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Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
740 Stevens Center, Room 1200, Richland, Washington
July 28, 1993

FROM/APPROVAL: _____ Date 8/25/93
Eric D. Goller, 100 Area Unit Manager, RL (A5-19)

APPROVAL: _____ Date 8/25/93
Jack W. Donnelly, 100 Aggregate Area Unit Manager, WA Department of Ecology

APPROVAL: _____ Date 8-25-93
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 Sheet
Attachment #3	-	Agenda
Attachment #4	-	Action Item Status List
Attachment #5	-	Status Package 100 Area Unit Manager's Meeting July 28, 1993
Attachment #6	-	100-NR-1 Surface Rad Survey
Attachment #7	-	100 D Island Radiological Characterization
Attachment #8	-	Tri-Party Agreement Milestone M-30-05
Attachment #9	-	100 Area Treatability Tests Schedule
Attachment #10	-	Laboratory Soil Washing Treatability Tests
Attachment #11	-	100-HR-3 Groundwater Treatability Tests
Attachment #12	-	100-HR-3 Groundwater Treatability Test Memorandum
Attachment #13	-	Request for Laboratory Space and Support
Attachment #14	-	100-HR-3 OU LFI Groundwater Investigation Validated Data Memorandum
Attachment #15	-	Ex Situ Soil Vitrification
Attachment #16	-	100 Area ISV Pilot-Scale Treatability Study for Retrieved Burial Ground Waste
Attachment #17	-	Status of 100-NR-1 and 100-NR-2 OU Work Plans
Attachment #18	-	Field Activity Report for period 07/14/93 to 07/23/93
Attachment #19	-	100 NPL Agreement/Change Control Form #54

Prepared by: Kay Kimmel Date: 8/25/93
Suzanne Clarke, Kay Kimmel, GSSC (A4-35)

Concurrence by: _____ Date: 8/25/93
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
July 28, 1993

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

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

   1AAMS.9 No additional information.

   1AAMS.15 No additional information.

   1AAMS.16 No additional information.

3. **NEW ACTION ITEMS:** No new action items were initiated this month.

4. **100 AREA ACTIVITIES:**

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

   - N Area Hot Spots: Alan Krug discussed completion of the survey to identify surface radiation at 100-NR-1. A "Rad Rover II" with a shielded detection system was utilized to identify hot spots in areas that could not be surveyed with unshielded detectors due to the high background levels (see attachment #6).

   - D Island: Alan Krug discussed results of the survey and removal of extremely small "hot particles" (see attachment #7).

   - Milestone 30-05: Robert E. Peterson presented an update of activities being performed to fulfill the M-30-05 Milestone (see attachment #8).

   - 100-HR-1 Excavation Treatability Study: Joan Woolard presented the status of the excavation test plan; a meeting to resolve comments is scheduled for 9-10 am on Friday, July 30. Comments on the test procedures are anticipated from the Regulators by August 2 (see attachment #9 for schedule).

   - Laboratory Soil Washing Treatability Test Status: Shas Mattigod presented the status of the 100 Area soil washing tests (See attachment #10). He provided a summary of the data for untreated soil and indicated that the results from the treated soil are not yet available.

   - 100-HR-3 Treatability Study: Jim Duncan presented the status of the groundwater treatability tests (see attachment #11). He supplied a memorandum concerning modifications to the precipitation testing program (attachment #12) and a procedure for those modifications (attachment #13). 100-

HR-3 validated data was provided to the Regulators (see attachment #14).

- Ex Situ Vitrification: John Ludowise discussed the on-site and off-site progress in ex-situ soil vitrification (see attachment #15).

- 100 Area ISV Pilot-Scale Treatability Study for Retrieved Burial Ground Waste: Ja-Kael Luey presented an overview of this pilot-scale treatability study (see attachment #16).

- N-Reactor Shutdown: Alan Krug presented minutes and update from the June 29, 1993 meeting with RL and the Regulators (see attachment #17). Some discussion on Action Item 1AAMS.9: Bryan Foley, the new actionee, will look into the action item.

- 100-HR-2 Treatability Study: Ecology is interested in initiating some treatability studies in this operable unit. They will provide a list of objectives within two weeks.

- Attachments: Field Activity Report for the period 07/14/93 through 07/23/93 was provided as attachment #18; 100 NPL Agreement/Change Control Form 54, 100 HR-3 Reduced Sample List was provided as attachment #19.

