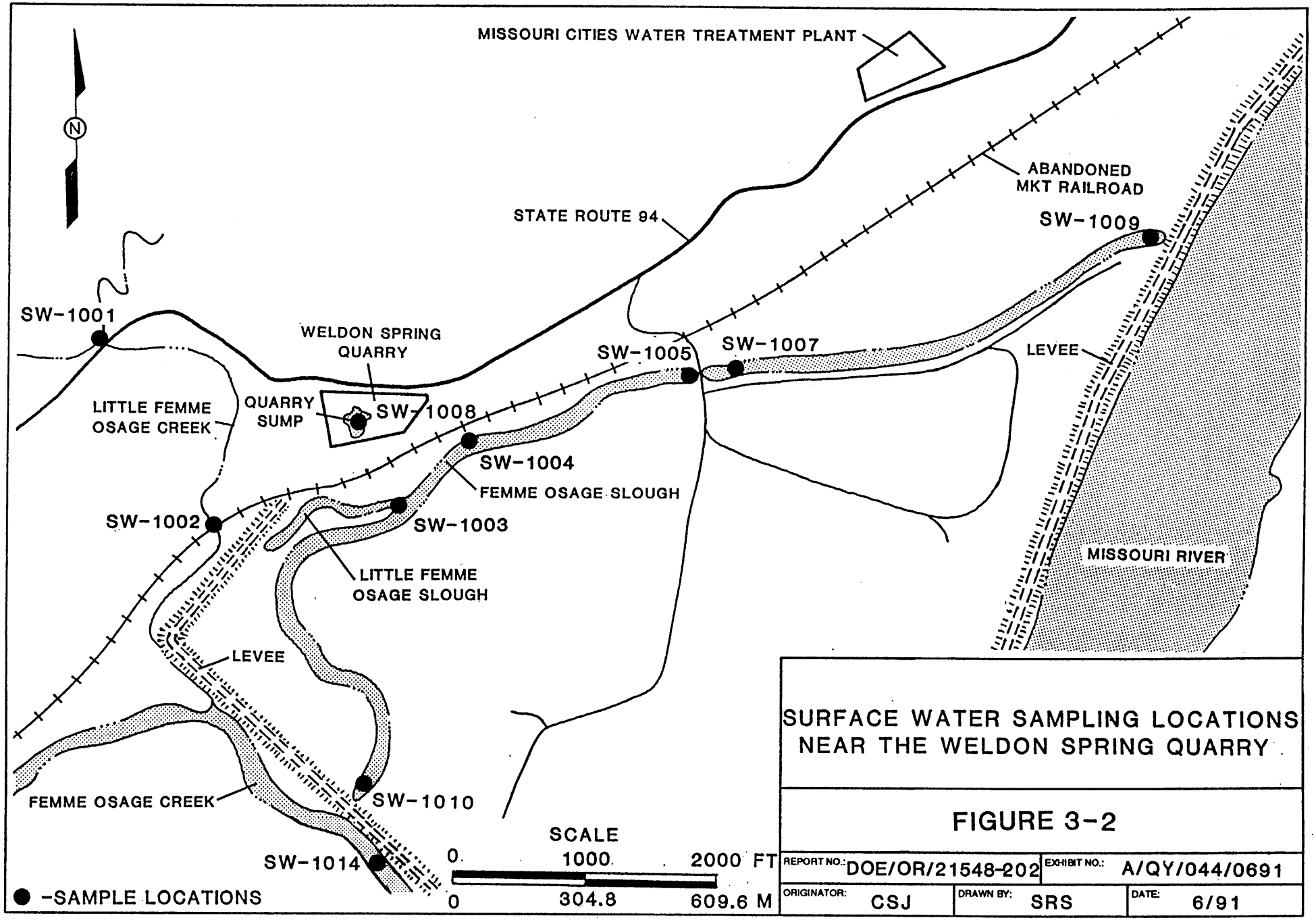
FIGURE 3-1

REPORT NO.: DOE/OR/21548-202	DRAWING NO.: A/VP/076/0691	
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91

TABLE 3-1 Second Quarter Uranium Results in Surface Water at the WSCP/RP/VP

WSSRAP_ID	TOTAL URANIUM (pCi/l)
SW-2001	4.0
SW-2002	16.0
SW-2003	8.0
SW-2004	19.0
SW-2005	18.0
SW-2007	ND
SW-2010	513
SW-2011	120
SW-3001	129
SW-3002	448
SW-3003	165
SW-3004	1770
SW-3002-Q291-DU	482.8

