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Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
2440 Stevens Center, Room 1200, Richland, Washington
June 30, 1994

FROM/APPROVAL: Eric D. Goller Date 8/24/94
Eric D. Goller, 100 Area Unit Manager, RL (A5-19)

APPROVAL: Phillip Stoss Date 8/24/94
Darci Teel, 100 Aggregate Area Unit Manager, WA Department of Ecology

APPROVAL: Dennis Faulk Date 8-24-94
Dennis Faulk, 100 Aggregate Area Unit Manager, EPA (B5-01)

Meeting Minutes are attached. Minutes are comprised of the following:

Attachment #1	-	Meeting Summary
Attachment #2	-	Attendance Record
Attachment #3	-	Agenda
Attachment #4	-	Action Item Status List
Attachment #5	-	June Unit Manager's Meeting 100 Area Status Package
Attachment #6	-	In Situ Redox Manipulation for Enhancement of Contaminant Destruction and Immobilization
Attachment #7	-	Results of 100-D Well Productivity Tests
Attachment #8	-	In Situ Permeable Flow Sensor
Attachment #9	-	100 NPL Agreement/Change Control Form #65
Attachment #10	-	100 NPL Agreement/Change Control Form #66
Attachment #11	-	100 NPL Agreement/Change Control Form #67
Attachment #12	-	100 NPL Agreement/Change Control Form #68

Prepared by: Kay Kimmel Date: 8/24/94
Kay Kimmel, Bob Scheck GSSC (B1-42)

Concurrence by: Bob Henckel Date: 8/24/94
Bob Henckel, BHI Coordinator (H6-02)

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Attachment #1
Meeting and Summary of Commitments and Agreements

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 30, 1994

1. **SIGNING OF THE PREVIOUS 100 AREA UNIT MANAGER'S MEETING MINUTES -** Minutes were reviewed and approved with no changes.

2. **ACTION ITEM UPDATE: (See Attachment 4 for complete status, items listed below indicate the update to Action Items made during the meeting):**

1AAMS.15	No additional information.
1AAMS.16	No additional information.
1AAMS.19	No additional information.

3. **NEW ACTION ITEMS:**

No new action items were initiated.

4. **100 AREA ACTIVITIES:**

100 Area Status

- Operable Unit Status: Attachment #5 was provided for general information on the 100 Areas Operable Units.

100 Area Treatability Studies

- 100-HR-3 Pump and Treat: Craig Swanson presented the results of the 100-D Well Productivity Testing (see Attachment #7). He indicated that extraction is designed for 25 gpm, reinjection is designed for 50 gpm, these flow rates represent a sum total of all the wells.

  Document DOE/RL-94-54 Draft A *Pilot-Scale Treatability Test Plan for the 100-HR-3 Operable Unit* was provided to the regulators. Comments were requested back by July 15. The document is based on agreements reached at an earlier date (see also Attachments #9 and #10). Comment resolution will be scheduled for the week following receipt of comments.

- 118-B-1 Burial Ground Excavation - Joan Woolard indicated that comment resolution was accomplished June 29 and NPL Agreement/Change Control Form #68 was signed (see Attachment #12).

- 100 Area Soil Washing Test Report - J. Woolard also noted that comment resolution has been accomplished on the 100 Area Soil Washing Test Report, except for Appendix B. A meeting is tentatively scheduled for the afternoon of Monday, July 18, for Appendix B discussions and revisions. (See Attachment #11 for NPL Agreement/Change Control Form #67.)

  She indicated that testing is currently underway to determine the impacts of dust control chemicals on soil washing. Solubility tests for contaminants of concern are also being conducted.

The 100-DR-1 soil washing treatability test schedule is on the agenda for the next Project Managers meeting. EPA indicated they are looking for a firm proposal on how to achieve a Record of Decision without this treatability information. It was agreed that Bechtel, RL, EPA and Ecology would meet Tuesday July 5 at 9 a.m., before the Project Managers meeting, to discuss this issue.

5. INFORMATION ITEMS:

- REDOX Manipulation: Presented by John Fruchter, In Situ Redox Manipulation technology and its current status was reviewed (see Attachment #6). Successful bench-scale tests have provided a basis for initiating a field study. Well H5-1 in the 100-H Area is the proposed site for sonic drilling. Drilling is anticipated to start July 14, however, if this window of time is not available, drilling would not occur until December. Eric Goller noted that the well can be installed in the short term with discussions concerning the technical aspects of performing this work to follow. J. Fruchter noted that no ER funds will be used for this work. Wayne Soper agreed to contact Charlie Cole and Eric Goller by July 6 with a decision from Ecology on the siting of this well. J. Fruchter noted that Lance Mamiya is the RL technical expert and that Mike Thompson will assume that role on July 1.

- IR Thermography - Roy Bauer presented an overview of infra-red thermography. He postulated that, with the great amount of water sent to the cribs and basins, the soil could, in effect, already be washed. If so, a temperature change may be noted by IR thermography. A helicopter flying approximately 650 feet above ground, loaded with infra-red instrumentation, is required to sub-surface scan the ground below. This tool could provide additional information on below surface interfaces and heterogeneities.

- In-Situ Permeable Flow Sensor - Dick Biggerstaff presented this topic (see Attachment #8). He noted that the original location of these sensors was modified since one of the wells was situated too close to pump and treat activities.

- LFI Data Quality Reassessment - Eric Goller indicated that the validated data has been reevaluated. RL has found the data valid for its intended use, however, there will be some presentations made to the regulators on July 20, with the time and location to be announced. In general, the procedures for validating data were flawed. He indicated a white paper will be written, submitted to the regulators and then sent to the public record.

- 100 B/C Pilot Project - Bob Henckel indicated that this pilot project is being developed using the SAFER process. He indicated the remedial action is relevant to the 100-BC area only, although the information acquired would be applicable across the 100 area.

- EPA Recapitulation - Dennis Faulk summarized information provided or requested by EPA at last month's unit manager meeting.

    - He indicated that EPA requested a letter from RL concerning codisposal. Eric Goller indicated the letter is currently in draft form.

- He requested confirmation that RL is performing recreational, residential and industrial sensitivity analyses for the focused feasibility studies. E. Goller indicated that sensitivity analyses will be performed for these cases. The request for greater detail on residential levels will be viewed as a recommendation as there is insufficient budget and time for this requested work scope.

- He indicated that since future land use is still uncertain, using the recreational scenario may not be realistic for the 100 Areas, and that the industrial scenario would be more realistic.
  Risk parameters of study

- He listed documents not yet finalized: 100 Area Soil Washing Bench-Scale Test Report Appendix B; 100-BC-5 and 100-BC-1 LFI/QRA are due before August 1; 100-BC-5 detailed analysis for technetium remediation technologies.

6. **NEXT MEETINGS:** The next meetings are scheduled for July 27 and 28, 1994.

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Attachment #2

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
June 30, 1994

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Richard L. Biggerstaff	WHC/ER	100 H	372-3729
Ralph C. Wilson	CH2M HILL Hanford/ERC	100 Area OUs	375-9432
Gary Freedman	Ecology	OUM	736-3026
Wayne W. Soper	Ecology	100 Area OUM	736-3049
Pamela S Innis	EPA	100 AREA UM	376-4919
William E. Lum II	USGS	EPA support	206 593 6510
Phillip Stoertz	Ecology	OUM	736-3029
Ted Wooley	Ecology	OUM	736-5012
Glenn Goldberg	DOE-RL	OU Manager	376-9552
KAY KIMMEL	MACTEC/D&M	RL SUPPORT	509-946-3692
Kevin Pollett	Dames & Moore	GSSC	946-3690
AVI TA/AR	Dames & Moore	GSSC	946-3690
BOB SCHECK	Dames + Moore	GSSC	946-4771
DENNIS FOWLER	EPA	U Man.	376-8631
Saleem Farooqui	Dames & Moore/Kiewit	GSSC	372-4023
fran Erickson	PNL	~~100-HR-3~~	376-3497
Eric Goller	DOE-RL	RL OU mgr 100-BC, -K, H, F	376-7326
RP HENCKEL	WHC	100 AREA	376-2091
GW McCellan	WHC	Redox Demo 100H	376-2260
SB Yabusaki	PNL	Redox	376-3290
MD Williams	PNL	Redox	372-3160
CR Cole	PNL	Redox	376-8451
John Fruchter	PNL	Redox	
JOAN WOOLARD	WHC	100 Area Treatability	376-2539
RON BELDEN	WHC	SW Proj Eng	372-1226

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100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
June 30, 1994

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PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Craig Swanson	WHC		
Paul Beaver	EPA	UM	376-8065

Attachment #3
Agenda

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 30, 1994

100 Area General Discussions

* 107 Basin D&D Work
* 100 Area General Status - R. Henckel
  - 100-BC Pilot-Test Project
  - RI Infra-Red Thermography - R. Bauer
  - Redox Manipulation - J. Fruchter
  - In-situ Flow Meter - D. Biggerstaff
  - LFI Reassessment - M. Schwab
* 100 Area Treatability Studies - J. Woolard

Operable Unit Status - Questions - N. Naiknimbalkar/J. Ayres/
D. Biggerstaff/A. Krug/J. Roberts

Action Item Status

Attachment #4

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 30, 1994

Action Item Status List

ITEM NO.	ACTION	STATUS
1AAMS.15	Provide response to April 2 EPA letter concerning river seeps. Action: Eric Goller (RL) 7/29/92.	Open (7/29/92). In DOE for transmittal (8/26/92). Letter is pending (03/31/94).
1AAMS.16	DOE should transmit Revision 1 of M-30-01.	Open (7/29/92). In DOE for transmittal (8/26/92). Letter is pending (03/31/94).
1AAMS.19	Meet, before the end of the month, with RL, EPA and Ecology concerned parties to discuss ERDF waste acceptance criteria and expected volumes. Action: Bryan Foley	Open 02/23/94.

1

Attachment #5

100 AREA UNIT MANAGERS' MEETING

JUNE, 1995

100 BC, 100 K, 100 D, 100 H AND 100 F

TREATABILITY TESTS

100 AREA EXCAVATION TREATABILITY TEST

The 100 Area Excavation Treatability Test Report was delayed one month. The document will be issued for regulatory review in early July.

118-B-1 BURIAL GROUND EXCAVATION TREATABILITY TEST

Regulator comments on the test plan were received Friday, June 17. A meeting will be scheduled to discuss comment resolution. The test procedures are currently under preparation.

100 AREA SOIL WASHING TREATABILITY TESTS

A milestone change form request for the 100 Area soil washing tests was submitted to the regulators and is being discussed.

Purchase ordering for pilot test equipment is underway. Equipment is expected to begin arriving at Hanford the last week of June and continue to arrive through the end of August, 1994.

Responses were prepared to regulator comments on the 100 Area Soil Washing Bench-Scale Test Report and a comment resolution meeting held with the regulators. NPL Agreement Form #67 was prepared to document concurrence by EPA and Ecology to comment responses and additional modifications to Appendix B of the document.

Procedures for the 100-DR-1 pilot scale soil washing test, WHC-SD-EN-TI-255, Rev. 0, were completed and submitted to RL and the regulators for review. Comments were requested by July 11, 1994.

The 100-F soil washing report, WHC-SD-EN-TI-268, Rev. 0, was completed and submitted to the regulators for information.

100-HR-3 GROUNDWATER TREATABILITY TEST

An NPL agreement form #66 addressing additional details concerning the scope of the 100-HR-3 pump and treat test was approved. Draft A of the test plan was transmitted by RL to the regulatory agencies for review and comment.

CO-DISPOSAL TREATABILITY TEST

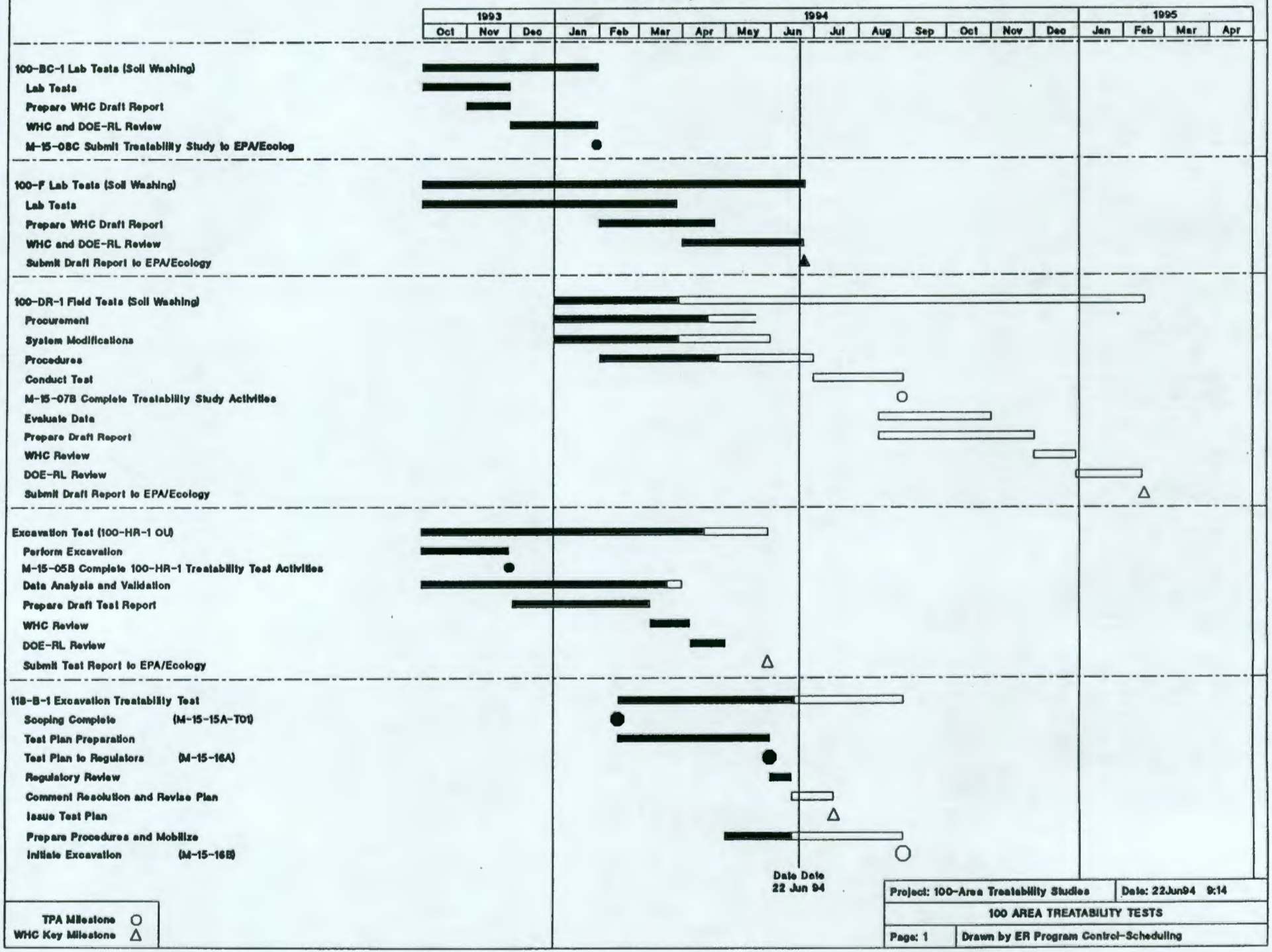
Draft A of the test plan was transmitted by RL to the regulatory agencies for review and comment.

Insitu Flowmeters

- The insitu flowmeters (SFM-1, SFM-2, SFM-3 and SFM-5) installed in proximity to the 183-H Solar Basin in the H Reactor area are functioning properly with the exception of SFM-1 (furthest inland sensor). The sensor signal shows a convection response consistent with poor formation collapse around the sensor. This sensor will continue to be monitored for a limited time to see if the

formation will collapse around the probe. SFM-2 and SFM-3 are completed in the Hanford formation and are showing good three-dimensional flow field response with a downward vertical flow and good response to the river with bank recharge and discharge. SFM-5, completed in the Ringold, shows an excellent response to the river and exhibits an upward flow potential. Phone modem problems experienced earlier have been resolved, and analysis of sensor data by Sandia Laboratories is currently underway.

100-Area Treatability Tests



B AREA

100-BC-1 QRA and LFI Reports

TASK 11: 100-BC-1 QRA (WHC-SD-EN-RA-003, Rev. 0) has been reviewed by the regulators. Comment resolutions were agreed upon and are currently being incorporated into the document for release as Rev. 0.

TASK 13: 100-BC-1 LFI (DOE/RL-93-06 Rev. 0) was given to DOE on April 19 for distribution to the regulators.

100-BC-1 FFS Report

The WHC Internal Draft was received on June 20, 1994 for review.

100-BC-2 QRA and LFI Reports

TASK 11: The 100-BC-2 QRA was initiated in January, 1994 and was subsequently combined with the LFI, producing one document. It is currently in DOE review.

TASK 13: The 100-BC-2 LFI was initiated in January, 1994 and was subsequently combined with the QRA, producing one document. It is currently in DOE review.

100-BC-5 QRA and LFI Reports

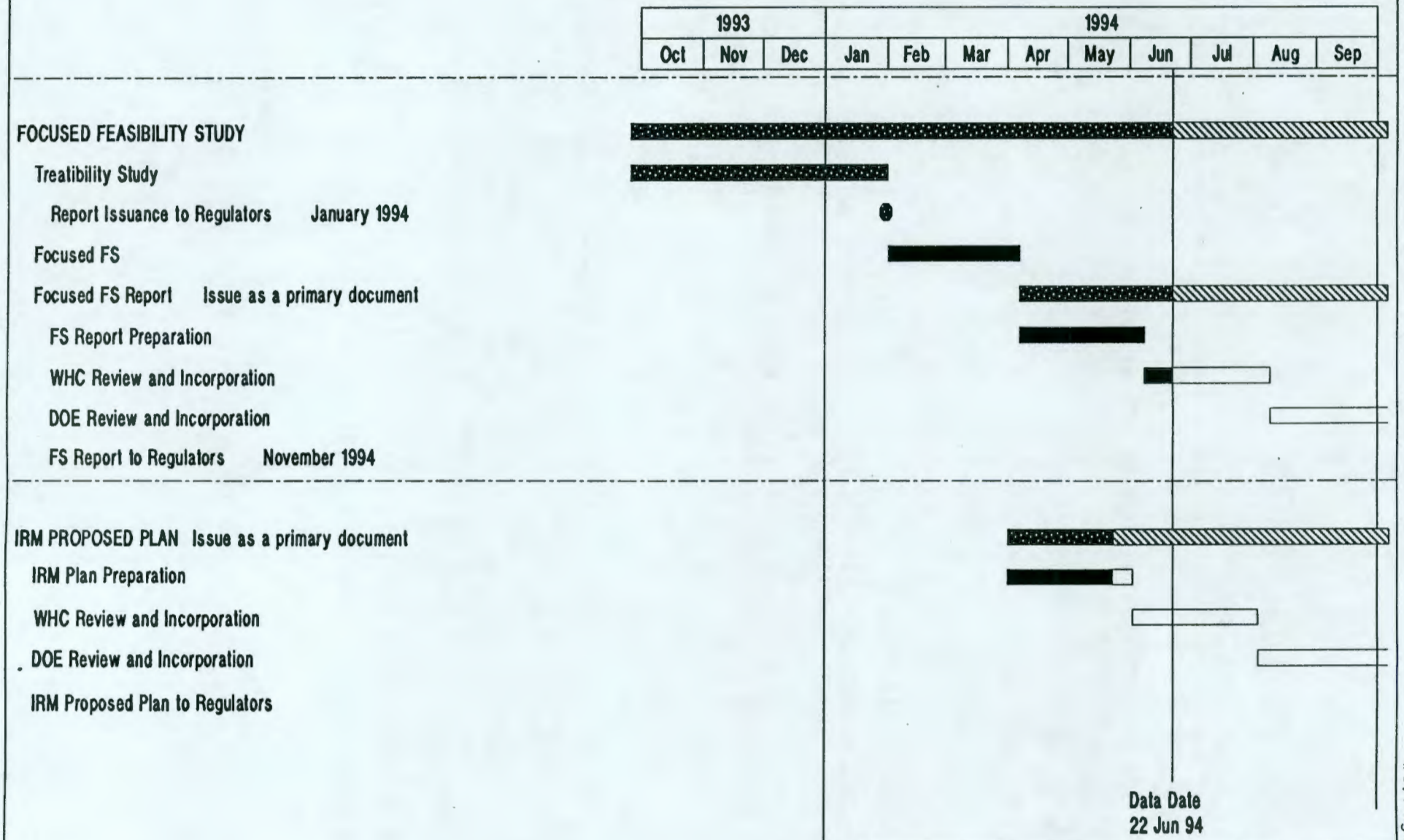
TASK 11: 100-BC-5 QRA (WHC-SD-EN-RA-006, Rev. 0) has been reviewed by the regulators. Comment resolutions were agreed upon and are currently being incorporated into the document for release as Rev. 0.

TASK 13: 100-BC-5 LFI (DOE/RL-93-37 Draft A) has been reviewed by the regulators. Comment resolutions were agreed upon and are currently being incorporated into the document for release as Rev 0.

100-BC-5 FFS Report

Task was initiated in January, 1994 and is currently on schedule.

100-BC-1 OPERABLE UNIT



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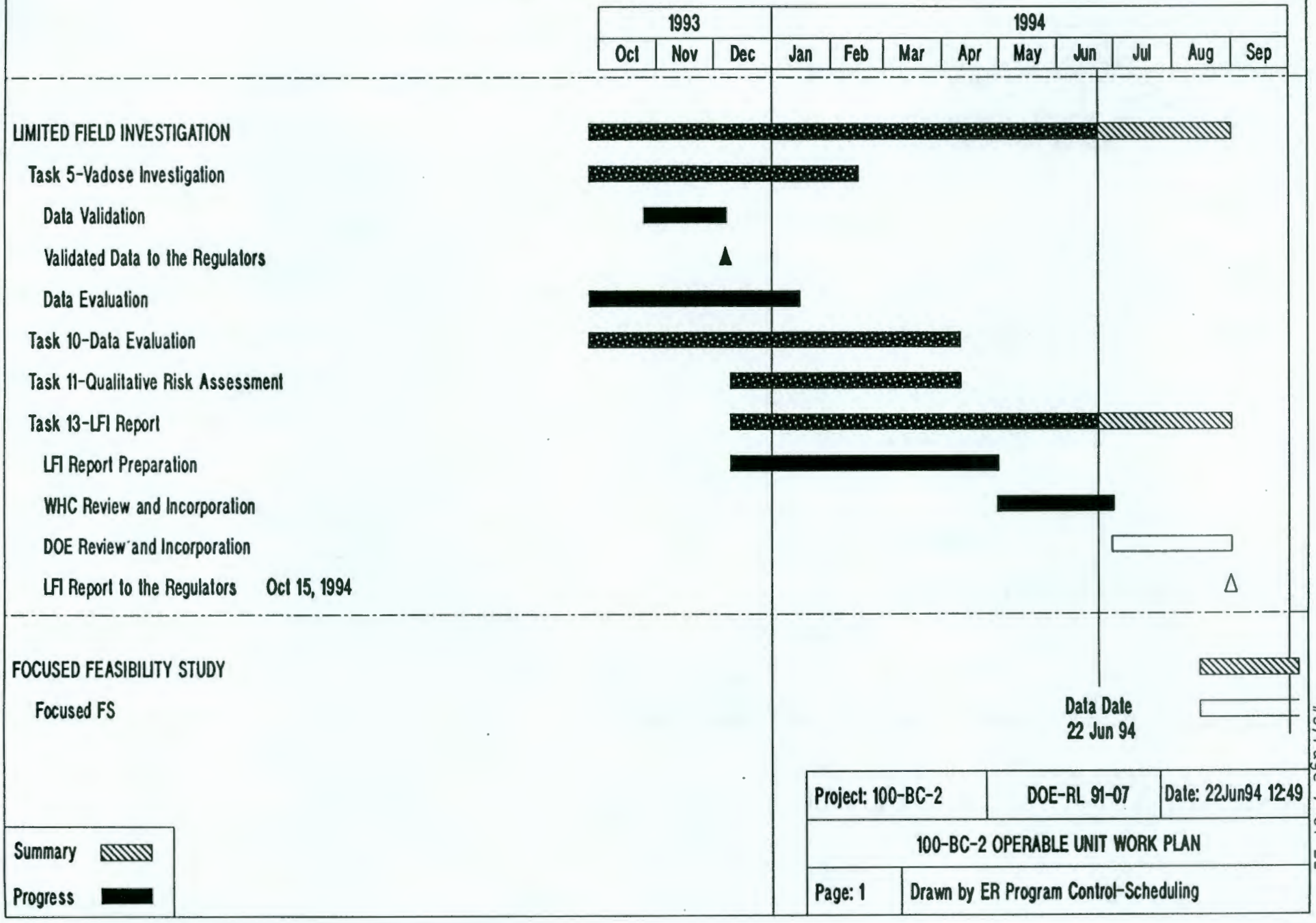
100-BC-2 OPERABLE UNIT



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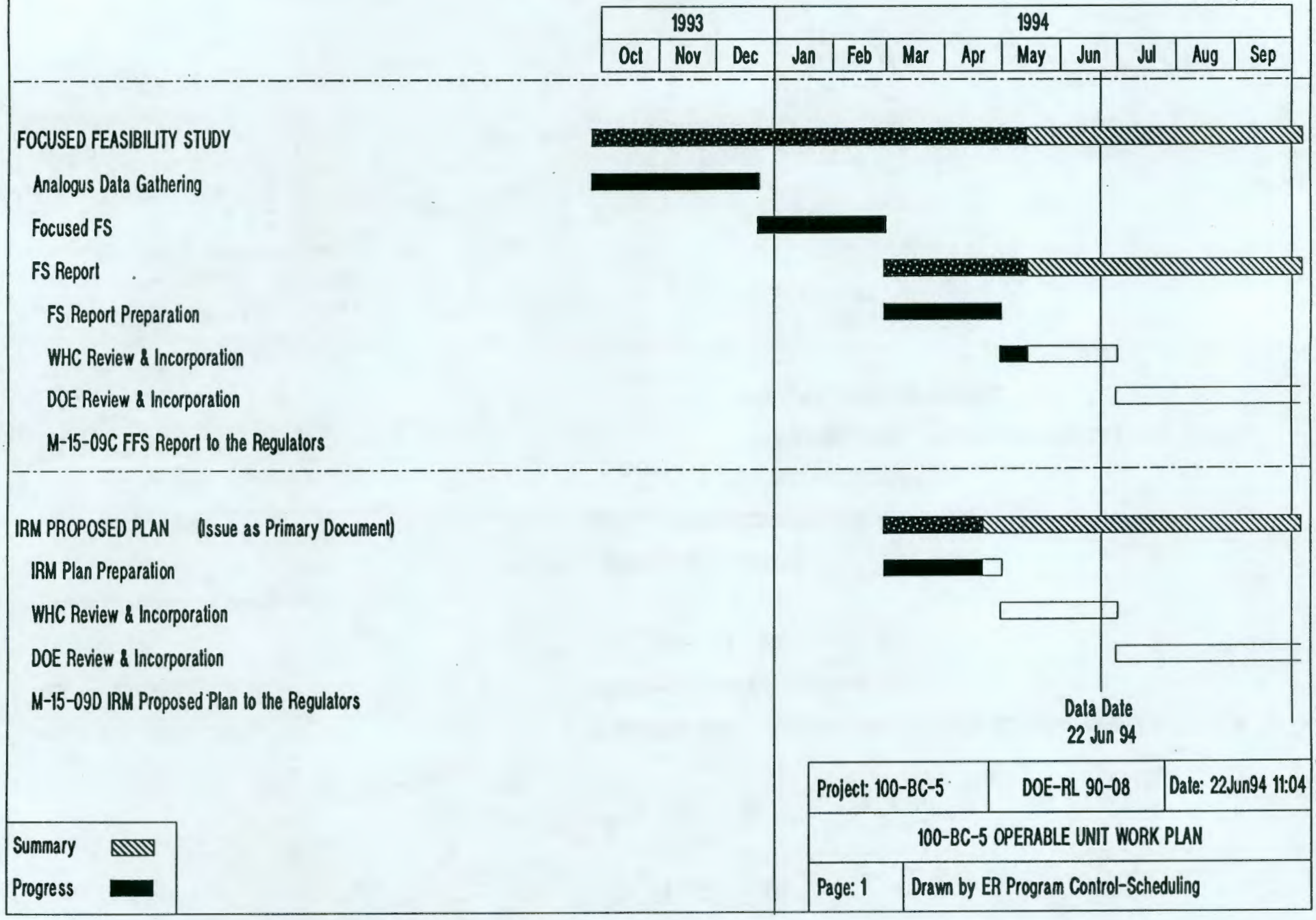
100-BC-5 OPERABLE UNIT



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100-BC-5 OPERABLE UNIT WORK PLAN		
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K AREA

100-KR-1 QRA and LFI Reports

Task 11: Responses to regulator comments on 100-KR-1 QRA (WHC-SD-EN-RA-009, Rev. 0) were submitted to DOE/RL on June 15, 1994.

