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Report No. RE-PB-83-015
Date: July 1983

6107206

INTERNAL TECHNICAL REPORT

Title: HYDROTHERMAL INJECTION PROGRAM
PHASE I TEST DATA INDEX

Organization: PHYSICAL & BIOLOGICAL SCIENCES DIVISION
EARTH & LIFE SCIENCES BRANCH
GEOSCIENCES SECTION

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HYDROTHERMAL INJECTION PROGRAM
PHASE I TEST DATA INDEX

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May 1983

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Prepared for the
U.S. Department of Energy
Idaho Operations Office
Under DOE Contract No. DE-AC07-76ID01570

ABSTRACT

This report presents a test data index for a series of nine experimental tests, conducted on the RRGP-5 well at the DOE Raft River Geothermal Site located 15 miles S.W. of Malta, Idaho. These data cover a three month testing and monitoring period starting September 1, 1982. Wellhead pressure and water level data were collected from other wells within the well field. This monitoring system consists of RRGE-1, RRMW-1, USGS-3, RRGP-4, RRPW-5 and the BLM-OFFSET well.

The data is stored on permanent files at the Idaho National Engineering Laboratory (INEL) Cyber Computer Complex. The main processors for this complex are located at the Computer Science Center (CSC) in Idaho Falls, Idaho.

This report lists the uninterpreted data available for analysis and is presented in engineering units. The data have been analyzed only to the extent necessary to ensure that they are reasonable and internally consistent.

The experimental testing program was a joint effort between EG&G Idaho, Inc. and the University of Utah Research Institute (UURI).

SUMMARY

The primary objective of the test sequence was to acquire the experimental data necessary to develop a technique for characterizing the fracture dominated Raft River geothermal reservoir. During each test, the geothermal injectant fluid was inoculated with a known concentration of secondary tracers. Tracer concentrations were monitored during the backflow stage. This experimental process has been labeled the "Huff-Puff" technique.

RRGP-5 injection system piping and pond were used as supply and disposal routes. (Figure 1). The injection supply water from RRGE-3 could be passed into the pond through spargers or valved directly to the suction side of the injection pump. The injection pump was also used as a method of disposal for backflow or warm-up flow fluids which had collected in the RRG-5 pond. RRG-5 fluids could also backflow directly to RRG-7 pond to be reinjected downwell RRG-7.

Tracers were mixed and injected from three large mixing tanks (Figure 1) downstream from the injection pump. Some problems occurred during the injection of $MgCl_2$ due to the plugging of filters and thus temporarily interrupting the flow of tracer into the injectant fluid. Tracer samples were collected through a cooling coil located in the chemistry trailer. A low volume cooling coil was attached to a continuous flow loop with the flow rate of 4 gpm. This helped cut down on lag time between fluid injection and sampling and provided an effective method of disposal into the lined pond at RRG-5.

Samples collected at Raft River were analyzed in the field for the indicated species using the following methods: alkalinity by titration, conductivity by conductance cell; fluorescein by fluorometer; magnesium and calcium by atomic absorption spectrophotometer (AA); boron by colorimetric techniques; chloride, bromide, pH, thiocyanate and iodide by selective ion electrode (SIE).

The multi-element and tracer analyses provided by UURI was analyzed using an inductively coupled plasma emission spectrophotometer (ICP), chloride and bicarbonate by titration, iodide and fluoride by selective ion electrode using the standard addition technique, sulfate by gravimetric and total dissolved solids (TDS) by evaporation and weighing.

The surrounding well field (Figure 2) was monitored and the data are presented to allow for interpretation of possible interference effects between the test well and the well field during injection and backflow.

CONTENTS

ABSTRACT	ii
SUMMARY	iii
INTRODUCTION	1
TEST SEQUENCE DATA FILES	4
APPENDIX A--Listing of Data Excluded From Data Base.....	35
APPENDIX B--Raft River Test Data (unattached)	B-1

FIGURES

1. Raft River RRGP-5 Well Flow Schematic	2
2. Raft River Well Locations	3

TABLES

1. Test titles, file names and start times	5
2. Tracers used during test	6
3. Test 2A1 - file contents	7
3A. Test 2A1 - test sequence and objectives	8
4. Test 2A2 - file contents	9
4A. Test 2A2 - test sequence and objective	10
4B. Test 2A2 - downhole logs information	11
5. Test 2C - file contents	12
5A. Test 2C - test sequence and objectives	13
5B. Test 2C - downhole logs information	15
6. Test 4A - file content	16
6A. Test 4A - test sequence and objectives	17
7. Test 4B - file contents	18
7A. Test 4B - test sequence and objectives	19

7B. Test 4B - downhole logs information	20
8. Test 4C - file contents	21
8A. Test 4C - test sequence and objectives	22
9. Test 4D - file contents	23
9A. Test 4D - test sequence and objectives	24
9B. Test 4D - downhole logs information	25
10. Test 2D - file contents	26
10A. Test 2D - test sequence and objectives	27
10B. Test 2D - downhole logs information	28
11. Test 5 - file contents	30
11A. Test 5 - file sequence and objectives	32

HYDROTHERMAL INJECTION PROGRAM PHASE I TEST DATA INDEX

INTRODUCTION

The intent of this report is to supply an index of the data available for analysis. The format of the report is in table form, with information pertaining to tracers data sampled, methods of recording and analytical methods combined with the units in which the data are recorded.

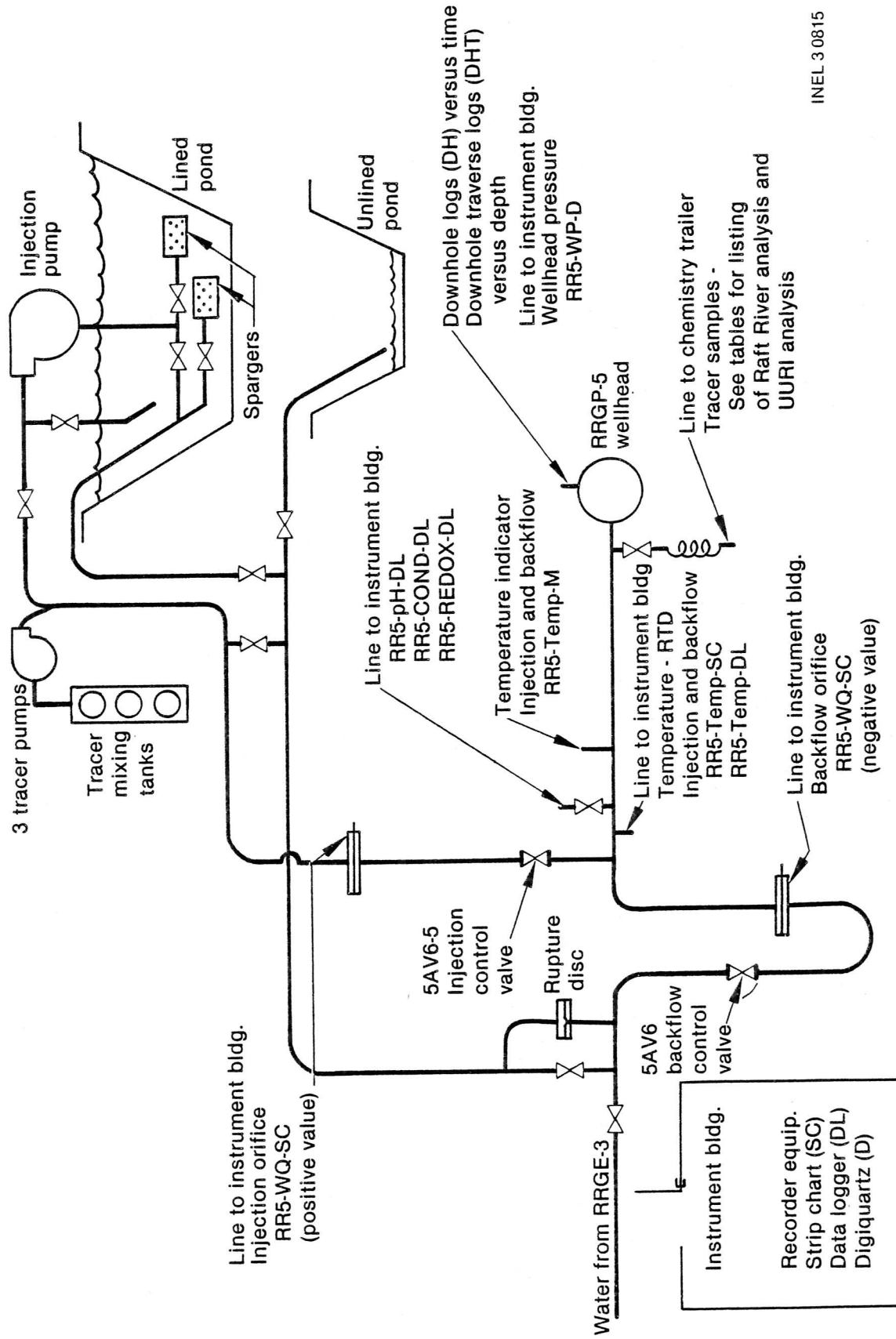
There are nine separate test files, one for each of the tests. The file names consist of location, test number and date. The files are listed in hours, with zero time simultaneous with the injection start time for each test. Each file contains pretest and posttest data as well as actual test time data (Table 1). For example, if there are 20 hours of pretest data, the file start time will be listed as a - (minus) 20.

