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Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
2440 Stevens Center, Room 2200, Richland, Washington
February 23, 1994

FROM/APPROVAL: Eric D Goller Date 3/31/94
Eric D. Goller, 100 Area Unit Manager, RL (A5-19)

APPROVAL: Date 3/31/94
Jack W. Donnelly, 100 Aggregate Area Unit Manager, WA Department of Ecology

APPROVAL: Dennis Faulk Date 4-5-94
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	-	December Unit Manager's Meeting 100 Area Status Package
Attachment #6	-	January Unit Manager's Meeting 100 Area Status Package
Attachment #7	-	February Unit Manager's Meeting 100 Area Status Package
Attachment #8	-	Groundwater Investigations Associated with the 100-K Area Fuel Storage Basins
Attachment #9	-	Preliminary Waste Acceptance Criteria
Attachment #10	-	100 Area Soil Washing Test Schedule
Attachment #11	-	Solidification/Stabilization Treatability Tests
Attachment #12	-	Figure 4-1 Chromium Concentrations in the 100 D/DR Area Groundwater
Attachment #13	-	Treatment Tests for the Removal of Uranium, Chromate and Nitrate from 100 Area (100-HR-3) Groundwaters
Attachment #14	-	100-HR-3 Biodenitrification Treatability Study
Attachment #15	-	Regulatory Comments: 100-KR-4 LFI and QRA, Letter from U.S. EPA to U.S. DOE dated February 23, 1994
Attachment #16	-	100-BC-2 OU LFI Vadose Investigation (116-C-2A) Validated Data Memorandum
Attachment #17	-	116-DR-7 Inkwell Crib Data Validation Report Memorandum

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Prepared by: Kay Kimmel Date: 3/31/94
Kay Kimmel, Bob Scheck GSSC (B1-42)

Concurrence by: Date: 3/31/94
Bob Henckel, WHC 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
February 23, 1994

1. **SIGNING OF THE NOVEMBER 100 AREA UNIT MANAGER'S MEETING MINUTES** - Minutes were reviewed and approved with minor changes. Unit Managers agreed to cancel the December 1993 meeting due to holiday schedules and January 1994 meeting due to DOE's nation-wide stand-down meetings.

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.

3. **NEW ACTION ITEMS:**

   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

4. **100 AREA ACTIVITIES:**

   100 Area Status

   - Operable Unit Status: Attachments #5, #6 and #7 were provided for general information on the 100 Areas Operable Units.

   - 100-NR-1 Operable Unit: Suspension of work on the QRA and LFI as noted in the 100 Area Unit Managers Meeting December Status Package was contrary to TPA negotiations. A footnote to that effect has been added to the page in question (see Attachment #5). It was agreed that, temporarily, the 100-NR-1 and 100-NR-2 OU managers would meet separately from the other 100 Area meetings until the 100-N Pilot Project is finalized.

   - Focused Feasibility Studies: Discussions on the focused feasibility studies are tentatively scheduled to be held within the next two weeks.

   - Status on 100-K Drilling: Robert Peterson and Bruce Williams presented the groundwater investigations associated with the K Areas (see Attachment #8). This investigation work is being monitored through operations and not through the CERCLA OU. R. Peterson indicated the purpose of this drilling project is to determine if the groundwater quality is being impacted. Further objectives include: determining the influence of the basins on groundwater, direction and rate of groundwater flow; provide improved groundwater monitoring capability; integrate with other sampling and analysis programs. R. Peterson indicated that the K-east fuel storage basin is of greater concern since it contains elevated tritium concentrations. B. Williams indicated the objectives on three proposed wells are to characterize sediments, vadose zone and saturated zone; and determine groundwater characteristics. He indicated that some radiation was

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detected in the upper aquifer which tapered off after 20 feet.

- ERDF Early Development Process: Bryan Foley presented the preliminary waste acceptance criteria for ERDF (see attachment #9). He indicated the criteria are used during the permit (CAMU) application process and the permit is currently in draft form. He would like to finalize the criteria by the end of this month and requested anyone with pertinent information could contact him. The permit is currently scheduled to undergo public review in June. An estimated two square miles will be required immediately for waste disposal. Currently, the ERDF is expected to be able to place bulk soils and containerized waste. Trenches will be opened by cell based on the amount of waste expected each day. A batch plant is being designed to process waste into a form which would prevent subsidence. B. Foley indicated that waste water from the operable units may be used to process this waste. Issues raised include: waste placement; leachability requirements; bulk soils acceptance; types of packaging. The discussions surrounding the information presented led to a request for a separate meeting to discuss waste acceptance criteria and estimated quantities (see Action Item 1AAMS.19).

ERA Activities

- Pickling Acid Crib: Paul Valcich provided the status, indicating that the proposed plan and the feasibility study are still under review. These documents will be provided to the regulators in mid-April.

- Riverland: Paul Valcich stated there is no indication of groundwater contamination. The assessment report and proposed plan are basically complete, however, the ordnance survey is delaying their release. The proposed plan is scheduled for public review in September 1994.

- Sodium Dichromate: The proposed plan is complete, however, it may be combined with the riverland and pickling acid crib proposed plans for the public review cycle.

- N-Springs: Public meetings are scheduled for February 28 at Hood River, March 2 at Richland for the engineering evaluation/cost analysis (EE/CA) and proposed plan. There are two preferred alternatives stated in the EE/CA.

- River Pipelines: Paul Valcich indicated that the EE/CA will undergo a WHC review in April.

100 Area Treatability Studies

- 116-F-4 Crib Lab/Bench Scale Soil Washing Treatability Study: Jim Field provided the soil washing update (see attachment #10). He noted the preliminary data provided is analyzed after wet sieving with no treatment, unless stated otherwise. He indicated a need for more studies using the autogenous grinder. Although flowcharts for 116-D-1B were provided in the attachment, J. Field indicated the scope and objectives of 100-DR-1 soil washing would be discussed at a meeting scheduled for March 2 at 8:00 a.m.

- Results of the Crucible Vitrification Tests Conducted by PNL: John Ludowise led a discussion on Solidification/Stabilization Treatability Tests (see Attachment #11). The prime objective of these treatability tests is to produce a durable waste form both in terms of strength and leachability. The information from these tests should be applicable to the ERDF batch plant.

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- Groundwater Treatability Bench-Scale Studies: Dick Biggerstaff provided an introduction to the ion exchange and biodenitrification studies (see Attachment #12). In the course of these tests, a concern was raised regarding nitrate treatment. Nitrate contamination levels are more significant in the 200 Areas, therefore treatability tests for nitrates will be emphasized there, not the 100 Area, and it was agreed that the 100 Area studies would not include nitrate treatment.

  - Mark Beck presented a summary of the 100-HR-3 groundwater treatability test report for uranium, chromate and nitrate removal. This is now available as a supporting document, WHC-SD-ER-DTR-001 (see Attachment #13).

  - Brent Peyton presented the 100-HR-3 groundwater biodenitrification treatability test results (see Attachment #14).

  D. Biggerstaff closed the discussions and summarized the results of the treatability studies and indicated how they could be implemented in the field. Informal copies of the final reports on each of these studies were provided to the regulators.

5. INFORMATION:

- Treatability Studies: A meeting will be scheduled to discuss the implications of the treatability studies and to develop implementation strategies.

- Contacts for the various 100 areas were noted: BC is Jim Roberts; D is Naik Naiknimbalkar; F is Jeff Ayres; H is Dick Biggerstaff; K is Alan Krug; Treatability Studies is Joan Woolard.

6. NEXT MEETINGS: The next meetings are scheduled for March 30 and 31, 1994.

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100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
February 23, 1994

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PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
G. I. Goldberg	DOE-RL	100-D UM	376-9552
N. HEPNER	ECOLOGY	ERDF	736-3048
[illegible]	Ecology	100	736-3029
[illegible]	Ecology	100 Area	736-3012
W Soper	Ecology	100 Area GW	736-3049
Eric Goller	DOE-RL	100-BC, K, H, and F UM	376-7326
BOB SCHECK	DAMES+MOORE	GSSC-CERCLA	946-3688
Richard Biggerstaff	WHC	KR-4, HR-3	376 5630
John Ludowise	WHC	Treatability Studies	376-6470
ROBERT P. HENCKEL	WHC	100 Area	376-2091
Tom JONES	PNL	PROGRAM OFFICE	373-6611
RueAnn Thomas	WHC	Program office	373-5132
BA WILLIAMS	WHC	100 AREA [illegible]	376-3416
JG Field	WHC	Treatability	376-3753
Dave Holland	Ecology	UM	736-3027
Brian Drost	USGS	EPA Support	206-593-6510
Larry Gadbois	EPA	UM	376-9884
Dennis Faulk	EPA	UM	376-8631
Jim PATTERSON	WHC	Program Office	376-0902
Alan D. Krug	WHC	100NRI	376-5634
KAY KIMMEL	MACTEC/D&M	RL SUPPORT	946-3692
Gary Freedman	Ecology	100 Area UM	736 3026
Jack Donnelly	Ecology	100 Area Supervisor	736-3013
Paul VALcich	WHC	ER	376-6686
Paul Beaver	EPA	Unit Mgr	376-8665

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Attachment #2

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
February 23, 1994

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PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
SHAS MATTIGOD	PNL	100 AREA SOILWASH	376-4311
RON BELDEN	WHC	100 AREA SOILWASH	372-1226
Jeff Ross	PRC-EMI	EPA Support	206/624-2692
BRENT M PEYTON	PNL	100 AREA BIODENITRIFICATION	376-0537
R. JEFF SERNE	PNL	100 AREA Soil Wash	376-8429
M.J. LAUTERBACH	WHC	N-Springs	376-5257
B.L. FOLEY	DOE-RL	100 N R1 & 2 UM	376-7087
D.L. Sickle	WHC	ER-Support	372-3141

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Attachment #3
Agenda

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
February 23, 1994

100 Area General Discussions

* 100 Area Status - R. Henckel
  - Status on 100-K Drilling - R. Peterson, B. Williams
  - ERDF Early Development Process - B. Foley

* ERA Activities - R. Henckel
  - Pickling Acid Crib
  - Riverland - P. Valcich
  - Sodium Dichromate
  - N-Springs
  - River Pipelines - P. Valcich

* 100 Area Treatability Studies
  - Status on 116-F-4 Crib Lab/Bench Scale Soil Washing Treatability Tests - J. Field
  - 100-D Area Pilot Scale Soil Washing Tests - Scope and objectives - J. Field
  - Results of the Crucible Vitrification Tests Conducted by PNL - J. Ludowise
  - GW Treatability Bench-Scale Studies - M. Beck, B. Peyton

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

Action Item Status

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Attachment #4

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
February 23, 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 (02/23/94).
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 (02/23/94).
1AAMS.18	Provide to EPA and Ecology all available shoreline site maps at a scale of 1:2000 by the October UMM. Action: Eric Goller, Bob Henckel	Open 09/29/93. Closed 11/17/93.
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.

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100 Area Unit Managers' Meeting

December Status Package

December Unit Managers' Meeting
100 Area Treatability Studies

100-HR-1 Excavation Treatability Test

The 100 Area Excavation Treatability Study field activities have been completed, which successfully met TPA interim milestone M-15-05B (November 30, 1993). The excavation reached a final depth of 18 feet. The area around the original vadose borehole was excavated down to approximately 26 ft to remove any potential contamination associated with it. Six verification samples were taken as agreed to by RL, EPA, and Ecology. Approximately 540 cubic yards of contaminated soil were placed in the TerraStor storage unit filling it to capacity. The final cover was placed over the TerraStor on November 24th, 1993. The excavated hole has been back-filled and the surface was recontoured.

A large percent of the laboratory data has been received. The data is currently being compiled and will be correlated with the field screening results. Preparation of the 100 Area Excavation Treatability Study Report has been initiated and is schedule for completion May 31, 1994.

Soil Washing

Soil washing data obtained to date was presented at the November UMM meeting. A report of the 100-B/C and 100-D tests is being prepared and scheduled to be delivered to EPA and Ecology by January 31, 1993. A meeting to present cost/benefit evaluations, flowsheets, and to discuss the 100-DR-1 treatability test is scheduled for Dec. 17, 1993.

100-F soils sieving and characterization is in progress. No analytical data has been received to date.

100-HR-3 Groundwater Treatability

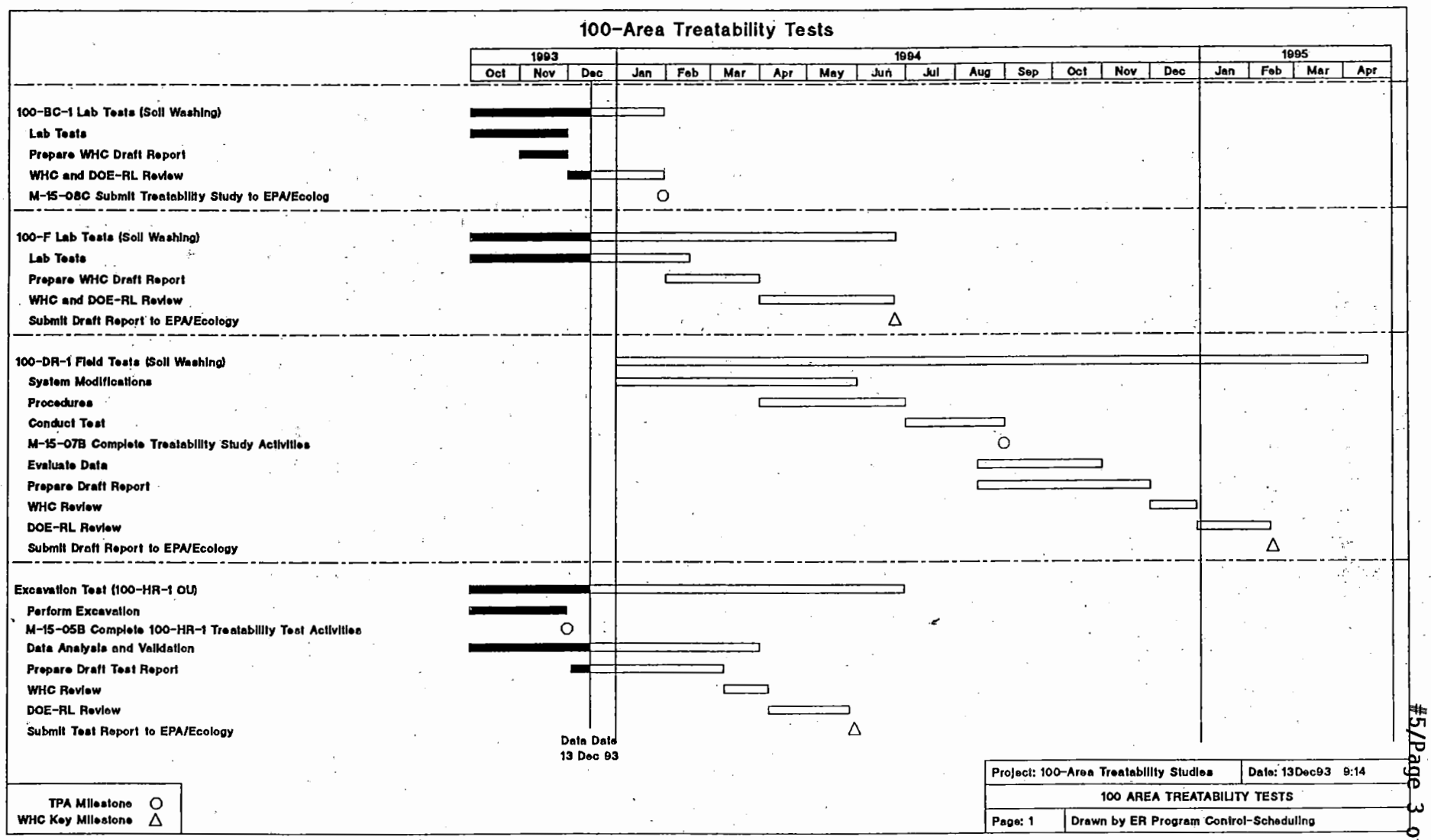
STATUS:

Biodenitrification:

Comments from DOE-RL have been received and incorporated into the report. The report is going through editing and PNL clearance.

Chemical Precipitation/Ion Exchange:

Comments from WHC have been incorporated and the report has been sent to DOE-RL for review and comment.



100-BC-1 SOURCE OPERABLE UNIT WORK SUMMARY
December 10, 1993

Task 11 - Qualitative Risk Assessment:

The final document was delivered to EPA and Ecology on July 31, 1993. Comments were received from EPA and have been dispositioned.

Task 13 - Limited Field Investigation (LFI) Report:

The final document was delivered to EPA and Ecology on July 31, 1993. Comments were received from EPA and have been dispositioned.

100-BC-2 SOURCE OPERABLE UNIT WORK SUMMARY

RI/FS Work Plan:

Regulator comments have been incorporated, and the schedule has been updated.

Field Activites:

Vadose drilling at the 116-C-2A pluto crib is complete. Sample data have been validated.

Validation Report:

The validation report for the 100-BC-2 borehole (116-C-2A Pluto Crib) was delivered on December 7, 1993.

100-BC-5 STATUS

- 1ST QUARTER (JULY), 2ND QUARTER (OCTOBER), 3RD QUARTER (JANUARY), 4TH QUARTER (APRIL), 5TH QUARTER GROUNDWATER SAMPLING COMPLETE. SAMPLING WILL BE ON A SEMI-ANNUAL BASIS STARTING IN OCTOBER 1993.

- SAMPLE VALIDATION REPORTS FOR DRILLING SAMPLE DATA AND 1ST QUARTER GW SUBMITTED DECEMBER 31, 1992

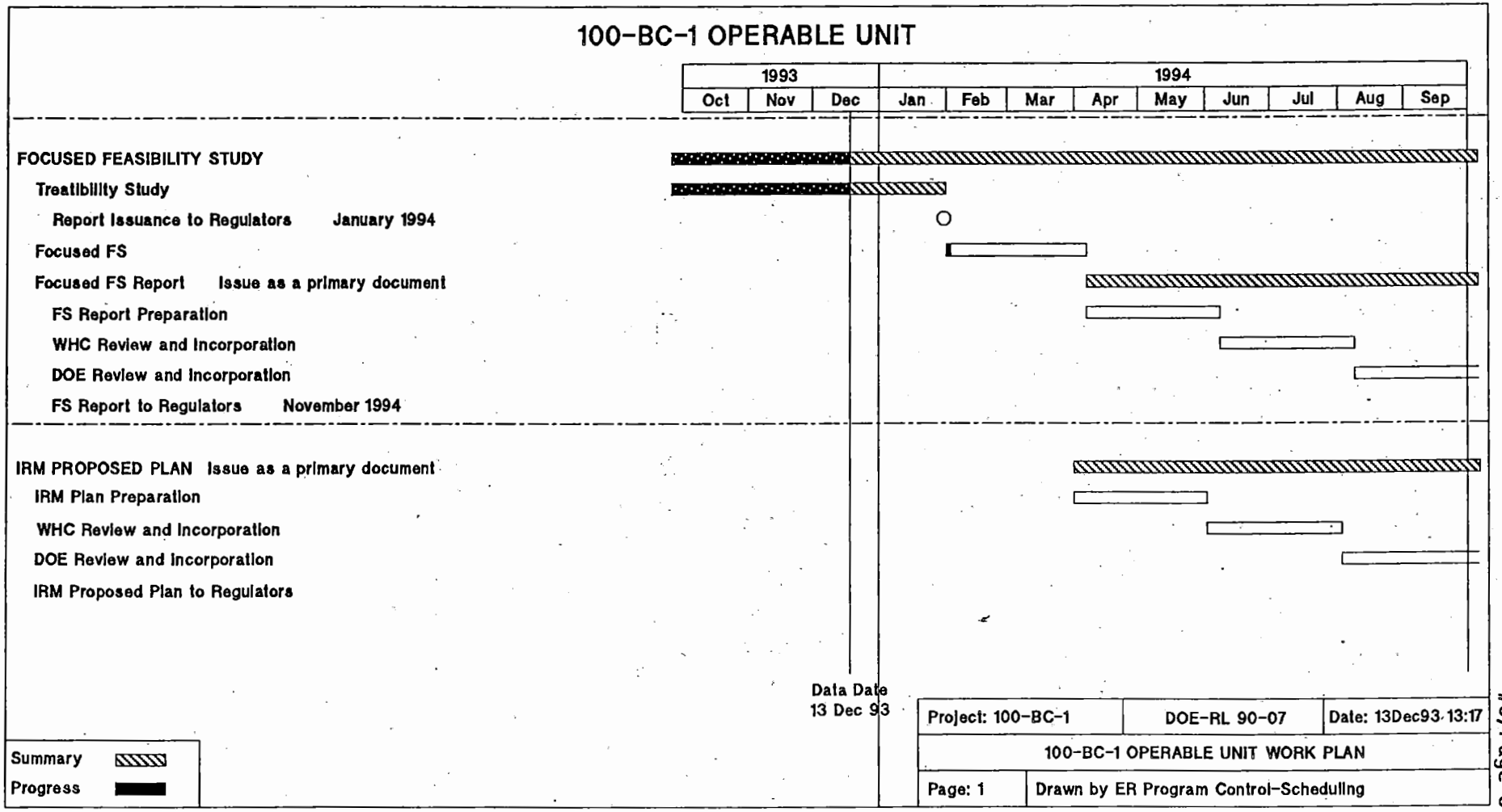
- SAMPLE VALIDATION REPORT FOR 2ND QUARTER GW SUBMITTED APRIL 14, 1993

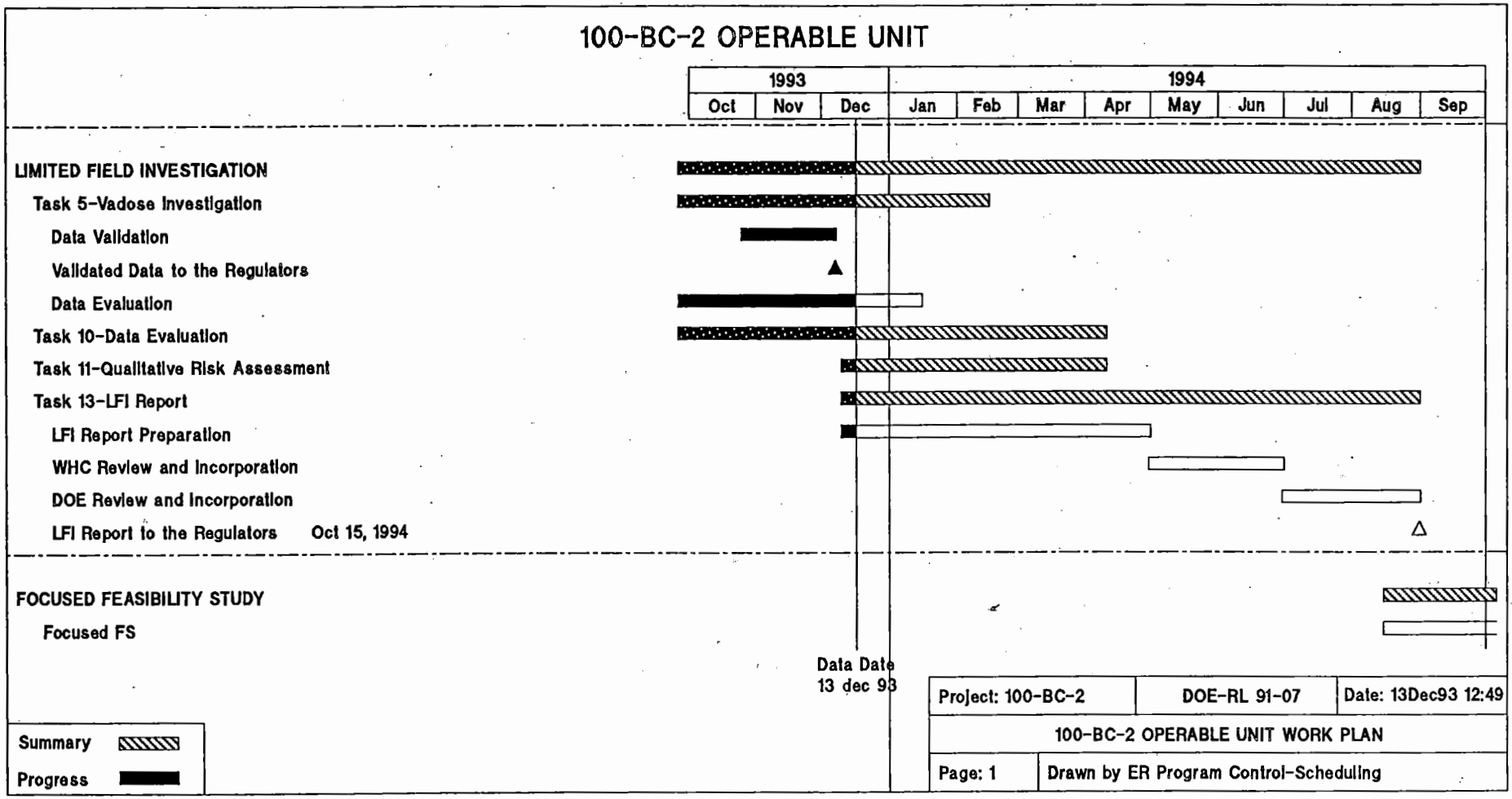
- SAMPLE VALIDATION REPORT FOR 3RD QUARTER GW SUBMITTED JUNE 1, 1993

- SAMPLE VALIDATION REPORT FOR 4TH QUARTER GW SUBMITTED AUGUST 27, 1993

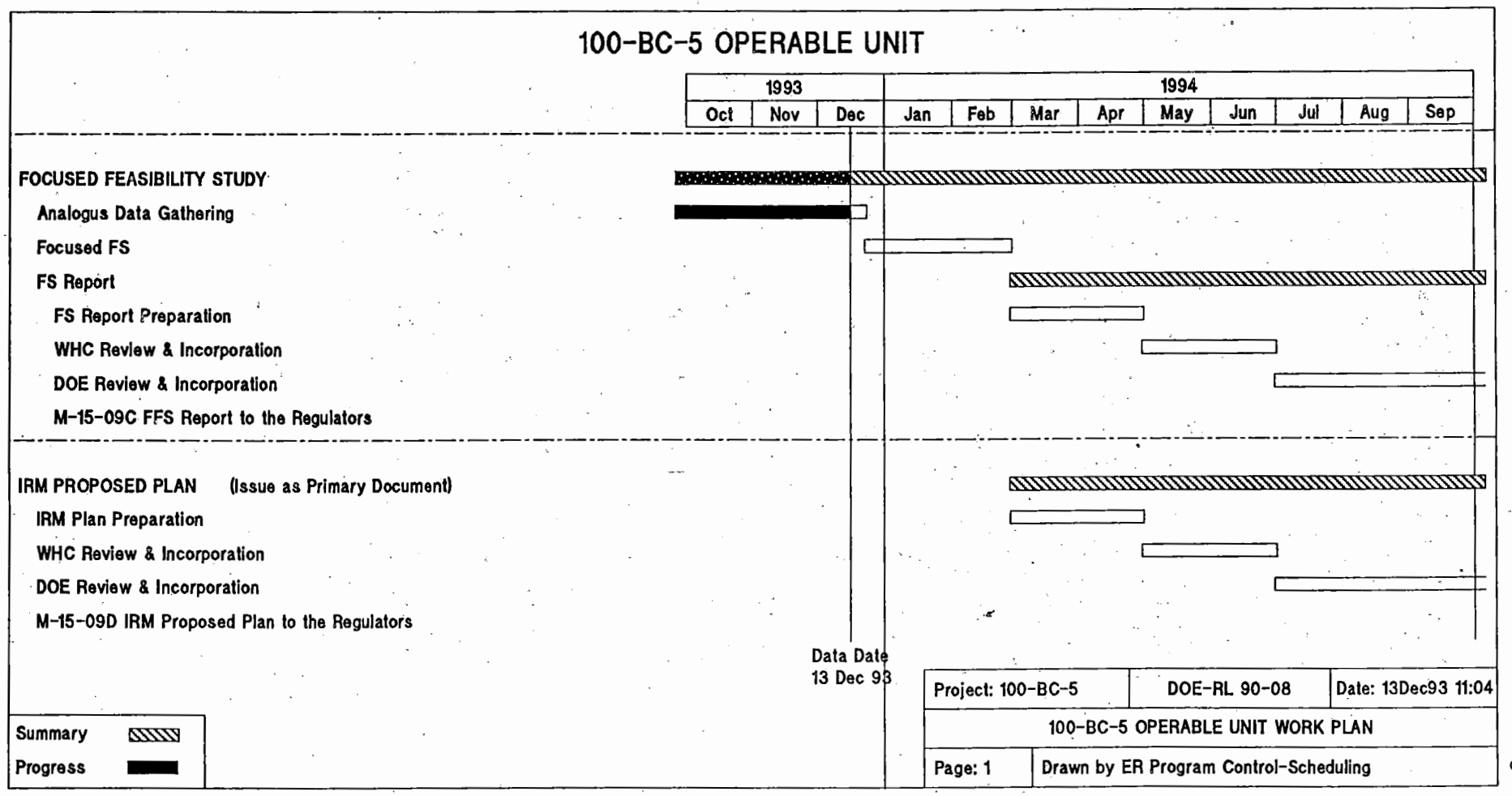
- LFI AND QRA REPORT SUBMITTED AUGUST 30, 1993
  - COMMENTS WERE RECEIVED FROM EPA AND HAVE BEEN DISPOSITIONED

100-BC-1 OPERABLE UNIT





100-BC-5 OPERABLE UNIT



FY 1993 ACTIVITIES FOR 100-KR-1

DECEMBER 1993 STATUS REPORT

N.M. Naiknimbalkar

o 100-KR-1 QRA and LFI Reports

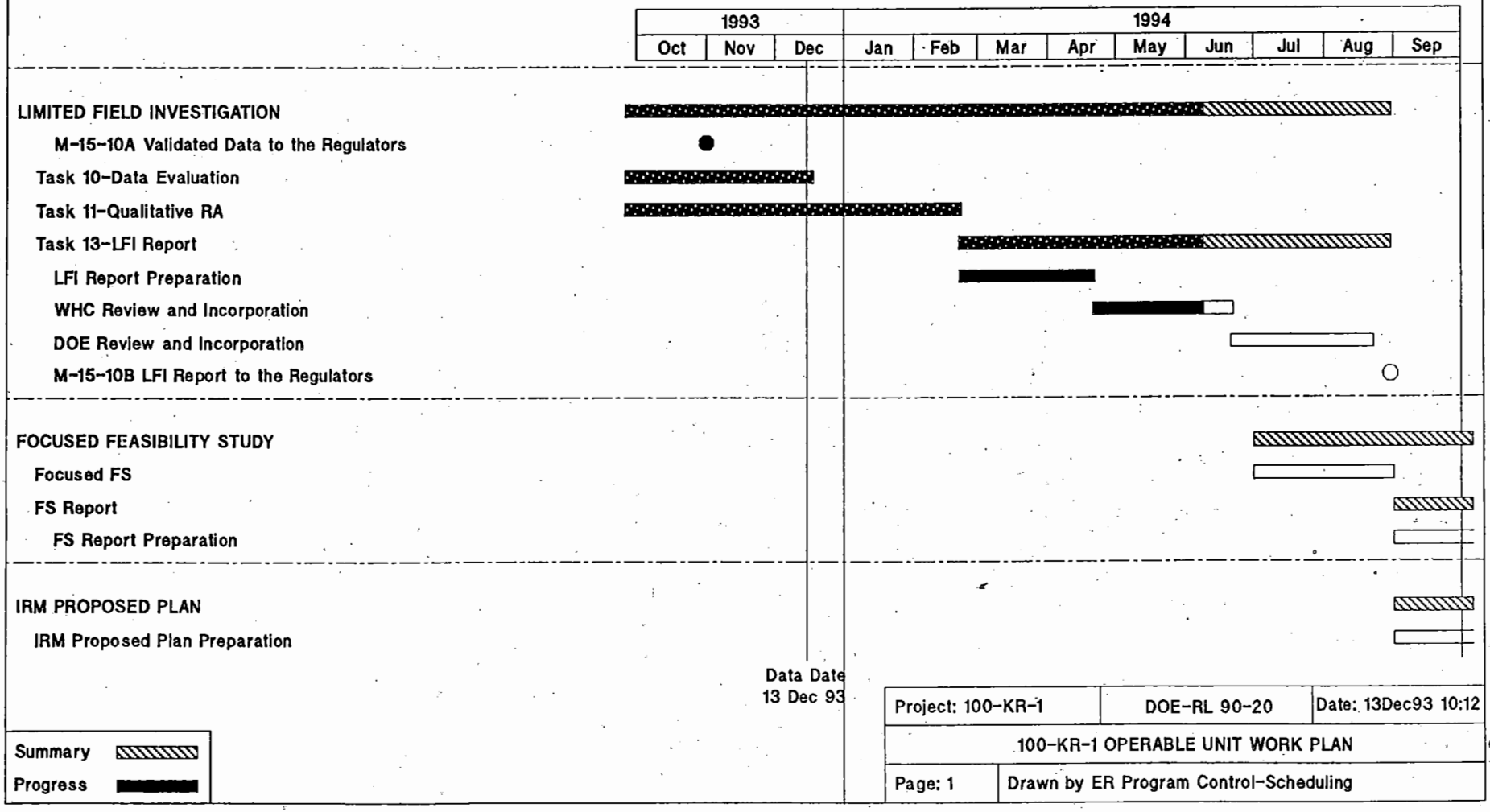
TASK 11: 100-KR-1 QRA (WHC-SD-EN-RA-009, Rev. 0) has been reviewed by Westinghouse Hanford Company (WHC) and the comments are being resolved for incorporation into the document.

TASK 13: 100-KR-1 LFI (DOE/RL 93-78 WHC Internal) draft has been reviewed by Westinghouse Hanford Company (WHC) and the comments are being resolved for incorporation into the document.

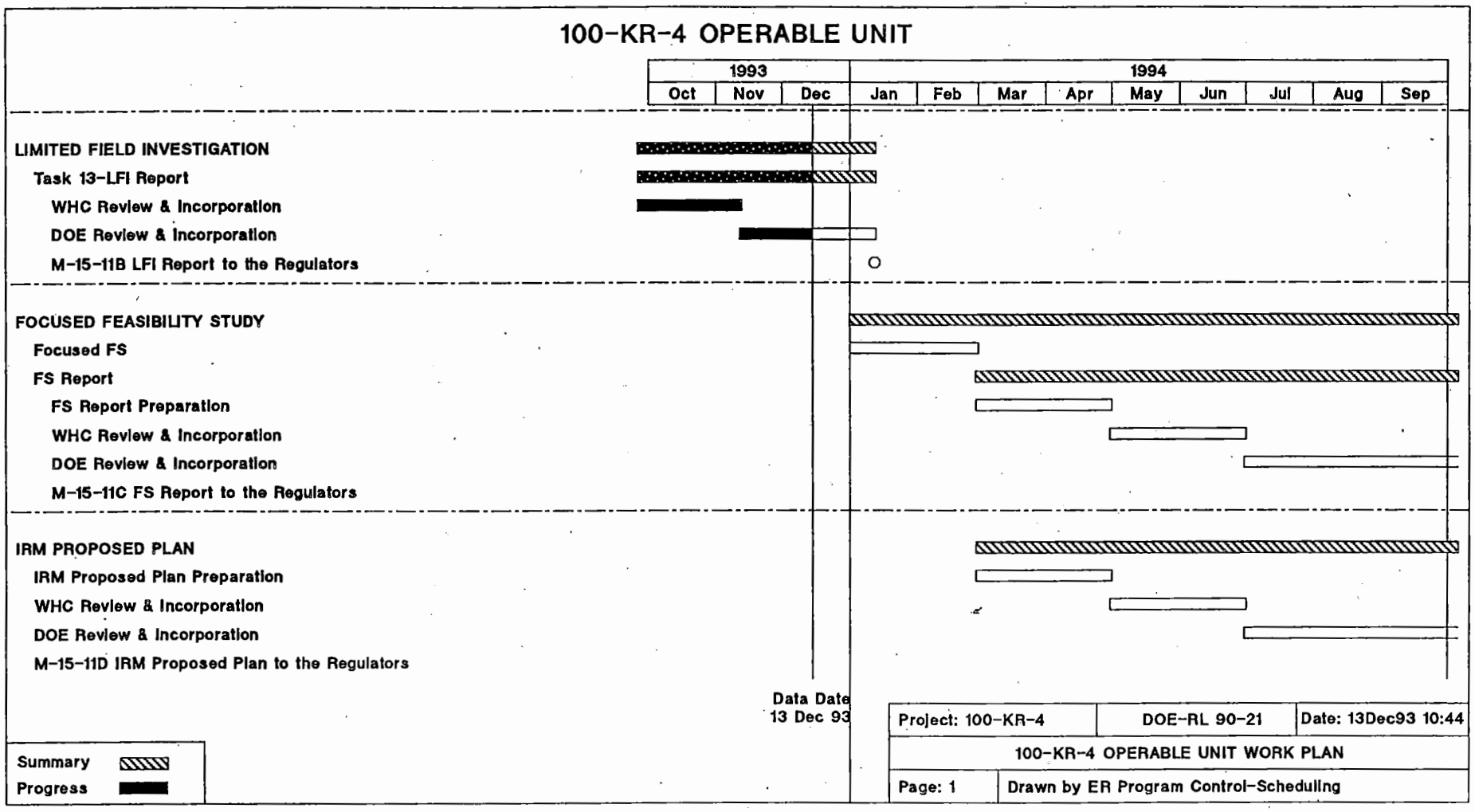
100-KR-4 STATUS

- WHC responses to RL and HQ DOE comments on the Limited Field Investigation Report (November 12th submittal) were submitted to DOE for for review and approval on December 15.
- A reduced analyte list for 5th Round groundwater sampling was submitted to DOE, USEPA and Ecology for review, comment and approval.
- WHC is currently responding to RL and HQ DOE comments on the Qualitative Risk Assessment Report (November 19th submittal).

100-KR-1 OPERABLE UNIT



100-KR-4 OPERABLE UNIT



N AREA

100-NR-1 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

100-NR-1 Qualitative Risk Assessment

- A draft of the QRA Report is undergoing Westinghouse review. Review comments will be collected, but not responded to at this time. Future work on the QRA is suspended*, awaiting further guidance from the Pilot Project discussions.

100-NR-1 Limited Field Investigation Report

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended*, pending further guidance from the Pilot Project discussions.

100-NR-2 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

100-NR-2 Limited Field Investigation Report

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended*, pending further guidance from the Pilot Project discussions.

100-NR-2 Qualitative Risk Assessment

- A draft of the QRA Report is undergoing DOE review. DOE-HQ comments have been received. DOE-RL comments are on hold, pending completion of the LFI Report. Review comments will be collected, but not responded to at this time. Future work of the QRA is suspended*, awaiting further guidance from the Pilot Project discussions.

* The stopping of work on these activities is not in accordance with the ground rules established for the Tri-party Agreement negotiations and does not have the concurrence of Ecology and EPA.

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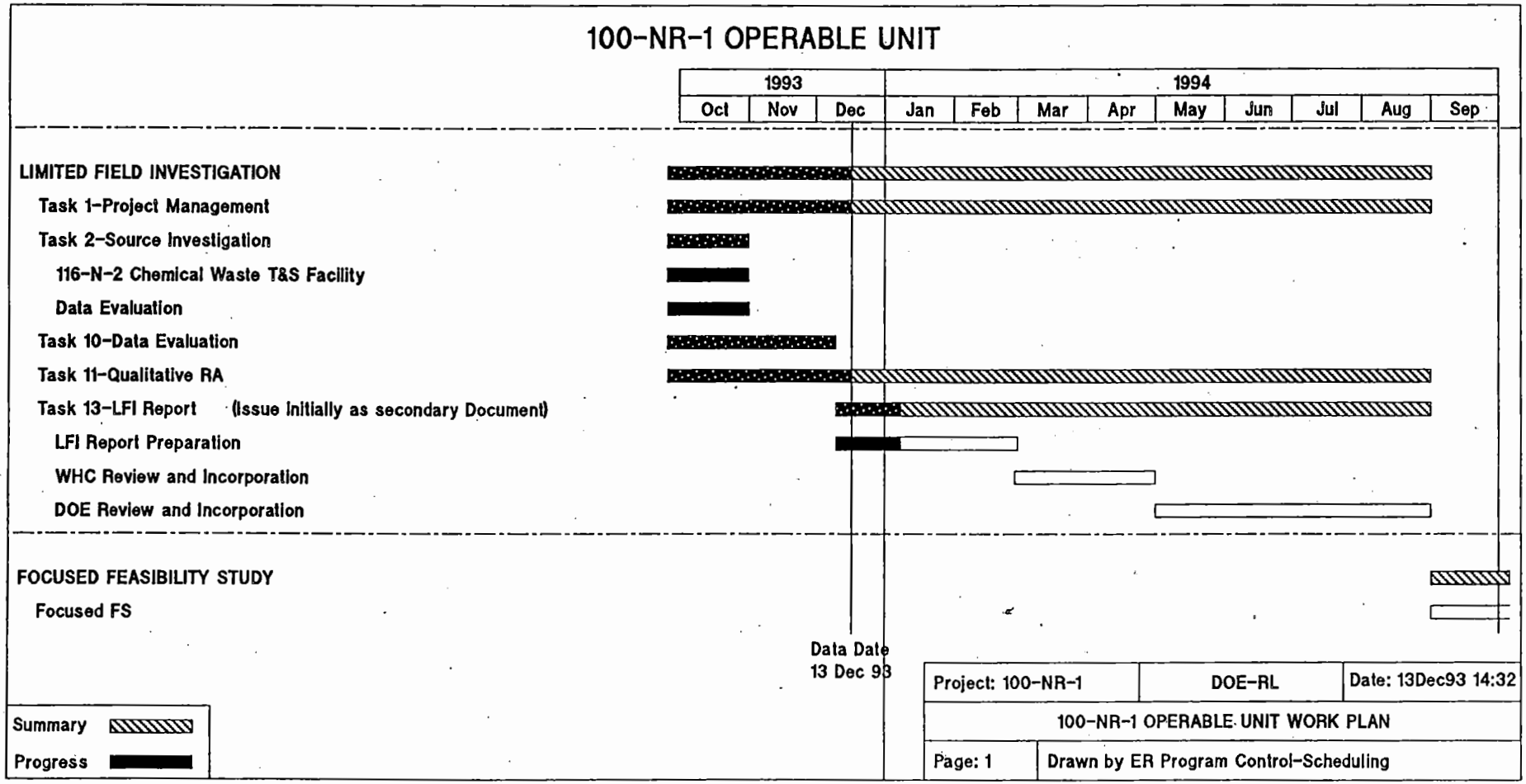
100-NR-1 OPERABLE UNIT
1993
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LIMITED FIELD INVESTIGATION
Task 1-Project Management
Task 2-Source Investigation
116-N-2 Chemical Waste T&S Facility
Data Evaluation
Task 10-Data Evaluation
Task 11-Qualitative RA
Task 13-LFI Report (Issue Initially as secondary Document)
LFI Report Preparation
WHC Review and Incorporation
DOE Review and Incorporation
FOCUSED FEASIBILITY STUDY
Focused FS
Data Date
13 Dec 93
Summary
Progress
Project: 100-NR-1
DOE-RL
Date: 13Dec93 14:32
100-NR-1 OPERABLE UNIT WORK PLAN
Page: 1
Drawn by ER Program Control-Scheduling

December Unit Manager's Meeting
100-NR-1

<u>100-NR-1 Operable Unit Work Plan</u>

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

<u>100-NR-1 Qualitative Risk Assessment</u>

- A draft of the QRA Report is undergoing Westinghouse review. Review comments will be collected, but not responded to at this time. Future work of the QRA is suspended, awaiting further guidance from the Pilot Project discussions.

<u>100-NR-1 Limited Field Investigation Report</u>

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended, pending further guidance from the Pilot Project discussions.

100 NR-2 GROUNDWATER OPERABLE UNIT

<u>100-NR-2 Operable Unit Work Plan</u>

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

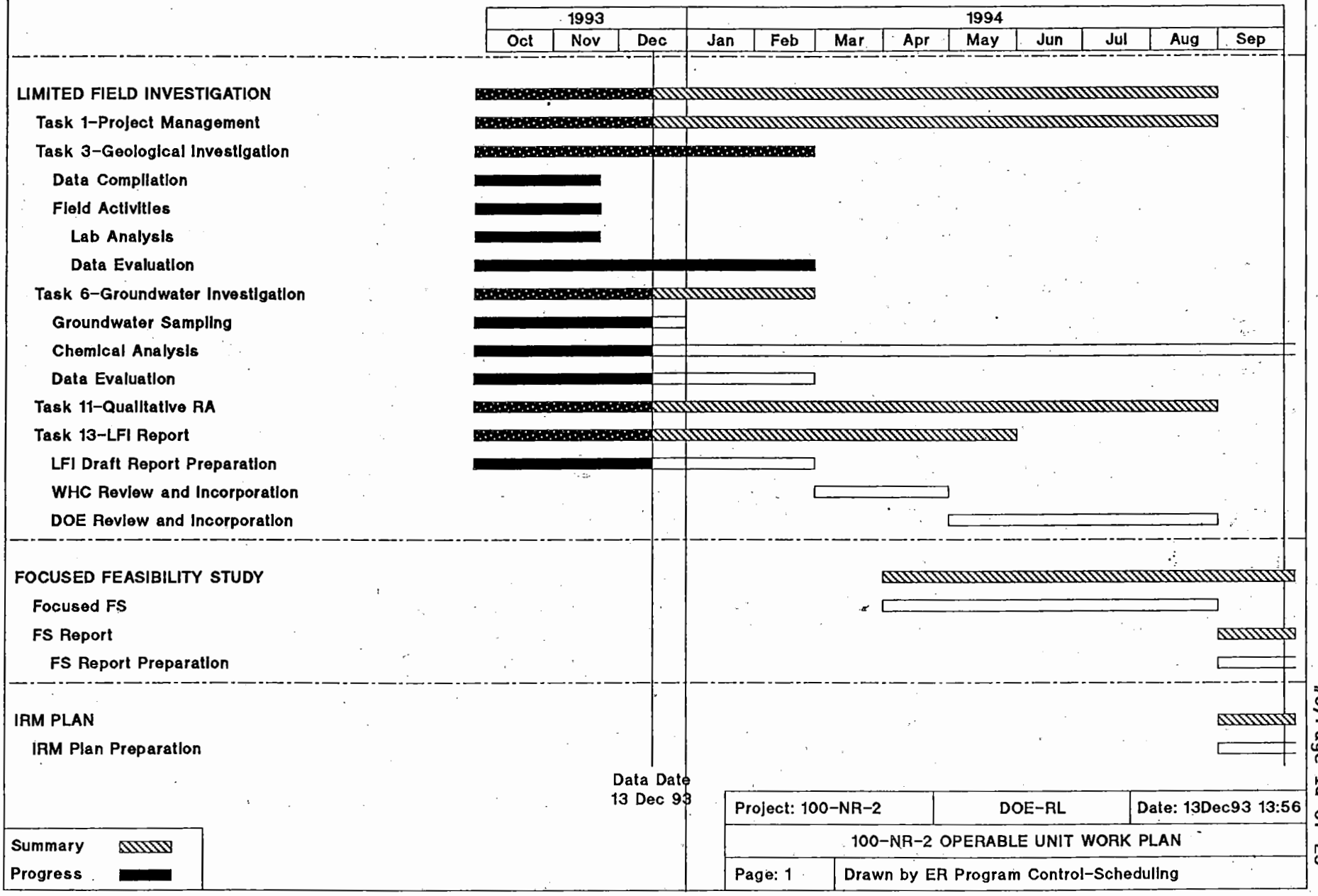
<u>100-NR-1 Limited Field Investigation Report</u>

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended, pending further guidance from the Pilot Project discussions.

<u>100-NR-2 Qualitative Risk Assessment</u>

- A draft of the QRA Report is undergoing DOE review. DOE-HQ comments have been received. DOE-RL comments are on hold, pending completion of the LFI Report. Review comments will be collected, but not responded to at this time. Future work of the QRA is suspended, awaiting further guidance from the Pilot Project discussions.

100-NR-2 OPERABLE UNIT



FY 1993 Activities for 100-DR-1/DR-2
N.M. Naiknimbalkar

DECEMBER 1993 Status Report

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100-DR-1 QUALITATIVE RISK ASSESSMENT/LFI STATUS

Qualitative Risk Assessment

- Qualitative Risk Assessment report Regulatory comments have been addressed and at present the resolutions are being transmitted to the regulators.

