



Department of Energy

**Ohio Field Office
Fernald Area Office**
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3790

JUL 31 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-0772-01

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

Ms. Val Orr
Division of Drinking and Ground Waters - UIC Unit
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

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

MAY 2001 RE-INJECTION OPERATING REPORT

The purpose of this letter is to submit the subject report for your review and approval.

The monthly reports are being submitted to you in accordance with the Re-Injection Demonstration Test Plan.

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

Sincerely,

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:R.J. Janke

Enclosure: As Stated

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JUL 31 2001

DOE-0772-01

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

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cc w/enclosure:

R. J. Janke, OH/FEMP
G. Jablonowski, USPEA-V, SRF-5J
T. Schneider, OEPA-Dayton (three copies of enclosure)
F. Bell, ATSDR
F. Hodge, Tetra Tech
M. Schupe, HSI GeoTrans
R. Vandegrift, ODH
D. Brettschneider, Fluor Fernald, Inc./MS52-5
K. Broberg, Fluor Fernald, Inc./MS52-5
W. Hertel, Fluor Fernald, Inc./MS52-5
M. Jewett, Fluor Fernald, Inc./MS52-2
C. Smyser, Fluor Fernald, Inc./MS52-5
R. White, Fluor Fernald, Inc./MS52-5
AR Coordinator, Fluor Fernald, Inc./MS78

cc w/o enclosure:

N. Hallein, EM-31/CLOV
A. Tanner, OH/FEMP
D. Carr, Fluor Fernald, Inc./MS2
T. Hagen, Fluor Fernald, Inc./MS65-2
S. Hinnefeld, Fluor Fernald, Inc./MS31
M. Jewett, Fluor Fernald, Inc./MS52-2
T. Walsh, Fluor Fernald, Inc./MS65-2
ECDC, Fluor Fernald, Inc./MS52-7

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MONTHLY RE-INJECTION
OPERATING REPORT
MAY 2001

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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.

Re-Injection at Fernald is exempted under 40 CFR 300.400(e)(1) from requiring a permit, as it is a CERCLA action. In accord with 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 May 1 to June 1, 2001.

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 are reported quarterly and are available for viewing on the Fernald Website, 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 groundwater 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 May 23, 2001. 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 1.65 micrograms per liter ($\mu\text{g/L}$). The FRL for uranium is 20 $\mu\text{g/L}$. The total uranium concentration of the daily composite sample also collected on May 23, 2001 was 1.7 $\mu\text{g/L}$.

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 gallons per minute (gpm). The combined design re-injection rate for all five wells is 1000 gpm. Figure 2 illustrates the location of the five re-injection wells; Tables 2 through 6 summarize the current calendar year's operational data by month. The tables also provide averages by year for the calendar years 1998, 1999, and 2000. 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 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 May 1 to June 1, 2001, as recorded 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.

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

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For the month of May 2001, re-injection took place at a reduced rate due to outages of Re-Injection Wells 8, 9, and 12. As depicted in Figures 1 and 3, Re-Injection Wells 10 and 11 were down on May 10 due to the uranium concentration being greater than 10 µg/L in the treatment plant discharge; the system was restarted on May 11, 2001. Re-injection was also inoperative on May 21 due to restart of 1800 Train 1 after regeneration. The system was restarted on May 22, 2001.

SUMMARY OF WELL MAINTENANCE FOR THE REPORTING PERIOD

- Re-Injection Wells 8, 9, and 12 were offline through the end of May 2001 as presented in Tables 2, 3, and 6, respectively.

NOTIFICATION OF SIGNIFICANT REDUCTION IN REINJECTION EFFICIENCY

The re-injection wells have been subject to increased residual plugging that has effectively stopped re-injection at Re-Injection Wells 8, 9, and 12. Furthermore, Re-Injection Well 10 is showing significant signs of plugging and is not expected to remain viable. The cessation of reinjection in these three wells has resulted in an overall wellfield reduction of 60 percent; the system has been re-injecting at roughly 400 gpm instead of the design rate of 1000 gpm.