Task 13:
Responses to regulator comments on 100-KR-1 LFI (DOE/RL 93-78, Draft A) were submitted to DOE/RL on June 15, 1994.

100-KR-4 QRA and LFI Reports

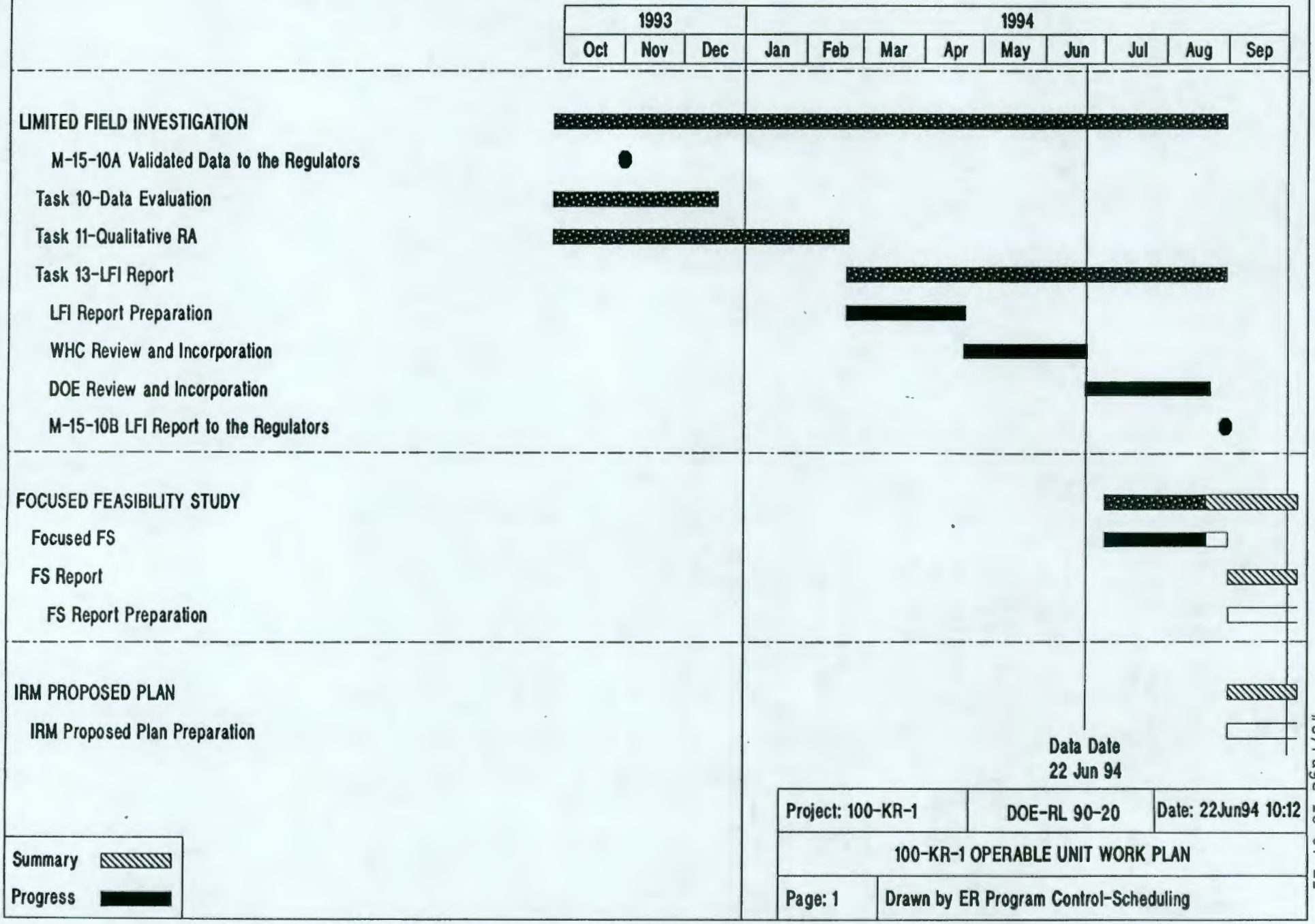
Task 11: The 100-KR-4 QRA (WHC-SD-EN-RA-010, Rev 0) was revised to incorporate regulator comments and is being prepared for release. It is expected to be released the week of June 20.

Task 13: The 100-KR-4 LFI (DOE/RL-93-79, Draft A) was revised to incorporate regulator comments and is being prepared for release. It is expected to be released the week of June 20.

Focused Feasibility Study

Work continued on the 100-KR-1 and 100-KR-4 Focused Feasibility Studies.

100-KR-1 OPERABLE UNIT



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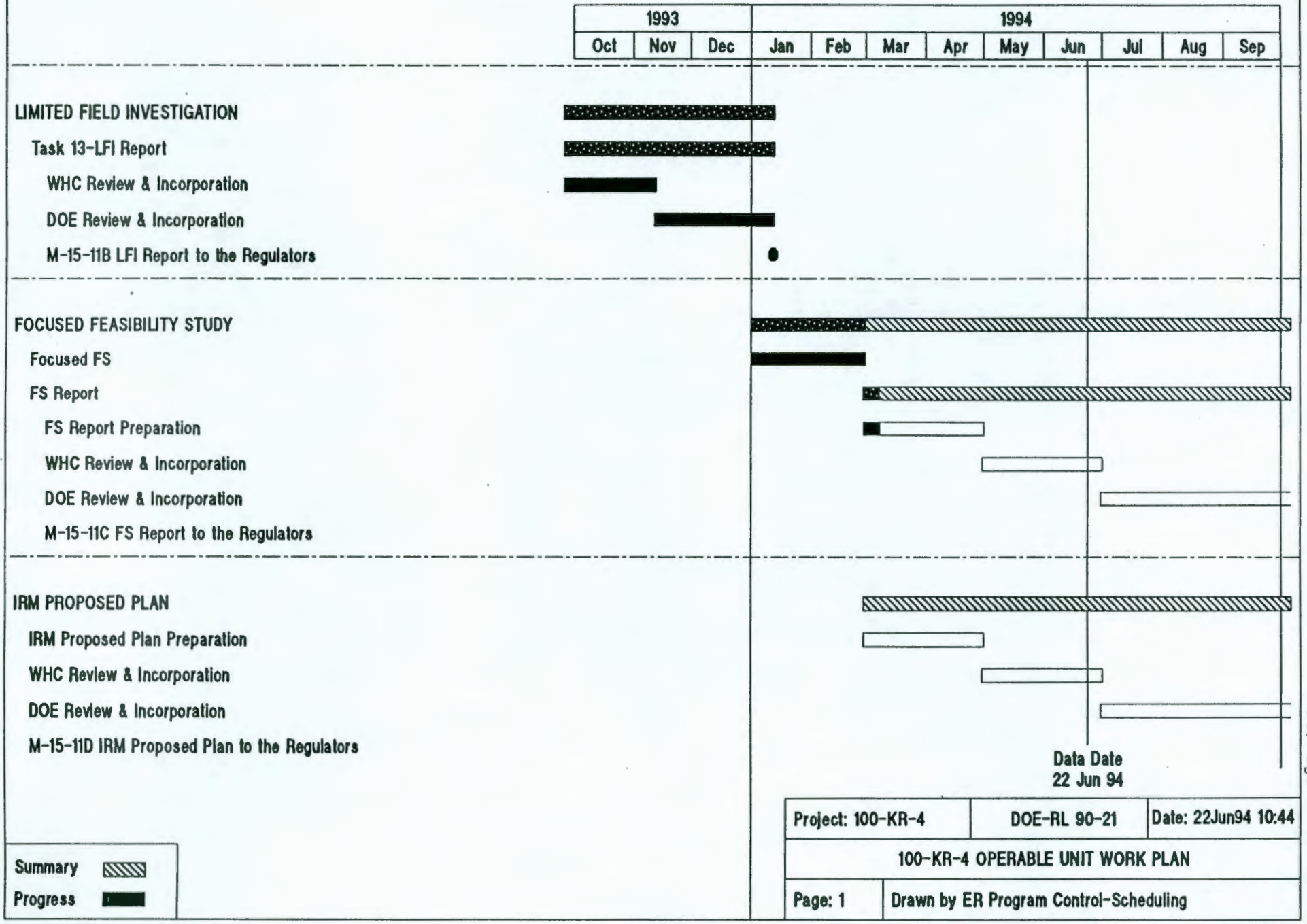
100-KR-4 OPERABLE UNIT



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D AREA

100-DR-1

100-DR-1 Focused Feasibility Study

o 100-DR-1 Focused Feasibility Study report is being prepared by IT and is on schedule for mid-June WHC review.

100-DR-2

100-DR-2 Work Plan

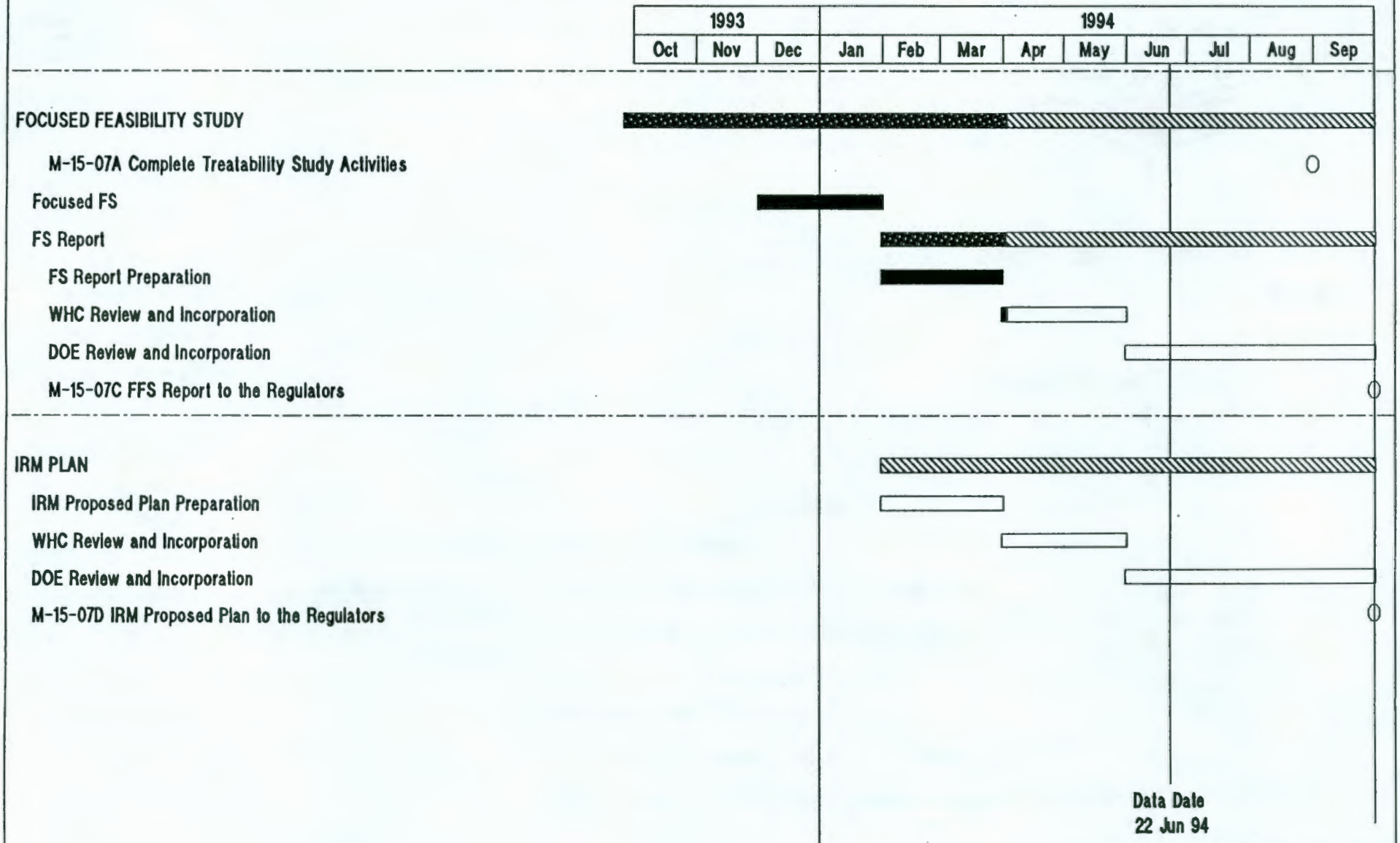
o A change control form C-93-01 was approved on April 14, 1994, by DOE-RL, Ecology and EPA. The change control combines 100-DR-3 Operable Unit into 100-DR-2 Operable Unit. The new milestone, M- 13-09, for the combined document is September 6, 1994.

The redlined copy of the changes due to addition of 100-DR-3 into 100-DR-2 are being reviewed by WHC. The document is scheduled for DOE-RL review on 6-24-94.

100-DR-2 LFI Report

o The LFI report was initiated on March 15, 1994, and is progressing on schedule. The document will be a combined LFI/QRA.

100-DR-1 OPERABLE UNIT



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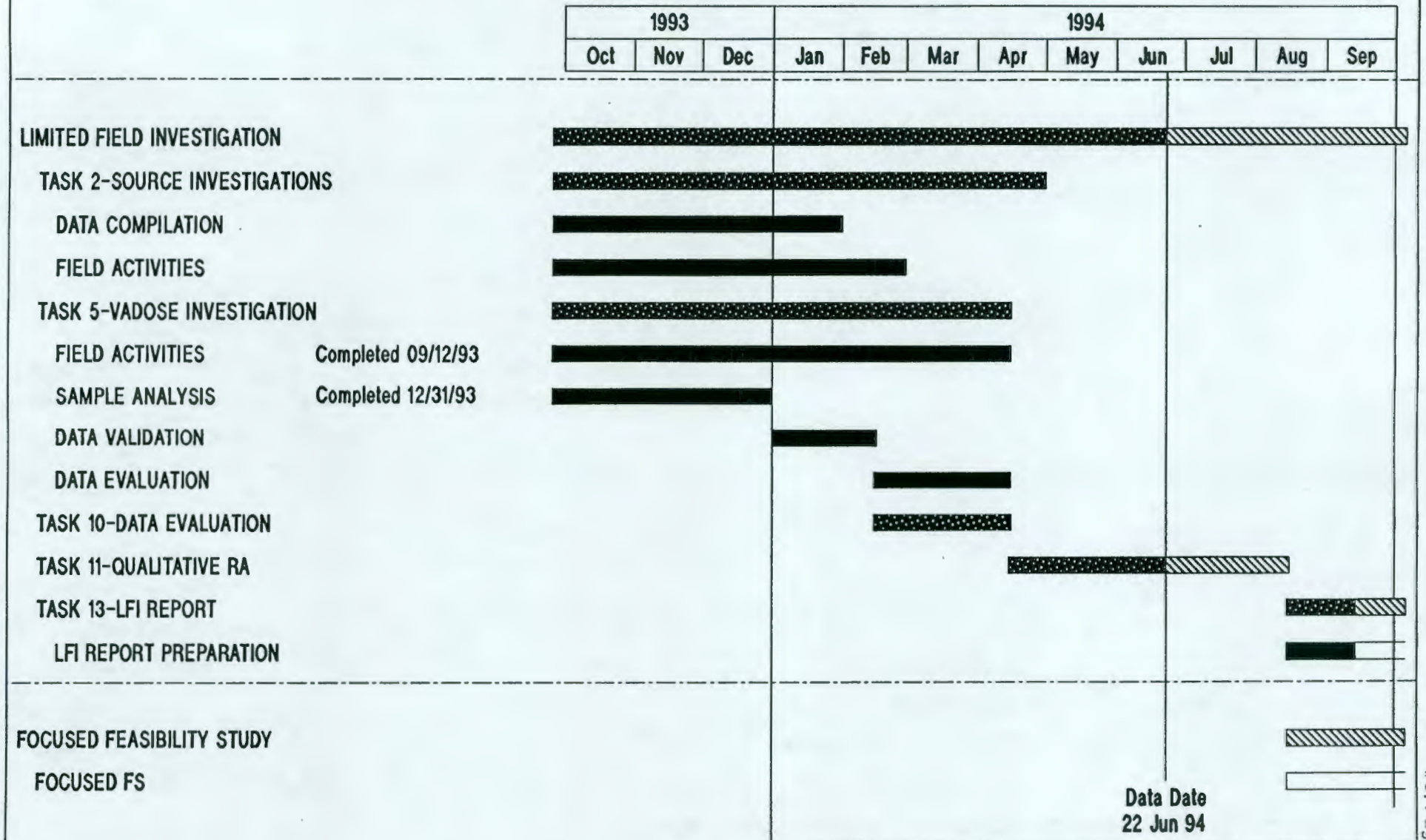

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H Area

100 HR-1

- Task 11: QRA Report- The 100-HR-1 QRA (WHC-SD-EN-RA-004, Rev. 0) document is being prepared for release.

- Task 12: LFI Report- The 100-HR-1 LFI (DOE/RL-93-51 Rev. 0) is being prepared for release.

100-HR-2

PLANNING DOCUMENT: 100-HR-2 Work Plan (DOE/RL-93-20 Draft A-1) Public review comment responses were transmitted to DOE on May 11, 1994.

100-HR-2 RADIOLOGICAL SURFACE SURVEY: The surface rad survey for 100-HR-2 was completed May 1994. A report with the survey results and methodology (WHC-SD-EN-RPT-026) is being prepared for WHC internal review in June, 1994.

TASK 11 and TASK 13: The DOE Decisional Draft of the 100-HR-2 LFI and QRA Report (DOE/RL-94-53) was delivered June 20, 1994.

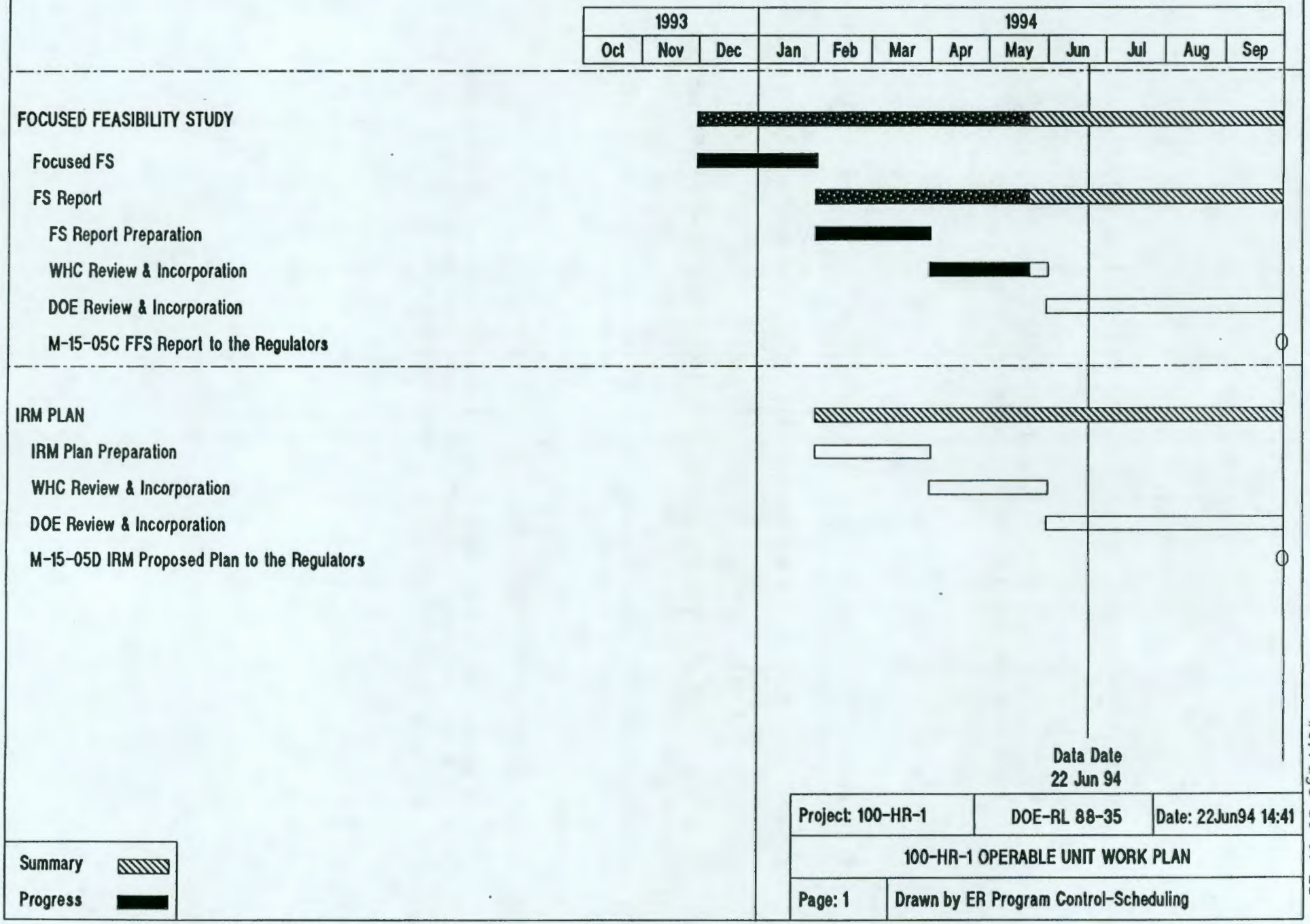
FOCUSED FEASIBILITY STUDY REPORT: The task was initiated in April 1994 and is currently on schedule with the WHC internal review coming up July 1, 1994.

100-HR-3

Task 6- GROUNDWATER INVESTIGATION

- A comment resolution meeting is planned for the week of June 20 to resolve final Regulatory comments on the Qualitative Risk Assessment and Limited Field Investigation Reports.

100-HR-1 OPERABLE UNIT



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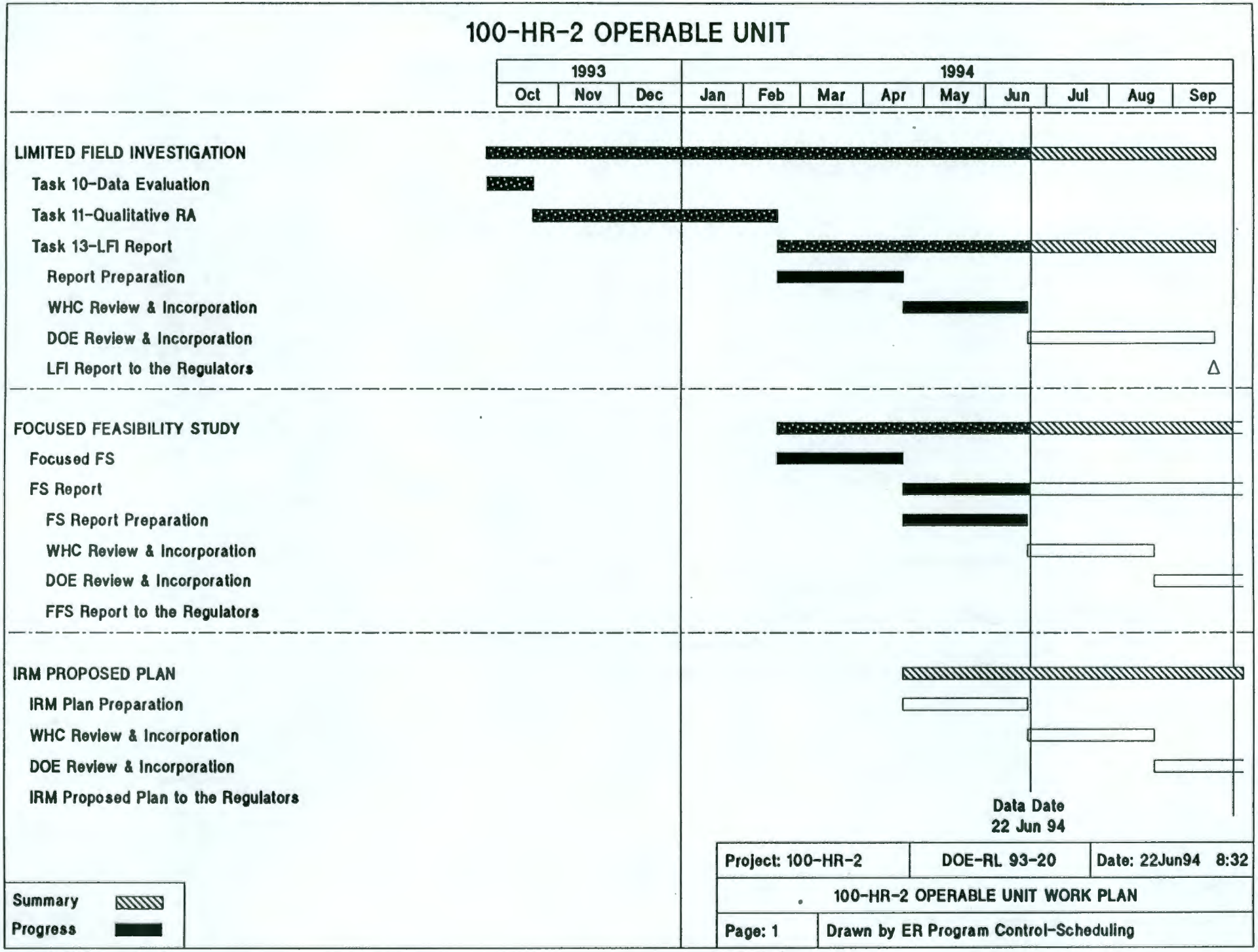
100-HR-2 OPERABLE UNIT



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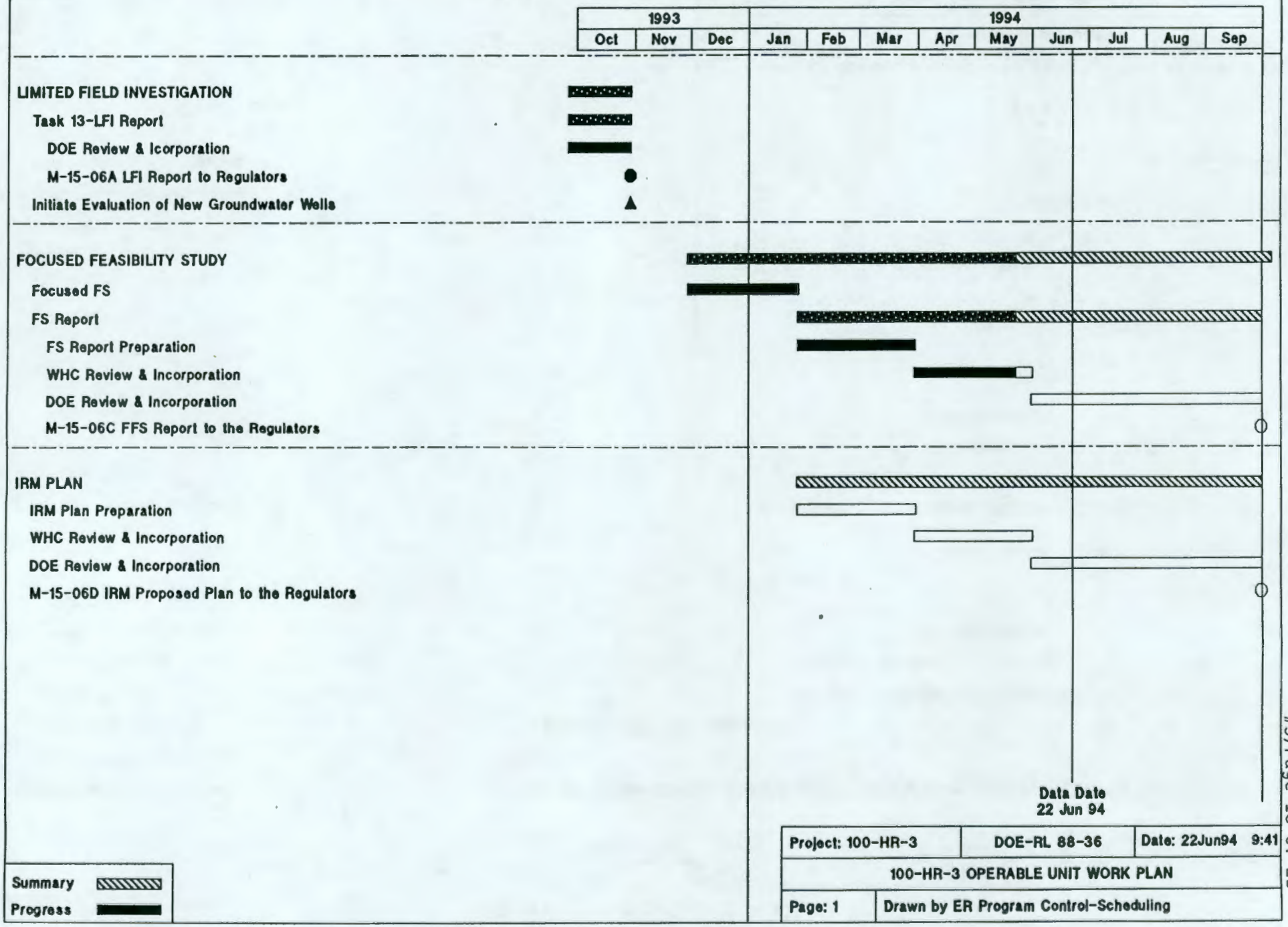
100-HR-3 OPERABLE UNIT



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F Area

100-FR-1

TASK 11: 100-FR-1 QRA (WHC-SD-EN-RA-013, Rev. 0) is in process. The report is currently out for DOE/RL review and comments are due on 30 June 1994.