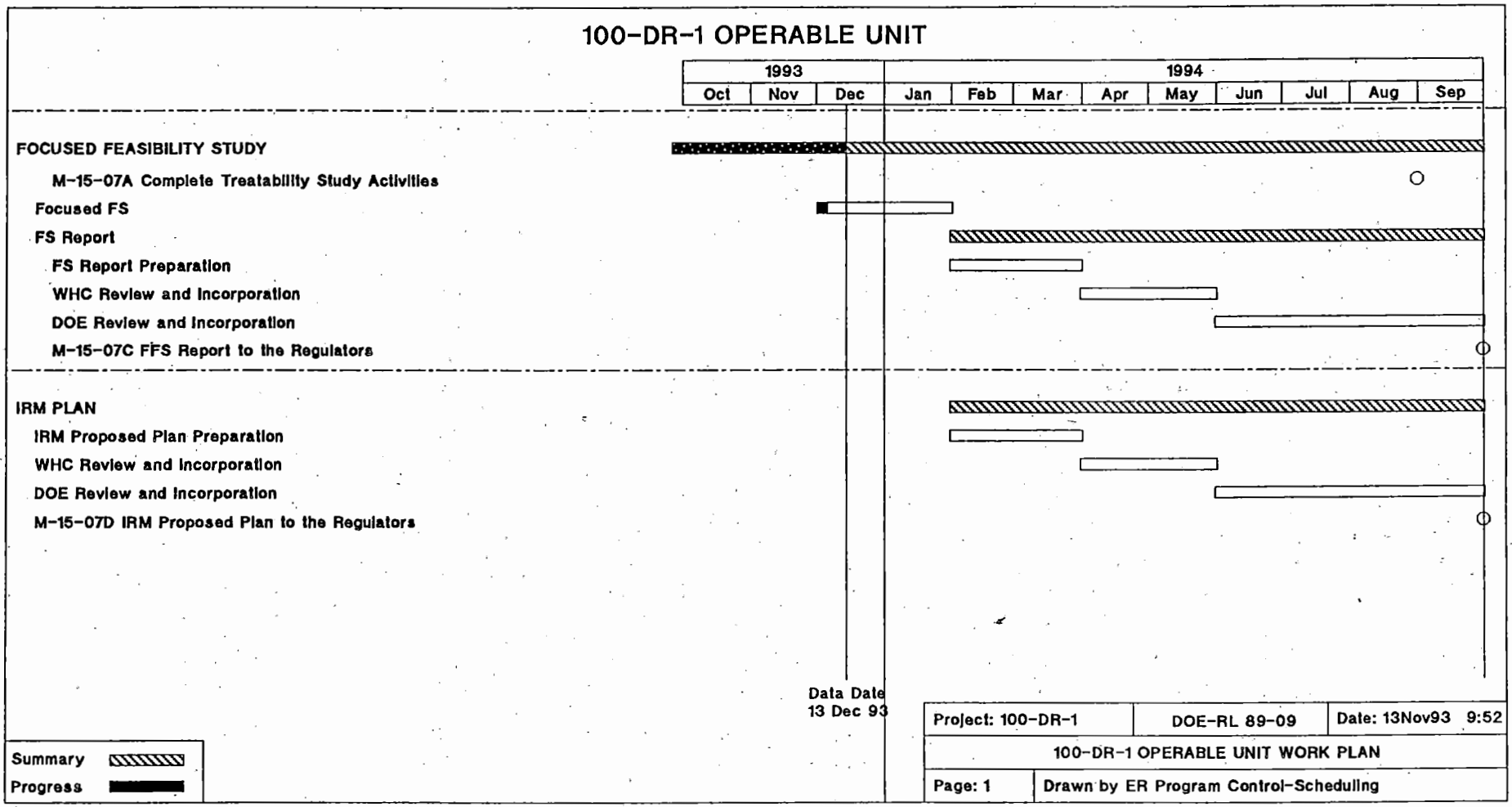
LFI Report

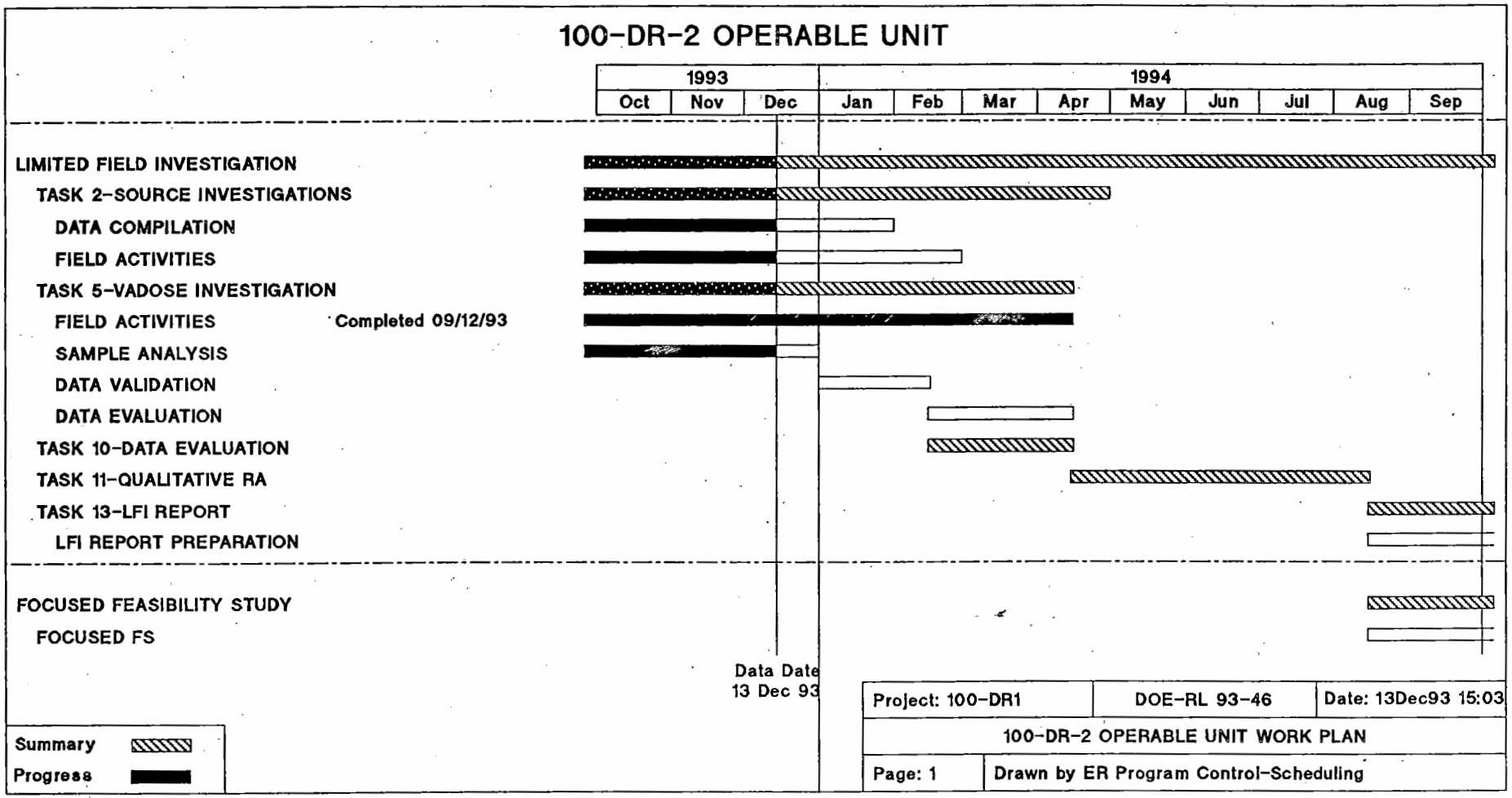
- Limited Field Investigation (LFI) report Regulatory comments have been addressed and at present the resolutions are being transmitted to the regulators.

100-DR-2 WORK PLAN AND FIELD ACTIVITIES STATUS

100-DR-2 Work Plan

- 100 DR-2 Work Plan is in Regulatory review.





December Unit Managers' Meeting

100-HR-1

- The Statement of Work for the Focused Feasibility Study has been written. The Kick-Off meeting for this project is January 4, 1994. The completion date to meet milestone M-15-05C is 9/30/94.

100-HR-2 SOURCE OPERABLE UNIT

PLANNING DOCUMENT

Final regulator comments have been incorporated into the public review draft. Changed pages were transmitted to DOE-RL December 13, 1993. Public review is anticipated to take place in January, 1994.

SURFACE GEOPHYSICS

A draft report for the H Area burial grounds is out for review. The final report is expected by the end of December.

SOIL GAS SURVEY

Soil gas surveys at the 128-H-1 Burn Pit have been completed. Preliminary interpretations of the data indicate no significant findings. A final report is expected in late December or early January.

100 HR-3 GROUNDWATER OPERABLE UNIT

TASK 6 - GROUNDWATER INVESTIGATION

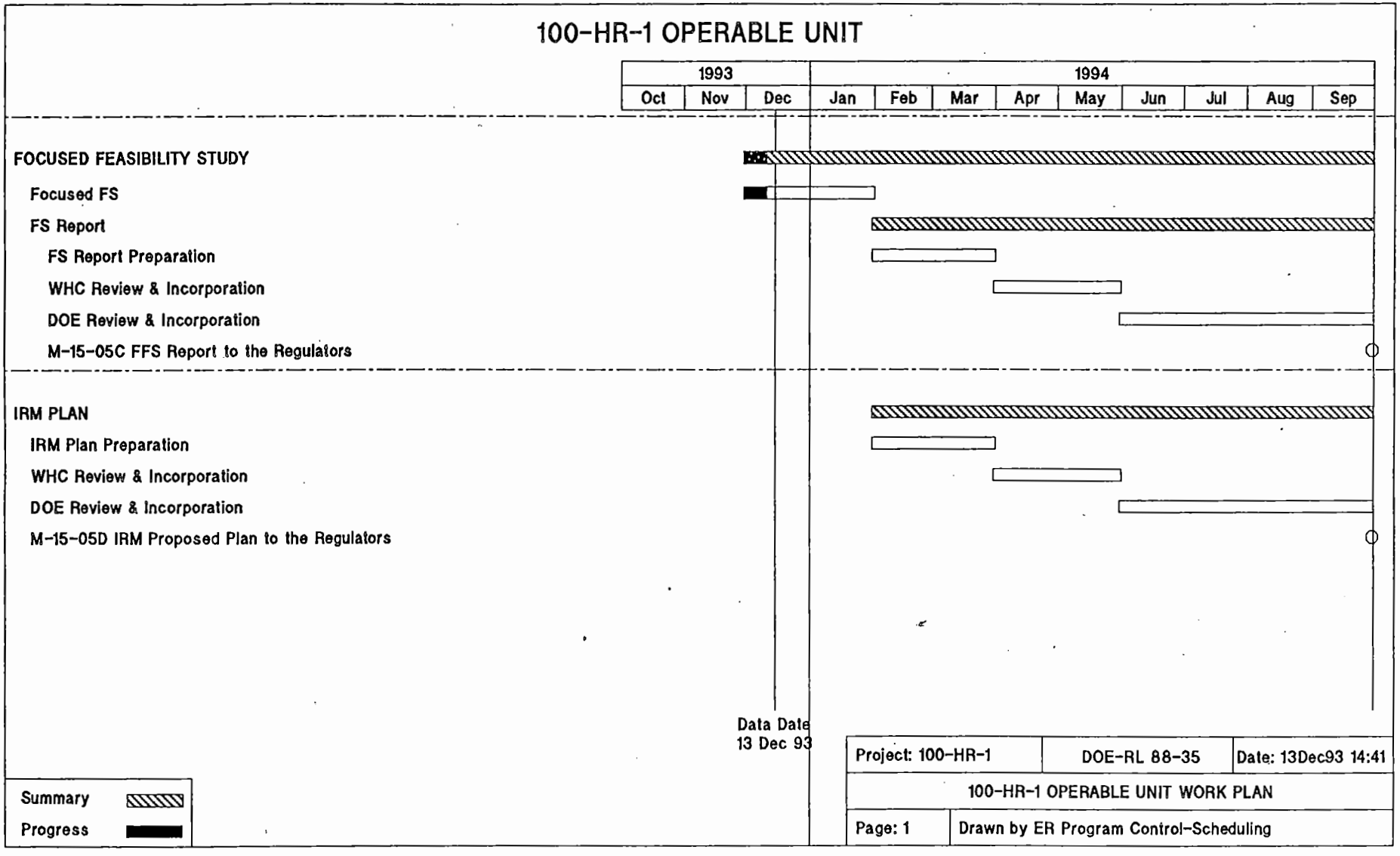
Quarterly Monitoring - Five rounds of groundwater samples have been taken.

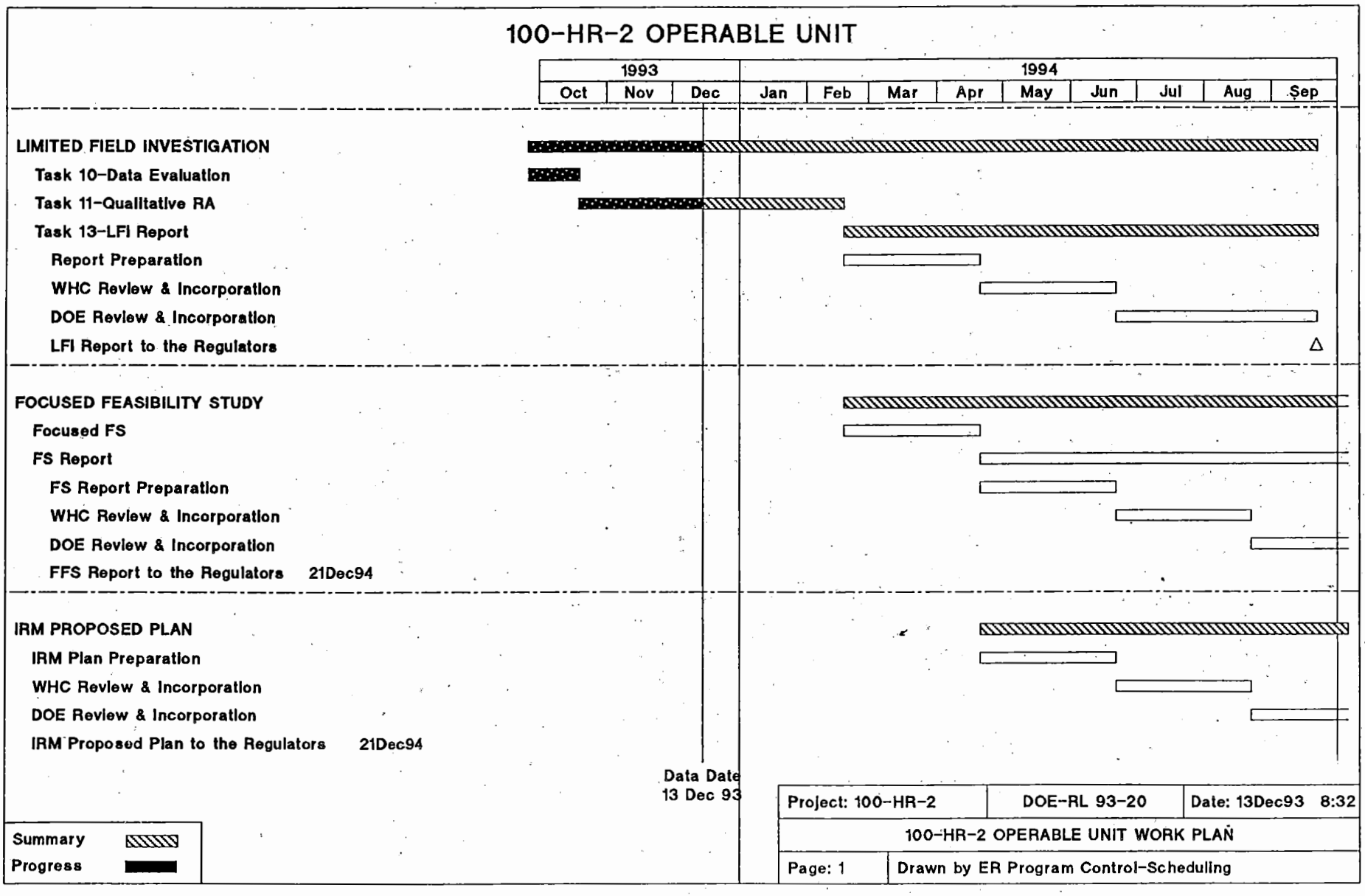
Data Validation - First, second, third and fourth round groundwater data has been validated. The fifth round is being validated.

LFI Report - WHC submitted the LFI to DOE for regulator review and is awaiting regulator comments.

QRA Report - WHC submitted the QRA to DOE for regulator review and is awaiting regulator comments .

100-HR-1 OPERABLE UNIT





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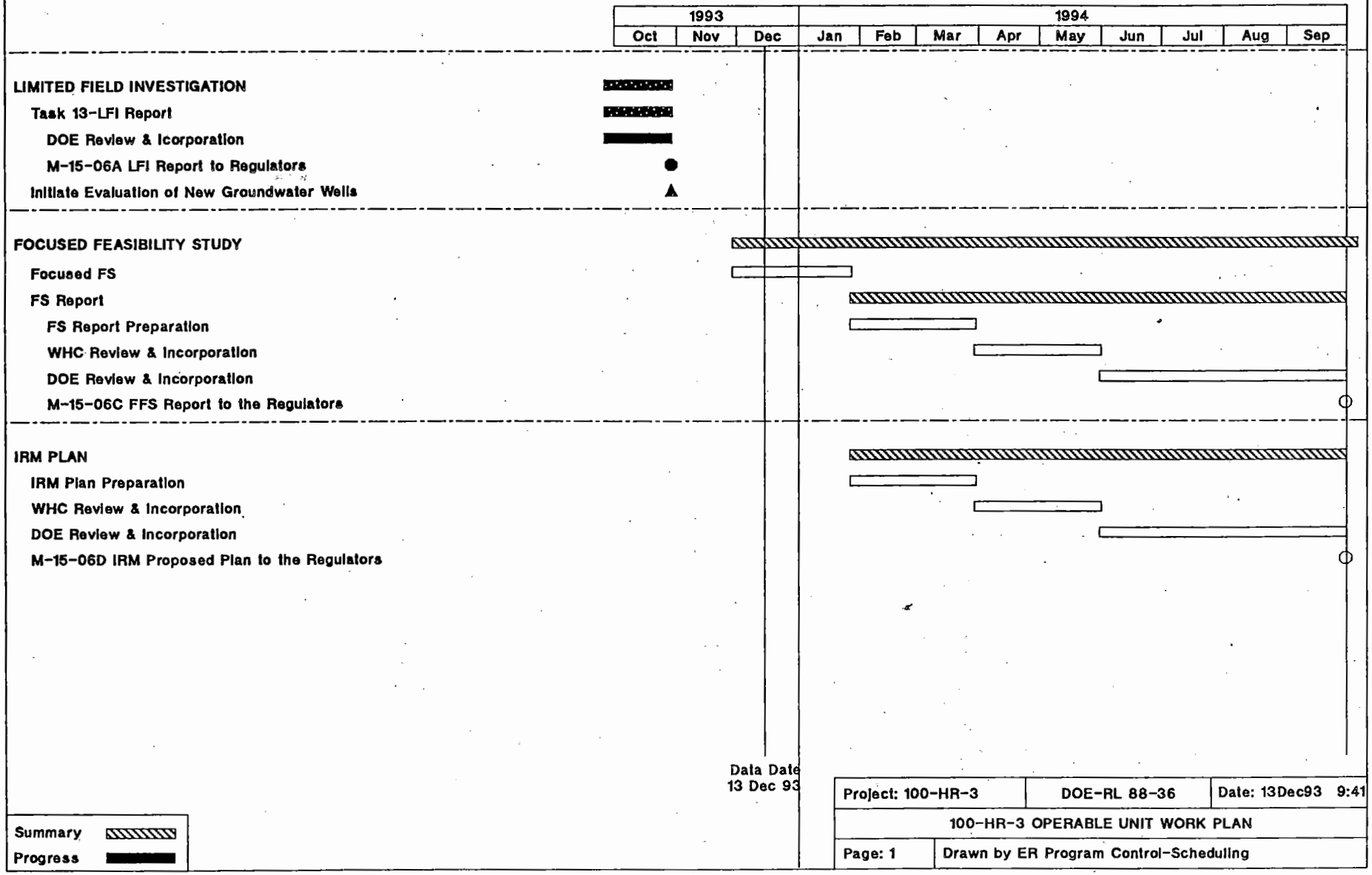


December Unit Managers' Meeting

100-FR-1

- The LFI and QRA reports are in process. The reports are scheduled to be ready for regulator review on 7/15/94 (date (6/15/04) reported in last month OU Managers briefing was incorrect).

100-FR-3

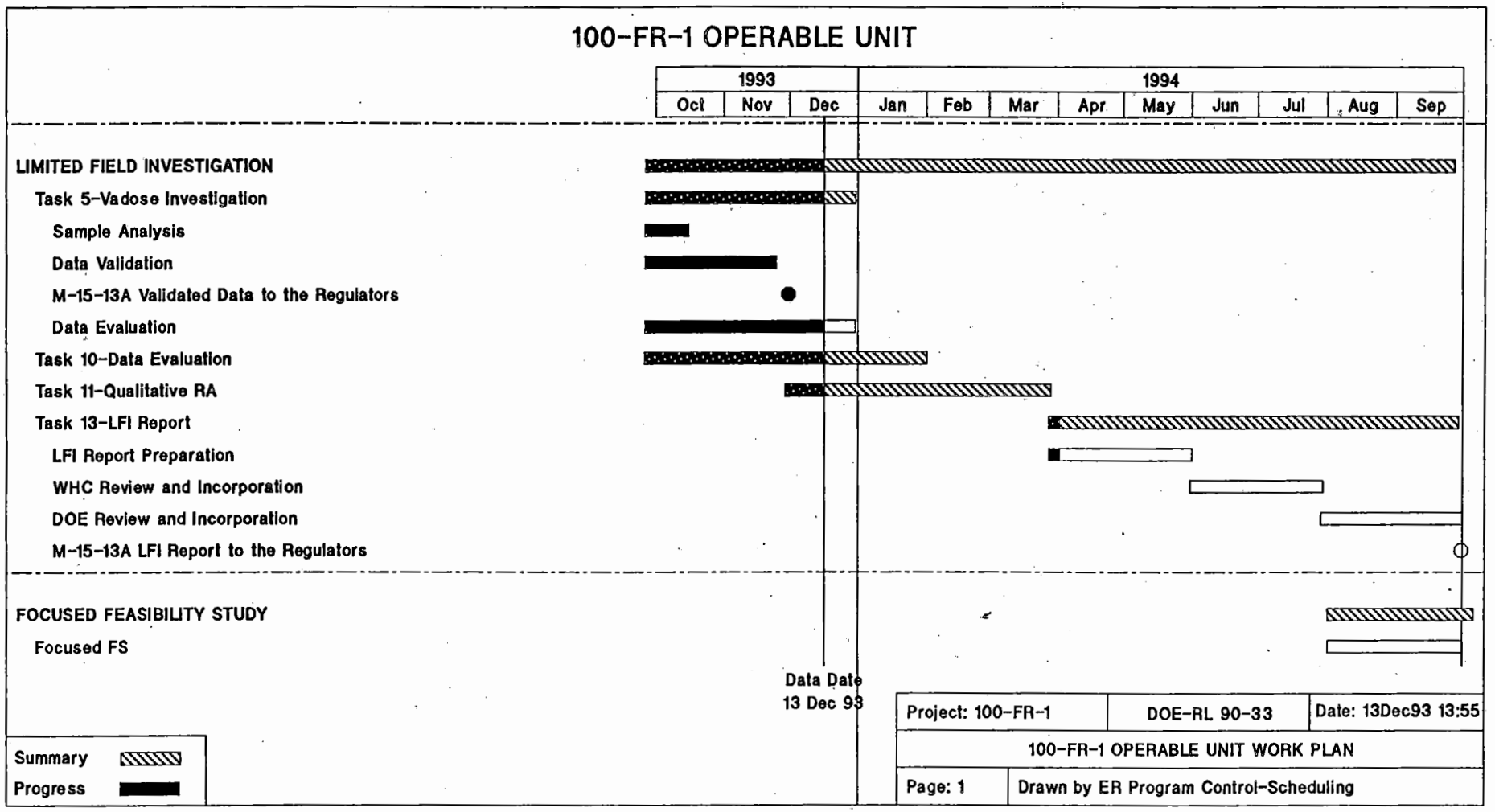
TASK 6 - GROUNDWATER INVESTIGATION

Quarterly Monitoring - Four rounds of groundwater samples have been taken.

Data Validation - Two rounds of groundwater data have been validated. The third round is being validated.

LFI Report - The LFI is on schedule to be submitted to the regulators on April 14, 1994.

QRA Report - The QRA is on schedule to be submitted to the regulators on April 14, 1994.



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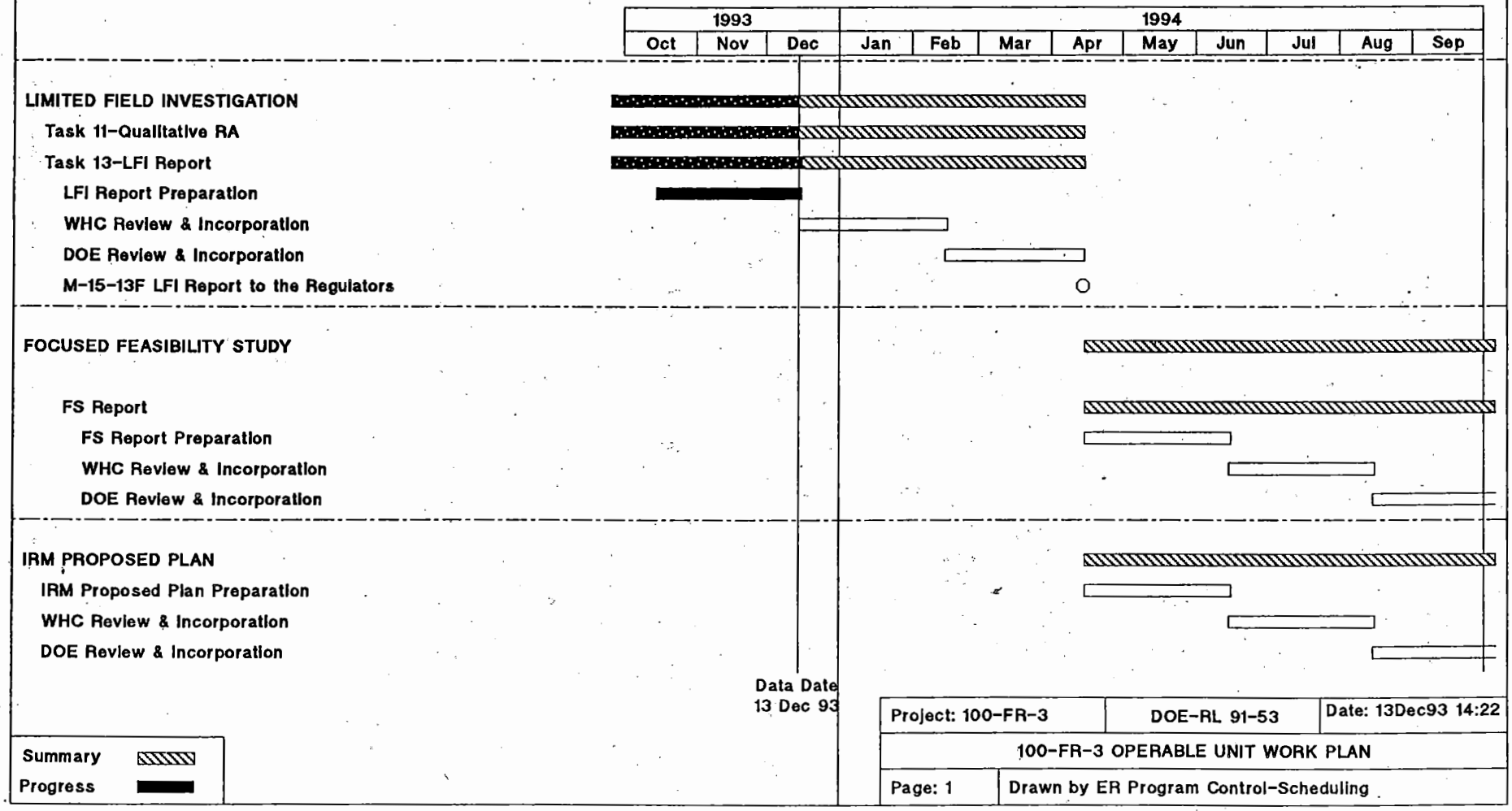

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100 AREA UNIT MANAGERS' MEETING

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JANUARY, 1994

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TREATABILITY TESTS

SOIL WASHING TREATABILITY TEST

The report of the 100-B/C and 100 D soil washing laboratory tests has been reviewed by WHC and RL and comments area being incorporated into the revised draft that will be transmitted to Ecology by January 31, 1994.

The 100-F soils sieving and characterization is in progress. The preliminary data indicates that 78.7 percent of the soil mass consists of particles greater than 13.5 mm in size. The analytical results indicated that europium, cobalt, and chromium are below the target performance levels in all size fractions less than 2mm and that cesium activities are above the target performance levels for all size fractions less than 2mm. Analytical data on the size fractions greater than 2mm and plutonium and strontium data on all size fractions will be received over the next couple weeks. Two-stage attrition scrubbing and chemical extraction tests on the fraction less than 2 mm has been initiated.

The Tri-Parties have agreed to conduct a pilot scale soil washing treatability test in the 100-D Area. The flow sheets and equipment procurement specifications are currently being finalized for the pilot test.

100-HR-1 EXCAVATION TREATABILITY TEST

A large percent of the laboratory data has been received. The data is currently being compiled and will be correlated with the field screening results. Preparation of the 100 Area Excavation Treatability Study Report has been initiated and is scheduled for completion May 31, 1994.

100-HR-3 Groundwater Treatability

Biodenitrification:

Comments from DOE-RL have been received and incorporated into the report. The report is in the PNL clearance process.

Chemical Precipitation/Ion Exchange:

Comments from DOE/RL are being incorporated prior to submittal for Regulatory review. Ion exchange has been selected as the method of choice and bid solicitation packages for a pilot scale unit will be sent out in late January.

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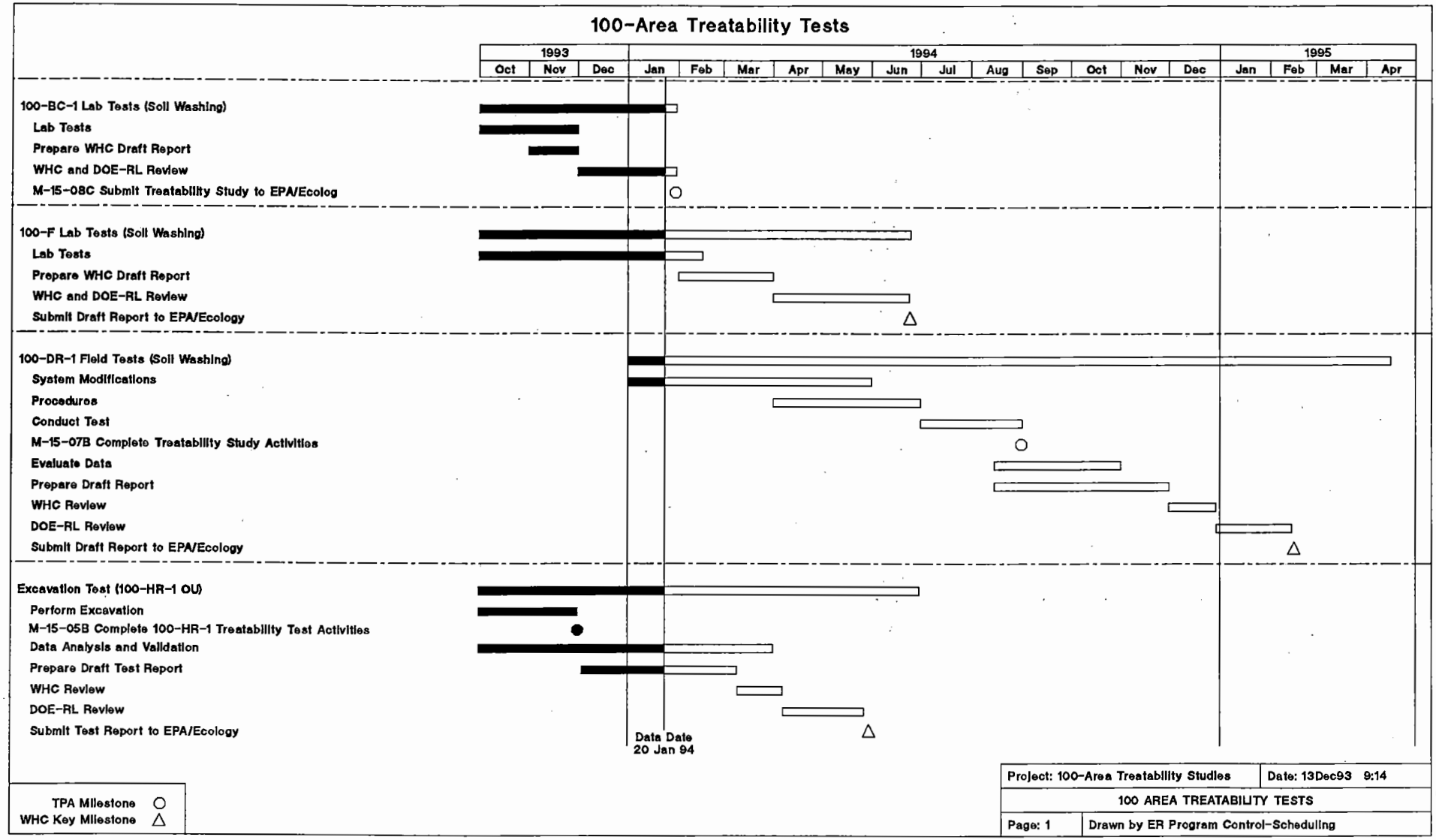

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K AREA

100-KR-1 QRA and LFI Reports

TASK 11: 100-KR-1 QRA (WHC-SD-EN-RA-009, Rev. 0) has been transmitted to DOE-RL for review.

TASK 13: 100-KR-1 LFI (DOE/RL 93-78 Decisional Draft) has been transmitted to DOE-RL for review.

100-KR-4

- The Limited Field Investigation Report, Draft A, was submitted to DOE for transmittal to the Regulators January 12 on schedule, satisfying Milestone M-15-11B.

- A reduced analyte list for 5th Round groundwater sampling was approved, and sampling commenced January 12.

- The Qualitative Risk Assessment Report, Rev 0, was submitted to DOE for transmittal to the Regulators January 12, on schedule.

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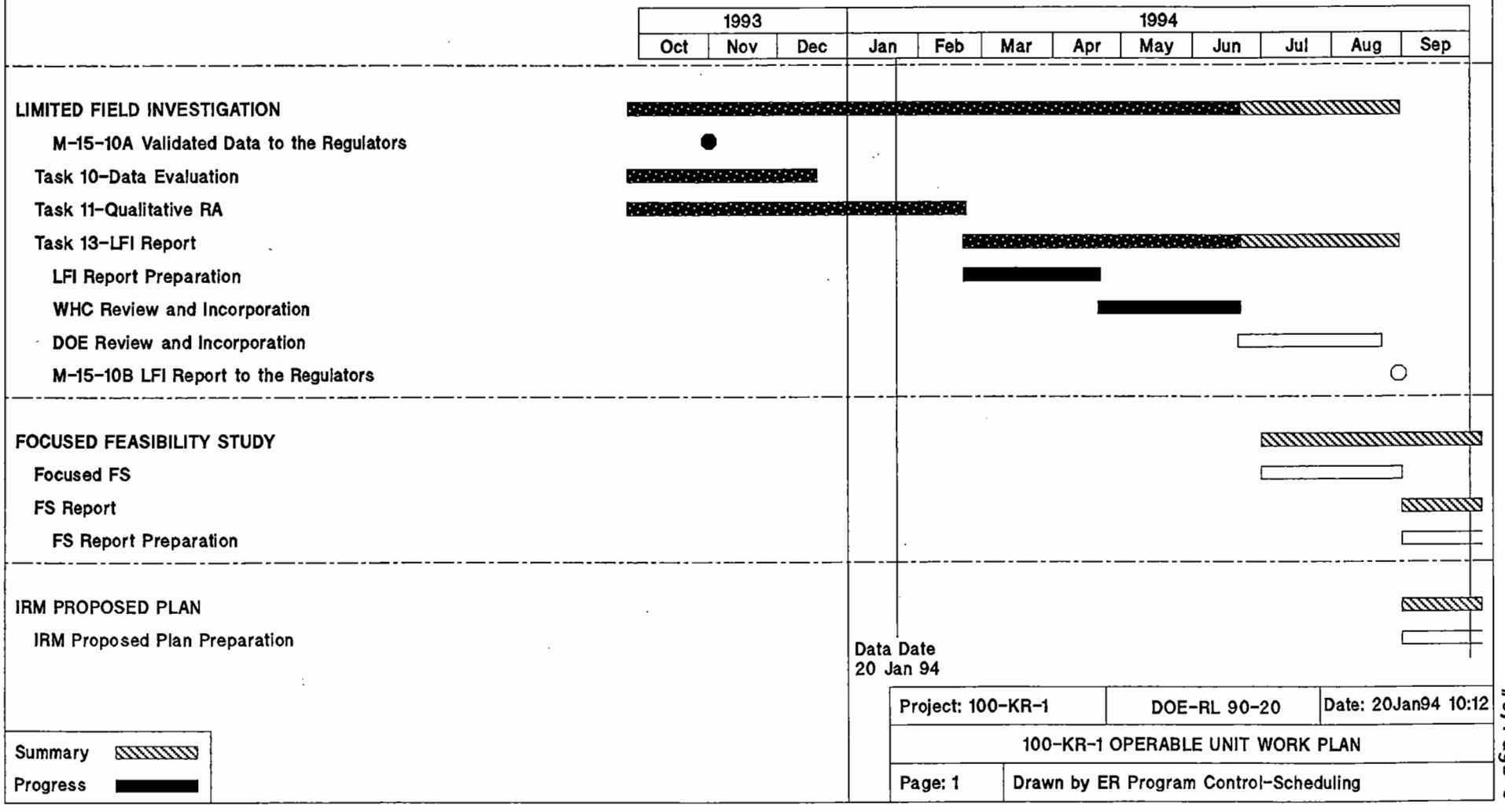

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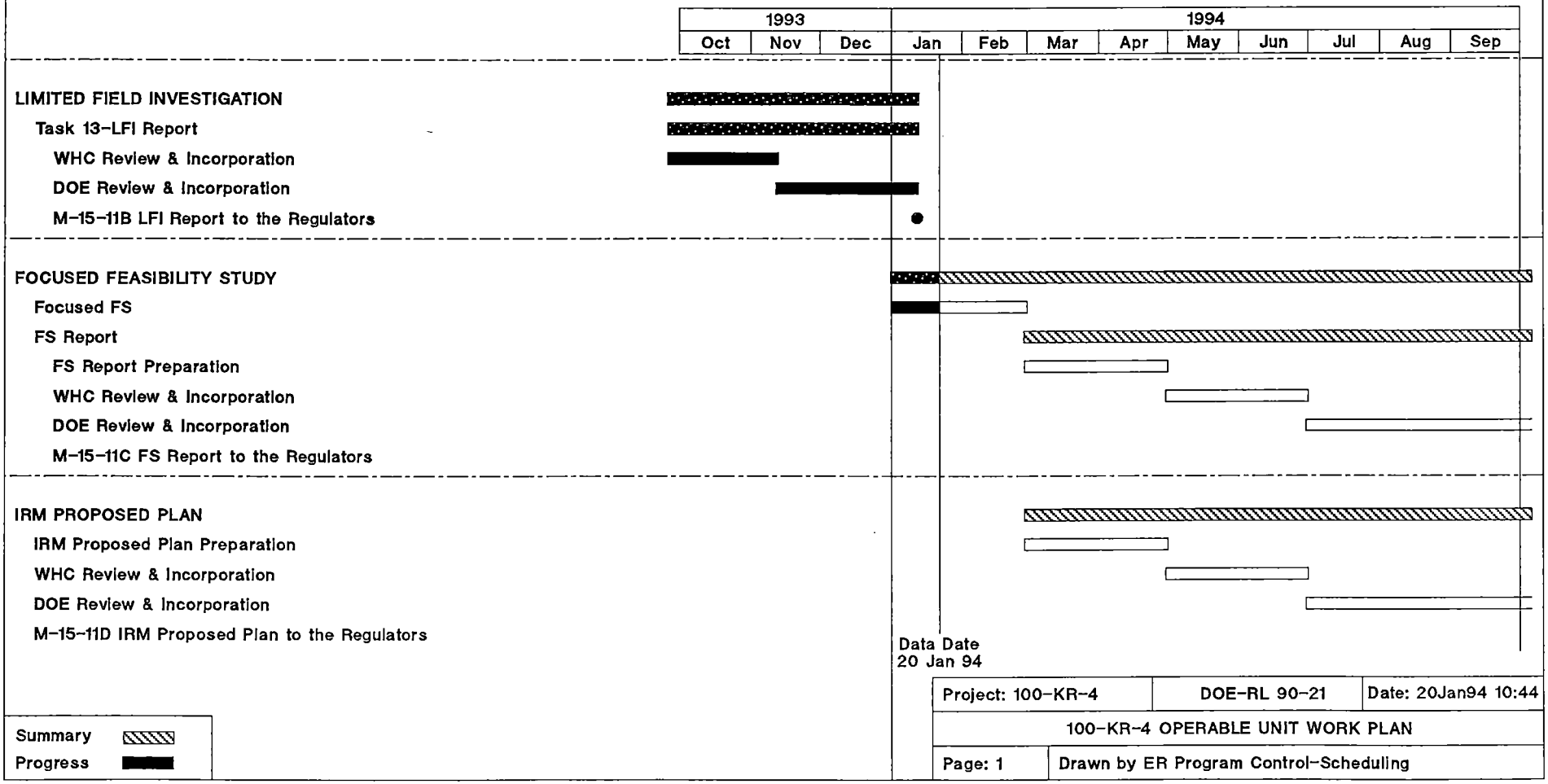

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D AREA

100-DR-1

Qualitative Risk Assessment

- Qualitative Risk Assessment report Regulatory comments have been addressed and the resolutions have been submitted to DOE-RL for transmittal to the Regulators.

LFI Report

- Limited Field Investigation (LFI) report Regulatory comments have been addressed and the resolutions have been submitted to DOE-RL for transmittal to the Regulators.

100-DR-2

100-DR-2 Work Plan

- 100 DR-2 Work Plan is in Regulatory review. Comments were due 12/30/93.

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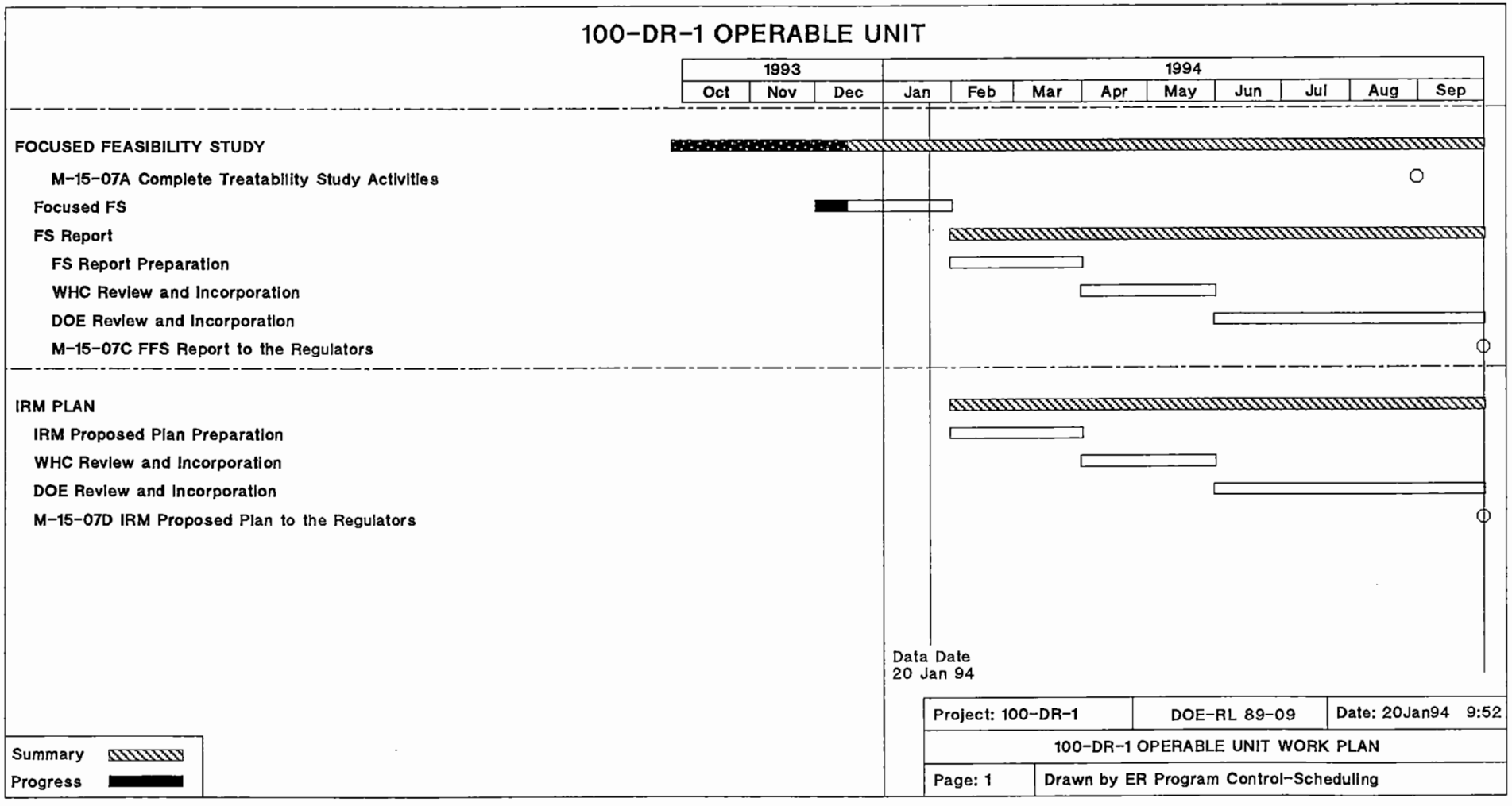

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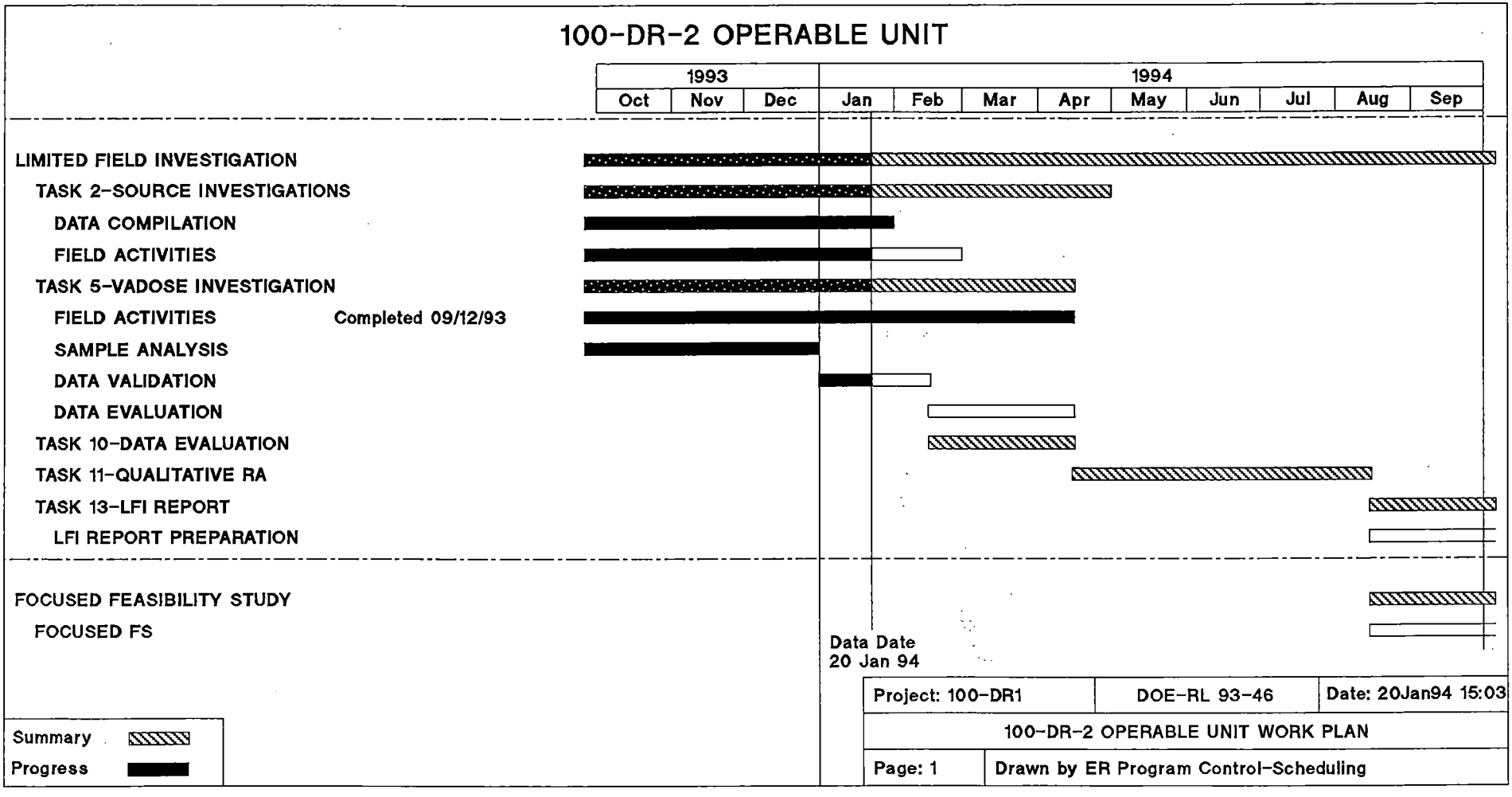

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N AREA

100-NR-1 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

100-NR-1 Qualitative Risk Assessment

- A draft of the QRA Report is undergoing Westinghouse review. Review comments will be collected, but not responded to at this time. Future work on the QRA is suspended*, awaiting further guidance from the Pilot Project discussions.

100-NR-1 Limited Field Investigation Report

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended*, pending further guidance from the Pilot Project discussions.

100-NR-2 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse have been initiated with the goal of completing negotiations of the details of the pilot project by January 1994.

100-NR-2 Limited Field Investigation Report

- Work on preparation of the LFI Report is continuing. It will be submitted for Westinghouse review and comments will be collected. Comments will not be responded to at this time. Further work on the LFI Report will be suspended*, pending further guidance from the Pilot Project discussions.

100-NR-2 Qualitative Risk Assessment

- A draft of the QRA Report is undergoing DOE review. DOE-HQ comments have been received. DOE-RL comments are on hold, pending completion of the LFI Report. Review comments will be collected, but not responded to at this time. Future work of the QRA is suspended*, awaiting further guidance from the Pilot Project discussions.

* The stopping of work on these activities is not in accordance with the ground rules established for the Tri-party Agreement negotiations and does not have the concurrence of Ecology and EPA.