While it is not within the scope of this report to detail both problem analysis and methods of solving this problem, steps currently underway include:

- Water samples from two of the re-injection wells were collected during the week of May 21, 2001. The samples were sent to Water Systems Engineering, Inc. (WSE) for chemical and bacterial analysis. Results are expected in the first week of June 2001. Once the analyses are complete, WSE will provide recommendations regarding re-injection well treatment.
- DOE has also solicited assistance from other experts in the well rehabilitation field. It is anticipated that the other experts will be available to help resolve our re-injection well plugging problems.
- A report is being prepared to status and update the issues associated with these re-injection wells. The report will outline the rehabilitation efforts that have taken place to date, including an analysis of the project's successes and failures.
- If the plugging of the re-injection wells proves to be non-reversible, the FEMP will re-evaluate the re-injection program to determine whether the program still possesses significant cost savings with respect to the acceleration of the groundwater remedy.
- If supportable, DOE will explore the possibility of new re-injection wells, including the possibility of a new well design to allow periodic pumping from the re-injection well at rates of 100 gpm or greater.

More information, including information beyond the temporal scope of this report (e.g., more recent than May 2001), will be presented in the weekly site conference calls as it becomes available.

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TABLE 1
ANALYSIS OF INJECTATE
Sample collected May 23, 2001

Constituents ^a	Result ^b	Groundwater FRL ^c	Detection Limit	Constituent Type ^g	Basis for FRL ^h
General Chemistry		mg/L			
Nitrate	0.43	11.0		MP	B
Inorganics		mg/L			
Antimony	U	0.006	0.0019	N	A
Arsenic	U	0.05	0.0023	N	A
Barium	0.0540 B ^c	2.0		N	A
Beryllium	U	0.004	0.0002	N	A
Cadmium	U	0.014	0.0003	N	B
Total Chromium	U	0.022 ^f	0.0009	MP	R
Cobalt	U	0.17	0.0008	N	R
Lead	U	0.015	0.0026	N	A
Manganese	0.0025 B ^c	0.9		N	B
Mercury	U	0.002	0.0001	MP	A
Nickel	0.0019 B ^c	0.1		N	A
Selenium	U	0.05	0.0026	N	A
Silver	U	0.05	0.0010	N	R
Vanadium	U	0.038	0.0007	N	R
Zinc	0.00054 B ^c	0.021		N	B
Radionuclides		pCi/L			
Neptunium-237	U	1.0	0.0264	MP	R*
Radium-226	U	20.0	0.517	N	A
Strontium-90	U	8.0	0.486	MP	A
Thorium-228	U	4.0	0.133	N	R*
Thorium-232	U	1.2	0.0102	N	R*
Total Uranium		µg/L			
Total Uranium	1.65	20.0		MP	A
Organics		µg/L			
Bis(2-ethylhexyl)phthalate	1 JB ^{c,d}	6.0		N	A
Carbon disulfide	U	5.5	1.0	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

^aConstituents 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.

^bIf a duplicate sample was analyzed, then the highest concentration between the regular sample and duplicate sample is reported.

U = Nondetect

^cB = Lab qualifier. Reported result is greater than the instrument detection level but less than the contract required detection limit.

^dJ = Lab qualifier. Reported result is positively detected but is estimated; the result is still usable for making decisions.

^eFrom Table 9-4 in OU5 ROD.

^fFRL is for hexavalent chromium.

^gConstituent 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.

^hA - Applicable or relevant and appropriate requirement based (MCL, PMCL, etc.).

B - Based on 95th percentile background concentrations.

R - Risk-based

R* - Risk-based radionuclide cleanup levels include constituent specific 95th percentile background concentration.