TASK 13: 100-FR-1 LFI (DOE/RL-93-82, Draft A) is in process. The report is currently out for DOE/RL review and comments are due on 30 June 1994.

100-FR-3

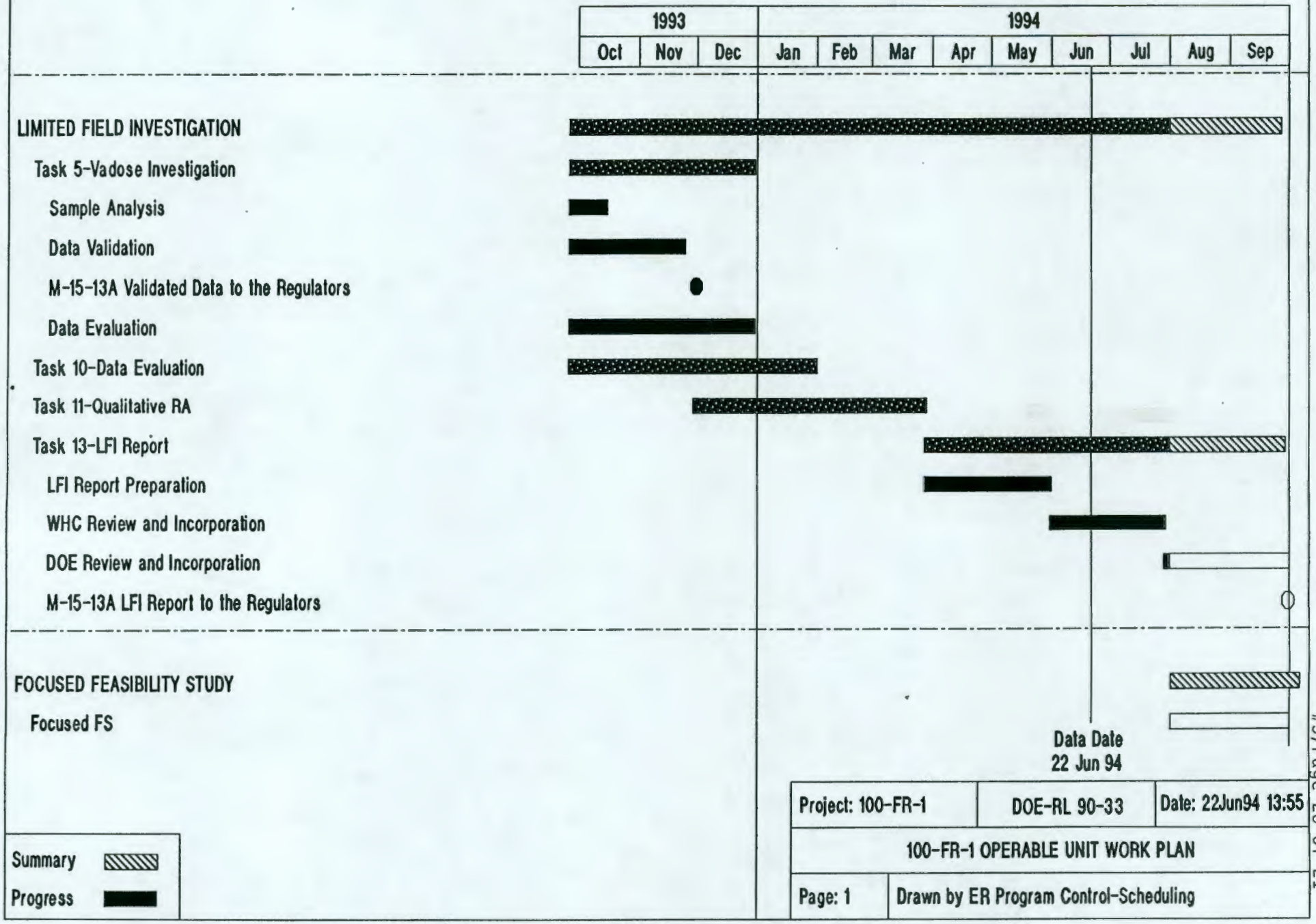
Task 11: DOE review comments on the 100-FR-3 QRA have been received and comment resolutions are being prepared.

Task 13: DOE review comments on the 100-FR-3 LFI have ben received and comment resolutions are being prepared.

Focused Feasibility Study

- The Focused Feasibility Study has been initiated and the WHC review draft is due in August 1994.

100-FR-1 OPERABLE UNIT



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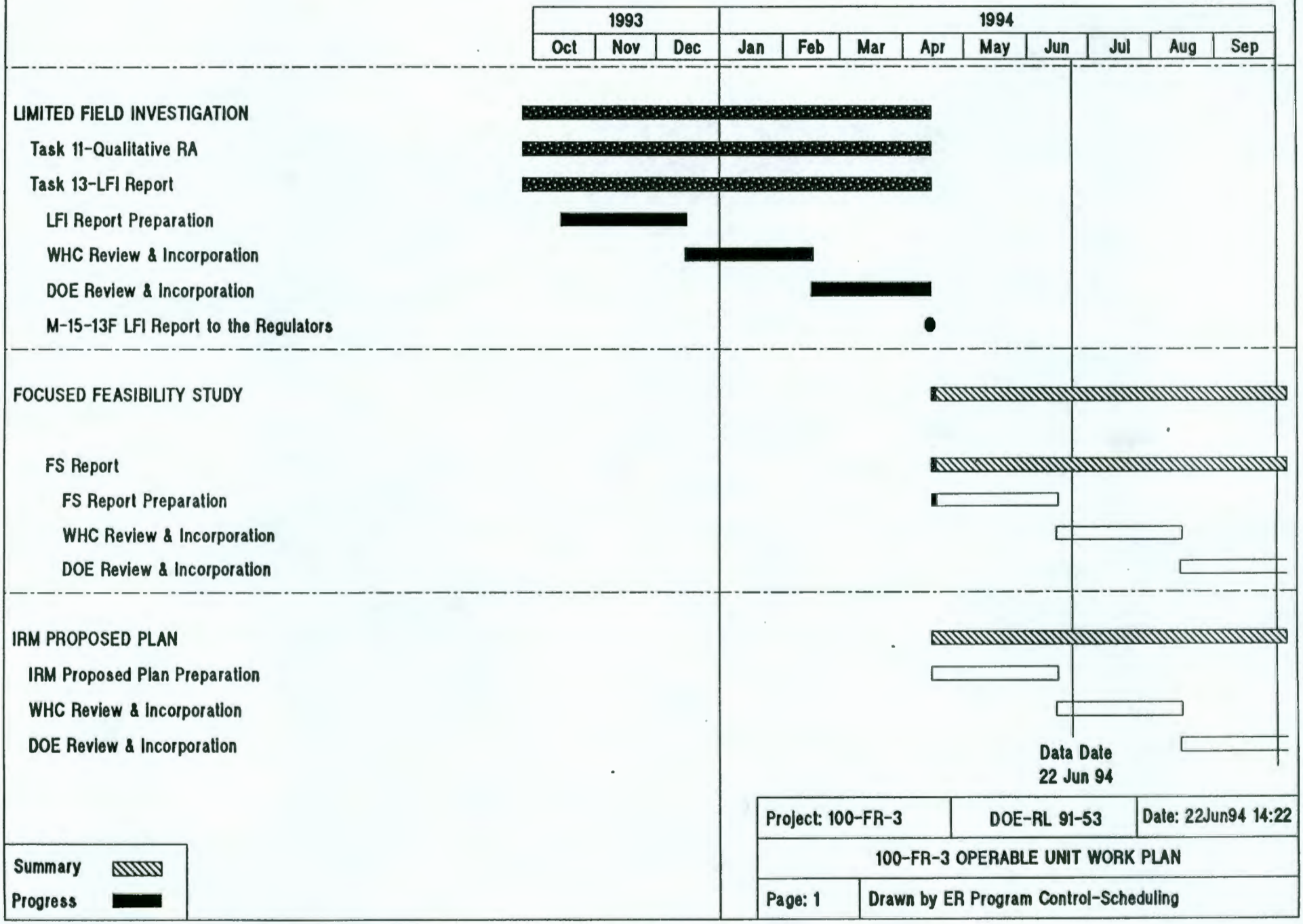

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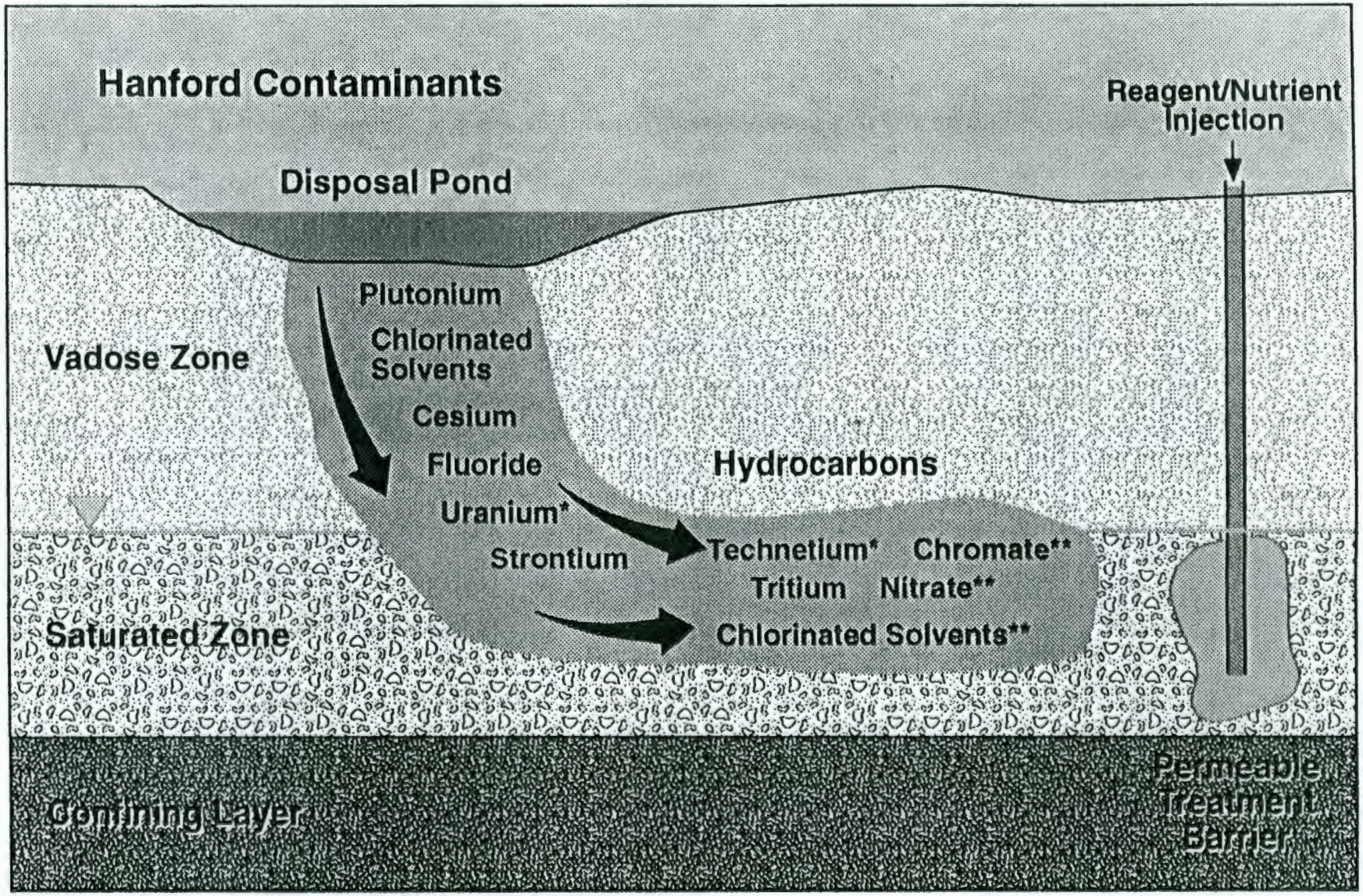
In Situ Redox Manipulation for Enhancement of Contaminant Destruction and Immobilization

J. S. Fruchter

Pacific Northwest Laboratory

Objective: Creation of an in Situ Permeable Treatment Barrier to Destroy or Immobilize Certain Groundwater Contaminants

In Situ Permeable Treatment Barrier



* Potential Candidate for Redox Treatment
** Favorable Candidate for Redox Treatment

S9303023.1V

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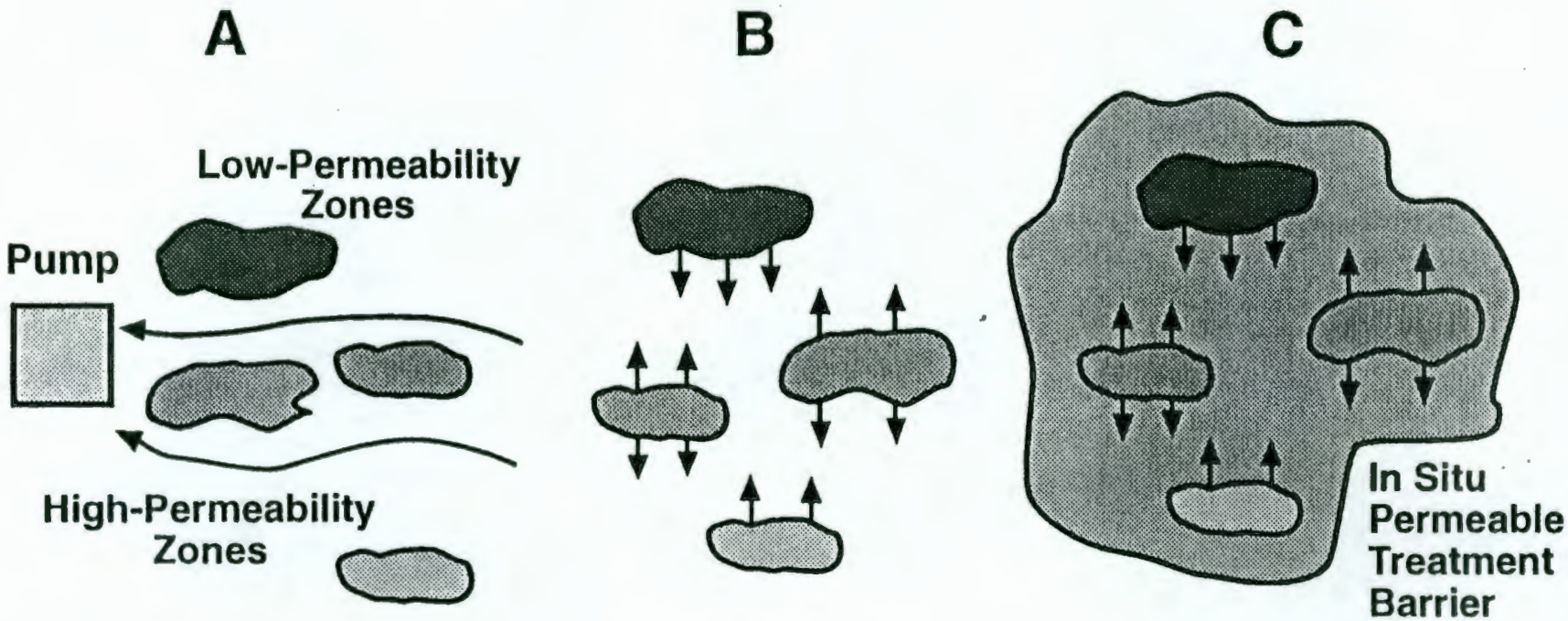
Advantages of the In Situ Permeable Treatment Barrier



Pump and treat fails because the majority of the withdrawn water comes from high-permeability zones

When the pump is turned off, contamination continues to seep out of the low-permeability zones.

An in situ permeable treatment barrier puts the treatment capacity where it is required

S9303023.2V

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95M3335.0859

Current Status

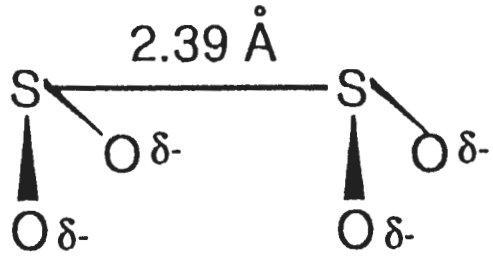
- Successful bench-scale tests
- Transitioning to field test
  - Scaleup
  - Site Selection
  - Field-test design
  - Regulatory approval

95133360.0860

DESIRABLE REDUCTANT CHARACTERISTICS

- Reduces Fe(III) in Soil Solids
- Reacts Quickly
- Decomposes in Absence of Oxidants
- Benign Reaction and Decomposition Products

DITHIONITE ION $S_2O_4^{-2}$



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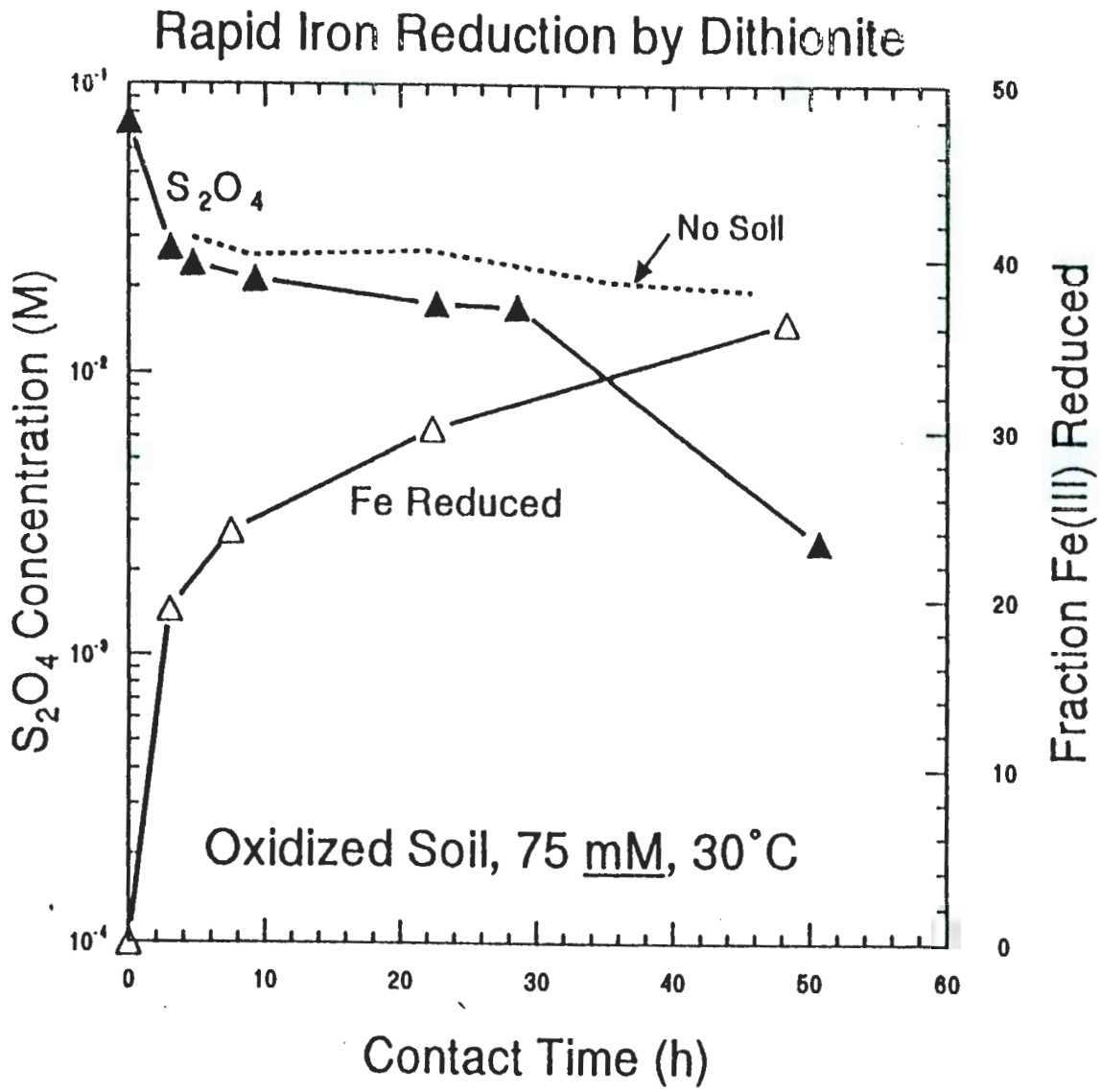
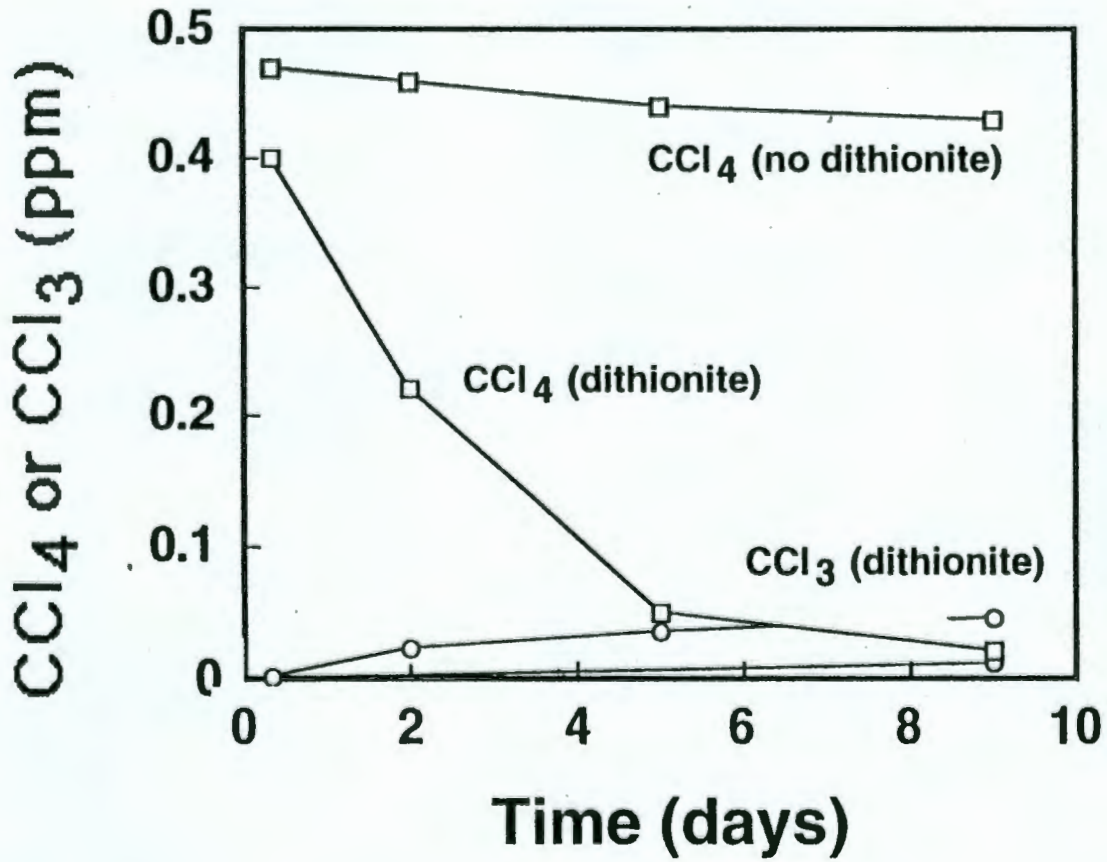