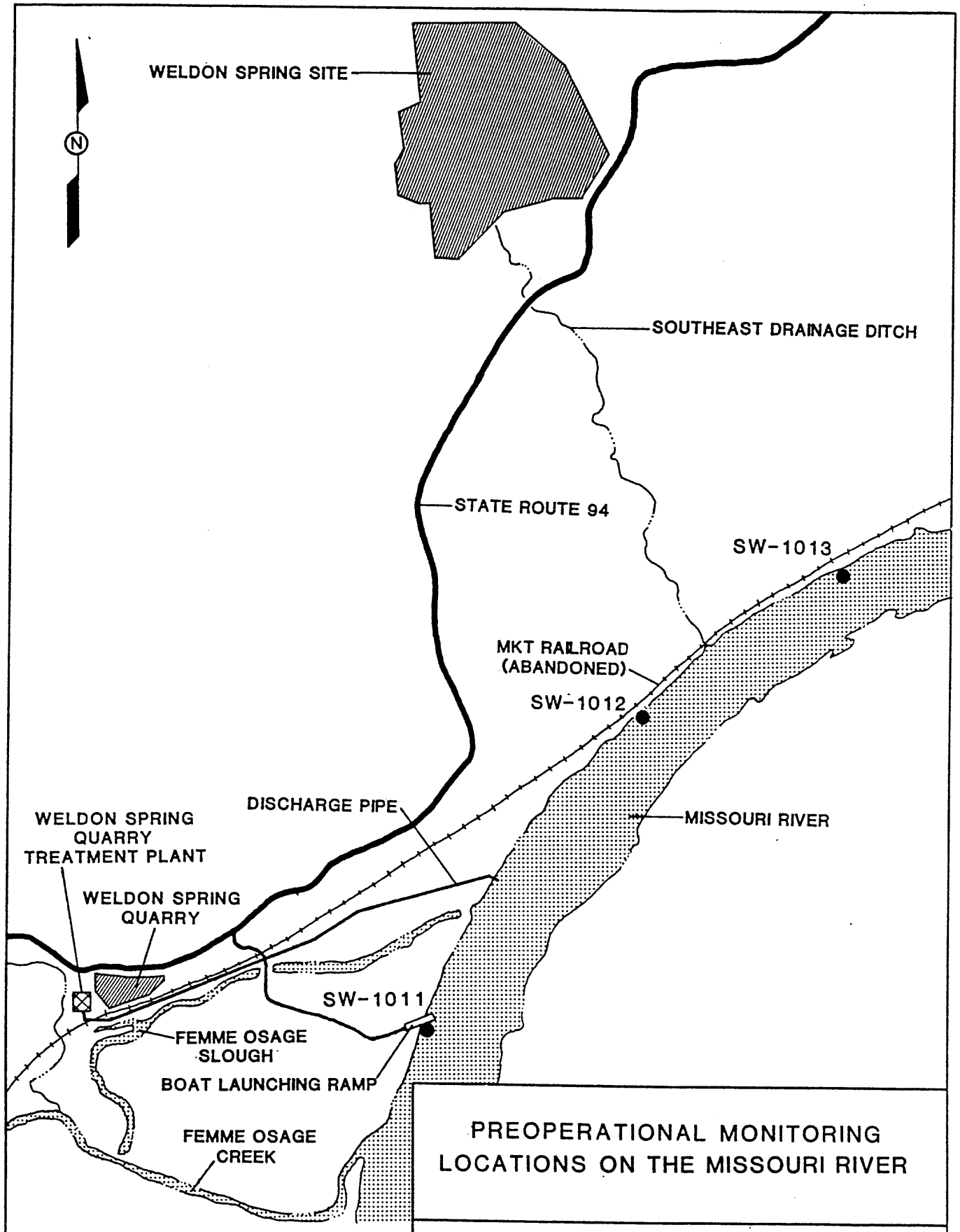
NA - NOT AVAILABLE AT THIS TIME
DU - DUPLICATE SAMPLE



SURFACE WATER SAMPLING LOCATIONS NEAR THE WELDON SPRING QUARRY

FIGURE 3-2

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/QY/044/0691	
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91	



PREOPERATIONAL MONITORING LOCATIONS ON THE MISSOURI RIVER

FIGURE 3-3

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/VP/077/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 3-2 Second Quarter Uranium Results in Surface Water at the Weldon Spring Quarry

WSSRAP ID	TOTAL URANIUM (pCi/l)
SW-1001	ND
SW-1002	ND
SW-1003	156.4
SW-1004	312.8
SW-1005	63.92
SW-1007	11.56
SW-1008	442
SW-1009	11.56
SW-1010	156.4
SW-1010-Q291-DU	361.8
SW-1011	2.04
SW-1012	ND
SW-1013	ND
SW-1014	0.68

ND - NOT DETECTED

monitoring increases the DOEs capability to ensure the safety of the public and the environment.

Arsenic and barium results in the second quarter for samples collected from the Missouri River were not available.

