

**Department of Energy**

**Ohio Field Office  
Fernald Area Office**

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**3431**

JAN 10 2001

Mr. James A. Saric, Remedial Project Manager  
U.S. Environmental Protection Agency  
Region V, SRF-5J  
77 West Jackson Boulevard  
Chicago, Illinois 60604-3590

DOE-0242-01

Mr. Tom Schneider, Project Manager  
Ohio Environmental Protection Agency  
401 East 5<sup>th</sup> Street  
Dayton, Ohio 45402-2911

Ms. Val Orr  
Division of Drinking and Ground Waters - UIC Unit  
P.O. Box 1049  
1800 Watermark Drive  
Columbus, Ohio 45316-1049

Dear Mr. Saric, Mr. Schneider, and Ms. Orr:

**NOVEMBER 2000 RE-INJECTION OPERATING REPORT**

This correspondence submits the Re-Injection Operation Report for the month of November 2000.

As specified in the Re-Injection Demonstration Test Plan, monthly re-injection operating reports are to be prepared and submitted to the U.S. Environmental Protection Agency (U.S. EPA), Ohio Environmental Protection Agency (OEPA) Office of Federal Facilities Oversight, and the OEPA Division of Drinking and Ground Waters - UIC Unit.

**3431**

JAN 10 2001

Mr. James A. Saric  
Mr. Tom Schneider  
Ms. Val Orr

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If you have any questions regarding this submittal, please contact Robert Janke at (513) 648-3124.

Sincerely,



Johnny W. Reising  
Fernald Remedial Action  
Project Manager

Enclosure

cc: w/enclosure

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T. Schneider, OEPA-Dayton (three copies of enclosure)

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R. Vandegrift, ODH

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K. Broberg, Fluor Fernald, Inc./52-5

W. Hertel, Fluor Fernald, Inc./52-5

M. Jewett, Fluor Fernald, Inc./52-2

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A. Tanner, OH/FEMP

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MONTHLY RE-INJECTION  
OPERATING REPORT  
NOVEMBER 2000

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OVERVIEW

On September 2, 1999, DOE completed one year of active groundwater re-injection as part of a field-scale demonstration. A report detailing the demonstration was issued to the U.S. EPA and Ohio EPA on May 30, 2000. Based on the results of the demonstration, re-injection will continue at Fernald.

Re-Injection at Fernald is exempted under 40 CFR 300.400(e)(1) from requiring a permit, as it is a CERCLA action. Per Ohio EPA Guidelines (OEPA 1997) DOE will prepare monthly operating reports that include:

- I. An analysis of the injectate
- II. The volume and rate of re-injection
- III. A description of any well maintenance and rehabilitation procedures conducted.

DOE will submit the monthly re-injection operating reports to the U.S. EPA, Ohio EPA Office of Federal Facilities Oversight, and the Division of Ohio EPA Drinking and Ground Waters – Underground Injection Control Unit.

This report covers re-injection operations from November 1, 2000 to December 1, 2000.

Routine monitoring of the aquifer in the re-injection area is conducted as part of the groundwater remedy performance monitoring program specified in Fernald's Integrated Environmental Monitoring Plan. Results of the Integrated Monitoring Program are reported quarterly and are available for viewing on the Fernald Website, [www.fernald.gov](http://www.fernald.gov).

ANALYSIS OF THE INJECTATE

Groundwater extracted from the Great Miami Aquifer is treated for uranium removal and is then re-injected into the Great Miami Aquifer. The groundwater is treated in the FEMP Advanced Waste Water Treatment (AWWT) Expansion Facility. The effluent from the AWWT Expansion Facility is sampled monthly for the parameters listed in Table 2.1 of the Re-Injection Demonstration Test Plan, Revision 0.

Monthly injectate grab sampling focuses on the final remediation level (FRL) constituents that have had an exceedance of their FRL in the region of the aquifer from which the groundwater is being pumped. The monthly injectate grab samples are sent to an off-site laboratory for analysis. In addition to the monthly

grab sample, 24-hour composite samples are collected and analyzed at the on-site lab for uranium. The 24-hour composite sampler samples the combined effluent from the active treatment trains comprising the facility. The daily composite results are used by plant management for making process control decisions. They provide a daily evaluation of the quality of the water that is re-injected into the aquifer. Composite daily uranium results from the AWWT Expansion Facility effluent for days when re-injection occurred are shown in Figure 1.

The monthly grab sample was collected on November 7, 2000. Results are provided in Table 1. These results indicate that all the constituent concentrations are below their respective FRLs. The uranium concentration measured in the monthly grab sample was 6.58  $\mu\text{g/L}$ . The FRL for uranium is 20  $\mu\text{g/L}$ . The total uranium concentration of the daily composite sample also collected on November 7, 2000 was 6.0  $\mu\text{g/L}$ .