The files on the actual tests contain RRGP-5 well-head pressure, temperature (surface and downhole), injection and backflow rates and duration, tracers used (Table 2), and water analysis, both those performed on site and in the laboratory. Downhole conductivity/temperature logs, spinner and caliper logs run during different phases of the tests are also available. On the final test, data was recorded at RRGE-1 which is incorporated in the file along with data from RRGP-5. However, the well-head pressure was put into the RRMONITOR82 file, as RRGE-1 is included in the monitoring system.

Appendix A is a listing of data excluded from the Data Base due to either duplication or spurious quality.

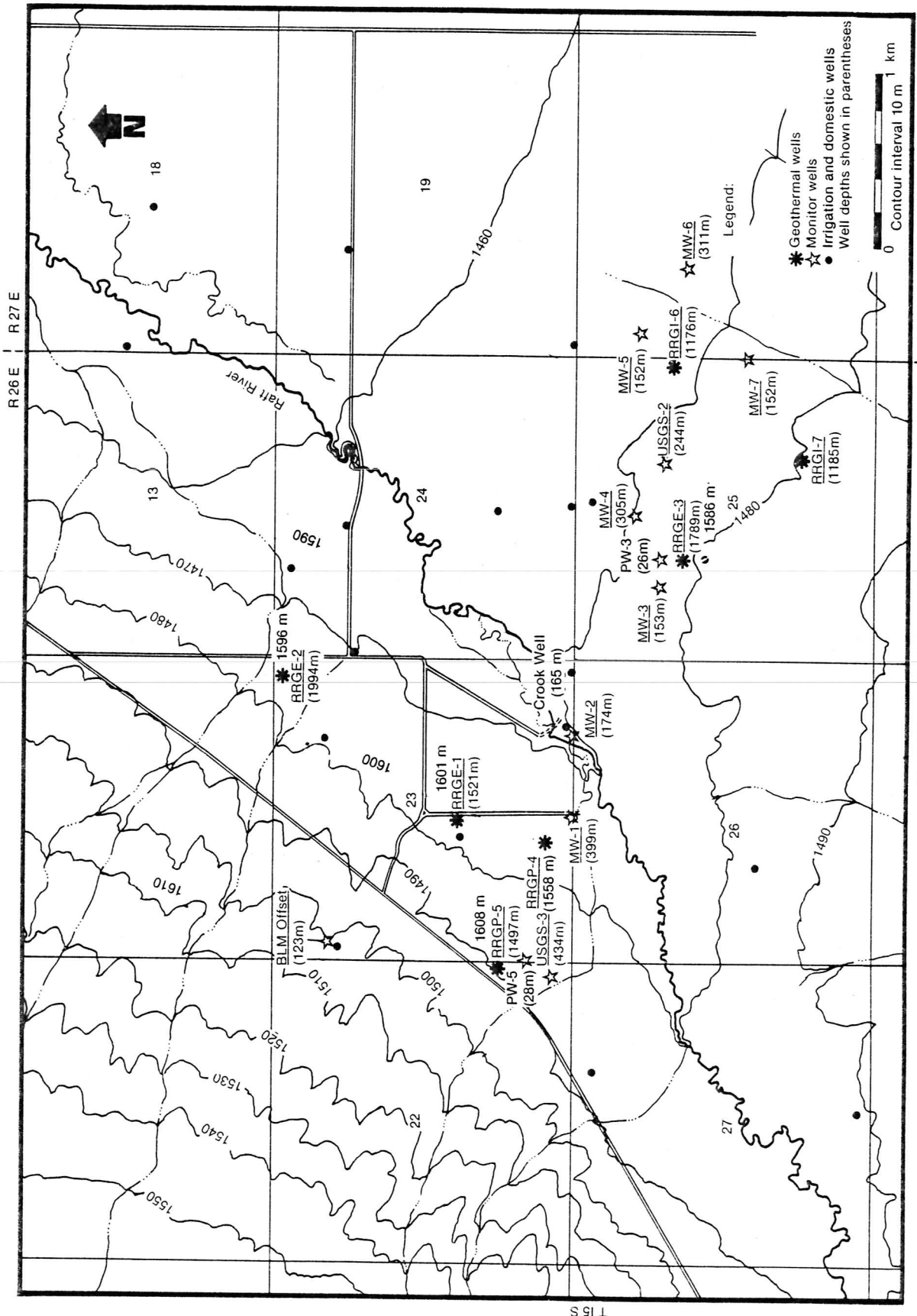
The Appendix B (unattached) contains examples of data collected during the series of test in a graphic format accompanied with code sheets of each test listing record identifiers, data sampled, analytical or recorder methods and units.

The file on the monitoring system, RRMONITOR82, presents data obtained from RRGE-1, RRMW-1 USGS-3, RRGP-4, RRPW-5 and BLM-OFFSET well. These data are reported in either psia of head pressure or water level below the measuring point. This file has a zero time on 09/01/82 at 00:00 hours.