Abiotic Transformation of CCl_4 in the Presence of Hanford Subsurface Materials



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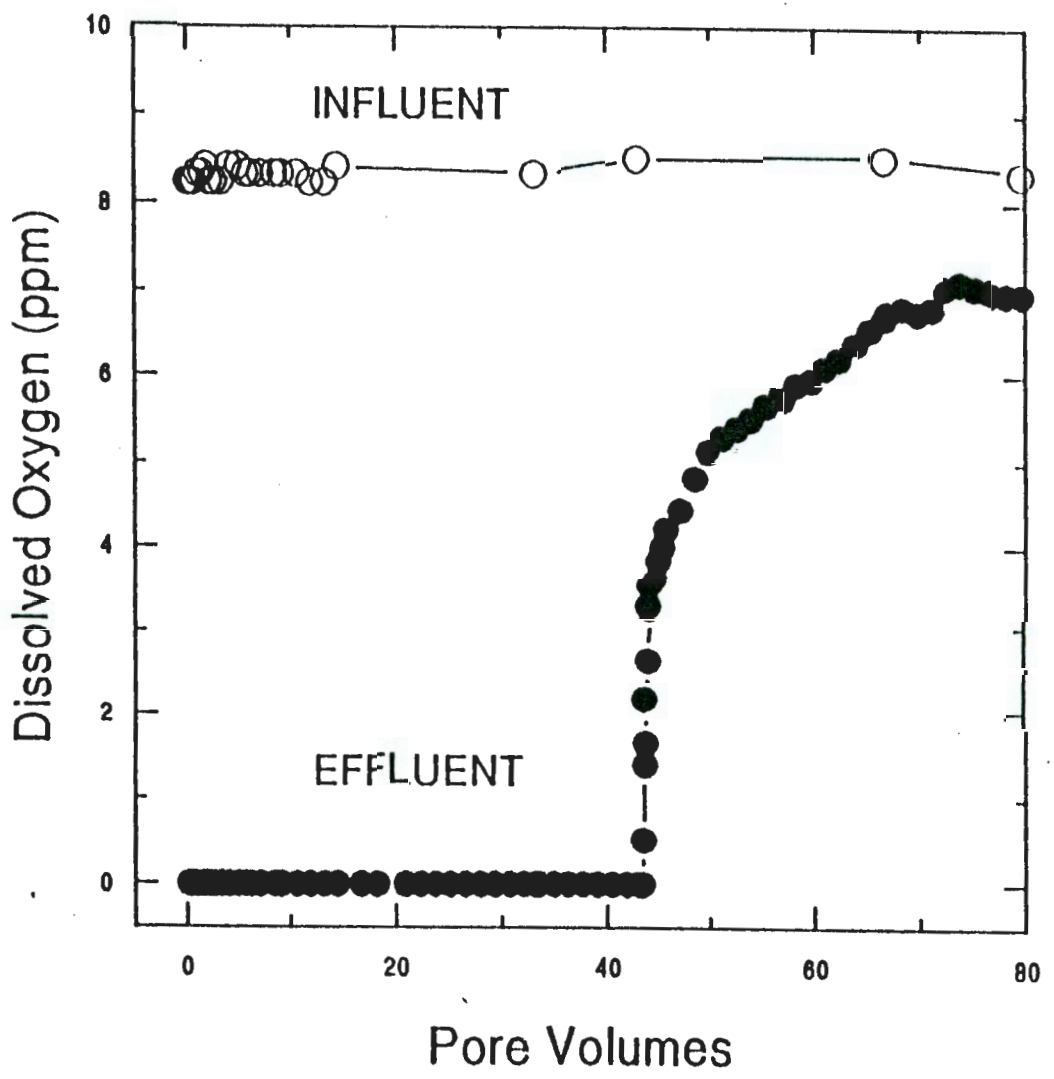
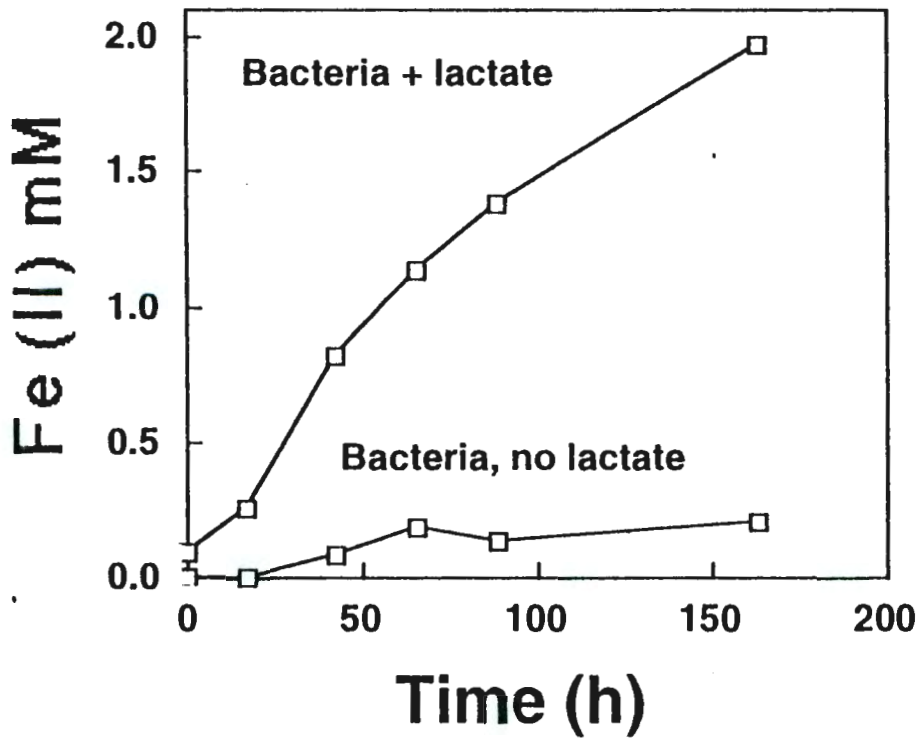
Oxygen Removal by Dithionite-Treated Soil



Reduction of Fe(III) in Hanford Subsurface Materials



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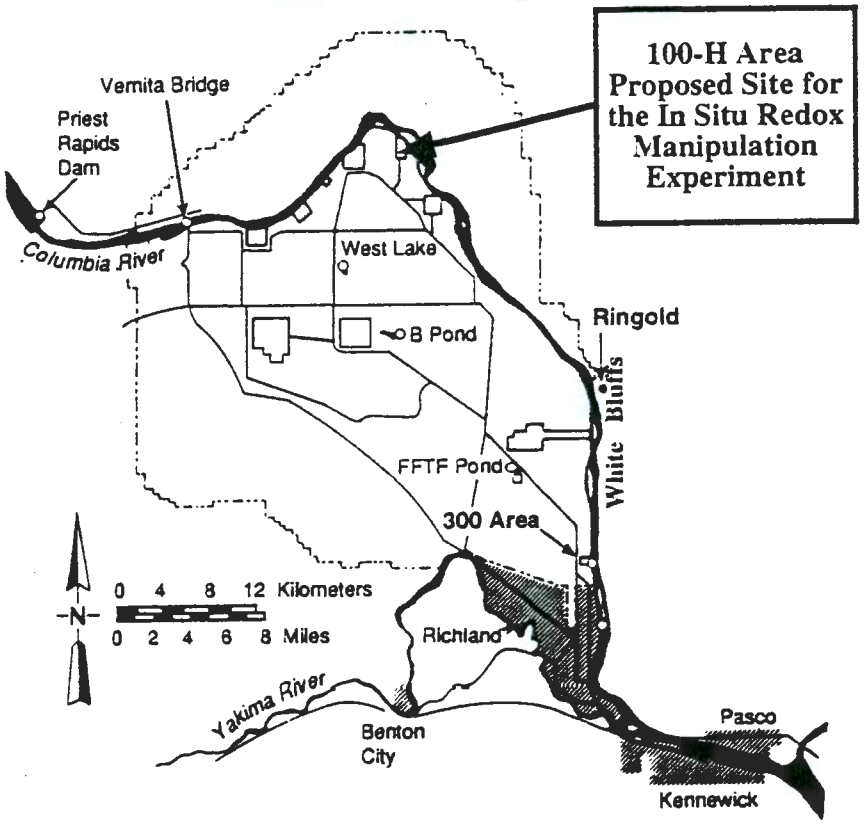
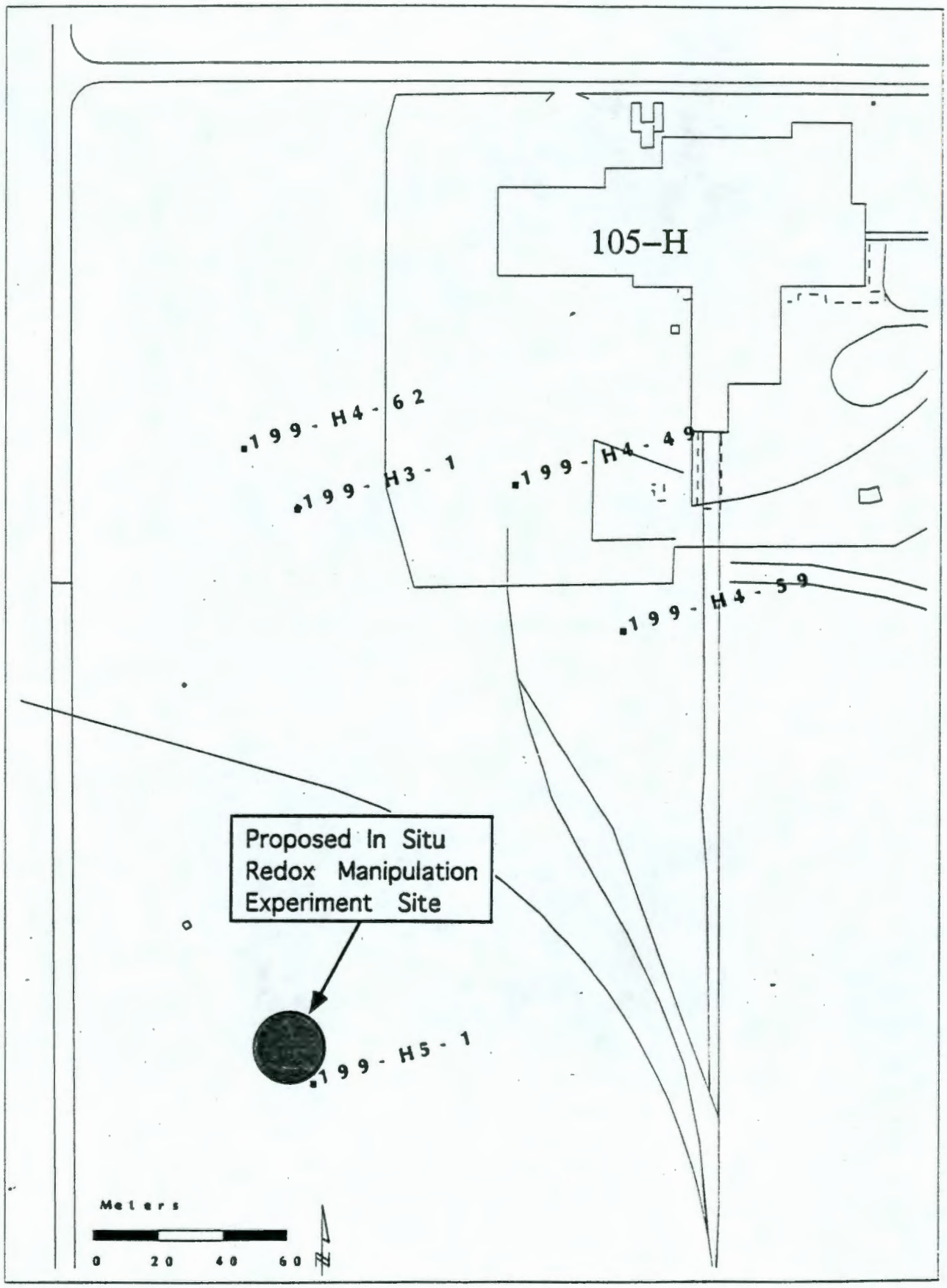
Biotic Treatment of Contaminated Subsurfaces

- Iron reducing bacteria reduce Fe(III) to reactive Fe(II) in Hanford subsurface materials
- Fe(II) chemically transforms CCl_4 and reduces soluble Cr(VI) to insoluble Cr(III)
- Iron reducing bacteria reduce soluble U(VI) to insoluble U(IV)

Hanford Site





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100-H Area Site (199-H5-1)

- 100-HR-3 Groundwater Operable Unit (RPP)
- Clay / Iron Analysis (in progress)
- Depth to Water Table = 40.6 ft
- Depth to Bottom of Aquifer = 52.0 ft
- Aquifer Thickness = 11.4 ft
- Hydraulic Gradient ~ 0.0009
- Hydraulic Conductivity = 113 ft/day
- Ave. Linear Velocity ~ 0.5 ft/day (20% porosity)
- Distance to River = 2400 ft
- Estimated Travel Time to River = 10.7 years
- Chromium Plumes at 100-H Area

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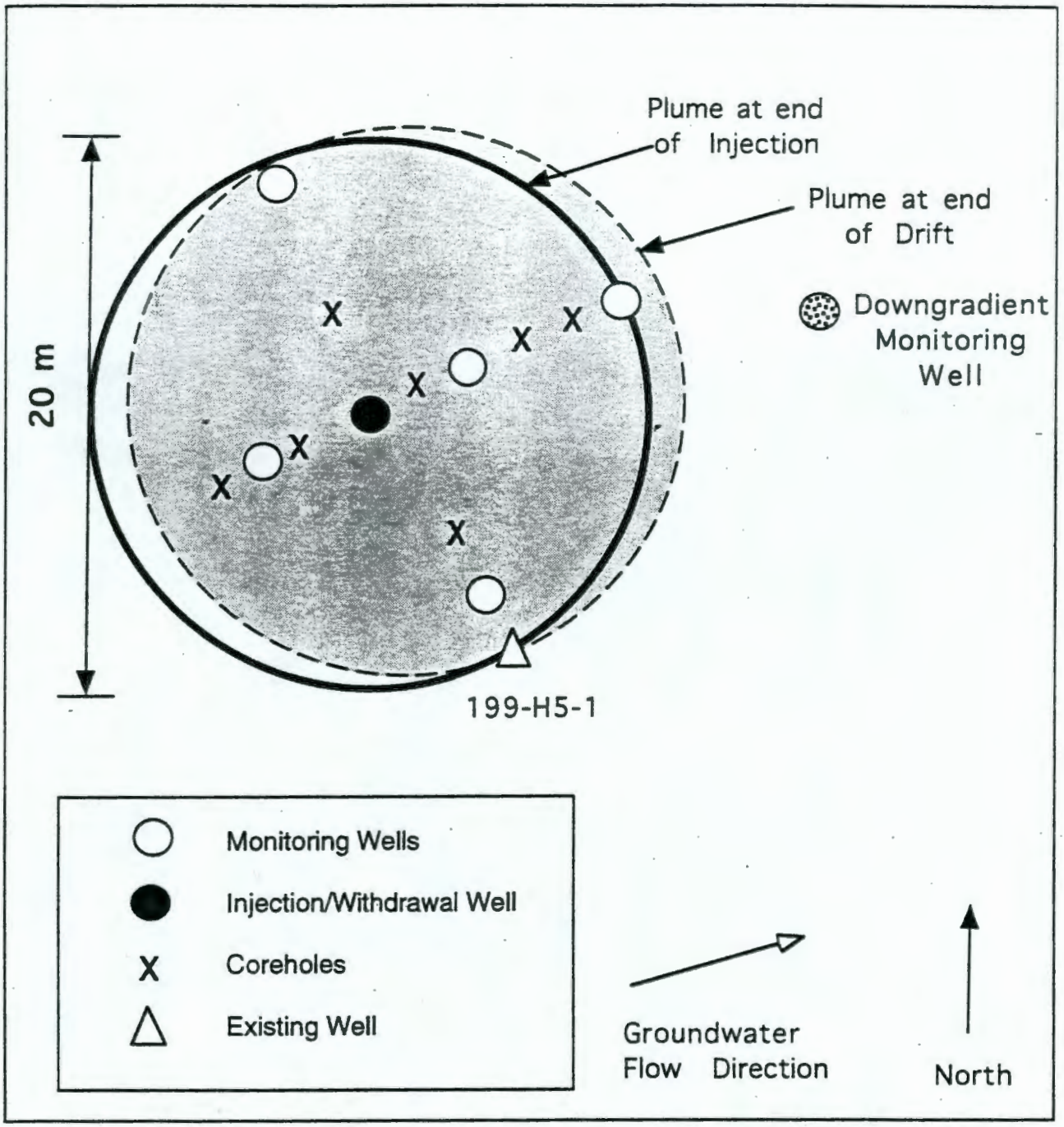
Approach

Injection Experiment

- Single-well, push-pull, reactive tracer experiment
- Reagents pumped in - reaction - unreacted reagent pumped out
- Measurement of aqueous phase reactants/products with time
- Post-reaction coring and solid phase analysis


Plume at end of Injection
Plume at end of Drift
Downgradient Monitoring Well
20 m
199-H5-1
Monitoring Wells
Injection/Withdrawal Well
Coreholes
Existing Well
Groundwater Flow Direction
North

Design Optimization

- Injection Stage
  - screened interval
  - rates
  - durations
  - concentrations
- Drift Stage
  - duration
- Withdrawal Stage
  - rate
  - duration

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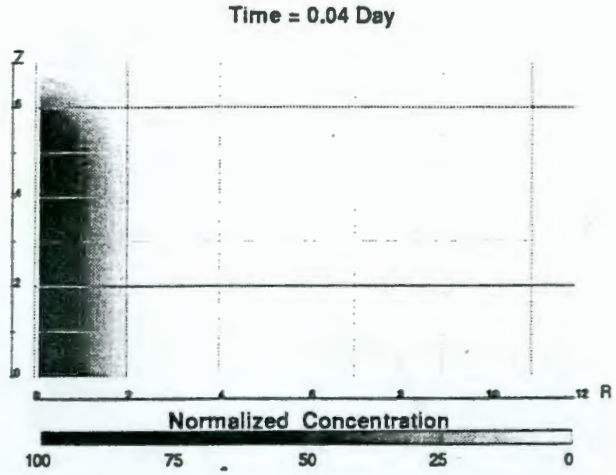
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R
Normalized Concentration
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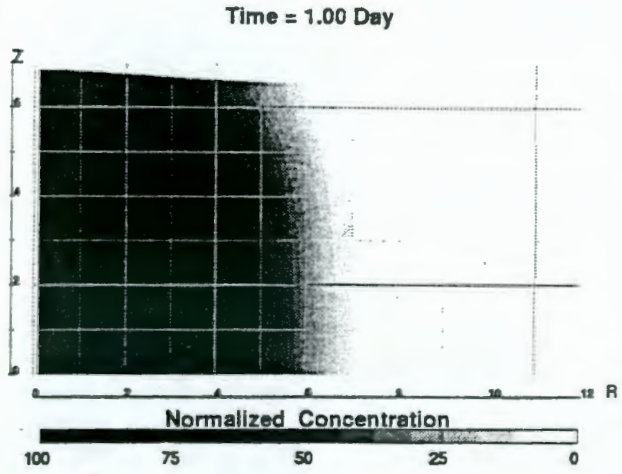
75
50
25
0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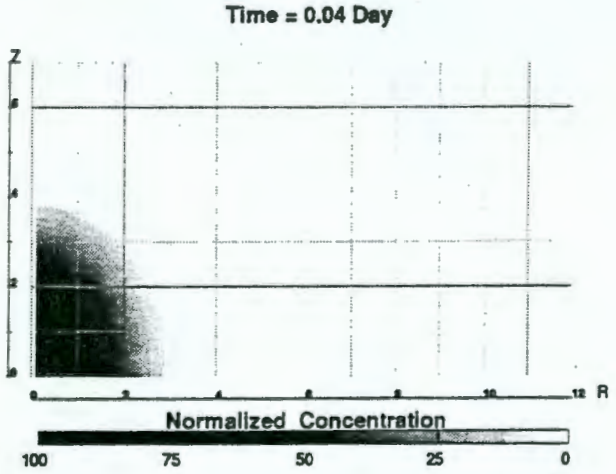
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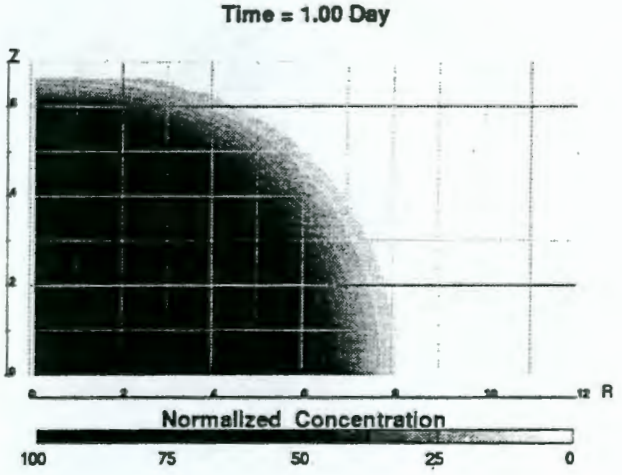
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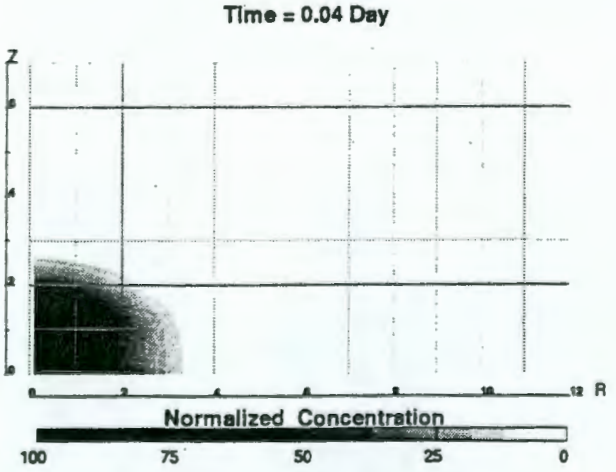
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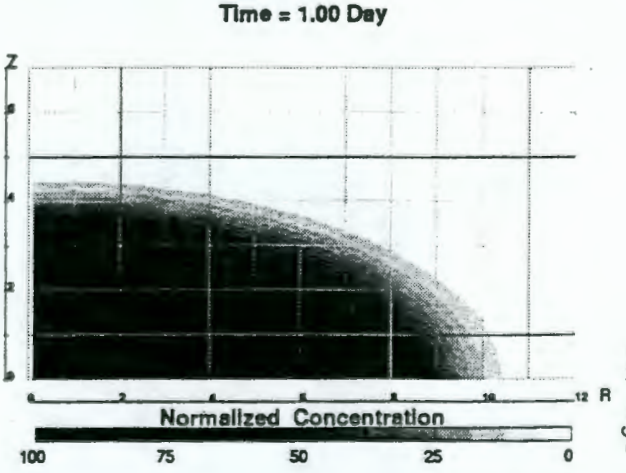
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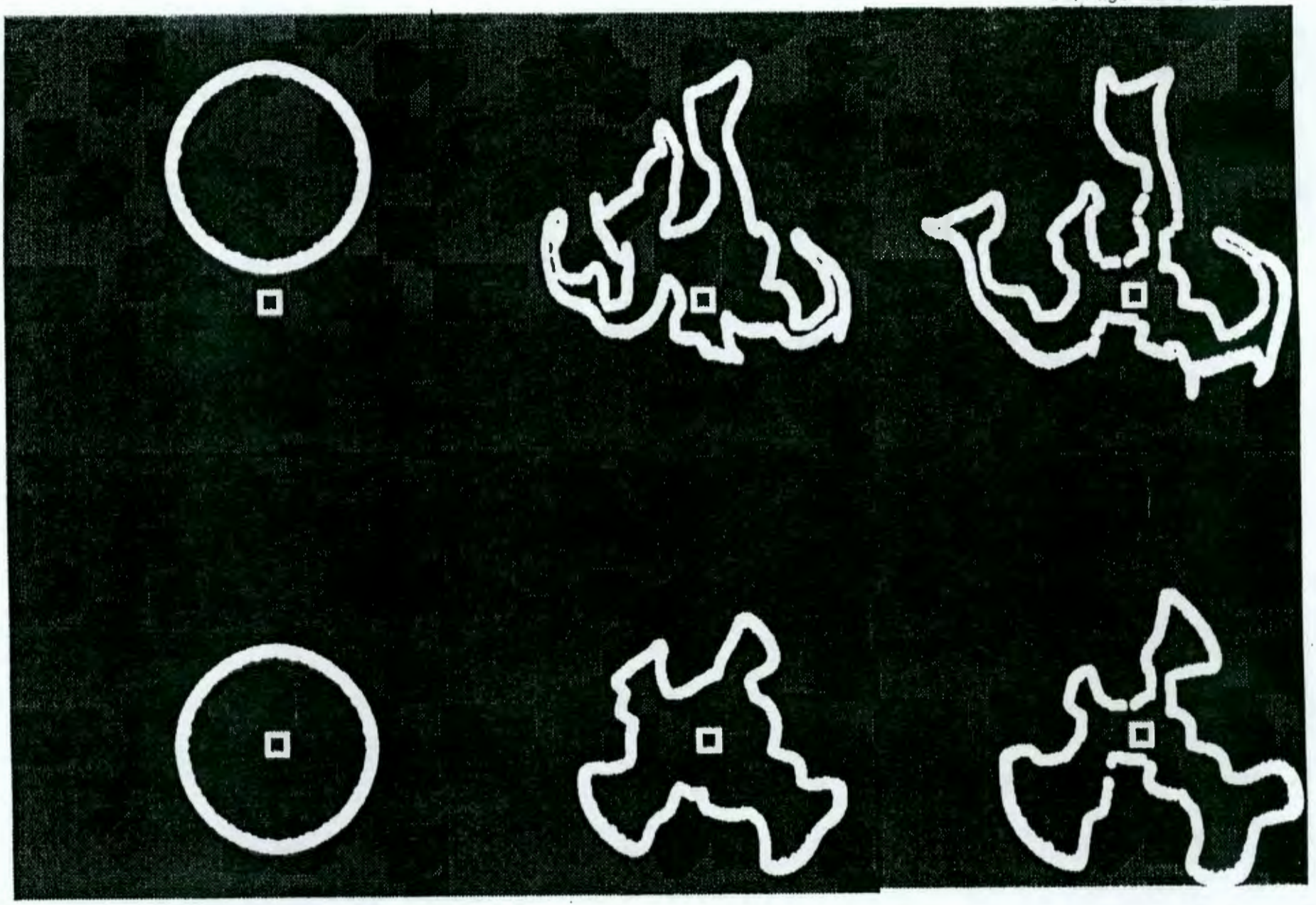

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Issues for Field Testing

- Effects of subsurface heterogeneity
- Formation plugging
- Mobilization of other contaminants
- Effects on microbial populations
- Reoxidation

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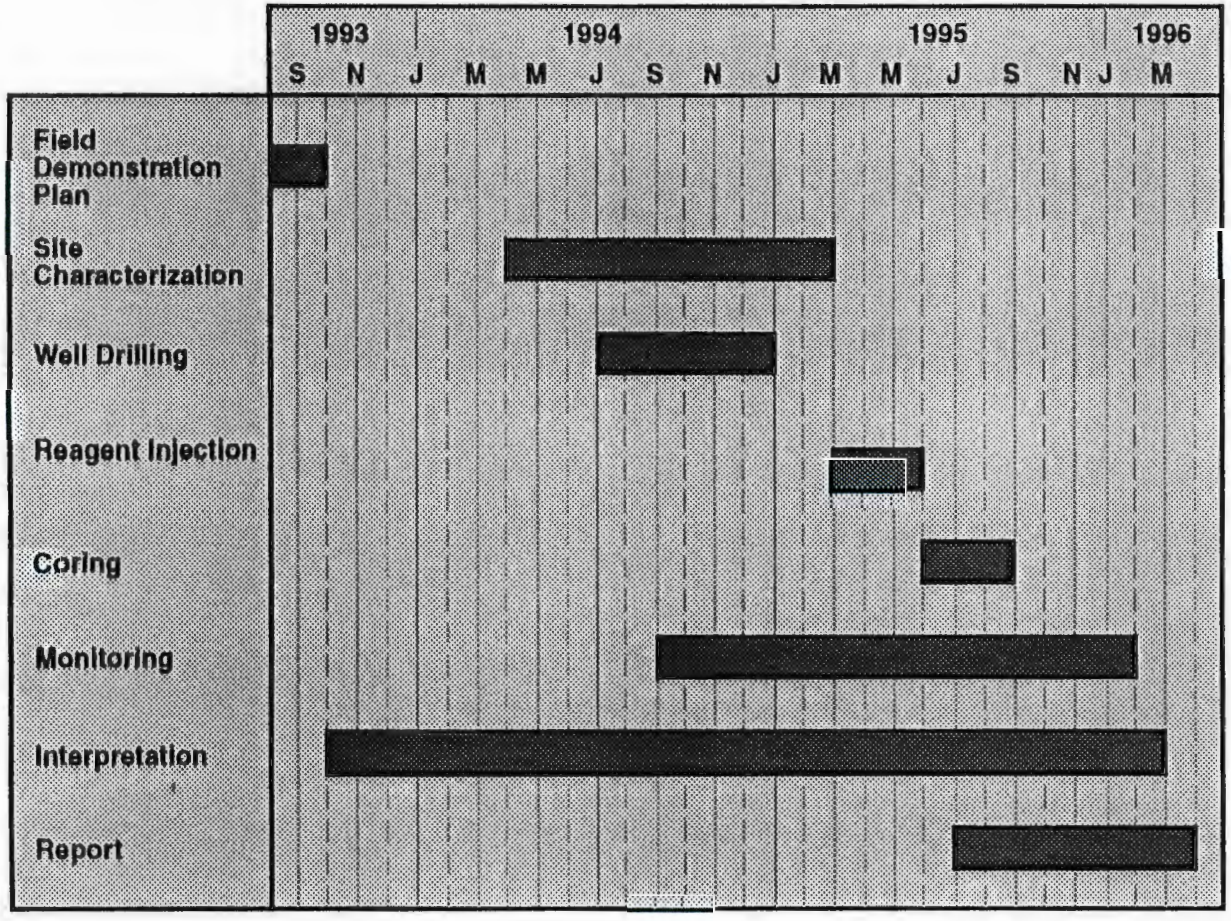
Industrial Participation/Collaboration

- Sonic drilling
- Geophysical techniques
- Reagent injection
- Groundwater monitoring

In Situ Redox Manipulation



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Future Directions

- First field test – dithionite injection
- Goal is to manipulate redox status of the aquifer
- Continuing investigation of microbiological reduction
- Increased emphasis on interpretive tools

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Attachment #7

Results of 100-D Well Productivity Tests

L. C. Swanson
Senior Scientist

Test Objective:

Estimate the long-term extraction and injection rates for each proposed pump-and-treat well

Field Procedure:

- Pump each of the wells, increasing the rate of discharge over time
- Monitor water-level changes during the tests

General Well Information

- 6 existing wells were tested, 3 extraction and 3 injection wells.