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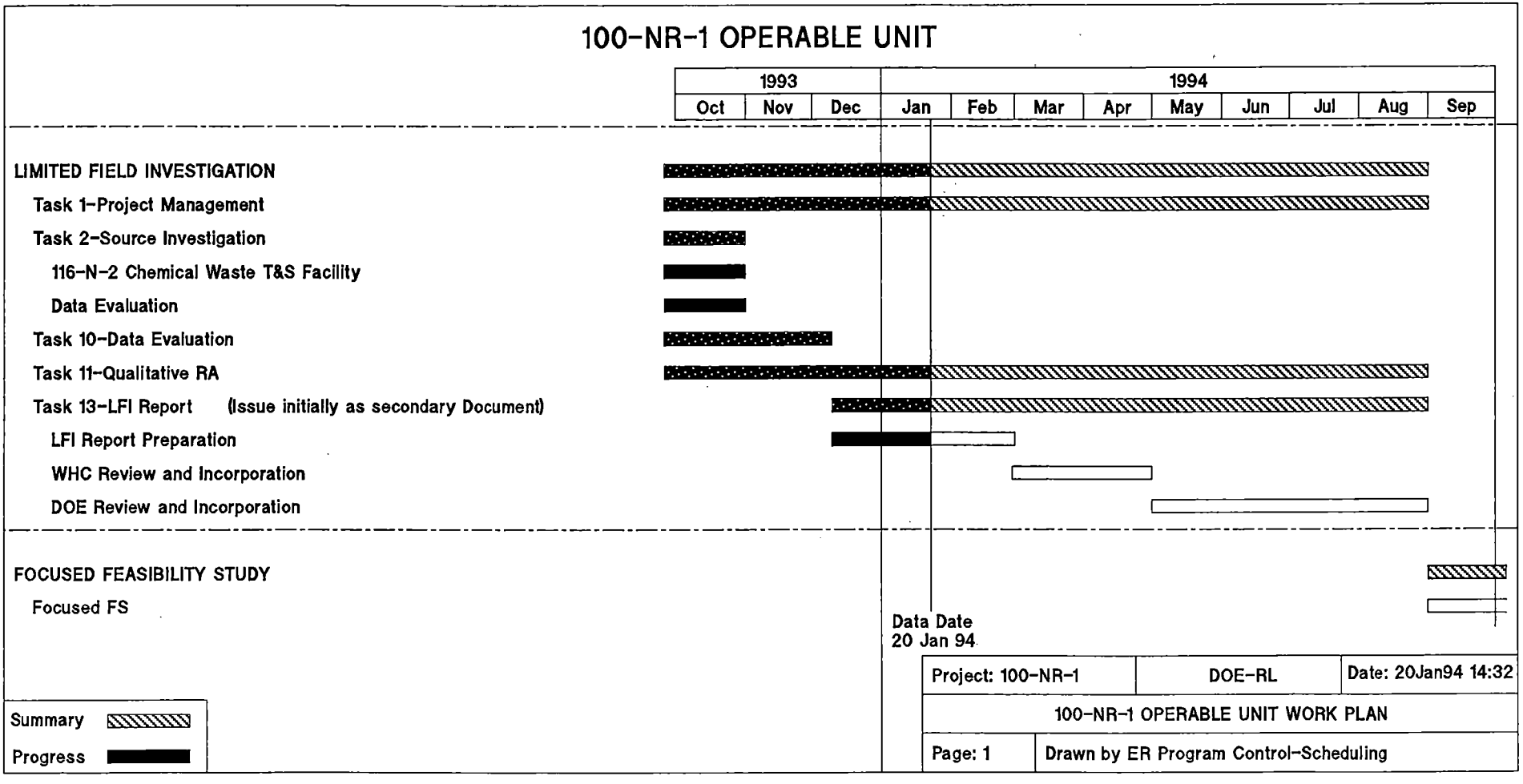

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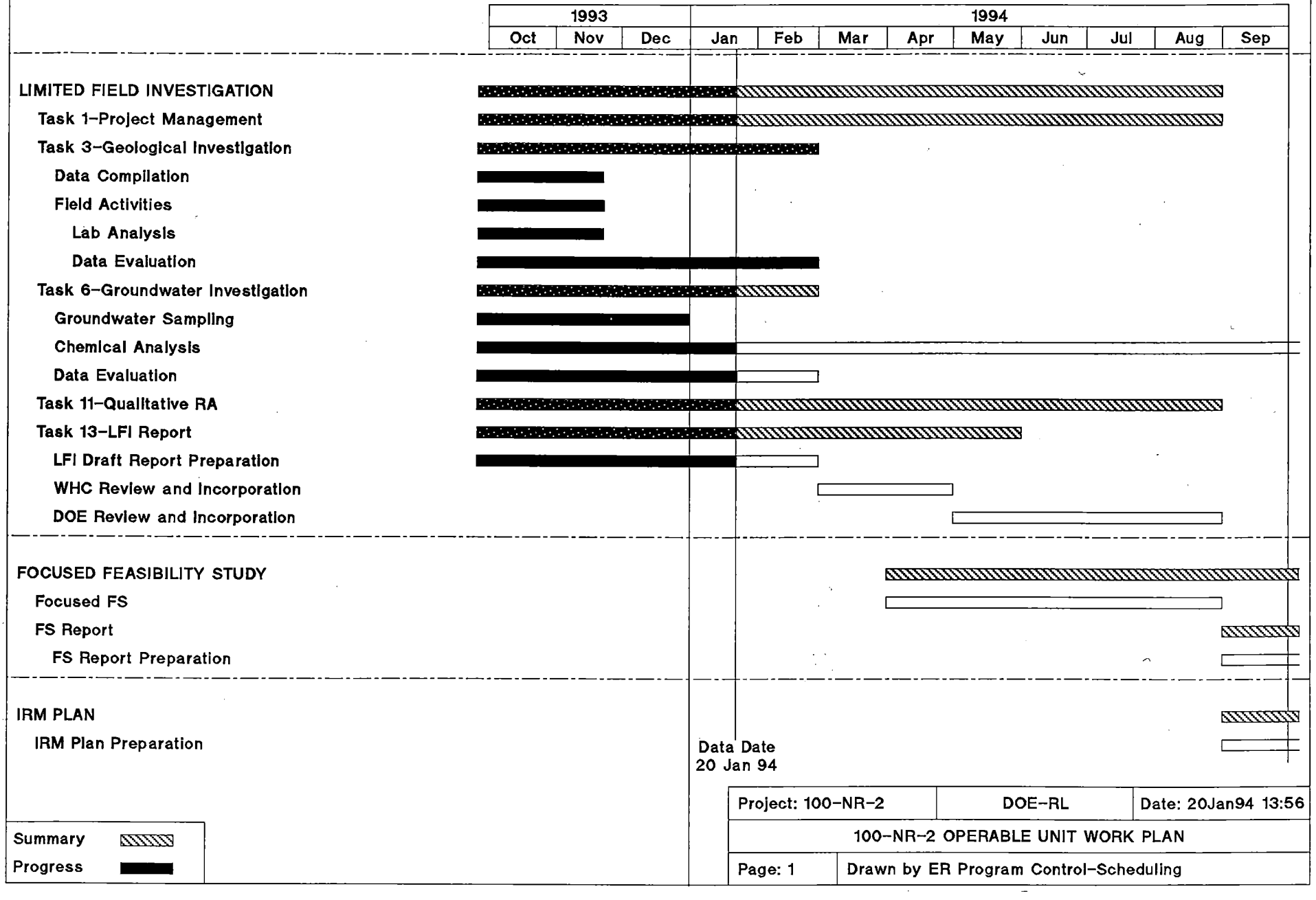

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F AREA

100-FR-1

- The LFI and QRA reports are in process. The regulator review drafts are scheduled to be distributed on June 23, 1994.

100-FR-3

TASK 6 - GROUNDWATER INVESTIGATION

- The fifth round of groundwater sampling is scheduled for February, 1994.
- The third round of groundwater data is currently being validated.
- The LFI and QRA are on schedule to be submitted to the regulators on April 14, 1994.

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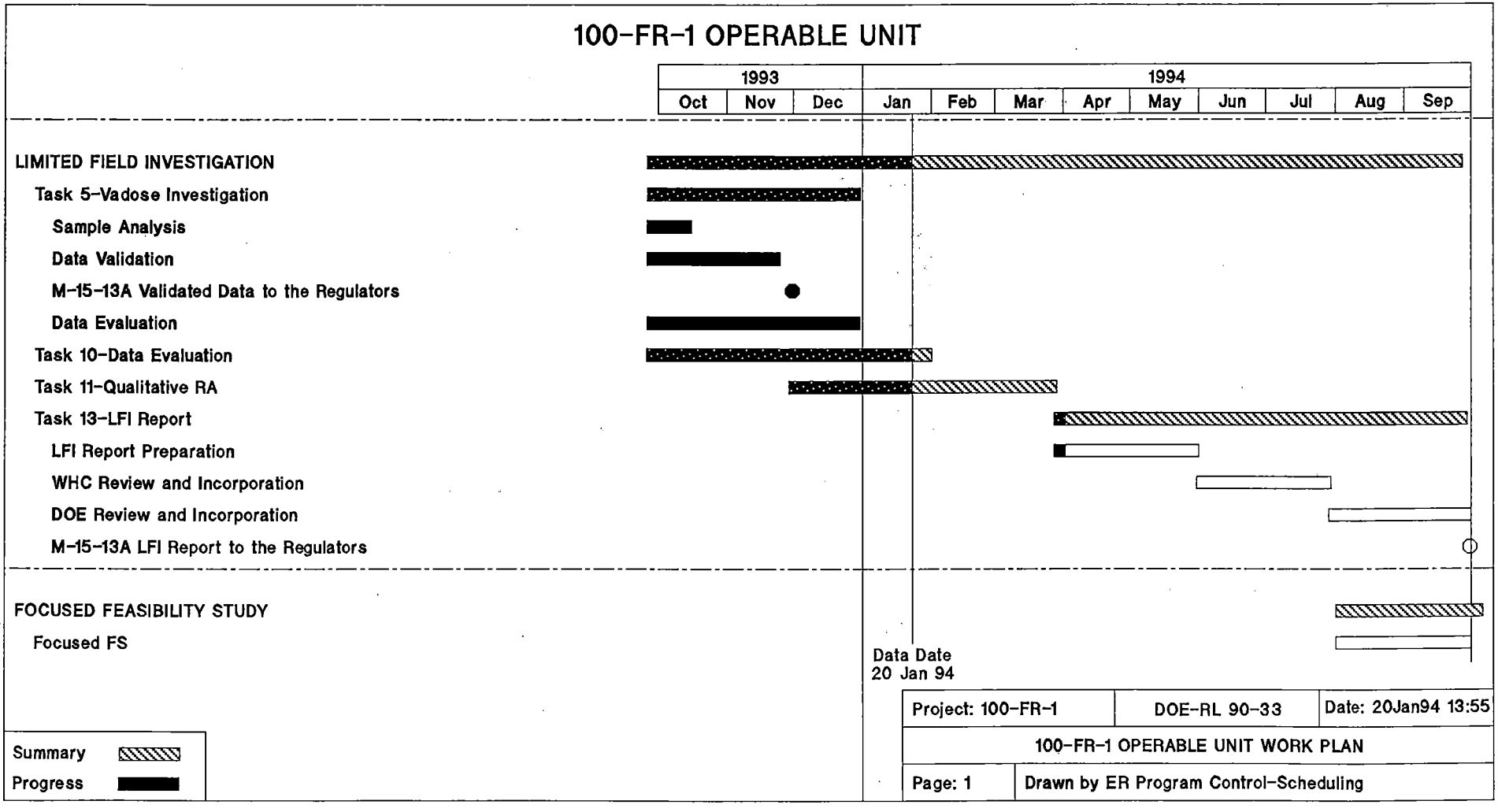

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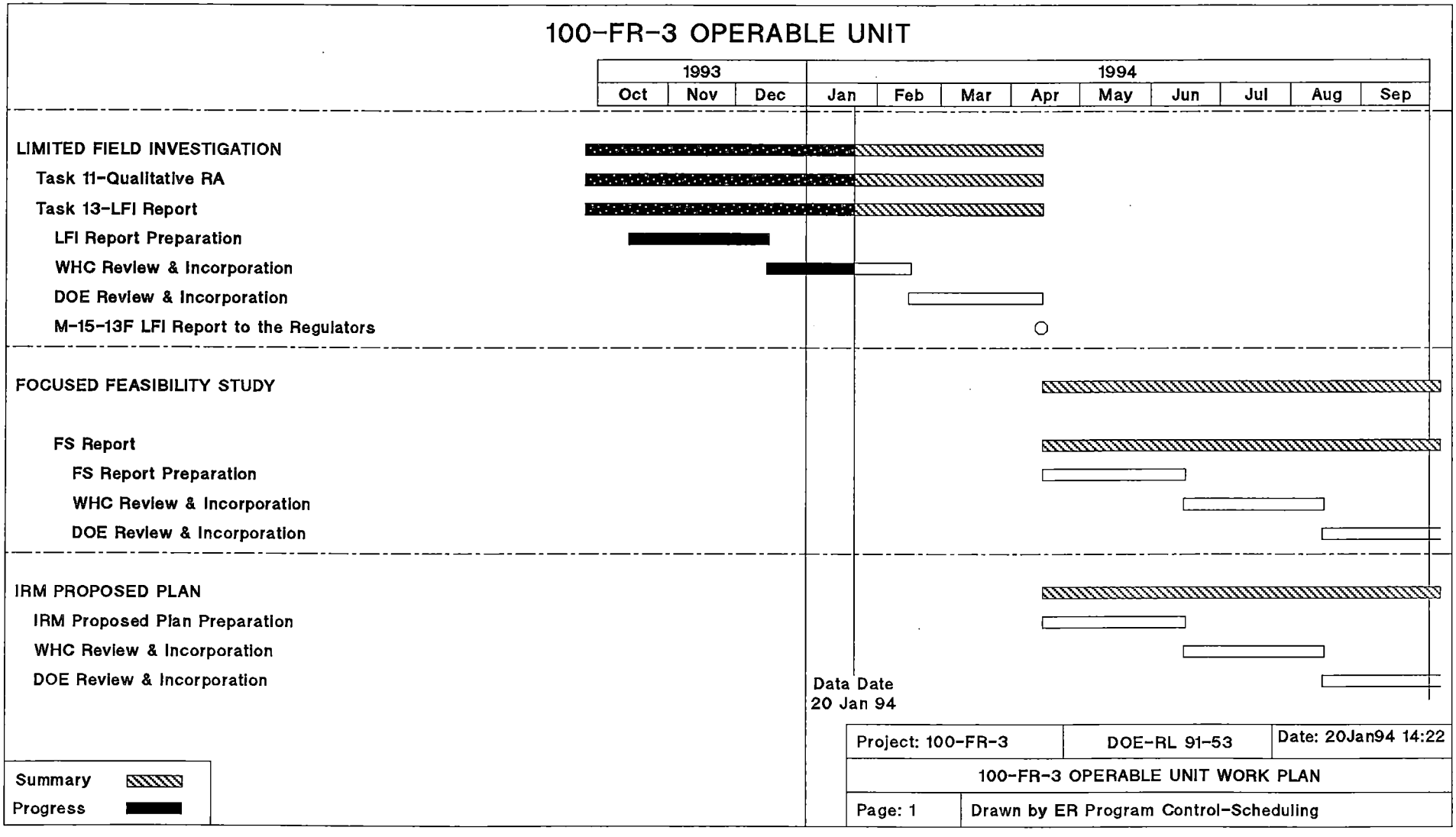

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H AREA

100-HR-1

- The kick off meeting for the Focused Feasibility Study (FFS) was held on January 11, 1994. The regulator review draft is scheduled for distribution on September 2, 1994.

100-HR-3

Task 6 - GROUNDWATER INVESTIGATION

°The fifth round groundwater data has been validated and submitted to DOE for distribution to the regulators.

°WHC is currently responding to regulator comments on the Qualitative Risk Assessment and the Limited Field Investigation Report.

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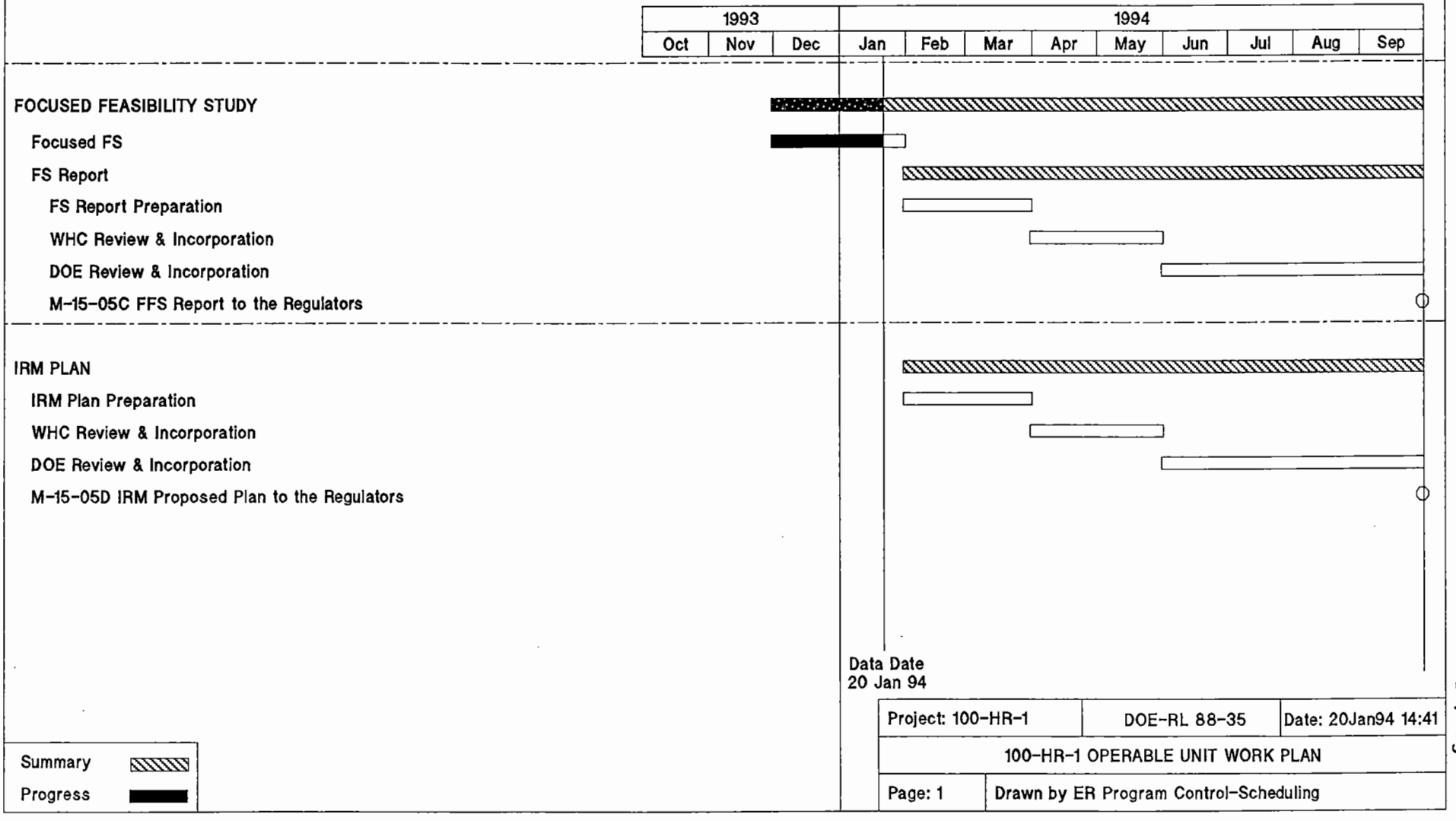

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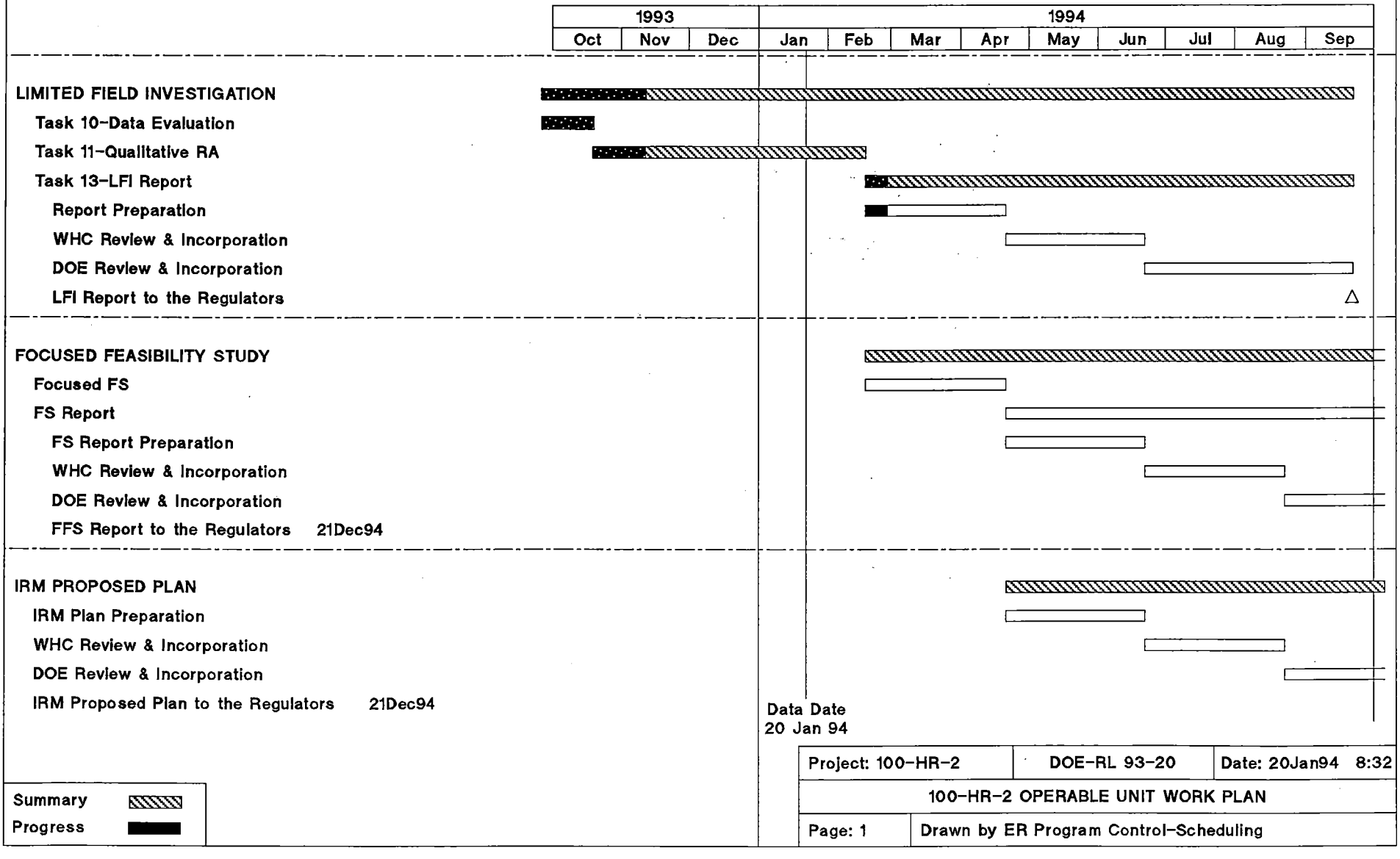

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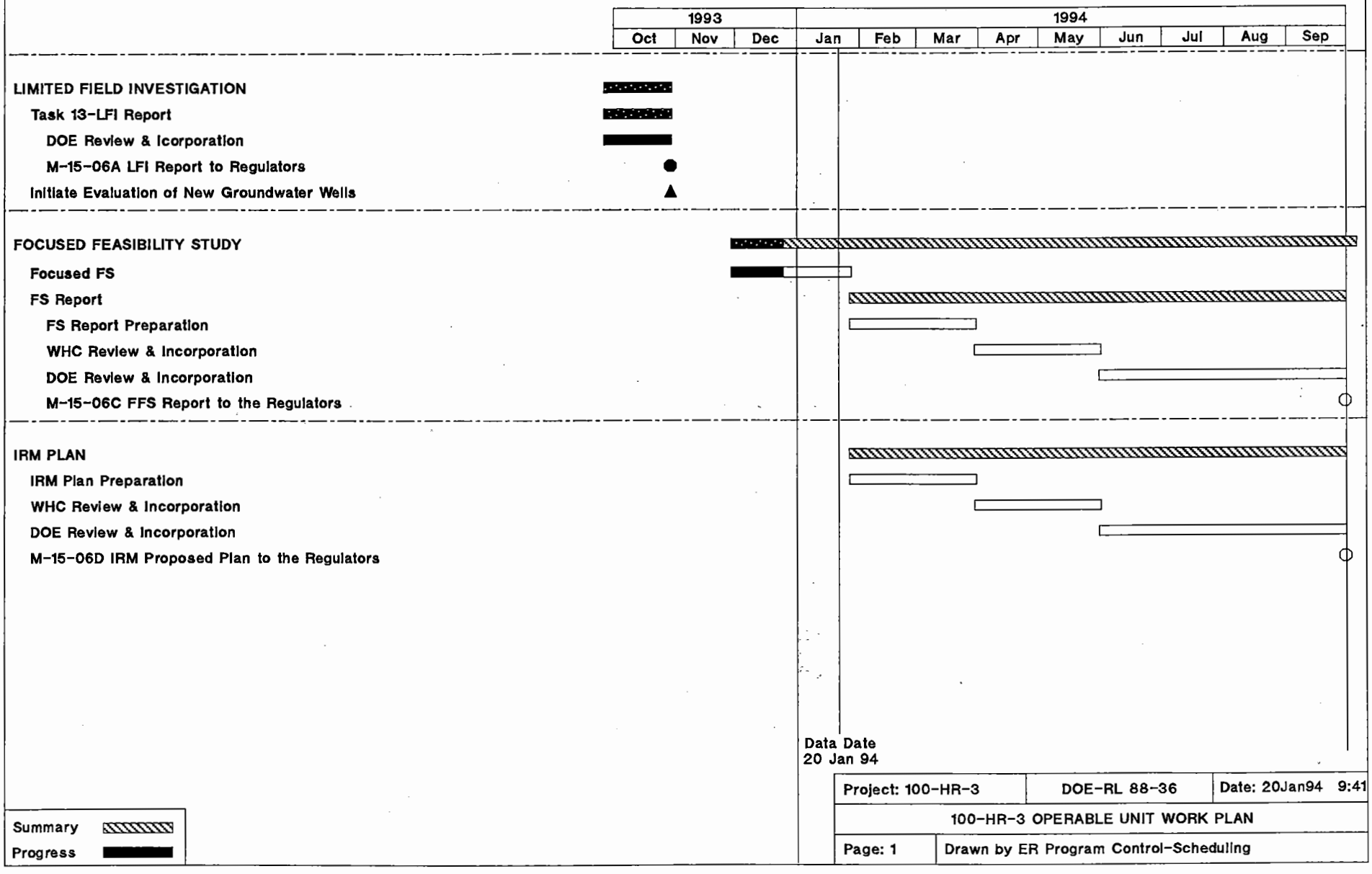

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B AREA

100-BC-1

Limited Field Investigation (LFI) Report:

Responses to regulator comments have been submitted to regulators with proposed text modifications.

Focused Feasibility Study:

Task initiated in January, 1994.

100-BC-2

RI/FS Work Plan:

Regulator comments have been incorporated, and the schedule has been updated and incorporated into the document. Waiting for regulator approval.

Limited Field Investigation (LFI) Report:

Task initiated in January, 1994.

100-BC-5

Limited Field Investigation (LFI) Report:

Regulator comments have been incorporated into the document. Waiting for regulator approval.

Focused Feasibility Study:

Task initiated in January, 1994.

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100-BC-1

Limited Field Investigation (LFI) Report:

Regulator comments have been incorporated into the document. Waiting for regulator approval.

Focused Feasibility Study:

Task initiated in January, 1994.

100-BC-2

RI/FS Work Plan:

Regulator comments have been incorporated, and the schedule has been updated and incorporated into the document. Waiting for regulator approval.

Limited Field Investigation (LFI) Report:

Task initiated in January, 1994.

100-BC-5

Limited Field Investigation (LFI) Report:

Regulator comments have been incorporated into the document. Waiting for regulator approval.

Focused Feasibility Study:

Task initiated in January, 1994.

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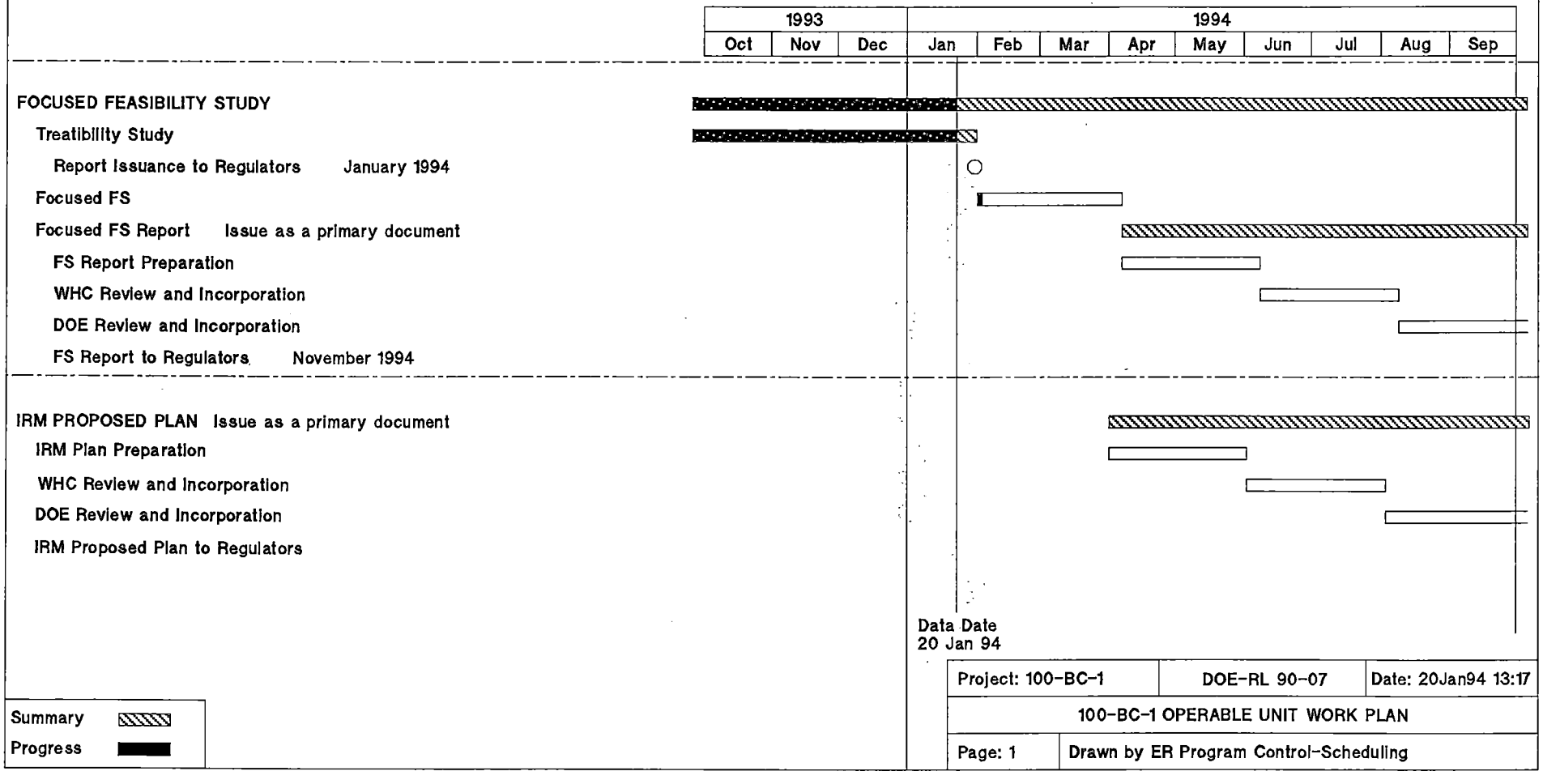

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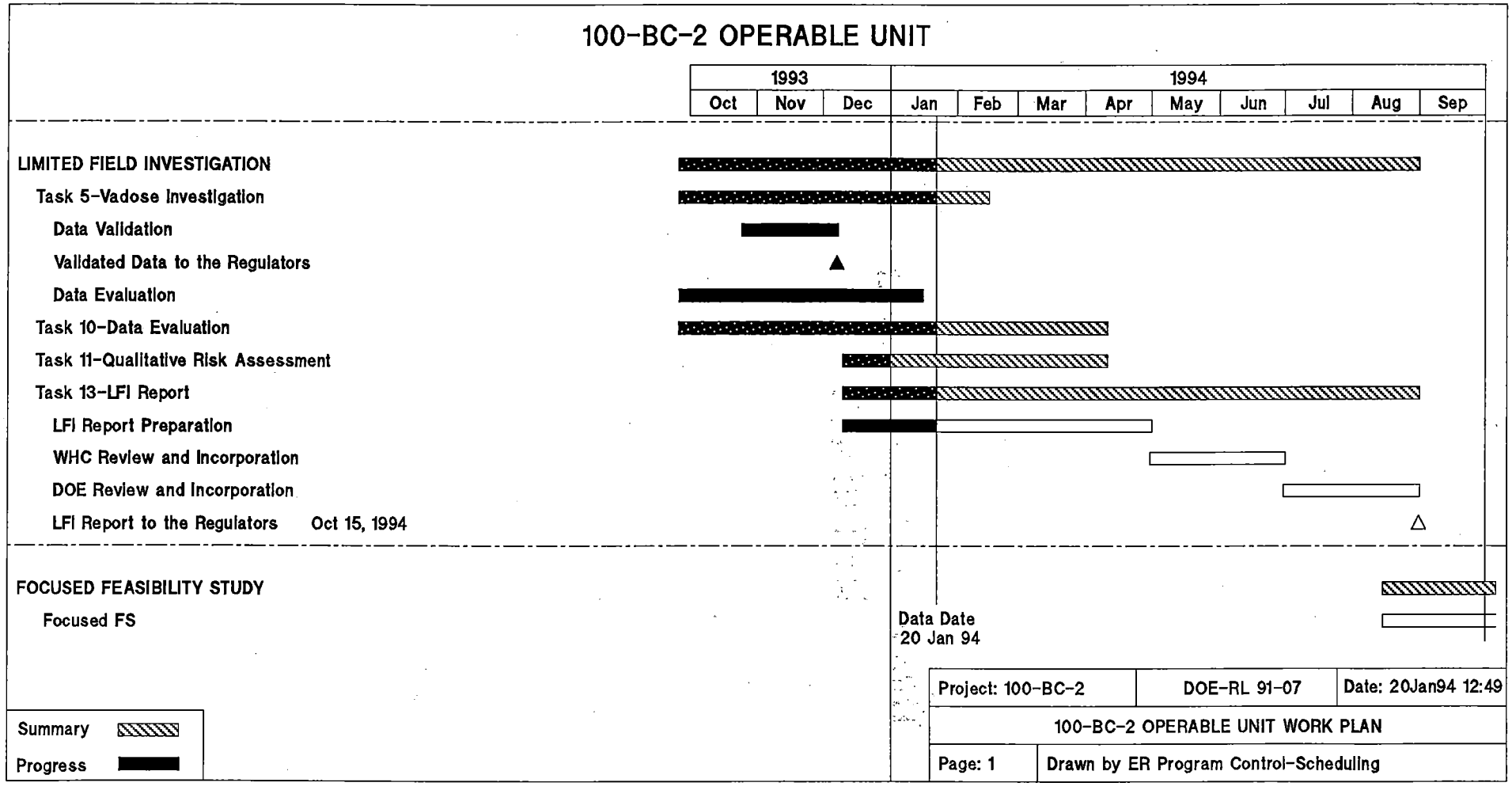

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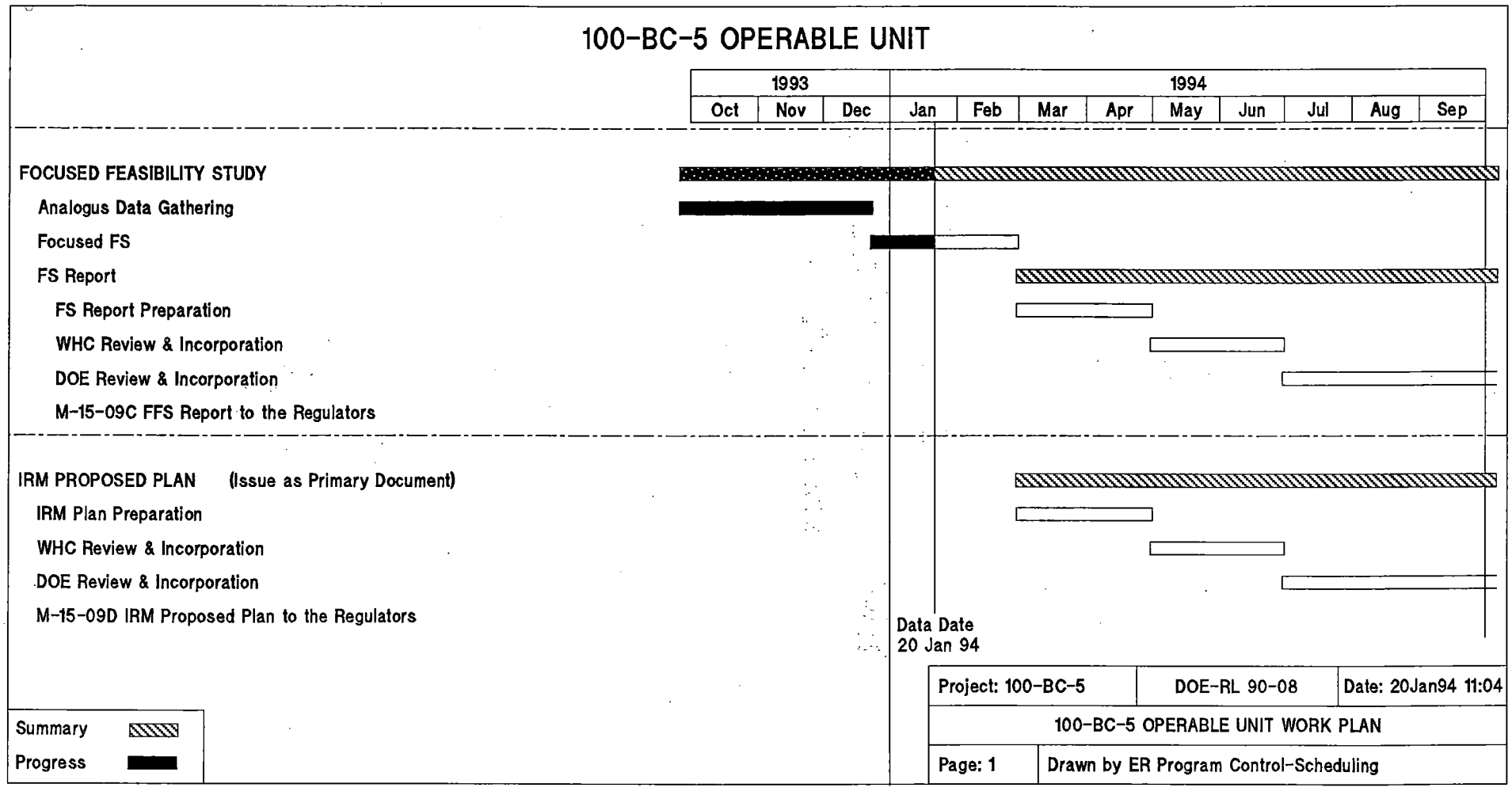

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100 AREA UNIT MANAGERS' MEETING

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FEBRUARY, 1994

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100 AREA TREATABILITY TEST STATUS

Soil Washing

The 100 Area Soil Washing Bench-Scale Tests report (DOE/RL-93-107, Draft) was submitted to EPA and Ecology for review in fulfillment of Milestone M-15-08C.

100-F soils tests are in progress and expected to be completed by mid February as scheduled. Data received to date indicates that soil washing may be a feasible alternative for the 100-F soils.

Purchase requisitions are being processed and procedures developed for 100-DR-1 pilot scale soil washing tests. Changes and additions to the test plan (DOE/RL-92-51) will be identified in the procedures, which will be reviewed by RL and the regulators. A draft of the procedures is scheduled to be submitted to RL by the end of April, 1994.

Co-Disposal

A test plan is being prepared for this work. A draft to RL is anticipated by the end of February.

Ex Situ Vitrification

PNL Crucible Tests

Tests conducted by PNL demonstrated the applicability of vitrification to the soil washing fines and provided data on the performance of actual, vitrified soil washing fines. A report detailing the results of these vitrification studies will be available in March.

Minimum Additive Waste Stabilization (MAWS) Program

Under the Minimum Additive Waste Stabilization (MAWS) Program Approximately 30 kg of soil fines excavated from the 116-F-4 trench were shipped to the Vitreous State Laboratory (VSL) located at the Catholic University of America (CUA) in early January. The soil was sifted through a No. 6 sieve (about 1/8 inch particle size) before shipment. VSL has completed analysis of the soil fines and has prepared the surrogate tank waste. Crucible melts are expected to be completed by the second week in February.

Vortec Combustion and Melting System

In early January, Hanford was selected as the site for Phase III testing. By late February, WHC began assisting Vortec in developing the test plan and procedures, NEPA and safety documentation. Phase I tests were completed using surrogate soils in a pilot plant near Pittsburgh. A report was issued, October 1993. Phase II is currently in progress. It will include verification testing in Pittsburgh plus design of a pilot scale unit having a nominal capacity of approximately 20 ton/day. Phase III will include fabrication, construction and testing of the integrated system at Hanford (testing to begin in mid FY 1995). Phase IV includes some optimization testing if necessary.

100-HR-1 Excavation Treatability Test

The 100 Area Excavation Treatability Test Report is being prepared. The initial draft is approximately 85% complete. The report will be reviewed by WHC at the end of the month. The final report will be transmitted to EPA and Ecology by May 31, 194.

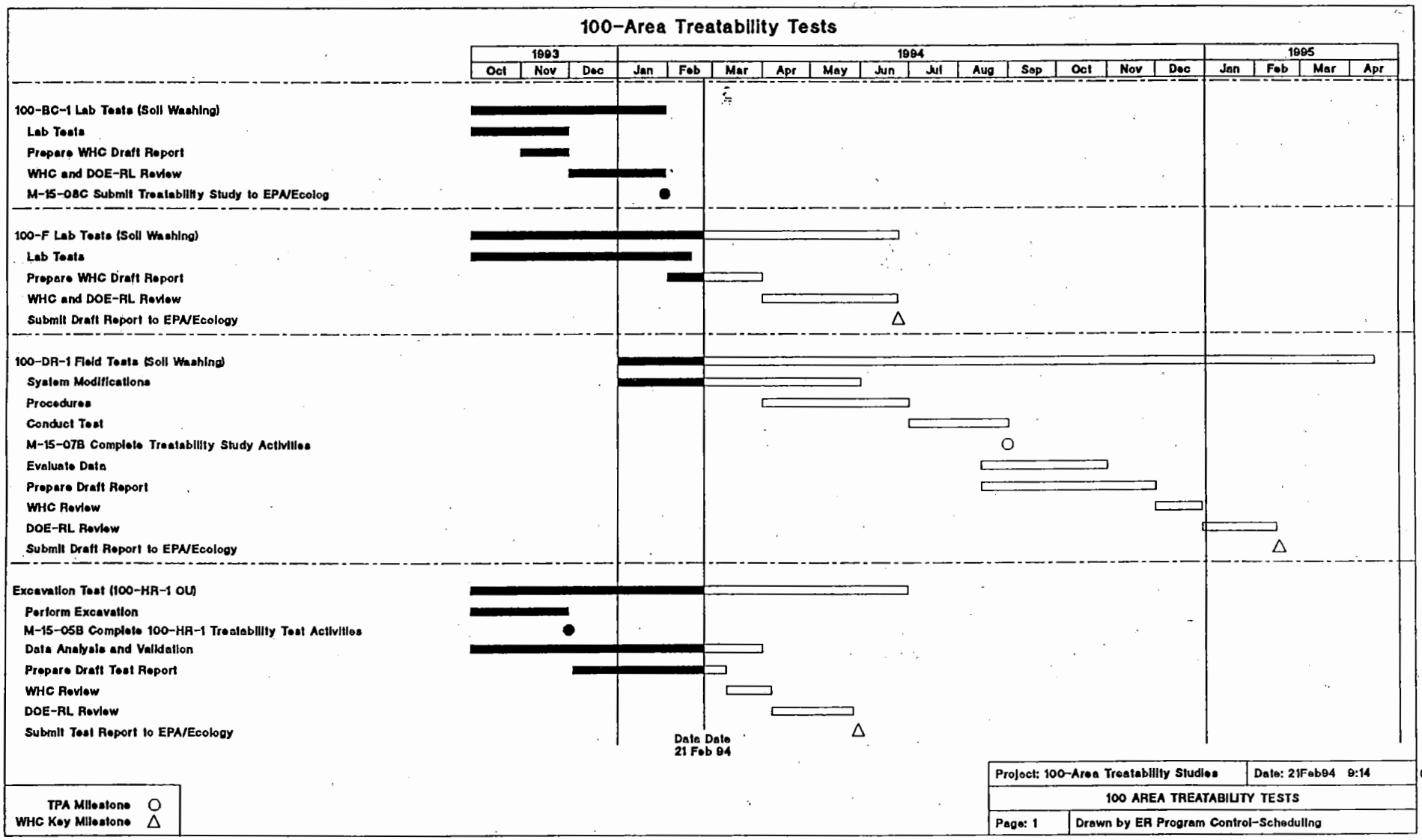
100-HR-3 Groundwater Treatability

Biodenitrification:

Comments from DOE-RL have been received and incorporated into the report. The report is in the final PNL clearance process.

Chemical Precipitation/Ion Exchange:

Comments from DOE/RL have been incorporated and the document is going through clearnace prior to submittal for Regulatory review. Ion exchange has been selected as the method of choice and bid solicitation packages for a pilot scale unit should be available for review in late February.



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B AREA

100-BC-1

Limited Field Investigation (LFI) Report:

Regulator comments have been incorporated into the document. Waiting for regulator approval.

Focused Feasibility Study:

Task initiated in January, 1994.

100-BC-2

RI/FS Work Plan:

Regulator comments have been incorporated, and the schedule has been updated and incorporated into the document. Waiting for regulator approval.

Limited Field Investigation (LFI) Report:

Task initiated in January, 1994.