INEL 3 0815

Raft River RRG5 Well Flow Schematic
Figure 1



Raft River Well Locations
Figure 2

INEL 3 0863

TEST SEQUENCE DATA FILES

TABLE 1. TABLE OF FILES AND START TIME

<u>Test Title</u>	<u>File Start Time</u>		<u>Real</u>	<u>Test Start Time</u>		
	<u>Name</u>	<u>Date</u>		<u>Pretest (Hours)</u>	<u>Injection (Hours)</u>	<u>Backflow (Hours)</u>
2A1	RR2A1820909	Sept 09	09:00	-30.0	0:00	1.18
2A2	RR2A2820913	Sept 13	12:00	-44.94	0:00	4.37
2C	RR2C820921	Sept 21	00:00	-10.0	0:00	48.58
4A	RR4A820928	Sept 28	00:00	-58.58	0:00	29.93
4B	RR4B821003	Oct 03	12:00	-97.0	0:00	4.52
4C	RR4C821008	Oct 08	12:00	-6.00	0:00	14.33
4D	RR4D821013	Oct 13	00:00	-9.05	0:00	51.95
2D	RR2D821018	Oct 18	00:00	-13.5	0:00	98.33
5	RR5821106	Nov 06	00:00	-10.08	0:00	479.92
N/A	RRMONITOR82	Sept 01	00:00	N/A	N/A	N/A

TABLE 2. TRACERS USED DURING TESTS

<u>File Name</u>	<u>Test</u>	<u>Sequence</u>	<u>Tracer</u>
RR2A1820909	2A1	1	Iodide (I ⁻) as NaI Magnesium (Mg ²⁺) as MgCl ₂ Boron (B ³⁺) as Borax Fluoresein Bromide (B ⁻) as NaBr
RR2A2820913	2A2	2	Iodide (I ⁻) as NaI
RR2C820921	2C	3	Magnesium (Mg ²⁺) as MgCl ₂
RR4A820928	4A	4	Iodide (I ⁻) as NaI
RR4B821003	4B	5	Fluorescein
RR4C821008	4C	6	Iodide (I ⁻) as NaI
RR4D821013	4D	7	Bromide (Br ⁻) as Na Br
RR2D821018	2D	8	Iodide (I ⁻) as NaI Boron (B ³⁺) as Borax Magnesium (Mg ²⁺) as MgCl ₂ Fluorescein
RR5821106	5	9	Iodide (I ⁻) as NaI Bromide (Br ⁻) as NaBr Rhodamine B Fluorescein

TABLE 3. TEST 2A1

File Name: RR2A1820909

Date: 09-09-82

Start Time: Real--09:00; File Start Time: -30.0

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	μ mho/cm
RR5-Redox-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	$^{\circ}$ F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-WP-D	18	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	19	Well flow	Strip charts	\pm gpm
RR5-TEMP-M	20	Temperature	Manually recorded	$^{\circ}$ F
RR5-B-TR	21	Boron	Colorimetrically	ppm
RR5-I-TR	22	Iodide	SIE	ppm
RR5-MG-TR	23	Magnesium	AA	ppm

TABLE 3A. SEQUENCE OF MAJOR OPERATIONS--TEST 2A1

<u>Date</u>	<u>Time</u>	
	File/Real	
Sept 09	-30.0/09:00	Final phase of test site preparations
Sept 10	-5.85/09:09	Initiate injection down well RRGP-5 for checkout of systems piping and instruments (water from RRGE-2) (150 gpm)
	-5.53/09:28	Hale pump on (tracer pump)
	-5.5/09:30	Hale pump off
	-5.43/09:34	Pump A & B (tracer pumps) on
	-5.08/09:55	Pump A & B off
	-4.90/10:06	Completed injection down well--shut in RRGP-5
	-4.65/10:21	Initiate backflow from RRGP-5 to lined pond (150 gpm)
	-3.61/11:20	Completed backflow--shut in RRGP-5; systems piping and instrument checkout completed
	zerotime/15:00	Initiate injection down well RRGP-5, water from RRGE-3 (148 gpm)
	0.13/15:08	Tracer pump B on
	0.83/15:50	Tracer pump B off
	1.00/16:00	Completed injection--shut in RRGP-5
	1.18/16:11	Initiate backflow to lined pond (150 gpm)
	2.52/17:31	Completed backflow--shut in RRGP-5
	2.75/17:45	Initiate backflow from RRGP-5 to experiments and pond #7 due to transit line break in RRGE-2 line which was being used to support experiments. (100 gpm)

Objectives:

1. System piping and instrumentation checkout.
-

TABLE 4. TEST 2A2

File Name: RR2A2820913

Date: 09-13-82

Start Time: Real--12:00; File Test Time: -44.94

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-COND-DH4640	1	Downhole Conductivity	Stripchart	%
RR5-TEMP-DH4640	2	Downhole Temperature	Stripchart	%
RR5-NA-ICP	3	Sodium	ICP	ppm
RR5-K-ICP	4	Potassium	ICP	ppm
RR5-CA-ICP	5	Calcium	ICP	ppm
RR5-MG-ICP	6	Magnesium	ICP	ppm
RR5-FE-ICP	7	Iron	ICP	ppm
RR5-SI02-ICP	8	Silica	ICP	ppm
RR5-SR-ICP	9	Strontium	ICP	ppm
RR5-LI-ICP	10	Lithium	ICP	ppm
RR5-B-ICP	11	Boron	ICP	ppm
RR5-TDS-ICP	12	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	13	Sulfate	Gravimetric	ppm
RR5-CL-ICP	14	Chloride	Titration	ppm
RR5-F-ICP	15	Fluoride	SIE	ppm
RR5-TEMP-M	16	Temperature	Manually recorded	°F
RR5-WP-D	17	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	18	Wellflow	Strip chart	± gpm
RR5-TEMP-SC	19	Temperature	Strip chart	°F
RR5-I-TR	20	Iodide	SIE	ppm
RR5-PH-TS	21	pH	SIE	standard
RR5-COND-TS	22	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	23	Alkalinity	Titration	ppm
RR5-PH-DL	24	pH	Data logger	millivolts
RR5-COND-DL	25	Conductivity	Data logger	µmho/cm
RR5-Redox-DL	26	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	27	Temperature	Data logger	°F

TABLE 4A. SEQUENCE OF MAJOR OPERATIONS--TEST 2A2

<u>Date</u>	<u>Time</u>	
	File/Real	
Sept 13	44.94/12:00	Flow from RRGP-5 for experiments and keep warm flow (100 gpm)
Sept 15	-7.27/01:40	Decreased flow from RRGP-5 to 75 gpm
	-6.15/02:47	Decreased flow from RRGP-5 to 50 gpm
	-4.77/04:10	Decreased flow from RRGP-5 to 25 gpm
	-3.93/05:00	RRGP-5 shut in except for sample line (4 gpm)
	zerotime/08:56	Initiate injection down well RRGP-5, water from RRGE-3 (150 gpm)
		Ran conductivity and temperature log
	0.10/09:02	Tracer Pump B on
	3.90/12:50	Tracer pump B off
	4.03/12:58	Completed injection downwell RRGP-5
	4.37/13:18	Initiate backflow from RRGP-5 to lined pond
	8.48/17:25	Conductivity and temperature log completed
	14.80/23:44	Complete backflow--shut in RRGP-5 except for sample line (4 gpm)
Sept 16	25.07/10:00	Ran XY caliper log on RRGP-5 4830' to 4600'--Logging speed up (not indicated)--(Table 4B-Record 28 and 29)

Objectives:

1. Test downhole Temperature/Conductivity probe.
 2. Determine tracer (I⁻) recovery from near well formation.
-

TABLE 4B. DOWNHOLE LOGS VERSUS DEPTH--TEST 2A2
File RR2A2820913

<u>Record Name</u>	<u>#</u>	<u>Time</u>	<u>Data</u>	<u>Depth Logged</u>	<u>Units</u>
0916 X CAL DHT-U	28	10:00	XY caliper	4830' to 4600'	inches-diameter
0916 Y CAL DHT-U	29	10:00	XY caliper	4830' to 4600'	inches-diameter

The above logs were recorded on stripcharts; the record name has the date and logging direction incorporated into it, however, the logging speed was not indicated. There was no flow during logging time.