#### VOLUME AND RATE OF RE-INJECTION

Five re-injection wells are currently available. The design re-injection set point for each of the re-injection wells is 200 gpm. The combined design re-injection rate for all five wells is 1000 gallons per minute. Figure 2 illustrates the location of the five re-injection wells; Tables 2 through 6 summarize the operational data by month. Re-Injection Well 8 is 8 inches in diameter. Re-Injection Well 9 is 12 inches in diameter. The other re-injection wells are all 16 inches in diameter.

In February of 2000, a new injection rate strategy was initiated to help compensate for well downtimes due to maintenance, electrical outages, etc. Injection rate set points may be temporarily increased to 220 gpm toward the end of a month and decreased to the 200 gpm rate at the start of a new month. The ability to increase re-injection rates is dependent upon the condition of the wells, availability of higher than average groundwater treatment capacity, and lower than normal uranium concentrations in the site effluent. This strategy for adjusting re-injection rate set points may continue in future months, depending on the variables noted above.

Figure 3 illustrates the water level rise in each of the operating re-injection wells from November 1, 2000 to December 1, 2000, as measured by the operators at the AWWT Expansion Facility Distributed Control System (DCS). Water levels are recorded three times each day. Water levels inside the re-injection wells are monitored as an indicator of plugging within the wells. Given a constant re-injection rate, as a well becomes plugged, the water level in the well rises to compensate for the greater pressure needed to move the same volume of water through a smaller opening.

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While it is not the intent of this report to discuss operational issues, the following information is provided to aid in the interpretation of Figures 1 and 3.

#### SUMMARY OF SYSTEM OUTAGES FOR THE REPORTING PERIOD

For the month of November 2000, re-injection took place in one or more wells every day.

#### SUMMARY OF WELL MAINTENANCE FOR THE REPORTING PERIOD

Re-Injection Wells 8, 9, and 10 were offline through the end of November 2000 as presented in Tables 2, 3, and 4, respectively. All three wells await rehabilitation as soon as the new, more aggressive chemical treatment method is approved.

#### REVISION TO WELL MAINTENANCE PROCEDURE

In late September 2000, DOE submitted a revised, more aggressive method for treating the wells to EPA and OEPA for their review and approval. DOE received their approvals in mid-October 2000. At the end of November 2000, the safety documentation procedure for the more aggressive well treatment method had not been approved.

TABLE 1

ANALYSIS OF INJECTATE  
Sample collected November 7, 2000

| Constituents <sup>a</sup>  | Result <sup>b</sup>                  | Groundwater FRL <sup>c</sup> | Detection Limit | Constituent Type <sup>g</sup> | Basis for FRL <sup>h</sup> |
|----------------------------|--------------------------------------|------------------------------|-----------------|-------------------------------|----------------------------|
| <b>General Chemistry</b>   |                                      | <b>mg/L</b>                  |                 |                               |                            |
| Nitrate                    | 0.26 J                               | 11.0                         |                 | MP                            | B                          |
| <b>Inorganics</b>          |                                      | <b>mg/L</b>                  |                 |                               |                            |
| Antimony                   | 0.000356 B <sup>N</sup> <sup>d</sup> | 0.006                        |                 | N                             | A                          |
| Arsenic                    | 0.000566 B                           | 0.05                         |                 | N                             | A                          |
| Barium                     | 0.0509 B                             | 2.0                          |                 | N                             | A                          |
| Beryllium                  | UN                                   | 0.004                        | 0.00001         | N                             | A                          |
| Cadmium                    | 0.000069 B                           | 0.014                        |                 | N                             | B                          |
| Total Chromium             | 0.000993 B                           | 0.022 <sup>f</sup>           |                 | MP                            | R                          |
| Cobalt                     | 0.00021 B                            | 0.17                         |                 | N                             | R                          |
| Lead                       | U                                    | 0.015                        | 0.000014        | N                             | A                          |
| Manganese                  | 0.000845 B                           | 0.9                          |                 | N                             | B                          |
| Mercury                    | U                                    | 0.002                        | 0.000048        | MP                            | A                          |
| Nickel                     | 0.0018 B                             | 0.1                          |                 | N                             | A                          |
| Selenium                   | 0.000899 B                           | 0.05                         |                 | N                             | A                          |
| Silver                     | 0.000739 B                           | 0.05                         |                 | N                             | R                          |
| Vanadium                   | 0.000171 B                           | 0.038                        |                 | N                             | R                          |
| Zinc                       | 0.00169 B                            | 0.021                        |                 | N                             | B                          |
| <b>Radionuclides</b>       |                                      | <b>pCi/L</b>                 |                 |                               |                            |
| Neptunium-237              | 0.0159                               | 1.0                          |                 | MP                            | R*                         |
| Radium-226                 | 1.41                                 | 20.0                         |                 | N                             | A                          |
| Strontium-90               | 0.457                                | 8.0                          |                 | MP                            | A                          |
| Thorium-228                | -0.0135                              | 4.0                          |                 | N                             | R*                         |
| Thorium-232                | 0.00108                              | 1.2                          |                 | N                             | R*                         |
| Total Uranium              | 6.58                                 | 20.0                         |                 | MP                            | A                          |
| <b>Organics</b>            |                                      | <b>µg/L</b>                  |                 |                               |                            |
| Bis(2-ethylhexyl)phthalate | U                                    | 6.0                          | 5.0             | N                             | A                          |
| Carbon disulfide           | U                                    | 5.5                          | 5.0             | N                             | A                          |
| 1, 1-Dichloroethene        | U                                    | 7.0                          | 1.0             | N                             | A                          |
| 1, 2-Dichloroethane        | U                                    | 5.0                          | 1.0             | MP                            | A                          |
| Trichloroethene            | U                                    | 5.0                          | 1.0             | N                             | A                          |