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TABLE 2

RE-INJECTION WELL 22107 (IW-8)
 OPERATIONAL SUMMARY SHEET
 MAY 2001

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

Hours in reporting period^a = 744.00
 Hours not injecting^b = 744.00
 Hours injecting^c = 0.00
 Operational percent^d = 0.0

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.04	207
1999	7.21	199
2000	4.26	149
1/01	0.00	0
2/01	0.00	0
3/01	0.00	0
4/01	0.00	0
5/01	0.00	0

^aFirst operational shift reading on May 1, 2001 to first operational shift reading on June 1, 2001.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d $(\text{Hours injecting} / \text{Hours in reporting period}) \times 100$

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected / (Hours Injecting x 60)

TABLE 3

RE-INJECTION WELL 22108 (IW-9)
OPERATIONAL SUMMARY SHEET
MAY 2001

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

Hours in reporting period^a = 744.00
Hours not injecting^b = 744.00
Hours injecting^c = 0.00
Operational percent^d = 0.0

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.67	204
1999	6.64	188
2000	4.29	164
1/01	0.00	0
2/01	0.00	0
3/01	0.11	204
4/01	0.00	0
5/01	0.00	0

^aFirst operational shift reading on May 1, 2001 to first operational shift reading on June 1, 2001.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected/(Hours Injecting x 60)

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TABLE 4

RE-INJECTION WELL 22109 (IW-10)
OPERATIONAL SUMMARY SHEET
MAY 2001

Reference Elevation (feet AMSL) - 576.92 (top of casing)
Northing Coordinate ('83) - 476175.65
Easting Coordinate ('83) - 1348860.53

Hours in reporting period^a = 744.77
Hours not injecting^b = 74.00
Hours injecting^c = 670.77
Operational percent^d = 90.1

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.66	204
1999	7.07	196
2000	3.96	149
1/01	2.72	206
2/01	6.27	199
3/01	7.82	200
4/01	7.81	201
5/01	8.01	199

^aFirst operational shift reading on May 1, 2001 to first operational shift reading on June 1, 2001.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected/(Hours Injecting x 60)

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TABLE 5

RE-INJECTION WELL 22240 (IW-11)
OPERATIONAL SUMMARY SHEET
MAY 2001

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

Hours in reporting period^a = 744.77
Hours not injecting^b = 78.00
Hours injecting^c = 666.77
Operational percent^d = 89.5

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.72	206
1999	7.61	199
2000	6.38	196
1/01	5.97	200
2/01	6.26	199
3/01	7.76	196
4/01	7.68	202
5/01	8.03	201

^aFirst operational shift reading on May 1, 2001 to first operational shift reading on June 1, 2001.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d $(\text{Hours injecting} / \text{Hours in reporting period}) \times 100$

^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected / (Hours Injecting x 60)

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TABLE 6

RE-INJECTION WELL 22111 (IW-12)
OPERATIONAL SUMMARY SHEET
MAY 2001

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

Hours in reporting period^a = 744.00
Hours not injecting^b = 0.00
Hours injecting^c = 0.00
Operational percent^d = 0.0

Target Injection Rate = 200 gpm

Monthly Measurements		
Month ^e	Million Gallons Injected ^f	Average Operating Injection Rate (gpm) ^g
1998	7.63	206
1999	7.55	198
2000	6.05	180
1/01	0.00	0
2/01	0.00	0
3/01	0.00	0
4/01	0.00	0
5/01	0.00	0

^aFirst operational shift reading on May 1, 2001 to first operational shift reading on June 1, 2001.

^bDowntime as noted in the text.