<u>Extraction</u>- 199-D5-14, -15 and -16

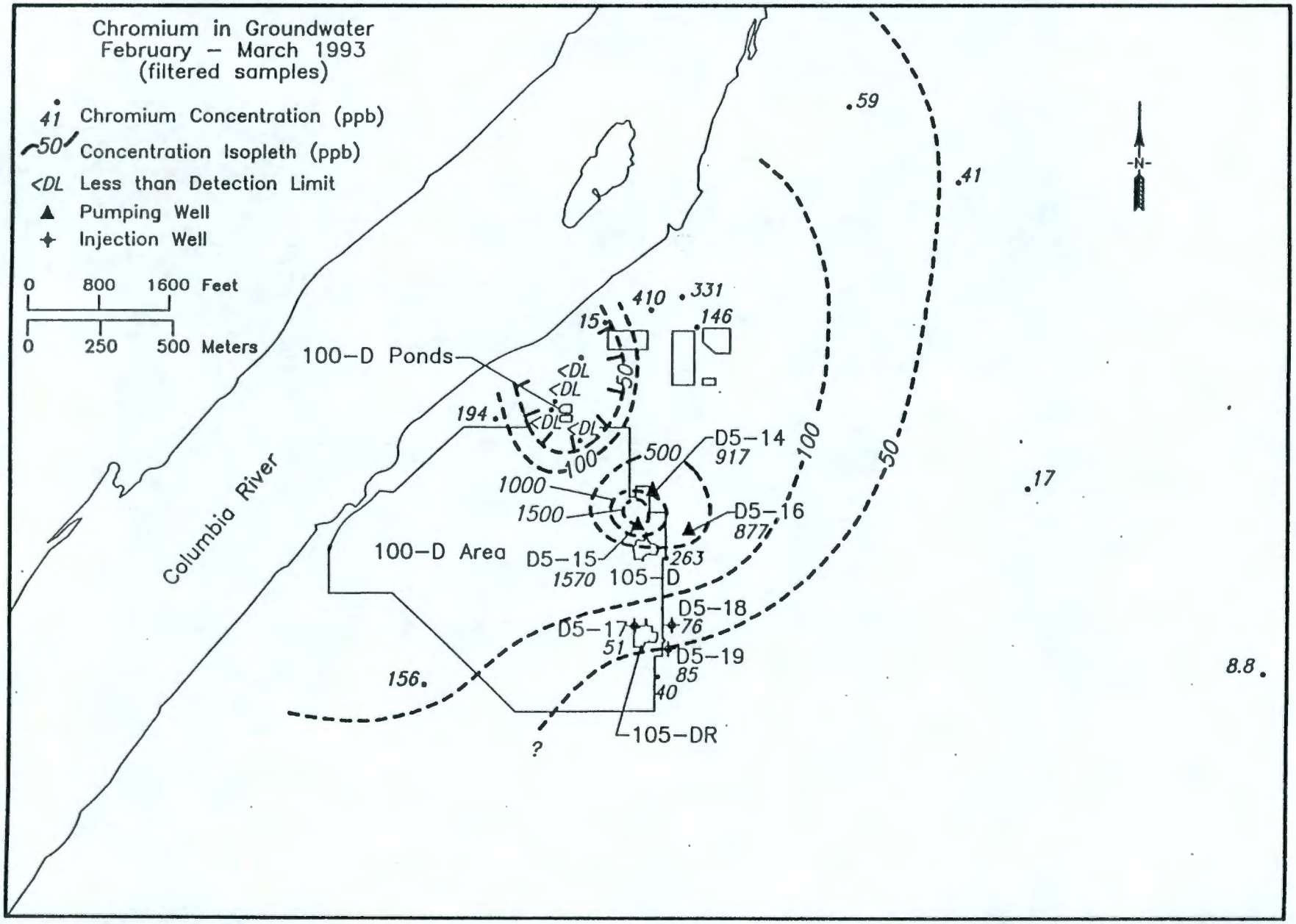
<u>Injection</u>- 199-D5-17, -18 and -19

- The 3 extraction wells are located in the area of highest chromium concentrations

- The 3 injection wells are located about 1,500 ft upgradient from the extraction wells

- The wells are existing wells, screened at the top of the unconfined aquifer, originally constructed for groundwater sampling

Figure 1-2. Chromium Groundwater Plume in the 100-D/DR Area.



Chromium in Groundwater, 100-D/DR Area

WHC:JJA:100DAREA:RFR-3

General Productivity Test Results

- The total expected long-term production of the 3 extraction wells is estimated at about 25 gpm

- The total injection capacity of the 3 injection wells is estimated at over 50 gpm

Well Productivity Testing at 100-D Wells

Well	Q (gpm)	ds (ft)	Time (mins)	Specific Capacity (gpm/ft)	Submerged Screen (ft)	Available Drawdown (ft)	Maximum Est. Flow (gpm)	Well Type
199-D5-14	8	8.4	88	0.95	13.9	8.9	5 to 6	Extraction
199-D5-15	20	8.2	120	2.4	14.1	9.1	15 to 17	Extraction
199-D5-16	3.25	7.2	170	0.45	12.0	7.0	2 to 3	Extraction
199-D5-17	1.78	5	120	0.36	13.9	8.9	2 to 3	Injection
199-D5-18	24	4.5	80	5.3	14.5	9.5	>30	Injection
199-D5-19	18	11	86	1.7	18.1	13.1	>20	Injection

Assumptions:

1. Available Drawdown = Total Submerged Screen - 5 ft
2. Maximum Est. Flow is based on the production tests and professional judgement
3. Flow rates are estimated for long-term production

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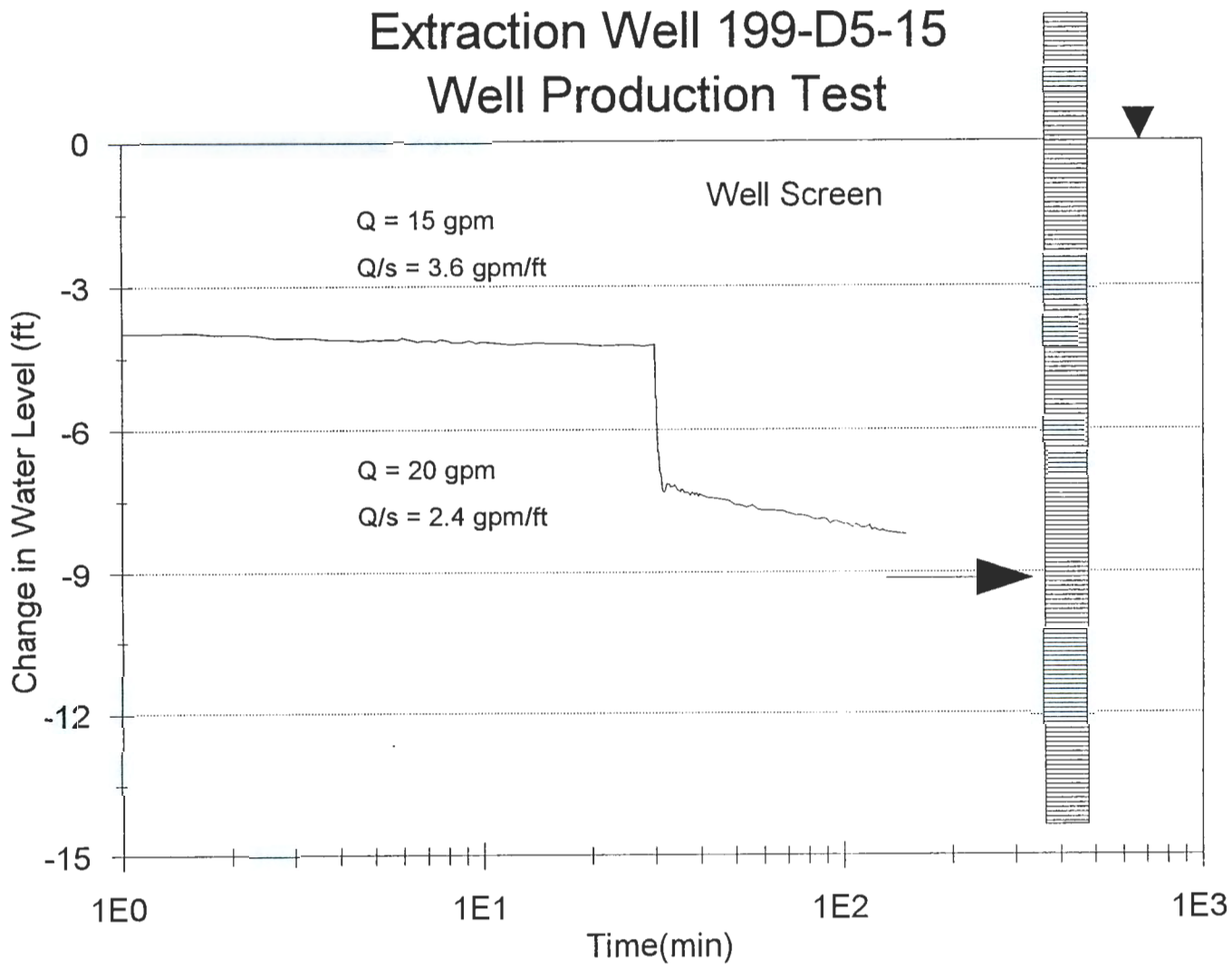

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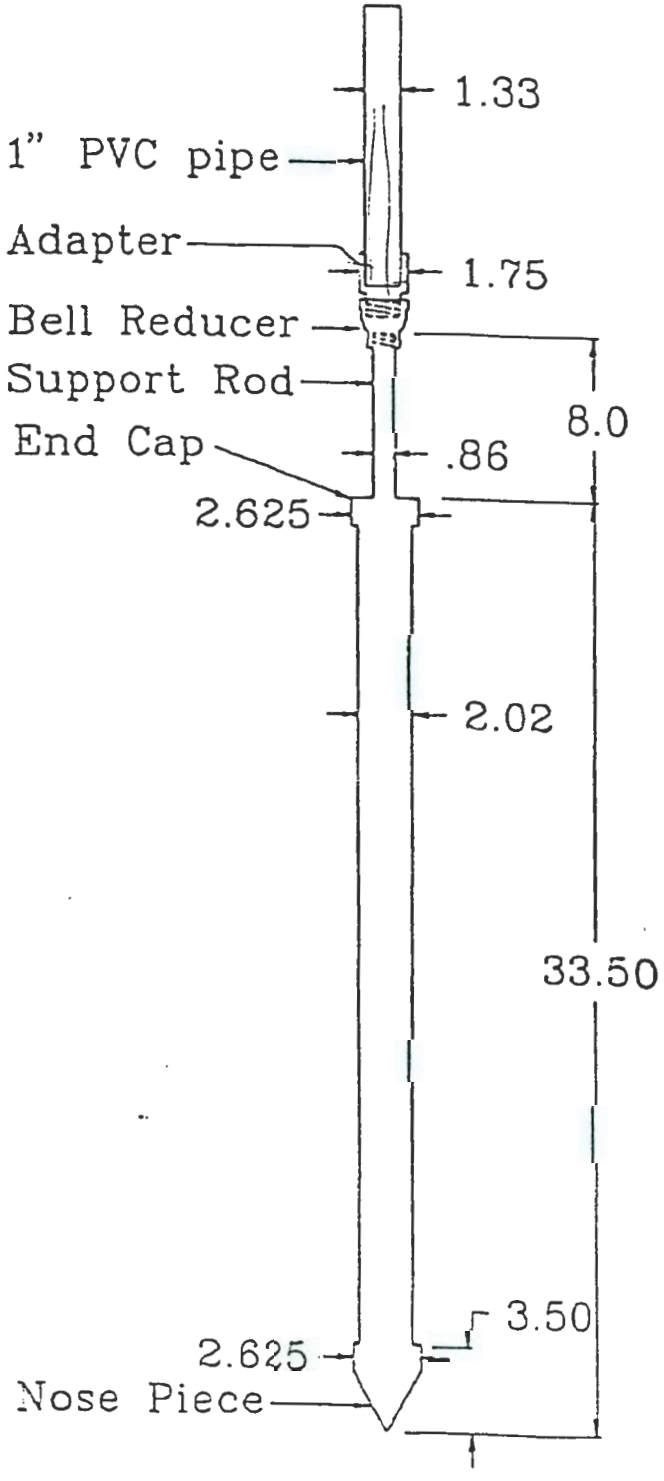
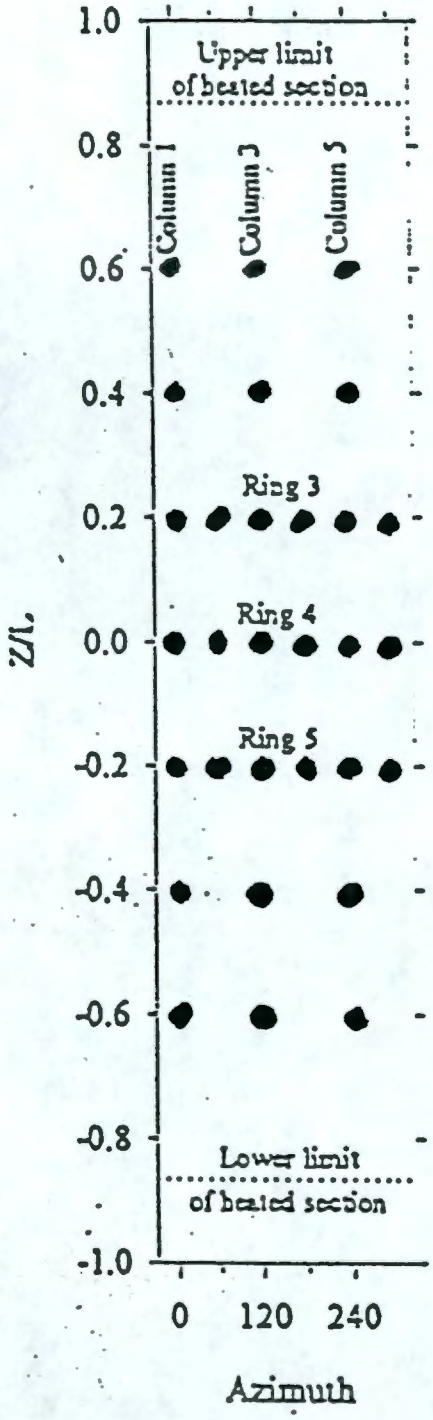
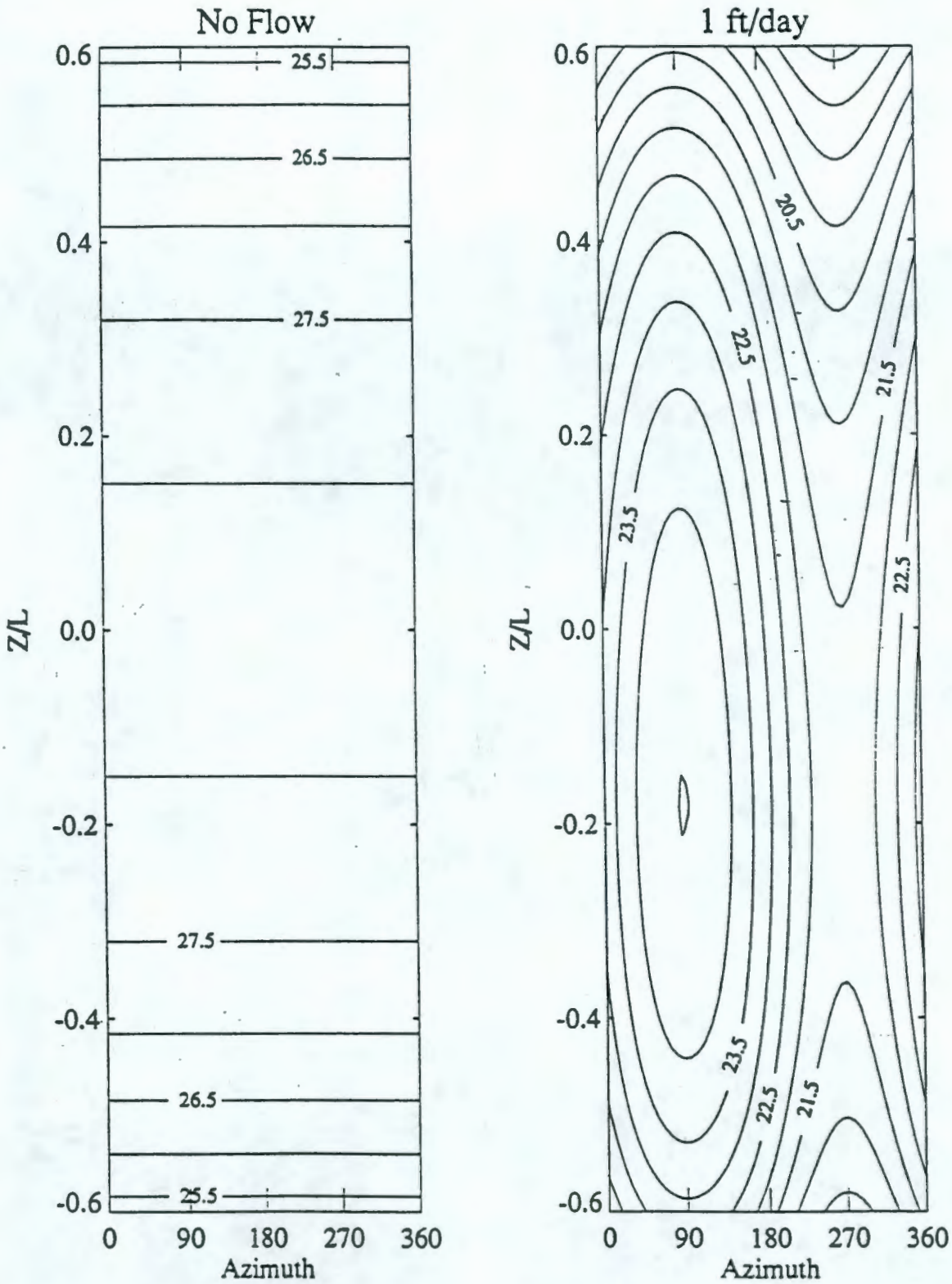
Attachment #8

In Situ Permeable Flow Sensor

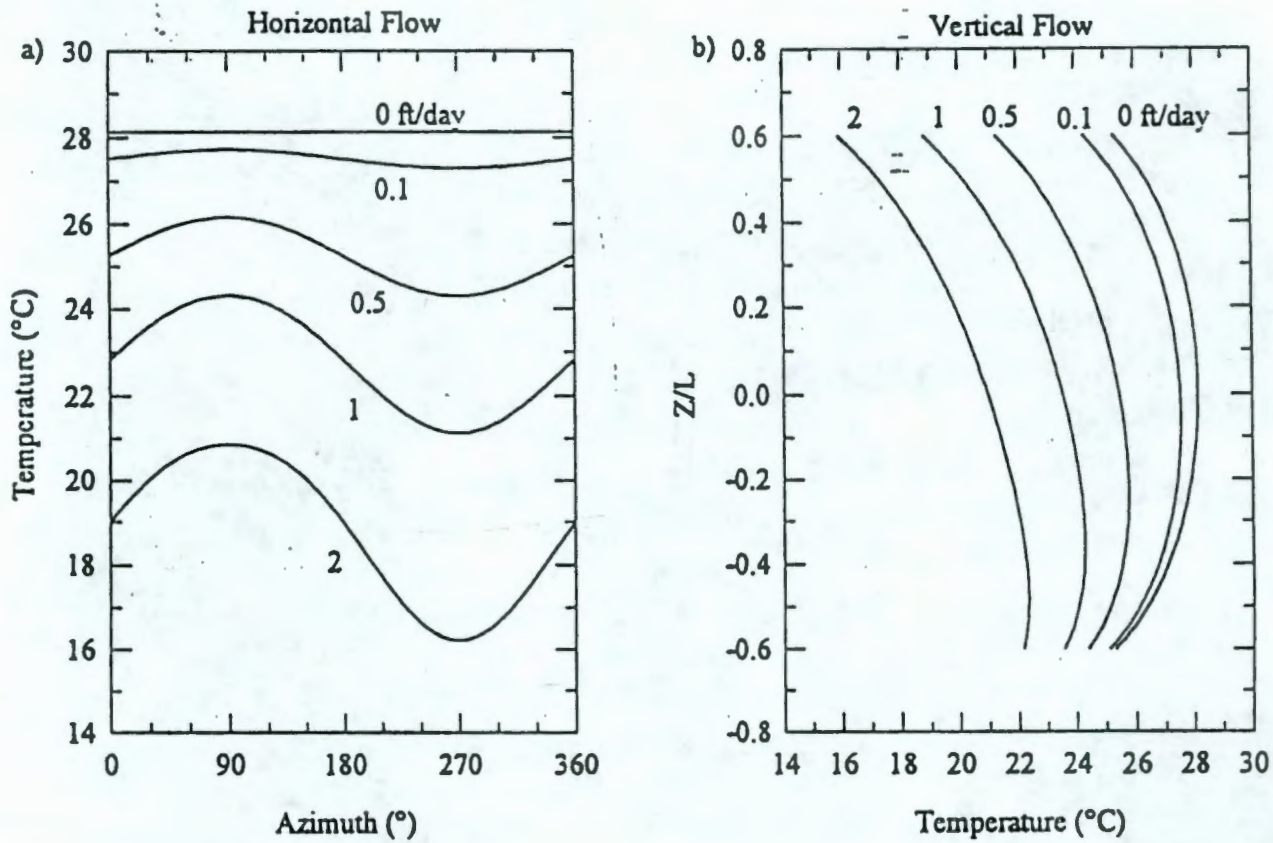




Distribution pattern of the 30 thermistor locations on the surface of the probes.



Contour maps of the theoretical probe surface temperature for a) a flow sensor buried in a medium where there is no flow and b) where there is flow of 1 ft/day oriented in a direction which is toward 90° from the reference direction and 30° down from the horizontal.



Temperature as a function of azimuth for a probe in a purely horizontal flow field. 270° and 90° on the horizontal axis represent the upstream and downstream sides of the probe, respectively. b) Temperature as a function of vertical position for a probe in a downwardly directed flow field.