<sup>a</sup>Constituents taken from Table 2-1 of Re-Injection Demonstration Test Plan. Constituents are those previously detected in aquifer zones 2 and 4 at concentrations above their FRL.

<sup>b</sup>If a duplicate sample was analyzed the highest concentration between the regular sample and duplicate sample is reported.

U = Nondetect

<sup>c</sup>B = Lab qualifier (inorganic). Reported result is greater than the instrument detection level but less than the contract required detection limit.

<sup>d</sup>N = the spiked sample recovery was not within control limits.

<sup>e</sup>From Table 9-4 in OU5 ROD.

<sup>f</sup>FRL is for hexavalent chromium.

<sup>g</sup>Constituent types from Appendix A of IEMP. MP indicates that the constituent has been identified as being able to migrate to the aquifer. N indicates that the constituent has been identified as not being able to migrate to the aquifer.

<sup>h</sup>A - Applicable or relevant and appropriate requirement based (MCL, PMCL, etc.).

B - Based on 95<sup>th</sup> percentile background concentrations.

R - Risk-based

R\* - Risk-based radionuclide cleanup levels include constituent specific 95<sup>th</sup> percentile background concentration.

TABLE 2

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RE-INJECTION WELL 22107 (IW-8)  
OPERATIONAL SUMMARY SHEET  
NOVEMBER 2000

Reference Elevation (feet AMSL) - 539.92 (top of casing)  
Northing Coordinate ('83) - 476196.22  
Easting Coordinate ('83) - 1347978.25

Hours in reporting period<sup>a</sup> = 720.00  
Hours not injecting<sup>b</sup> = 720.00  
Hours injecting<sup>c</sup> = 0.00  
Operational percent<sup>d</sup> = 0.0

Target Injection Rate = 200 gpm

| Monthly Measurements |                                       |   |
|----------------------|---------------------------------------|---|
| Month                | Million Gallons Injected <sup>e</sup> | Average Operating Injection Rate (gpm) <sup>f</sup> |
| 9/98                 | 8.16                                  | 206   |
| 10/98                | 5.78                                  | 203   |
| 11/98                | 8.47                                  | 196   |
| 12/98                | 5.76                                  | 222   |
| 1/99                 | 5.35                                  | 227   |
| 2/99                 | 7.06                                  | 196   |
| 3/99                 | 7.34                                  | 205   |
| 4/99                 | 7.75                                  | 197   |
| 5/99                 | 7.46                                  | 216   |
| 6/99                 | 8.42                                  | 197   |
| 7/99                 | 8.93                                  | 201   |
| 8/99                 | 8.64                                  | 199   |
| 9/99                 | 3.92                                  | 181   |
| 10/99                | 7.86                                  | 199   |
| 11/99                | 6.54                                  | 196   |
| 12/99                | 7.28                                  | 178   |
| 1/00                 | 7.74                                  | 192   |
| 2/00                 | 8.85                                  | 212   |
| 3/00                 | 9.22                                  | 208   |
| 4/00                 | 4.07                                  | 190   |
| 5/00                 | 0                                     | 0   |
| 6/00                 | 5.70                                  | 181   |
| 7/00                 | 2.44                                  | 203   |
| 8/00                 | 1.11                                  | 197   |
| 9/00                 | 8.00                                  | 202   |
| 10/00                | 3.98                                  | 199   |
| 11/00                | 0.00                                  | 0   |

<sup>a</sup>First operational shift reading on November 1, 2000 to first operational shift reading on December 1, 2000.