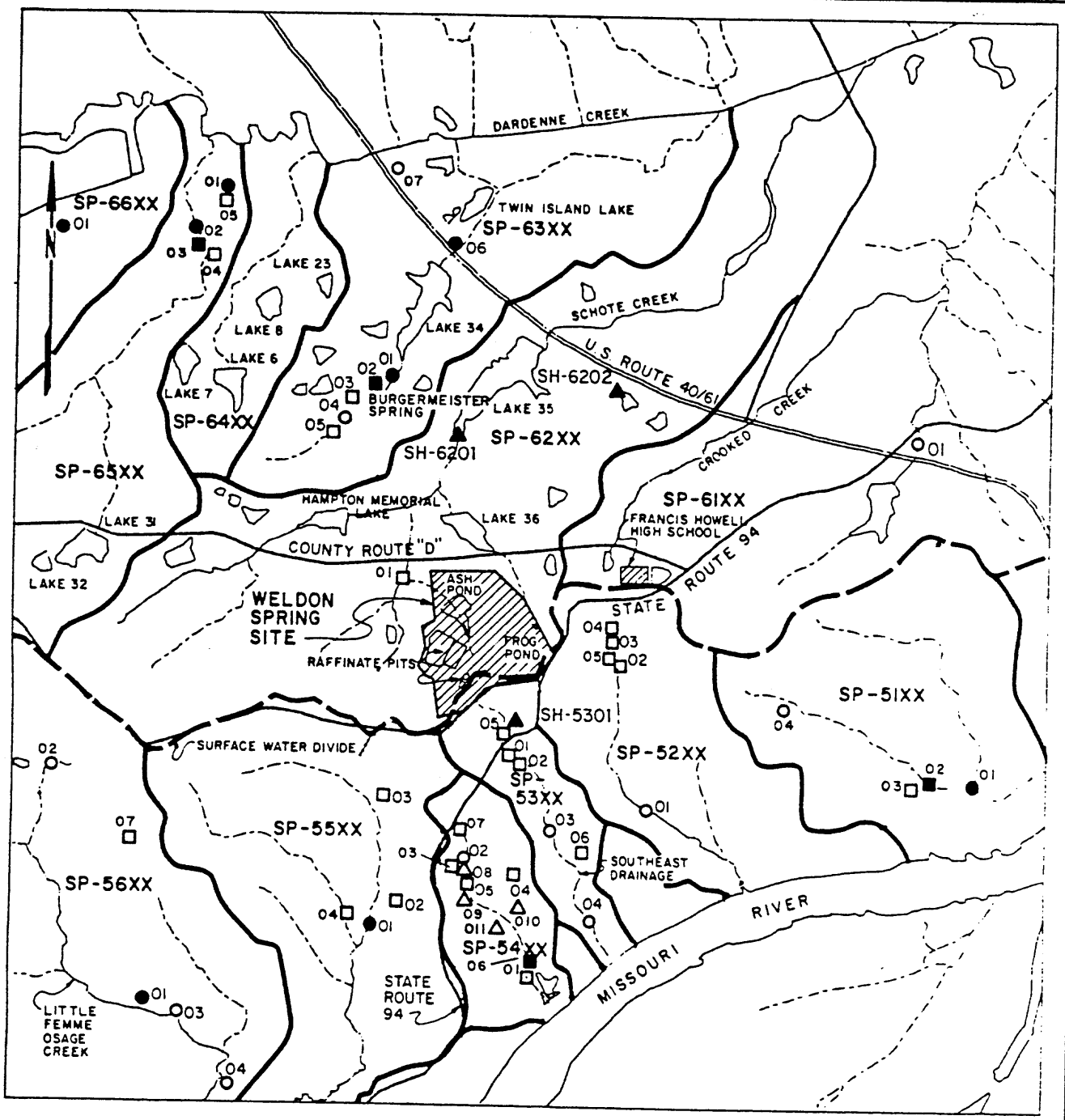
The analytical results for the six nitroaromatic compounds within the quarry sump were not available at the time of this report. The ponded water is to be treated for nitroaromatic compounds and other organics upon completion of the quarry water treatment plant.

3.3 Springs

Eleven springs around the Weldon Spring site (WSS) are sampled quarterly (see Figure 3-4 for spring locations). 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-6301, SP-6302, SP-6306, and SP-5301 through SP-5304. All spring samples are analyzed for uranium with a select few analyzed for nitroaromatics, inorganics and metals. Available analytical results for these parameters are listed in Tables 3-3 and 3-4. Values for these parameters remain consistent with their historical values.

3.4 National Pollutant Discharge Elimination System Data Review

Surface water and effluent samples were collected and analyzed in compliance with the Weldon Spring Site National Pollutant Discharge Elimination System (NPDES) permit. This permit (Number MO-0107701) was issued in November 1988 and currently addresses these seven storm water and wastewater discharges shown in Figure 3-5. Outfalls NP-0001 through NP-0005 represent storm water discharge and NP–0006 represents the treated effluent discharge associated with the administration building sanitary wastewater treatment plant. Outfall NP-0007 represents the new site contaminated water treatment plant which is under contract but not yet constructed. Outfalls NP-0006 and NP-0007 have effluent limitations. The five surface water outfalls have monitoring requirements only. Second quarter 1991 analytical data for each outfall is presented in Table 3-5.



SOURCE: MDNR, 1989

LEGEND:

- SURFACE WATER DIVIDE BETWEEN MISSISSIPPI RIVER AND MISSOURI RIVER
- DRAINAGE BOUNDARY
- CREEK OR SURFACE DRAINAGE
- POND OR LAKE
- ● PERENNIAL SPRING WITH LARGE MAXIMUM FLOW
- ○ PERENNIAL SPRING WITH SMALL MAXIMUM FLOW
- ■ WET WEATHER SPRING WITH LARGE MAXIMUM FLOW
- □ WET WEATHER SPRING WITH SMALL MAXIMUM FLOW
- ▲ SHALLOW HOLE (SH)
- △ SEEP
- SP-63XX SPRING OR SEEP IN DESIGNATED DRAINAGE AREA NUMBER 63. XX REPRESENTS THE DESIGNATED SPRING NUMBER IN DRAINAGE 63.