0916 X CAL DHT - U

date direction
 U - up
 D - down

TABLE 5. TEST 2C

File Name: RR2C820921

Date: 09-21-82

Start Time: Real--00:00; File Start Time: -10.0

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	μ mho/cm
RR5-Redox-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	$^{\circ}$ F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SI02-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-S04-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-I-TR	18	Iodide	SIE	ppm
RR5-TEMP-M	19	Temperature	Manually recorded	$^{\circ}$ F
RR5-WP-D	20	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	21	Well flow	Stripchart	\pm gpm
RR5-TEMP-SC	22	Temperature	Stripchart	$^{\circ}$ F
RR5-FLUOR-TR	23	Fluorescein	Fluorometer	ppm
RR5-MG-TR	24	Magnesium	AA	ppm
RR5-PH-TS	25	pH	SIE	standard
RR5-COND-TS	26	Conductivity	Conductance cell	μ mho/cm
RR5-ALK-TS	27	Alkalinity	Titration	ppm

TABLE 5A. SEQUENCE OF MAJOR OPERATIONS--TEST 2C

<u>Date</u>	<u>Time</u>	
	File/Real	
Sept 21	-10.0/00:00	RRGP-5 shut in
	zerotime/10:00	Initiated injection down well RRG-5 water from RRG-3 (150 gpm)
	0.03/10:02	Tracer pump B on--pump quit due to plugged suction line.
	0.37/10:22	Restart on tracer pump B
	2.20/12:12	Ran downhole conductivity and temperature logs: 4637' to 4820--75'/min-down (Table 5B--Records 34 and 35)
	2.23/12:14	4820' to 4750'--25'/min-up (Table 5B--Records 36 and 37)
	2.28/12:17	4750' to 4830'--50'/min-down (Table 5B--Records 38 and 39)
	2.33/12:20	4830' to 4765'--25'/min-up (Table 5B--Records 32 and 33)
	2.38/12:23	4770' to 4820'--25'/min-down (Table 5B--Records 40 and 41)
	2.43/12:26	4820' to 4770'--25'/min-up (Table 5B--Records 42 and 43)
	2.53/12:32	4740' to 4830'--25'/min-down (Table 5B--Records 28 and 29)
	2.60/12:36	4830' to 4740'--25'/min-up (Table 5B--Records 30 and 31) conductivity and temperature logs completed
	4.75/14:45	Valved out in-line conductivity, pH and oxidation-reduction probes due to malfunction
	5.17/15:10	Valved probes back in
	10.0/20:00	Problems with tracer pump--repaired and functioning properly
Sept 22	30.0/16:00	Tracer tank B filter plugged--repaired

TABLE 5A. (Continued)

Date	Time	
	File/Real	
Sept 22	31.0/17:00	Ran downhole temperature log 4835' to 0'--30'/min-up (Table 5B--Record 44)
	32.07/18:04	Tracer pump A on
	32.65/18:39	Tracer pump B off--changed filters
	32.83/18:50	Tracer pump B on
	33.07/19:04	Tracer pump A off
Sept 23	40.5/02:30	Tracer pump B off--filter plugged
	40.83/02:50	Tracer pump B on
	41.92/03:55	Tracer pump B off--filter problems
	41.98/03:59	Tracer pump B on
	42.80/04:48	Tracer pump B off--filter problems
	42.88/04:53	Tracer pump B on
	44.0/06:00	Tracer pump A on
	44.1/06:06	Tracer pump B off--changed filters
	44.18/06:11	Tracer pump B on
	46.5/08:30	Changed out filter on tank B
	48.25/10:15	Tracer pumps A & B off
	48.5/10:30	Completed injection down well RRGP-5
	48.58/10:35	Initiate backflow from RRGP-5 to lined pond (150 gpm)
	52.92/14:55	All backflow diverted to RRG1-7 pond (150 gpm)
Sept. 27	149.17/15:10	Increased backflow to RRG1-7 pond (155 gpm)
	149.5/15:30	Ran downhole temperature log 4600' to 4838'--20'/min-down (Table 5B--Record 45)
	156.78/22:47	Decreased backflow from RRGP-5 to RRG1-7 pond to 25 gpm to keep system warm

Objectives:

Explore a larger volume of the reservoir
Determine the position in the open bore where the fluid is leaving.
Determine tracer (Mg^{2+}) recovery from a larger volume of the reservoir.

TABLE 5B. DOWNHOLE LOGS VERSUS DEPTH--TEST 2C
File RR2C820921

<u>Record Name</u>	<u>#</u>	<u>Time</u>	<u>Data</u>	<u>Depth Logged</u>	<u>Units</u>
0921 CON DHT-25D	28	12:32	Conductivity	4740' to 4830'	%
0921 TEM DHT-25D	29	12:32	Temperature	4740' to 4830'	°F
0921 CON DHT-25U	30	12:36	Conductivity	4830' to 4740'	%
0921 TEM DHT-25U	31	12:36	Temperature	4830' to 4740'	°F
0921 CON DHT-25U	32	12:20	Conductivity	4830' to 4765'	%
0921 TEM DHT-25U	33	12:20	Temperature	4830' to 4765'	°F
0921 CON DHT-75D	34	12:12	Conductivity	4637' to 4820'	%
0921 TEM DHT-75D	35	12:12	Temperature	4637' to 4820'	°F
0921 CON DHT-25U	36	12:14	Conductivity	4820' to 4750'	%
0921 TEM DHT-25U	37	12:14	Temperature	4820' to 4750'	°F
0921 CON DHT-50D	38	12:17	Conductivity	4750' to 4830'	%
0921 TEM DHT-50D	39	12:17	Temperature	4750' to 4830'	°F
0921 CON DHT-25D	40	12:23	Conductivity	4770' to 4820'	%
0921 TEM DHT-25D	41	12:23	Temperature	4770' to 4820'	°F
0921 CON DHT-25U	42	12:26	Conductivity	4820' to 4770'	%
0921 TEM DHT-25U	43	12:26	Temperature	4820' to 4770'	°F
0922 TEM DHT-30U	44	17:00	Temperature	4835' to 0'	°F
0927 TEM DHT-20D	45	15:30	Temperature	4600' to 4838'	°F

The above logs were recorded on stripcharts. The record name has the date and logging speed and direction incorporated into it.