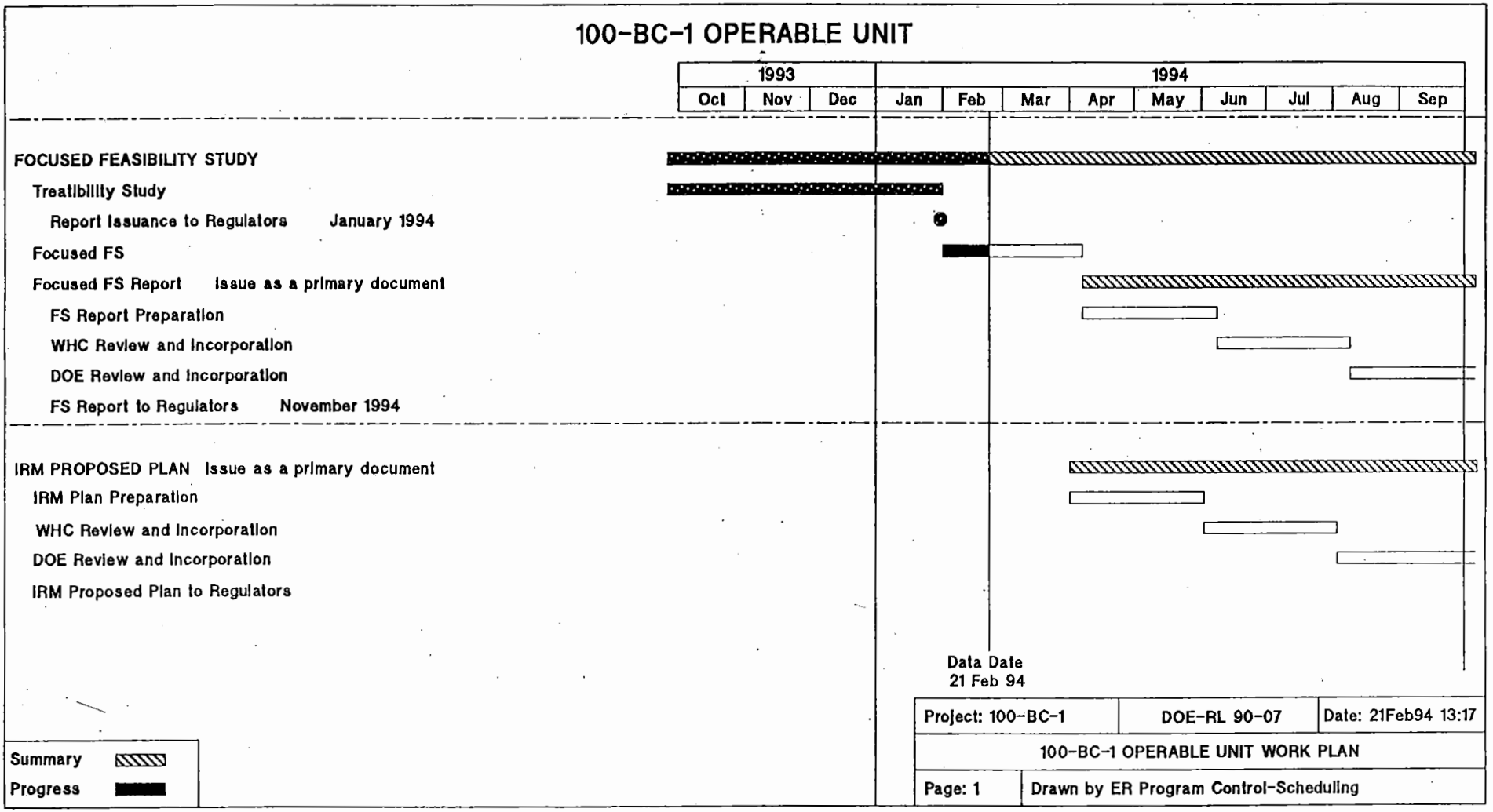
100-BC-5

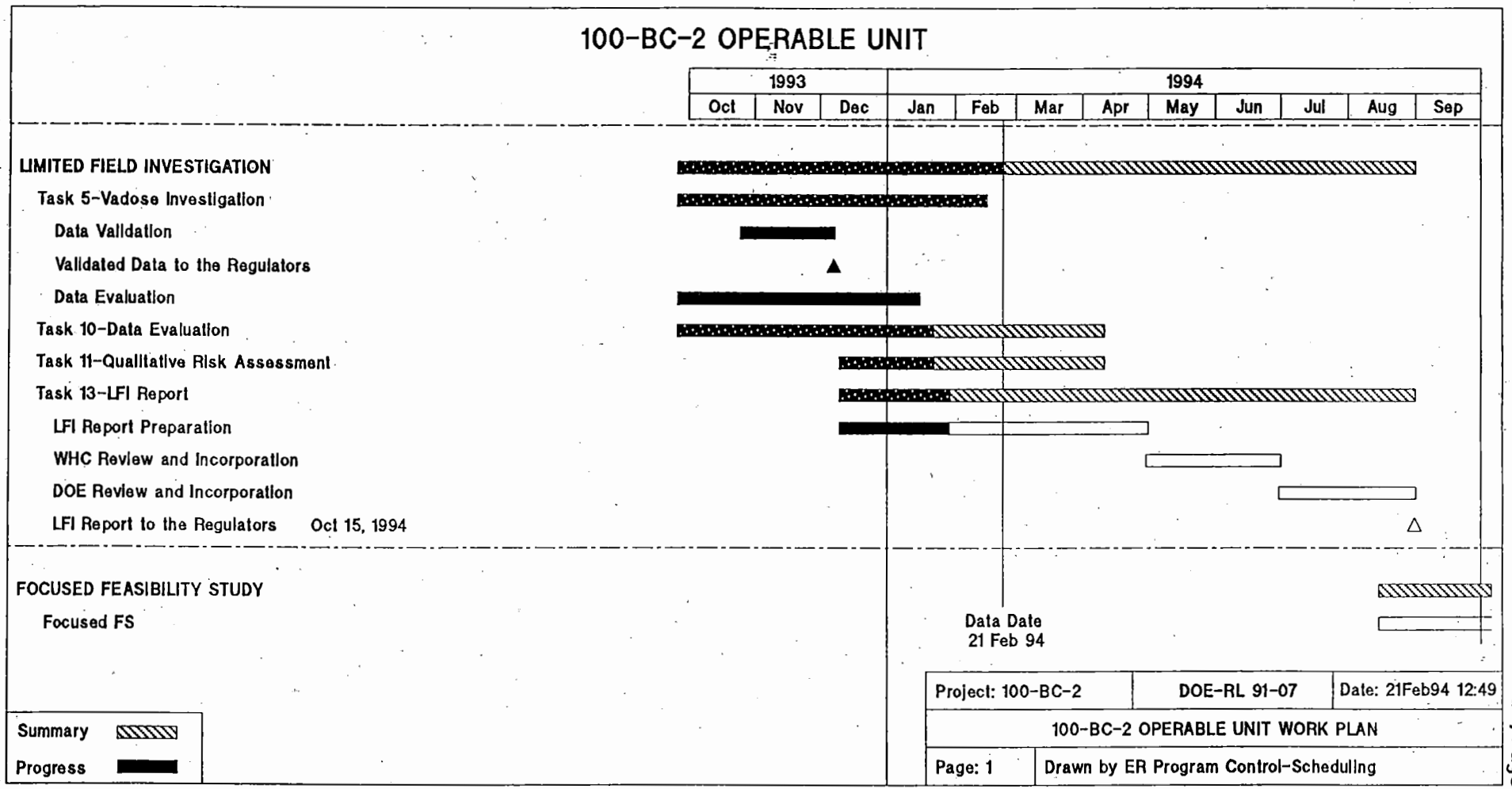
Limited Field Investigation (LFI) Report:

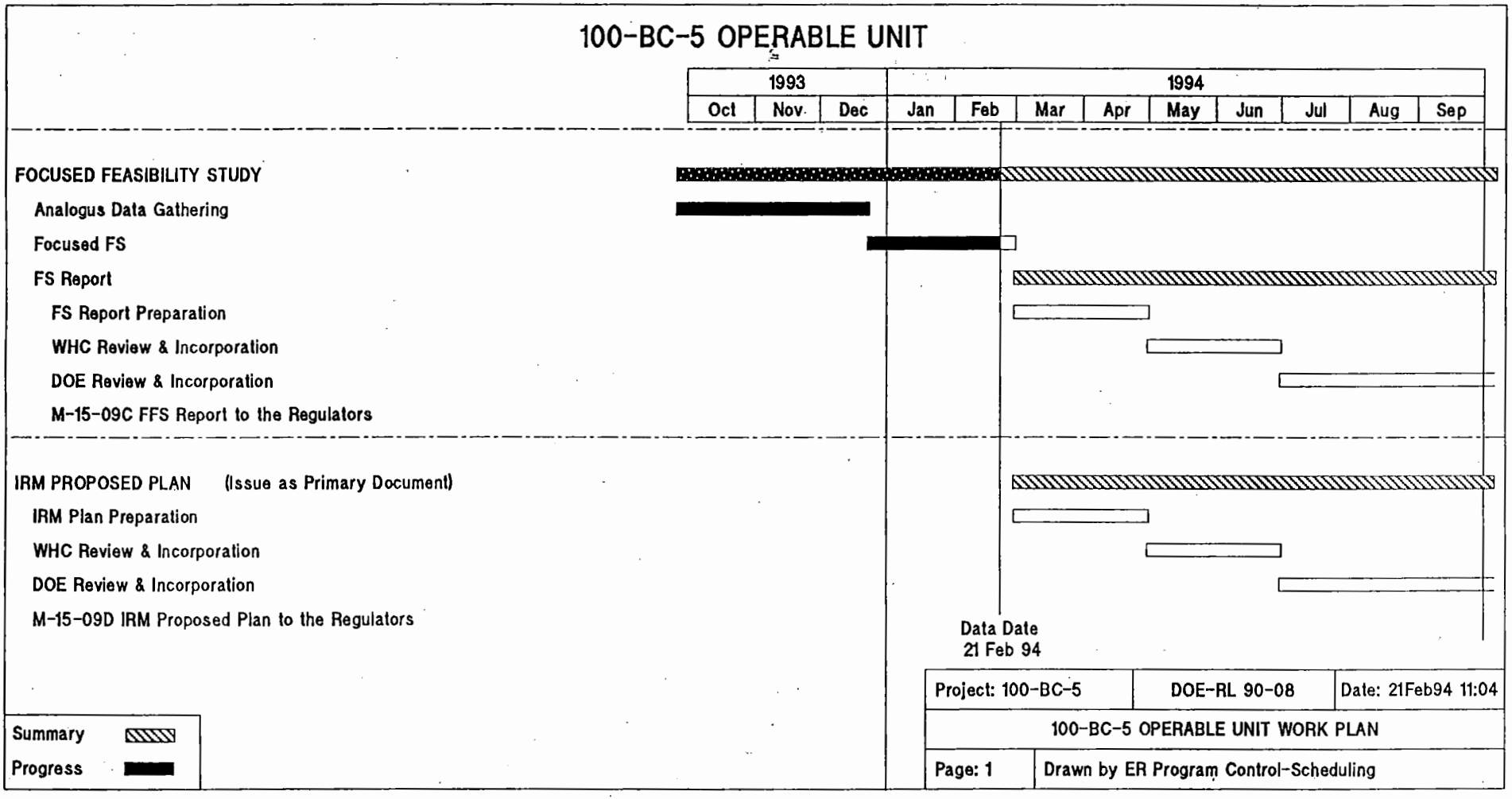
Regulator comments have been incorporated into the document. Waiting for regulator approval.

Focused Feasibility Study:

Task initiated in January, 1994.







K AREA

100-KR-1 QRA and LFI Reports

TASK 11: 100-KR-1 QRA (WHC-SD-EN-RA-009, Rev. 0) has been reviewed by DOE-RL. The comments resolutions were completed and transmitted to DOE-RL for review and approval.

TASK 13: 100-KR-1 LFI (DOE/RL 93-78 Decisional Draft) has been reviewed by DOE-RL. The comments resolutions were completed and transmitted to DOE-RL for review and approval.

100-KR-4 STATUS

- The Limited Field Investigation Report, Draft A and the Qualitative Risk Assessment Report. Rev 0 are in the regulatory review process.
- The 5th Round bi-annual groundwater sampling was completed in January in accord with the reduced analyte list.
- Focused Feasability Studies have been initiated for the 100-KR-4 OU.

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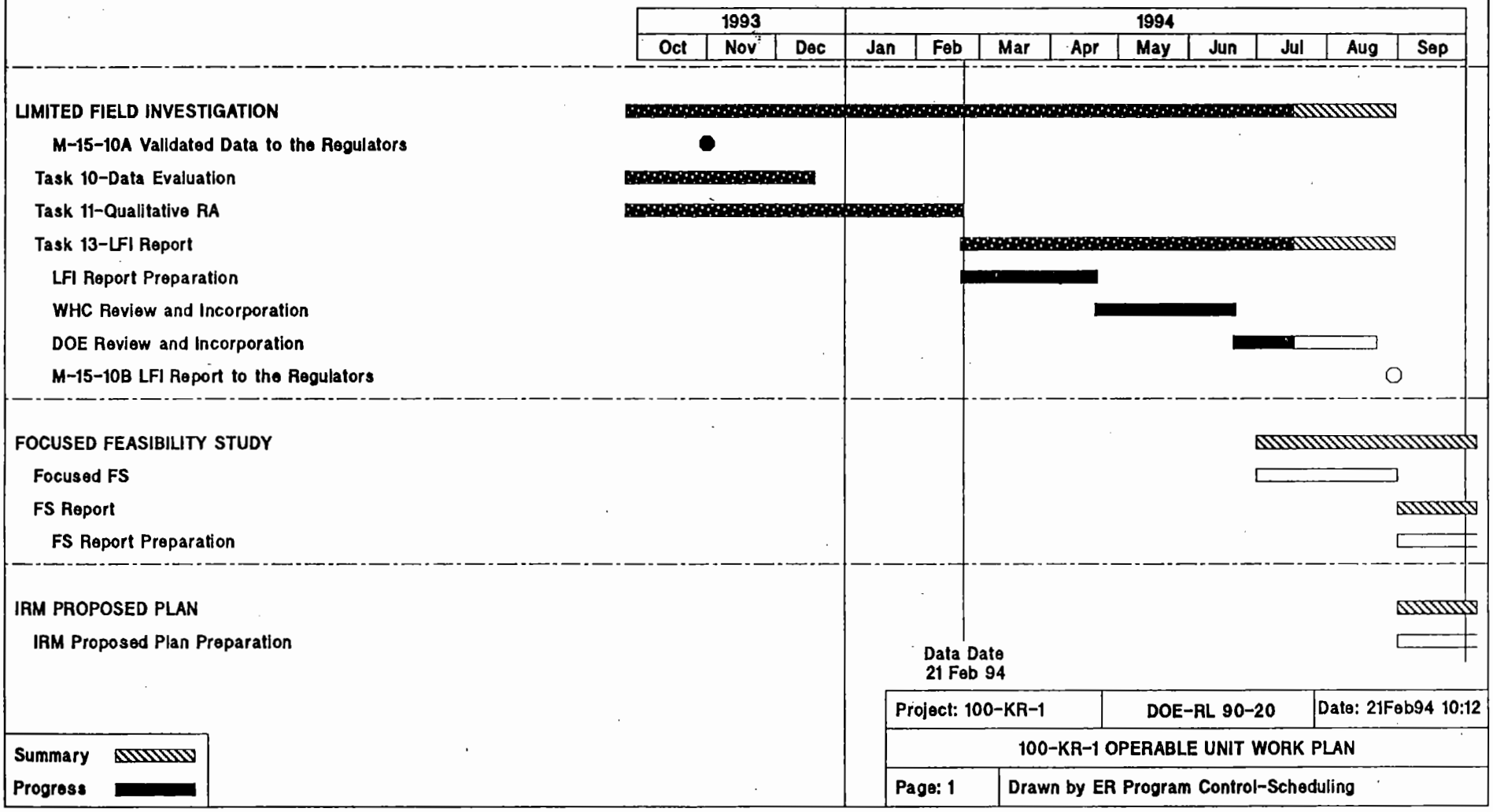

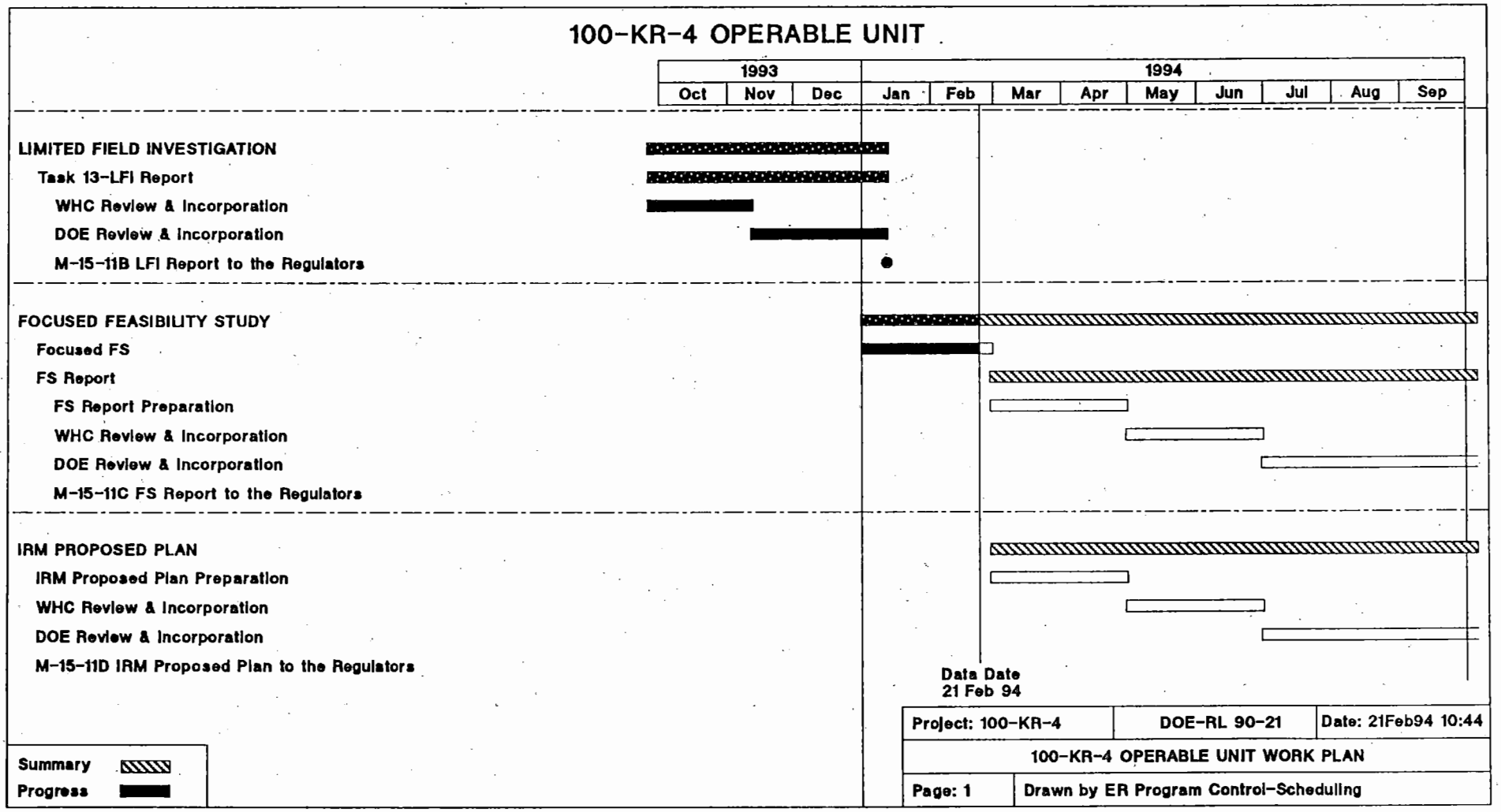

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N AREA

100-NR-1

100-NR-1 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse are ongoing. It was agreed to proceed with production of the work plans even though the Pilot Project scope has not been finalized. The work plan will refer to a 100 N Area Pilot Project Program Management Plan for details of integrating the 100 N activities.

100-NR-1 Qualitative Risk Assessment

- A draft of the QRA Report is undergoing Westinghouse review. As part of the document revision associated with the comment resolution process, the 1301-N (116-N-1) and 1325-N (116-N-3) sites will be included as high priority sites on the IRM pathway.

100-NR-1 Limited Field Investigation Report

- A draft of the LFI Report is undergoing Westinghouse review. As part of the document revision associated with the comment resolution process, the 1301-N (116-N-1) and 1325-N (116-N-3) sites will be included as high priority sites on the IRM pathway.

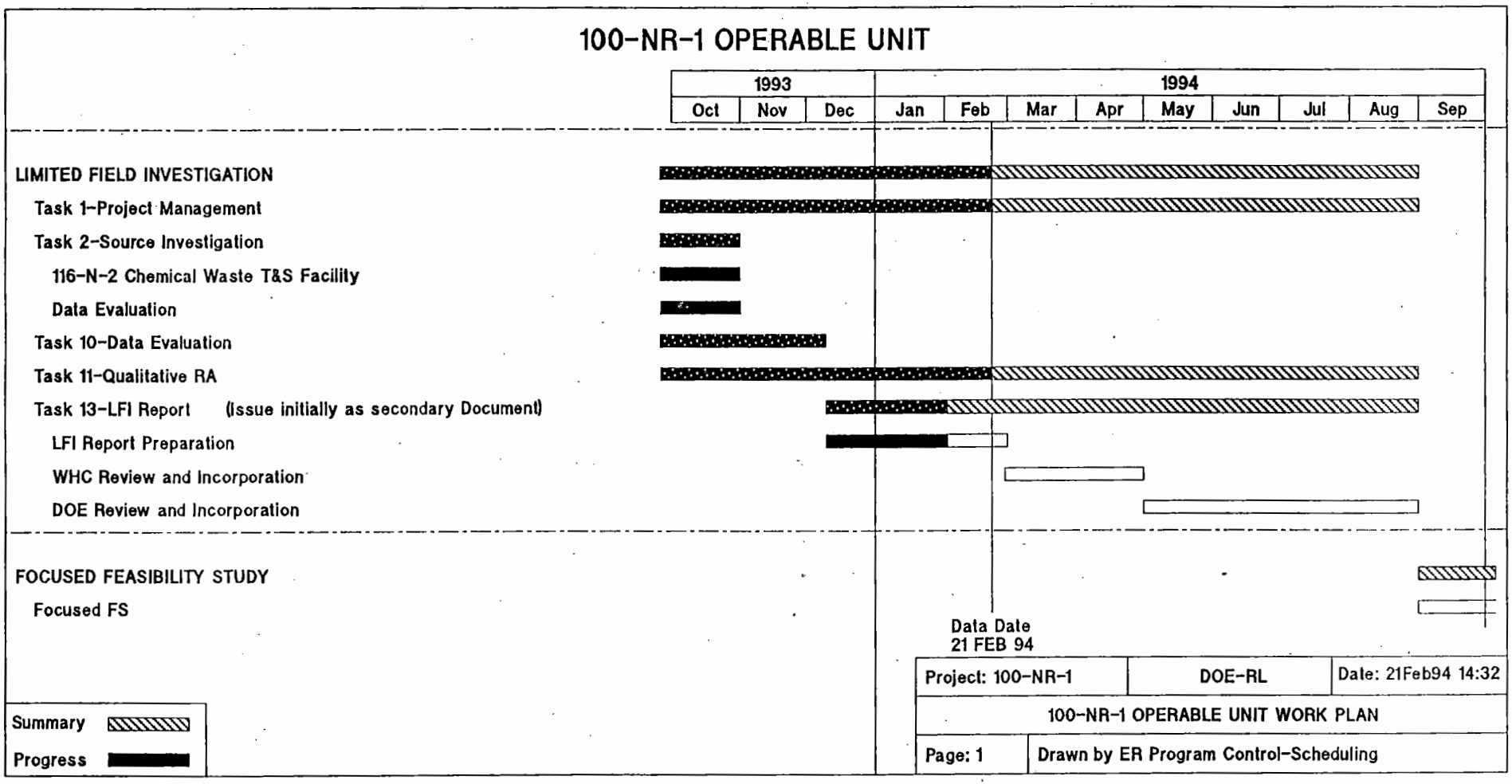
100 NR-2

100-NR-2 Operable Unit Work Plan

- As part of the TPA negotiations, a 100-N Area Pilot Project has been selected to demonstrate coordination of ongoing cleanup activities with facility transition, stabilization, and D&D activities. Discussions between the three parties and Westinghouse are ongoing. It was agreed to proceed with production of the work plans even though the Pilot Project scope has not been finalized. The work plan will refer to a 100 N Area Pilot Project Program Management Plan for details of integrating the 100 N activities.

100-NR-2 Qualitative Risk Assessment

- A draft of the LFI Report is undergoing Westinghouse review. As part of the document revision associated with the comment resolution process, the 1301-N (116-N-1) and 1325-N (116-N-3) sites will be included as high priority sites on the IRM pathway.



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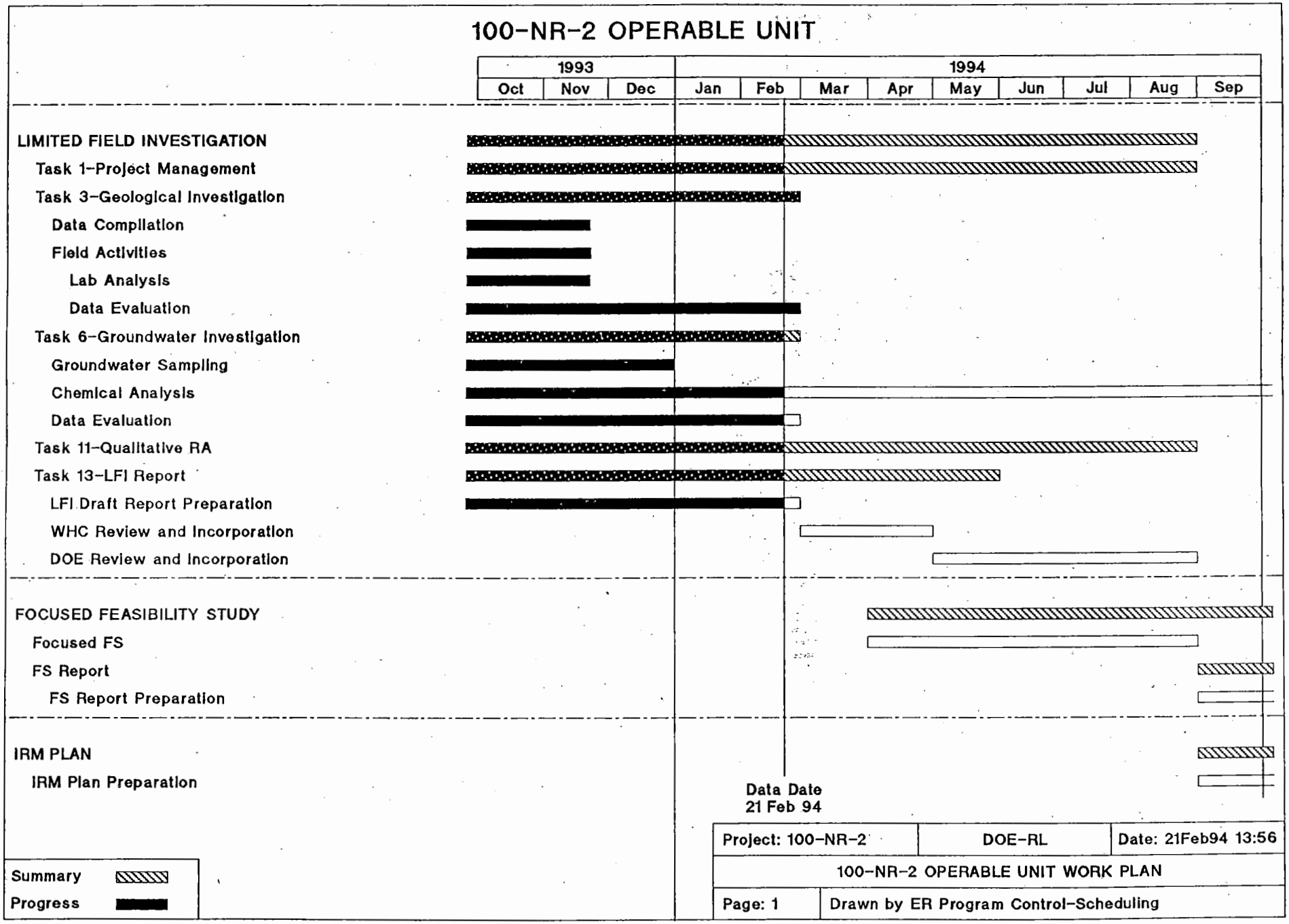

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H-AREA

100-HR-1

- The kick off meeting for the Focused Feasibility Study (FFS) was held on January 11, 1994. The regulator review draft is scheduled for distribution on September 2, 1994.

- Comment disposition meetings for the LFI and QRA are scheduled for Feb. 22 and 25, 1994.

100-HR-2

Work Plan

The document is in public review from January ~~24~~ 31 through ~~February 24~~ March 1, 1994.

TASK 10 - DATA EVALUATION

The task is essentially complete. The Historical Data Baseline Report for 100 H-Area is in final editing and is expected to be issued at the end of February 1994.

TASK 11 - QUALITATIVE RISK ASSESSMENT (QRA)

The data package needed to begin the QRA was completed and transmitted to WHC on February 14, 1994.

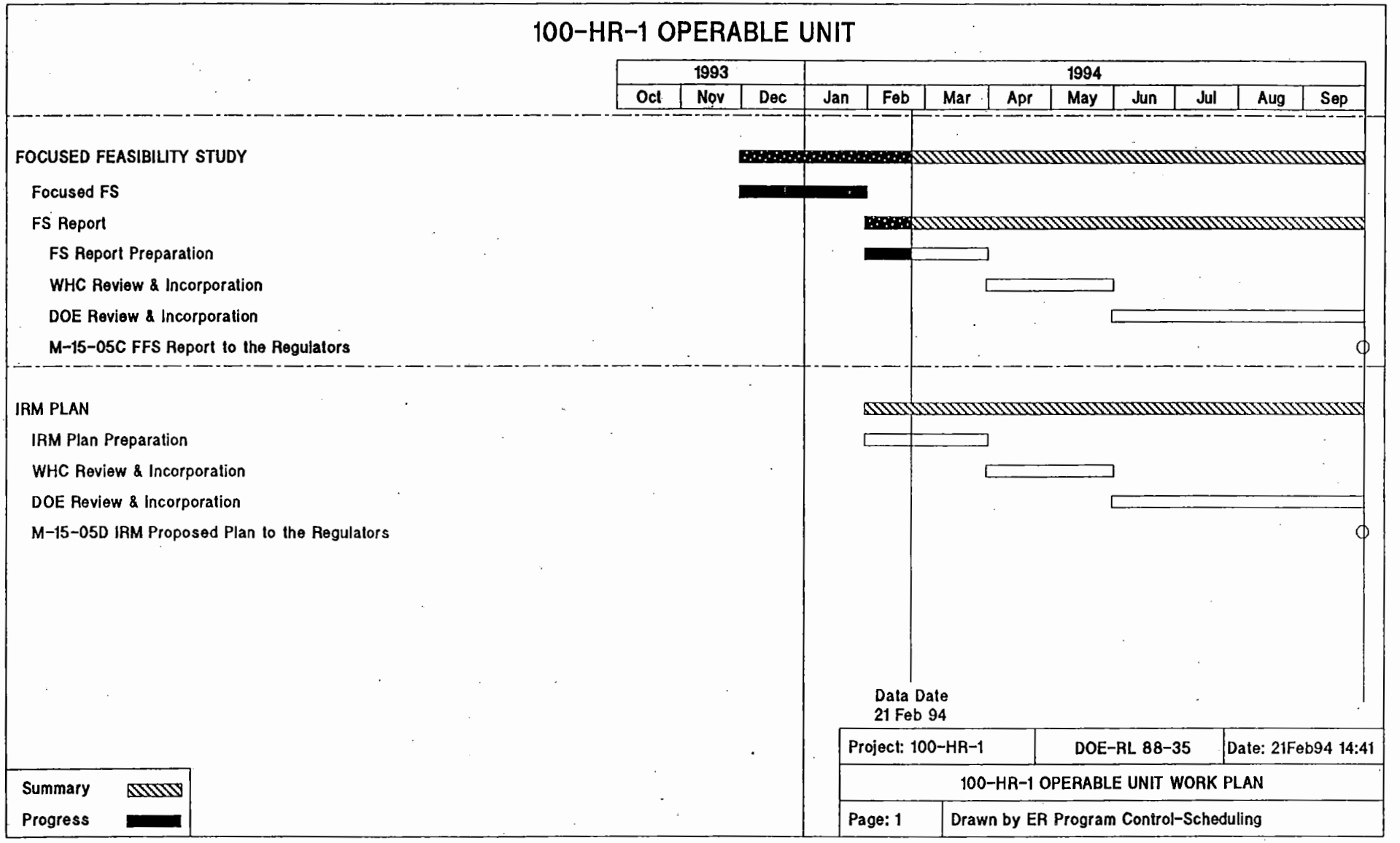
TASK 13 - LFI REPORT

The QRA Report and the LFI Report will be combined into one report for the 100-HR-2 OU. Preparation of the report was started in February and is due to the Regulators for review on September 23, 1994.

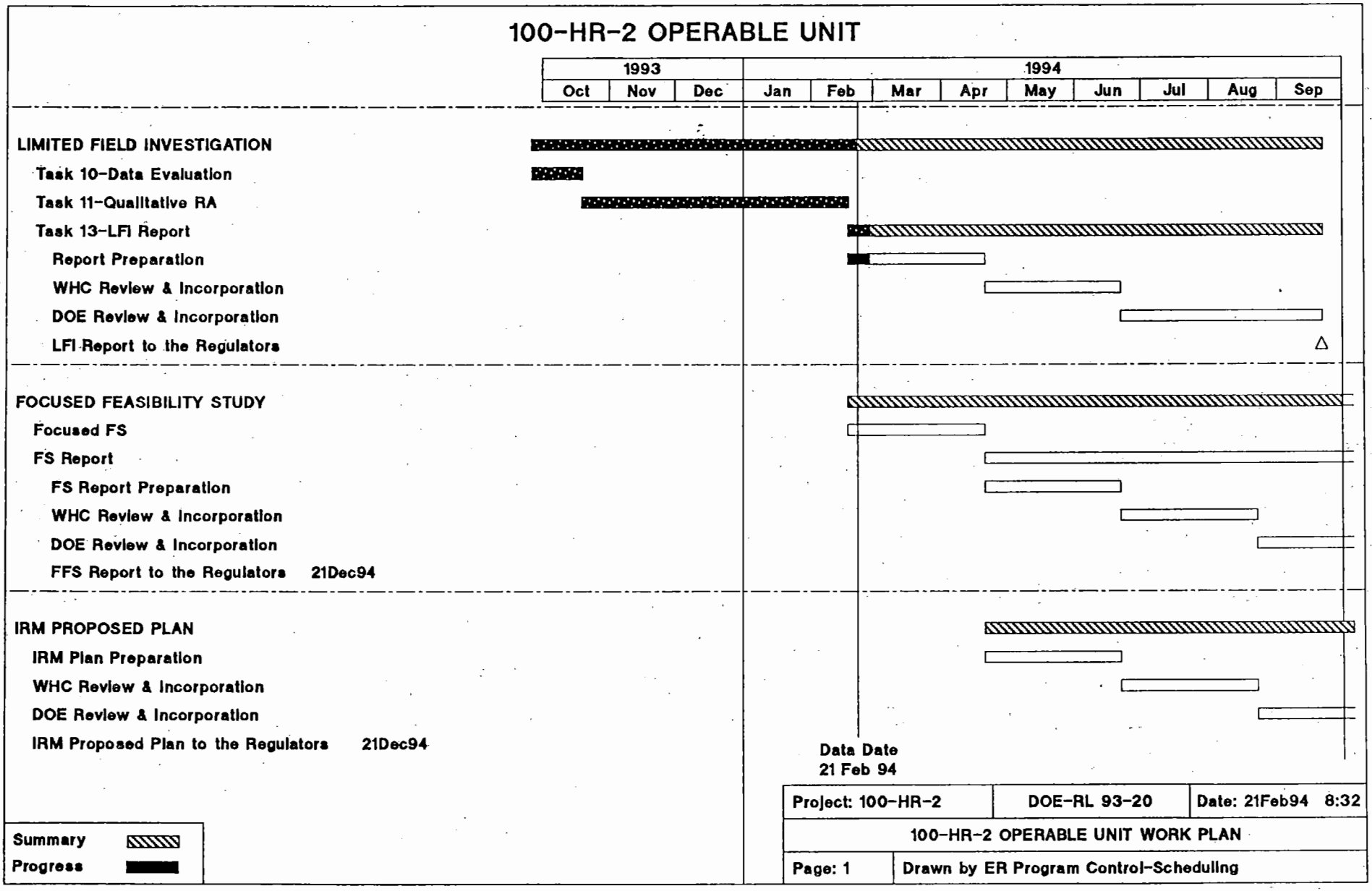
100-HR-3

Task 6- GROUNDWATER INVESTIGATION

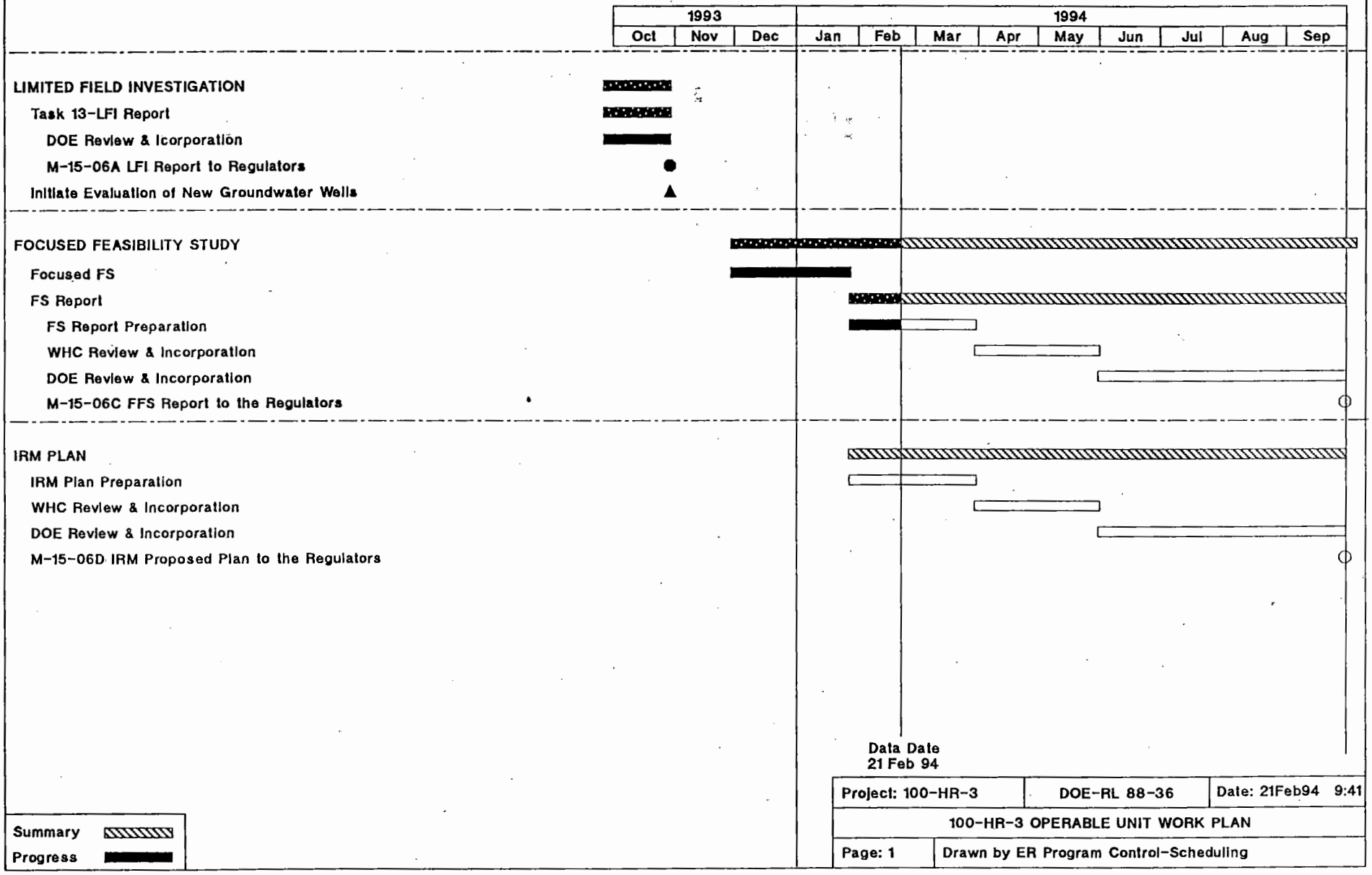
- WHC is currently responding to regulator comments on the Qualitative Risk Assessment and Limited Field Investigation Report.



100-HR-2 OPERABLE UNIT



100-HR-3 OPERABLE UNIT



D AREA

100-DR-1

Qualitative Risk Assessment

- Qualitative Risk Assessment report Regulatory comments have been addressed and the resolutions to specific comments will be discussed with DOE-RL and the Regulators on February 22, 1994.

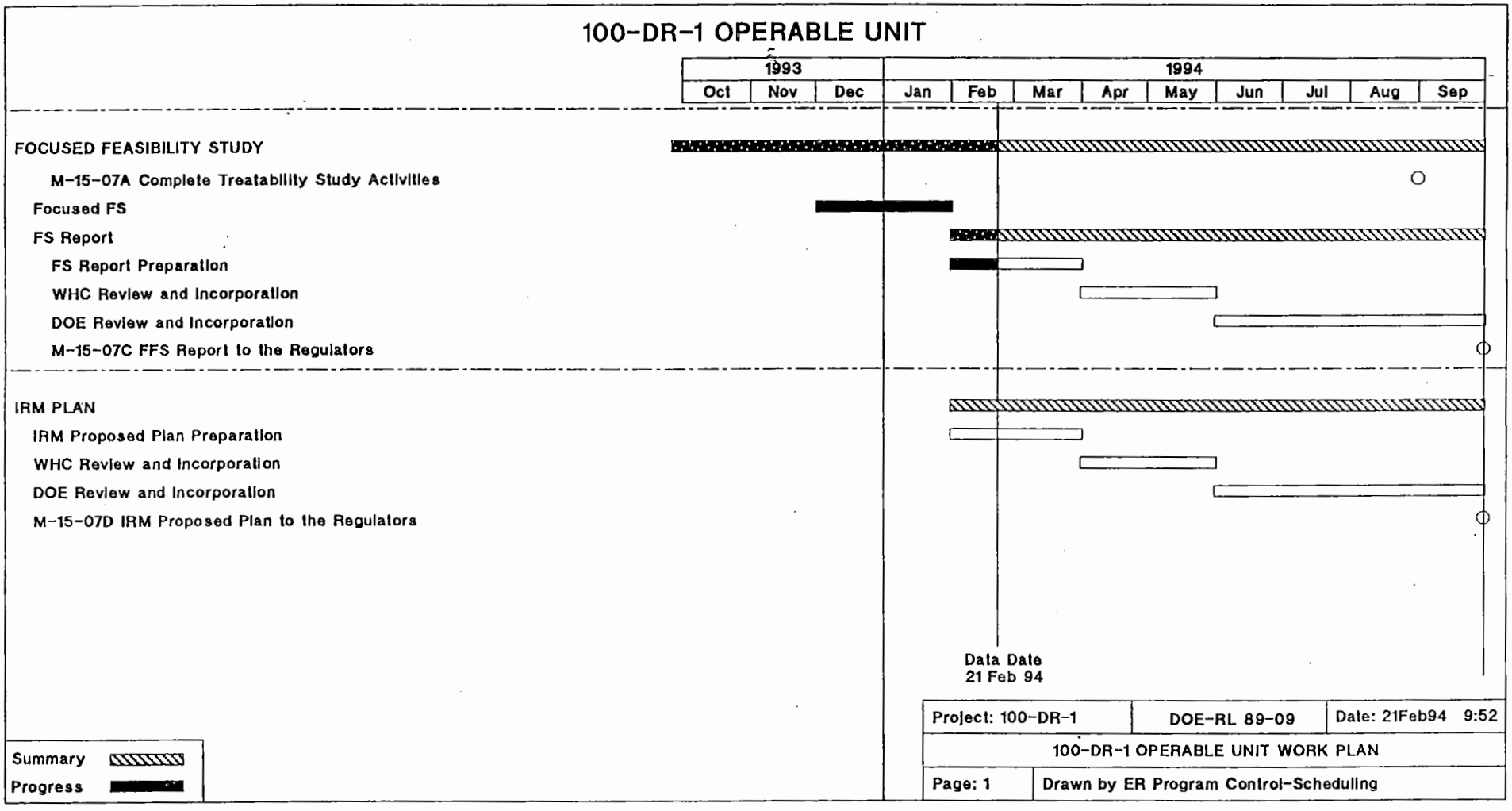
LFI Report

- Limited Field Investigation (LFI) report Regulatory comments have been addressed and the resolutions to specific comments will be discussed with DOE-RL and the Regulators on February 25, 1994.

100-DR-2

100-DR-2 Work Plan

- 100 DR-2 Work Plan has been reviewed by the Regulators. Comments were received on January 28, 1994 and at present are being addressed.



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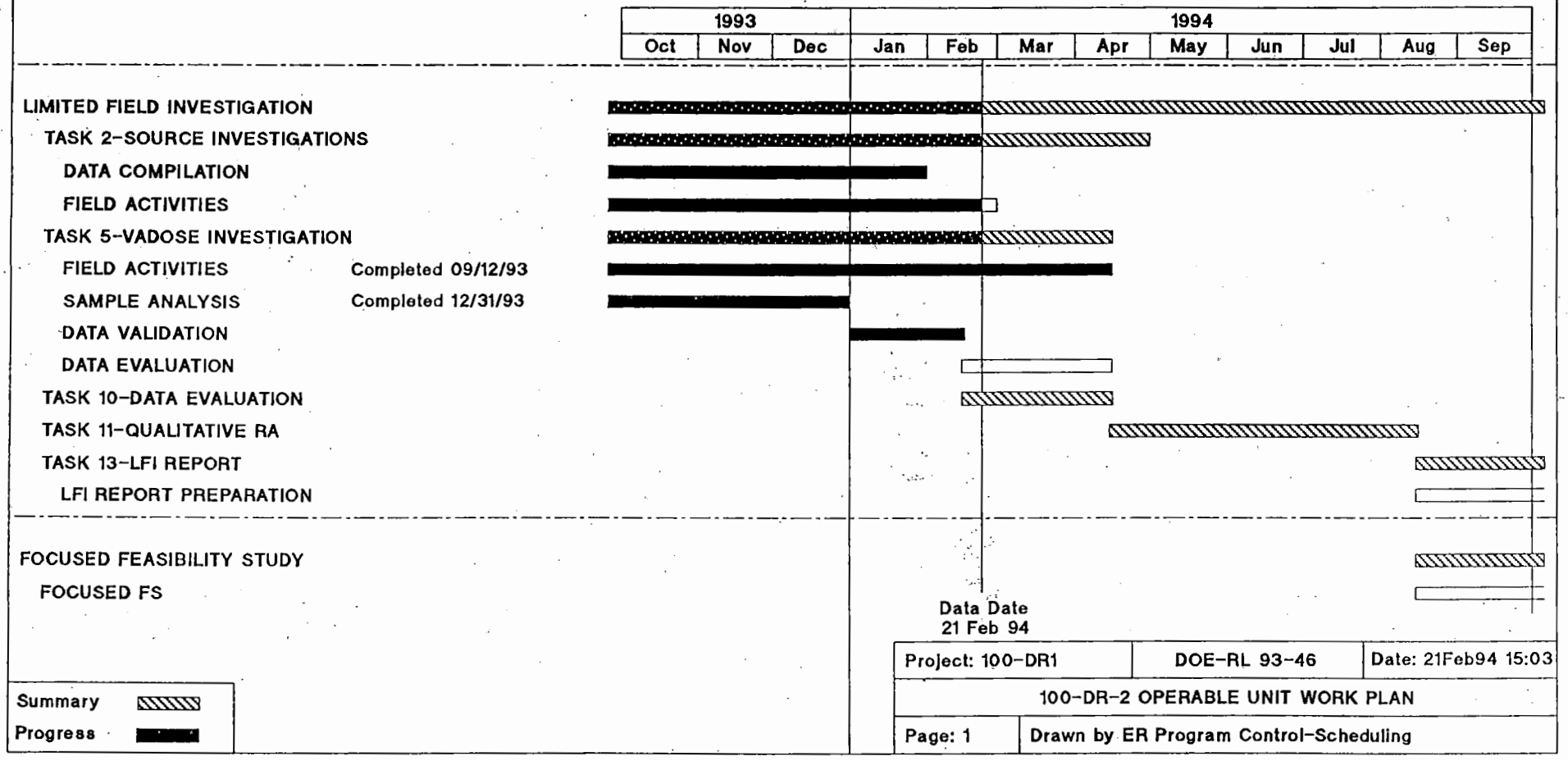

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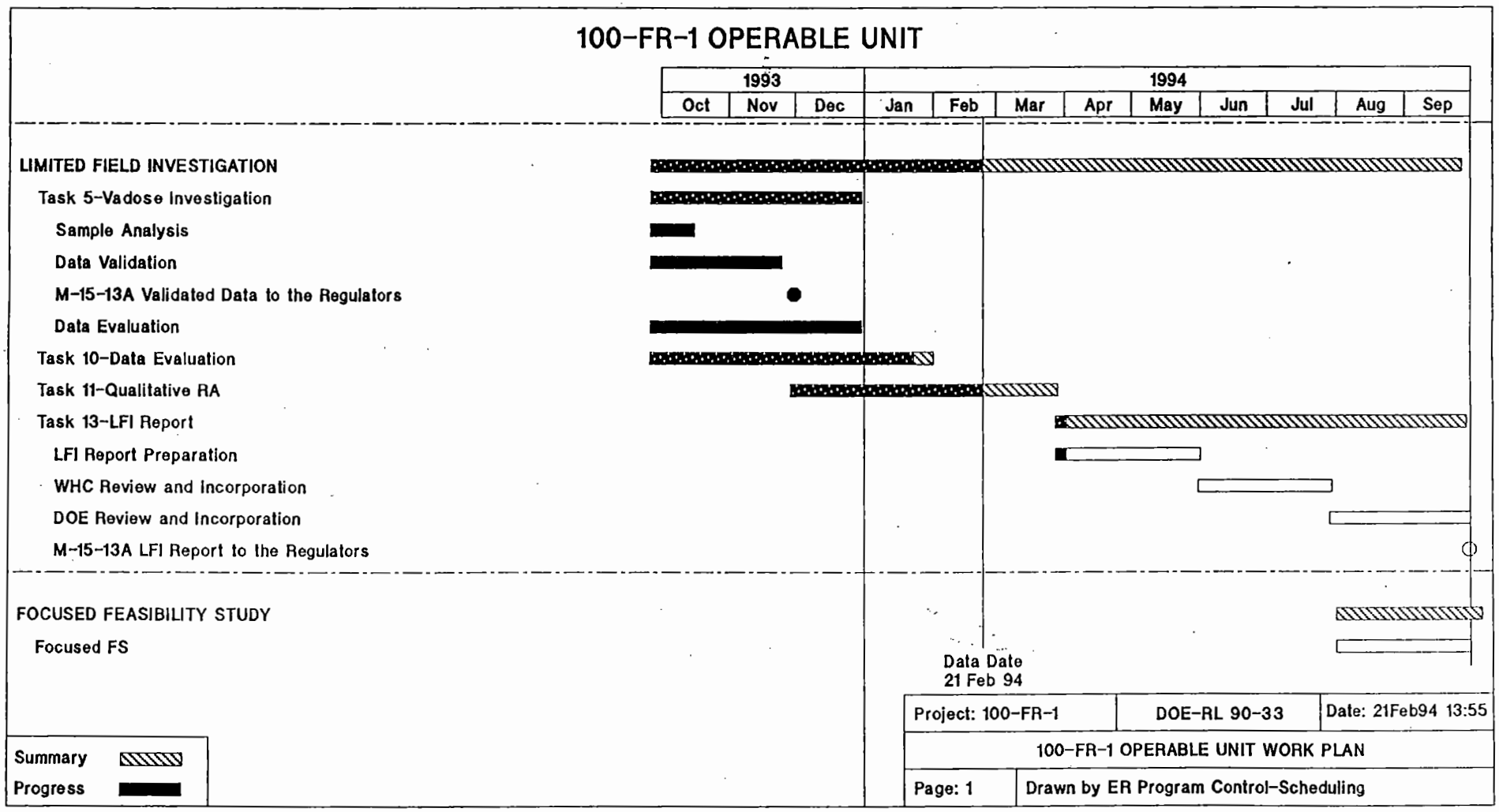


F AREA

100-FR-1

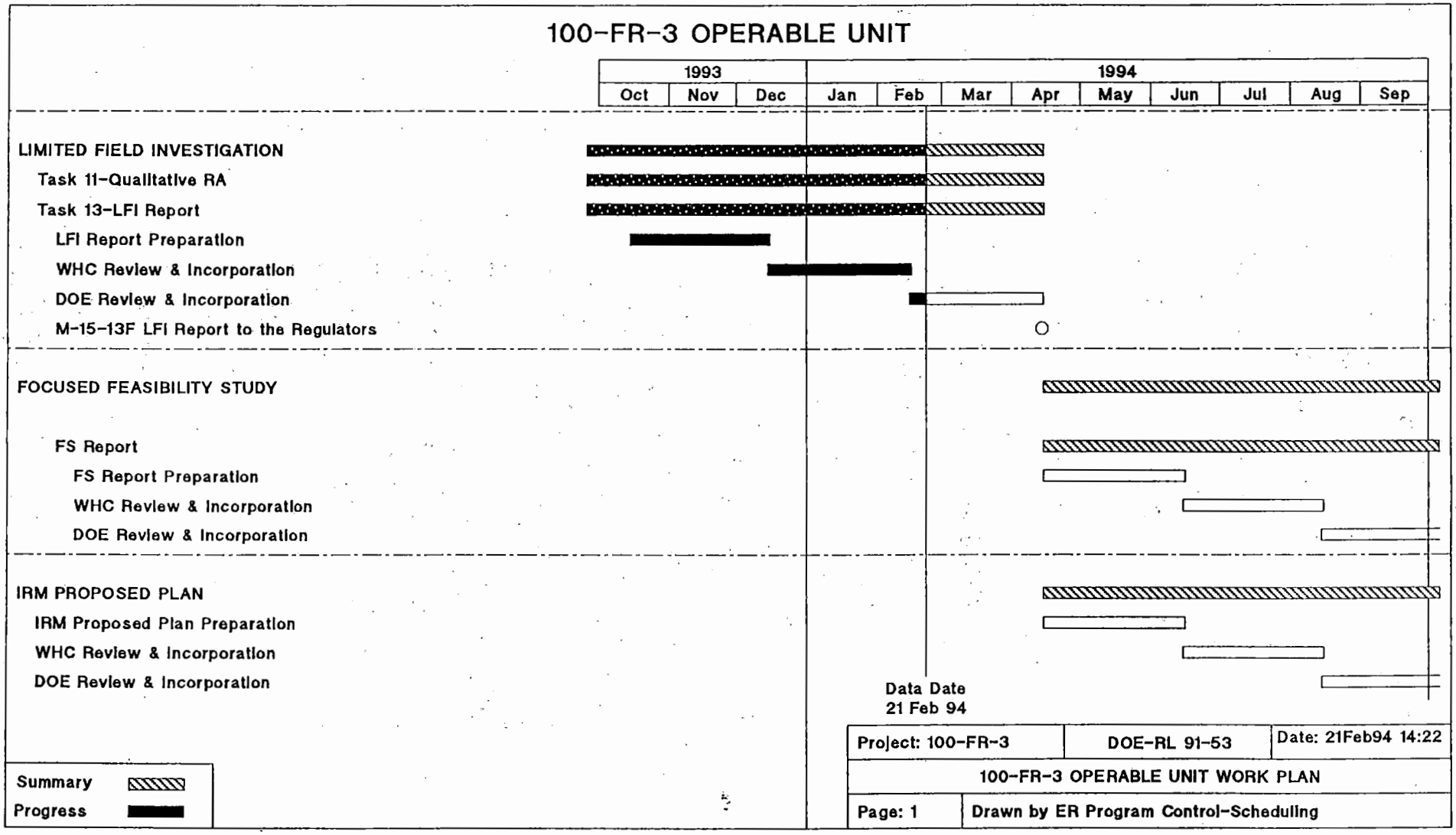
- The LFI and QRA reports are in process. The regulator review drafts are scheduled to be distributed on June 23, 1994.