SCALE 0 3200 6400 FT
0 975.4 1950.7 M

SPRINGS AND SEEPS IN THE VICINITY OF THE WSS

FIGURE 3-4

REPORT NO.: DOE/OR/21548-202	EXHIBIT NO.: A/VP/078/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91

TABLE 3-3 Second Quarter Uranium Results in Springs Near the Weldon Spring Site

WSSRAP ID	TOTAL URANIUM (pCi/l)
SP-5201	NA
SP-5203	NA
SP-5301	NA
SP-5302	NA
SP-5303	129
SP-5304	163
SP-5503	NA
SP-5601	ND
SP-6301	NA
SP-6301-Q291-DU	136.0
SP-6302	NA
SP-6303	NA
SP-6306	16.32

NA - NOT AVAILABLE
ND - NOT DETECTED
DU - DUPLICATE SAMPLE

TABLE 3-4 Second Quarter Nitroaromatic Results in Springs Near the Weldon Spring Site

WSSRAP_ID	1,3,5-TRINITROBENZENE	1,3-DINITROBENZENE	2,4,6-TNT	2,4-DNT	2,6-DNT	NITROBENZENE
SP-5601	ND	ND	ND	ND	0.041	ND
SP-6301	NA	NA	NA	NA	NA	NA
SP-6302	NA	NA	NA	NA	NA	NA
SP-6303	NA	NA	NA	NA	NA	NA
SP-6306	ND	ND	ND	ND	ND	ND

ND - NOT DETECTED
NA - NOT AVAILABLE

3.4.1 Radiological Analysis

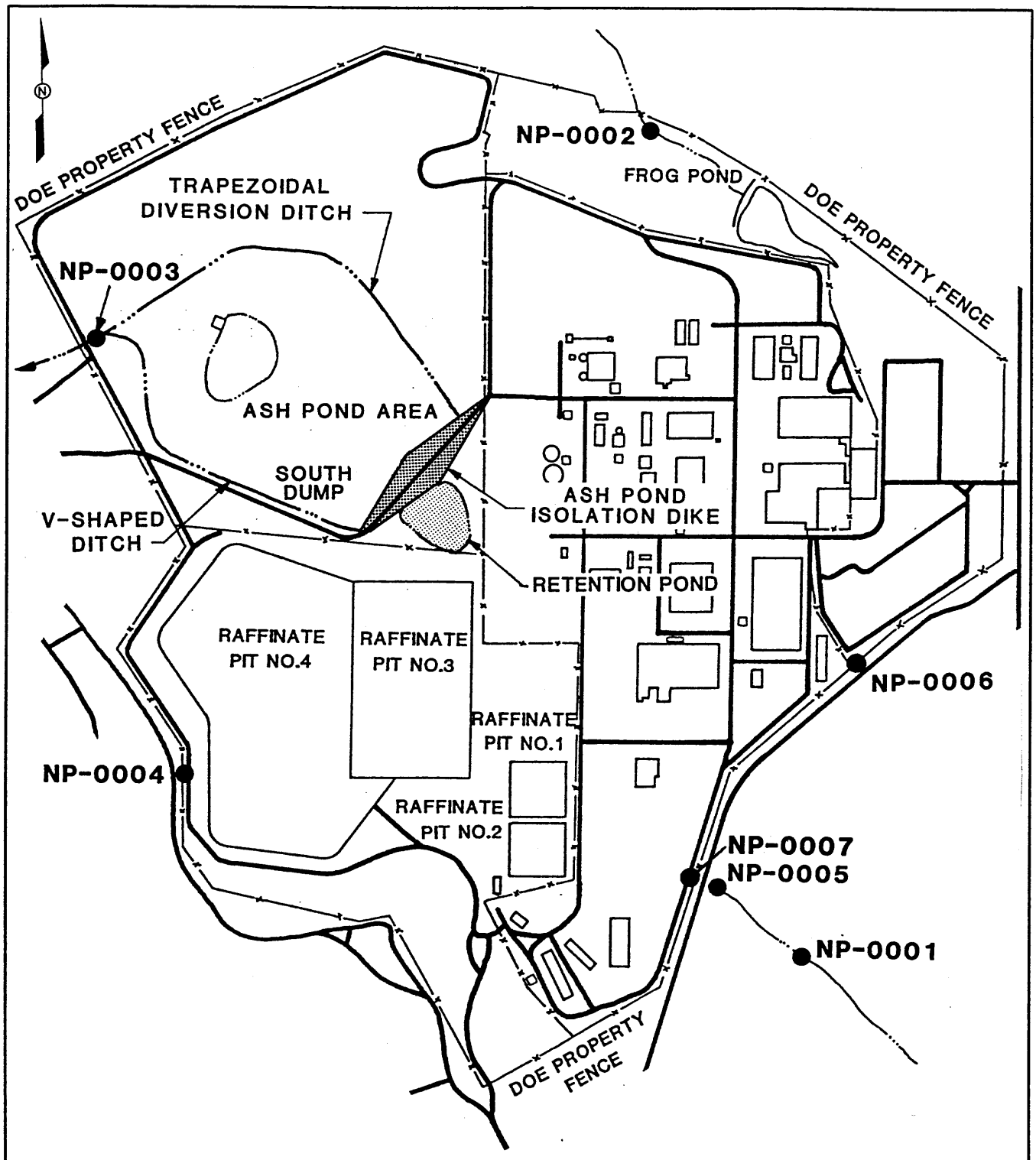
Gross Alpha and Total Uranium analyses correspond reasonably well with past data. The highest uranium levels were present in surface flow from the southeast portion of the site (NP-0001 and NP-0005). The peaks for these points were 666 pCi/l and 571 pCi/l, respectively.

Other outfalls exhibited the following peaks of uranium concentrations. NP-0002, the drainage from the Frog Pond area, was measured at 150 pCi/l. NP-0003, with drainage from the Ash Pond area, was measured at 156 pCi/l. A uranium concentration of 9.5 pCi/l was present in the sample collected from NP-0004, behind raffinate pit No. 4.