0921 CON DHT-25D
speed & direction
date ft/min D - down
U - up

TABLE 6. TEST 4A

File Name: RR4A820928

Date: 09-28-82

Start Time: Real--00:00; File Start Time: -58.58

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-CL-UURI	1	Chloride	SIE	ppm
RR5-NA-ICP	2	Sodium	ICP	ppm
RR5-K-ICP	3	Potassium	ICP	ppm
RR5-CA-ICP	4	Calcium	ICP	ppm
RR5-MG-ICP	5	Magnesium	ICP	ppm
RR5-SIO2-ICP	6	Silica	ICP	ppm
RR5-SR-ICP	7	Strontium	ICP	ppm
RR5-LI-ICP	8	Lithium	ICP	ppm
RR5-B-ICP	9	Boron	ICP	ppm
RR5-HCO3-ICP	10	Bicarbonate	Titration	ppm
RR5-SO4-ICP	11	Sulfate	Gravimetric	ppm
RR5-CL-ICP	12	Chloride	Titration	ppm
RR5-F-ICP	13	Fluoride	SIE	ppm
RR5-TDS-ICP	14	TDS	evaporation and weighing	ppm
RR5-PH-ICP	15	pH	SIE	standard
RR5-FE-ICP	16	Iron	ICP	ppm
RR5-TEMP-M	17	Temperature	Manually recorded	°F
RR5-WP-D	18	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	19	Well flow	Stripcharts	±gpm
RR5-TEMP-SC	20	Temperature	Stripcharts	°F
RR5-I-TR	21	Iodide	SIE	ppm
RR5-PH-TS	22	pH	SIE	ppm
RR5-COND-TS	23	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	24	Alkalinity	Titration	ppm
RR5-PH-DL	25	pH	Data logger	millivolts
RR5-COND-DL	26	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	27	Oxidation-reduction	Data logger	millivolts
RR5-TEMP DL	28	Temperature	Data logger	°F

TABLE 6A. SEQUENCE OF MAJOR OPERATIONS--TEST 4A
RR4A820928

Date	Time	
	File/Real	
Sept 28	-58.58/00:00	RRGP-5 backflow to RRG1-7 pond (25 gpm)
Sept 29	-28.65/05:55	Increased backflow from RRG-5 to 30 gpm
	-16.65/17:55	Diverted RRG-5 backflow to RRG-5 pond to warm up system
Sept 30	-0.23/10:20	Initiate injection down well RRG-5, water from RRG-3 (150 gpm)
	-0.17/10:24	Injection stopped--problems with instrumentation--blew rupture disc at RRG-3
	zerotime/10:34	Initiate injection down well RRG-5 water from RRG-3 (150 gpm)
	0.07/10:38	Tracer pump on
	1.32/11:53	Tracer pump off
	2.38/12:57	Completed injection down well; shut in RRG-5
Oct 01	29.93/16:30	Initiate backflow from RRG-5 to lined pond
	30.23/16:48	Problems with in-line conductivity probe--getting it repaired
	30.55/17:07	Conductivity probe now working
Oct 02	45.93/08:30	Completed backflow; shut in RRG-5
	51.46/14:02	Initiate backflow from RRG-5 to lined pond to keep system warm (undetermined amount)

Objective:

Determine whether a natural hydrological flow system was removing injected solutions from the immediate vicinity of injection well.

TABLE 7. TEST 4B

File Name: RR4B821003

Date: 10-03-82

Start Time: Real--12:00; File Start Time: -97.0

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	μ mho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	$^{\circ}$ F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR56-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	SIE	ppm
RR5-F-ICP	17	Fluoride	Titration	ppm
RR5-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	19	pH	SIE	standard
RR5-TEMP-M	20	Temperature	Manually recorded	$^{\circ}$ F
RR5-WP-D	21	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	22	Well flow	Stripchart	\pm gpm
RR5-TEMP-SC	23	Temperature	Stripchart	$^{\circ}$ F
RR5-I-TR	24	Iodide	SIE	ppm
RR5-SCN-TR	25	Thiocyanate	SIE	ppm
RR5-FLUOR-TR	26	Fluorocein	Fluorometer	ppm
RR5-PH-TS	27	pH	SIE	standard
RR5-COND-TS	28	Conductivity	Conductance cell	μ mho/cm
RR5-ALK-TS	29	Alkalinity	Titration	ppm

TABLE 7A. SEQUENCE OF MAJOR OPERATIONS--TEST 4B

<u>Date</u>	<u>Time</u>	
	File/Real	
Oct 03	-97.0/12:00	Backflow from RRGP-5 to RRG1-7 pond to keep system warm--(undeterminable small amount)
Oct 04	-83.02/01:59	Increased backflow from RRGP-5 to 25 gpm
	-76.25/08:45	Decreased backflow from RRGP-5 to 15 gpm
	-70.05/15:00	Ran temperature log on RRGP-5 3000' to 4300'--10'/min-down (Table 7B--Record 30)
	-68.05/16:57	Diverted backflow to lined pond at RRGP-5 and increased to 100 gpm
	-68.0/17:00	Ran temperature log on RRGP-5 4300' to 3000'--20'/min-up (Table 7B--Record 31)
	-66.62/18:23	Shut in RRGP-5
	-66.5/18:30	Initiate small backflow from RRGP-5 to lined pond (undetermined amount)
Oct 05	-53.0/08:00	Backflow from RRGP-5 to RRG1-7 pond (25 gpm)
Oct 07	-0.05/12:57	Shut in RRGP-5
	zerotime/13:00	Initiate injection down well RRGP-5, water from RRGE-3 (150 gpm)
	0.02/13:01	Tracer pump B on
	1.52/14:31	Tracer pump B off
	2.52/15:31	Completed injection down well RRGP-5
	4.52/17:31	Initiate backflow from RRGP-5 to lined pond (150 gpm)
	5.00/18:00	Diverted backflow to RRG1-7 pond
Oct 08	19.62/08:37	Decreased backflow to RRG1-7 and to 16 gpm
	21.90/10:54	Diverted backflow to RRGP-5 lined pond and increased to 30 gpm

Objective:

Determine whether a natural hydrological flow system was removing injected solutions from the immediate vicinity of the injection well.

TABLE 7B. DOWNHOLE LOGS VERSUS DEPTH--TEST 4B
File RR4B821003

<u>Record Name</u>	<u>#</u>	<u>Time</u>	<u>Data</u>	<u>Depth Logged</u>	<u>Units</u>
1004 TEM DHT-10D	30	15:00	Temperature	3000' to 4300'	°F
1004 TEM DHT-20U	31	17:00	Temperature	4300' to 3000'	°F

The above logs were recorded on stripcharts, the record name has the date and logging speed and direction incorporated into it. The well was flowing 15 gpm during the first log and 100 gpm on the second log.

1004 TEM DHT - 10D

date speed & direction

ft/min D - down

U - up

TABLE 8. TEST 4C

File Name: RR4C821008

Date: 10-08-82

Start Time: Real--12:00; File Start Time: -6.00

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-NA-ICP	1	Sodium	ICP	ppm
RR5-K-ICP	2	Potassium	ICP	ppm
RR5-CA-ICP	3	Calcium	ICP	ppm
RR5-MG-ICP	4	Magnesium	ICP	ppm
RR5-FE-ICP	5	Iron	ICP	ppm
RR5-SIO2-ICP	6	Silica	ICP	ppm
RR5-SR-ICP	7	Strontium	ICP	ppm
RR5-LI-ICP	8	Lithium	ICP	ppm
RR5-B-ICP	9	Boron	ICP	ppm
RR5-HCO3-ICP	10	Bicarbonate	Titration	ppm
RR5-SO4-ICP	11	Sulfate	Gravimetric	ppm
RR5-CL-ICP	12	Chloride	Titration	ppm
RR5-F-ICP	13	Fluoride	SIE	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	15	pH	SIE	standard
RR5-TEMP-M	16	Temperature	Manually recorded	°F
RR5-WP-D	17	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	18	Well flow	Stripchart	± gpm
RR5-TEMP-SC	19	Temperature	Stripchart	°F
RR5-I-TR	20	Iodide	SIE	ppm
RR5-PH-TS	21	pH	SIE	standard
RR5-COND-TS	22	Conductivity	Conductance cell	μmho/cm
RR5-ALK-TS	23	Alkalinity	Titration	ppm
RR5-PH-DL	24	pH	Data logger	millivolts
RR5-COND-DL	25	Conductivity	Data logger	μmho/cm
RR5-REDOX-DL	26	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	27	Temperature	Data logger	°F

TABLE 8A. SEQUENCE OF MAJOR OPERATIONS--TEST 4C

<u>Date</u>	<u>Time</u>	
	File/Real	
Oct 08	-6.0/12:00	RRGP-5 flowing (30 gpm) warm-up
	-1.5/16:30	Shut in RRG-5
	zerotime/18:00	Initiate injection down well RRG-5 water from RRG-3 (150 gpm)
	0.02/18:01	Tracer pump on
	1.5/19:30	Tracer pump off
	2.33/20:20	Completed injection downwell; shut in RRG-5
Oct 09	14.33/08:20	Initiate backflow from RRG-5 to lined pond (150 gpm)
	23.0/17:00	Completed backflow--decreased to 16 gpm diverted to RRG-7 pond
Oct 10	42.0/12:00	RRG-5 flow to RRG-7 pond (16 gpm)

Objective:

Determine whether a natural hydrological flow system was removing injected solutions from the immediate vicinity of the injection well.