100-FR-3

TASK 6 - GROUNDWATER INVESTIGATION

- The fifth round of groundwater sampling is scheduled for the end of February, 1994.
- The third round of groundwater data has been validated.
- The LFI and QRA are on schedule to be submitted to the regulators on April 14, 1994.

100-FR-3 OPERABLE UNIT



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GROUNDWATER INVESTIGATIONS ASSOCIATED WITH THE 100-K AREA FUEL STORAGE BASINS

Geosciences
Westinghouse Hanford Company

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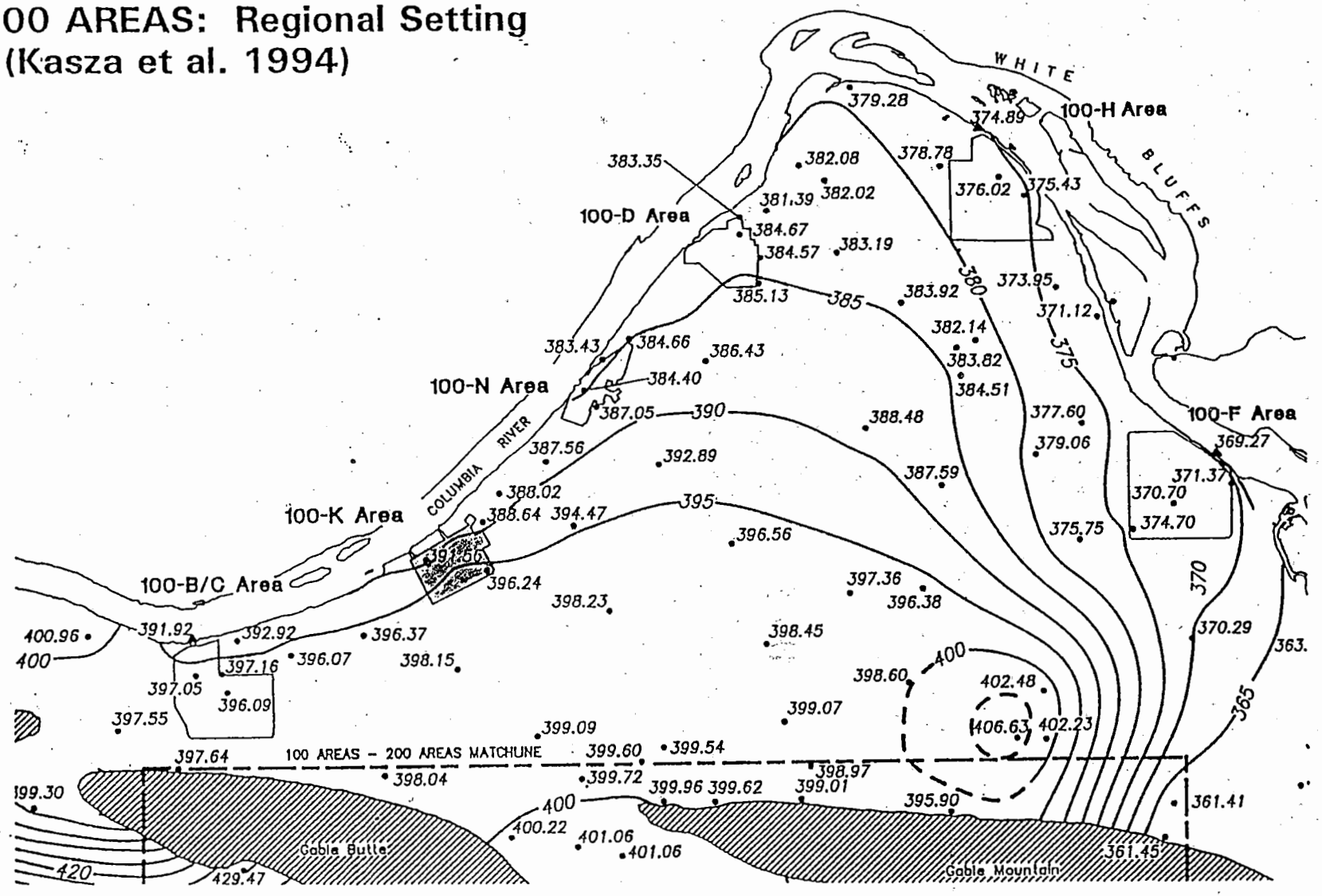
100 AREAS: Regional Setting (Kasza et al. 1994)



100-K FUEL STORAGE BASINS (02/09/94)

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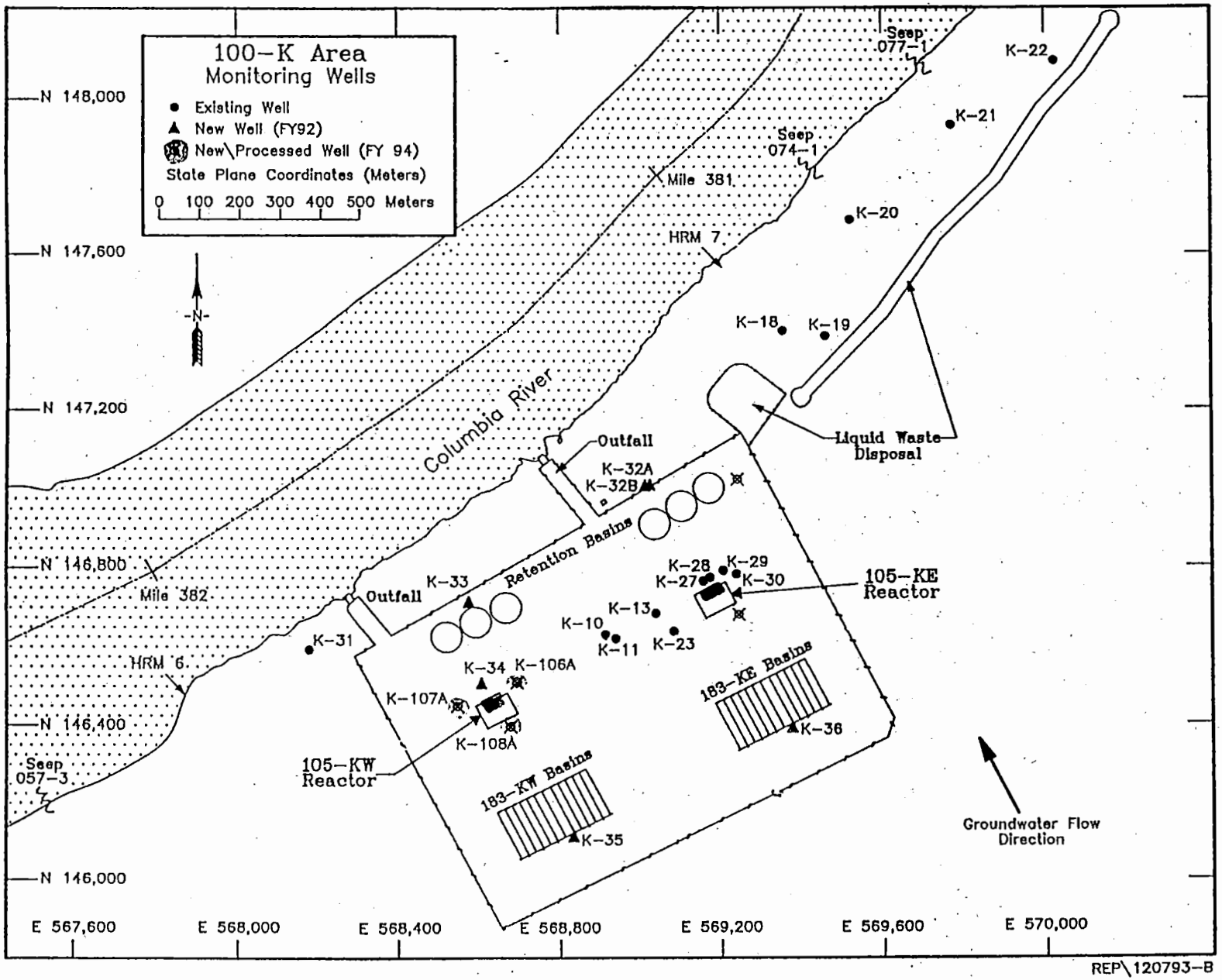

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GROUNDWATER PROGRAMS AT 100-K AREA

100-K Fuel Storage Basins

- Operational Groundwater Monitoring: Assess Impact of Facility Operations on Groundwater Quality

Other 100-K Area Programs

- Past Practices: 100-KR-4 Groundwater Operable Unit
- Sitewide Environmental Surveillance Program (PNL)
- Oversight: Washington State Department of Health

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RESPONSE ACTIONS: FOCUSED GROUNDWATER INVESTIGATIONS

Objectives

- Determine Influence of Basins on Groundwater Characteristics
- Determine Direction and Rate of Groundwater Flow Near Basins
- Improve Capability to Monitor Groundwater Quality by Installing Additional Wells
- Interpret Results of Sampling and Analysis to Support:

  (1) Groundwater Impact Assessments
  (2) Future Use Feasibility Studies

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INTEGRATED SAMPLING AND ANALYSIS PROGRAM FOR 100-K AREA

Well	Prog	Prime Proj	1993 OCT	NOV	DEC	1994 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
K-11	OPER	100K	X		C	X			X			X		
K-13	OPER	100K	A	A	A	A	A	A	A	A	A	A	A	A
K-18	OPER	100K	A	A	A	A	A	A	A	A	A	A	A	A
K-19	OPER	100K	X		C	X			X			X		
K-20	CERC	KR-4			C							C		
K-21	CERC	KR-4			C							C		
K-22	CERC	KR-4			C							C		
K-23	CERC	KR-4			C							C		
K-27	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-28	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-29	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-30	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-31	CERC	KR-4			C							C		
K-32A	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-32B	CERC	KR-4			C							C		
K-33	OPER	100K	X		C	X			X			X		
K-34	OPER	100K	X	A	A	X	A	A	X	A	A	X	A	A
K-35	CERC	KR-4			C							C		
K-36	CERC	KR-4			C							C		
K-37	CERC	KR-4			C							C		
70-68	CERC	KR-4			C							C		
73-61	CERC	KR-4			C							C		
78-62	CERC	KR-4			C							C		
074-1	CERC	KR-4										C		
077-1	CERC	KR-4										C		

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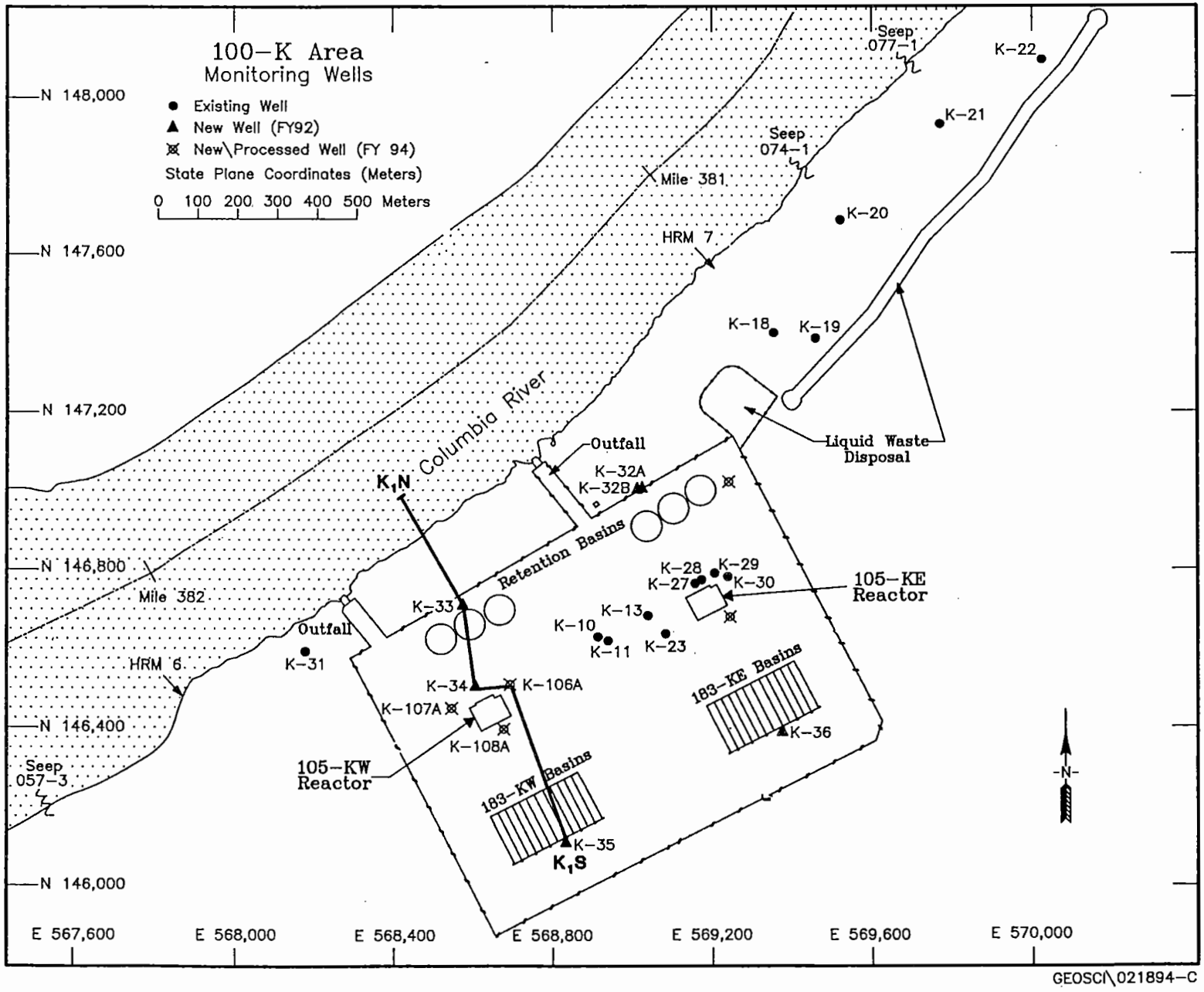

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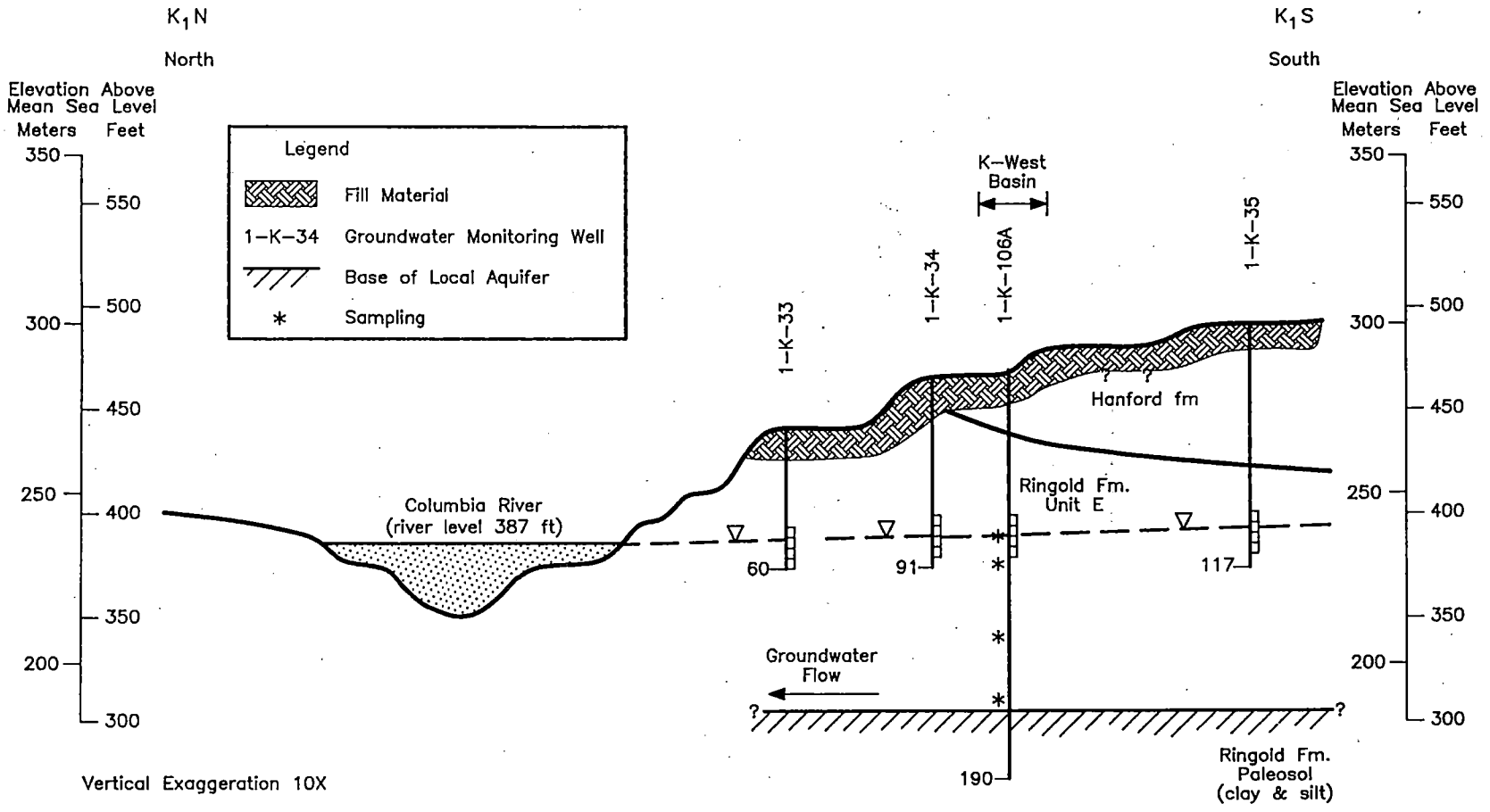
K–West Basin
Schematic Cross Section
K_1N – K_1S



WHC:JJA:K–BASIN

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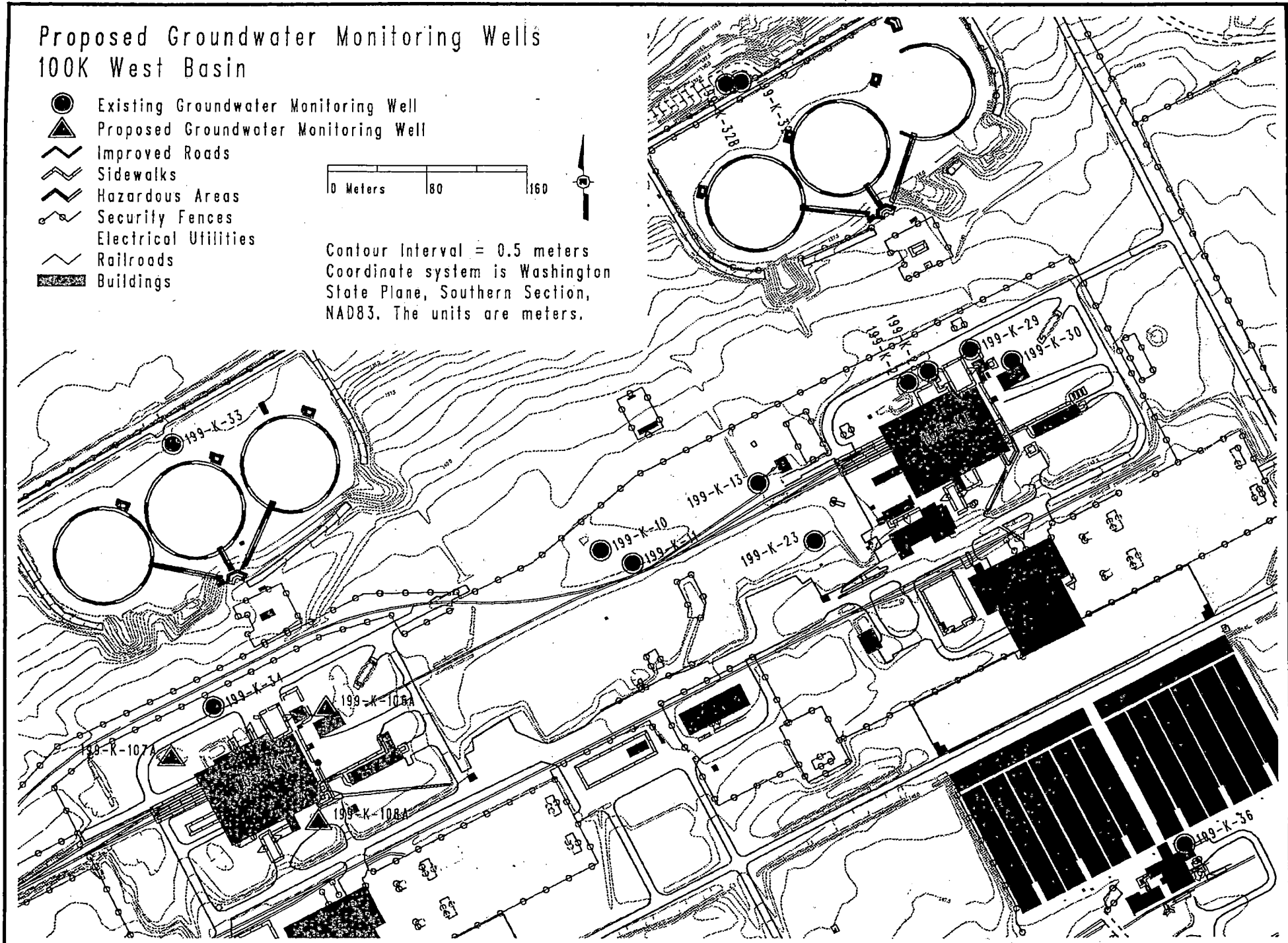
Proposed Groundwater Monitoring Wells
100K West Basin



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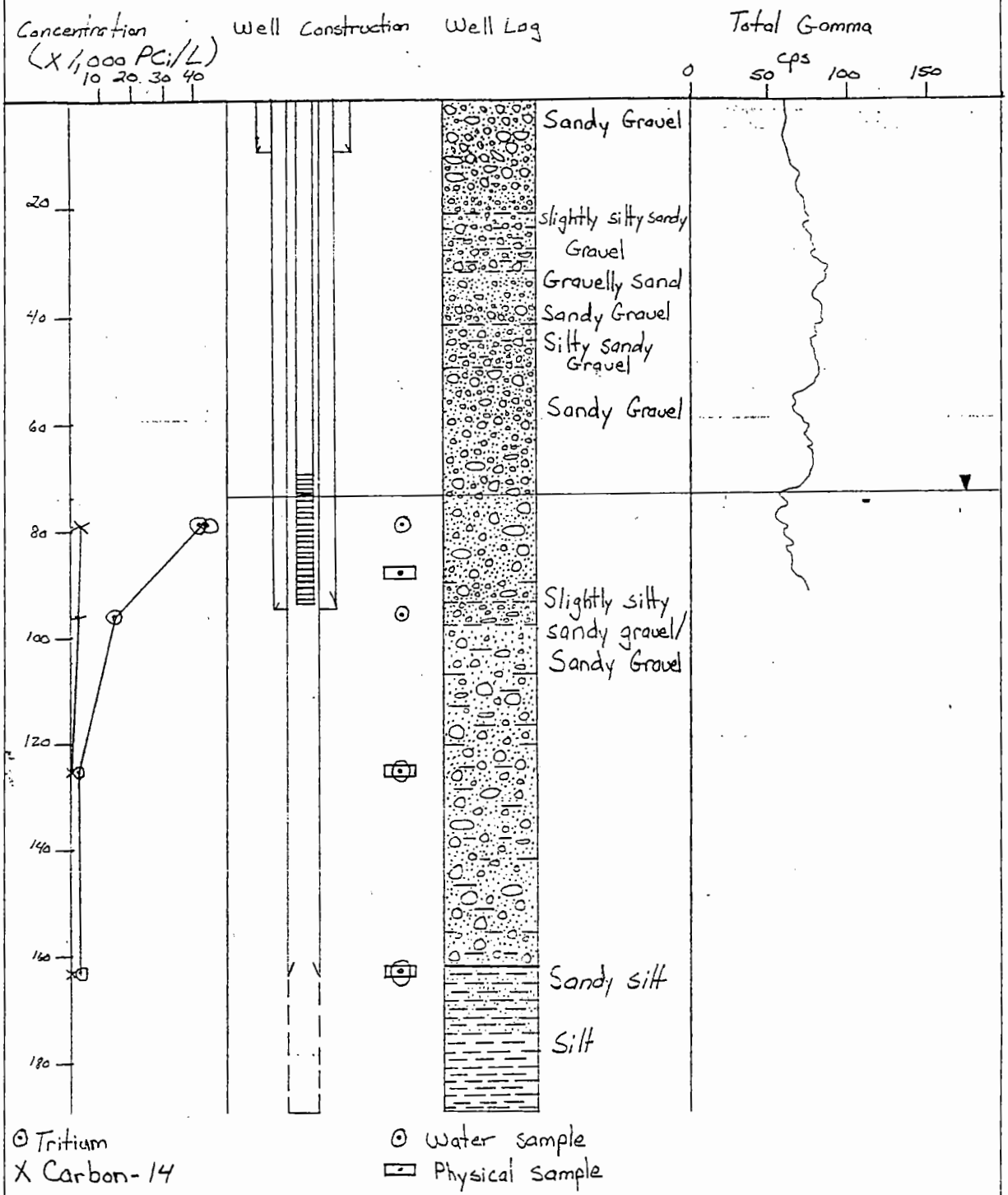
Detail and sampling results from Well #199-K-106A



Spectral Gamma Logging (R.L.S.) did not detect any MAN-MADE radionuclides.

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PRELIMINARY WASTE ACCEPTANCE CRITERIA

The waste acceptance criteria are being developed by others. This preliminary waste acceptance criteria is based on the Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063-4 and provides the outer bounds of the types of wastes that will be disposed at the Environmental Restoration Disposal Facility (ERDF). The waste acceptance criteria are important to ensure the proper equipment and liner materials are utilized. For the purposes of this conceptual design report (CDR), the following preliminary waste acceptance criteria was developed:

Volume of waste:

- approximately 21.8 million cubic meters (m^3) (28.5 million cubic yards [yds^3])

Type of waste:

- no waste higher than category 3 (per Table 4-1 of WHC-EP-0063) will be accepted
- no transuranic (TRU) waste will be accepted
- no waste containing free liquids will be accepted
- no waste containing decomposable material in concentrations greater than 10 percent of the waste volume will be accepted
- waste that is compatible with the liner system considering a 30-year performance rating for the liner
- single-use container of debris will not contain more than 10 percent volume of voids and decomposable material
- soil material in single use containers shall be compacted to approximately 95 percent modified proctor (assumed to be achieved by placing soil into the container in 2-foot maximum thickness lifts and compacting by tamping the material thoroughly with the backhoe bucket)
- the void space between the surface of the waste and the top of the single-use container shall be grouted to fill all voids.

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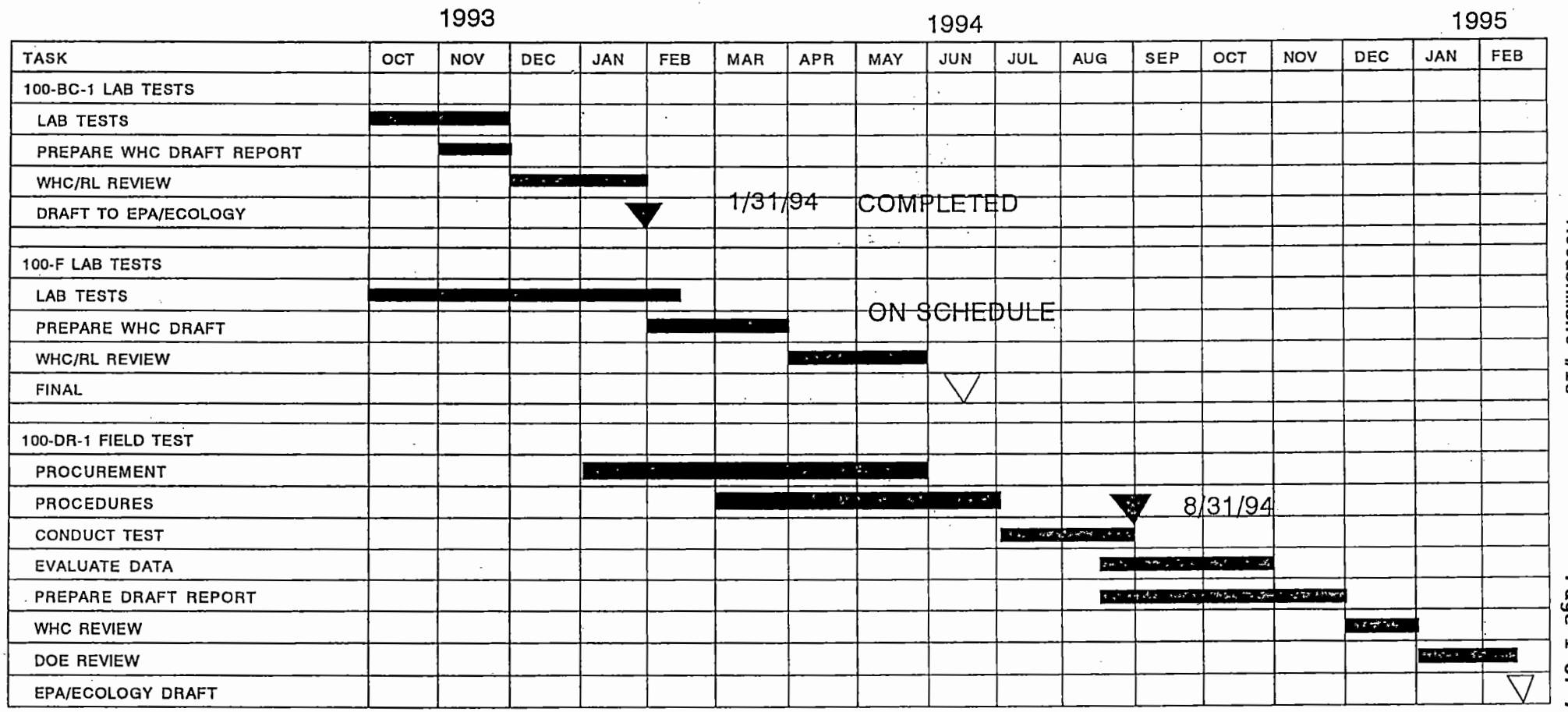
100 AREA SOIL WASHING TEST SCHEDULE

FEB, 1994



Attachment #10

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100 AREA SOIL WASHING BENCH-SCALE TEST PROCEDURES

Task Status (116-F-4 Soil) February 16, 1994

Task	Completed	In Progress	Scheduled
Chemical and Isotopic Analyses	■		
Moisture Content	■		
Soil pH	■		
Specific Gravity	■		
Particle Size Distribution	■		
Total Organic Carbon	■		
Exchangeable cations		■	
Toxicity Characteristic Leaching Procedure		■	
Sequential Extraction	■		
Optical and Electron Microscopy		■	
Mineralogy by X-ray Diffraction Analysis		■	
Wet Screening	■		
Attrition Scrubbing	■		
Autogenous Grinding		■	
Chemical Extraction	■		
Combination Tests			■
Waste Water Treatment			■
Report			■

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PRELIMINARY DATA FROM 116-F-4 SOIL WASHING TESTS

SOIL PH - 8.8

PARTICLE SIZE

ABOUT 81% BY WT. > 2 MM
ABOUT 78% BY WT > 13.5 MM

ANALYSES

CONCENTRATIONS OF CHROMIUM (TOTAL) BY XRF: 16 mg/kg
Cr AND OTHER TRACE ELEMENTS LOW

MEASURED Sr AND Pu

	Sr	Pu
< 2 MM	262	NOT YET RECEIVED
0.5 TO 1.5 IN	6.7	NOT YET RECEIVED
1.5 TO 3.0 IN	4.2	3.6

RADIONUCLIDE AND MASS DISTRIBUTION DATA (< 2 MM SOILS)

PARTICLE-SIZE	Cs	Eu	Co	WT (%)
2 TO 0.425 MM	218	0.4	1.2	5.2
0.425 TO 0.25 MM	220	0.4	0.2	7.7
0.25 TO 0.075 MM	449	0.8	0.6	3.8
< 0.075 MM	2620	17	1.1	2.3

PRELIMINARY ATTRITION SCRUBBING RESULTS

ATTRITION SCRUBBING	Cs INITIAL	Cs FINAL
I STAGE	262	122
II STAGE	262	98

2 MM TO 0.25 MM SIZE FRACTION FROM 116-F-4 PLUTO CRIB
ATTRITION SCRUBBING WITH ELECTROLYTE

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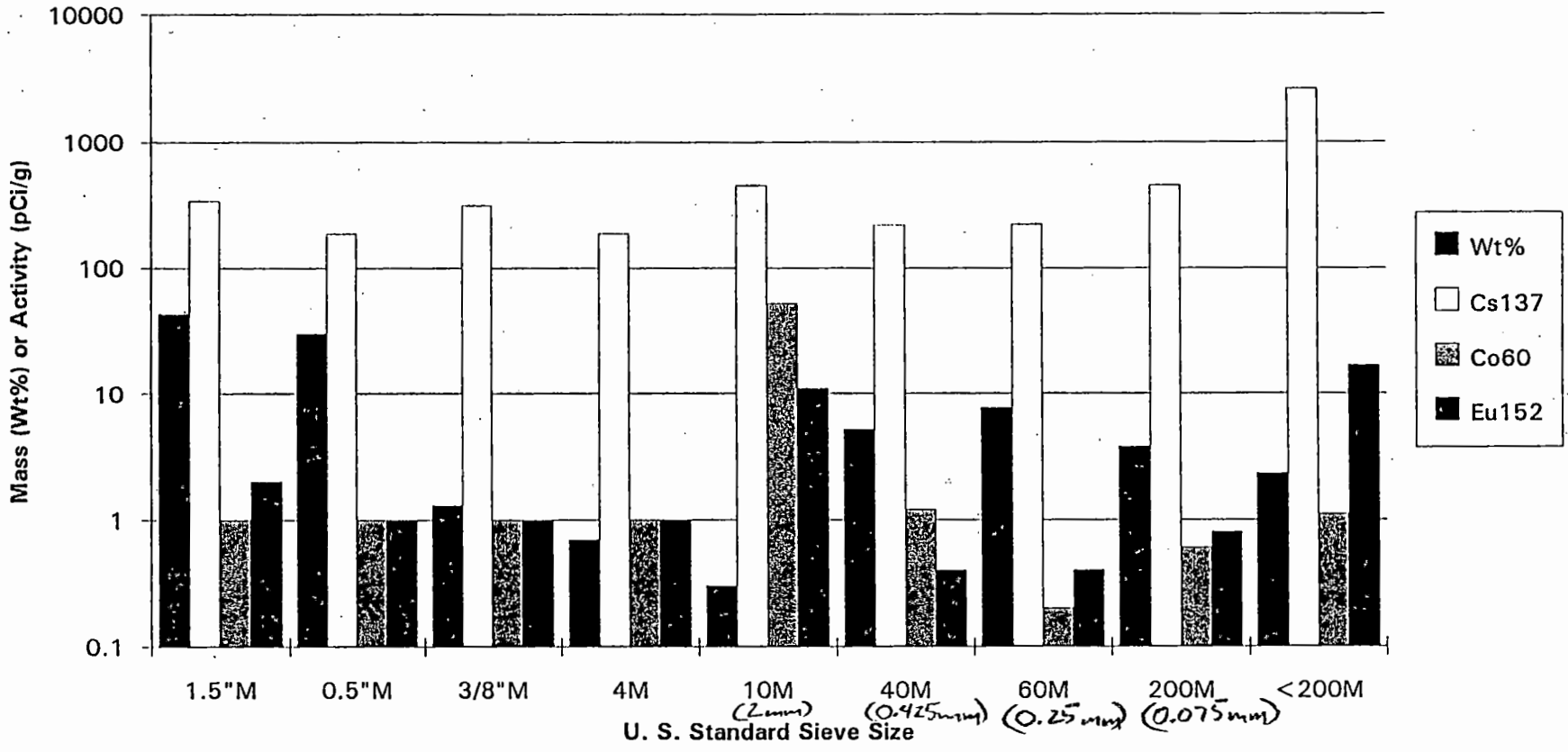
Mass and Activity Distribution in 116-F-4 Pluto Crib Soil



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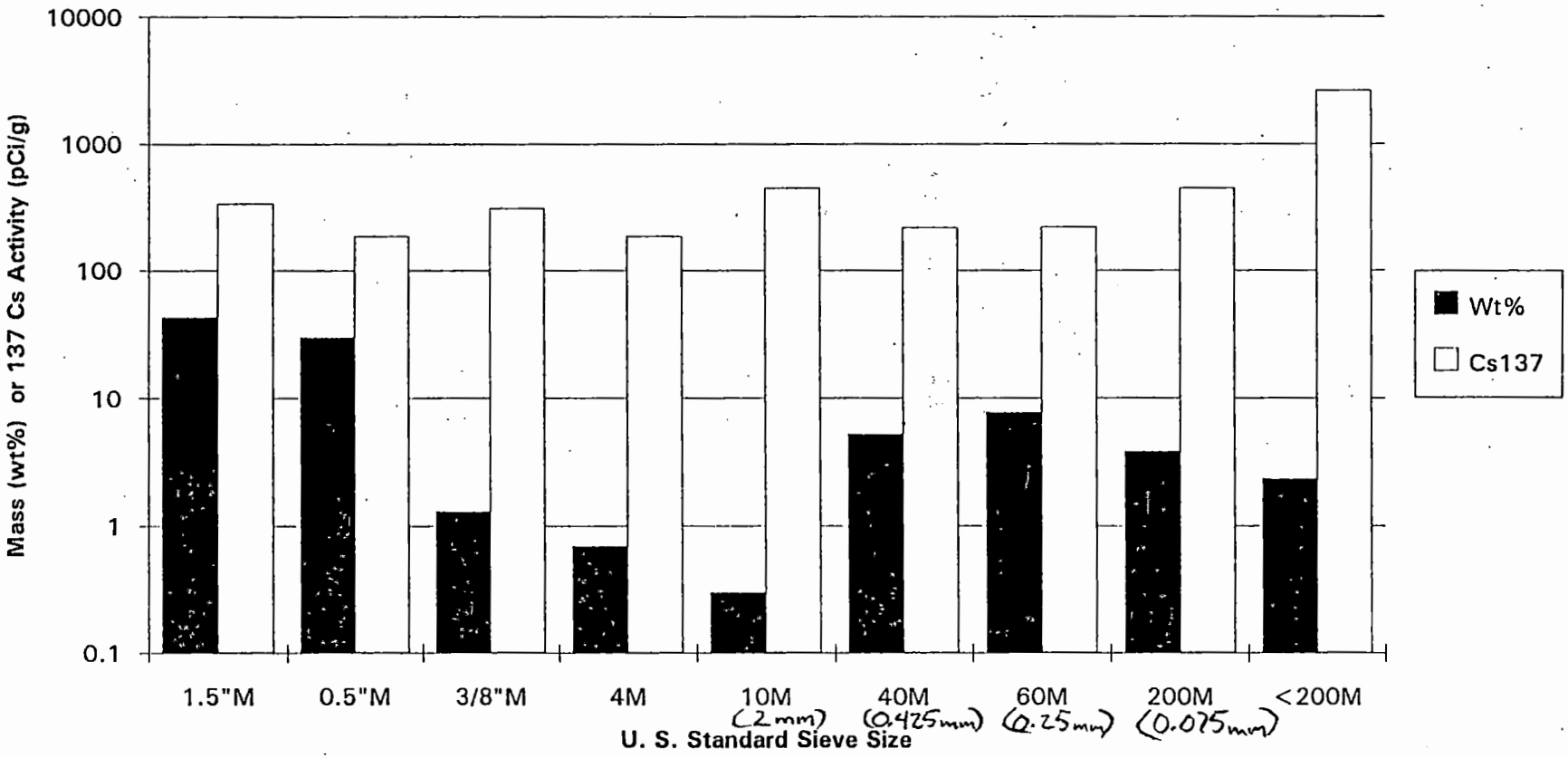
Mass and 137Cs Activity Distribution in 116-F-4 Pluto Crib Soil



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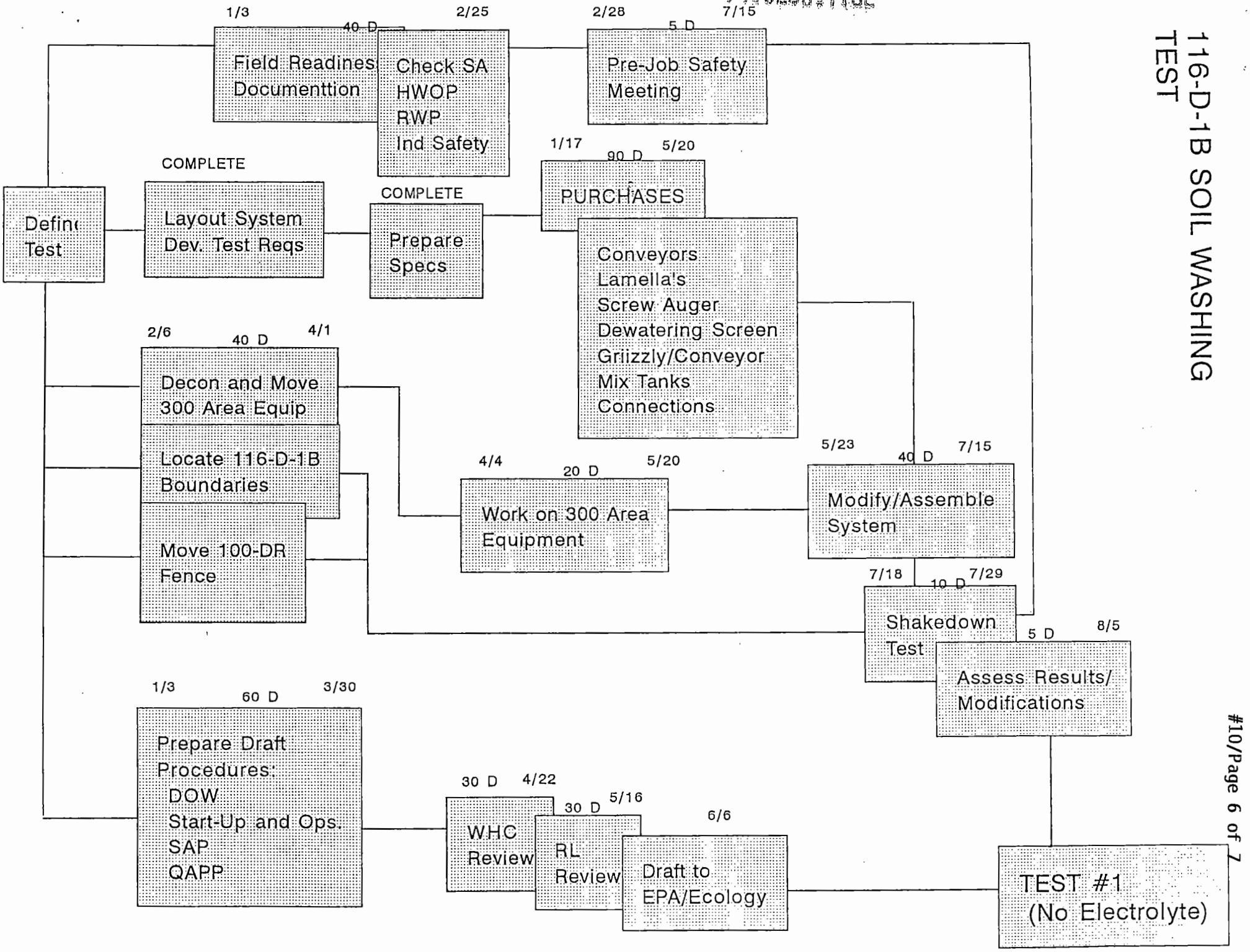
116-D-1B SOIL WASHING TEST



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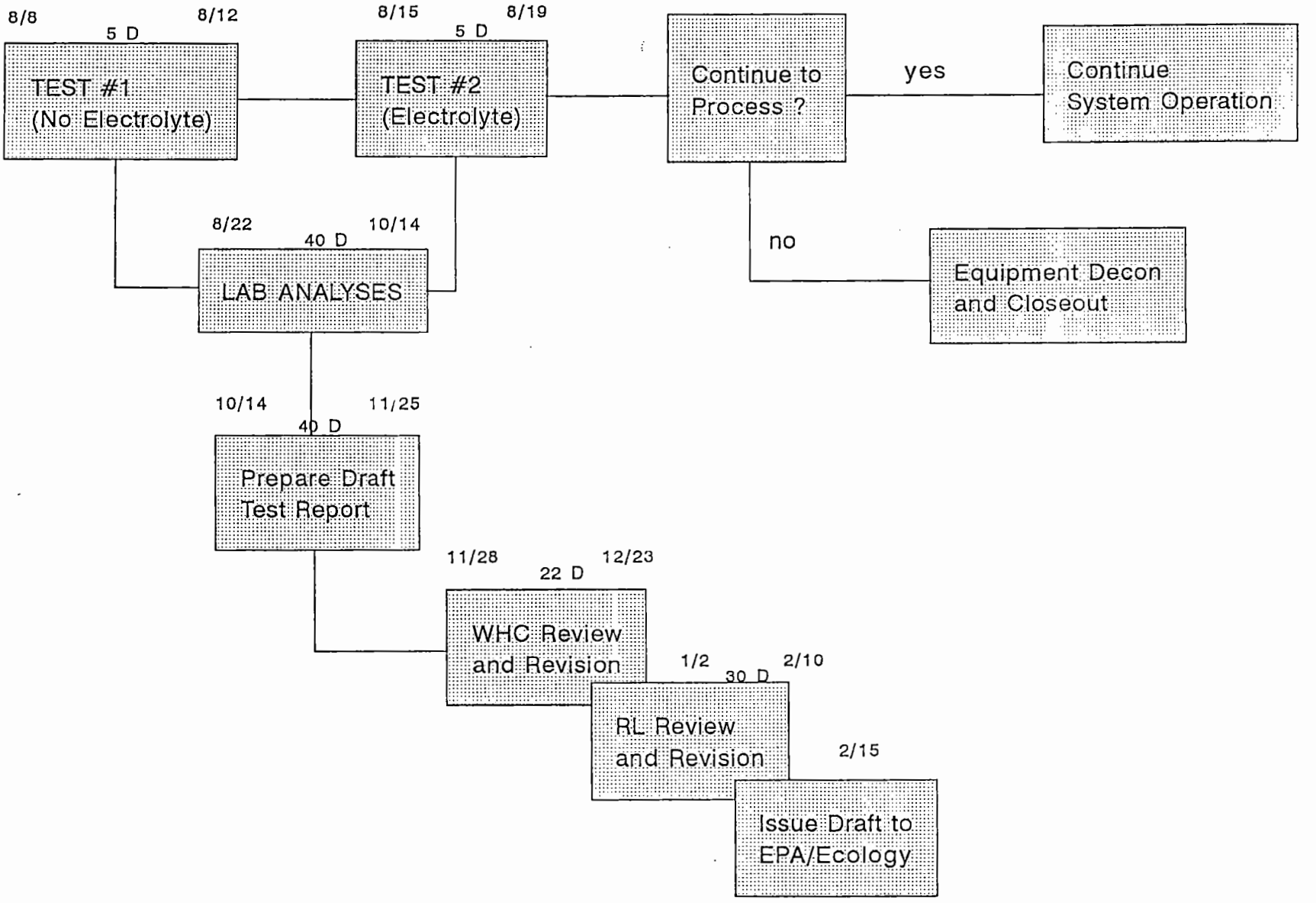
116-D-1B SOIL WASHING TEST



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Solidification/Stabilization Treatability Tests

John Ludowise
Westinghouse Hanford Company

February 23, 1994

Agenda

- Ex Situ Vitrification -- Results of crucible tests conducted by Pacific Northwest Laboratories (PNL)