3.4.2 Other Analysis

Other analyses include physical analysis (settleable solids and suspended solids) and chemical analysis (nitrate, pH, and lithium). Second quarter 1991 values generally correspond to past values for the majority of parameters. The Ash Pond weir (NP-0003) discharged an excessive amount of solids because of erosion from a new construction activity on the day the samples were taken.

The discharge from the administration building treatment plant, NP-0006, has effluent limitations for quarterly samples. In addition to this quarterly monitoring, the subcontractor monitors the same parameters monthly, to assess plant performance. The NPDES permit contains effluent limitations on biochemical oxygen demand (BOD), total suspended solids (TSS), and fecal coliform at this outfall. These limits are 15 mg/l (BOD), and 20 mg/l (TSS), for weekly averages with maximum daily fecal coliform of 1,000 colonies per 100 ml. NPDES permit limits were not exceeded in the second of quarter 1991 at this outfall.



SCALE 0 500 1000 FT
0 152.4 304.8 M

NPDES MONITORING LOCATIONS

FIGURE 3-5

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/CP/149/0991	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 9/91	

TABLE 3-5 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006

Outfall NP-0001 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Apr. 15	22,000	4.0	<0.1	1.08	7.93	ND	480	0.98	666

Outfall NP-0002 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Apr. 15	637,000	26	<0.1	1.09	7.27	ND	110	0.2	136
May 16	82,000	9	<0.1	ND	6.01	ND	140	0.22	150
June	DRY								

Outfall NP-003 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Apr. 15	800,000	7,930	0.2	0.96	7.18	0.176	640	0.13	88
May 16	53,000	32	<0.1	0.89	5.92*	ND	120	0.23	156
June	No Discharge								

* Indicates value which exceeded effluent limitation

TABLE 3-5 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006 (Continued)

Outfall NP-0004 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
June 13	Not Flowing	890	Not Obtained	48	7.35	0.038	ND	0.002	1.4

Outfall NP-0005 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Apr. 15	164,000	7	<0.1	6.1	7.58	ND	440	0.84	571
May 16	11,000	16	<0.1	9.17	5.54*	ND	550	0.74	503
June	No Discharge								

* Indicates value which exceeded effluent limitation

Outfall NP-0006 NPDES data for Q2 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	BOD	FECAL COLIFORMS	pH
UNITS	GPD	mg/l	mg/l	No./100 ml	
Apr. 3	1,530	10	<3.0	<1	6.5
May 22	2,500	1	9.3	<1	6.6
June 5	1,620	5	<3.0	<1	6.25

4 AIR MONITORING

4.1 Radon Gas

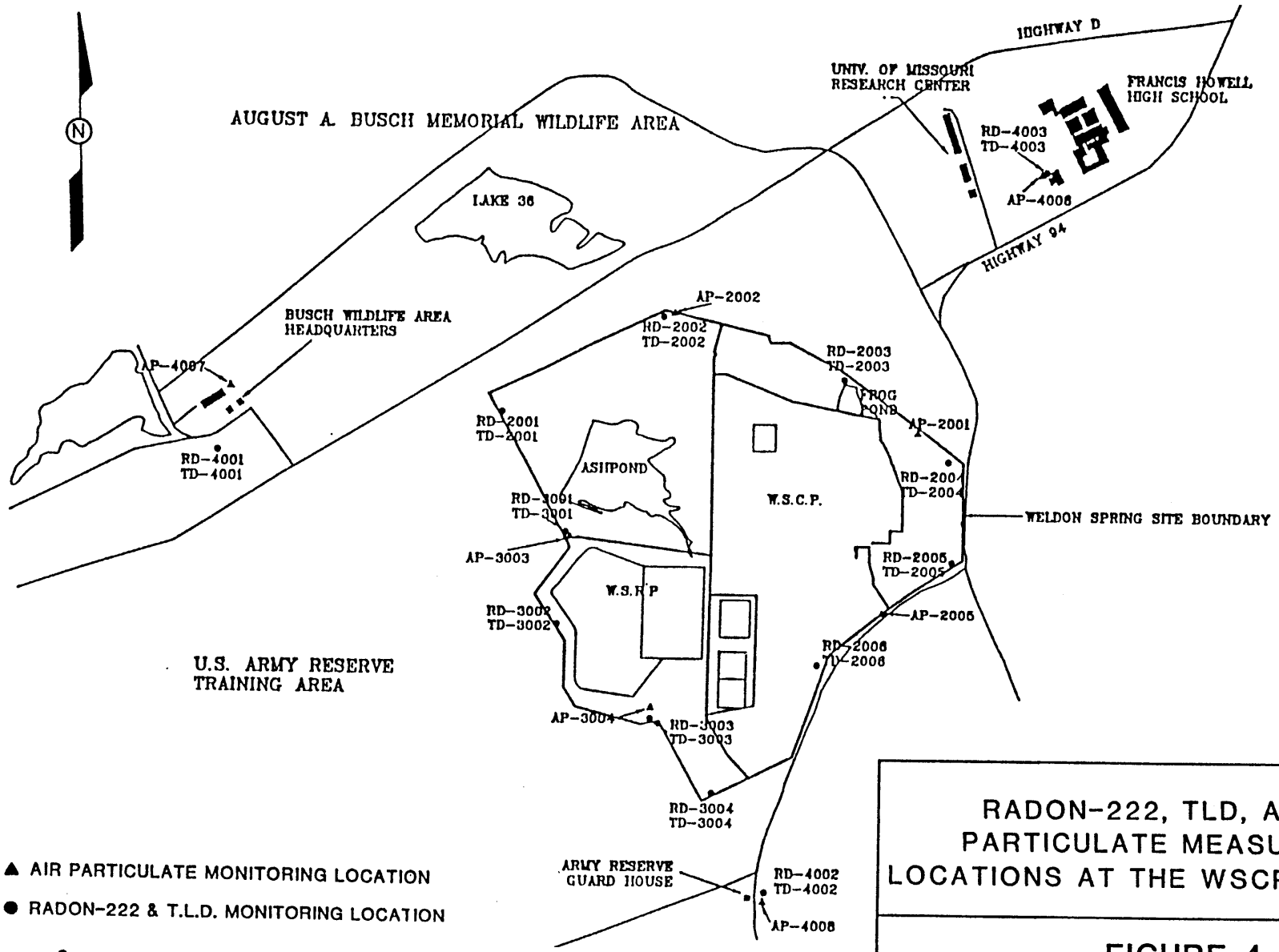
The radon gas monitoring program utilizes a pair of radon detectors at each of 22 permanent locations; each detector is exchanged quarterly. These detectors are deployed at six locations at the Weldon Spring Chemical Plant, six locations at the Weldon Spring quarry, four locations at the Weldon Spring raffinate pits, and six off-site locations. Radon monitoring locations are shown in Figures 4-1, 4-2, and 4-3. 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, and RD-4006 were used to monitor background levels near the site.