<sup>b</sup>Downtime as noted in the text.

<sup>c</sup>Hours in reporting period - Hours not injecting

<sup>d</sup>(Hours injecting/Hours in reporting period) x 100

<sup>e</sup>Summation of daily totalizer differences

<sup>f</sup>Million Gallons Injected/(Hours Injecting x 60)

TABLE 3

RE-INJECTION WELL 22108 (IW-9)  
OPERATIONAL SUMMARY SHEET  
NOVEMBER 2000

Reference Elevation (feet AMSL) - 578.025 (top of casing)  
Northing Coordinate ('83) - 476255.74  
Easting Coordinate ('83) - 1348384.49

Hours in reporting period<sup>a</sup> = 720.00  
Hours not injecting<sup>b</sup> = 720.00  
Hours injecting<sup>c</sup> = 0.00  
Operational percent<sup>d</sup> = 0.0

Target Injection Rate = 200 gpm

| Monthly Measurements |                                       |   |
|----------------------|---------------------------------------|---|
| Month                | Million Gallons Injected <sup>e</sup> | Average Operating Injection Rate (gpm) <sup>f</sup> |
| 9/98                 | 8.17                                  | 206   |
| 10/98                | 8.30                                  | 201   |
| 11/98                | 8.53                                  | 197   |
| 12/98                | 5.66                                  | 214   |
| 1/99                 | 4.33                                  | 181   |
| 2/99                 | 6.07                                  | 156   |
| 3/99                 | 5.93                                  | 178   |
| 4/99                 | 6.66                                  | 184   |
| 5/99                 | 7.83                                  | 200   |
| 6/99                 | 8.41                                  | 197   |
| 7/99                 | 8.79                                  | 198   |
| 8/99                 | 8.63                                  | 198   |
| 9/99                 | 5.68                                  | 187   |
| 10/99                | 7.80                                  | 198   |
| 11/99                | 6.54                                  | 185   |
| 12/99                | 3.08                                  | 189   |
| 1/00                 | 6.12                                  | 212   |
| 2/00                 | 8.78                                  | 218   |
| 3/00                 | 9.22                                  | 206   |
| 4/00                 | 7.54                                  | 202   |
| 5/00                 | 1.42                                  | 164   |
| 6/00                 | 5.75                                  | 183   |
| 7/00                 | 1.57                                  | 190   |
| 8/00                 | 6.80                                  | 198   |
| 9/00                 | 3.42                                  | 194   |
| 10/00                | 0.868                                 | 198   |
| 11/00                | 0.00                                  | 0   |

<sup>a</sup>First operational shift reading on November 1, 2000 to first operational shift reading on December 1, 2000.

<sup>b</sup>Downtime as noted in the text.

<sup>c</sup>Hours in reporting period - Hours not injecting

<sup>d</sup>(Hours injecting/Hours in reporting period) x 100

<sup>e</sup>Summation of daily totalizer differences

<sup>f</sup>Million Gallons Injected/(Hours Injecting x 60)

TABLE 4

**3431**

**RE-INJECTION WELL 22109 (IW-10)  
OPERATIONAL SUMMARY SHEET  
NOVEMBER 2000**

Reference Elevation (feet AMSL) - 576.92 (top of casing)

Northing Coordinate ('83) - 476175.65

Easting Coordinate ('83) - 1348860.53

Hours in reporting period<sup>a</sup> = 720.00

Target Injection Rate = 200 gpm

Hours not injecting<sup>b</sup> = 720.00Hours injecting<sup>c</sup> = 0.00Operational percent<sup>d</sup> = 0.0

| Monthly Measurements |                                       |   |
|----------------------|---------------------------------------|---|
| Month                | Million Gallons Injected <sup>e</sup> | Average Operating Injection Rate (gpm) <sup>f</sup> |
| 9/98                 | 8.13                                  | 205   |
| 10/98                | 8.28                                  | 200   |
| 11/98                | 8.50                                  | 196   |
| 12/98                | 5.72                                  | 217   |
| 1/99                 | 5.48                                  | 229   |
| 2/99                 | 8.09                                  | 208   |
| 3/99                 | 8.13                                  | 204   |
| 4/99                 | 5.35                                  | 190   |
| 5/99                 | 8.25                                  | 197   |
| 6/99                 | 8.36                                  | 196   |
| 7/99                 | 8.81                                  | 199   |
| 8/99                 | 8.52                                  | 196   |
| 9/99                 | 1.97                                  | 169   |
| 10/99                | 7.79                                  | 198   |
| 11/99                | 6.47                                  | 183   |
| 12/99                | 7.58                                  | 186   |
| 1/00                 | 8.72                                  | 195   |
| 2/00                 | 6.61                                  | 233   |
| 3/00                 | 9.11                                  | 204   |
| 4/00                 | 7.47                                  | 200   |
| 5/00                 | 1.43                                  | 165   |
| 6/00                 | 1.26                                  | 190   |
| 7/00                 | 2.63                                  | 204   |
| 8/00                 | 6.82                                  | 198   |
| 9/00                 | 3.44                                  | 195   |
| 10/00                | 0.00                                  | 0   |
| 11/00                | 0.00                                  | 0   |