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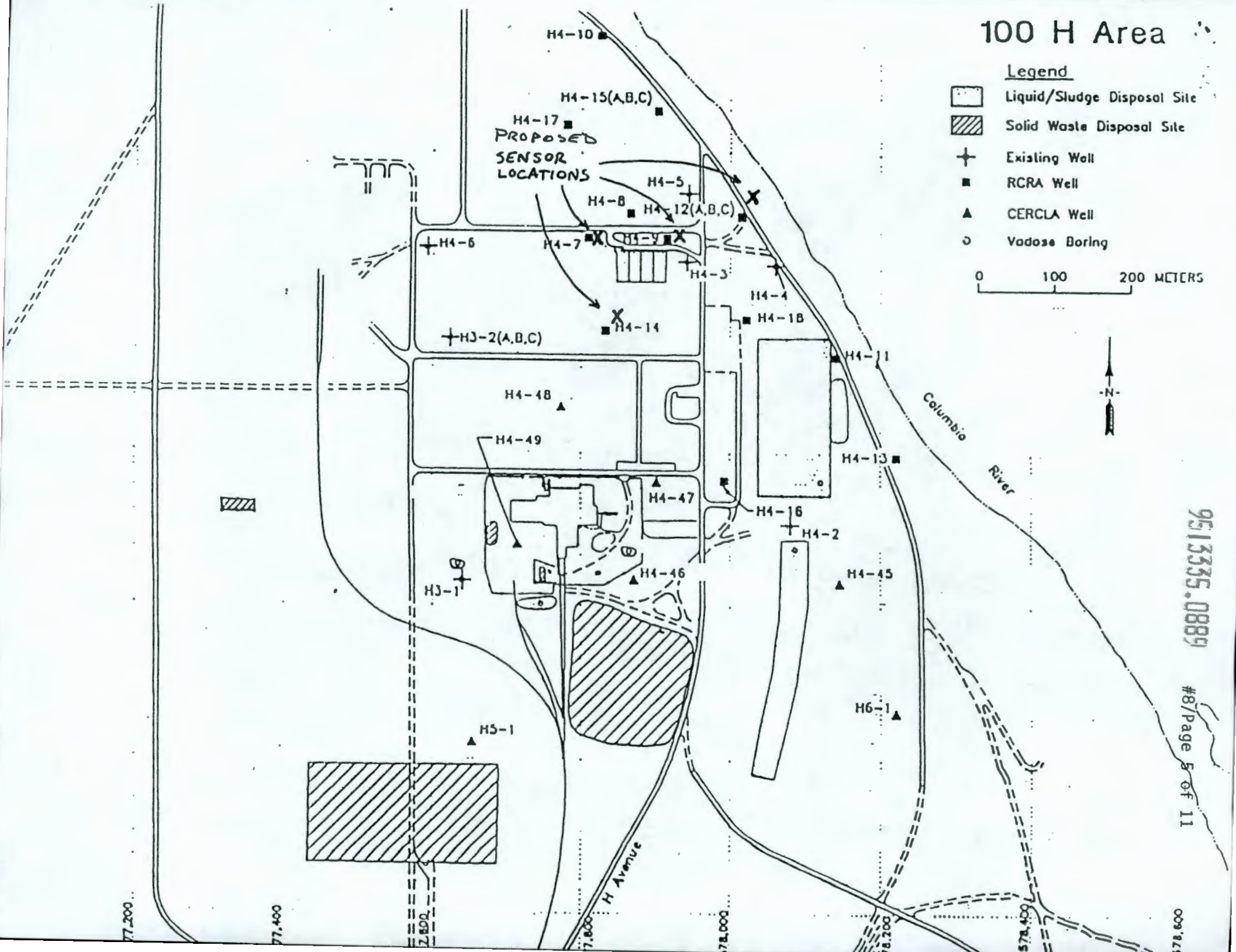
100 H Area
Legend
Liquid/Sludge Disposal Site
Solid Waste Disposal Site
Existing Well
RCRA Well
CERCLA Well
Vadose Boring
0 100 200 METERS
N
H4-10
H4-15(A,B,C)
H4-17
PROPOSED SENSOR LOCATIONS
H4-5
H4-8
H4-12(A,B,C)
H4-6
H4-7
H4-9
H4-3
H4-4
H4-14
H4-18
H3-2(A,B,C)
H4-11
H4-48
H4-49
H4-13
H4-47
H4-16
H4-2
H4-46
H4-45
H3-1
H6-1
H5-1
Columbia River
H Avenue
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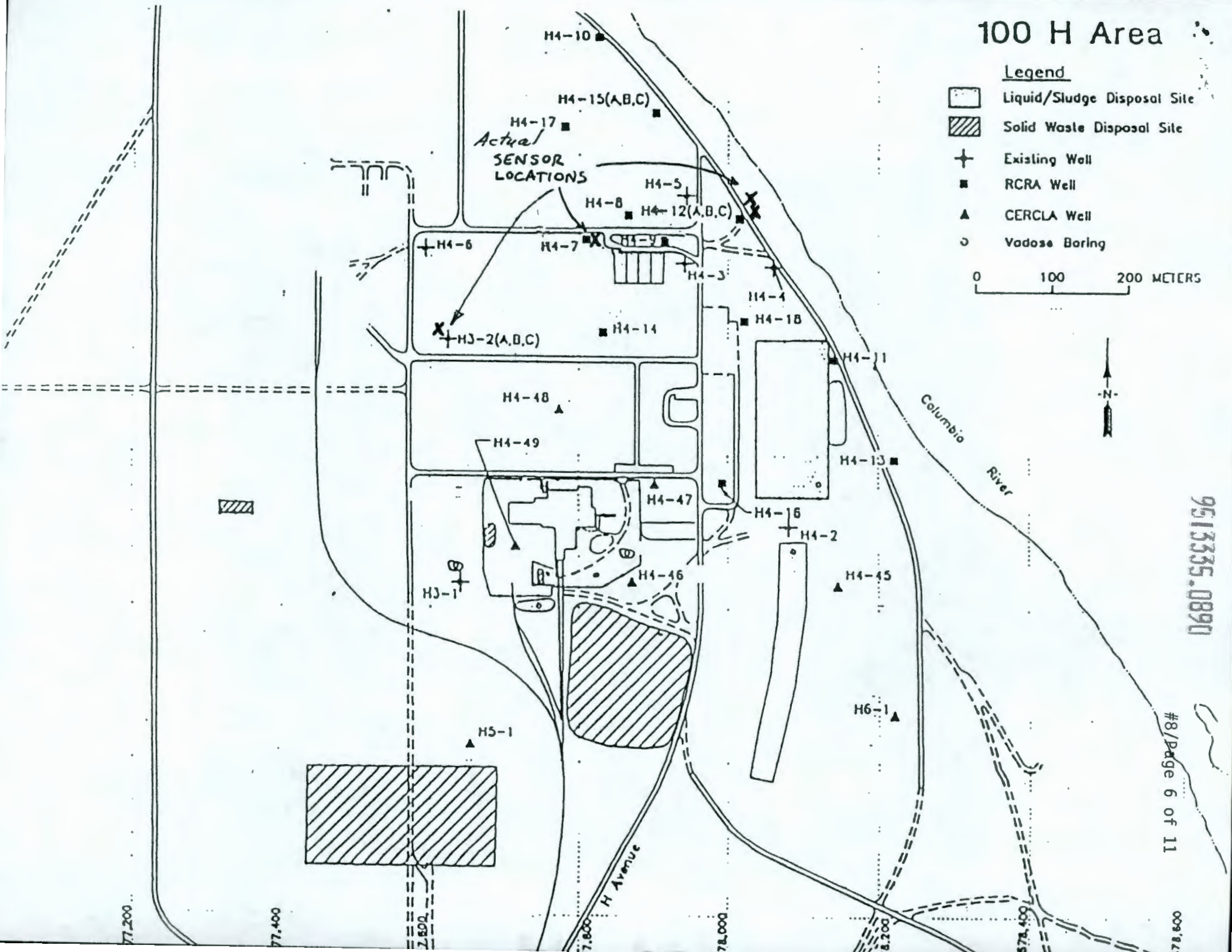
100 H Area
Legend
Liquid/Sludge Disposal Site
Solid Waste Disposal Site
Existing Well
RCRA Well
CERCLA Well
Vadose Boring
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100
200 METERS
N
H4-10
H4-15(A,B,C)
H4-17
Actual SENSOR LOCATIONS
H4-5
H4-8
H4-12(A,B,C)
H4-6
H4-7
H4-9
H4-3
H4-4
H4-18
H3-2(A,B,C)
H4-14
H4-11
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H4-49
H4-13
H4-47
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H4-46
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H5-1
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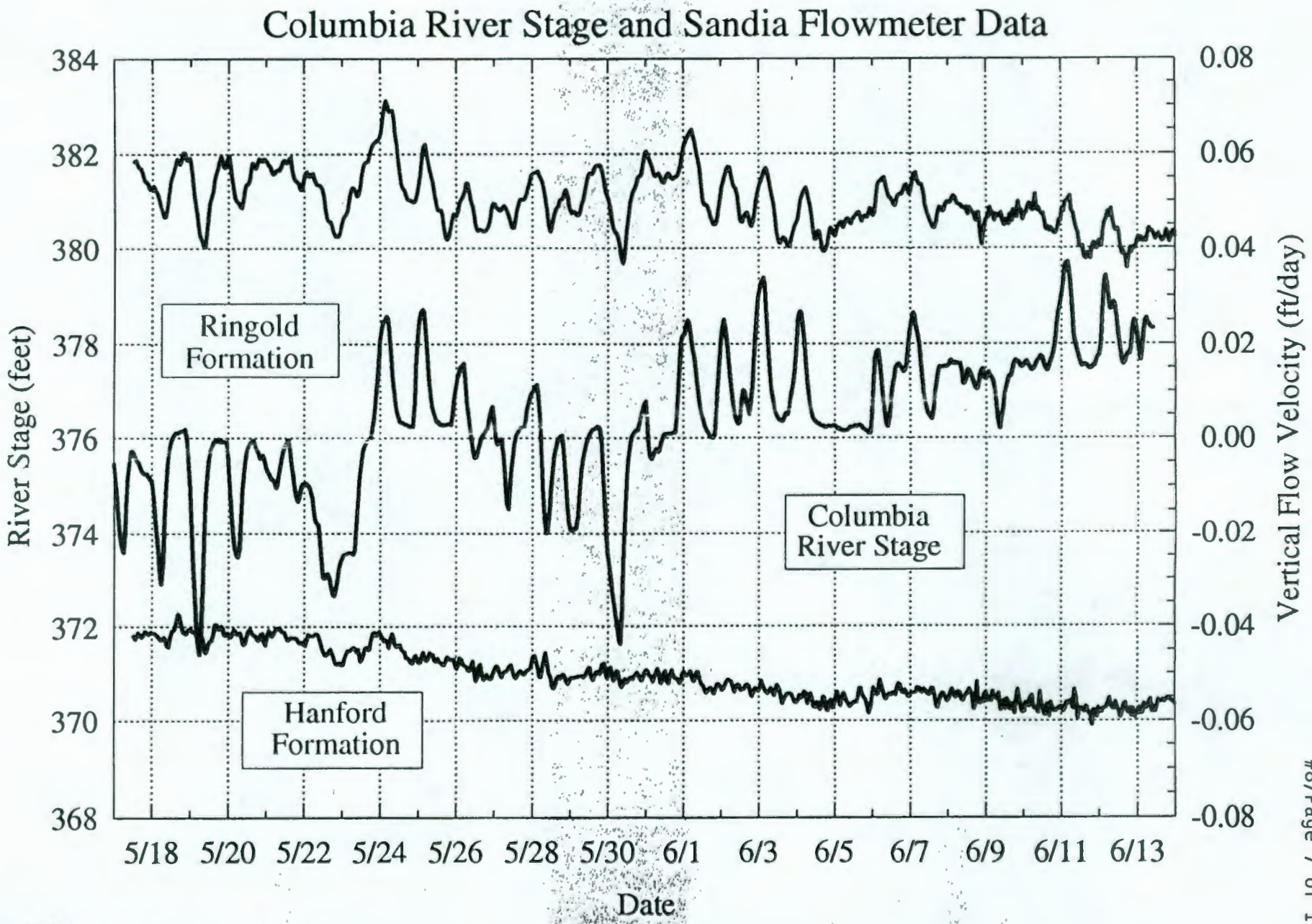
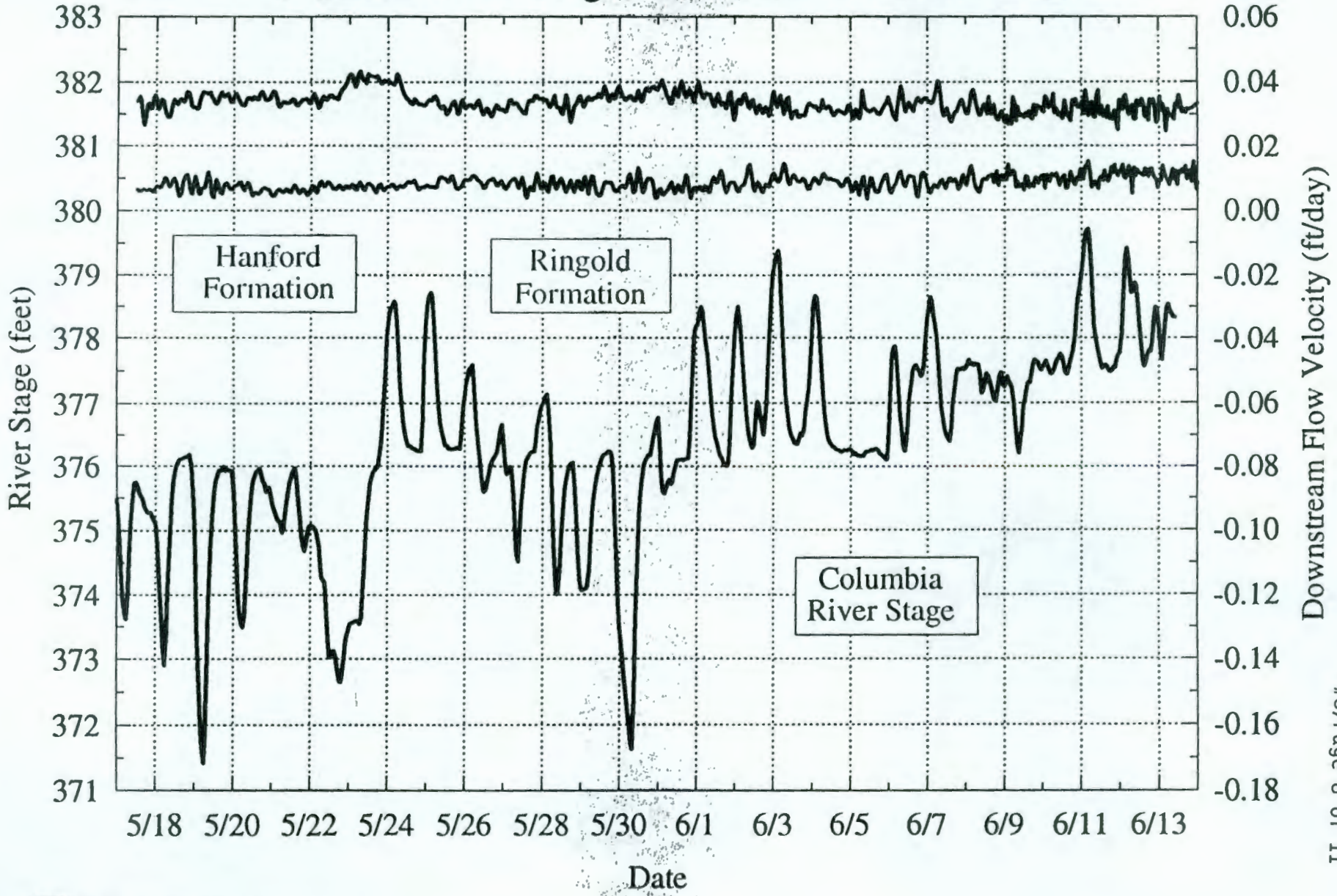


Sandia National Laboratories

Columbia River Stage and Sandia Flowmeter Data



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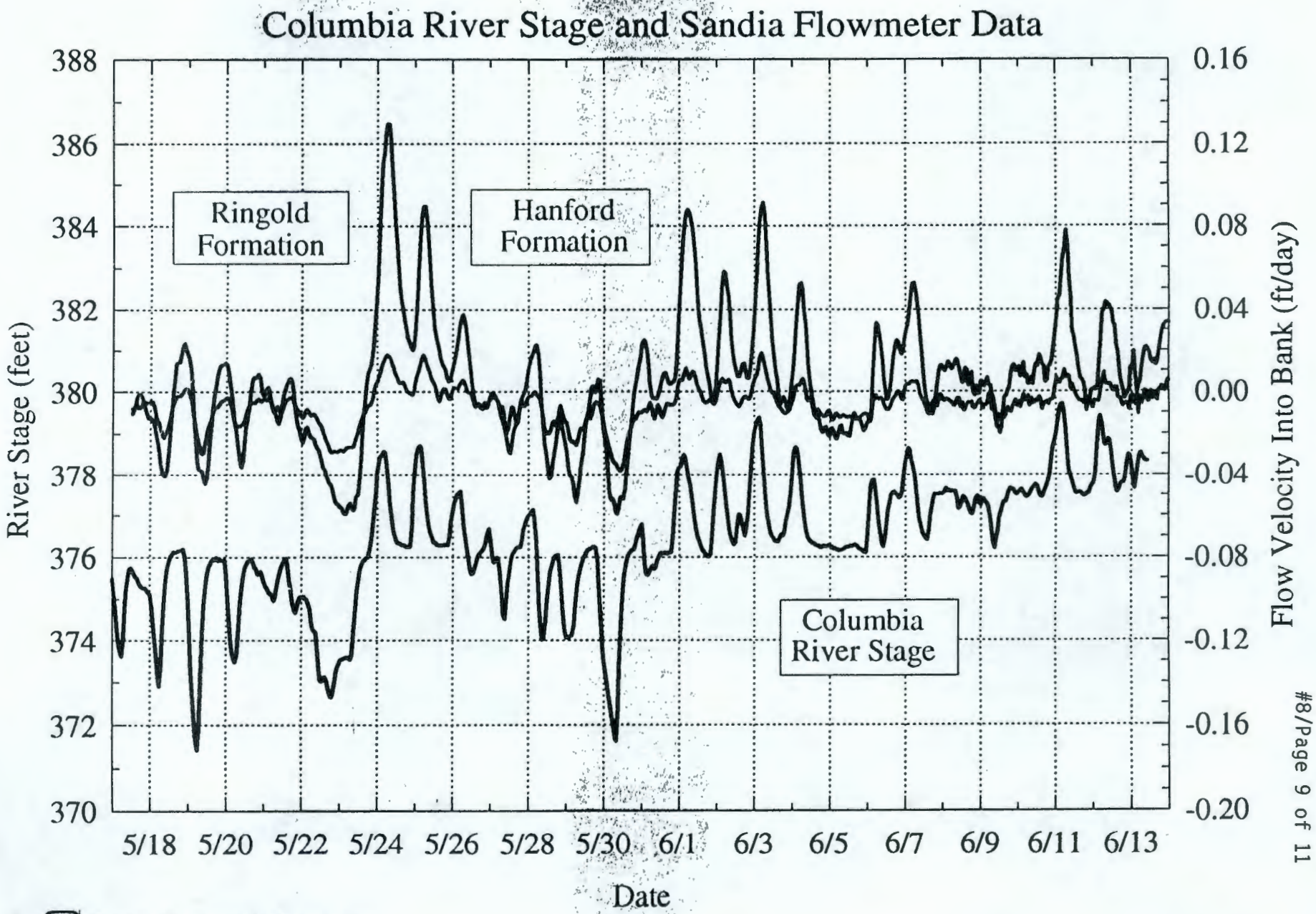

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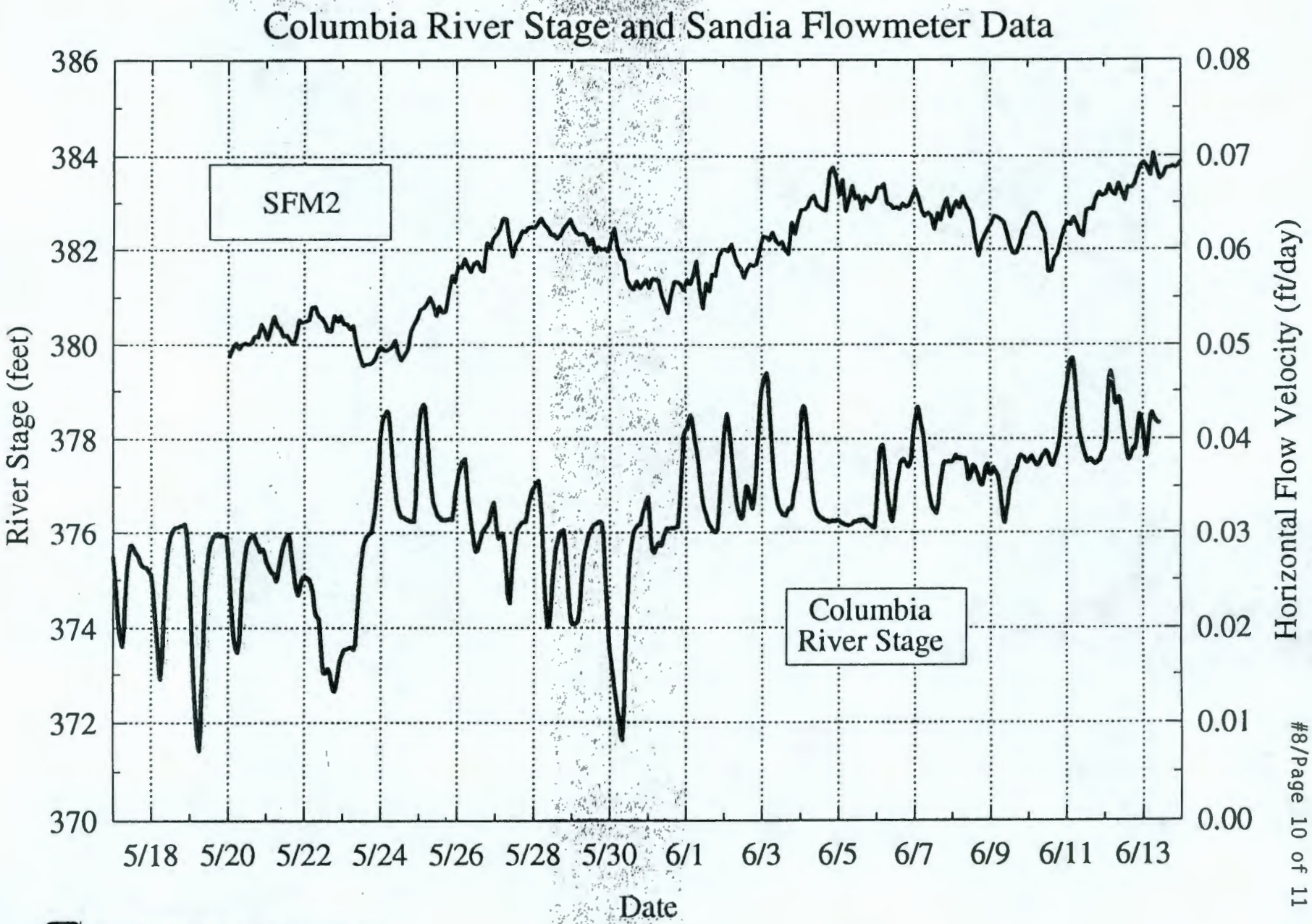

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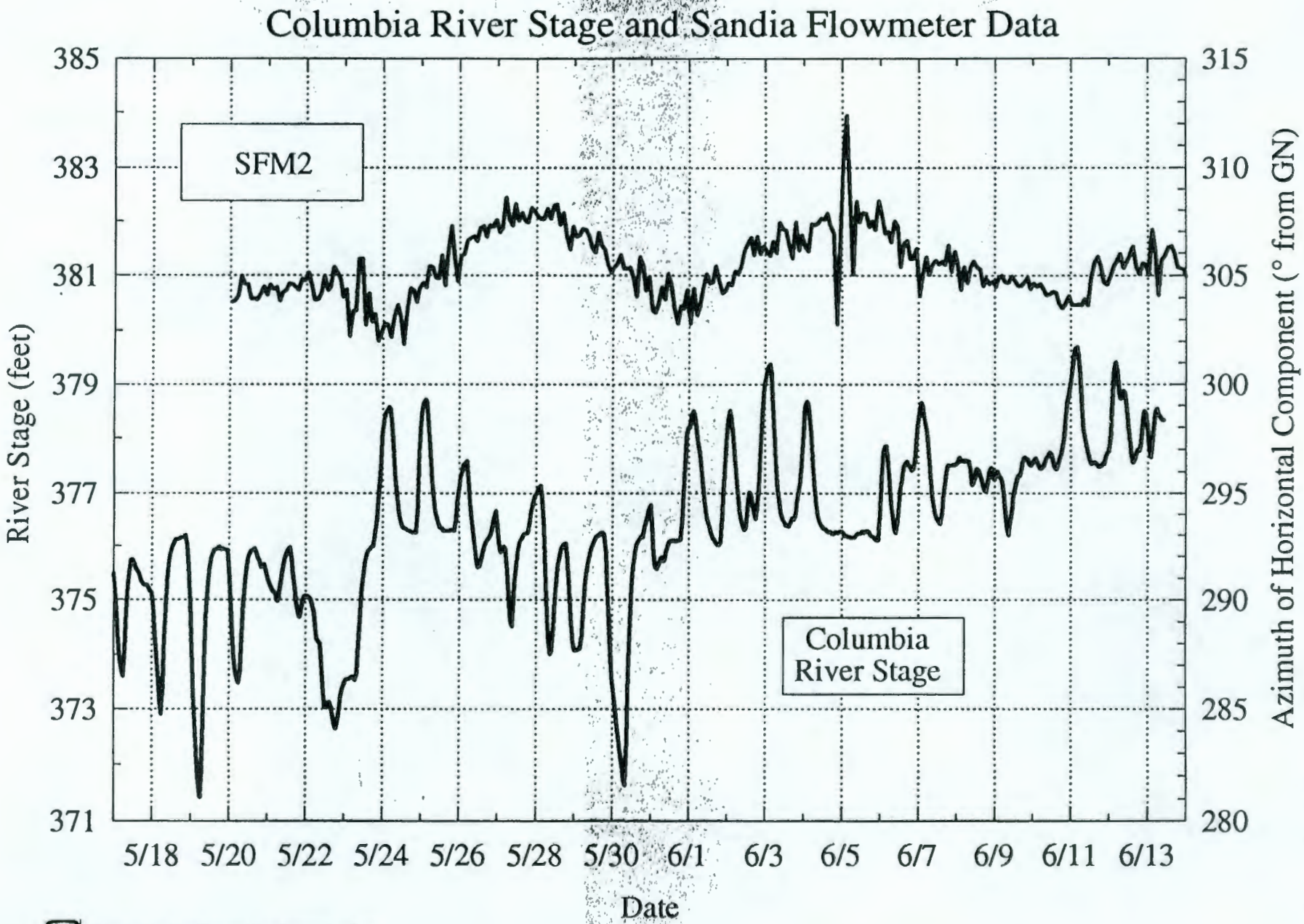

Sandia National Laboratories

Control Number:	100 NPL Agreement/Change Control Form	Date Submitted:
65	__ Change X Agreement __ Information Operable Unit(s):	05/31/94 Date Approved: 5/31/94

Document Number and Title: M-15-06E 100-HR-3 Pilot-Scale Pump and Treat	Date Document Last Issued:
Originator: J. G. Woolard	Phone: 376-2539

Summary Description: This form documents agreements reached by the Tri-Parties concerning further scope definition fo the 100-HR-3 pilot-scale treatability test. The signatures document concurrence with the attachment.

Justification and Impact of Change: The Federal Facility Agreement and Consent Order Change Control Form #M-15-93-02 states, "Additional details and clarifications will be developed by the responsible Unit Managers and documented on the Tri-Party Agreement, Unit Manager Agreement Forms." This agreement form provides the additional details and clarification for the 100-HR-3 pilot-scale pump and treat test.

This agreement will have no impact on previous schedules or established TPA milestones.

R. L. Biggerstaff WHC Operable Unit Coordinator Richard L. Biggerstaff	Date 5/31/94
E. D. Goller DOE Unit Manager Eric Goller	Date 5/31/94
W. W. Soper Ecology Unit Manager Wayne W. Soper	Date 5-31-94
P. R. Beaver Env. Protection Agency Unit Manager Paul R. Beaver	Date 5/31/94

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3.

100-HR-3 Groundwater Treatability Pilot Test
Summmary of Items of Aggreement
Among WHC/DOE/WSDOE/EPA

Considerable discussion concerning the 100 HR-3 Groundwater Treatability Pilot Test has taken place over the last six months. The summary below is an agreement between the parties.

- The Groundwater Treatability Pilot Test (Pilot Test) will utilize only **existing wells** in the 100 HR-3 groundwater operable unit.

- **Chromium (VI)** is the **contaminant of concern** for treatment, and sampling and analysis in the Pilot Test will focus on this constituent. Limited additional sampling will include analysis with the 100-HR-3 groundwater operable unit reduced analyte list to determine incidental co-removal of co-contaminates. The total number of analyses will be determined in the Test Plan.

- **Biodentrification** was agreed to be **deleted** from the current 100HR-3 Pilot Test.

- **Ion exchange** treatment will be tested in the Pilot Test, based upon conclusions of the Bench Scale Tests.

- Well **D5-15 in D Reactor** area is the existing well for extraction of chrome VI for initiation of the Pilot Test.

- Treated **effluent** to be disposed by **re-injection** via existing wells.

Control Number:	100 NPL Agreement/Change Control Form	Date Submitted:
66	__ Change X Agreement __ Information Operable Unit(s):	06/07/94 Date Approved:

Document Number and Title: M-15-06-E 100-HR-3 Pilot Scale Treatability Test Scope of Work	Date Document Last Issued: N/A
Originator: R. L. Biggerstaff	Phone: 376-5634

Summary Description:

This form documents agreements marked by the Tri-Parties on further scope definition for the 100-HR-3 Pilot Scale Treatability Test. The signatures document concurrence with the attached.

Justification and Impact of Change:

Justification and impact of Change: The Federal Facility Agreement and Consent Order Change Control Form #M-15-93-02 states, "Additional details and clarifications will be developed by the responsible Unit Managers and documented on the Tri-Party Agreement, Unit Manager Agreement Form." This agreement form provides the additional details and clarification for the 100-HR-3 pilot-scale pump and treat test.

This agreement will have no impact on previous schedules or established TPA milestones.

R. L. Biggerstaff R L Biggerstaff WHC Operable Unit Coordinator	Date 6/7/94
E. D. Goller Eric Goller DOE Unit Manager	Date 6/7/94
W. W. Soper Wayne W. Soper Ecology Unit Manager	Date 6-16-94
P. R. Beaver Paul R Beaver Env. Protection Agency Unit Manager	Date 6/21/94

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3.

100-HR-3 PILOT SCALE TREATABILITY TEST
SCOPE OF WORK

June 7, 1994

Regulatory Requirement

TPA Milestone M-15-06E -- Begin pilot-scale pump and treat operations for 100-HR-3 by August 31, 1994.

Pilot Test, Phase I and II

Ion exchange was selected as the treatment methodology as described in document WHC-SD-EN-TC-003, Rev 1, 100-HR-3 Area Groundwater Treatment tests for Ex Situ Removal of Chromate, Nitrate and Uranium (VI) by Precipitation/Reduction and/or Ion Exchange, dated August 5, 1993. As a result, ion exchange (IX) will be demonstrated to meet the M-15-06E milestone.

The IX system will be operated in two phases. Phase I includes startup and operation to determine equipment operation parameters, hydrology limits (extraction/injection), resin loading, and completion of winterization. During Phase I of the treatability test the IX system will be operated nominally 8 hours per day, 5 days per week.

Phase II will gather technical information on the IX system, the wells, and the aquifer while maximizing the removal of chrome; given the physical limitations of the hydrology and construction of existing wells selected for the test. Prior to Phase II operations, the IX system and extraction and injection well systems will be modified as required for 24 hour/day, 7 day/week four season operation. Phase II will commence immediately after attainment of Phase I objectives, or 11/15 unless extended by agreement with the Unit Managers.

Spill protection, for extracted water prior to treatment, will consist of drip trays installed at all areas of line fittings, valves, flanges, etc. between the well head and the IX treatment column.

Site Considerations

<u>Reactor area</u> --The 100-D Reactor area was selected as the Treatability Test site because wells in this area have the highest measured values of chromium (VI) e.g. 1000 to 2000±ppb Vs 350± ppb in H Reactor area. The relatively narrow configuration of the chromium plume in proximity to well D5-15 (highest chrome) also was a consideration.

Preferred extraction wells --Wells D5-15, D5-14 and D5-16 were selected as the extraction well network due to their proximity to each other and their high chrome (VI) values. Limited existing data indicate that these wells may have limited extraction capacity, i.e. 15±, 2± and 2± gpm, respectively. Actual extraction rates will be determined by conducting pumping tests following redevelopment of these wells.