TABLE 9. TEST 4D

File Name: RR4D821013

Date: 10-13-82

Start Time: Real--00:00; File Start Time: -9.05

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	μ mho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	$^{\circ}$ F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	19	pH	SIE	standard
RR5-TEMP-M	20	Temperature	Manually recorded	$^{\circ}$ F
RR5-TEMP-SC	21	Temperature	Stripchart	$^{\circ}$ F
RR5-BR-TR	22	Bromide	SIE	ppm
RR5-FLUOR-TR	23	Fluorescein	Fluorometer	ppm
RR5-PH-TS	24	pH	SIE	standard
RR5-COND-TS	25	Conductivity	Conductance cell	μ mho/cm
RR5-ALK-TS	26	Alkalinity	Titration	ppm
RR5-WP-D	27	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	28	Well flow	Stripcharts	\pm gpm

TABLE 9A. SEQUENCE OF MAJOR OPERATIONS--TEST 4D

Date	Time	File/Real
Oct 13	-9.05/00:00	RRGP-5 flow to RRG1-7 pond (16 gpm)
	-6.62/02:26	RRGP-5 shut in
	zerotime/09:03	Initiate injection down well RRG-5, water from RRG-3 (155 gpm)
	0.02/09:04	Tracer pump on
	1.52/10:34	Tracer pump off
	2.40/11:27	Completed injection
	2.45/11:30	RRGP-5 shut in
	8.47/17:31	Ran downhole conductivity and temperature logs 4600' to 4840'--10'/min down (Table 9B--Records 29 and 30)
Oct 14	15.45/00:30	4600' to 4842'--15'/min-down (Table 9B--Records 31 and 32)
	21.82/06:52	4600' to 4842'--15'/min-down (Table 9B--Records 33 and 34)
Oct 15	39.20/00:15	4600' to 4842'--15'/min-down (Table 9B--Records 35 and 36)
	49.72/10:46	4600' to 4842'--15'/min-down (Table 9B--Records 37 and 38) conductivity and temperature logs completed
	51.95/13:00	Initiate backflow from RRG-5 to lined pond (150 gpm)
	53.47/14:31	Split backflow; 40 gpm going to RRG1-7 pond and 110 gpm going to lined pond at RRG-5
	55.12/16:10	RRGP-5 backflow diverted to RRG1-7 pond (150 gpm)
Oct 16	72.53/09:35	Collected last chemistry samples and terminated test. Backflow continues to clean out well (150 gpm).

Objective:

Determine whether a natural hydrological flow system was removing injected solution from the immediate vicinity of the injection well.

TABLE 9B. DOWNHOLE LOGS VERSUS DEPTH--TEST 4D
File RR4D821013

<u>Record Name</u>	<u>#</u>	<u>Time</u>	<u>Data</u>	<u>Depth Logged</u>	<u>Units</u>
1013 CON DHT-10D	29	17:31	Conductivity	4600' to 4840'	μmho/cm
1013 TEM DHT-10D	30	17:31	Temperature	4600' to 4840'	°F
1014 CON DHT-15D	31	00:30	Conductivity	4600' to 4842'	μmho/cm
1014 TEM DHT-15D	32	00:30	Temperature	4600' to 4842'	°F
1014 CON DHT-15D	33	06:52	Conductivity	4600' to 4842'	μmho/cm
1014 TEM DHT-15D	34	06:52	Temperature	4600' to 4842'	°F
1015 CON DHT-15D	35	00:15	Conductivity	4600' to 4842'	μmho/cm
1015 TEM DHT-15D	36	00:15	Temperature	4600' to 4842'	°F
1015 CON DHT-15D	37	10:46	Conductivity	4600' to 4840'	μmho/cm
1015 TEM DHT-15D	38	10:46	Temperature	4600' to 4840'	°F

The above logs were recorded on stripcharts, the record name has the date, logging speed and direction incorporated into it. The well was shut in during logging.

1013	CON	DHT - 10D
date		speed & direction
		ft/min D - down U - up

TABLE 10. TEST 2D

File Name: RR2D821018

Date: 10-18-82

Start Time: Real--00:00; File Start Time: -13.5

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	μ mho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	$^{\circ}$ F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-TEMP-M	18	Temperature	Manually recorded	$^{\circ}$ F
RR5-I-TR	19	Iodide	SIE	ppm
RR5-FLUOR-TR	20	Fluorescein	Fluorometer	ppm
RR5-B-TR	21	Boron	Colorimetrically	ppm
RR5-MG-TR	22	Magnesium	AA	ppm
RR5-CA-TS	23	Calcium	AA	ppm
RR5-CL-TS	24	Chloride	SIE	ppm
RR5-WP-D	25	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	26	Well flow	Stripcharts	\pm gpm
RR5-TEMP-SC	27	Temperature	Stripcharts	$^{\circ}$ F
RR5-PH-TS	28	pH	SIE	standard
RR5-COND-TS	29	Conductivity	Conductance cell	μ mho/cm
RR5-ALK-TS	30	Alkalinity	Titration	ppm
RR5-TEMP- DH4600'	39	Temperature	Stripchart	$^{\circ}$ F

TABLE 10A. SEQUENCE OF MAJOR OPERATIONS--TEST 2D

Date	Time	File/Real
Oct 18	-13.5/00:00	RRGP-5 backflow to RRG1-7 pond (150 gpm)
	-9.5/04:00	Shut in RRG-5 backflow to RRG1-7--started small warmup flow through piping system to lined pond at RRG-5
	-2.75/10:45	RRGP-5 shut in
	zerotime/13:30	Initiate injection down well RRG-5, water from RRG-3 (155 gpm)
	0.02/13:31	Tracer pump on--pump off
	0.08/13:35	Tracer pump on
	0.27/13:46	Tracer pump off
	3.60/16:06	Problems with automatic valve 5AV6-5 valve keeps searching causing the injection flow to vary--placed 5AV6-5 valve in manual mode--still having problems with 5AV6-5 valve--flow is varying 10 to 15 gpm
Oct 19	24.08/13:35	Tracer pump on
	24.28/13:47	Tracer pump off
Oct 20	48.08/13:35	Tracer pump on
	48.25/13:45	Tracer pump off
	53.0/18:30	Ran spinner logs on RRG-5: 4600' to 4820'--20 ft/min-down (Table 10B--Record 31)
	53.18/18:41	4820' to 4600'--20 ft/min-up (Table 10B--Record 32) spinner logs completed
Oct 22	92.5/10:00	Tracer pump on
	98.27/15:46	Tracer pump off
	98.33/15:50	Completed injection down well RRG-5
	98.42/15:55	Backflow started from RRG-5 to lined pond (145 gpm)
Oct 25	196.0/17:30	Ran temperature logs on RRG-5: 4600' to 4840'--15 ft/min-down (Table 10B--Record 35)
	196.27/17:46	4840' to 4600'--15 ft/min-up (Table 10B--Record 36) temperature logs completed

TABLE 10A. (continued)

<u>Date</u>	<u>Time</u>	
		File/Real
Oct 29	260.5/10:30	Ran spinner logs on RRGP-5: 4600' to 4820'--20 ft/min-down (Table 10B--Record 33)
	260.58/10:41	4820' to 4600'--20 ft/min-up (Table 10B--Record 34)
	266.5/16:00	Ran XY caliper log on RRGP-5: 4700' to 0'--Logging speed (not indicated) up (Table 10B--Records 37 and 38)
Nov 01	334.5/12:00	Shut in backflow from RRGP-5
Objectives:		
Explore a larger volume of the reservoir.		
Determine the response of the reservoir to multiple injection of tracer slugs.		
Cleanup reservoir in preparation for Test 5.		