<sup>a</sup>First operational shift reading on November 1, 2000 to first operational shift reading on December 1, 2000.<sup>b</sup>Downtime as noted in the text.<sup>c</sup>Hours in reporting period - Hours not injecting<sup>d</sup>(Hours injecting/Hours in reporting period) x 100<sup>e</sup>Summation of daily totalizer differences<sup>f</sup>Million Gallons Injected/(Hours Injecting x 60)

TABLE 5

RE-INJECTION WELL 22240 (IW-11)  
OPERATIONAL SUMMARY SHEET  
NOVEMBER 2000

Reference Elevation (feet AMSL) - 577.14 (top of casing)  
Northing Coordinate ('83) - 476422.82  
Easting Coordinate ('83) - 1349386.92

Hours in reporting period<sup>a</sup> = 720.93  
Hours not injecting<sup>b</sup> = 0.00  
Hours injecting<sup>c</sup> = 720.93  
Operational percent<sup>d</sup> = 100.0

Target Injection Rate = 200 gpm

| Monthly Measurements |                                       |   |
|----------------------|---------------------------------------|---|
| Month                | Million Gallons Injected <sup>e</sup> | Average Operating Injection Rate (gpm) <sup>f</sup> |
| 9/98                 | 8.39                                  | 211   |
| 10/98                | 8.29                                  | 199   |
| 11/98                | 8.50                                  | 197   |
| 12/98                | 5.68                                  | 216   |
| 1/99                 | 5.53                                  | 230   |
| 2/99                 | 8.06                                  | 208   |
| 3/99                 | 8.04                                  | 204   |
| 4/99                 | 7.56                                  | 192   |
| 5/99                 | 8.34                                  | 199   |
| 6/99                 | 8.42                                  | 197   |
| 7/99                 | 8.85                                  | 199   |
| 8/99                 | 8.65                                  | 199   |
| 9/99                 | 5.64                                  | 186   |
| 10/99                | 7.91                                  | 200   |
| 11/99                | 6.67                                  | 189   |
| 12/99                | 7.62                                  | 187   |
| 1/00                 | 8.86                                  | 198   |
| 2/00                 | 8.76                                  | 217   |
| 3/00                 | 9.19                                  | 206   |
| 4/00                 | 7.53                                  | 201   |
| 5/00                 | 1.41                                  | 163   |
| 6/00                 | 5.77                                  | 184   |
| 7/00                 | 3.94                                  | 198   |
| 8/00                 | 5.68                                  | 207   |
| 9/00                 | 2.86                                  | 201   |
| 10/00                | 7.62                                  | 198   |
| 11/00                | 8.34                                  | 193   |

<sup>a</sup>First operational shift reading on November 1, 2000 to first operational shift reading on December 1, 2000.

<sup>b</sup>Downtime as noted in the text.

<sup>c</sup>Hours in reporting period - Hours not injecting

<sup>d</sup>(Hours injecting/Hours in reporting period) x 100

<sup>e</sup>Summation of daily totalizer differences

<sup>f</sup>Million Gallons Injected/(Hours Injecting x 60)

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TABLE 6

RE-INJECTION WELL 22111 (IW-12)  
OPERATIONAL SUMMARY SHEET  
NOVEMBER 2000

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Reference Elevation (feet AMSL) - 583.01 (top of casing)  
Northing Coordinate ('83) - 476518.64  
Easting Coordinate ('83) - 1350105.39

Hours in reporting period<sup>a</sup> = 720.93  
Hours not injecting<sup>b</sup> = 0.00  
Hours injecting<sup>c</sup> = 720.93  
Operational percent<sup>d</sup> = 100.0