Influent- Phase I -- Well D5-15 will be pumped at its nominal sustainable rate to the IX system. The IX system will be operated on a nominal 8 hour/day basis 5 days/week. If sustained flow from well D5-15 is less than the minimum flow requirements of the IX system, an inventory will be built up in the influent tanks prior to IX system operation. Following an extended period of pumping from well D5-15 (to observe potential drawdown in wells D5-14 and D5-16) these wells will be manifolded to the IX system to provide additional influent capacity and chromium plume capture and treatment. Sustained flow capacities for each individual well will also be measured.

Effluent -Phase I -- Effluent from the IX system will flow through a polishing filter, a biocide injector, and then via flow line to injection wells located 500 to 600 meters to the south (D5-17,D5-18 and D5-19). These wells have been selected for injection based on several criteria: 1) nearest wells to the extraction well network, 2) upgradient position, 3) wells are in source area of tritium plume and tritium will pass through the treatment system and be returned to the source area, and 5) estimated well capacities exceed extraction well capacities.

Influent- Phase II--It appears that the three well network may be extraction limited, therefore all three wells will be manifolded for continuous (24 hour/day, 7 days/week) pumping to influent storage tanks. This will facilitate handling the various flow rates and pressures from the three individual wells. Additional IX system shifts may be added dependent upon the extraction well network capacity.

Effluent- Phase II--Effluent from the IX system will flow into effluent storage tanks. These tanks provide several functions: 1) sufficient capacity to allow continuous (24 hour) flow to the injection well system (to inhibit potential "sanding" problems); 2) act as a "blending" tank for the biocide addition; and 3) provide storage capacity (prior to injection) that can be routed back to the influent tanks for reprocessing should the need arise. A booster pump, if needed, will be installed to pump fluid from the effluent tanks through the polishing filter to the injection well network.

Winterization-- Prior to November 15, the entire pilot test system will be modified to support four season operations.

Treatment System

Ion Exchange Unit -- The IX unit will consist of four columns with three in operation in a lead-lag-lag (series) alignment and the fourth in standby (resin change out). The columns will be manifolded to allow all possible variations of alignment. The unit will be skid-mounted, expandable, and operated via programmable logic controllers (PLC's) with air-operated control valves. All piping is schedule 80 PVC and the unit is being fabricated by Resource Technologies Group, Inc. in Lakewood, Colorado.

Resin -- Selected resin is DOWEX 21K, manufactured by Dow Chemical Company. DOWEX 21K is a strong-base anion exchange resin and will very effectively remove chromate (target contaminant), and uranium, with limited nitrate capability.

Sampling -- The IX unit will have sampling valves on the system influent line and effluent line of each column for grab samples. Samples will initially be field tested for Cr(VI) with a HACH DR-100 colorimeter using an Acc-u-vac ampule with a Cr(VI) detection limit of <50 ppb. QA samples will be collected and laboratory analyzed for Cr(VI) (water) and gross alpha and beta (resin). The Test Plan, currently in progress, will define in detail the sampling requirements including evaluation of co-contaminant treatment.

Hydrogeologic Considerations

Adjacent wells -- Surrounding wells are currently monitored monthly for water level and every six months for chemical analyses and this schedule will remain unchanged. This information will be used to assess general changes in localized groundwater flow and chromium plume concentration. Wells D5-14, D5-16 and D5-12 will initially be instrumented with pressure transducers and data loggers to monitor potential water level response to pumpage from well D5-15.

Test Performance Goals

Effluent Chromium (VI) Concentration-- The treatability goal for the IX system shall be to maintain injected effluent below 50 ppb which is consistent with WAC 173-200 for disposal to the ground, and more conservative than the Model Toxics Control Act (MTCA) guidelines.

Phase I -- The objectives for Phase I are as follows:

- Determine individual extraction well flow capacities and chromium VI concentration Vs time.
- Evaluate injection well capacities.
- Evaluate the zone of influence due to 8 hour/day extraction.

- Determine the effectiveness of the IX unit to consistently treat chromium VI to less than 50 ppb.
- Verify IX column resin life Vs flow rate/concentration of influent.
- Refine operational configurations, requirements, and procedures.
- Assess the effectiveness of the IX unit in removing co-contaminants, i.e. reduced analyte list constituents.
- Complete at least one resin canister cycle to evaluate sampling protocols and verify chromium break-through estimates.
- Evaluate spent resin for disposal/regeneration, i.e. very low uranium at this location may not yield a mixed waste designation.
- Upgrade system for 24 hr and four season operations.

Phase II -- The objectives for Phase II are as follows:

- Determine long-term individual well flow rates and chromium VI concentration Vs time.
- Determine operational reliability and safety of the extraction, IX and reinjection system for 24 hour/day, 7 day/week operation.
- Estimate zone of influence of 24 hour/day, 7 day/week extraction well network.
- Determine the efficiency of chromium VI mass removal in the groundwater plume.
- Refine health and safety requirements.
- Estimate cost/gallon for treatment, and the mass of chromium VI removed per unit time/volume treated per influent concentration.

Continuous Operation

The continuous operation of the IX system may be interrupted for valid technical reasons such as: 1) to modify and upgrade the components or controls of the system; 2) to evaluate the operational mode of "pulsing" the extraction system by switching the system off for sufficient time to "rewet" the sediments in the cone of depression; 3) to conduct various tests/remediation of the extraction, injection or treatment systems; 4) to move the entire system to another area of interest; or 5) the influent concentration approaches the treatment concentration goal of 50 ppb and it is no longer economically nor technically feasible to continue system operation at that well network. The Test Plan will elaborate on the criteria for determination of what constitutes completion of the pilot test. System interruptions described above will be discussed and aggreement reached with the Unit Managers prior to being initiated. System interruptions for general maintenance, minor repairs, or to meet the requirements of the Test Plan (under preparation) will be conducted without prior notice to the Tri-Parties.

Control Number	100 NPL Agreement/Change Control Form	Date Submitted:
67	__ Change X Agreement __ Information Operable Unit: 100-DR-1	6/7/94 Date Approved:

Document Number and Title:	Date Document Last Issued:
100 Area Soil Washing Bench-Scale Tests DOE/RL-93-107, Draft A	NA

Originator: J. G. Field **Phone:** 376-3753

Summary Description:

Signatures are for concurrence with the attached responses to EPA and Ecology comments on DOE/RL-93-107 Draft A, discussed in a working meeting held June 6, 1994.

In addition, Appendix B of the report will be expanded to discuss potential appliactions for soil washing. The Tri-Parties will jointly determine the appropriate language for the Appendix. The Tri-Parties Commit to finish Appendix B by 8-1-94.

Justification and Impact of Change:

This agreement does not impact previous schedules or established TPA milestones.

N. M. Naiknimbalkar for **WHC Operable Unit Coordinator**	6/30/94 **Date**
E. D. Goller **DOE Unit Manager**	6/30/94 **Date**
P. Staats **Ecology Unit Manager**	6/30/94 **Date**
D. A. Faulk **Env. Protection Agency Unit Manager**	6-30-94 **Date**

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

RESPONSE TO COMMENTS

100 AREA SOIL WASHING BENCH-SCALE TESTS

DOE/RL-93-107 DRAFT A

GENERAL COMMENTS:

1) Overall this document provided valuable information about whether soil washing can effectively reduce radionuclide contamination in some 100 Area soil.

Response: Concur.

2) Based on the bench scale tests, several key parameters including particle size and radionuclide activity distribution, presence of aluminosilicate and iron oxide coatings on soil fractions and the quantity of micaceous minerals in the soil matrix have been identified to predict soil washing effectiveness. However, more data is needed to develop a reliable, predictive model.

   The 116-C-1 soil was not effectively treated using the autogenous grinding methods with electrolyte solutions or chemical extractants employed in this study. It may be possible to achieve cleanup levels through more intense surface grindings, leaching with hot mineral acids, or conducting autogenous grindings in a hot chemical extractant.

Response: Concur. Currently, more data are being collected on 116-F-4 soil and any additional feasibility data that are collected (both lab- and pilot-scale) can be used to formulate a model.

More intense grinding (using centrifugal barrel mill) is being conducted on gravel and cobble size material from the 116-F-4 Pluto Crib. If necessary, we will also test other intensive treatment techniques.

3) More data is needed before or in parallel with the pilot-scale soil washing. The data requirements include:

   A) Develop a predictive model based on soil characteristics conducive to washing
   B) Determine if extractant mobilizes trace metals and clean backfill fails TCLP
   C) Determine recyclability of electrolyte and extractant in waste stream
   E) Determine variability of contaminant activities and particle size distribution of soil

Response: A) See response 2 (first paragraph)

B, C, D) These are included as part of laboratory-scalce water recycling tests that will be conducted prior to the pilot-scale tests

4) The Executive Summary indicated that less attention would be given to Batch I soils because of the notable absence of radioactivity. To that end, it would be useful to define more clearly how data generated from analysis of the Batch I soils (in regards to Batch II and Batch III soils) should be used, and whether it is prudent to perform further analysis of Batch I soils in the future.

Response: Recommendations regarding Batch I soils were included on page vii and section 11-3 in the report.

5) The discussion in Section 8 on percent activity removed, based on the use of proprietary extractants will not be considered useful, until the chemical composition of these extractants are revealed. This information will have to be available well in advance of regulatory approval of their use.

Response: Acknowledged.

6) There needs to be a more comprehensive discussion regarding the conformational sampling that will occur for soil particles greater than 2 mm in diameter. It is not a given that use of the analytical method XRF will be acceptable as replacement for SW-846 methods. Therefore, the validity of the report will be contingent on an acceptable solution to the analytical limitations that are plaguing this bench test.

Response: Previously approved test procedures (100 Area Soil Washing Bench-scale Test Procedures) listed XRF as the method of choice for Cr analyses (Table 6.1 and 6.2).

7) Cleanup levels or target performance levels are based on the 1988 Westinghouse document. It is important that regulatory cleanup levels are set to determine the actual success of soil washing technology.

Response: Acknowledged (See Attachment C, and EPA general comment #2).

SPECIFIC COMMENTS:

1) Deficiency: Section 2, Page 2-3, Paragraphs 1 and 3

Wet-screening is referred to as both wet-screening and wet-sieving.

Recommendation: It may be confusing to use both terms. Use one or the other or if there is a difference, clarify what it is.

Response: Wet-screening will be changed to Wet-Sieving.

2) Deficiency: Section 3, Page 3-6, Soil Sample Collection

There is no discussion on the minimum acceptable cpm levels for soil samples. It is obvious that the highest levels are the most desirable for running tests on however, there should be discussion regarding the lowest cpm that samples were collected at, and why.

Recommendation: Add a sentence or two describing the rational for setting the lower limit.

Response: The sampling rationale was discussed in detail in the Sampling Plan (Description of Work WHC-SD-EN-AP-118, Rev. 0 1993). Text will be added.

3) Deficiency: Section 4, Page 4-6, Table 4-1

Y-axis title reads Cumulative % Finer by Weight.

Recommendation: Change Finer to Fines.

Response: Cumulative % finer is the standard ASTM nomenclature

4) Deficiency: Section 4, Page 4-7, Table 4-3

This table reports TOC content for all batches. There is no indication as to the particle size that was analyzed.

Recommendation: Provide a legend that stipulates a particle size of 2 mm or less.

Response: A footnote will be appended.

5) Comment: Section 4, Page 4-8, Table 4-5

It is noted in Table 4-1 that 97.2% of the batch II soils are greater than 4.75 mm. Table 4-5 reports CEC for soils 2 mm or less. What percentage of soil does the CEC number reported for batch II soils actually represent?

6) Recommendation: Clarify the percentage of batch II soil that is actually 2 mm or less.

Response to 5 and 6: As noted the CEC number for Batch II soil represents 2.8% of the total soil mass.

7) Comment: Section 4, Page 4-11, Table 4-8

This table reports Accessible Soils Activity Limits. The reference indicates that these numbers came from the same document as the Test Performance Levels; however, it is not clear whether these two sets of numbers are the same or different.

Recommendation: If there is no difference in the two sets of numbers, then use either TPL or ASAL, not both.

Response: Will change ASAL to TPL.

8) Comment: Section 8.3, Page 8-2, 3rd and 4th Paragraphs

Conclusions provided in paragraph three indicate that no single standard extractant is capable of reducing activities of all contaminants of concern. Paragraph four discusses the effectiveness of the proprietary extractants I and II however, there is not even a minimum amount of information on the chemical characteristics of these solvents. It would be useful if characteristics such as pH, and solubility for a given molarity of extractant I and extractant II are provided so that a quick comparison could be made between the standard extractants and the proprietary ones. It is very unlikely that this type of information would allow patent embezzlement to occur.

Recommendation: Provide this information.

Response: Detailed information will be disclosed thorough a non-disclosure agreement.

EPA GENERAL COMMENTS:

1) The report clearly describes the bench-scale tests completed by Pacific Northwest Laboratories (PNL) as part of the remedy screening phase (Phase I) of an overall three-phase treatability study. The treatability approach is well grounded in the geochemistry of the contaminants to be removed from soils (cobalt-60, cesium-137, and europium-152). However, the report does not integrate the approach presented in the 100 Area Soil Washing Treatability Test Plan (DOE 1992), or the testing procedures described in the 100 Area Soil Washing Bench-Scale Test Procedures (Freeman et al. 1992). The bench-scale tests report should present test results in the context of the approach required by the test plan and testing procedures.

Response: Discussion included as Attachment A. This will be added to the text.

2) Significant changes have been made in the target performance levels (TPL) identified in the test plan (Table 1-1, DOE 1992) and those identified in this study (Table 3-1). These changes have increased the TPLs by factors of 5 to 200 (in the case of strontium-90). Both the test plan (DOE 1992) and the bench-scale tests document refer to the environmental compliance manual (WHC 1988) as the source of significantly different data for TPLs. The TPLs presented in the test plan (DOE 1992) are significantly more protective than those presented in the bench-scale tests report. The choice of TPLs has enormous importance in determining the success or failure of the soil treatments evaluated in this report. The bench-scale tests report should clearly document any changes in TPLs agreed to by the three parties subsequent to finalization of the test plan (DOE 1992). Otherwise, the report should discuss the rationale for changing the TPLs to significantly higher values in greater detail.

Response: The document will be modified and Appendices attached (See Attachment C).

3) Linear density gradient fractionation tests are not discussed in the bench-scale tests report. Although these tests are not specifically mentioned in the treatability test plan (DOE 1992), they are described in the bench-scale test procedures (Freeman et al. 1992). If these tests were completed, the results should be presented. If the tests were not performed, the text should explain why these tests were not conducted.

Response: The linear density gradient (LDG) technique is designed to provide data regarding contaminant mineral associations. The same information can be obtained by other techniques such as autoradiography and SEM-EDXA. Instead of LDG, the other two techniques were used to obtain this information.

4) Heap leaching tests, discussed in Section 6.0 of the bench-scale test procedures (Freeman et al. 1992), do not appear to have been conducted during the bench-scale tests. However, static leaching tests are briefly described in Section 8.3 of the document, with results presented in Table 8-4. If the static leaching tests are the equivalent of the heap leaching tests, the report should clearly state so. If they are not, the differences between the two tests should be explained and a rationale for not conducting the heap leaching tests should be provided.

Response: Rationale will be added.

5) In the report, it is hypothesized that the majority of radioactive cesium contamination is bound to "wedge" sites on the edges of mica minerals. Techniques for separating mica from the bulk soil (such as density differences) should be investigated to determine if cesium can be efficiently concentrated and removed from contaminated soil by these methods. This task could be added to the supplementary data requirements described in Section 11.0 of the report.

Response: Mica minerals in this soil are present both as separate particles and as inclusions in fledspathic mineral matrix. Eventhough one could attempt to remove separate mica particles, it is not practical to remove significant fractions of matrix-associated mica.

6) Finally, the quality of the data obtained from the bench-scale tests should be discussed. The discussion should include analyses of the quality control samples, data validation procedures, and corrective actions taken to process unacceptable data. Completeness, measured in terms of valid data obtained from measurement system compared to the amount expected under normal conditions, should be identified. This information should be presented so that the data quality can be evaluated.

Response: Accept. The discussion will be added as an Appendix.

SPECIFIC COMMENTS:

1) Section 4.2.6, page 4-3. The text lists seven regulated metals that the samples were analyzed for by toxicity characteristic leaching procedure (TCLP) tests. However, Table 4-10 lists eight metals (the seven regulated metals plus silver) that were analyzed for using those tests. The text should include silver as a regulated metal for which these samples were also analyzed.

Response: Accepted.

2) Section 4.4.2, page 4-9, first paragraph. This section identifies cobalt-60, cesium-137, and europium-152 as the contaminants that exceed the TPLs in batch III soils. Table 4-8, which lists the radionuclide data for the 100 area soils, indicates that europium-154 also exceeded the TPL in both batch II and III soils. This radionuclide should also be identified as exceeding the TPL.

Response: Accepted.

3) Section 4.4.2, page 4-9, second paragraph. This section states that the >2mm fractions of the batch II and III soils were analyzed for cobalt-60, cesium-137, and europium-152 radionuclides. These results should be provided in this section.

Response: The results are reported in Section 5 therefore, the statement on page 4-9 will be deleted.

4) Table 4-7, page 4-10. This table lists the trace element concentrations, including vanadium, in the 100 area soil samples using x-ray fluorescence spectrometry. Section 4.2.4 identifies targets used in the total element analyses. The target used for vanadium analysis should be identified in Section 4.2.4. In addition, Section 4.2.4 lists cobalt as one of the analyzed elements; thus, the concentration of cobalt should also be included in Table 4-7.

Response: Will include Co in Table 4-7.

5) Table 4-9, page 4-11. This table lists the activities and concentrations of radionuclides. The reported concentrations, which are based on the specific activity of the radionuclides, are 1,000 times lower than the reviewer's calculation of these values as shown below for cobalt-60 and cesium-137.

Cobalt-60: 7 pCi/g x 1000 g/kg x 1 pg/1133 pCi x 1 mg/10^6 pg = 6.17 X 10^{-6} mg/kg

Cesium-137: 0.74 pCi/g x 1000 g/kg x 1 pg/87 pCi x 1 mg/10^6 pg = 8.5 X 10^{-6} mg/kg
(from Gorbitt 1989)

The calculations in the report should be checked and the table should be corrected accordingly.

Response: 1 mg is equal to 10^9 pg. Therefore, the numbers listed in Table 4-9 are correct.

6) Section 4.4.2, page 4-12, second paragraph. The last sentence of this section compares europium-152 recovery of batch I and III soils by sequential extraction. Radionuclide recovery data for batch I should be listed in Table 4-11.

Response: Typographic error (should be Batch II and not Batch I) will be corrected.

7) Section 5.2, page 5-2. This section states that at the end of the sieving cycle, soil fractions were rinsed with fresh deionized water. It should be explained how this rinse water was processed i.e., was it added to the recycled water or treated differently.

Response: The rinse water was added to the recycled wash water.

8) Section 5.3, page 5-6, first paragraph. This paragraph discusses Figure 5-4, which was not, but should be, included in the document.

Response: Will include Figure 5-4 which was inadvertantly left out.

9) Section 6.2, page 6-3, second paragraph. The last sentence of this section states that the wash water from the single stage attrition scrubbing was counted for radionuclide activity. These results should be provided in this report.

Response: Wash water data is reported in Section 10 therefore the sentence on page 6-2 will be deleted.

10) Section 7.1, page 7-1. The last sentence of this section states that since washing batch II gravels with water did not significantly reduce the activity of radionuclides, additional physical treatment such as autogenous grinding was tested. The results of water washing of batch II gravels should be provided in this report.

Response: Radionuclide data on washed gravel from Batch II was reported in Section 5.3 (second paragraph).

11) Table 7-1, page 7-3. This table provides the autogenous grinding data for gravels from batch II soil. Two of the tested treatment processes included grinding with sand. Percent fines for these processes are defined in the footnote as the fraction of fines generated from rocks or groundup sand. Procedures used to identify these fractions should be discussed.

Response: The fines generated from rocks were computed as a loss in weight before and after grinding and this was subtracted from the total fines generated to obtain fines generated from the sand fraction. This explanation will be added to the text.

Section 8.3, page 8-2, first paragraph. This section states that a minimum removal efficiency of 50 percent for cesium-137 is required to meet the TPL. The initial activities of cesium-137 in the samples analyzed from the 2- to 25-mm sized fraction range from 90 to 94 pCi/g (Table 8-1). With the TPL of 30 pCi/g for cesium-137, this removal efficiency should be about 67 percent. The source of this 50 percent removal requirement should be identified.

Response: Figure 5-4 is the source of this statement. For the composite (treated 2-0.25 mm fraction with >2mm fraction) to meet the TPL, the Cs activity of 2-0.25mm fraction needs to be reduced by 50% Explanation will be added to the text.

12) Table 8-2, page 8-3. The footnote to this table provides the solid-to-"solution" ratio for extraction II-3. This footnote should be corrected to show extraction II-C. In addition, Section 8.2 provides information on the weight of solids and extractant combination, which is the "solution." This information results in solid-to-"solvent" ratios of 1 to 2 and 1 to 4. The footnote should correctly identify this as a solid-to-"solvent" ratio.

Response: Accepted. The footnote will be corrected.

13) Section 8.3, page 8-4, second paragraph. This section discusses the results of static chemical leaching of gravel fractions of batch II soils with extraction II. The concentration of this extractant used with the solid-to-solvent ratio should be identified.

Response: Will be identified in the footnote.

14) Section 9.2, page 9-1, second paragraph. This section describes the combination tests; the solution temperatures at which these tests were conducted should be specified.

Additionally, one of the experiments in the combination tests consisted of surface grinding the gravel-sized fraction with extractant II at 50 percent solids by weight. This concentration of solids is higher than the concentrations identified in Section 8 of this report (20 to 33 percent solids by weight). The rationale for selection of this concentration should be explained.

Response: Will be specified and explained.

15) Section 9.3, page 9-2, first paragraph. This section provides the results of the combination tests, which include two-stage scrubbing in deionized water or in an electrolyte. The duration of this scrubbing should be identified for comparison of test results from each test.

Response: The scrubbing time will be specified.

16) Section 11.3, page 11-3, second paragraph. This section lists additional tests that may achieve the required cesium-137 removal from the contaminated soils. These tests include: more intense surface grinding, leaching with hot mineral acids, and autogenous grinding in hot chemical extractant. Two-stage autogenous grinding with extractant II should also be considered as a potential method to remove cesium-137 to below the TPL.

Response: Two-stage grinding essentially is grinding for longer time periods. This will be included as an option.

Table 11-1, page 11-5. The columns listing the average contaminant levels should identify the measurement units (i.e., pCi/g).

Response: Will identify the units.

Appendix A, page A-1. This table shows that the vendor quotes were multiplied by 2.5 for Hanford for the "purchase and mobilize" items. The rationale for this increase should be explained.

Response: The Hanford multiplying factor of 2.5 is from WHC-SD-W049H-ER-03, Rev.0, p. U-95 and following. It is based on a comparison of Hanford costs with industry costs. This reference will be added to the text.

REFERENCES

DOE 1992. 100 Area Soil Washing Treatability Test Plan. DOE/RL-92-51. U.S. Department of Energy. November.

Freeman, H. D., M. A. Gerber, S. V. Mattigod, and R.J. Serne 1992. 100 Area Soil Washing Bench-scale Test Procedures. PNL-8520. Pacific Northwest Laboratory, Richland, Washington. December.

Gorbitt, Robert A. 1989. Standard Handbook of Environmental Engineering. McGraw Hill Publishing Company. New York.

WHC 1988. Environmental Compliance Manual. WHC-CM-7-5. Westinghouse Hanford Company, Richland, Washington.

Response to EPA General Comment (1)

ATTACHMENT A

TEST METHODS

The test plan (100 Area Soil Washing Treatability Test Plan , DOE, 1992) was developed to to examine the soil washing reatability of 100 Area soils. This test plan was based on the general information regarding the types and concentrations of contaminants expected to be present in the 116-C-1, and 116-D-1B trenches. Based on the test plan, a detailed set of procedures were developed to conduct the characterization and a set of bench-scale tests that incorporated any addtional data that were obtained on these soils. For instance, during sampling of trench 116-C-1, it was found that the soil was coarse- textured with significant fraction of the material present as gravels. This information was incorporated into the test procedure by including autogenous grinding as one of the methods of treating gravel fractions. During the bench scale-tests, the test methods used closely followed the methods outlined in the test plan and the procedures with two exceptions. First, the test procedures included the Linear Density Gradient (LDG) method as a means of establishing specific contaminant-mineral associations. However, during the tests, it was found that the same type of information could be obtained by a combination of autoradiography and scanning electron microscopy with energy dispersive x-ray analyses (SEM-EDXA). Therefore, these alternate methods were used to obtain necessay data. Second, during bench-scale tests, to assess the effectiveness of Cs removal static leaching at ambient and at high (96 C) temperatures was used on gravel fractions from 116-C-1 (Batch II). Based on the results obtained from these tests and the chemical extraction tests, it was concluded that heap leaching (usually conducted at ambient temperature for extended time periods) experiments would not offer any improvements in Cs removal performance. Therefore, heap leaching tests on this soil was not conducted.

Finally, the method used in these tests followed very closely, the methods in the test plan and the test procedure with above noted exceptions.

Response to EPA General Comment (6)
ATTACHMENT B

DATA QUALITY

The data collection, evaluation, and analyses were conducted according to the QA Project Plan No. EES-084 (Freeman, 1983). The Data Quality Objectives (DQO) were established (Table 6.1, 6.2 QA Plan) based on performance criteria: precision, accuracy, completeness, comparability and representativeness (PARCC). According to the QA plan, initial contaminant determination was designated as EPA Level III analyses, and all other bench-scale measurements were designated as EPA Level II analyses. All data were collected acccording to the methods outlined in the Test Procedures (Freeman, 1993) by trained staff. Planned procedural deviations were documented (including justification) and approved by the Task Leader. Data outside the established criteria was documented by the task leader and appropriate corrective action that included review of data and calculations, flagging of suspect data or reanalyses of individual or entire batches of samples. All data packages were reviewed and approved by the project manager in compliance with Analytical Data Handling and Verification Procedure (Freeman, 1993).

Response to EPA General Comment (2)
ATTACHMENT C

TPL's

2.3 Target Performance Levels

One of the goals of the soil washing tests was for treated soils to meet or exceed Target Performance Levels (TPLs). Other than radionuclides, total chromium was the only contaminant of concern identified in the test plan. The TPL for total chromium was 1,600 ppm (DOE/RL 1992b). TPL's used to assess the effectiveness of treating radionuclides in soils are shown in Table 3.1. These values are different from those identified in the test plan. The rationale for the change and a summary showing differences between the two sets of values is included in Appendix A.

11.4.1 (first sentence, add)

Options presented in this section are based on meeting TPL's shown in Table 3-1. As mentioned previously, these are not cleanup levels. Appendix B discusses the relative effectiveness of soil washing if cleanup levels are higher or lower than these TPL's.

ATTACHMENT C (CONT.)
APPENDIX A

TARGET PERFORMANCE LEVELS

Target Performance Levels in the test plan are lower than those discussed in this report. This Appendix discusses the rationale for using the new values, and includes a summary of the approach used to develop the new values.

Standards from Table K-1 of the WHC-CM-7-5 Environmental Compliance were included in the test plan (DOE/RL-92-51) as test goals or TPLs for soils containing radionuclides. However, since the test plan was written Table K-1 has been deleted from the WHC manual in an attempt to avoid misleading users from planning or executing work thinking that that these were regulator approved clean up levels. When this table was deleted from the WHC manual a decision was required whether to continue to compare test results against the Table K-1 values, which now were not WHC standards and had no real basis, or to compare results using values such as the accessible soil values in Table 6.2 of the revised WHC manual.

Table K-1 values were originally selected because there was no regulatory foundation on which to base cleanup levels for radionuclides. Table K-1 was derived from "Development of Criteria for Release of Idaho National Engineering Laboratory Sites Following Decontamination and Decommissioning, " EG&G Idaho Inc., August 1986 (EG-2400). The EG&G values were for 100 mrem/y (based on a DOE 5400.5 draft), divided by four for Hanford purposes. For isotopes not listed by EG&G, but of importance to Hanford, ratios based on isotopes with the same decay schemes were used. The table was a rough, though not unreasonable, approximation, but the pathway method employed had no nationally accepted pedigree.