^cHours in reporting period - Hours not injecting

^d(Hours injecting/Hours in reporting period) x 100

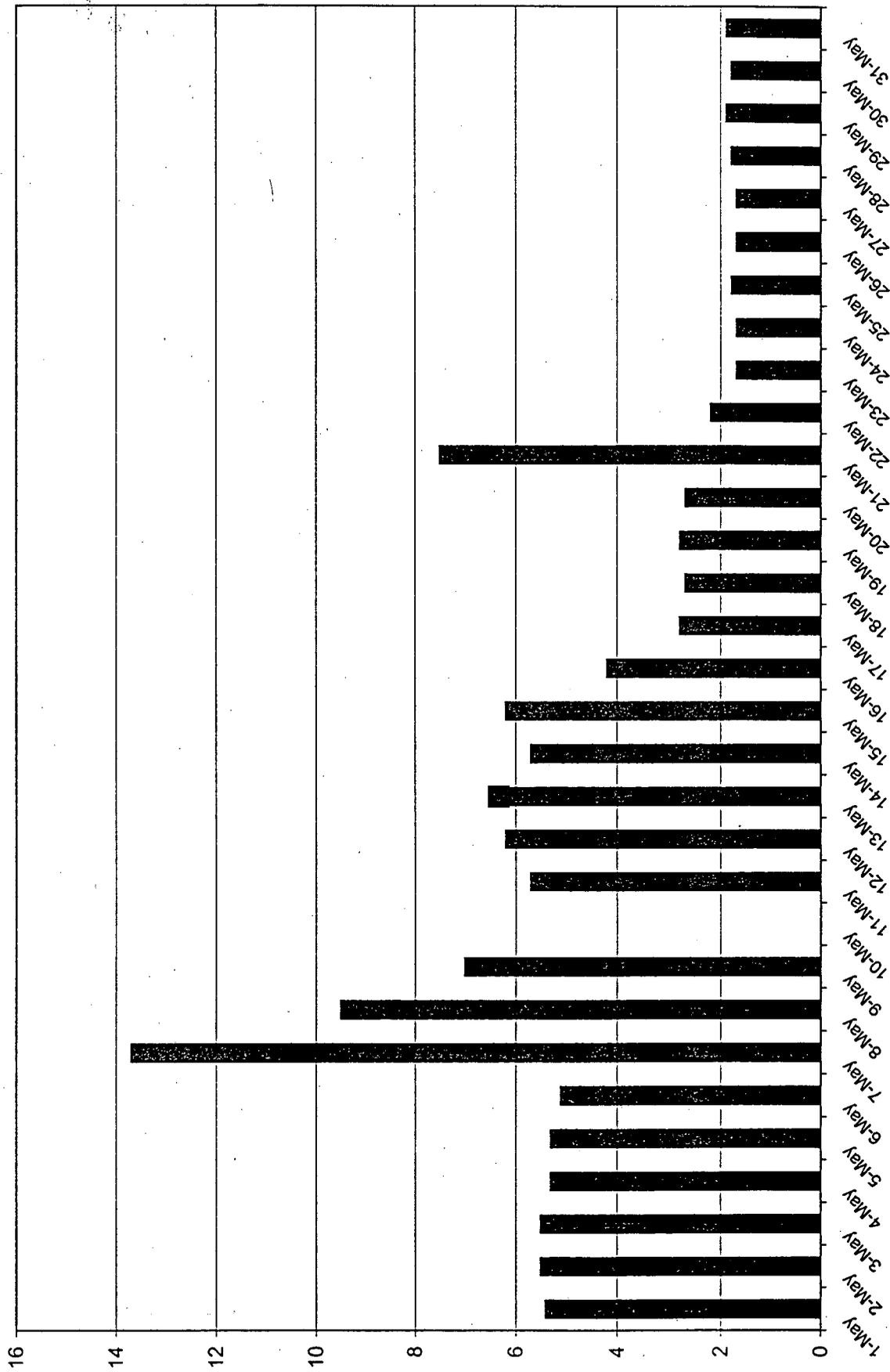
^eAverage for calendar years 1998, 1999, and 2000

^fSummation of daily totalizer differences

^gGallons Injected/(Hours Injecting x 60)