Table 4-1 summarizes the second quarter 1991 radon concentrations detected at all site perimeter and off-site monitoring locations. Also contained in Table 4-1 is a comparison of the measured concentration with the Federally permitted radon concentration (for unrestricted areas) of 3 pCi/l (110 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 four background locations. This data yielded an average ambient background radon concentration of 0.3 pCi/l for the second quarter of 1991. This concentration was then subtracted from the concentration for each monitoring station, and compared to the DOE guideline of 3 pCi/l above background.

Radon concentrations at the site and quarry perimeters and at off-site locations for the second quarter of 1991 were within the typical range expected during years of normal precipitation. The quarterly radon concentrations (background included) ranged from 0.1 pCi/l at RD-2002 to 1.3 pCi/l at monitoring location RD-1001 and RD-1002.

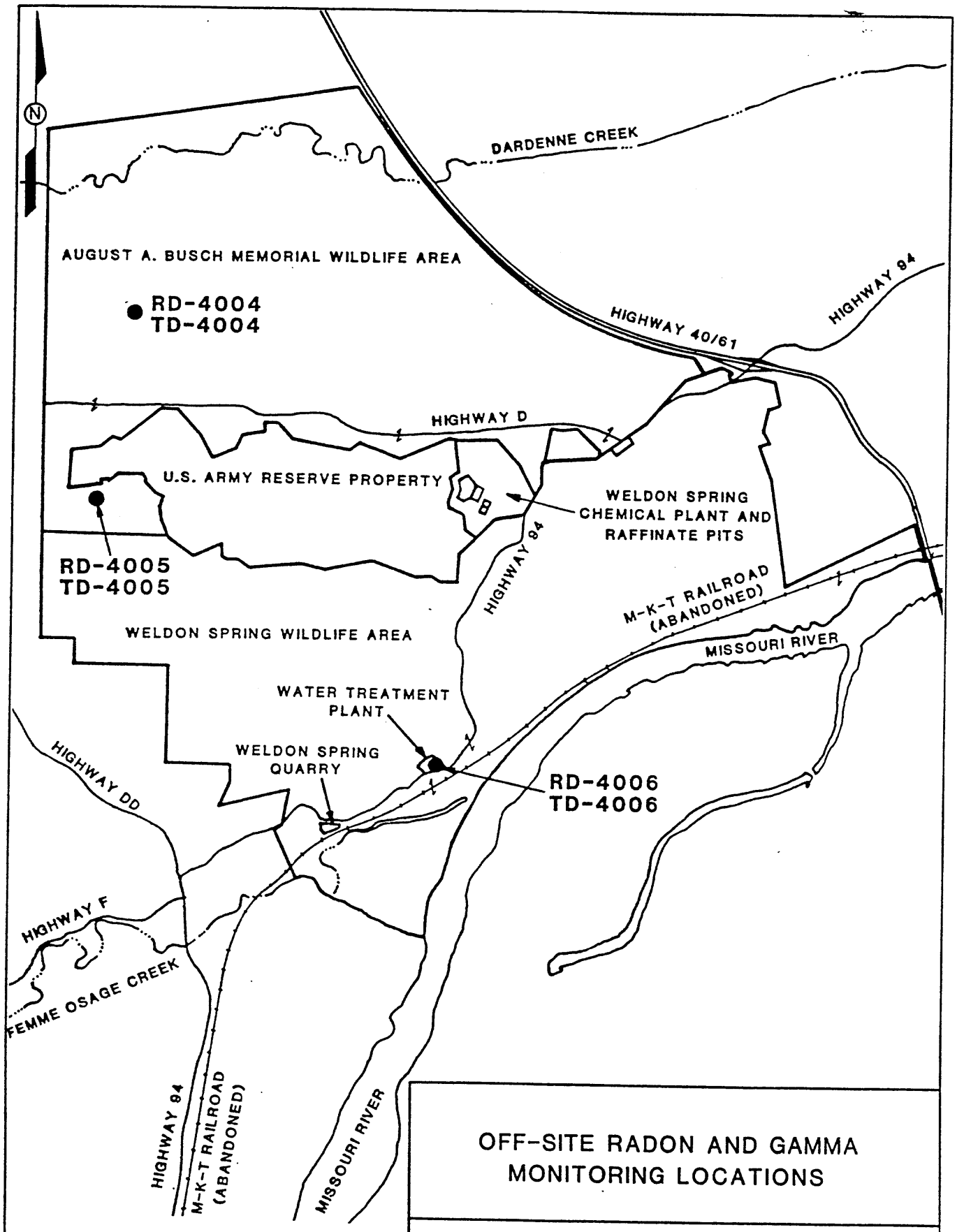
Radon concentrations found in the quarry are higher than concentrations measured at other locations because the radium concentrations in quarry wastes are typically much higher than other areas, and because the quarry is a large depression with side walls ranging from 3 m to 15 m (10 ft to 50 ft) high. In conjunction with stable meteorological conditions,