Target Injection Rate = 200 gpm

| Monthly Measurements |                                       |   |
|----------------------|---------------------------------------|---|
| Month                | Million Gallons Injected <sup>c</sup> | Average Operating Injection Rate (gpm) <sup>f</sup> |
| 9/98                 | 8.12                                  | 205   |
| 10/98                | 8.27                                  | 201   |
| 11/98                | 8.53                                  | 197   |
| 12/98                | 5.61                                  | 219   |
| 1/99                 | 5.08                                  | 212   |
| 2/99                 | 8.06                                  | 208   |
| 3/99                 | 8.13                                  | 203   |
| 4/99                 | 7.65                                  | 195   |
| 5/99                 | 8.27                                  | 197   |
| 6/99                 | 8.42                                  | 197   |
| 7/99                 | 8.80                                  | 198   |
| 8/99                 | 8.67                                  | 199   |
| 9/99                 | 5.66                                  | 187   |
| 10/99                | 7.82                                  | 198   |
| 11/99                | 6.65                                  | 188   |
| 12/99                | 7.41                                  | 198   |
| 1/00                 | 8.84                                  | 198   |
| 2/00                 | 8.77                                  | 217   |
| 3/00                 | 9.19                                  | 206   |
| 4/00                 | 7.52                                  | 201   |
| 5/00                 | 1.45                                  | 166   |
| 6/00                 | 5.74                                  | 183   |
| 7/00                 | 1.38                                  | 196   |
| 8/00                 | 5.77                                  | 202   |
| 9/00                 | 8.01                                  | 200   |
| 10/00                | 7.68                                  | 199   |
| 11/00                | 8.28                                  | 191   |

<sup>a</sup>First operational shift reading on November 1, 2000 to first operational shift reading on December 1, 2000.

<sup>b</sup>Downtime as noted in the text.

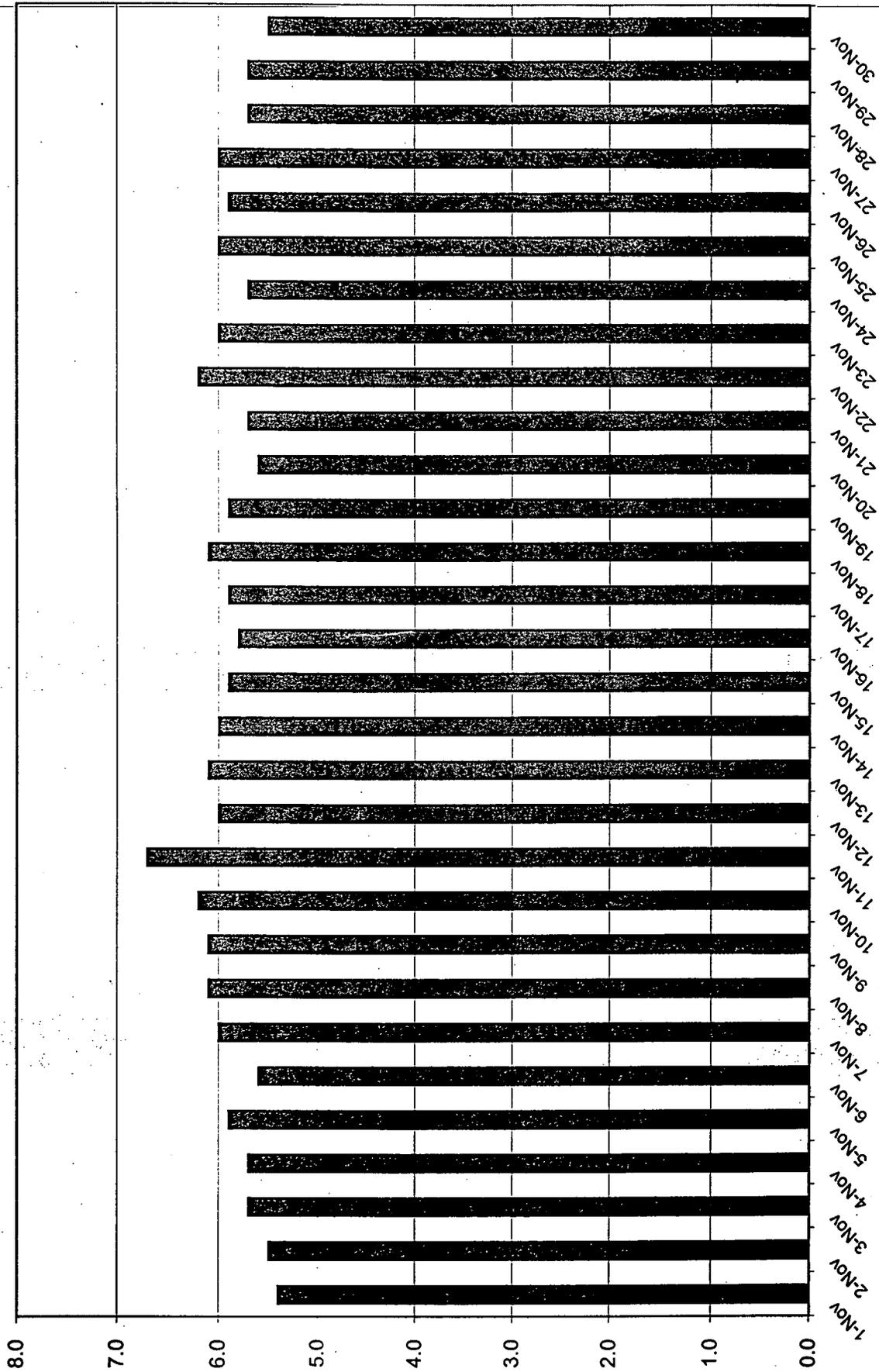
<sup>c</sup>Hours in reporting period - Hours not injecting