TABLE 10B. DOWNHOLE LOGS VERSUS DEPTH--TEST 2D
File RR2D821018

<u>Record Name</u>	<u>#</u>	<u>Time</u>	<u>Data</u>	<u>Depth Logged</u>	<u>Units</u>
1020 SPF DHT-20D	31	18:30	Spinner	4600' to 4820'	%
1020 SPF DHT-20U	32	18:41	Spinner	4820' to 4600'	%
1029 SPF DHT-20D	33	10:30	Spinner	4600' to 4820'	%
1029 SPF DHT-10U	34	10:41	Spinner	4820' to 4600'	%
1025 TEM DHT-15D	35	17:30	Temperature	4600' to 4840'	°F
1025 TEM DHT-15U	36	17:46	Temperature	4840' to 4600'	°F
1029 XCAL DHT-U	37	16:00	Caliper	4700' to 0'	inches-diameter
1029 YCAL DHT-U	38	16:00	Caliper	4700' to 0'	inches-diameter

The above logs were recorded by stripchart, the record name has the date and logging speed and direction incorporated into it.

1020 SPF DHT - 20D

date

speed and direction

ft/min D - down
 U - up

TABLE 11. TEST 5

File Name: RR5821106

Date: 11-06-82

Start Time: Real--00:00; File Start Time: -10.08

Record Name	#	Data Sampled	Recorder or Method	Units
RR1-PH-DL	1	pH	Data logger	millivolts
RR1-REDOX-DL	2	Oxidation-reduction	Data logger	millivolts
RR1-COND-DL	3	Conductivity	Data logger	$\mu\text{mho/cm}$
RR1-TEMP-DL	4	Temperature	Data logger	$^{\circ}\text{F}$
RR1-NA-ICP	5	Sodium	ICP	ppm
RR1-K-ICP	6	Potassium	ICP	ppm
RR1-CA-ICP	7	Calcium	ICP	ppm
RR1-MG-ICP	8	Magnesium	ICP	ppm
RR1-FE-ICP	9	Iron	ICP	ppm
RR1-SIO2-ICP	10	Silica	ICP	ppm
RR1-SR-ICP	11	Strontium	ICP	ppm
RR1-LI-ICP	12	Lithium	ICP	ppm
RR1-B-ICP	13	Boron	ICP	ppm
RR1-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR1-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR1-CL-ICP	16	Chloride	Titration	ppm
RR1-F-ICP	17	Fluoride	SIE	ppm
RR1-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR1-PH-ICP	19	pH	SIE	standard
RR1-TEMP-M	20	Temperature	Manually recorded	$^{\circ}\text{F}$
RR1-I-TR	21	Iodide	SIE	ppm
RR1-MG-TS	22	Magnesium	AA	ppm
RR1-CA-TS	23	Calcium	AA	ppm
RR1-PH-TS	24	pH	SIE	standard
RR1-COND-TS	25	Conductivity	Conductance cell	$\mu\text{mho/cm}$
RR1-ALK-TS	26	Alkalinity	Titration	ppm
RR5-PH-DL	27	pH	Data logger	millivolts
RR5-COND-DL	28	Conductivity	Data logger	$\mu\text{mho/cm}$
RR5-REDOX-DL	29	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	30	Temperature	Data logger	$^{\circ}\text{F}$
RR5-NA-ICP	31	Sodium	ICP	ppm
RR5-K-ICP	32	Potassium	ICP	ppm
RR5-CA-ICP	33	Calcium	ICP	ppm
RR5-MG-ICP	34	Magnesium	ICP	ppm
RR5-FE-ICP	35	Iron	ICP	ppm
RR5-SIO2-ICP	36	Silica	ICP	ppm
RR5-SR-ICP	37	Strontium	ICP	ppm
RR5-LI-ICP	38	Lithium	ICP	ppm
RR5-B-ICP	39	Boron	ICP	ppm
RR5-HCO3-ICP	40	Bicarbonate	Titration	ppm

TABLE 11. (continued)

Record Name	#	Data Sampled	Recorder or Method	Units
RR5-S04-ICP	41	Sulfate	Gravimetric	ppm
RR5-CL-ICP	42	Chloride	Titration	ppm
RR5-F-ICP	43	Fluoride	SIE	ppm
RR5-TDS-ICP	44	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	45	pH	SIE	standard
RR5-TEMP-M	46	Temperature	Manually recorded	°F
RR5-WP-D	47	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	48	Well flow	Stripchart	±gpm
RR5-I-TR	49	Iodide	SIE	ppm
RR5-FLUOR-TR	50	Fluorescein	Fluorometer	ppm
RR5-BR-TR	51	Bromide	SIE	ppm
RR5-I-TR	52	Iodide	SIE	ppm
RR5-FLUOR-TR	53	Fluorescein	Fluorometer	ppm
RR5-RHODA-TR	54	Rhodamine-B	Spectrophotometer	ppm
RR5-CL-ICP	55	Chloride	SIE	ppm
RR1-WQ-SC	56	Well flow	Stripchart	±gpm
RR1-TEMP-SC	57	Temperature	Stripchart	°F

TABLE 11A. SEQUENCE OF MAJOR OPERATIONS--TEST 5
 File Name: RR5821106

Date	Time	RRGP-5 and RRGE-1
	File/Real	
Nov 06	-10.08/00:00	RRGP-5 shut in
	-0.32/09:46	RRGE-1 backflowing to RRGE-1 pond (300 gpm)
	zerotime/10:05	Initiate injection down well RRGP-5, water from RRGE-3 (155 gpm)
	0.10/10:11	Tracer pump on
	0.20/10:17	Tracer pump off
Nov 07	13.92/00:00	Noticed pH on data logger at RRGE-1 not working properly
	20.92/07:00	RRGP-5 conductivity recording high offscale could be instrumentation problems
Nov 08	52.75/14:50	RRGE-1 shut in due to well logging problems--packer flapper valve partially closed
Nov 09	71.75/09:50	Injecting down well RRGP-1 in attempt to pressurize well enough to force packer flapper valve open (250 gpm)
	72.58/10:40	Shut in to RRGE-1
	73.33/11:25	Initiate backflow from RRGE-1 to RRGE-1 pond (300 gpm)
Nov 16	244.70/14:47	Injection at RRGP-5 stopped due to power dip
	244.75/14:50	Injection back on down well RRGP-5 (155 gpm)
Nov 22	376.13/02:13	Completed injection down well RRGP-5
	376.47/02:41	RRGE-1 decreased backflow from 300 gpm to 30 gpm
Nov 26	479.92/10:00	Initiate RRGP-5 backflow to lined pond (145 gpm)
	484.75/14:50	Diverted backflow from RRGP-5 to RRGI-7 pond (145 gpm)
	485.55/15:38	Initiate backflow from RRGE-1 to RRGE-1 pond
	486.17/16:15	RRGE-1 backflow stabilized at 200 gpm