RADON-222, TLD, AND AIR PARTICULATE MEASUREMENT LOCATIONS AT THE WSCP/WSRP AREA

FIGURE 4-1

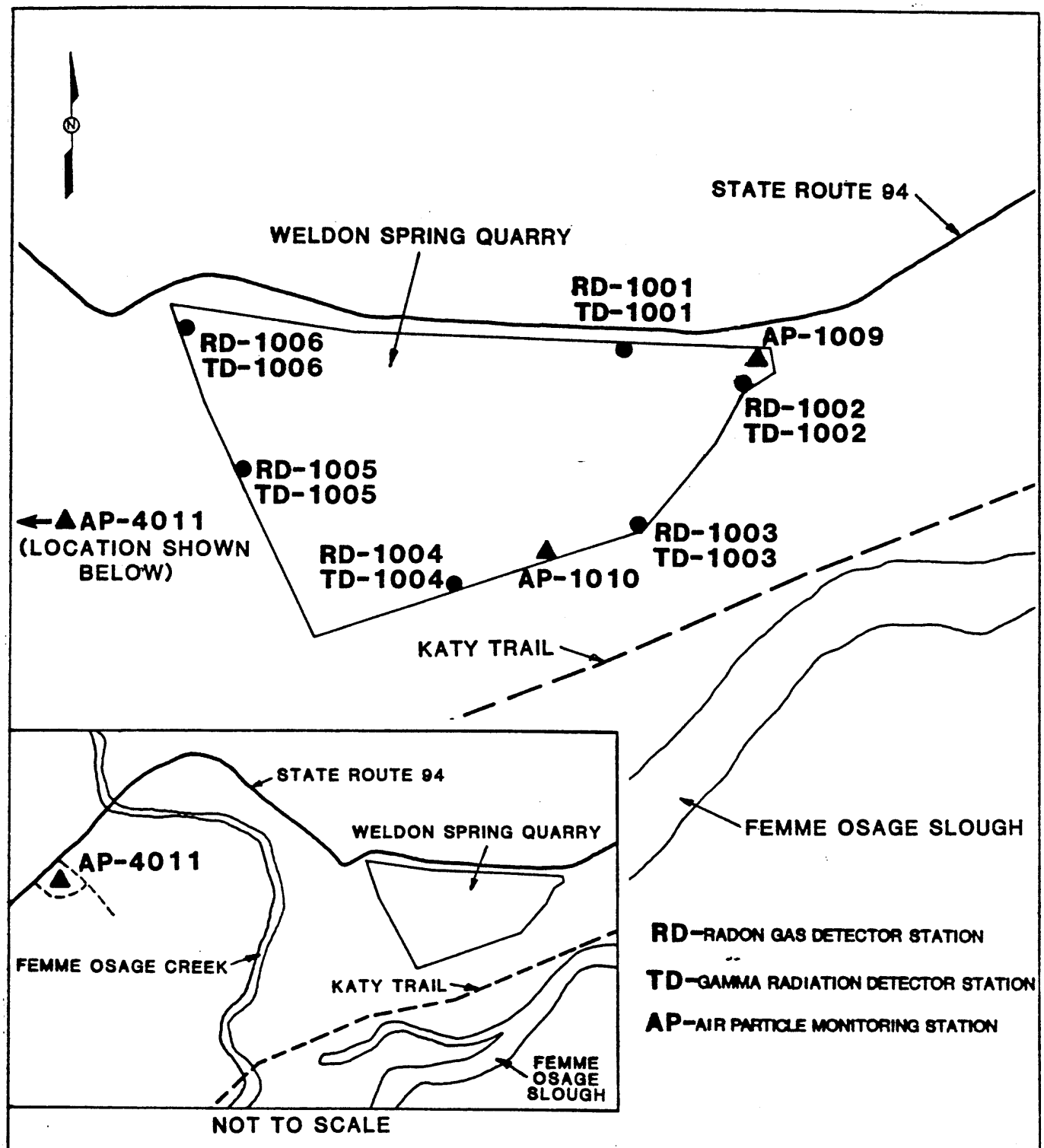
REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/VP/079/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	



OFF-SITE RADON AND GAMMA MONITORING LOCATIONS

FIGURE 4-2

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/VP/080/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	



RADON-222, THERMO LUMINESCENT DOSIMETER (TLD) AND AIR PARTICULATE MEASUREMENT LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 4-3

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/QY/049/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 4-1 1991 Track Etch Radon Results[a]