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

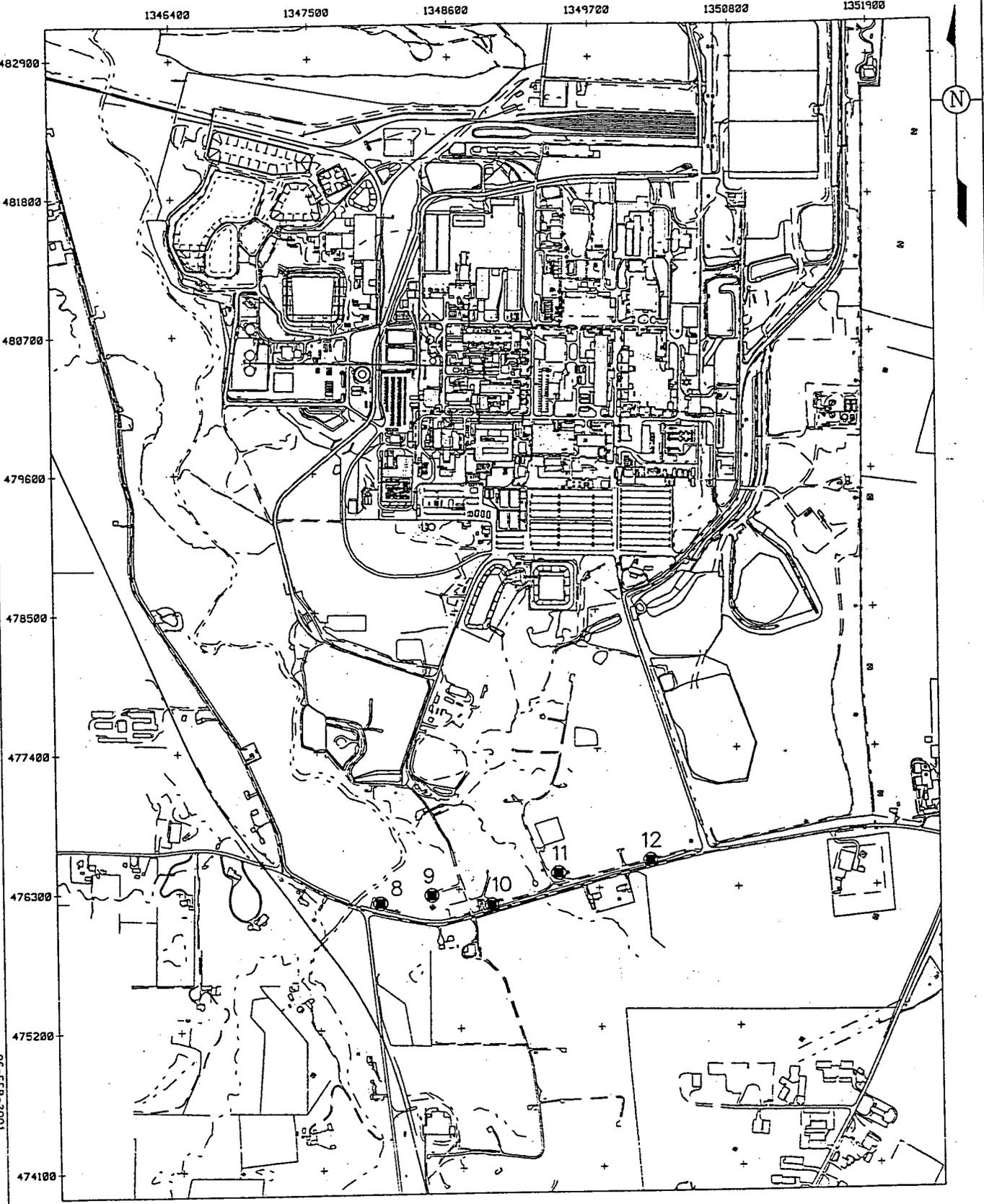


Note: Down times are discussed in the text.