TABLE 11A. (continued)

Date	Time	RRGP-5 and RRGE-1
	File/Real	
Nov 30	581.43/15:31	RRGE-1 shut in
Dec 01	599.62/09:42	RRGP-5 shut in--prep for Pulse test
	600.00/10:05	Backflow from RRG-5 (75 gpm)
	600.02/10:06	RRGP-5 shut in
	600.07/10:09	Backflow from RRG-5 (75 gpm) -- Pulse Test 1
	600.38/10:28	RRGP-5 shut in
	600.57/10:39	Backflow from RRG-5 (125 gpm) -- Pulse Test 2
	600.83/10:55	RRGP-5 shut in
	600.98/11:04	Backflow from RRG-5 (222 gpm) decreased to 162 gpm
	601.00/11:05	Increased to 175 gpm
	601.02/11:06	RRGP-5 shut in
	601.07/11:09	Backflow from RRG-5 (250 gpm) decreased to 170
	601.09/11:10	RRGP-5 shut in
	601.15/11:14	Backflow from RRG-5 (170 gpm) -- Pulse Test 3
	601.53/11:37	RRGP-5 shut in
	601.70/11:47	Backflow from RRG-5 (225 gpm) -- Pulse Test 4
	601.98/12:04	RRGP-5 shut in
	603.95/14:02	Backflow from RRG-5 (276 gpm) -- Pulse Test 5
	604.50/14:35	RRGP-5 shut in
	604.73/14:49	Backflow from RRG-5 (325 gpm) -- Pulse Test 6
	604.77/14:51	RRGP-5 shut in

TABLE 11A. (continued)

Date	Time	RRGP-5 and RRGE-1
	File/Real	
Dec 01	604.88/14:58	Backflow from RRG-5 (300 gpm) -- Pulse Test 7
	604.93/15:01	RRGP-5 shut in--end of Pulse tests

Objectives:

Determine whether breakthrough from RRG-5 to RRGE-1 can be accomplished in 18 to 21 days.

Determine whether the extent of fluid flow can be traced using spontaneous potential or resistivity surveys.

Determine reservoir pressure recovery as a function of flow rate

APPENDIX A
LISTING OF DATA EXCLUDED FROM DATA BASE

APPENDIX A -- LISTING OF DATA NOT INCLUDED IN DATA BASE

Test	Data	Reason	References	
			File Name	Record
2A1	Flow	Duplication	RR2A1820909	RR5-WQ-SC
2A1	Pressure	Duplication	RR2A1820909	RR5-WP-D
2A1	Conductivity	Duplication	RR2A1820909	RR5-COND-DL
2A1	pH	Duplication	RR2A1820909	RR5-PH-DL
2A1	Oxidation-reduction	Duplication	RR2A1820909	RR5-Redox-DL
2A1	Temperature	Instrument failed	RR2A1820909	RR5-TEMP-M
2A2	Flow	Duplication	RR2A2820913	RR5-WQ-SC
2A2	Pressure	Duplication	RR2A2820913	RR5-WP-D
2A2	Conductivity	Duplication	RR2A2820913	RR5-COND-DL
2A2	pH	Duplication	RR2A2820913	RR5-PH-DL
2A2	Oxidation-reduction	Duplication	RR2A2820913	RR5-Redox-DL
2A2	Conductivity	Spurious	N/A	N/A
2A2	Temperature	Spurious	N/A	N/A
2C	Flow	Duplication	RR2C820921	RR5-WQ-SC
2C	Pressure	Duplication	RR2C820921	RR5-WP-D
2C	Conductivity	Duplication	RR2C820921	RR5-COND-DL
2C	pH	Duplication	RR2C820921	RR5-PH-DL
2C	Oxidation-reduction	Duplication	RR2C820921	RR5-Redox-DL
2C	Conductivity	Spurious	N/A	N/A
2C	Temperature	Spurious	N/A	N/A
2D	Flow	Duplication	RR2D821018	RR5-WQ-SC
2D	Pressure	Duplication	RR2D821018	RR5-WP-D
2D	Conductivity	Duplication	RR2D821018	RR5-COND-DL
2D	pH	Duplication	RR2D821018	RR5-PH-DL
2D	Oxidation-reduction	Duplication	RR2D821018	RR5-Redox-DL
2D	Conductivity	Spurious	N/A	N/A
2D	Temperature	Spurious	N/A	N/A
4A	Flow	Duplication	RR4A820928	RR5-WQ-SC
4A	Pressure	Duplication	RR4A820928	RR5-WP-D
4A	Conductivity	Duplication	RR4A820928	RR5-COND-DL
4A	pH	Duplication	RR4A820928	RR5-PH-DL
4A	Oxidation-reduction	Duplication	RR4A820928	RR5-Redox-DL
4A	Conductivity	Spurious	N/A	N/A
4A	Temperature	Spurious	N/A	N/A
4B	Flow	Duplication	RR4B821003	RR5-WQ-SC
4B	Pressure	Duplication	RR4B821003	RR5-WP-D
4B	Conductivity	Duplication	RR4B821003	RR5-COND-DL
4B	pH	Duplication	RR4B821003	RR5-PH-DL
4B	Oxidation-reduction	Duplication	RR4B821003	RR5-Redox-DL
4B	Conductivity	Spurious	N/A	N/A
4B	Temperature	Spurious	N/A	N/A

APPENDIX A -- (continued)

Test	Data	Reason	References	
			File Name	Record
4C	Flow	Duplication	RR4C821008	RR5-WQ-SC
4C	Pressure	Duplication	RR4C821008	RR5-WP-D
4C	Conductivity	Duplication	RR4C821008	RR5-COND-DL
4C	pH	Duplication	RR4C821008	RR5-PH-DL
4C	Oxidation-reduction	Duplication	RR4C821008	RR5-Redox-DL
4C	Conductivity	Spurious	N/A	N/A
4C	Temperature	Spurious	N/A	N/A
4D	Flow	Duplication	RR4D821013	RR5-WQ-SC
4D	Pressure	Duplication	RR4D821013	RR5-WP-D
4D	Conductivity	Duplication	RR4D821013	RR5-COND-DL
4D	pH	Duplication	RR4D821013	RR5-PH-DL
4D	Redox	Duplication	RR4D821013	RR5-Redox-DL
4D	Conductivity	Spurious	N/A	N/A
5	Flow	Duplication	RR5821106	RR5-WQ-SC
5	Pressure	Duplication	RR5821106	RR5-WP-D
5	Temperature	Duplication	RR5821106	RR5-TEMP-M
5	Conductivity	Duplication	RR5821106	RR5-COND-DL
5	pH	Duplication	RR5821106	RR5-PH-DL
5	Oxidation-reduction	Duplication	RR5821106	RR5-Redox-DL
5	RR1-flow	Duplication	RR5821106	RR1-WQ-SC
5	RR1-pressure	Duplication	RR5821106	RR1-WP-D
5	RR1-temperature	Duplication	RR5821106	RR1-TEMP-SC

APPENDIX B
RAFT RIVER TEST DATA