- Solidification -- Codisposal treatability test plan synopsis

PNL Crucible Testing

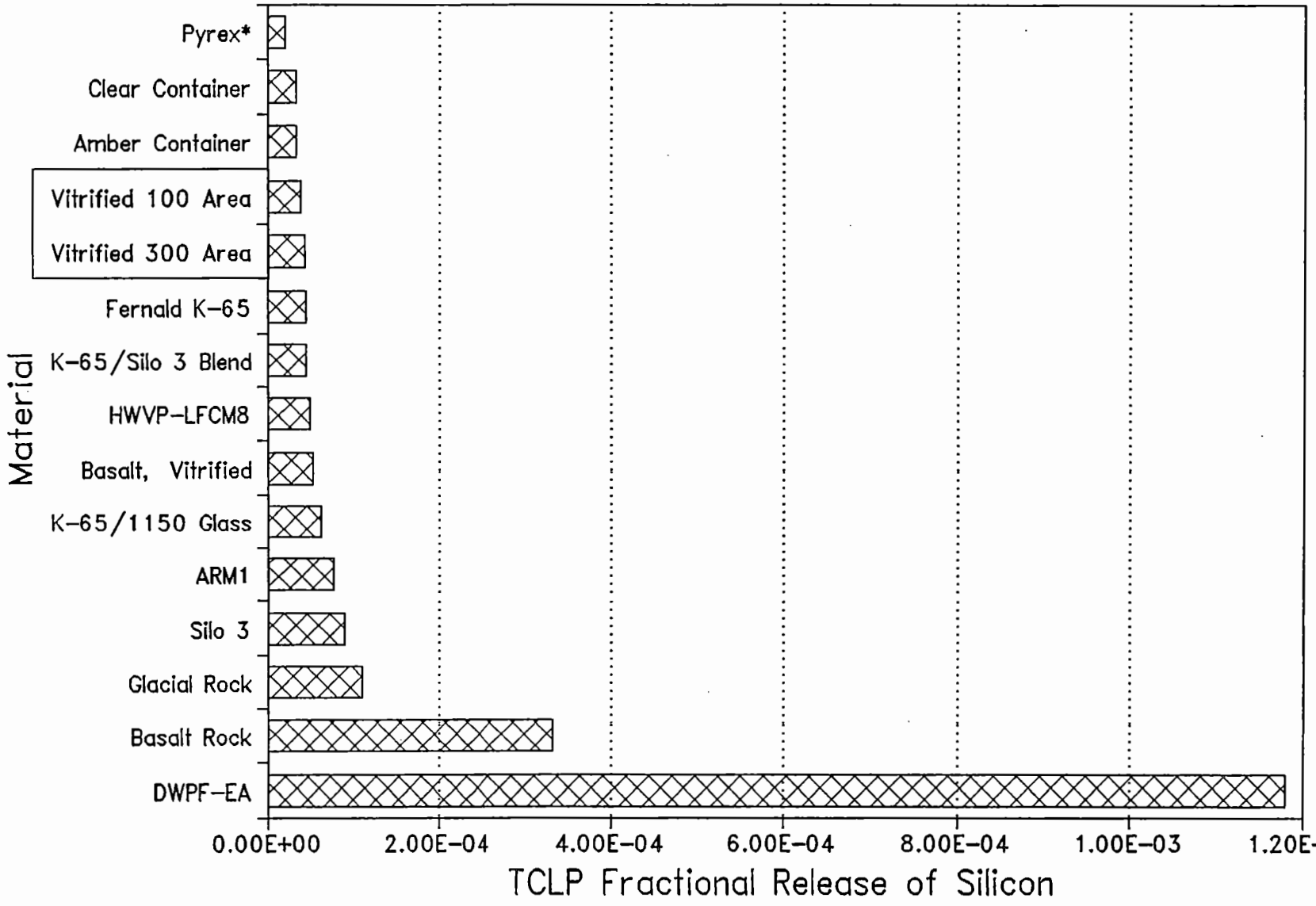
Test Objectives

- Demonstrate the durability of the glasses using various combinations of additives
- Provide experimental evidence of the quality of the vitrified product using actual (contaminated) feed soils

Work Scope

- Vitrification of both surrogate (600 Area) and contaminated (316-2 North Process Pond & 116-D-1B Trench) fines
- Leach Testing
- Electrical Conductivity and Viscosity Analysis

Durability Comparison



* Pyrex is a trademark of Corning Glass Works, Corning, New York

TCLP Testing

		Ba	Cr
RCRA Regulatory Level, mg/L*		100	5.0
100 Area	Oxide in Soil, wt %	0.12	0.01
	Soil Leachate, mg/L	0.467	LD
	Glass Leachate, mg/L	LD	LD
300 Area	Oxide in Soil, wt %	0.15	0.04
	Soil Leachate, mg/L	9.580	0.122
	Glass Leachate, mg/L	0.014	LD

* 40 CFR 261.24

LD - Less than detection limit

Other RCRA Regulated metals were below detection limits

Leach Testing Results

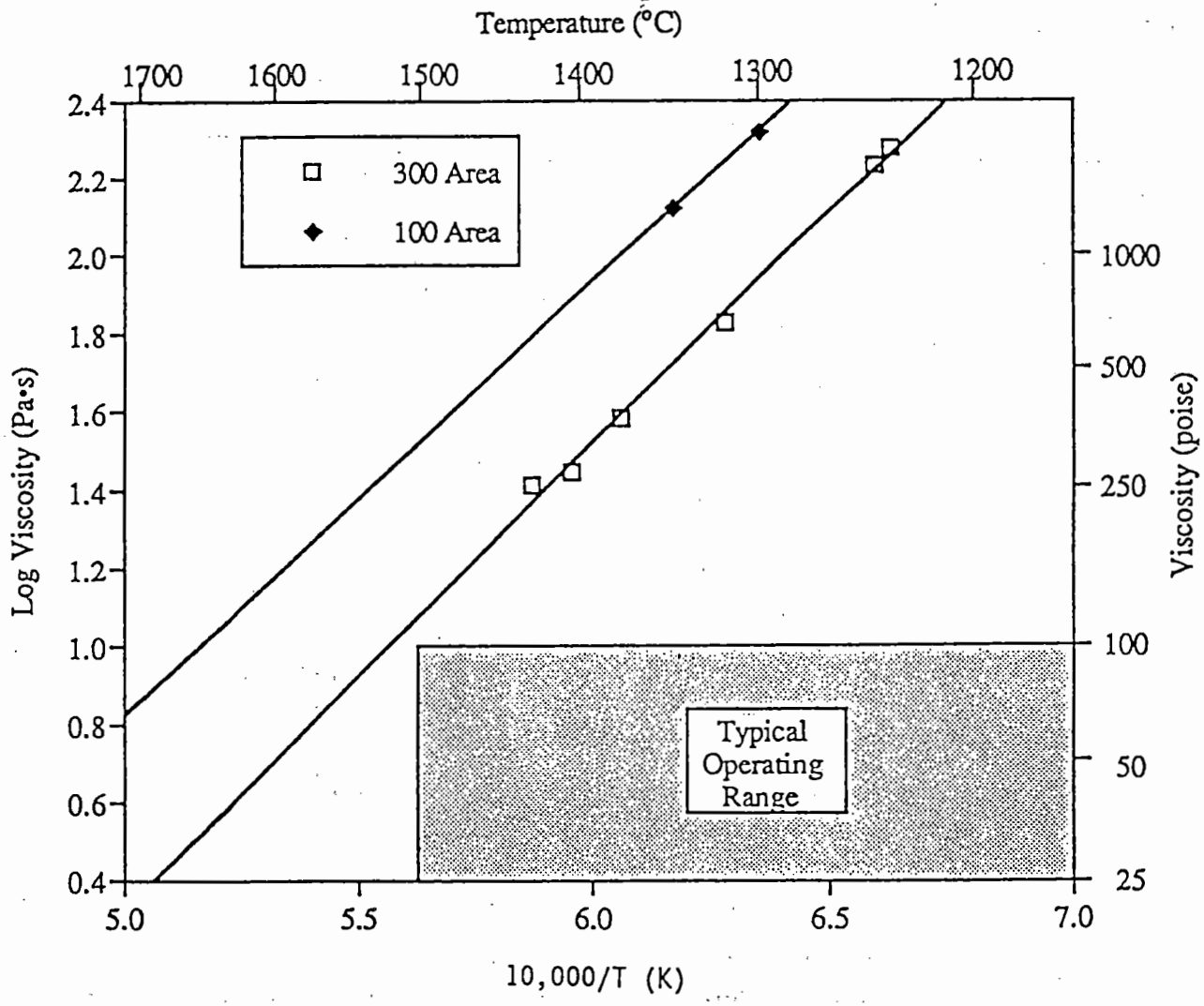
		^{60}Co	^{90}Sr	^{137}Cs	^{152}Eu	^{154}Eu	^{238}U	$^{239/0}Pu$
100 Area	Soil	< 56	250	37	200	< 90	--	< 20
	Glass *	< 4	< 80	< 4	< 17	< 10	--	< 35
300 Area	Soil	--	--	--	--	--	60,500	--
	Glass 1	--	--	--	--	--	13	--
	Glass 2	--	--	--	--	--	30	--
	Glass 3	--	--	--	--	--	22	--

* Leachates from each of 3 glass samples were combined due to low levels of activity in each separate leachate

-- Not Analyzed

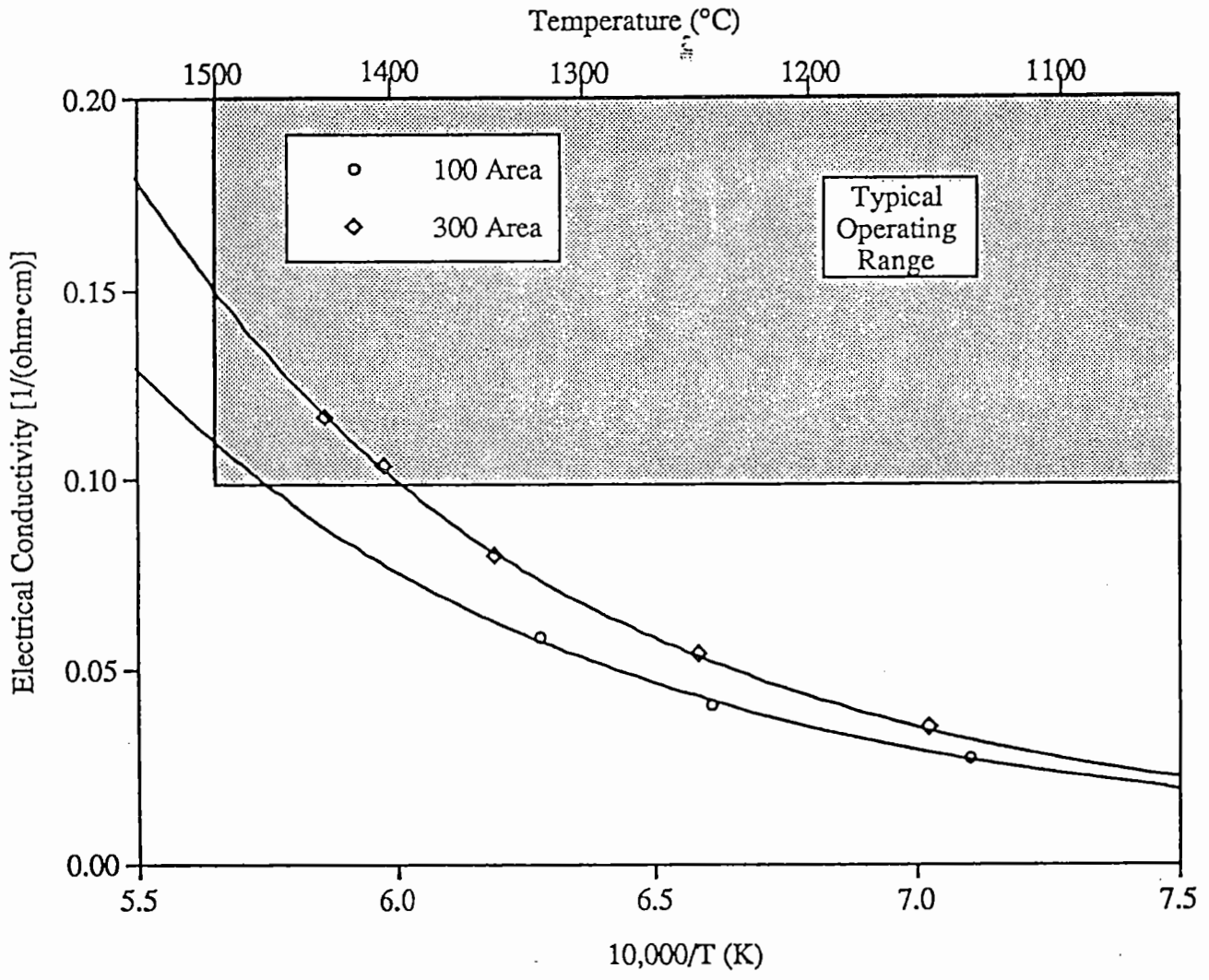
Melt Viscosity

- **Viscosity is an important parameter in design of any melter**



Electrical Conductivity

- Conductivity is an important parameter in design of Joule heated melter



PNL Crucible Testing

Results

- Glass formulations designed to be high melting (1400°C to 1500°C) in order to maximize durability and minimize additives (melting temperature slightly high, needs refinement)

- Vitrified product showed improved (compared to untreated fines) resistance to leaching using Toxicity Characteristic Leaching Procedure (TCLP)

- Electrical conductivity and viscosity are close to being optimized (need refinement through additives)

- Soil fines are readily melted into a homogeneous glass with the simple additions of CaO and/or Na_2O

Status

- Report undergoing review by RL

Solidification - Codisposal

Description

- Blend contaminated wastes with cementitious materials, polymers, or other additives to use for beneficial purposes

  - Among applications being considered are using the stabilized waste for open void fill, structural fill, and/or pipeline fill

  - May combine waste streams from numerous sources such as remediation activity wastes (i.e. soil washing fines), well purge water, and power plant ash

  - Reduces need to dispose of the materials as traditional solid, low-level, or mixed waste

Solidification - Codisposal

Objective

- Demonstrate the ability to produce a stable waste formulation for the application of co-disposal

Work Scope

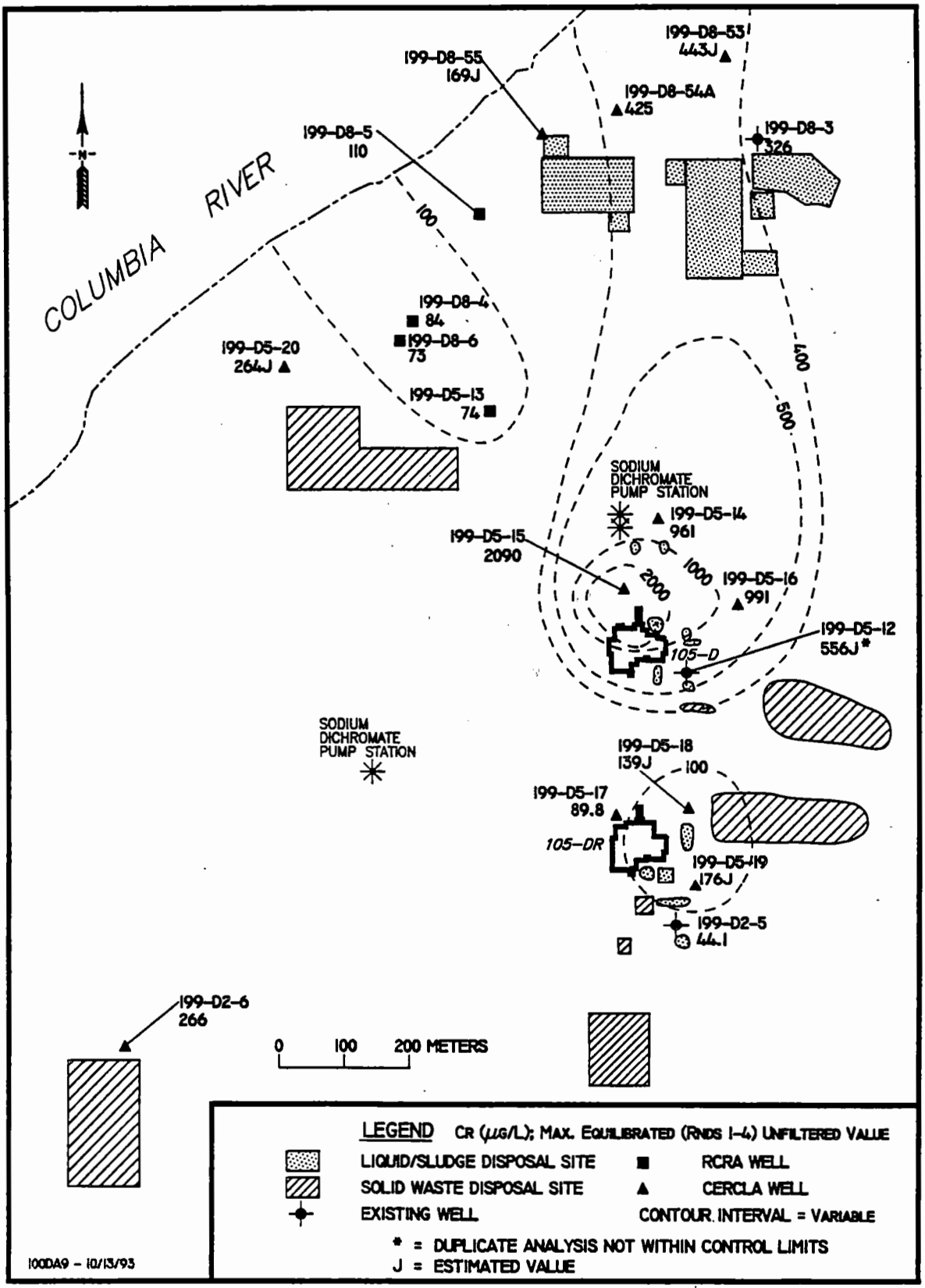
- Laboratory qualification of mix formulations
  - Develop specific waste formulations
  - Perform qualification testing

Solidification - Codisposal

Status

- Test plan being reviewed by RL and WHC; available for regulatory review in April
- Laboratory work to begin in July, dependant on finalizing scope of work

Figure 4-1 Chromium Concentrations in the 100 D/DR Area Groundwater



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Change Number	Federal Facility Agreement and Consent Order Change Control Form	Date
M-15-93-02	Do not use blue ink. Type or print using black ink.	Jan. 25, 1994

Originator: Julie Erickson — Phone: 376-3603

Class of Change
[ ] I - Signatories [X] II - Project Manager [ ] III - Unit Manager

Change Title

100-HR Area Groundwater Operable Unit Milestone Revision.

Description/Justification of Change

Add to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) the following milestone:

M-15-06E:
Begin pilot-scale pump and treat operations for 100-HR-3. Due Date: August 1994

The scope of the test will be determined based upon the results of the lab/bench scale tests currently being conducted to meet interim Milestone M-15-06B.

Impact of Change

Pilot-scale testing of chemical reduction/precipitation will be necessary to support remedian design and full scale implementation. However, pilot-scale testing of ion exchange will likely not be necessary since scale-up effects are well-known for this technology.

Conduct of pilot-scale test activities may lead to accelerated cleanup of groundwater in the 100-HR-3 Operable Unit.

Affected Documents

Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Action Plan, Appendix D, Work Schedule.

Approvals X Approved ___Disapproved

This change form approved by Amendment Four to the Hanford Federal Facility Agreement and Consent Order executed by the signatories on January 25, 1994.

John Wagoner DOE	January 25, 1994 Date
Gerald Emison EPA	January 25, 1994 Date
Mary Riveland Ecology	January 25, 1994 Date

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SPECIFICATIONS FOR ION EXCHANGE PILOT UNIT

- SKID MOUNTED UNIT WITH FOUR COLUMNS (LEAD/LAG)
- 50 GALLONS PER MINUTE FLOW
- DOWNFLOW OPERATION
- SERVICE PORTS FOR SLUICING/REPLACING RESIN
- REMOTE PROCESS CONTROL VIA PC MODEM
- SERVICE TO BE 480 VOLT, 3-PHASE
- COLUMNS TO CONTAIN 16 - 30 MESH RESIN

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TASK	START	END	F M A M J J A S O N D J
NEPA/CX	2/26	3/31	
READINESS REVIEW	2/24	8/30	
INDUSTRIAL SAFETY	2/28	7/29	
PROCEDURES	2/28	8/25	
PREPARE PROCEDURES	2/28	4/15	
REVIEW (WHC, DOE, REGULATORS)	4/18	6/15	
QA REVIEW	6/28	7/15	
EQUIPMENT	2/21	7/25	
RECEIVE BID/AWARD CONTRACT	3/4	3/18	
DELIVERY		7/25	
PROCURE RESIN		5/15	
GROUNDWATER TESTING	2/28	6/30	

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Treatment Tests for the Removal of Uranium, Chromate and Nitrate from 100 Area (100-HR-3) Groundwaters

A Summary of Results Contained in WHC-SD-ER-DTR-001

Mark A. Beck
Advanced Scientist
Process Chemistry Laboratories
Westinghouse Hanford Co.
February 23, 1994

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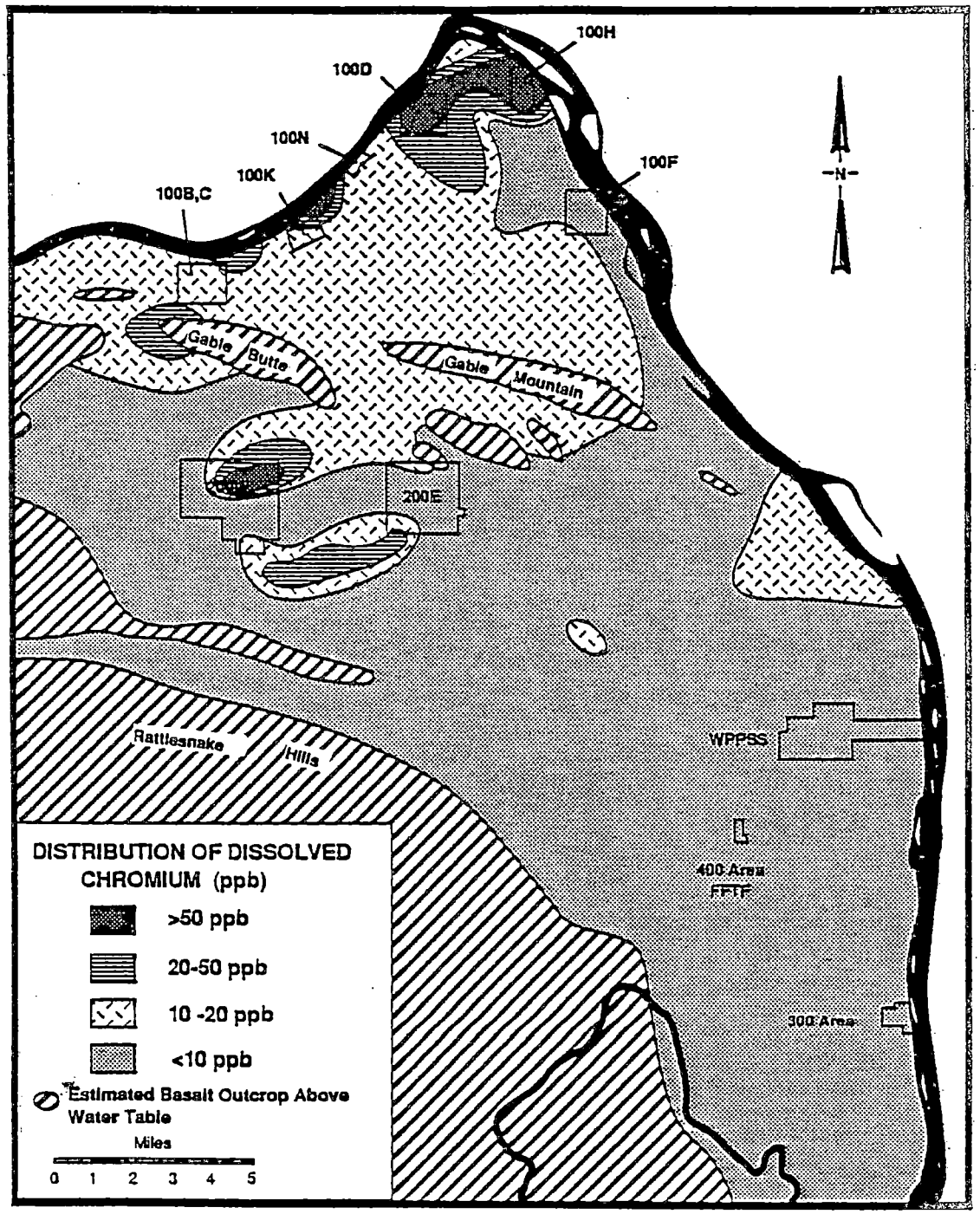

Figure 2.7. Distribution of Chromium in the Hanford Unconfined Aquifer. Filtered chromium groundwater values obtained from Evans et al. (1988a and 1988b) and Serkowski and Jordan (1989).

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Proposed Solution for Problem: "Pump and Treat" Exsitu groundwater treatment		
Precipitation	**Reduction Precipitation**	**Anion Exchange**
$CaHPO_4$ coprecipitation of Uranium	Reduction by Na_2S Precipitation and reduction by $FeSO_4$	Adsorption on a strong base ion exchange resin (3 different resins tried)
Expectation: + uranium, ? chromium - nitrate	Expectation: + chromium ? uranium - nitrate	Expectation: + uranium + chromate + nitrate Efficiency unknown

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The Tests		
Batch: **Full Factorial** **2^3design** **done for all** **methods-** **precipitation** **precipitation** **/reduction** **3 Anion resins**	**Breakthrough:** **Done only for** **Dowex 21K** **anion exchange** **resin** **load only on** **column** **6-7 day tests**	**Cycling:** **done once** **for Dowex 21K** **10 cycles** **column load** **elute** **wash** **12 day test**

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Average Decontamination Factors for Precipitation Methods.

Method	Uranium	Nitrate	Total Chromium-by ICP	Chromium (VI)
Sodium sulfide/ ferrous sulfate	1.3[a]	0.9	9.6	64
Sodium hydrogen phosphate without added calcium chloride	0.9	1.0	1.2	1.2
Sodium hydrogen phosphate with added calcium chloride	32	1.1	0.9	1.6
Filter alone	0.9	1.0	1.3	0.9
Standard, no treatment	1.5	1.0	1.3	1.9

[a]The data do not support more significant figures than shown in this table.

$$DF = C_o/C_f$$

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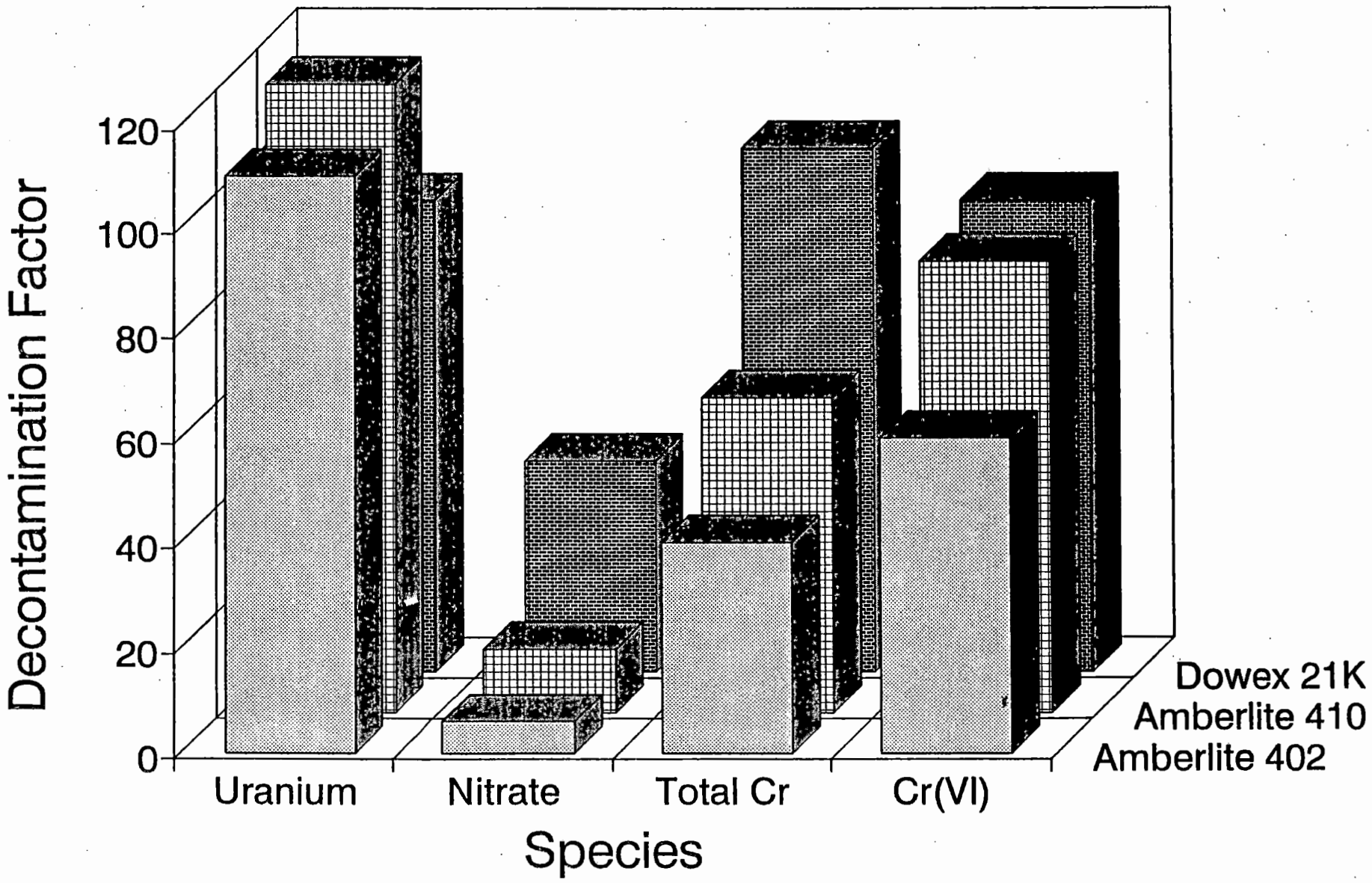
Decontamination Factors

Anion Exchange Resins Batch Tests



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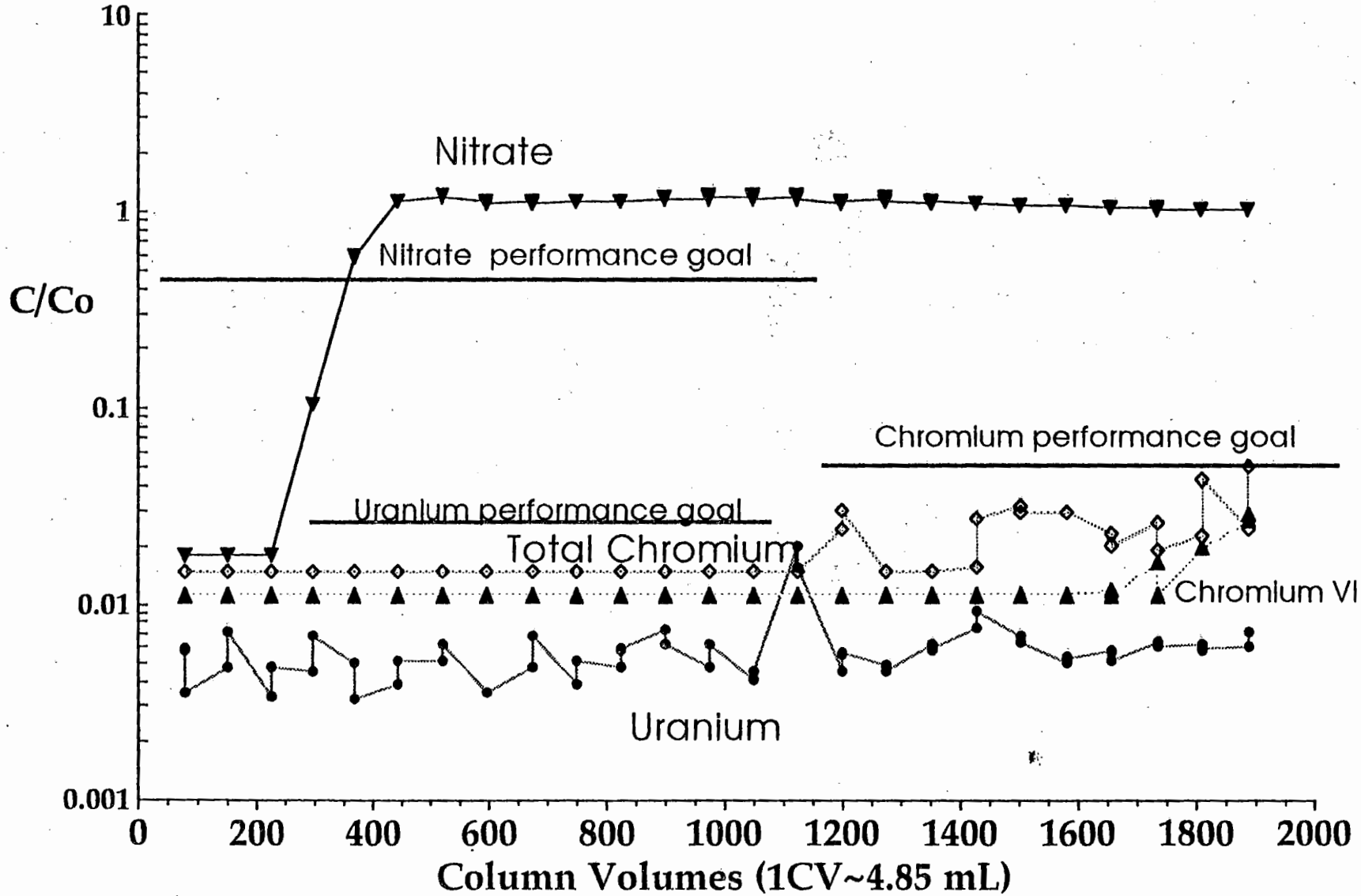
Spiked H2-3C Slow Flow C/Co vs Column Volumes



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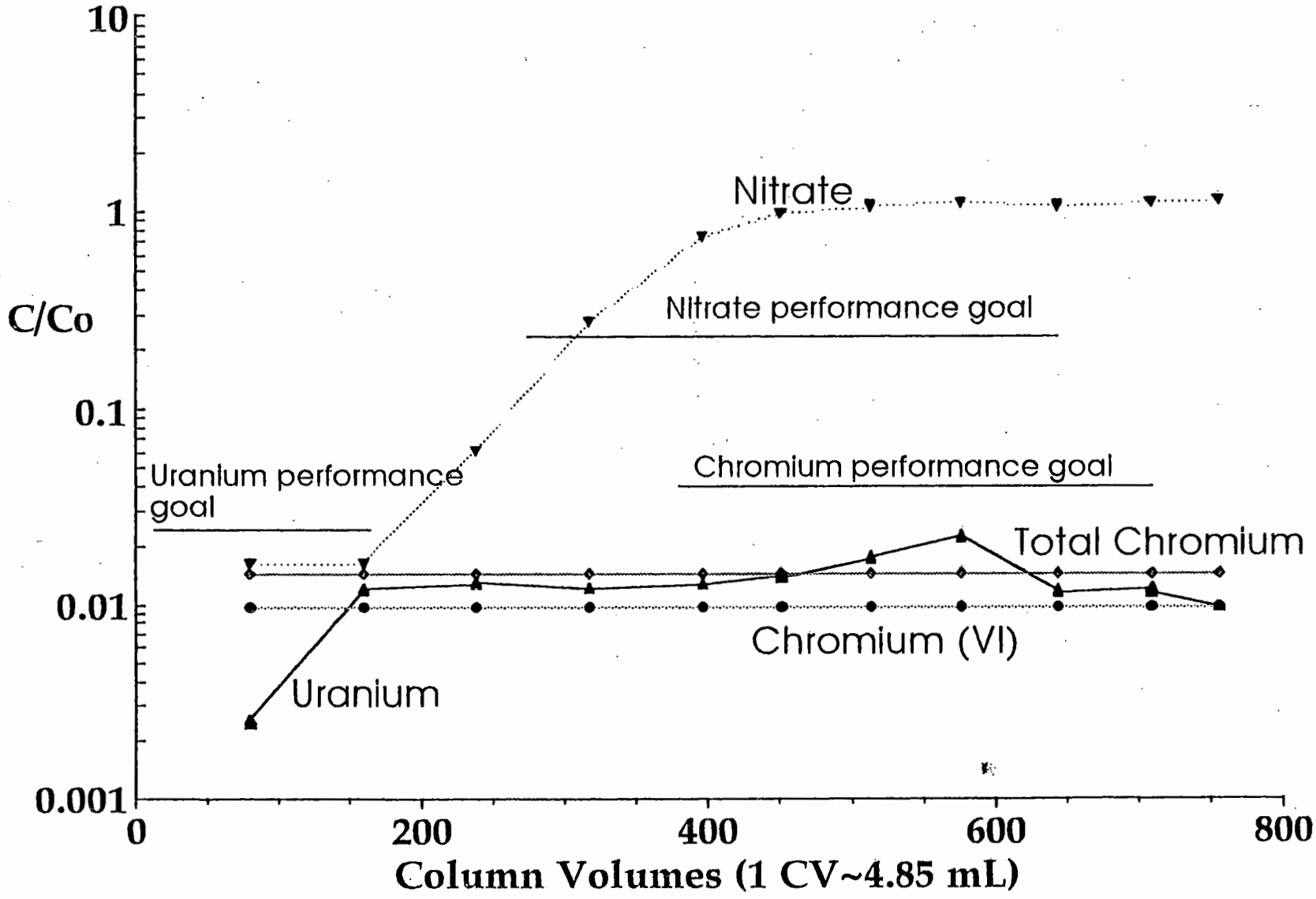
Fast Flow Test Spiked H3-2C, C/Co vs CV



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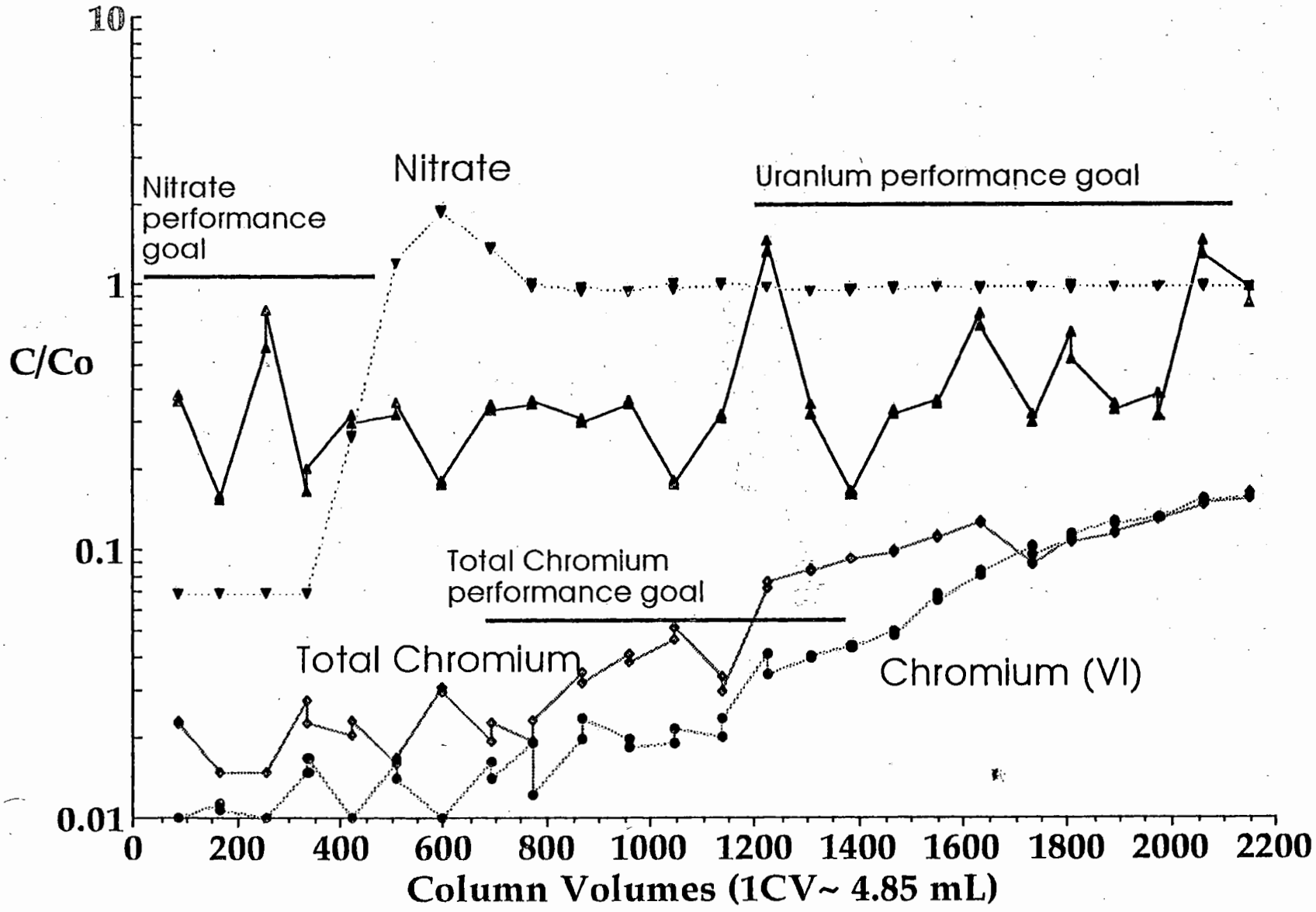
Well D5-15 C/Co vs Column Volumes



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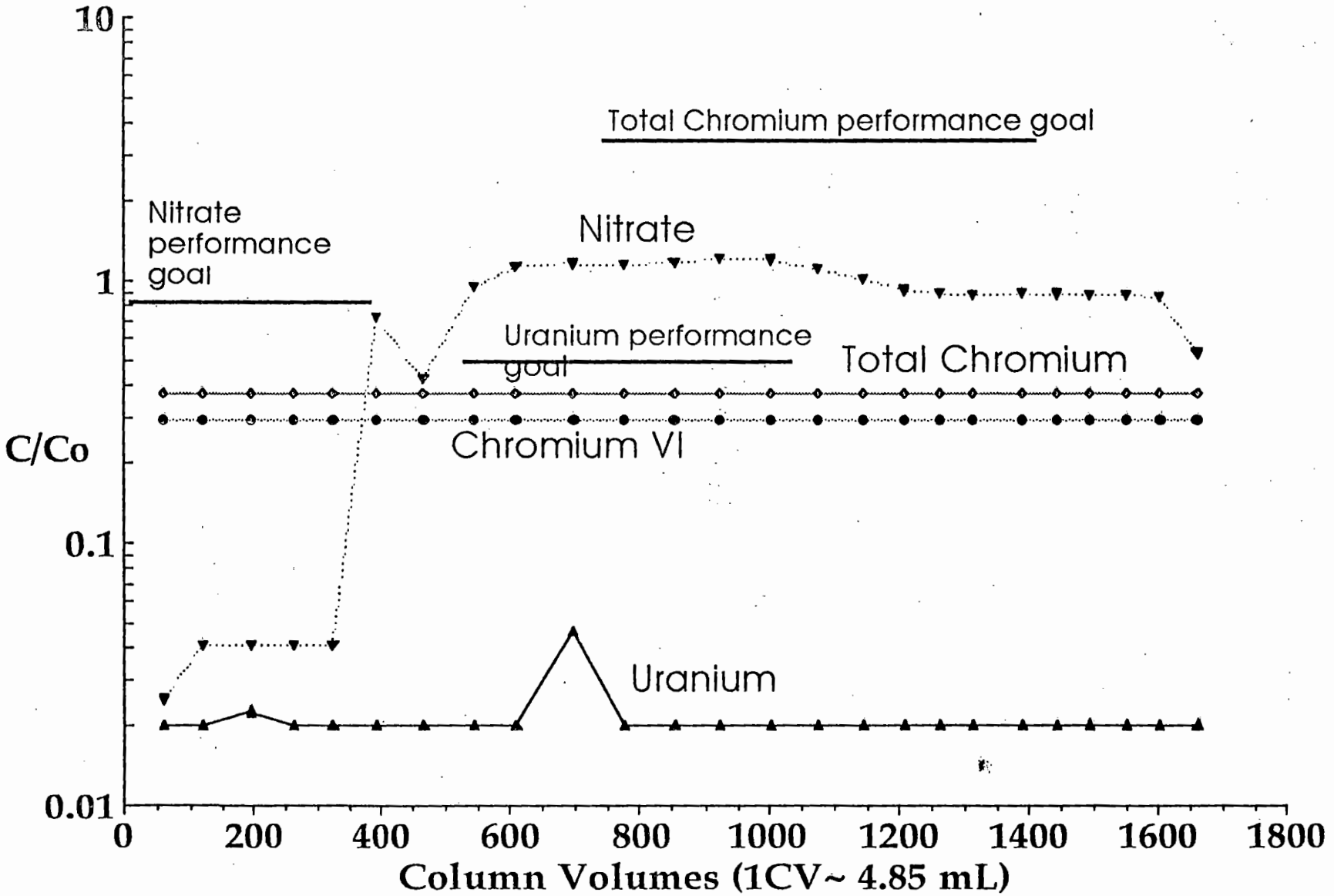
Well H4-4 C/Co vs Column Volumes



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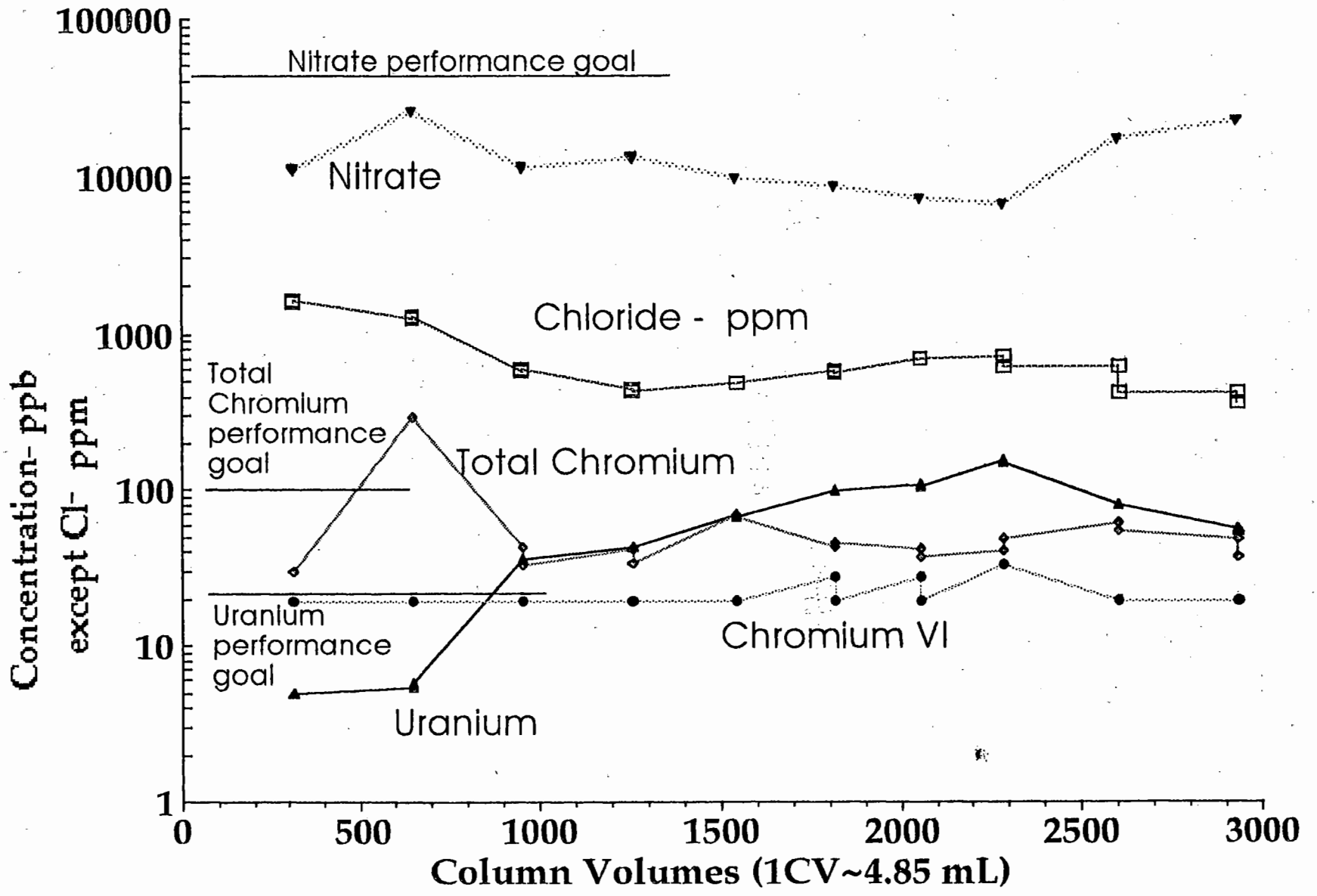
Cycling Test, Treated Effluent Concentration vs CV



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CONCLUSIONS and RECOMMENDATIONS:

- The anion exchange technique is superior to the precipitation methods.
- Dowex 21K is the recommeded anion exchange resin.
- Contaminant and eluant are incompletely removed by elution and washing.
- Simple loading of the resin (Dowex 21K) with contaminants followed by disposal of the resin is the recommended process.

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ACKNOWLEDGMENTS

The author would like to acknowledge the help provided by Louis Jensen and Kirk Remund in exploring the interactions and the statistical data. Sadie Kunkler performed most of the sample generating tests described in this report, and the author thanks her for her work. Cal Delegard provided useful discussions.

PUREX Laboratory performed the analyses to generate all the data presented in this report. Few problems were encountered with the data (several thousand analyses). If problems, perceived or actual, arose, PUREX Laboratory responded promptly to resolve those capable of resolution.

222-S Analytical Laboratory shift personnel made the breakthrough tests possible by changing out sample bottles during the 6-day, 24-hour-per-day breakthrough tests.