<sup>d</sup>(Hours injecting/Hours in reporting period) x 100

<sup>e</sup>Summation of daily totalizer differences

<sup>f</sup>Million Gallons Injected/(Hours Injecting x 60)

**Figure 1**  
**AWWT Expansion 1800 System Effluent Total Uranium Concentration (µg/L)**  
**on Days when Re-Injection Occurred**



Note: Down times are discussed in the text.

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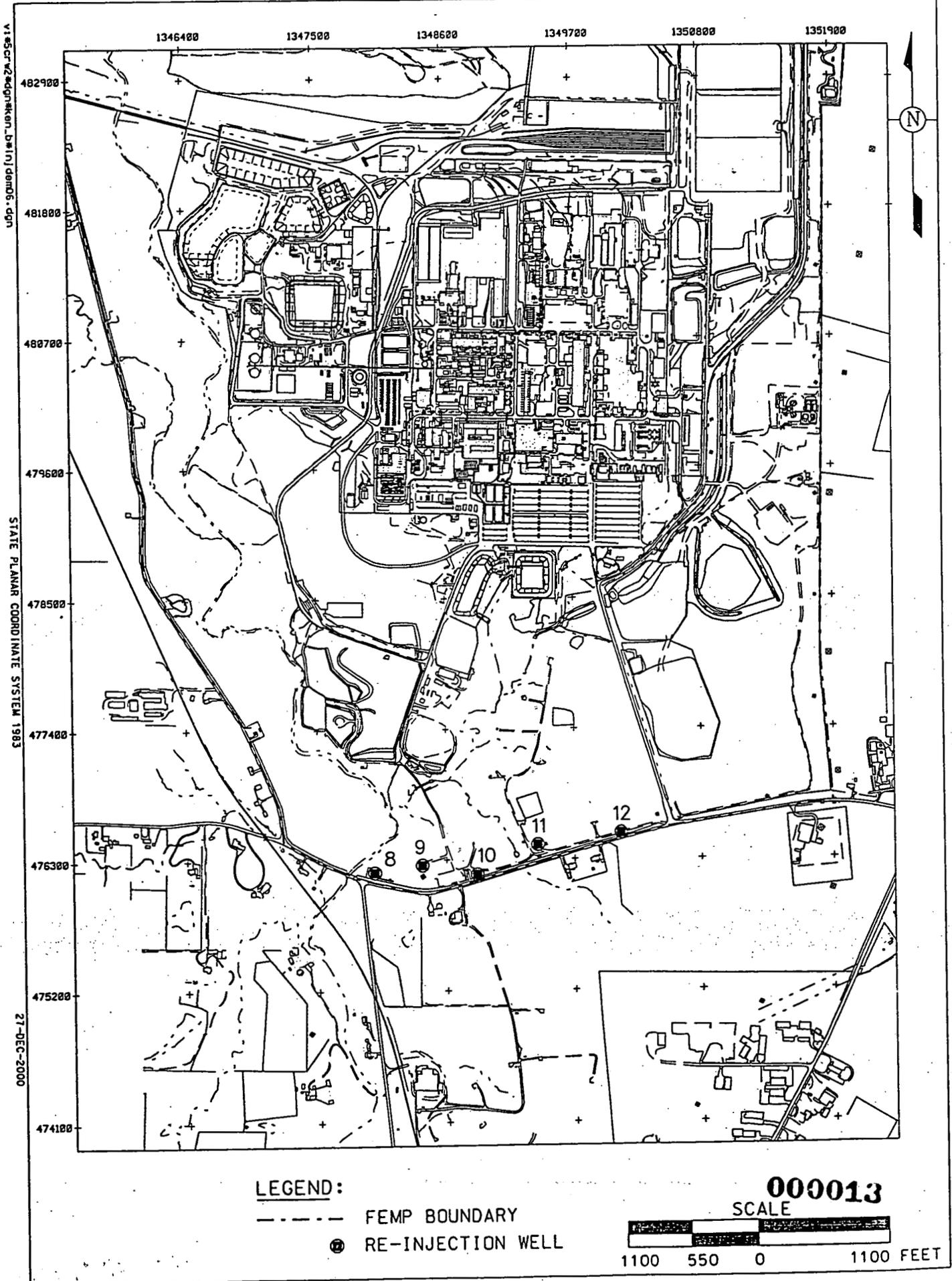
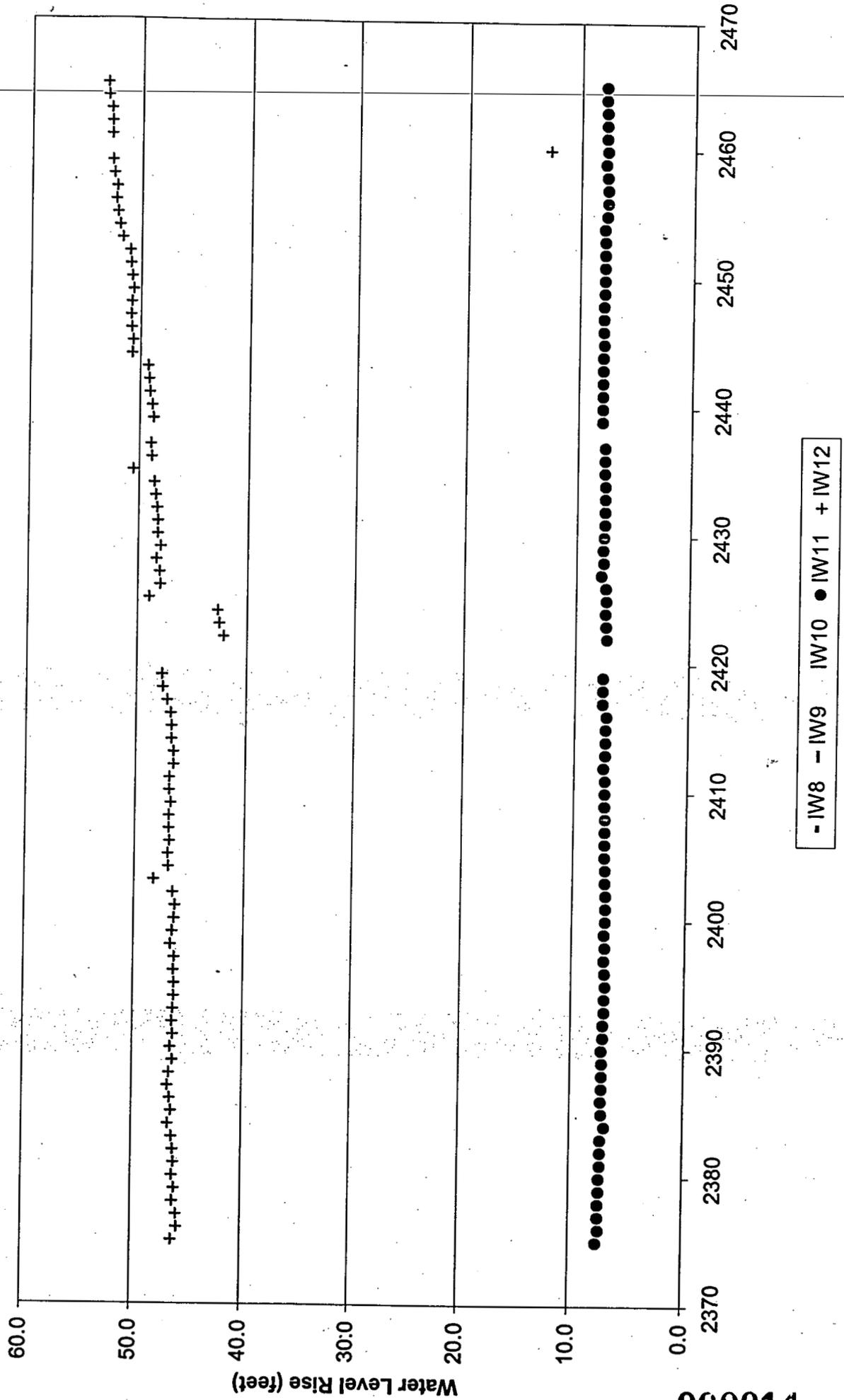


FIGURE 2. LOCATION OF RE-INJECTION WELLS

Figure 3  
 Re-Injection Wells, Water Level Rise  
 First Shift on November 1, 2000 (Sample Number 2375) to  
 First Shift on December 1, 2000 (Sample Number 2465)



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