Two new tables were created in the WHC Environmental Compliance Manual.

Table 6.1 (inaccessible soils) reflects the on-site soil concentrations that should not cause an off-site air exposure greater than 10 mrem/yr to the maximum exposed member of the public. The purpose was to assure that on-site soils of this operating site would not cause WHC to exceed the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPs). A safety factor of 10 was built in such that in reality the calculated dose was 1 mrem/yr.

Table 6.2, is the lower of the values derived in Table 6.1 or radionuclide levels resulting in a 10 mrem/yr dose due to direct exposure for 100 hours/yr. It should be noted in comparison that the standard exposure time for the recreational scenario used in the GENII code is 53/hours per year. Also, a safety factor of 10 was built in such that in reality the calculated dose was 1 mrem/yr. (Note: The GENII code was used in the determination of the soil concentrations. For supporting references refer to WHC-SD-EN-TI-070.)

The Table 6-2 values were selected as test goals for 100 area soil washing tests because, no regulatory foundation for test goals was established, they were agreed to previously (DOE/RL 92-21, Rev. 1, "300-FF-1 Physical Separations CERCLA Treatability Test Plan"), they reflect a 10 mrem/yr EDE limit, they are consistent with DOE Order 5400.5, and they are more realistic values to achieve (some of the Table K-2 values appeared to be near or below background levels).

ATTACHMENT C (CONT.)
APPENDIX B

COMPARISONS OF SOIL WASHING EFFECTIVENESS FOR A RANGE OF PERFORMANCE LEVELS

The effectiveness of the soil washing tests conducted depends in large part on the ultimate clean up levels for the soils. In this section, test results will be compared with the TPL's in the test plan, the TPL's used in this report and a range of values both lower and higher than TPL's. If the cleanup levels are significantly lower than the TPL's it will be shown that soil washing may not meet those levels or that only a small fraction of the soils can be treated.

Since ^{137}Cs is the most difficult to treat in all of the soils tested and was the limiting factor to determine whether soils met or exceeded performance levels, this section evaluates effectiveness for ^{137}Cs levels only.

In rough terms six treatment options were identified in this report. In each of the options different fractions of the soil were treated to a given level. Because of the difference in activity levels and size fraction of soils all treatments were not applied to all batches, and it is not known whether each treatment option will be equally effective on soils from all sites. However, for purposes of this discussion it is assumed that a treatment process is equally effective for all batches tested (Eg. attrition scrubbing with electrolyte removes 47% of the ^{137}Cs in all batches).
Tables B.1, B.2 and B.3 and Figures B.1, B.2 and B.3 show specific values for each of the treatment options and soil batches.

(These Tables and discussion will be added to the text)

Control Number	100 NPL Agreement/Change Control Form	Date Submitted
68	Change X Agreement Information Operable Unit(s) 100-BC-2 OU	6/30/94 Date Approved

Document Number & Title:	Date Document Last Issued
118-B-1 Excavation Treatability Test Plan DOE/RL-94-43, Decisional Draft	N/A

Originator	Phone
J. G. Woolard	6-2539

Summary Description

A comment resolution meeting was held on 6/29/94 resolve comments received on the 118-B-1 Excavation Treatability Test Plan. The working group consisted of representatives from WHC, MACTC, and the Tri-Parties: Joan Woolard, Linda Bergmann, Jil Frain (WHC); Eric Goller(RL); Bob Scheck, Avi Tayar (MACTC); Dennis Faulk (EPA); Ted Wooley (Ecology); Jeff Ross, Joe Mollusky (PRC); Dona Jones (KEH); Jay Celorie, John April (CH2M Hill), John Olson (IT).
There is one attachment to this agreement form: resolution of regulatory comments on the 118-B-1 Excavation Treatability Test Plan. Signatures represent agreement with the resolution of comments and approval of the treatability test work scope identified in the 118-B-1 Excavation Treatability Test Plan.

Justification and Impact of Change

This agreement does not impact previous schedules or established TPA milestones.

WHC Operable Unit Coordinator	Date 6-30-94
DOE Unit Manager	Date 6/30/94
Ecology Unit Manager	Date 6-30-94
Env. Protection Agency Unit Manager	Date 6-30-94

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

EPA Comments on the 118-B-1 Excavation
Treatability Test Plan Draft A

General Comments:

The excavation treatability test plan presents an oversimplified approach to excavate previously disposed radioactive material. Reference to hazard assessments and related safety documentation is minimal and should be expanded. The proposed plan applies to shallow land burial trenches that were operational between 1944 and 1965. Based on historical information of that timeframe, radiological and chemical controls were a great deal less stringent than today's standards. Likewise, radiological detection and analytical equipment was less developed. The only indication of radioisotope quantities and activities relies on characterization done by Dorian and Richards in 1978. However, the text does not specify characterization methods used in that study. After reviewing Figure 2-1, it seems as though the 14 Dorian and Richards (1978) boreholes may not be representative of all radiological contaminated waste. Without knowing the ranges in activity levels as well as isotopic distributions, mitigative measures should be considered. The use of weather structures, contamination control huts with high-efficiency particulate air ventilation, and continuous air monitors should be considered.

Airborne radioactive emission controls are not adequately addressed. Although dust suppression will be used, volatile and semivolatile radionuclides such as tritium, carbon-14, and iodine-129 may be released. Additionally, other isotopes such as long-lived alpha emitters may contribute to emissions through aerodynamic entrainment. These emissions could pose an additional radiological burden on personnel. More information regarding emission control should be provided.

Response: Work performed around radiological sources is conducted in a very stringent and controlled manner as prescribed by a site-specific Radiological Work Permit (RWP). Personnel will not come into contact with any materials that have not been screened and/or identified. Since these procedures concern health and safety, the protocol is presented in the Test Procedures and will not be included in the test plan.

The amount of secondary waste generated through excavation is not adequately addressed. After it is exhumed and segregated, the waste will be placed back into the trench. If this waste is placed outside the trench, additional cross-contamination may result. Other secondary waste may involve personal clothing, soil liners, and decontamination materials. The estimated volume of secondary waste generation should also be provided.

Response: The handling of investigation derived waste will be addressed in the Test Procedures. Cross-contamination will be minimized to the extent possible during excavation and stockpiling.

The intent of this excavation activity is to learn and refine best practices for future remediation. Since it is intended that the 118-B-l area is to be remediated to recreational or unrestricted cleanup levels, additional sampling should be conducted. Specifically, samples from native soils below the waste should be collected and analyzed to help determine the potential for groundwater migration and partitioning of the more soluble chemicals and isotopes.

Response: For the purpose of assessing the conceptual model in terms of the depth boundary, up to 5 samples will be collected in the bottom of trenches where the field screening instruments indicate clean soil. It is not required to attempt to excavate to the trench bottom in every trench

and samples are not required in every trench. The samples will be analyzed for the list of primary contaminants as presented in the 100 Area FFS. A paragraph discussing this sampling will be added to Section 4.

Container handling methods are not clearly described in the plan. Additional types of container handling equipment should be considered for use during excavation so that container damage can be minimized. For example, a drum grappler may be useful for removing drums or smaller containers.

Response: Drums are not expected in the 118-B-1 Burial Ground and they would be considered a deviant condition. An assumption of the SOWA was that only standard excavating equipment would be used (e.g. backhoe equipped with a thumb), which is capable of removing drums from the excavation if they are encountered.

Specific Comments:

1. Page 1-1, Section 1.O, Introduction, 1st paragraph, lines 5-6. References "(Thompson, 1991) and (1991)" are not in reference list in this form.

Comment accepted. These references will be added to Section 10.

2. Page 1-1, Section 1.1. This section discusses the purposes of the test. Is (2) providing information for ERDF? Also, if other remedial alternatives are being considered in the FFS, they should be listed in this section.

Comment noted. The words "the design of burial grounds" will be deleted. Some of the information developed from this excavation test could be used for ERDF. This section includes alternatives that are supported by this treatability test plan for the 100 Area burial grounds.

3. Page 1-2, Section 1-2, 3rd paragraph. This section mentions the purposes of the test. What is said here does not appear to be consistent with the purposes laid out in section 1.1.

Comment accepted. The word "purpose" will be replaced with "goal".

4. Page 1-2, Section 1.3, 1st line. The reactors operated from 1944 through 1987 instead of 1973.

Comment accepted. The first two sentences will be revised to read: "Solid low-level radioactive wastes and other debris and trash associated with the reactor operations were disposed in 28 burial grounds in the 100 Area during the period between 1944 and 1973."

5. Page 2-1, Section 2.1, 1st paragraph, line 9. Add reference (WHC, 1994) to document number WHC-SD-EN-TI-220) as shown in reference list.

Comment accepted. The reference notation will be revised.

6. Page 2-1, Section 2.1, 1st paragraph, last sentence. The sentence implies that the 118-B-1 Burial Ground is made up ONLY of the additions. Rewrite to state that burial ground consists of original trenches plus additions.

Comment accepted. The text will be revised.

7. Page 2-1, Section 2.1., last paragraph, line 2. Reference "DOE-RL 1993b" is not on the reference list. Is this "Bergstrom and others, 1993"?

Comment accepted. This reference will be added to the Section 10.

8. Page 2-3, Section 2.1., 1st full paragraph, line 6. It is stated that the maximum activity found by Dorian and Richards was 50,000 counts. On page 4-25 of Dorian and Richards, they list a value of 80,000 (hole H, 12-14 feet) and state that the GM was "swamped" at 17 feet in the same hole.

Comment accepted. The text will be revised to reflect the maximum activity recordings described in Dorian and Richards, 1978.

9. Page 2-4, Section 2.2.3., 1st paragraph, line 6. Should the (1987) reference be "(Miller and Wahlen, 1987)"?

Comment accepted. The reference notation will be revised.

10. Page 2-6, Section 2.2.5., Bullet list of dose rates. The "descending order" does not agree with the dose rates in Table 2-4. According to the values in Table 2-4, the descending order should be:

- Aluminum tubes (6,401)
- Miscellaneous waste (1,652)
- Soft waste (234)
- Lead brick (171)
- Aluminum/boron splines (136)
- Graphite (37.1)
- Lead/cadmium poison piecEs (33.5)
- Lead sheet (7.68)
- Aluminum Spacers (O.19)
- Desiccant (neg.)

Comment accepted.

11. Table 2-2, page 2-7. The special waste inventory includes the approximate total weight of materials from tho tritium separation program. The text explains that dimensions; unit weights; and the approximate number of units for containers, pumping material, and piping material are not available. However, a total weight for each material is estimated. The table should note the assumptions or reference the source of the weight estimations for these special wastes.

Comment noted. The references used are listed at the bottom of the table.

12. Page 2-10, Section 2.2.6, 3rd paragraph

This section discusses containerized liquids. A statement is made that containerized liquids are not expected. This statement cannot be verified and contingencies should be made to deal with free liquids. Same comment applies to VOCs in the next paragraph.

Comment accepted. Aerosols will be added to the conceptual model as potential sources of VOCs and free liquids.

13. Table 3-1, page 3-1. This table presents the treatability test objectives. The handling operation should include an objective to evaluate staging methods and locations for screening, sorting, and preparing for transportation. The treatability test plan should also include the overall objectives to determine labor and equipment requirements and costs for all operations.

Comment noted. The SOWA does not include decisions or data needs related to the evaluation of staging methods and labor/equipment costs. Furthermore, it may be difficult to evaluate these aspects because the full-scale production will most likely be significantly different than the operations of this excavation test.

14. Section 3.1.1, page 3-2. The treatability test plan should identify the locations of the overburden spoil piles as well as the waste sorting and staging areas for all three excavation removal approaches.

Comment noted. At the request of the field team leader, these staging locations will be identified in the Test Procedures. However, it is expected that these locations will most likely change based on judgement in the field.

15. Section 3.1.1, page 3-2, second bullet. The text states that because the waste material has been in place for many years and is covered with several feet of overburden, the waste is assumed to be mostly compressed and stable. However, the burial grounds were not compacted, and the waste material may contain voids that add to soil instability for the top-down, over trench excavation approach. Therefore, this assumption should be modified or deleted, and caution should be exercised when operating equipment close to the edge of the excavation.

Comment noted. Based on the expected amount of cover materials over the trenches, it is expected that for the most part, the waste materials are compressed. For example, removing 10 feet of cover soil is approximately equivalent to removing the contact pressure produced by a large trackhoe. The operation of the trackhoe adjacent to the excavation and slope conditions will be monitored closely to apply field judgement regarding slope stability.

16. Section 3.1.4, page 3-5, first paragraph. The text states that a breach of a closed container could result In an uncontrolled release of a free or organic liquid and explains that waste materials with visible containers will be handled with an added level of care. The text should explain whether drums will be handled with the trackhoe bucket and thumb. Container handling procedures should be described.

Comment noted. Based upon existing information, drums are not expected in the burial ground. If drums are encountered in the excavation, they will either be removed with the trackhoe or left in place.

17. Table 3-2, page 3-9. For the quantity of cross-contamination criterion, the data requirement will be fulfilled by observing the location of uncontaminated soil relative to the trench materials. It is unclear how this will ba accomplished. The data quality column indicates relative soil density as an indication of native or fill materials. The table should clarify if in-situ density tests or field screening will be performed to determine the bottom of the burial ground and estimate crosscontamination.

    The degree to which native material is mixed into waste material will be assessed through monitoring of the nearest 6 inches averaged over the excavated section. Due to high background counts, it is unclear how monitoring equipment would discern between clean and contaminated soils. This should be assessed.

Comment noted. It is recognized that this data need will be difficult to obtain in the field. As indicated by the SOWA Attachment 2, the data collected in the field will be on a visual basis. Limited field screening and sampling will be conducted on the trench bottom when possible.

18. Section 3.4, page 3-13, second bullet. One of the analytical screening objectives is to determine whether the proposed screening methodology is appropriate. This objective should include the timing and location of field screening performed in conjunction with excavation activities, such as screening waste in-situ, within the trackhoe bucket or at a staging area.

Comment noted. An objective of the test plan is to evaluate whether field screening during waste removal can determine if the waste exceeds ERDF WAC. The timing and location of the screening operation is a part of the objective; however, this level of detail is too specific for this test plan. Additional detail will be provided in the test procedures, and field modifications will be necessary to respond to observations during implementation.

19. Section 3.5, page 3-14. The objectives for waste handling operations should include evaluating options for staging locations, spoil piles, sorting areas, and transportation preparation areas.

See response to Comment 13.

20. Table 3-3, page 3-15. The data quality objectives (DQO) for analytical screening are presented in this table. The quality of the data for greater than category 3 is 10 percent of the critical value and 10 percent of the counts per second (CPS) for transuranics (TRU). These critical values should be specified or referenced. Also, the quality of the organic vapor measurement should be specified.

    The determination of whether a given waste exceeds category 3 limits based on dose measurement is unclear. Category 3 limits are based on a given isotope's activity, not dose. Similarly, measurement of gross beta-gamma activity with a Geiger-Mueller detector does not identify individual isotopes. Although the table indicates the use of

gamma spectroscope equipment, verification for pure beta emitters such as carbon-14 and tritium should also be provided.

The text indicates that TRU isotopes will be determined by neutron detection. The text should state if this applies to passive or active measurement. Passive measurement would rely on spontaneous fission neutron contributions, whereas active measurement would apply to neutron interrogation for fissile determination. Both methods usually rely on isotopic distributions for accurate measurement. Since this waste is from post-reactor operations, it is unclear how isotopic distributions would be determined.

Comment accepted. Table 3-3 will be revised to include a footnote which reads: The critical values are either the expected dose rate or Category 3 dose rate. Figure 4-2 will be revised by replacing "CR" with "dose rate". Block 1.3 will be revised to read: "Is dose rate less than estimated Category 3 dose rate for waste type?". The text in Section 4.5 will describe how the ratios were used to develop the Category 3 dose rates. The data quality for organics screening will be included in Table 3-3. Section 4.3.1.1 will be revised to include the following: If graphite (C-14) is encountered, collect a grab sample and perform isotopic analysis to confirm assumed ratios of isotopes. Neutron detection will be performed using passive detectors.

21. Table 3-4, page 3-16. The DQOs for handling operations are presented in this table. The data quality for segregation of waste forms for visible containers should include a description of the physical condition of the containers.

    The rate of production by segregation equipment and hand sorting will be measured as the number of cubic yards segregated or sorted in a 30-minute period. This time duration seems too short to obtain a representative production rate and should be expanded to hourly and daily (8 hours) rate estimations.

Comment accepted. The description of the container will be added to the data measurement in the DQO table. Up to a 2-hour block time period duration will be monitored for production. However, shorter duration measurement periods may be used at the FTLs discretion for the following reasons:

- Production rates will vary with different materials and trench conditions, and it is expected that these will change over different time periods
- Sorting time may be limited by dose exposure and an 8 hour rate may not be possible
- Field judgement may be used to extend or shorten the time periods for measurement as deemed appropriate

22. Page 3-17, Section 3.5.2., last line. Appendix C is referenced but is not part of the document.

Comment accepted. This reference to Appendix C will be deleted.

23. Section 4.1.2, page 4-2, first paragraph. The text states that trenches P-1 and P-2 may contain liquid tritium waste that cannot be handled and should be avoided. The treatability test plan should include contingency procedures for locating and handling tritium wastes.

Comment noted. This sentence will be revised to indicate that procedures for handling tritium wastes will be developed at a later time and will not be addressed under this test plan. Work performed around radiological sources is conducted in a very stringent and controlled manner as prescribed by a site-specific Radiological Work Permit (RWP). Personnel will not come into contact with any materials that have not been screened and/or identified. Since these procedures concern health and safety, the protocol is presented in the Test Procedures and will not be included in the test plan.

Pages 4-3 and 4-4, Figure 4-1. There are many symbols on the figure that are not in the explanation (e.g., circles with letters/numbers, arrows, shading pattern). Also, the reference is given as "Bergstrom," but should be ~Bergstrom and others (1993)".

Comment accepted. The reference will changed as recommended. A legend for the GPR shading was not provided because of the difficulty in reading the map in the 11x17 format. However, the concentrations of shading was thought to be helpful in understanding the site conditions and location of the trenches.

24. Section 4.2.1.1, page 4-5, second paragraph. The text states that the cut slope angle will be determined during the test procedures and will be a function of depth, materials encountered, and top of trench loading/access conditions. The initial slope angle should be specified and be consistent with standard excavation practices (1V:1H).

Comment not accepted. A safe and adequate cut slope will be determined in the field by the field team leader based on observations of the cut slope during excavation.

25. Table 4-1, page 4-7. For cross-contamination the table states that if cross-contamination depths under similar conditions do not vary more than 6 inches after four measurements, the frequency of estimates will be reduced to once per trench. Clean soil/waste interface estimates should be performed on all side walls and excavation bottom despite previous estimations to minimize cross-contamination and waste generation.

Comment noted. The purpose of this type of contingency plan is to reduce number of observations of any data need that is not changing significantly and subsequently not impacting the decision that needs to be made.

26. Section 4.2.2, page 4-9, fourth paragraph. The text indicates that analytical screening will be conducted during bulk removal. However, it is unclear if radiological and chemical screening would also be conducted during segregation as well. As a result of concerns raised in the general comments regarding radiation exposure, continuous monitoring and screening should be an ongoing effort.

Comment noted. Work performed around radiological sources is conducted in a very stringent and controlled manner as prescribed by a site-specific Radiological Work Permit (RWP). Personnel will not come into contact with any materials that have not been screened and/or

identified. Since these procedures concern health and safety, the protocol is presented in the Test Procedures and will not be included in the test plan.

27. Section 4.2.2, page 4-9, last paragraph. The text states that after 10 percent of the total planned volume is excavated, bulk removal could be performed using the side approach. The side approach could be used until 20 percent of the total planned volume is excavated and then five combinations could be used to excavate the remainder of the trench. Depending on the production rate, the frequent changing of excavation procedures may make it difficult to evaluate individual approaches. It is suggested that each trench be divided in thirds for the three excavation approaches to obtain a more representative evaluation duration.

Comment noted. The text describing the conceptual excavation approach was intended provide an understanding of how the test will proceed. However, the actual implementation will most likely be different in some way to accommodate field decisions necessary to maximize safety, maximize the outcome of the test, and minimize contamination. Each excavation approach will be performed for a sufficient duration to reasonably evaluate the approach comparatively.

For example, the three excavation approaches are presented in the test plan; however, the two approaches which operate from above the trench are very similar. If during the treatability testing it is determined that there is no discernable difference between the two approaches only one will be evaluated from then on. Therefore, at this planning stage, we can only conceptualize the specifics of the treatability testing realizing that adjustments, modifications, and changes will occur in the field in response to observations.

28. Table 4-2, page 4-11. The table states that if waste is not identifiable and may be greater than Category 3, the operational decision will be to perform additional radionuclide screening or the material will be ignored. Unidentified wastes should be characterized while accessible, not ignored.

See response to Comment 34. In Table 4-2, the phrase "or ignore material" will be deleted. On a case by case basis, attempts may be made to screen unidentifiable materials.

29. Section 4.3, page 4-12, first paragraph. The text states that information from Miller and Wahlen (1987) would suggest that 118-B-1 burial ground does not contain greater than Category 3 waste. It has been previously stated that the only source of empirical radiological data comes from analysis by Dorian and Richards (1973). Without conducting analysis of their own, it is unclear how Mills and Whalen's information could be used to make that claim. This should be clarified.

Comment accepted. Miller and Wahlen relied on the Dorian and Richards data along with knowledge of reactor operations to arrive at their estimates. The link between Miller and Wahlen and Dorian and Richards will be discussed in the text.

30. Section 4.3, page 4-12, fifth bullet. The text states that alpha-emitting radionuclides will not approach Category 1 limits. However, historical data are not presented to support this claim. TRU wastes were not defined at the time wastes were placed in the trenches. Therefore, it appears unlikely that controls would have been in place to 1) prevent TRU

waste from entering the trench, and 2) measure transuranic activity levels greater than 100 nanocuries per gram. This issue should be addressed.

Comment noted. The Miller and Wahlen document (using Dorian and Richards data) shows that TRU isotopes are not above Category 1 limits, and that TRU isotopes were not routinely placed in burial grounds; therefore, TRU waste is not expected. For further information, please read the Dorian and Richards report. On page 4-12, a sentence with be added to the fifth bullet: As shown in Figure 4-2, neutron detection is used as a primary screen for TRU.

31. Page 4-12, Section 4.3., 1st paragraph, lines 5 and 6. Graphite and aluminum process tubes are listed as the only waste types that exceed Category 1. However, Table 4-3 lists the Category 1 limit for C-14 to be 4.0 E-02 and Table 2-3 lists desiccant as having C-14 of 0.044. Also, two radionuclides are listed in Table 2-3 (Eu-154 and Ag-108) but not in Table 4-3.

Comment accepted. The dessicant exceeds Category 1 limits. The text will be changed. Eu-154 and Ag-108 do not have Category 1 or Category 3 limits.

32. Figure 4-2, page 4-15. The figure shows the 1a.2 decision block that questions if identification of the waste type is possible. If no, it is stated that radiological procedures screening is required and the methodology will be defined in the field procedures. The radiological screening methods should be described in the test plan since waste classification is a critical objective of the treatability test.

Comment accepted. Additional information will be provided in the test procedures.

33. Figure 4-2, pages 4-15 and 16. Step 1.2 refers to Table 2-4. As discussed previously, the verification of individual isotopes to less than Category 3 limits through dose rate analysis is not justified. Likewise, step 1.3 refers to Table 4-5 dose rates. Again, it is unclear how a Category 3 dose rate would be determined. Radiological alteration, self-absorption, and heterogeneity of waste densities makes isotopic determinations almost impossible. This issue should be addressed.

Comment accepted. The considerations listed are true; however, process knowledge (i.e. Dorian and Richards and Miller and Wahlen) allow estimation of the dose rate from each type of waste (through MICROSHIELD). Thus, if a single waste form is present, then the limits and rates presented are applicable. If the waste form is a mixture, than individual pieces must be screened. The text will be expanded to discuss this aspect.

34. Table 4-4, page 17, Step 1a.3. Step 1a.3 states that if materials contain radionuclides greater than Category 3 is located, operations will cease until DOE and the regulators are contacted. Work should continue and efforts made to work around this material.

Comment accepted. The following will be included in the text: If Category 3 is encountered, work would stop at that location, the material would be covered if necessary, the stakeholders would be notified, and work would proceed at another location if possible.

35. Section 4.3.1.1, page 4-20, last paragraph. The text states that if radionuclide monitoring during bulk removal measured dose rates will be compared to Category 3 dose rate for

each waste type as shown in Table 4-5. Bucketloads of material may be screened against a single dose rate (110 mR/h based on graphite) to expedite screening. However, if multiple waste types are screened simultaneously, screening levels for Category 3 may be exceeded and the waste categorized incorrectly. Radiological screening of Category 3 materials should be confirmed after segregation/sorting.

Comment noted. The 110 mR/hr is based on a loader bucket-full of graphite and corresponds to the lowest Category 3 limit (dose rate). This number was specified with the understanding that a radiation detection expert on site at all times to ensure that the appropriate limits are used. Radiological screening will be performed during/after sorting; however, some waste will not be sorted, thus another method is necessary for screening.

36. Section 4.3.1.2, page 4-22, last paragraph. The text states that initially all containers will be opened, however, once sufficient information is gathered on a type of container, the frequency of sampling may be reduced to 10 percent. This will not be consistent with the full-scale operation or give an indication of the total volume of liquids requiring treatment. It is recommended that all containers be visually inspected, screened and sampled, if necessary.

Comment noted. The purpose of limiting the number of containers was to focus the treatability test on excavating, screening, segregating, and sorting; as opposed to opening and characterizing containers. It is also recognized that this test excavation may not be necessarily consistent with a full-scale operation.

37. Section 4.4.1, page 4-24, second paragraph. The text states that if a large number of waste containers is found with liquid, the excavation activities will cease. The rationale for this should be provided. Quantifying numbers of containers with free liquids is an important part of the project.

Comment noted. Finding containers with free liquids is considered a deviant condition. The purpose of limiting the number of free liquids containers is to focus on the SOWA test objectives.

38. Section 4.4.2, page 4-24, first paragraph. The text states that sorting equipment is not specified for the sorting test. However, the use of a grizzly screen, stationary disk screen and bucket disk screen is described on page 4-27. The text should state that at a minimum these three types of sorting equipment will be tested and other equipment or modification may be tried to optimize sorting efficiency or rate. Also, the text indicates that the sorting test should be considered a pilot test to evaluate the effectiveness rather than a demonstration text to evaluate production rates and material handling. However, the sorting production rate is a critical element of the entire process and production from the sorting methods should be quantified and evaluated and included as a test objective.

Comment noted. There is more uncertainty associated with the sorting of this waste than with any of the other test objectives. For example, some of the uncertainties include the following: what are the major types of materials that will require sorting, is sorting necessary (in addition to segregation), what equipment will work the best, and, will this test equipment provide sufficient information for a full scale operation. Therefore, the test plan is focused on evaluating the

effectiveness of a piece of sorting equipment judged to be the most appropriate based on existing information and the conceptual model.

39. Section 4.4.2, page 4-27, first paragraph. Waste found with unacceptable radioactivity levels may have to be handled. Likewise, containers found with free liquid may also be handled and stored. Therefore, these activities should be evaluated in the test program.

Comment noted. Materials found that are greater than Category 3 will not be handled, as discussed in response to Comment 34. Free liquids will set aside and handled as investigation derived waste, as stated in the SOWA Attachment 1.

40. Section 4.5.1, page 4-30. In addition to documenting the location of waste materials replaced in the burial ground, some marker or indicator should be placed at the clean soil/waste interface to facilitate excavation efficiency during final remediation.

Comment accepted. At the field team leaders discretion, a marker may be placed in the trench to identify the bottom or side of the trench for future reference. The Test Procedures discuss the placement of markers or plastic sheeting in the trench.

Distribution
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
June 30, 1994

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Mark Hanson	PNL (K1-51)	Bill Stillwell	PNL (K1-30)
Roy Gephart	PNL (K1-22)	Ben Johnson	PNL (K1-78)

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