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
July 28, 1993

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
PAMELA INNIS	EPA	UNIT MANAGER	376-4919
Larry Gadbois	EPA	Unit Manager	376-9884
CHUCK CLINE	ECOLOGY	HYDRO GEO Support	(206) 438-7556
Fred Weekley	Ecology	Unit Mgr	736-3012
Gary Friedman	Ecology	Unit Manager	736-3026
Allan C. Harris	RL	D&D	376-4339
P.D. Mix	WHC	D&D	376-0787
Ben Wyrick	WHC	D&D	376-5066
Kevin Parrett	GSSC	RL Support	
Nancy Lane	WHC	Risk Assessment	376-3975
BOB PETERSON	WHC/GEOSCIENCES	100 AREAS GRDWTR	376-5858
TED KARR	WHC	PROGRAM CONTROL	376-1702
Kevin Kytola	WHC	100-BC-1/2	372-1662
DAVID L. SMITH	WHC	D&D / RARA	3-5729
Eric Goller	RL	100 Area Unit Mgr	6-7826
Bryan Foley	RL	100-NR-1 & NR-2 UNIT MANAGER	376-7087
DICK BIGGERSTAFF	WHC	KR4 & 100 Areas Groundwater	6-5634
Allan D. Krug	WHC	100 Area Sources OUs	6-5634
John Ludowise	WHC	100 Area Treatability studies	376-6470
Brian Drost	USGS	EPA Support	206-593-6510
JOAN WOLFARD	WHC	100 Area Treatability Studies	376-2539
SHAS MATTIGOD	PNL	"	376-4311
JA-KAEL LUEY	PNL	"	376-5740
Tom JONES	PNL	PROGRAM OFFICE	375-2710
KAY KIMMEL	MACTEC (D&M)	RL SUPPORT	376-1985

100 Aggregate Area Unit Manager's Meeting
Official Attendance Record
July 28, 1993

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Suzanne Clarke	Dames & Moore	GSSC to RW	376-8189
Jim Duncan	WHC	100 HR 3	372-0896
Bob Henckel	WHC	100 AREA	376-2091

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Attachment #3
Agenda

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
July 28, 1993

100 Area General Discussions

- **M-30-05** - Robert E. Peterson
- **N Area Hot Spots** - Robert Henckel/Alan Krug
- **D Island** - Robert Henckel/Alan Krug
- **Treatability Studies**
  - **100-HR-1 Excavation Treatability Study** - Jil Frain
  - **Soil Washing Treatability Study** - Jim Field
  - **100-HR-3 Treatability Study** - Jim Duncan

Operable Unit Status - Questions - Naiknimbalkar/Ayres/Krug/Steve Vukelich/Jim Roberts/Kytola

Action Item Status

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Attachment #4

Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
July 28, 1993

Action Item Status List

ITEM NO.	ACTION	STATUS
1AAMS.9	DOE shall send a letter to Ecology, suggested from S. H. Wisness to D. Jansen with a cc. to EPA, explaining what is included in the ER Program for the N Reactor Area and how the multiple programs will be handled organizationally. Action to J. D. Goodenough (2/27/92). Action: E. D. Goller (5/27/92). Action: Bryan Foley (7/28/93).	Open. Related to the N Areas Issues Papers. No answer 7/29/92. No additional information (8/26/92). On General Topics Agenda for October (9/23/92). No new information (July 28, 1993).
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). No additional information (July 28, 1993).
1AAMS.16	DOE should transmit Revision 1 of M-30-01.	Open (7/29/92). In DOE for transmittal (8/26/92). No additional information (July 28, 1993).

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STATUS PACKAGE

100 AREA UNIT MANAGER'S MEETING

JULY 28, 1993

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100 AREA TREATABILITY TEST STATUS
July 1993, Unit Managers Meeting

Soil Washing

100 Area soil washing tests are on schedule, except for the gamma counter being down for repairs from late June to mid July. Analyses of wet sieved samples are in progress. Preliminary attrition scrubbing tests have been completed. Additional attrition tests are in progress. Sequential extraction tests are nearly completed; results will be presented in the July Unit Manager Meeting. The first group of chemical extraction tests have started, and microscopic analyses and x-ray diffraction are in progress. All tests are expected to be completed by the end of September.

100-HR-3 Groundwater Treatability Tests

Chromium and Uranium Reduction/Precipitation and Ion Exchange:

The chromium and uranium reduction/precipitation reactions have resulted in pin flocs which are unsettlable by gravity within 15 to 30 minutes. A proposal was made to DOE to determine whether a polymeric flocculation aid would coagulate the pin floc. These test will be conducted over the next couple weeks instead of conducting kinetic tests originally outlined in the test procedures.

The ion exchange batch testing is complete. The data is currently being evaluated for interaction and interferences of and from the contaminants.