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STATE PLANNAR COORDINATE SYSTEM 1983

06-FEB-2001



LEGEND:

- FEMP BOUNDARY
- ⊙ RE-INJECTION WELL

SCALE

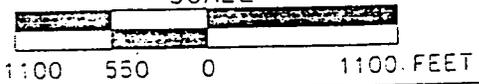
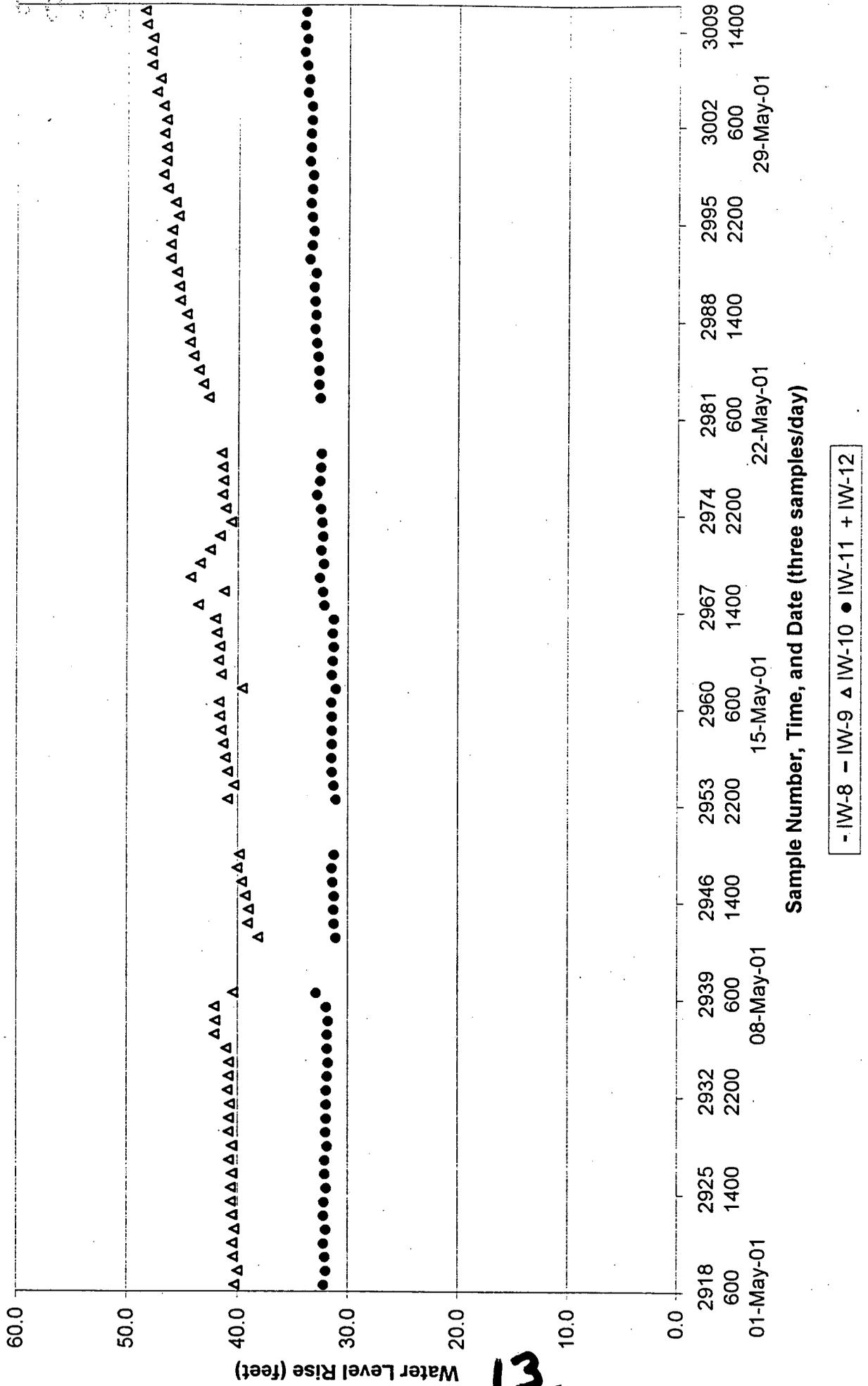


FIGURE 2. LOCATION OF RE-INJECTION WELLS

Figure 3
Re-Injection Wells, Water Level Rise
First Shift on May 1, 2001 (Sample Number 2918) to First Shift on June 1, 2001 (Sample Number 3011)



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