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ION EXCHANGE

ASSUMPTIONS: 1 COLUMN, VOLUME 106 CUBIC FEET, NO REGENERATION (ONCE THROUGH)
RESIN COSTS: ($182/CU FT)(106 CU FT) = $19,297
DISPOSAL COSTS: ($134/CU FT)(106 CU FT) = $14,204

COST FOR CHROMATE:

C/C_o = 1500 CV (APPROXIMATELY 2,000 ppb TO 40 ppb)

(1500 CV)(106 CU FT) = 159,000 CU FT OF WATER TREATED = 1,189,320 GALLONS

COST = $0.028/GALLON

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100 HR-3 Biodenitrification Treatability Study

Brent M. Peyton - PNL
James B. Duncan - WHC

February 23, 1994

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Problem Statement

- Groundwater may require treatment to reduce nitrate concentrations to below the MCL of 45 mg/L nitrate (10 mg/L as N)
- 100-HR-3 wells 199-H4-4 and 199-D5-15 were used to determine the applicability of biological nitrate removal

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Biodenitrification

- Biological conversion of nitrate to nitrogen gas
  - $NO_3 \rightarrow NO_2 \rightarrow NO \rightarrow N_2O \rightarrow N_2$
- Natural process - native bacteria
- Hanford denitrifying consortia
  - Isolated from Hanford groundwater
- Anoxic process - No oxygen
- A carbon source is required
  - Acetate and methanol were tested

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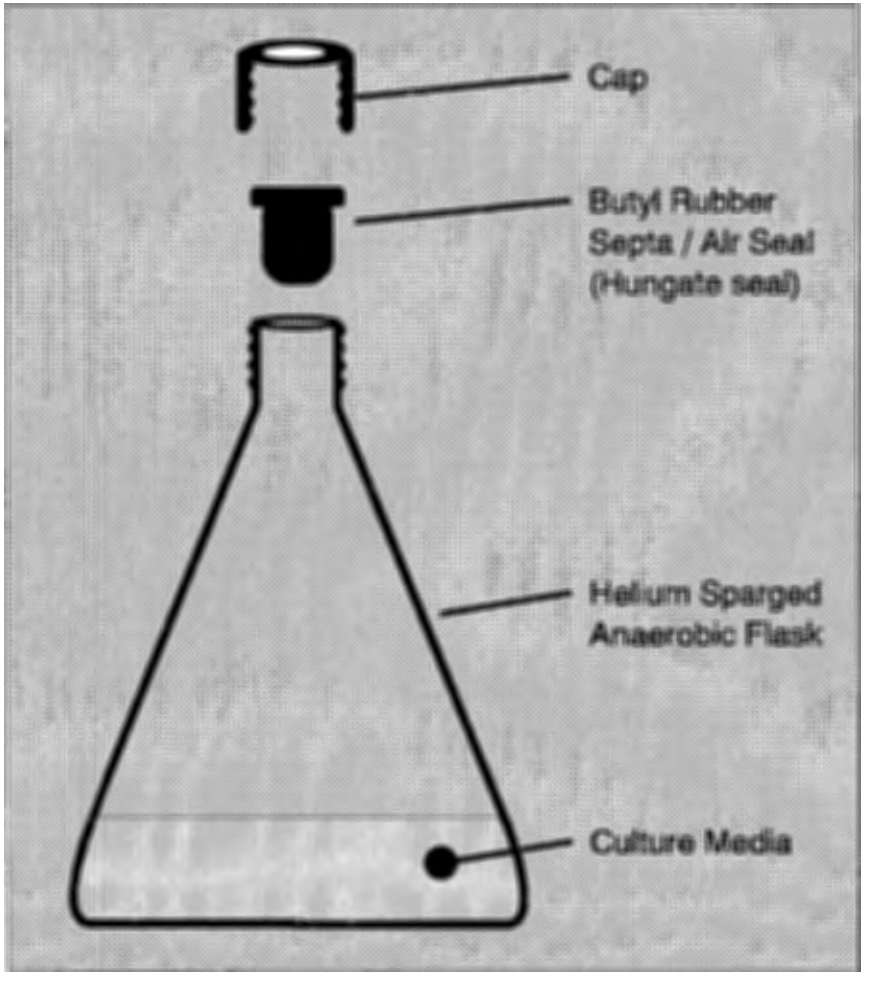
Shake Flasks



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Treatability Test Objectives

- What conditions allow denitrification?
- Determine optimum carbon source and dosage
- Are inhibitors present in groundwater?
- Can the performance level be met?
- Determine Incidental Cr and radionuclide removal

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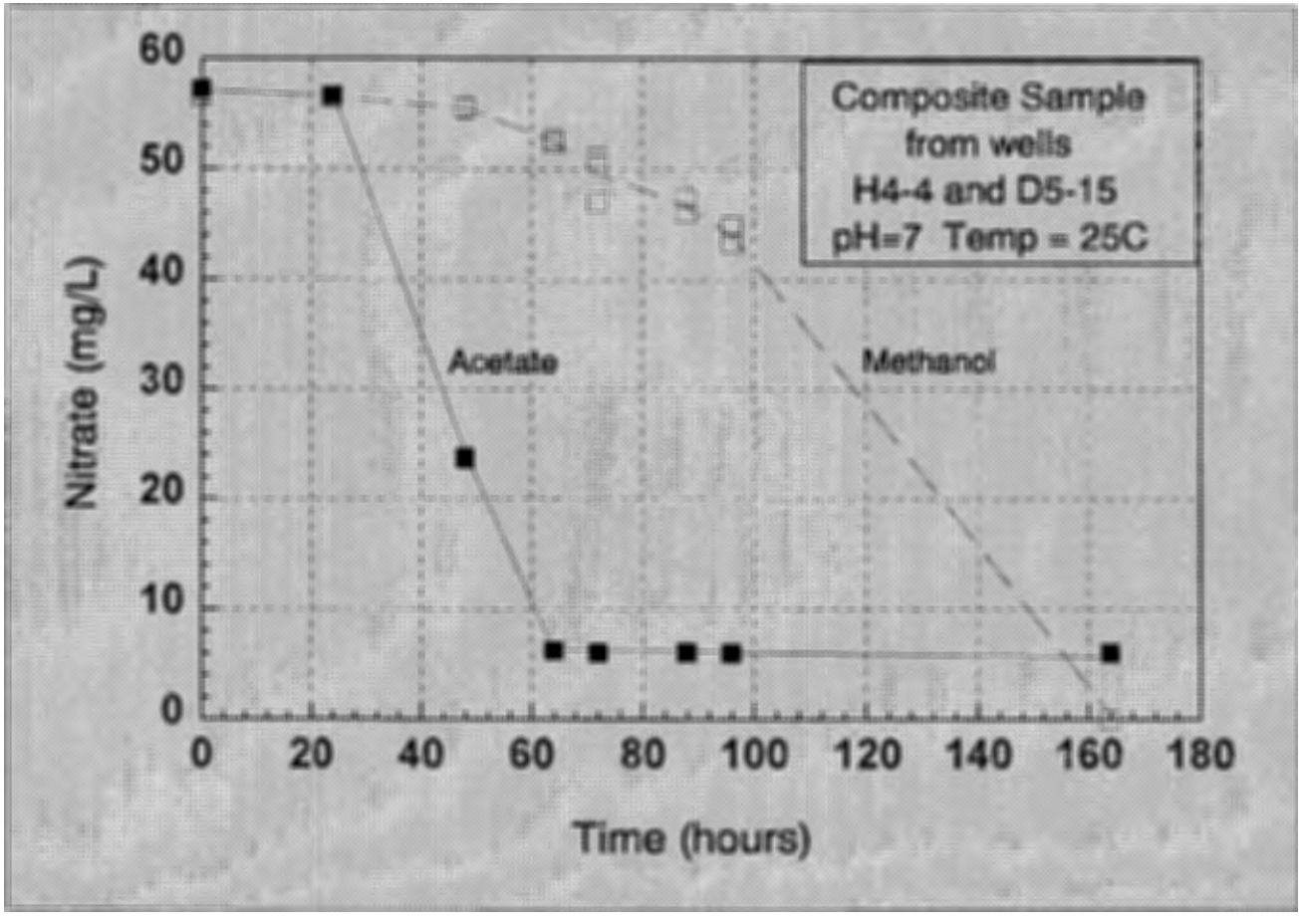
Acetate vs. Methanol - Denitrification Rates



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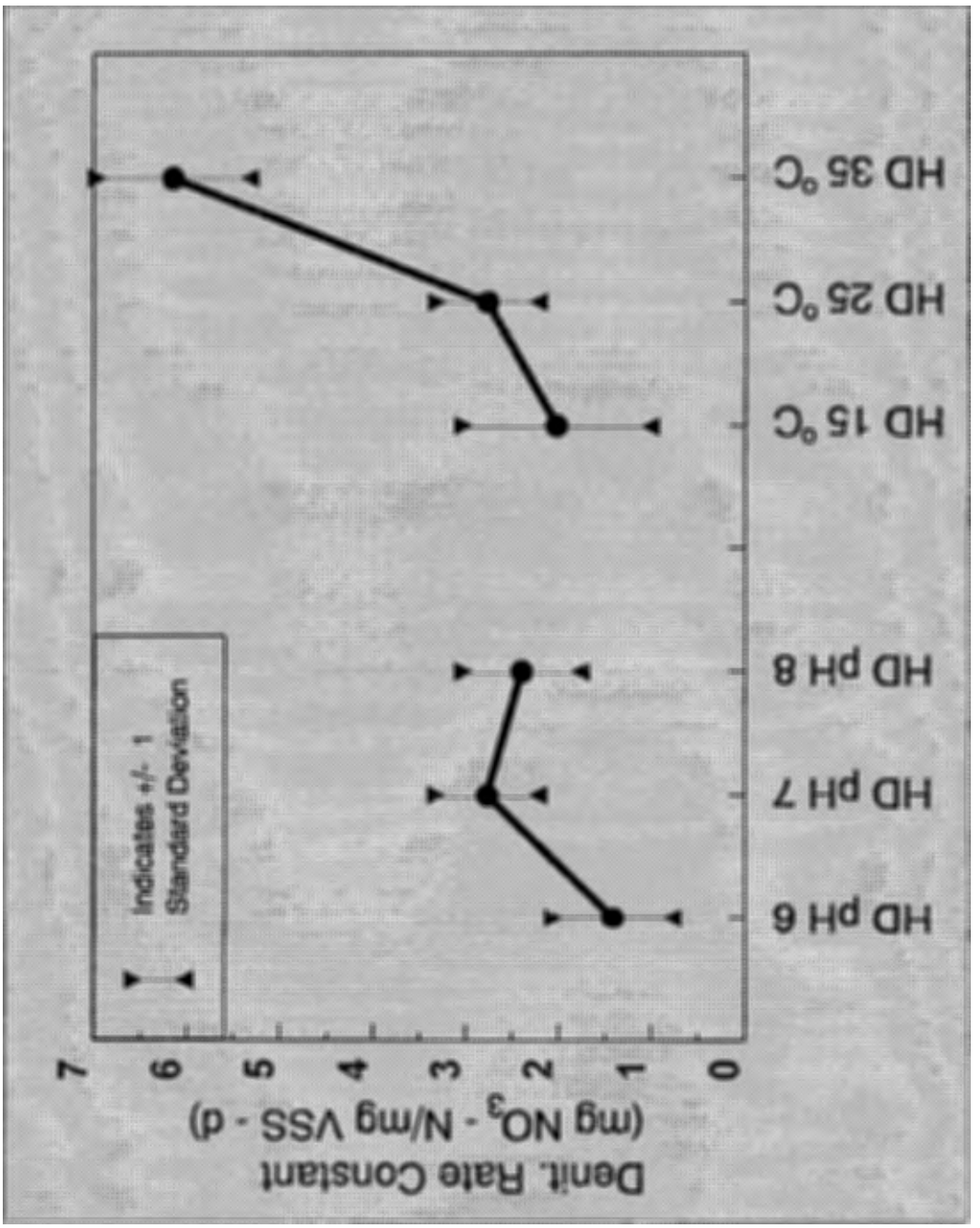
pH and Temperature Summary



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Acetate vs. Methanol - Raw Chemical Costs

Table 4.5. Estimated Annual Raw Chemical Costs for Alternative Carbon Sources (Acetate and Methanol) with Process Flow Rate.

Flow Rate (gpm)	Cost for Acetate	Cost for Methanol
1000	$47,600	$6,830
100	4,760	683
10	476	68
1	48	7

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Annual Raw Chemical Costs - Calculations

Calculation Basis

	Raw Chemical Cost ($/Kg)	Dosage Kg/Kg NO3	Cost $/Kg NO3	Density (g/mL)
Methanol	0.15	0.56	0.09	0.79
Acetic Acid	0.73	0.82	0.60	1.05

Annual Data

GPM Process	Kg Nitrate	Kg MeOH	Kg Acetic Acid	Gal. MeOH	Gal. Acetic Acid
1000	79471	44504	65484	14855	16475
100	7947	4450	6548	1486	1648
10	795	445	655	149	165
1	79	45	65	15	16

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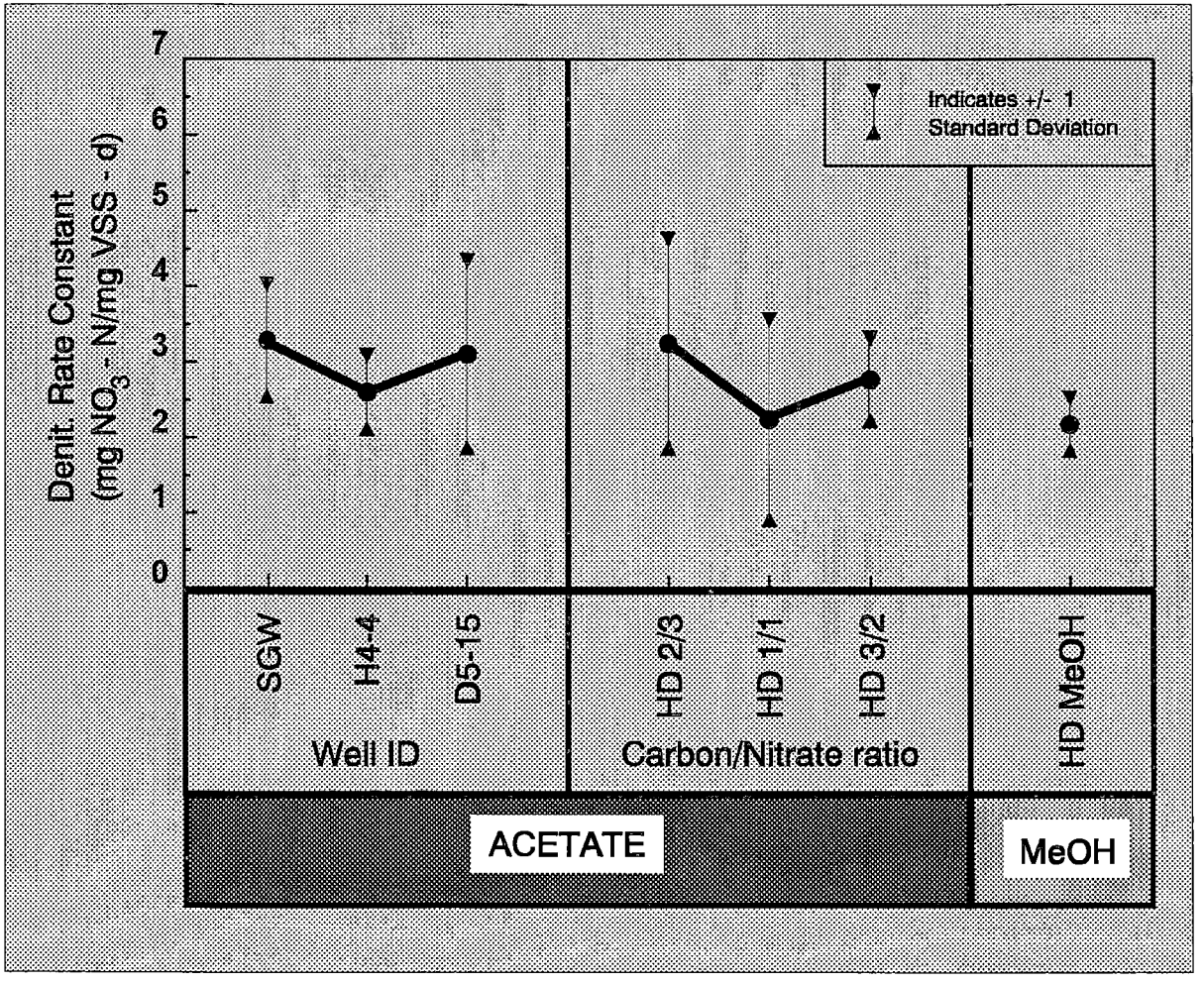
Observed Denitrification Rates



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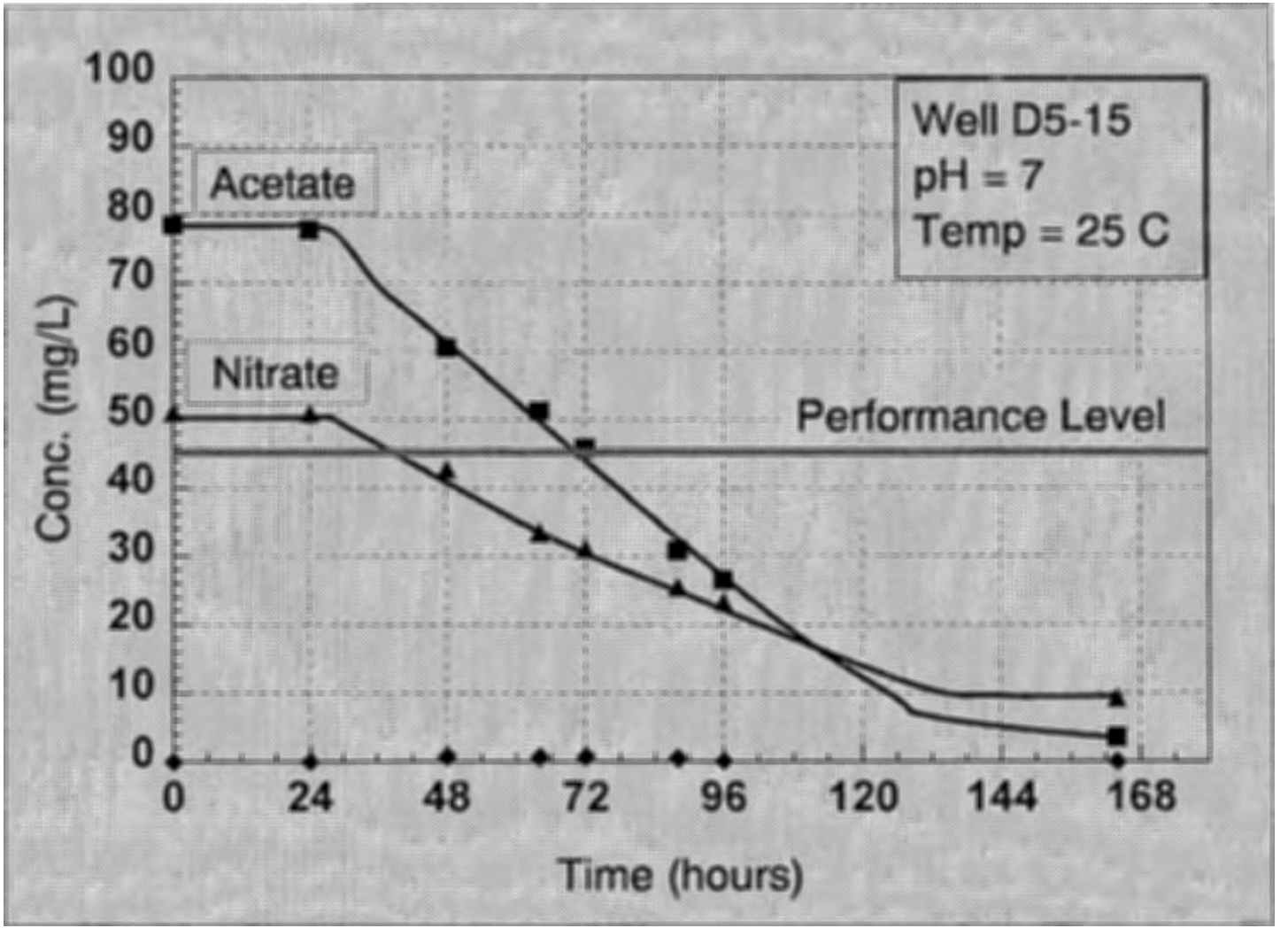
Performance Levels



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Incidental Cr and Radionuclide Removal

Table B.1. Biological Chromium and Radionuclide Removal from Composite Groundwater from Wells 199-H4-4 and 199-D5-15. Values are Average ± 68% Confidence Value.

	Before Filtration	After Filtration	Average % Removal
Total Chromium (μg Cr/L)	990 ± 80	980 ± 80	1.5
	990 ± 80	970 ± 80	
Gross Alpha (pCi/L)	8.2 ± 1.9	5.4 ± 1.5	25.
	6.2 ± 1.8	5.4 ± 1.6	
Gross Beta (pCi/L)	32.5 ± 2.2	29.2 ± 2.2	3.0
	29.6 ± 2.1	31.3 ± 2.1	

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Treatability Test Summary

- What conditions allow denitrification?
  - pH 6.5 to 8 and Temp 15 to 35 C
- Determine optimum carbon source and dosage
  - Acetate - slightly faster and safer, but 7x more expensive
  - Methanol - industry standard, less expensive
- Are inhibitors present in GW?
  - Raw groundwater denitrification rates were insignificantly different than laboratory simulated groundwater

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Treatability Test Summary

- Can the performance level be met?
  - 45 mg/L nitrate is not a problem for the biological denitrification process
- Biological Cr and radionuclide removal
  - Chromium removal (1.5%)
  - Gross Alpha removal (25%)
  - Gross Beta removal (3.0%)

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This work was supported by the U. S. Department of Energy and the Westinghouse Hanford Company.

- Pacific Northwest Laboratory is operated for the U. S. Department of Energy by Battelle Memorial Institute under contract DE-AC06-76RLO 1830.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 HANFORD PROJECT OFFICE
712 SWIFT BOULEVARD, SUITE 5
RICHLAND, WASHINGTON 99352

February 23, 1994

Eric Goller
100 Area RL Monitor
U.S. Department of Energy
P.O. Box 550 A5-19
Richland, Washington 99352

Subject: Regulatory Comments: 100-KR-4 LFI and QRA.

Dear Mr. Goller:

Enclosed are comments provided by the regulators on DOE/RL-93-79, Draft A, "Limited Field Investigation Report for the 100-KR-4 Operable Unit" and WHC-SD-EN-RA-010, Revision 0, "Qualitative Risk Assessment for the 100-KR-4 Groundwater Operable Unit". We request your comment responses by March 25, 1994. If you have any questions, please call me at (509) 376-9884.

Sincerely,
Laurence E Gadbois
Laurence E. Gadbois
100-KR-4 Unit Manager

Encl. (1) Regulator Comments: "Qualitative Risk Assessment for the 100-KR-4 Groundwater Operable Unit", WHC-SD-EN-RA-010, Revision 0
(2) Regulator Comments: "Limited Field Investigation Report for the 100-KR-4 Operable Unit", DOE/RL-93-79, Draft A

cc w/ encl:
Wayne Soper, Ecology
Jeff Ross, PRC
Brian Drost, USGS
Dick Biggerstaff, WHC
Administrative Record, 100-KR-4

cc w/o encl:
Steve Wisness, DOE
Roger Stanley, Ecology
Becky Austin, WHC

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Enclosure 1.
Regulator Comments: "Qualitative Risk Assessment for the 100-KR-4 Groundwater Operable Unit", WHC-SD-EN-RA-010, Revision 0

General Comments

1. This document represents a commendable effort to provide the risk assessment information in a concise, usable format. Thank you for the streamlined approach that this represents.

2. Under the Work Plan for the 100-KR-4 Operable Unit, the DOE was only obligated to include the first two rounds of groundwater sampling in these documents. We appreciate the extra effort involved and added value DOE has provided by including the first four rounds of groundwater data into these documents.

3. In general, the QRA follows EPA guidance for risk assessments and the Hanford Site Baseline Risk Assessment Methodology. However, there are a few areas needing clarification.

A. The purpose of the QRA is not clearly defined in the Executive Summary. The purpose of the QRA is to qualitatively assess if human and environmental risk exists from contamination.

B. The information presented in the QRA clearly supports the need for remedial action (IRM pathway). However, the reason for IRM candidacy is not stated clearly in the conclusion.

C. In the QRA, data is presented for the 100-KR-4 springs. However, the spring locations are not given. Therefore, it is not clear if the springs sampled are down gradient of the present contaminant plumes. Furthermore, it is misleading to compare near-river well concentrations of contaminants with spring concentrations for the same reasoning. The same can be said for the listed Maximum River Concentrations.

4. The QRA only considered data in the LFI document. That was not appropriate. The QRA is a judgement based upon **available site data.** Only a portion of the available site data is in the LFI document.

The design behind the **limited** field investigations is because we already had a lot of **available site data** for a QRA. The LFI data was designed to provide additional data, not provide the sole basis for the QRA.

The LFI "is performed to provide **additional data** and characterization needed to support selection, design and implementation of IRMs" (100-KR-4 Work Plan, page WP 1-5). "The LFI analysis activities **include review of pertinent information from previous studies and from the 100 Area aggregate studies.**" (100-KR-4 Work Plan, page WP 1-5). The HSPPS and HSBRAM define a QRA as "a judgement not based solely on quantification, agreed to by the parties, based upon **available site data** regarding the

threat posed by site contamination." (HSBRAM page C-1). (Emphasis added to the above quotes.)

We all have a responsibility to use whatever information we have available to best characterize, in a qualitative way, the risks posed by this site. Limiting our data use to that collected as part of the CERCLA LFI for this operable unit does not fulfill that responsibility.

The above explanation is provided to identify that this request cannot be considered new work scope beyond that already agreed to in the 100-KR-4 Work Plan. The reason for inclusion of other data is to identify if other analytes should qualify for inclusion on the IRM pathway, identify contaminant trending to better determine analyte IRM candidacy, and to better defend the IRM candidate selection process.

The data available for 100-KR-4 beyond that included in the first versions of the QRA and LFI is extensive. Recitation of the additional data within the QRA/LFI would not be productive and is not requested by this comment. A qualitative review of that data in order to frame the four rounds of CERCLA data and the risk assessment is requested.

5. The risks from non-radiological and radiological stressors (contaminants) are calculated independently for both the human health and environmental QRAs. The uncertainty associated with not evaluating the combined risk should be discussed.

Specific Comments

6. Page ES-1, 3rd paragraph, 5th line

We need to be careful of the distinction in using upper and lower bound verses RME. I would suggest the following to clarify this distinction. "For humans, risks that might occur under frequent and occasional use were included to provide upper and lower bound ~~and reasonable maximum exposure (RME)~~ estimates of risk for a reasonable maximum exposure (RME) under these two scenarios."

7. Page ES-2, Results, 3rd bullet

It may be more accurate to say that tritium and C-14 account for almost 90% of the total risk (rather than more than 80%).

8. Page ES-3, Results, 1st bullet

Was the calculated C-14 EHQ equal to 1.0 or greater than 1.0?

9. Page ES-3, Uncertainties, 2nd paragraph, 2nd line

Modify along the lines of "...was meant to be ~~an upper bound for the actual risks~~ a RME for the two risk-bounding scenarios.

10. Page ES-3, Uncertainties, 2nd paragraph, 4th line

The document states that "no allowance was made for dilution effects". When the data evaluation is changed to remove the separate treatment of "near-river" wells (see comment #110), this

sentence could be changed to something like "river dilution was not factored into the exposure calculations".

11. Page ES-3, Uncertainties

It is interesting to note that all the uncertainties listed are the ones that could illustrate how overly conservative the risk estimates are. In fact, this section leads up to the final paragraph that states "In summary, it can be reasonably assumed that the actual human and ecological risk are less than the risks calculated as part of this QRA". This statement should be removed, and replaced with statements about the uncertainty that shows that the risks could be higher or lower. Examples: It should be pointed out that analytical detection limits for numerous analytes were less sensitive than risk thresholds associated with establishing remediation goals as defined in 40 CFR 300.430(e)2. It should also be pointed out that groundwater contaminant uptake into biota that is then eaten by humans is ignored in the human scenario. This could be the main uptake path in the current recreational scenario. It should be pointed out that widespread laboratory blank contamination noted in the validated data packages resulted in a significant portion of the data flagged as "U" (because possible actual site contamination was not 5 or 10x the blank contamination) and not factored into the QRA (even though some amount of these contaminants may have been present). It should also be noted that the human exposure scenarios did not factor in the additional impact that would result from the 100-KR-1,2,3 operable units. The combined risks are used in the remedial decision process. There were anomalous spikes in the metals data for the first few rounds of sampling from some of the new CERCLA wells, that can misrepresent what the actual contaminant conditions are. Etc., Etc.

Recommendation: Provide a more complete and balanced list of uncertainties.

12. Page iii

Need to add NRC.

13. Page 1-1, 2nd paragraph

As identified, there seem to be two paths (ERA and IRM), and the IRM path is forked (w/ & w/o an LFI), which is slightly different than three paths.

14. Page 1-1, paragraph 5

The QRA evaluates two scenarios: "frequent" and "occasional" use, not "residential" and "recreational" as stated here. HSBRAM is identified as the methodology for the QRA document, but the HSBRAM uses the "residential" and "recreational" terms and states "For the 100 Area QRAs, the residential and recreational scenarios will be evaluated for each site under current contaminant concentrations."(HSBRAM page C-4) If DOE has chosen to use the alternate terms "frequent" and "occasional" it needs to be clearly stated both here and in the third paragraph on page ES-1 that "frequent" use is synonymous with "residential" use, and that "occasional" use is synonymous with "recreational" use.

15. Page 1-1, paragraph 5, 4th line

Modify the statement "although they do not reflect current land uses" to something like "although only the occasional use scenario is reflected in current land uses". Note that the public has authorized access to the river portion of the 100-KR-4 operable unit (see figure 1-2) for recreational(occasional) use purposes, and may trespass on the shoreline portion (rare but not unheard of).

16. Page 1-1, 5th paragraph, 5th line

Change as follows ..."by the 100-KR-4 ~~100 Area~~ Tri-Party Agreement unit managers." This is necessary to keep it clear that agreements made between 100-KR-4 unit managers is not binding on other unit managers, and vise versa.

17. Page 1-1, paragraph 5, last half (re HFSUWG)

The way this is worded, leading up to the last sentence gives the impression that the HFSUWG did not endorse cleaning up the 100 area to support residential use. As an attendee of technical discussions on the 100 area, I can assure you that was not their message to the cleanup agencies. Their cleanup scenario "A" (HFSUWG 1992, page 67, 69) is for unrestricted use of the groundwater. In their terminology "Unrestricted means that contamination does not preclude any human uses." (HFSUWG 1992, page 18). Note that "residential" is not specifically identified as one of the future use options anywhere on site (HFSUWG 1992, page 23) because it is an implicit use option in an unrestricted cleanup scenario.

The whole tone of this paragraph, ie. that the residential scenario does "not reflect current land uses" and that "None of the HFSUWG recommendations specify residential use", appears to be building a case for dismissing any risk conclusions of a magnitude that could trigger a cause for concern. The second paragraph of the executive summary identifies how DOE-RL's 1991 Hanford Past-Practice Strategy "emphasize initiating and completing waste site cleanups with a bias for action. This paragraph on page 5 indicates a "bias for inaction".

The following is an attempt at revising this paragraph to take away the bias for inaction, and to not mislead the reader as to the intent of the HFSUWG. The first sentence of the paragraph is fine. The following replaces the rest of the paragraph.

The 'frequent' use scenario is analogous to the 'residential' use scenario in the HSBRAM, as is 'occasional' analogous to 'recreational'. The terms 'frequent' and 'occasional' are used to stress the qualitative aspect of the QRA as opposed to the more rigorous baseline risk assessment to be done in the future wherein the 'residential' and 'recreational' terms will be used. The frequent use scenario considers the potential future use of this site. Ecological scenarios are evaluated using biological endpoints appropriate for the size and the nature of the operable unit. These use scenarios are consistent with the recommendations of the Hanford Future Site Uses Working Group (HFSUWG). The HFSUWG identified several cleanup scenarios for the 100 area. One of three cleanup

scenarios for the 100 area is to support unrestricted land use. To the HFSUWG, "unrestricted means that contamination does not preclude any human uses". Residential use is the most conservative use scenario in HSBRAM, so evaluation of this risk scenario supports all the uses encompassed by the HFSUWG under the unrestricted cleanup scenario.

18. Page 1-2, Section 1.2.2, last paragraph
The list of "active facilities" should include the "...experimental fish rearing activities..."(see LFI, page 2-4, Section 2.2, 4th paragraph, line 3).

19. Page 1-3, Section 1.3
Throughout this whole section, there is not a single statement that supports the final statement, i.e. "The net result of the assessments is that the QRA produces an upper bound for both human health and ecological risk...". This statement should be removed.

20. Page 2-1, Section 2.1.1, second paragraph.
Please explain why well K-19 was not sampled in rounds 1 and 2. Also explain why wells K-23 and K-33 were not sampled in round 2.

21. Page 2-1, Section 2.1.1, third paragraph.
Although the wells listed were not used in the QRA, they should have been. Please include this data.

22. Pages 2-1, Section 2.0, through 2-7
This section discusses the process of selecting the data to be used during the QRA. The text refers to the "maximum representative values" used in the QRA. However, there is little discussion concerning how this value is determined. At a minimum, the text should include a reference to Appendix A of the 100-KR-4 limited field investigation (LFI) report, which includes a discussion of the selection process.

23. Page 2-2, Section 2.1.1, last paragraph, 2nd line
This identifies that unfiltered samples were used for inorganics. That's good. Need to identify what was used for organics and rad.

24. Page 2-2, Section 2.1.1, last paragraph, last line
"The filtered values should be comparable to the unfiltered values in an equilibrated well." What does comparable in this statement mean? Any two or more things are comparable. The comparison can show how alike or dissimilar they are. If comparable is intended to mean "about the same", this statement is wrong. Particulate/colloidal transport of contaminants is a phenomenon observable in the comparison of filtered and unfiltered data.

25. Page 2-3, Section 2.2.1, second paragraph.

Can't data termed "U" also be used in the QRA? In the last sentence of this paragraph please qualify 'technical concerns'.

26. Page 2-4, Section 2.2.5, first paragraph.
Define round as it pertains to the data. Case? Event? Day?

27. Page 2-4, Section 2.2.6
Suggest this clarification: "...were compared to the 95% upper tolerance limit Hanford Site background..."

28. Page 2-4, Section 2.2.5, first paragraph.
The second sentence states, "If the concentration of a constituent in an equipment blank is higher than the maximum concentration observed, the constituent is removed from further consideration." Does this apply to the whole data set? Please clarify.

29. Page 2-4, Section 2.2.6, first paragraph.
The first sentence states, "The maximum representative concentrations were compared to the Hanford Site background data (DOE-RL 1992c) and analytes were eliminated if their concentration was less than the background concentration." It needs to be noted that threshold background concentrations have not been agreed to.

30. Page 2-4, Section 2.2.6, first paragraph.
The question arises why arsenic should be eliminated from the background screening. Arsenic concentrations may be due to background or historical site practices. Provide data.

31. Page 2-4, Section 2.2.6:
The background screen for the near-river groundwater wells does not seem to be consistently applied. Aluminum, arsenic, barium, cadmium, and silver are identified as below background (Table 2-2; the concentration of Vanadium is greater than background, but it labeled with a B in Table 2-2); yet all analytes except arsenic and barium were retained for further consideration. Arsenic was retained in the human risk analysis and for consistency perhaps should be addressed. Acute and chronic freshwater criteria are available for arsenic (57 FR 60910).

32. Page 2-4, Section 2.2.7:
It should be clearly indicated that this screening procedure is only for humans and does not affect the screening for ecological contaminants of concern.

33. Page 2-4, Section 2.2.8, end of 1st paragraph
Add the following: ...for 365 days a year for 30 years.

34. Page 2-4, 2nd last line
Short legal note: DOE orders are not ARARs. ARARs have to be promulgated. DOE orders are issued, not promulgated.

Since this section is not identified as being just for the human screening, I am assuming that the ecological screening is included. The ecological screening used DOE Order 5400.5. Therefore there are more than just ARARs involved. Therefore the first two sentences of this paragraph need to be changed.

35. Page 2-6, Section 2.2.10, 2nd paragraph:
Nickel and chloride also were retained for the ecological evaluation (as well as total dissolved solids). For the same reason as for silver, perhaps arsenic should also be retained (see previous comment on section 2.2.6 "The background...").

36. Page 2-6, Section 2.2.10, 3rd paragraph
TOC is total organic carbon, not ~~compounds~~.

37. Page 2-7, Section 2.4, last paragraph, 2nd sentence:
The sentence is speculative and provides incomplete information. Whether chloroform is truly present in the groundwater should be based on a comparison to trip, equipment, and method blanks, and on the pattern of detects in the wells (Table 2-1).

38. Table 2-1, page 2-9.
In second column add the words 'In Wells'.

39. Pages 2-9 to 2-12, Tables 2-1 and 2-2
These tables summarize analytes detected in the groundwater wells. Information found in these tables include the MRC and data range for each contaminant. The MRC is greater than the data range for the following contaminants in Table 2-1: zinc (MRC = 461 micrograms per liter (µg/L), data range = 2.3 to 278 µg/L), carbon-14 (MRC = 23,000 picocuries per liter (pCi/L), data range = 51 to 17,000 pCi/L), technetium-99 (MRC=46 pCi/L, data range = 1 to 41 pCi/L), tritium (MRC = 1.9E+06 pCi/L, data range = 1.6E+06), nitrate (MRC = 26.0 milligrams per liter (mg/L), data range = 0.71 to 22.6 mg/L), and total dissolved solids (MRC = 453 mg/L, data range = 132 to 405 mg/L). The MRC is greater than the data range for the following contaminants in Table 2-2: sodium (MRC = 20,300 µg/L, data range = 3,720 to 18,700 µg/L), zinc (MRC = 461 µg/L, data range = 2.3 to 278 µg/L), carbon-14 (MRC = 16,000 (pCi/L), data range = 57 to 15,000 pCi/L, tritium (MRC = 35,000 pCi/L, data range = 210 to 13,000 pCi/L), nitrate (MRC = 26.0 mg/L, data range = 0.71 to 22.6 mg/L), sulfate (MRC = 85.2 mg/L, data range = 20 to 73 mg/L), and total dissolved solids (MRC = 453 mg/L, data range = 132 to 374 mg/L). This discrepancy should be corrected, or the data used to support the selection of the MRC should be provided.

40. Pages 2-9 and 2-10, Table 2-1
Cobalt and sulfate are shown as "retained" analytes, but they are not included in Table 3-1 (COPCs) in the LFI.

41. Page 2-13, Table 2-3

DOE-RL 1992b contains detected concentrations of barium and manganese in the spring samples and barium and antimony in the river samples. However, these constituents are not included in this table. They should either be included or an explanation should be provided for why they aren't included.

42. Page 4-1, Section 4.1.2, first paragraph.
We recommend adding two points to this paragraph. First, that COPCs can accumulate in sediments, wetlands and estuaries not just the Columbia River. Second, Appendix B deals only with radiological COPCs and does not explain other COPCs such as chromium.

43. Page 4-1, Section 4.1.2.1, first paragraph.
Three comments on this section: There is a need for some type of bioassay. Frog embryos may be a good trigger. Again, should take in to account sediment, wetlands and estuaries.

44. Page 4-2, 1st paragraph, 4th line
"All contaminants...uniformly distributed in the river. These are conservative assumptions...". Uniform distribution in the river is not a conservative assumption. For example, contaminants that are mobile in the pH/Eh conditions in the groundwater may become less soluble in the river conditions, and concentrate in the river sediments. Another example, is that the elevated organic content of river sediments or pore water may accumulate certain contaminants more so than the aquifer matrix. Another example, localized "hot spots" may be missed with the current well network. **Recommendation:** Remove the sentence "These are conservative assumptions...". This statement itself points out how this approach is particularly non-conservative to suspension feeders.

45. Page 4-2, Section 4.1.2.2, 3rd sentence of the 1st paragraph:
(1) The type of measurement endpoints that are used require some clarification. The adverse effects or systemic toxicity relate to a particular benchmark dose that is determined to cause a health effect in the receptor of concern. (2) The QRA also needs to define assessment endpoints and address how the chosen measurement endpoints are predictive of or correlate with the assessment endpoints.

46. Page 4-2, Section 4.1.2.2, 2nd paragraph
It should be pointed out that water quality criteria have elements of toxicity, analytical detection limits, practicable attainability, corporate lobby influence, and political influence. As an example, water saturated with petroleum (but not over saturated to show a surface sheen) is within water quality criteria, but no toxicologist would state that this protects aquatic life. Therefore the last sentence of this paragraph should be removed.

47. Page 4-2, Section 4.1.3, 1st paragraph, last sentence

Suggest modification such as: ..."acute or chronic exposure ~~are~~ include behavioral, physiological"...

48. Page 4-2, 3rd paragraph, 3rd line
Remove ~~and are protective of all aquatic life~~.

49. Page 4-2, Section 4.1.3, 2nd paragraph.
The basis for the DOE Order 5400.5 limit of 1 rad/day needs to be identified. The level of protection this affords needs to be identified in light of more stringent conclusions reached by the IAEA (Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards, 1992). That document makes several notable conclusions: (1) Irradiation at chronic dose rates of 0.1 rad/day or less does not appear likely to cause observable changes in terrestrial animal populations (p. 22). (2) Aquatic organisms are no more sensitive than other organisms (i.e. 0.1 rad/day is applicable). (3) The threshold levels in the IAEA document (0.1 to 1.0 rad/day) were threshold levels below which appreciable effects were not seen at the population level. (Note that these levels do not have a final built-in safety factor.) (4) The review indicated that the dose rate range 0.5-10 rad/day would encompass the level at which a variety of low level effects on reproduction, development and genetic integrity are detectable in sensitive tissues and organisms. Thus, based on the IAEA document, the DOE Order of 1.0 rad/day is protective at the population level for most organisms. The suite of organisms at Hanford, however, may contain some of the species for which the 1.0 rad/day is not protective at the population level. In addition, there are special status species exposed to 100-KR-4 groundwater contaminants for which management at the individual rather than the population level is appropriate.

50. Page 4-2, 3rd paragraph
For priority pollutants, EPA's "Red Book" (1986) has been superseded by 40 CFR Part 131 (December 22, 1992). This should be used instead.

51. Page 4-3, Section 4.2, first paragraph
The text states that spring and river samples were collected only one time and are not considered representative. While it is preferable to have data from additional sampling events, this is not sufficient justification to deem the results unrepresentative. Table 5-3, which presents a comparison of near-river groundwater wells and K-area springs results, shows that aluminum and silver were detected at higher concentrations in the K-springs area than in the near-river groundwater wells. Additional rationale should be provided for not using the LFI springs data in the IRM decision path or in the risk calculations in the QRA. In addition, available data from other studies, should be reviewed for inclusion in the QRA/LFI when there is value added trend analysis, consistency of the LFI data with other data collection efforts, actual sample verification of modeled conclusions, to add robustness to IRM candidate status

decisions (especially in marginal cases), and if the expanded data coverage indicates any appropriate changes to the IRM candidate list of contaminants. The representativeness of available spring and river data should be discussed in the uncertainty section of the QRA.

52. Page 4-4, Section 4.3, 1st complete paragraph on the page, 4th sentence:
This sentence implies that the carbon-14 may be attributable to natural occurrence; however, Sections 1.2 and 4.1.4 of the LFI imply that the presence of carbon-14 could be attributed to reactor operations. The QRA and LFI should be consistent in how they address the possible sources of carbon-14.

53. Page 4-4, Section 4.4, 1st paragraph, 1st sentence
The statement that "undiluted source terms" are used is not entirely correct. The use of "near-river" ground-water concentrations may not represent a completely undiluted source. The maximum observed ground-water concentrations could reach the river under worst-case conditions. Therefore, these maxima represent an "undiluted source", not the concentrations in the river-aquifer mixing zone (when present).

54. Page 4-5, (Tables in general)
We would suggest that the shaded portions of the table be a slightly darker shading. The faint shading is hard to see on an original, and doesn't survive into a photocopy.

55. Page 4-5, Table 4-1, Footnote (Typo ~~comd~~ to ?)

56. Page 4-5, Table 4-1:
Change the first sentence of the Note to the table to read: "The EHQ is a ratio of calculated dose compared to a benchmark radiological dose of 1 rad/day."

57. Page 4-5, Table 4-2:
Values in the table require additional clarification. (1) Freshwater criteria for cadmium, lead, nickel, silver, and zinc are all affected by water hardness (except the chronic criteria for silver). Because the listed values in Table 4-2 are not those that correspond to a standard water hardness value of 100 mg/L $CaCO_3$, there should be an indication of how the criteria for these metals were derived. (2) Chromium should be identified as hexavalent chromium (measured as total chromium). (3) There are freshwater criteria available for chloride (see 53 FR 19028). (4) Aluminum values are pH dependent. Again, there should be an indication of how the aluminum criteria were derived. (5) The source for the criteria for manganese, vanadium, and trichloroethene (trichloroethylene) should be identified. They are not from the USEPA water quality criteria, except that the chronic criteria for trichloroethene seems to have been taken from the marine acute criteria for trichloroethene (see 45 FR 79341).

58. Page 5-1, Section 5.1, 1st paragraph, middle
Revise to read "there are no residential ~~or recreational~~ uses of the groundwater ~~or overlying surface area~~ of the..." See the explanation for this change in the comment to Page 1-1, paragraph 5, 4th line

59. Page 5-2, 1st full sentence.
The statement "This is true because the only difference ...is the exposure frequency" is not true. The frequent use included the inhalation of organic vapors pathway.

60. Page 5-2, 1st full paragraph, 3rd line
Remove the statement "~~therefore, the risks associated with arsenic are likely related to background~~". Arsenic is high in background, but it was common in the agricultural practices of the pre-Hanford days. Therefore the arsenic could be from background and/or agriculture. In addition the QRA (page A-4) identifies arsenic as common in coal ash. Coal ash was deposited in waste sites, and thus is a potential source as well.

61. Page 5-2, Section 5.1.3, end of section.
Suggest adding something like "The effect on humans from consumption of plants or animals that have assimilated 100-KR-4 contaminants was not considered." to here or add it to the uncertainty section.

62. Page 5-2, Section 5.2, 3rd line
Suggest a change such as: "compared to ~~acceptable~~ criteria, such as...". EPA promulgated regulations generally limit off-site human exposure to 4 mrem/year as an acceptable level. DOE Order 5400.5 uses 100 mrem/year. Levels acceptable to DOE are not acceptable by EPA regulations.

63. Page 5-3, 5th line
Suggest a change such as: "however, it probably can be ~~safely~~ assumed that...". This is in light of the many uncertainties raised in previous comments that could lead to a greater or lesser exposure than calculated.

64. Page 5-3, 1st full paragraph, 1st line
Remove "potentially" from the statement "which ~~potentially~~ affects the Columbia River."

65. Page 5-3, Section 5.2, last paragraph of section, 2nd and 4th sentences:
Add silver to these two sentences. Its concentration in the K Area springs exceeds the chronic freshwater criteria. (For additional information see the 5th sentence of Section 3.3.2.2 of the LFI.)

66. Page 5-3, Section 5.2.2:
(1) In the second sentence add chromium as a non-detect in the river using CLP methods. Note that the City of Richland's water intake generally measures Cr at about 10 ppb. (2) In the

last sentence Becker (1990) should be added to the references in Section 6.0.

67. Page 5-4, Section 5.3.1, first line
When the document is revised, this may be more accurately stated as something like the following: "The data available to conduct the QRA are LFI data included four rounds of groundwater sampling, groundwater data from other monitoring programs including historical data valuable for trending analysis, several sets of springs/seeps data, and biological tissue data to evaluate the ecological modeling efforts."

68. Page 5-4, Section 5.3.1, last line
Change to read "at the K Area is only partially known ~~not known~~." We actually know a fair amount about the river/aquifer interaction in the 100-K area. Sure, we could know more, but to say "is not known" sells us short.

69. Page 5-4, Section 5.3.2, 1st paragraph, 2nd sentence
For reasons already given in previous comments, change to read: "~~While~~ These risks are based on the best knowledge of current contaminated conditions, ~~they do not represent actual risks since neither residential or recreational uses currently occur at the operable unit.~~" That statement will be true when the data scope is expanded (beyond just the M-30-01 and LFI well data) so that the best knowledge of current contaminated conditions is used.

70. Page 5-5, Section 5.3.3, 1st paragraph, 5th line
As an observation, "no river dilution was considered" perhaps would be better stated as "river dilution was not factored into the exposure calculations".

71. Page 5-5, Section 5.3.3, 1st paragraph, 3rd sentence
Apparently "maximum representative groundwater concentration" is used here in place of "near-river groundwater concentration". See comment on Page 4-4, Section 4.4, 1st paragraph, 1st sentence.

72. Page 5-5, Section 5.3.3, 3rd paragraph, 2nd sentence
Suggest changing to read "...and conservatism and non-conservatism of many...".

73. Page 5-5, 1st paragraph, last 2 lines
Remove "~~none of the calculated risks are based on current exposure scenarios, and future land uses have not yet been determined.~~" Previous comments have already pointed out that there is some current recreational exposure to 100-KR-4 contaminants (people taking fish and game that has been exposed, downstream drinking of 100-KR-4 derived contaminants...). As far as the future land uses statement, cleanup decisions should be based on reasonably foreseeable future uses. Riverfront property is prime residential land and the HFSUWG has identified cleanup scenario "A" to support unrestricted land use. Hence the

residential scenario, even though it does not currently exist, is a potential future scenario that should be considered in cleanup decisions. With current recreational use of the area, and initiatives such as the Wild and Scenic River designation under way, consideration of the recreational scenario is also appropriate.

74. Page 5-5, Section 5.4, 2nd paragraph, 1st phrase
Change to read: "The bounding risk scenarios (or RME estimates of risk) ~~upper bound estimates of risk~~". The HSBRAM methodology defines RMEs for the two bounding risk scenarios used.

75. Page 5-5, Section 5.4, 2nd paragraph, 2nd sentence
Change to read something like: "The average ~~true~~ risk from the groundwater at the K Area are potentially ~~is~~ less than the risk estimates presented in this QRA.

76. Page 5-6, 1st sentence
Add to the first sentence to read: "...is oral ingestion of water (food uptake ignored)." Oral ingestion normally considers water and food. We need to make it very clear to the reader that in this QRA, oral ingestion does not consider food.

77. Page A-4 to A-5
The QRA is to consider both human and ecological consequences of exposure. The ecological/aquatic aspect hasn't made it into this section. For example, probably the primary ecological contaminant of concern for 100-KR-4 is Cr^{+6}. For this contaminant, ecological concerns will likely be the driver for cleanup decisions more so than human considerations. Yet this contaminant is discussed in terms of its human toxicity and carcinogenic potential. Another example is aluminum. Aluminum is particularly toxic (skeletal/spinal deformations) to developing fish larva/fry. Coyote rapids area (100-KR-4) is among the best salmon spawning grounds on the Columbia River. The salmon spend their first few months of life down in the hyporeic zone with a potential highest concentration exposure to 100-KR-4 contaminants. **Recommendation:** The ecological concerns for each contaminant in appendix A needs to be included.

78. Page A-4 thru A-8
As a 100-KR-4 document there are several opportunities to prune what may be unnecessary text. These include: Aluminum's use in the aircraft industry, medicinal purposes, arsenic in the smelting of ores, lead is a bluish-grey metal, that zinc is a ubiquitous metal commonly detected in the earth's crust (can't this be said for all the identified metals?), chloroform is a colorless volatile liquid at room temperature, TCE is a colorless liquid with a odor similar to ether or chloroform and is used for extracting caffeine from coffee and in spot removers, nitrate is an odorless, colorless-to-white, crystalline substance, used in fireworks, ceramics, rocket propellants, and pickling of meats.

79. Page A-7, Strontium
Add that the MCL is 8 pCi/l.

80. Page A-8, Tritium
Add that the MCL is 20,000 pCi/l.

81. Page B-1 to B-12
We understand that the conceptual model for the site is under development. We support that effort as a high priority. Recognizing that appendix B is part of this rapidly developing model, we will highlight several goals that we hope to see this conceptual model evolving to support.

The ecological structure will be of particular use when it shows the primary species/functions/carbon-energy paths. Exhaustive species lists helps in the identification of special status species, much of which has been done. Identification of the cornerstone species for the food web, species interactions, critical ecological functions particularly vulnerable to contaminant affects, etc will be more difficult but provide an important basis for end point selection. We would expect that the next revision to the risk assessment portion of the LFI be updated to incorporate as much of the detail of this developing conceptual model as is available and relevant.