Location I.D.	2nd quarter pCi/l	Percent of Guidance [b]
WSQ		
RD-1001	1.3	33
RD-1002	1.3	33
RD-1003	0.5	7
RD-1004	0.4	3
RD-1005	0.4	3
RD-1006	0.4	3
WSCP		
RD-2001	0.3	0
RD-2002	0.1	0
RD-2003	0.3	0
RD-2004	0.3	0
RD-2005	0.2	0
RD-2006	0.2	0
WSRP		
RD-3001	0.2	0
RD-3002	0.3	0
RD-3003	0.3	0
RD-3004	0.3	0
OFF-SITE		
RD-4001*	0.3	0
RD-4002	0.2	0
RD-4003	0.2	0
RD-4004*	0.3	0
RD-4005*	0.2	0
RD-4006*	0.3	0

(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 (100 Bq/m^3) (Annual average above background) for uncontrolled areas.
* Denotes Background Station

this configuration tends to trap emanating radon within the quarry and raise the concentrations along the quarry perimeter.

4.2 Gamma Radiation Exposure

To monitor exposure from gamma radiation, spherical environmental thermoluminescent dosimeters (TLDs) were deployed at 22 locations. The gamma monitoring station locations are the same as the ambient radon monitoring locations (see Section 4.1).

Table 4-2 summarizes the first and second quarter results of total gamma radiation monitoring at the 16 Weldon Spring site (WSS) perimeter monitoring stations, the Francis Howell High School, the Weldon Spring Army Reserve Training Area, and at the four background monitoring stations.

The annual average background gamma exposures measured with TLDs in 1989 and 1990 were 68 mR/year and 62 mR/year, respectively. The gamma exposures measured with TLDs in the first and second quarter of 1991 were consistent with 1989 and 1990 data. This was expected because no significant changes in the configuration or location of the wastes have occurred.

4.3 Radioactive Air Particulates

Eleven 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 as shown in Figure 4-3. Three monitoring stations (AP-4006, AP-4008, and AP-4011) are located off site at sensitive receptor locations; including Francis Howell High School, the Army Reserve property, and near a residential site west of the quarry. The monitoring station at the August A. Busch Wildlife Area (AP-4007) is used to monitor background levels in the vicinity of the WSCP. The off-site monitoring stations are also shown in Figure 4-2.

TABLE 4-2 1991 Environmental TLD Results[a]

Location I.D.	1st Quarter mrem	2nd Quarter mrem
WSQ		
TD-1001	24	17
TD-1002	20	15
TD-1003	20	20
TD-1004	19	17
TD-1005	20	17
TD-1006	19	18
WSCP		
TD-2001	18	16
TD-2002	17	16
TD-2003	18	17
TD-2004	19	17
TD-2005	18	14
TD-2006	17	15
WSRP		
TD-3001	22	14
TD-3002	17	13
TD-3003	19	17
TD-3004	16	14
OFF-SITE		
TD-4001*	18	16
TD-4002	16	13
TD-4003	16	12
TD-4004*	19	--
TD-4005*	16	13
TD-4006*	17	15

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

The sampling station near the August A. Busch Wildlife Area (ABWA) headquarters is used as a background air monitoring station. This station 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/ Weldon Spring raffinate pits (WSRP). In addition, winds from the southeast are relatively rare at the WSCP.

Table 4-3 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 either the weekly air particulate analysis results or the counting instrument's lower limit of detection (LLD), whichever was greater. The "<" sign in Table 4-3 appears when the actual average is less than the calculated average due to the use of LLD values in the calculation. The standard deviation for each of the monitoring locations was calculated using only results that were above the LLD. Due to maintenance, all monitors were not operating the entire 13 weeks as indicated in Table 4-3. However, the sensitive receptor monitoring stations (AP-4006, AP-4008, and AP-4011) were in operation the majority of the time and these stations are also equipped with high volume air monitoring. The high volume air monitors are part of the WSS radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAPs) requirements and were in operation the entire 13 weeks. The high volume monitoring results will be presented in the *Annual Site Environmental Report*.

The first quarter net alpha concentrations ranged from $<9.19 \times 10^{-16}$ μCi/ml to $<1.28 \times 10^{-15}$ μCi/ml with 1.12×10^{-15} μCi/ml detected at the background station.

4.4 Asbestos

No environmental asbestos monitoring was performed in the second quarter of 1991.

TABLE 4-3 Radiological Air Particulate Second Quarter 1991

MONITOR IDENTIFICATION NUMBER	QUARTERLY AVG. CONCENTRATION (1E-15 μCi/ml)	STANDARD DEVIATION	NUMBER OF WEEKS COLLECTED	NUMBER OF VALUES ABOVE LLD
AP-2001	<9.62E-16	2.83E-16	10	7
AP-2002	<1.06E-15	4.50E-16	10	5
AP-3003	<1.23E-15	5.11E-16	10	7
AP-3004	<9.19E-16	NA	4	1
AP-2005	<1.20E-15	6.26E-16	13	7
AP-4006	<9.49E-16	2.64E-16	13	8
AP-4007*	1.12E-15	3.72E-16	9	9
AP-4008	<1.08E-15	4.12E-16	12	6
AP-1009	<1.28E-15	3.67E-16	10	8
AP1010	<1.04E-15	4.53E-16	12	9
AP-4011	<1.19E-15	5.26E-16	12	8

* Indicates background monitor station.
To convert μCi/ml to Bq/M^3, multiply by 3.7E10.
NA Not available

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