In general, the content of appendix B is good as far as it goes. Several specific comments are offered at this point:

(1) Page B-5, 3rd paragraph from bottom. Change middle portion to ..."to protect most aquatic organisms at the population level. ~~Because of its conservative nature, it should protect populations and the ecosystem in general until additional data indicates otherwise.~~ One example qualifier to this is the"... It needs to be noted that there are other studies that would qualify the 1 rad/day concept. For example, Trabalka and Allen (1977) who found that dose rates as high as 0.4 rad/day in 1965, declining to 0.2 rad/day in 1971 and 0.06 rad/day in 1975; cause significantly more dead and abnormal embryos, and the fitness of the males of the F_1 had a significantly different critical temperature tolerance arising from an increased frequency of deleterious genes in the gene pool.

Trabalka, J.R., Allen, C.P., 1977. "Aspects of fitness of a mosquitofish Gambusia affinis population exposed to chronic low-level environmental radiation". Radiation Research, vol 70. p 198.

Unresolved comments previously submitted on the Qualitative Risk Assessment for the 100-HR-3 Groundwater Operable Unit that are applicable to 100-KR-4.

General Comments:

82. The Columbia River Impact Evaluation Plan (CRIEP) (DOE-RL 1993b) addresses similar concerns in regard to impacts from Hanford activities on the aquatic and riparian zones of the Hanford Reach of the Columbia River, though at a larger scale

than the 100-KR-4 QRA. The CRIEP already has been out for public comment. Because the ecological impact evaluation in the CRIEP is functionally equivalent to a QRA (letter, Clausing [WA Dept of Wildlife] to Gadbois [EPA], dated August 5, 1993), it establishes a precedent, right or wrong, for how ecological risk was assessed. Unfortunately, the receptors differ between the two documents and risks are calculated differently (e.g., the CRIEP sums the risk from chemical contaminants; whereas, the 100-KR-4 QRA does not). One method of calculating an ecological QRA for aquatic and riparian organisms needs to be developed and agreed on by the risk assessment committee, or differences justified; otherwise, the public could legitimately question the inconsistencies. The question of how to qualitatively assess the interactive effects of contaminants still needs to be decided (see Sutter 1993:234-238, and references therein, for a discussion of models of chemical mixtures in risk assessment; also see DOE-RL 1993a:83 and C-10).

Sutter, G. W. II (ed.). 1993 Ecological Risk Assessment. Lewis Publishers, Ann Arbor, Michigan.

83. The receptors are not clearly defined. The approach for the source operable unit QRAs was to use a specific species, the Great Basin pocket mouse (<u>Perognathus parvus</u>) as an indicator species. The present QRA uses five generic types of animals and a plant (radionuclide contaminants) and an undefined fish (chemical contaminants) to assess risk. Moreover, the pathways of exposure are not defined. For a QRA one receptor may suffice (more will need to be added for the baseline risk assessment); however, this receptor should be clearly defined and it should represent the best possible indicator of possible ecological effects.

84. The 100-KR-4 QRA uses LOELs (lowest observed effects level) as benchmarks for chemical contaminants; whereas, NOELs (no observed effects level) are used for the source operable unit QRAs. Although it is understandable how the application of different types of benchmarks occurred (i.e., the benchmarks are taken from available references for both aquatic and terrestrial organisms), the result is that aquatic organisms (fish) and the pocket mouse are evaluated at two different levels of risk. There should be consistency here. The risk assessment committee needs to decide what level of risk is appropriate and the necessary conversions made to bring the source and groundwater QRAs into agreement.

85. Also relevant to the above discussion is whether EPA's chronic water quality criteria (EPA 1987) for aquatic organisms are actually LOELs. The method of calculating the chronic values (EPA 1987:Appendix A) implies they are equal to Sutter's (1993:502) maximum acceptable toxicant concentration (MATC) (which is equivalent to the geometric mean between NOELs and LOELs).

EPA. 1987. Quality Criteria for Water 1986 (Update #2, May 1987). U.S. Environmental Protection Agency, Washington, D.C.

Sutter, G. W. II (ed.). 1993 Ecological Risk Assessment. Lewis Publishers, Ann Arbor, Michigan.

86. Some radionuclides, such as uranium, also may be chemically toxic. This needs to be addressed for those radionuclides that fall into this category.

Comments to Specific Sections:

87. Page 1-1, Section 1.1, 4th sentence of the 1st paragraph:
The Hanford Future Site Uses Working Group (HFSUWG 1992) did not under all possible future use options recommend the 100 Areas to be classified for unrestricted land use. Three cleanup scenarios were identified that enabled different use options. Under all three options only the groundwater (as a goal) would be cleaned up to unrestricted status. Cleanup requirements for the surface and subsurface depended on the use option chosen. In cleanup scenario B, areas managed for wildlife and habitat need only be cleaned up to restricted status.

88. Page 4-2, Section 4.1.3, last sentence of the 2nd paragraph:
Besides being a regulatory limit the 1 rad/day dose rate also is referable to the recommendations of the National Council on Radiation Protection and Measurements (NCRP 1991) concerning the effects of ionizing radiation on aquatic organisms. The NCRP suggested this value as a chronic dose rate limit for the maximally exposed individual that would be overall protective of endemic populations of aquatic organisms. They also suggested a warning level of 0.25 rad/day. If this level was exceeded, they recommended a more comprehensive ecological evaluation of the radiation exposure regime along with an evaluation of other environmental stressors that may be present (e.g., toxic chemicals) (NCRP 1991:38). Because the NCRP provides a defensible basis for its suggested limit, the QRA should incorporate its report as a reference and discuss its rationale.

NCRP. 1991. Effects of Ionizing Radiation on Aquatic Organisms. NCRP Report No. 109. National Council on Radiation Protection and Measurements, Bethesda, Maryland.

89. Page 4-2, Section 4.1.3, 3rd sentence of the 3rd paragraph:
Appendix B of the Quality Criteria for Water 1986 (EPA 1987) states: "The resulting criteria are not intended to provide 100 percent protection of all species and all uses of aquatic life all of the time, but they are intended to protect most species in a balanced, healthy aquatic community". Revise the 3rd sentence to accurately reflect the intent of the quality criteria.

90. Page 5-3, Section 5.2, 1st sentence on page:

It is not clear as to how the ecological QRA screens for relative risk (relative to what?) and then allows a determination of whether an IRM is necessary. This whole concept of relative risk requires explanation.

91. Page B-3, Section on Plants, 1st paragraph:
Not all periphyton are classified as algae (C. Cushing, pers. comm. with John Hall, WA Dept of Wildlife)

92. Page B-4, Sections on Primary Carnivores and Fish:
There is some inconsistency between these two sections about where steelhead are located on the Hanford Reach that should be clarified.

93. Page B-5, Section on Dose of Constituents of Concern to Aquatic Receptors, 3rd paragraph:
The discussion in this paragraph must be related to the chosen dose limit. The present discussion does not indicate to the reader why 0.02 mg/L was not used as the dose limit for hexavalent chromium.

94. Page B-5, 1st sentence of last paragraph on the page:
The sentence implies that radiation doses are weighted by the energy of the radiation (i.e., quality factors are applied); however, weighted values of radiation exposure are usually associated with human exposure. The QRA needs to clarify how radiation doses were weighted for the purposes of the ecological QRA.

Enclosure 2.
Regulator Comments: "Limited Field Investigation Report for the 100-KR-4 Operable Unit", DOE/RL-93-79, Draft A

General Comments:

95. We note that there is no table summary of all the LFI data such as appendix A in the 100-BC-1 Draft A LFI. We accept this approach, provided DOE places all the LFI data in the administrative record. Note that this comment is provided in the context that the LFI needs to address other applicable, relevant and appropriate data that is part of the decision process for this operable unit.

96. The limited field investigation (LFI) briefly addresses the analytical results pertaining to the 100-KR-4 operable unit (OU) without describing data collection activities at this OU. The 100-KR-4 OU includes groundwater underlying the 100-KR-1, 100-KR-2, and 100-KR-3 source OUs, and the adjacent groundwater, surface water, and sediments. The LFI does not include information on the source OUs, the surface water, or the sediments investigation, and indicates that surface water and sediments were investigated under a separate 100 area site-wide effort. Previous groundwater analytical results are not discussed either (for example, the text in Section 1.3 references Peterson [1992] and Peterson and Johnson [1992] as pertinent sources of groundwater data). As needed, the results of applicable previous studies should be included in this LFI report to support the conclusions reached regarding contaminant of potential concern (COPC) selection and risk categorization. The remedial investigation/feasibility study work plan for the 100-KR-4 operable unit (DOE 1992) indicates that cultural resources investigation, including a review of available data on historic land uses, was planned as part of this LFI, although there is no information given on the cultural resource investigation. Some of the groundwater data in the LFI were collected from existing wells that were determined to be "fit-for-use." The criteria used to determine the fitness of these wells should be described in this LFI report.

97. The Executive Summary should be modified to state that the purpose of the LFI is performed to provide additional data and characterization needed to support selection, design and implementation of IRMs, if needed.

98. We agree with the recommendation to continue the 100-KR-4 OU along the interim remedial measure (IRM) pathway. However, strontium-90, gross beta, and aluminum should be added as COPCs based on comparison to ARARs. If reevaluation including other data sources suggests modification to the analyte list, this analyte list should be revised appropriately.

99. The LFI should provide data on the relationship between water-table fluctuations and release and transport of

contaminants from the lower vadose zone and capillary fringe to groundwater.

100. Information is missing on the nature and extent of groundwater contamination discharging to the Columbia River.

101. The purpose of the qualitative risk assessment (QRA) is to assist in the decision if an IRM is warranted. The Executive Summary should spell out the parameters used to define QRA risk levels and hazard quotients.

102. Provide the location of the seeps (if there are any) to the Columbia River on the maps (page 3-2, most probable exposure scenario is occasional use of springs by trespassers near the river).

103. Include Columbia River surface elevation data.

104. On each COPC figure, show the most restrictive regulatory limits in the legend. Also, draw the regulatory threshold contour lines in each plume. Provide enough information in the text to show what data was used in constructing these maps.

105. Include a Water-Table Elevation map for each sampling event.

Specific Comments

106. Page ES-1, 1st paragraph, 2nd last line
The use of "and/or" needs to be clarified. It is unclear if all the IRM triggers need to be activated at once (ie. **and**), or if any of the triggers is sufficient cause for an IRM (ie. **or**). Suggest replacing ~~and/or~~ with or.

107. Page ES-1, second paragraph, first sentence.
Were soil sample results also used in this investigation? If so provide data.

108. Page ES-1, second paragraph, third sentence.
Sentence should be modified to read ..... potential contamination.

109. Page ES-1, 5th paragraph, 1st sentence
This is incorrect. The ecological QRA did not use a subset of the data used in the human health QRA. See bullet #2 in section 2.5.1. This sentence should be removed.

110. Page ES-1, 5th paragraph, 2nd sentence
A year and a half ago, Ecology and EPA wrote letters to DOE regarding use of groundwater data as a surrogate for spring and seep data. (Larry Goldstein[Ecology] to Julie Erickson[DOE], June 23, 1992; Laurence Gadbois[EPA] to Julie Erickson[DOE], June 24, 1992.) For a year and a half we have been unable to solicit a reply in writing, however we understood an oral agreement to

use the maximum groundwater plume concentration in risk assessments as what could potentially discharge into the river.

The QRA and LFI made a distinction between near-river wells and the rest of the OU wells, which is in contrast to the agreement. If we had good well coverage all along the river, and had good monitoring data during extended periods of low river stage, we probably could justify the separate treatment of near-river well data. We don't have that good well coverage and low river stage monitoring data. For example the LFI identifies only one possible upper aquifer "near-river" well down gradient from the 105-KE basin/reactor building area. The plume in that area may travel between the K-32 well pair and the K-18/19 well pair (resulting in no "near-river" well coverage). (See IT's January 21, 1994 revision to figures 2-2 and 2-3.) With the interbeds of highly conductive gravels that exist in the area, it is very plausible for a plume to travel the short 600 meters distance to the river with its radiological/chemical content intact.

Recommendation: Remove the distinction between the "near-river" and other well data.

111. Page ES-1, fifth paragraph, last sentence.
Sentence reads, "Based on this method ..." Which method is this sentence referring to?

112. Page ES-1, last paragraph, 1st sentence:
Indicate which ARAR(s) was exceeded.

113. Page ES-1, 5th paragraph, last sentence
With the revised method of using all the well data, this list should change. Table 3-1 shows how significantly higher concentrations of many analytes are found in the more inland wells. Another example is the aluminum in the K-27 well during the 3rd round of sampling that exceeds water quality criteria. In the risk assessment general comments we identify the need to look at more than just the LFI CERCLA well data to identify risks. The high strontium-90 in tree vegetation that is rooted in 100-KR-4 might help identify that this contaminant is of concern. (Note that because the QRA/LFI did address the tree vegetation data and the drinking water standard of 8 pCi/l, the QRA dropped strontium-90 as a contaminant of potential concern. Note also that the regulators have previously identified our concern over strontium-90, and rejected DOE's proposal to drop it from future groundwater sampling. [Memo from Larry Gadbois, EPA to Eric Goller, DOE; December 9, 1993]) The following is an excerpt from that memo to explain our concern with Strontium-90: [begin quote]

The following is provided to explain my interest in Sr-90. I'd be glad to discuss this with you if you would like. I could dig further if this isn't enough justification to make you comfortable with the decision to continue with the Sr-90 sampling.

The highest Sr-90 levels (35 pCi/gm) measured in tree leaf vegetation samples collected for CERCLA in the whole 100 Areas in

July 1992 was in sample B06N58 (K area impacted, and not even in the heart of the rad plume). (WHC-EP-0620, pages A-3, D-4.) WHC did a follow-on sampling in October a bit closer to the reactor area and it was even higher (88 pCi/gm, sample B07934). (WHC-EP-0620, pages A-3, D-5.) Again, this was higher than any of the other 100 Area hot spots sampled that month.

100-KR-4 spring sample B015D2 was 8.8 pCi/l. Similar and higher concentrations have been measured in K area wells. Such as:

199-K-19	(round 3)	15.00 pCi/l
	(round 4)	11.00 pCi/l
199-K-20	(round 1)	9.00 pCi/l
	(round 2)	12.00 pCi/l
	(round 3)	13.00 pCi/l
	(round 4)	11.00 pCi/l
	(round 4)	12.00 pCi/l
	(round 4)	11.00 pCi/l
199-K-21	(round 1)	30.00 pCi/l
	(round 2)	33.00 pCi/l
	(round 3)	100.00 pCi/l
	(round 4)	32.00 pCi/l
199-K-22	(round 4)	9.00 pCi/l
199-K-34	(round 1)	24.00 pCi/l
	(round 2)	36.00 pCi/l
	(round 3)	31.00 pCi/l
	(round 4)	37.00 pCi/l
699-70-68	(round 4)	88.00 pCi/l

Thus, it's in the groundwater and discharging to the river at significant concentrations, and is traversing the biological systems. That's enough justification for me. Please let me know of anything else you need in this regard.

[end quote]

Recommendation: Revise the list of contaminants on page ES-1 when the expanded data set is evaluated.

114. Page ES-1, last paragraph

The first sentence is OK. Request that the second sentence is removed in light of previous comments.

115. Page 1-1, Section 1.1, 1st paragraph, last sentence

This sentence should be removed. These waste units are part of the 100-KR-1 operable unit. (See table 4-3 in the 100-KR-1 Work Plan; DOE/RL-90-20, Revision 0.)

116. Page 1-1, Section 1.1, 2nd paragraph, last paragraph

Add the concept of the aquifer matrix, and then this is the correct definition for 100-KR-4. (Note that most of the contaminants in 100-KR-4 are attached to the aquifer matrix. Efforts to clean the groundwater in fact are primarily efforts to clean the aquifer matrix.)

117. Page 1-1, Section 1.2, second paragraph.

At the end of the first sentence add ..... due to its mobility.

118. Page 1-1, Section 1.2.
This section lists major waste disposal sites, with their locations shown in Figure 1-3. The sludge handling burial ground (118-K-2) is not identified in Figure 1-3, however, and the retention basin (116-KE-4) is listed twice in the text. These errors should be corrected.

119. Page 1-1, Section 1.2, 1st and 3rd bullets
"116-KE-4 is listed as a retention basin and as a small crib." Also, a "sludge handling burial ground" (118-K-2) is listed, but apparently the "118-K-2" label was left off of figure 1-3.

120. Page 1-3, 1st paragraph
Suggest adding the following idea to the end of the paragraph: New wells were sited with regard to the existing well network.

121. Page 1-3, middle paragraph, first line
Suggest this clarification: ..."as part of early CERCLA characterization"... As opposed to many of the pre-CERCLA documents on many of these same topics.

122. Page 1-3, Section 1.3, third paragraph.
When were the seven new wells completed for the RI/FS? Provide a table with completion date, depth, sample interval, stratigraphy, etc.

123. Page 1-4, 1st paragraph
This paragraph appears to document how we had hoped the data validation would have progressed. That is not how the validation actually went. In response to EPA's May 19, 1993 letter [Laurence Gadbois, EPA to Paul Carter, DOE and Julie Erickson, DOE] regarding "Problems with Analytical Data Quality Control", we were informed that WHC requested that the data be re-evaluated with the correct interpretation of the validation guidelines. By our records this has not been done. At an analytical services unit manager meeting (October 20, 1993) and an informal 100-KR-4 unit manager meeting (November 2, 1993) I pointed out that the 199-K-21 3rd round data illustrates that all the data is not being verified.
Recommendation: I would replace this whole paragraph with something like ..."The data validation reports are presented in:" and then the four bullets.

124. Page 1-4, Section 1.4.
This section provides a reference for the validation procedures. A reference or description of the verification process should be provided.

125. Figure 1-1, page 1F-1.
Please add 100 Area southern boundary line.

126. Figure 1-3, page 1F-3.

Please expand figure to include all of 166-K-2 trench.

127. Page 1F-3, Figure 1-3
Two different sites are labeled as "118-KE-2".

128. Figure 1-4, page 1F-4.
For reference please date HPPSP document on this figure.

129. Page 2-1, Section 2.1, first paragraph.
According to this paragraph, six shallow wells were installed for this LFI. However, Figure 1-2 shows well K-31 was also installed for this LFI. Text should be modified to include this well.

130. Page 2-1, Section 2.1, 1st paragraph, 1st line
Append to read "...and potential sources of groundwater contamination, where existing well coverage was determined to be insufficient".

131. Page 2-1, Section 2.1, 1st paragraph, 1st sentence
Figure 1-2 indicates that well 199-K-31 was also "drilled for the LFI".

132. Page 2-1, Section 2.1, second paragraph.
Provide a stratigraphic cross-section showing the new wells, encountered stratigraphy, and hydrogeology.

133. Page 2-1, Section 2.1, 2nd paragraph
This paragraph seems to document how we had hoped the sample collection would have progressed. The second sentence is incorrect. The three samples described were not collected from the 199-K-32B well. The sample that was to be taken 10' above the groundwater in the 199-K-33 well was not collected. One of the three samples for the 199-K-36 well was not collected. Recommendation: Replace this sentence with a description of what was actually done.

134. Page 2-1, Section 2.1, 3rd paragraph, last line
"...Lindberg (1993) and Lindsey (1991). These discussions have been revised to include the data from LFI wells." Noting that the LFI wells were drilled in 1992, how'd he do that? I know Lindsey is good, but that's amazing! Recommendation: ~~These discussions have been revised to include the data from LFI wells.~~ The following discussions use data from LFI wells to build on the previous work. (Note that the dangling "these" in "these discussions..." causes the confusion.)

135. Page 2-1, Section 2.1, last line
The reference to Table 2-1 should be to Table 2-2.

136. Page 2-1, Section 2.1.1 through 2.1.3.4
General comment. Note that the "surface" of the 100-KR-4 operable unit is the top of the water table/river surface.

Recommend: Page 2-1 ...The surface topography of the ~~100-KR-4 Operable Unit~~ 100 K Area is...
Page 2-2 ...underlie the ~~100-KR-4 Operable Unit~~ 100 K Area.
Page 2-3 ...The uppermost deposits within the ~~100-KR-4 Operable Unit~~ 100 K Area consist...

137. Page 2-2, Section 2.1.3.1, second sentence
The Elephant Mountain member is discussed as the uppermost basalt unit. This unit is not labeled on figure 2-1.

138. Page 2-2, Section 2.1.3.2, item 1. (Unit A)
Unit A is discussed, but is not shown on Figure 2-1.

139. Page 2-3, Section 2.1.5, first paragraph.
Which wells were sampled for physical properties?

140. Page 2-4, Section 2.2, 1st paragraph, 1st sentence
The "sampled interval" is discussed as being in Table 2-2. This is not the case. Presumably the "sampled interval" is the same as the "completion".

141. Page 2-4, Section 2.2, third paragraph.
Mention that the buried erosional channels may also provide preferential pathways for contamination migration.

142. Page 2-4, Section 2.2, fifth paragraph.
The length of the trench is not necessarily evidence of the low hydraulic conductivity in this area. The length of the trench may be due to inflow rates or sediment buildup.

143. Page 2-4, Section 2.2
Much of the discussion in this section relates to the configurations of the water table shown in figures 2-2 and 2-3. These figures are in error due to use of incorrect reference elevations for some of the wells. In phone conversations with Bob Peterson of Westinghouse and Dave Myers of IT, these errors were discovered and new figures have been drawn (supplied to EPA BY Dave Myers on 1/21/94). Much of this section needs to be rewritten to reflect the different water-table configurations shown in the new figures. In particular, the discussion of a mound near the 100 KE Reactor is no longer valid.

144. Page 2-4, Section 2.2, 3rd paragraph, 3rd sentence
The relatively steep gradients probably do reflect low conductivity. However, it should also be stated that the increased gradient could also be due to a decrease in aquifer thickness and/or an increase in discharge.

145. Page 2-5, Section 2.2.1, first paragraph.
Reference The Bouwer and Rice Slug Test -- An Update, Ground Water, Vol. 27, No. 3, pp 304-309, 1989.

146. Page 2-5, Section 2.2.1
Have the test data been published in some form?

147. Page 2-5, Section 2.2.1, fourth paragraph.
For reference give data for well 199-K-32B.

148. Page 2-5, Section 2.4, 3rd-4th line
See earlier comment. Revise accordingly.

149. Page 2-5, Section 2.4, last full sentence
It is stated that soil analyte concentrations are generally within the bounds of background ranges as defined by DOE-RL 1993b. DOE-RL 1993b (Table 6-1) contains two analytes that do not appear in Table 2-4 of this document (lead and thallium). Were the soil samples tested for these analytes? If so, they should be included in the table.

150. Page 2-6, Section 2.4.
This section discusses soil contamination and states that since acetone and methylene chloride were not found in the groundwater, they were determined to be laboratory artifacts. These compounds should have been detected in laboratory blanks to accurately determine whether they are indeed laboratory artifacts.
This section also compares detected levels of inorganics and radionuclides to background levels. Background levels should be listed in a table for comparison.

151. Page 2-6, Section 2.5, first paragraph.
Provide rationale for only sampling wells 699-65-72 and 699-66-64 during the second round.

152. Page 2-6, Section 2.5.1, 1st sentence
The reference to Figure 2-4 apparently should be to Figure 2-5.

153. Page 2-7, 1st bullet.
This seems to be describing what the QRA termed the "maximum representative value". Is that so? If so, this should be explicitly stated.

154. Page 2-7, 3rd bullet, 6th line
Change to "that exist ~~naturally~~ in the groundwater at the Hanford Site in areas presumed uncontaminated by Hanford operations.

155. Page 2-7, Section 2.5.1, 1st bullet, 3rd sentence
"Internal consistency check #2" (consistency between sampling rounds) should be used with extreme caution. Changes between rounds can be caused by seasonal changes in the flow system (a primary reason for conducting quarterly sampling).

156. Page 2-7, Section 2.5.1, 1st bullet, 4th sentence
The use of "closest nearby well" as a consistency check may not be reliable. Our understanding of the flow system (past and present) may not be sufficient to accurately determine the probable distribution of contaminants. With a well network

interspersed among and nearby waste sites we would expect potentially large differences among wells.

157. Page 2-7, Section 2.5.1, fifth bullet.
The paragraph states that analytes are excluded if they are at or below Hanford and/or local background levels. Have local background levels been determined for all analytes? If so, give appropriate references.

158. Page 2-7, last sentence
Suggest this change: "This method assures that COPC used in the QRA are the maximum defensible concentrations, thus providing a conservative yet realistic assessment of risk, for the pathways examined." For the pathways examined, this statement was PERFECTLY WORDED!

159. Page 2-8, 1st paragraph
This paragraph should be dropped in light of the fact that, as with the 100-KR-4 LFI/QRA, there is additional data available to define the site contamination.

160. Page 2-8, Section 2.5.1, 2nd paragraph, 2nd sentence
Why was 199-K-13 selected over 199-K-11 as a "near-river" well? They appear to be approximately the same distance from the river. The same goes for wells 199-K-27 and 199-K-30 wells. See also comment #110.

161. Page 2-8, Section 2.5.1, last paragraph
The list of COPCs does not agree with the COPCs as indicated in Tables 2-9, 2-10, 2-14, and 2-15.
- pH is listed as a COPC in Tables 2-9 and 2-14
- sulfate is listed as a COPC in Table 2-9
- TDS is listed as a COPC in Tables 2-9 and 2-14
- cobalt is listed as a COPC in Table 2-10
- calcium is listed as a COPC in Table 2-15

162. Page 2F-1, Figure 2-1.
This figure presents a stratigraphic column for the 100-KR-4 OU. The thicknesses of the various Ringold Formation units shown in this figure vary significantly from the description in Section 2.1.3.2. For example, the thickness of the overbank-paleosols deposits shown in the figure is approximately 80 feet, whereas the text describes this unit as being approximately 209 feet thick. Although some uncertainty is expected in the figure, such significant discrepancies should be resolved.

163. Pages 2F-2 and 2F-3, Figures 2-2 and 2-3.
Water level elevations are not provided for wells 199-K-35 and 199-K-36. This information should be presented if available, especially since the highest observed chromium concentrations were found in well 199-K-36.

164. Page 2F-2 and 2F-3, Figures 2-2 and 2-3

Add water levels for wells K-35, K-36 and K-37. Add contours also.

165. Pages 2F-2 and 2F-3, Figures 2-2 and 2-3
- The period of water-level measurements should be given more precisely than by month and year.
- The range and/or average river stage should be indicated for the period of water-level measurements.
- The contours curve away from the river to the east of a line connecting K-19 and K-30. Is this based on data from wells outside of the K Area? If not, this curvature should be removed.

166. Page 2F-4, Figure 2-4
Well K-31 is shown as an "existing well". On Figure 1-2, this well is indicated to be a "new" well.

167. Page 2T-1, Table 2-1
Provide dates of each round of sampling events on this table.

168. Page 2T-2, Table 2-2.
This table presents the screened intervals of the wells by depth below the ground surface (assumed). It would also be useful to present this information as feet above mean sea level, so that screened intervals can be directly compared to the water level elevations.

169. Page 2T-2, Table 2-2.
Give rationale for not conducting a slug test on well 199-K-32B.

170. Page 2T-2, Table 2-2
Figure 1-2 shows well K-31 as a "new" well, but it is not included in this table of "new" wells.

171. Page 2T-4, Table 2-8.
Provide a column listing the most stringent ARAR and highlight those constituents over the ARAR (based on table 4-2).

172. Tables 2-4 through 2-16
Only two of these tables (2-10 and 2-15) indicate that they are for unfiltered data. What is the filtered/unfiltered status of all the other data tables. Each table should be labeled, or the front of the document should clearly state that all data used in this LFI was unfiltered. If any filtered data was used, the reason for this needs to be identified.

173. Tables 2-11 through 2-16
These tables are a product of treating "near-river" wells differently in the ecological analysis. We expect that these tables will not be needed when the document is revised. See comment #110.

174. Page 2T-5, Table 2-5
The identified COPCs (chloroform and trichloroethene) are not included in Table 4-1 (which lists "100-KR-4 COPC Data").

175. Page 2T-8, Table 2-8
Sr-90, Tc-99, U-233/234, U-235, and U-238 are identified as COPCs, but no data are included in Table 4-1 (which lists "100-KR-4 COPC Data").

176. Page 2T-9, Table 2-9
Chloride, pH, sulfate, and TDS are identified as COPCs, but no data are included in Table 4-1 (which lists "100-KR-4 COPC Data").

177. Page 2T-10, Table 2-10
The maximum filtered concentration for chromium (2010 ug/L, Table 4-1) exceeds the maximum reported concentration (1950 ug/L, unfiltered) in Table 2-10. Unless a reasonable explanation exists to eliminate this filtered concentration, this value (2010) should be used as the maximum observed.
Also, the maximum unfiltered lead value is shown in Table 2-10 as 7.6; Table 4-1 contains a value of 91.9 (K-21, round 3).

178. Tables 2-10 vs 2-15
It is unclear why table 2-10 has a 'Non-Toxic?' column while table 2-15 does not.

179. Page 3-1, 1st paragraph, 5th line
Change to read: "agreed on by the ~~100 Area~~ 100-KR-4".

180. Page 3-1, Section 3.1, first paragraph.
Which wells were evaluated to determine the COPC's for the human health evaluation for 100-KR-4?

181. Page 3-1, Section 3.1, 1st paragraph, last sentence
"The rationale for using unfiltered sample results is explained in the QRA (WHC 1993e)." The only place I found in the QRA on this topic was section 2.1.1. This section explained **how** comparisons were done. It does not explain the **rationale.** Is there another section of the QRA that this refers to? Recommendation: Provide the section number in the reference that explains the rationale.

182. Page 3-1, Section 3.1, second paragraph.
The text indicates that the ecological evaluation looked at the near-river portion of the 100-KR-4 OU. Tables in Section 2.0 also present near-river data, but Table 2-1 does not identify wells that are considered to be near-river. The near-river wells should be identified. See also comment #110.

183. Page 3-1, Section 3.2
Recommendation: Remove the second paragraph. The LFI/QRA process provides a "conservative yet realistic assessment of risk" (DOE/RL-93-79, Draft A).

184. Page 3-1, last line
Remove ~~Currently, there is no use of groundwater in the 100-KR-4 Operable Unit.~~ The benthic invertebrates and fish which spawn and live in the river sediments/cobbles are a testament to the contrary. Shoreline vegetation rooted in 100-KR-4 also use the groundwater. This groundwater flows into the Columbia River with an explosive increase in users, including human.

185. Page 3-2, Section 3.2.2.1, 2nd bullet
Change to "whether the ~~target~~ threshold HQ".

186. Page 3-3, 1st line
"the only difference in the intake is the exposure frequency" is incorrect. The residential scenario includes the inhalation of organics.

187. Page 3-3, 2nd line
What does "this" refer to in "this rule of thumb"? Seven days a year vs 365 days a year? The two orders of magnitude concept from the previous page?

188. Page 3-4, Section 3.3.1.3, 2nd paragraph, 2nd sentence
"Criteria for non-radiological contaminants..." used water quality criteria in addition to LOELs and NOELs. Also the Fernald document that I think was used to obtain the LOELs and NOELs needs to be referenced (FEMP-SWCR-3).

189. Page 3-4, Section 3.3.1.3, 2nd sentence of the 2nd paragraph:
NOELs were not considered in the QRA.

190. Page 3-4, Section 3.3.1.3, last sentence
"ambient water quality criteria (EPA 1986) to determine LOEL". As we have noted in a previous comment, water quality criteria are not the same as the LOEL. Throughout this document as well as the QRA, this use of terms needs to be reviewed.

191. Page 3-4, Section 3.3.1.3, last paragraph:
(1) The second sentence should be revised to indicate that two types of ducks were evaluated: plant-eating and fish-eating. (2) Identify the receptor for non-radioactive contaminants in the last sentence.

192. Page 3-4, Section 3.3.2, 2nd line
Yes, there is only round of CERCLA data collected under M-30-01, but that is not the only good data. Refer back to the general comment on the QRA for our request to expand the data set discussed in these documents.

193. Page 3-4, 1st paragraph, last line
Change to read "of ~~bounding~~ exposure scenarios..." Groundwater concentrations in unmeasured areas or time periods may be higher or lower than available data indicates.

194. Page 3-4, 2nd last line

The "adverse effect levels" this sentence refers to need to be listed. Among the DOE Order 5400.5, water quality criteria, LOEL, and CRITR2 model results, which threshold for the different analytes was used?

195. Page 3-4, 2nd last line

Aluminum and chromium are identified as being above an identified adverse effect level. Why was aluminum dropped as a refined contaminant of concern? Contaminants are supposed to be retained if either an ARAR or a risk value is exceeded (see figure 2-5). This aluminum example in the ecological assessment, and the Sr-90 MCL on the human health assessment indicate that some alternate decision tree seems to have been used. In a February 16, 1994 discussion of a draft version of these comments with DOE, we were informed that the ARAR and risk evaluations were conducted on the same list of contaminants. This approach needs to be evident in the document in addition to a revision of the analytes carried along the IRM candidacy path in the conclusion section.

196. Page 3-4, 2nd paragraph

Remove "~~Once contaminants enter the Columbia River, dilution should result in rapid reduction of the concentrations to levels below any possible risk level. This appears to be the case, even for aluminum and chromium, which were not detected in the Columbia River.~~" Points of compliance will be set in a ROD, not by DOE in an LFI. As a note however, a reasonable guess is that the most sensitive important ecological receptor are salmon larva living in the river hyporeic zone. Thus their exposure will not be up in the river water column post-dilution. This is particularly true for the two contaminants specifically identified in the quote, aluminum and chromium.

197. Pages 3-4 and 3-5, Section 3.3.2.

The text indicates that the K Area springs data are used for comparative purposes, and implies that near-river groundwater concentrations represent adequate source term concentrations for the ecological evaluation. However, aluminum concentrations are significantly higher in the springs as compared to the near-river groundwater. The text should specify in Section 3.3.2.2 that aluminum concentrations are higher in the springs than in the near-river groundwater, and compare the spring levels to acute and chronic ambient water quality criteria.

198. Pages 3-4 & 5, Section 3.3.2, 2nd paragraph, 2nd and 4th sentences:

Add silver to these two sentences. Its concentration in the K Area springs exceeds the chronic freshwater criteria. (For additional information see the 5th sentence of Section 3.3.2.2.).

199. Page 3-5, Section 3.3.2.1, 1st line

Modify to read "Radionuclide doses were calculated for some of the..."

200. Page 3-5, Section 3.3.2.1, 2nd paragraph, 3rd line
This LFI is supposed to have been developed with a bias-for-action. In that light, something like the following would be more appropriate.
"Carbon-14 is a COPC in the near-river wells, ~~however it is a naturally occurring constituent~~ and 200 Ci of carbon-14 were disposed to each of the french drains 116-KW-1 and 116-KE-1. Two wells have Carbon-14 elevated orders of magnitude above the others in the area. These two wells are down gradient of the 116-KW-1 french drain.

201. Page 3-5, Section 3.3.2.2
Check if LOEL or water quality criteria should be used.

202. Page 3-5, Section 3.3.2.2
Suggest changing to "~~The~~ A primary concern...and if the ~~spring~~ groundwater concentrations exceed the ~~acute and~~ chronic..."

203. Page 3-5, Section 3.4.1
Reference previous comment regarding the inclusion of additional data analysis. When that is completed, this statement will need to be revised.

204. Page 3-6, 2nd paragraph, last sentence
Remove the statement "~~therefore, the risks associated with arsenic are likely related to background~~". Arsenic is high in background, but it was common in the agricultural practices of the pre-Hanford days. Therefore the arsenic could be from background and/or agriculture. In addition coal ash in the waste sites may be a factor.

205. Page 3-6, 3rd paragraph, 2nd line
Change to something like the following: ..."an over-estimation of risk to an average organism for the pathways evaluated, but is appropriate in a reasonable maximum exposure scenario, which the ORA establishes. It is also appropriate under a bias-for-action scenario.

206. Page 3-6, Section 3.4.1, last paragraph, 1st sentence
To be more accurate, "...maximum concentration..." should be changed to "...maximum observed concentration...".

207. Page 3-6, Section 3.4.2, 2nd paragraph
Suggest changing such as: "agreements by the ~~100 Area~~ 100-KR-4 Tri-Party unit managers. ~~While~~ These risks are based on the best knowledge of current contaminated conditions. ~~they do not represent actual risks since neither residential or recreational uses currently occur at the operable unit.~~

208. Page 3-6, end of 3rd paragraph
Suggest adding: For others, decay to daughters can increase exposures to receptors. The Pu to Am decay occurring at the PFP is a good close-to-home example.

209. Page 3-7, 2nd paragraph
Suggest changing to read: "~~at~~ in some 100 K Area ~~waste units~~ operations.

210. Page 3-7, Section 3.4.3, end of 1st paragraph
"groundwater concentration was used as the source term and no river dilution was considered". Only the "near-river" wells were used which may have been within an area of river dilution, so the statement that "no river dilution was considered" should be removed. See also comment #110.

211. Page 3-7, Section 3.4.3, 3rd paragraph
Suggest changing to: "At low dose levels organisms can repair some damage to correct for radiological dose. Repairs are not necessarily correct, resulting in permanent alterations.

212. Page 3-8, Section 3.5, 1st paragraph, last sentence
Remove, for reasons already explained in previous comments.

213. Page 3-8, last line
Suggest changing to: "at the K Area is ~~less than the risk presented in this QRA~~ likely different than that illustrated in this QRA.

214. Page 3T-1, Table 3-1.
Do the values presented in this table represent maximum concentrations? Also, what sampling intervals are these related too? Provide dates for the columns.

215. Page 3T-1, Table 3-1
Cobalt, pH, and sulfate are listed as COPCs on Tables 2-9 or 2-10, but are not included here. Also, TDS is included here, but is not included in the list in the last paragraph of page 2-8.

216. Table 3-3, footnote b
Remove. This makes it sound like the very high carbon-14 values in the two wells down-gradient of the carbon-14 loaded 116-KW-1 waste site may be due to a spike in the background.

217. Page 3T-5, Table 3-5:
As discussed in the comments to the QRA, consider adding arsenic to this table.

218. Page 4-1, 1st paragraph, 6th line
"identified using four sampling rounds". This needs to be modified in response to the general comment in the QRA regarding using other data.

219. Page 4-1, Section 4.0.
This section describes COPCs. Sections 4.1.1 through 4.1.8 identify where all the COPCs except nitrate/nitrites were detected. Locations where these analytes were detected should also be identified.

220. Page 4-1, Section 4.1, 1st line
Revise to read: "...The human health QRA..." Note that Sr-90 and any other contaminants identified in other data sources should be added.

221. Page 4-1, Section 4.1, last line
Aluminum should be added to this list of ecological contaminants of concern.

222. Page 4-1
The reference to the "near-river" well concentrations should be replaced by the maximum representative concentrations. See also comment #110.

223. Page 4-1, Section 4.1.1, second sentence
The reference to the KW basin should apparently be to the KE basin (see Figure 4-1).

224. Page 4-1, Section 4.1.1.
The text reports the three highest concentrations of chromium detected but does not include well 199-K-20, which had a concentration of 261 µg/L. The text should include the results from this well.

225. Page 4-1, Section 4.1.2, Arsenic
This will be improved with the addition of one sentence. "Arsenic was commonly used in agricultural pesticides during pre-Hanford operations.", or something like that.

226. Page 4-1, Section 4.1.2:
Indicate whether there were any agricultural activities in the 100 K Area that could have contributed to the arsenic concentrations.

227. Page 4-1, Section 4.1.2, last sentence
Although there is no known source for the arsenic in the 100 K Area, the occurrence of the highest concentrations seems to be associated with the highest concentrations of other contaminants. Is there any explanation for this distribution?

228. Page 4-1, Section 4.1.3, second sentence
Wells K-27 and K-30 are listed as the only wells which exceed the 20,000 pCi/L DWS for tritium. This is true according to Figure 4-3, however, Tables 2-16, 3-1 and 4-1 contain a value of 35,000J (Round 4) for well K-33. When the data review is expanded, other wells will be shown to have exceeded this level. Among those wells at 199-K-7, 199-K-10, 199-K-11, 199-K-19, and 199-K-29.

229. Page 4-1, Section 4.1.3
Suggest removing the statement "~~These wells are near the dry well associated with the inert gas recirculation system for the 105-KE Reactor where know disposal of tritiated water occurred.~~" due to its speculative nature.

230. Page 4-2, Section 4.1.4, last sentence
It is stated that C-14 was not detected in the vicinity of the 116-K-2 Trench. Table 4-1 contains the following detected values for wells near the trench;

well	maximum concentration
K-18	19
K-20	630J
K-21	8.6
K-22	236

231. Page 4-2, Section 4.1.6, last sentence
"Large quantities...was..." should be changed to "Large quantities...were...".

232. Page 4-3, 2nd paragraph
It looks like this is where the error occurred in identifying the Sr-90 MCL, and gross beta (MCL = 50 pCi/l, 199-K-34 was 78 pCi/l in 3rd round sampling), and maybe others. Comparison to ARARs appears to have been done after the risk assessment rather than in parallel. Thus, it appears like contaminants are removed from consideration before the ARAR comparison. This needs to be corrected. The text and conclusions needs to better reflect the process illustrated in figure 2-5. At the February 16 meeting with DOE on the draft version of these comments, IT Corp presented a draft table for the conclusions section that would largely eliminate the current confusion. We endorse that approach and emphasize that contaminants should have both a human health and ecological column to indicate their IRM candidacy, and within each of those, it should indicate if candidacy was based on risk calculation or ARARs/DOE orders or both.

233. Page 4-3, Section 4.3:
Table 4.2 implies that the EPA Water Quality Criteria for aquatic organisms (and the State of Washington Water Quality Standards) are potential chemical-specific ARARs. Were they applied? Where are they applied (i.e., what is the point of compliance?).

234. Figure 4-1 through 4-4, page 4F-1 through 4F-4.
List the MCL, aquatic chronic criteria or other ARARs/DOE Order thresholds, and add these contour lines (for hexavalent chromium measured as total chromium).

235. Pages 4F-1 through 4F-4, Figures 4-1 through 4-4
The method of construction of these figures is not mentioned. It appears as if they represent the maximum values for each constituent at each well (regardless of sampling round). The method should be stated.

236. Page 4F-1, Figure 4-1
- The 17.2 value at well K-11 does not fit the contours (it is placed between the 25- and 50-contours).

- On what basis is the 25-contour placed between the river and wells K-33, K-32A, and K-18?
- On what basis are the 25- and 50-contours placed to the southeast of the 116-K-2 Trench? The nearest data point in this direction from the trench is well 699-78-62 which had concentrations of 42.5 to 48.9 during the four rounds of sampling.

237. Page 4F-2, Figure 4-2
It appears as if the figure was constructed using the maximum values from the four rounds (except for well K-18 which is shown as "U" and has a maximum of 3.1B in Table 4-1).

238. Page 4F-3, Figure 4-3
It appears as is the figure was constructed using the maximum values from the four rounds (except for wells K-27 and K-18 which are shown as 140,000 and 13,000 but have maximums of 180,000 and 14,000 in Table 4-1).

239. Page 4F-4, Figure 4-4
- It appears as is the figure was constructed using the maximum values from the four rounds (except for wells K-31 and K-32A which are shown as 57 and 440 but have maximums of 59 and 450 in Table 4-1).
- The 23,000J value for K-30 is listed without the J in Table 4-1.
- Wells K-18, K-20, K-21, and K-22 are all shown as "U". However, all of the wells have detected values in Table 4-1 (respective maximums; 19, 630J, 236, 8.6, and 236). Using these maximum values, the contours in Figure 4-1 should be redrawn.
- The use of a zero contour may be misleading. The undetects in Table 4-1 are at levels as high as 370U. Therefore, an undetect does not necessarily equal zero. The zero contour should be a "undetect" contour.
- On what basis was the configuration of the 10,000-contour determined? It links wells K-33 and K-37 by passing between wells K-32A and K-27 which have respective values of 440 and 410.

240. Page 4T-1a, Table 4-1
- Chloroform and TCE are listed as COPCs in Table 2-5, but are not included here as "COPCs Data".
- Sr-90, Tc-99, U-233/234, U-235, and U-238 are listed as COPCs in Table 2-8 but not here.
- Chloride, pH, sulfate, and TDS are listed as COPCs in Table 2-9 but not here.
- Nickel, cadmium, cobalt, manganese, and vanadium are listed as COPCs in Table 2-10 but not here.
- A qualifier of "S" is used (699-73-61, Round 1 split) for lead but is not included in the list of qualifiers at the end of the table.

241. Page 4T-1a, Table 4-1.
This table provides the 100-KR-4 COPC data. Analytical results from well 199-K-19 should also be included in this table.

242. Table 4-1
Should this be labeled: "100-KR-4 Refined Contaminants..." (See figure 2.5) and include analytes such as Sr-90, aluminum, and gross beta? Otherwise it should be labeled "...without consideration of ARARs".

243. Table 4-2
Footnote: Should use 40 CFR Part 131 (December 22, 1992) for priority pollutants. Also, include Strontium-90, gross beta, aluminum and any others that are identified during the reassessment.

244. Page 5-1, 1st sentence
Revise to read: "...was ~~conducted to determine the nature and extent of hazardous/radioactive materials present in the groundwater.~~ performed to provide additional data and characterization needed to support selection, design and implementation of IRMs, if needed. A traditional CERCLA RI is more of a "nature and extent" investigation.

245. Page 5-1, 4th line
"calculated risk values and potential groundwater ARAR to determine COPC" We expect that this will actually be done for the next version of this document. A reminder that exceeding a risk threshold **or** an ARAR is sufficient grounds to proceed on the IRM decision path for that analyte.

246. Page 5-1, 1st paragraph
It needs to be noted that using the medium or high risk occasional-use scenario in the IRM decision path is appropriate to support current uses. The residential scenario will better support a more efficient strategy of doing a single cleanup action. Having both of these risk values available from the start will support more efficient remedial planning.

247. Page 5-1, Section 5.1, 1st paragraph
Suggest revision to: "Radioactive decay ~~is reducing the concentrations of tritium, but~~ has relatively little impact on carbon-14 and Strontium-90 due to their long half-life relative to the 30-year cleanup timetable for Hanford.

248. Page 5-1, Section 5.1, first paragraph.
This paragraph is unclear and needs revising. Data shows that contaminants are and have been entering the Columbia River. Furthermore, clarify how carbon-14 is effected by radioactive decay.

249. Page 5-1, Section 5.1, second paragraph.
This paragraph needs revising. Granted that an IRM is necessary due to contaminants exceeding the ARAR levels, but what is the rational for the remedial actions to be coordinated with the source units?

250. Page 5-1, Section 5.1, 2nd paragraph
This paragraph should be removed. What is an unacceptable risk will be determined in the ROD, not by DOE in this draft LFI document. The ARARs will also be established in the ROD. This document also does not make decisions on the timing of remedial actions relative to the source operable units.

251. Page 5-1, Section 5.1, third paragraph.
Please define what causes slow contaminant migration. It is not clear why this (slow migration) feature adds to the credibility of performing an IRM.

252. Page 5-1, Section 5.2, second bullet.
This is an LFI for 100-KR-4, not a proposed plan for the 100 K area. Furthermore this document does not contain or reference characterization of the downward migration rate of contaminants from source units, so the appropriateness of postponing groundwater cleanup cannot be evaluated. In addition, this document does not indicate that the source units will be remediated within a couple years, an argument that might support justification of delayed action on the groundwater. Recommendation: This bullet should be removed.

253. Page 5-1, Section 5.2, third bullet
Suggest to read as: "until such time that beneficial uses can be supported ~~remediation is completed~~. Note that some beneficial uses may be supported prior to final completion of remedial actions.

254. Page A-3
Need to define: "Result from split sample analysis". It appears that if this result has a greater difference than some threshold, it is rejected. How big that difference is needs to be identified. Also, the QAPjP already specifies that if splits differ by some threshold, the data is marked as "R". Why is a different threshold being introduced at the LFI stage?

255. Page A-3
Need to define: "Bad analysis". What is this? What is the criteria to determine a bad analysis? Where is this in the QAPjP? If there is bad data, why isn't it flagged "bad" in the data validation packages. Why wasn't this bad data noted by anyone until EPA highlighted it?

256. Page AT-1a, Table A-1
- Some statement regarding lack of consistency between rounds would be helpful. Was some minimum difference used (e.g., a factor of 10)? In particular, potassium-40 in well K-13 shows two values (87.2 and 210) which were eliminated because they were "Not consistent between rounds". This does not seem inconsistent. The rejection of these data should be further explained.

257. Table A-1, page 3 of 4

This is identified as "**Unfiltered** Inorganics". Were the rest of the analytes filtered? Note that for our cleanup decisions, unfiltered data is needed.

Unresolved comment previously submitted on the Limited Field Investigation for the 100-HR-3 Groundwater Operable Unit that are applicable to 100-KR-4.

258. Page ES-1, 1st paragraph of the Executive Summary:
This paragraph identifies the specific scenario and associated risk level for human health that is used to determine whether an IRM is necessary. In a similar manner the LFI needs to define under what ecological conditions and risk level an IRM would be necessary.

DON'T SAY IT --- *Write It!*

DATE: February 1, 1994

TO: Dennis Faulk, EPA B5-01
Ted Wooley, Ecology Kennewick

FROM: Eric Goller, RL A5-19
Telephone: 376-7326

cc: Jim Patterson, WHC H6-27 (w/o att.)
Bob Henckel, WHC H6-02 (w/o att.)
Alan Krug, WHC H6-02 (w/o att.)
Jeff Day, COE A5-19 (w/o att.)
Bob Scheck, D&M G1-01 (w/o att.)
Kay Kimmel, D&M G1-01 (w/o att.)

SUBJECT: 100-BC-2 OU LFI VADOSE INVESTIGATION (116-C-2A) VALIDATED DATA

Attached please find a document reporting the validated data summary from the 100-BC-2 OU LFI vadose investigation. The document title and WHC identification number is:

WHC-SD-EN-TI-215 Data Validation Report for the 100-BC-2 Operable Unit Vadose Investigation, 116-C-2A Pluto Crib, rev 0.

Please contact me with any comments or questions regarding this document. After you have had an opportunity to take a look at the subject document, I suggest we get together to address any questions you may have. In addition, comments or questions regarding data quality, validation, and associated issues can be directed to Jeff Day on 372-1876.

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DON'T SAY IT --- *Write It!*

DATE: February 28, 1994

TO: Paul Beaver, EPA B5-01
Ted Wooley, WDOE B5-18

FROM: Glenn Goldberg, DOE

Telephone: 376-9552

CC: Kay Kimmel B1-42

SUBJECT: 116-DR-7 Inkwell Crib Data Validation Report

Gentlemen,

At the Unit Managers Meeting on February 23rd I handed across 4 copies of the 116-DR-7 Inkwell Crib Data Validation Report. The report includes data validation for the Sodium Dichromate Transfer Station and the 105-DR Storage Basin Trench.

If you have any questions, please contact me at 376-9552.

Thanks,

Glenn

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February 23, 1994

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