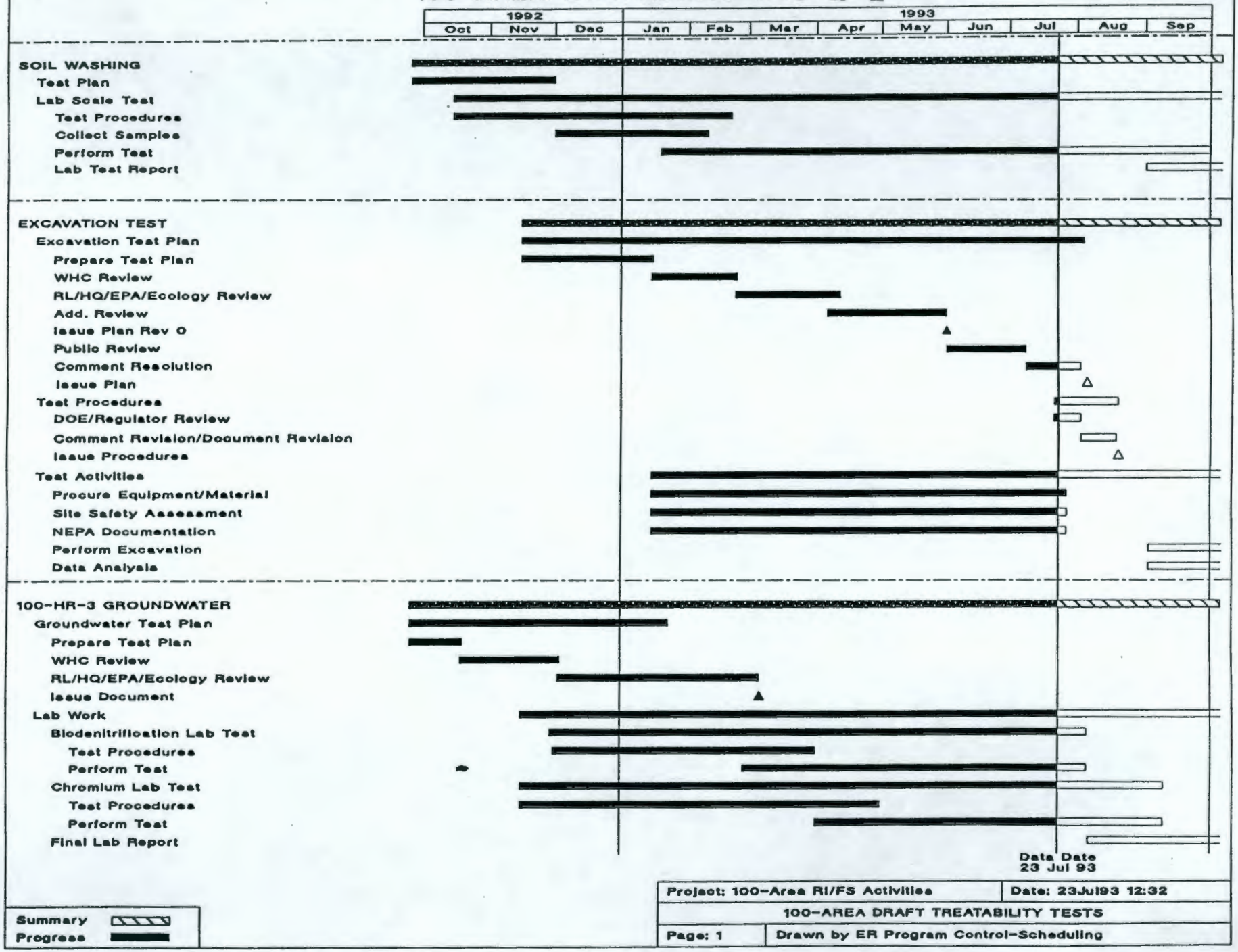
Biodenitrification:

The large volume tests are complete. The data is currently under evaluation. The confirmation testing has begun and should be complete by July 29th.

Excavation

The public comment period for the Excavation Test Plan closed July 7, 1993. Comments are currently being addressed by Ecology. The Test Procedures were submitted to RL and the regulatory agencies for review on July 19, 1993. Comments are required by August 2, 1993.

100-AREA TREATABILITY TESTS



Project: 100-Area RI/FS Activities	Date: 23Jul93 12:32
100-AREA DRAFT TREATABILITY TESTS	
Page: 1	Drawn by ER Program Control-Scheduling

Status of 100-Area Wide Activities
July 1992

River Impact Studies

Columbia River Impact Evaluation Plan. Public Review began July 6, 1993 (Primary Document)

River sediment sampling field work, and sampling and validation completed. Validated Results submitted to regulators. The evaluation report is in preparation (no change).

Cultural Resources Investigations

Historic Sites in 100-HR-3 are being recorded; consultations with State Historic Preservation Office continue.

100-Area Ecological Investigations

Work is continuing on delination of habitats of concern as identified in the Hanford Site Baseline Risk Assesment Methodology Report and the Columbia River Impact Evaluation Plan (No change)

An initial draft of a literature search on the ecotoxicology of contaminants of concern for ecological investigations is being used by ecological risk assessors. The document will be published in fall.

The 100 Areas CERCLA Ecological Investigations report, with analysis of sample results, is being sent for WHC and PNL review the week of July 19.

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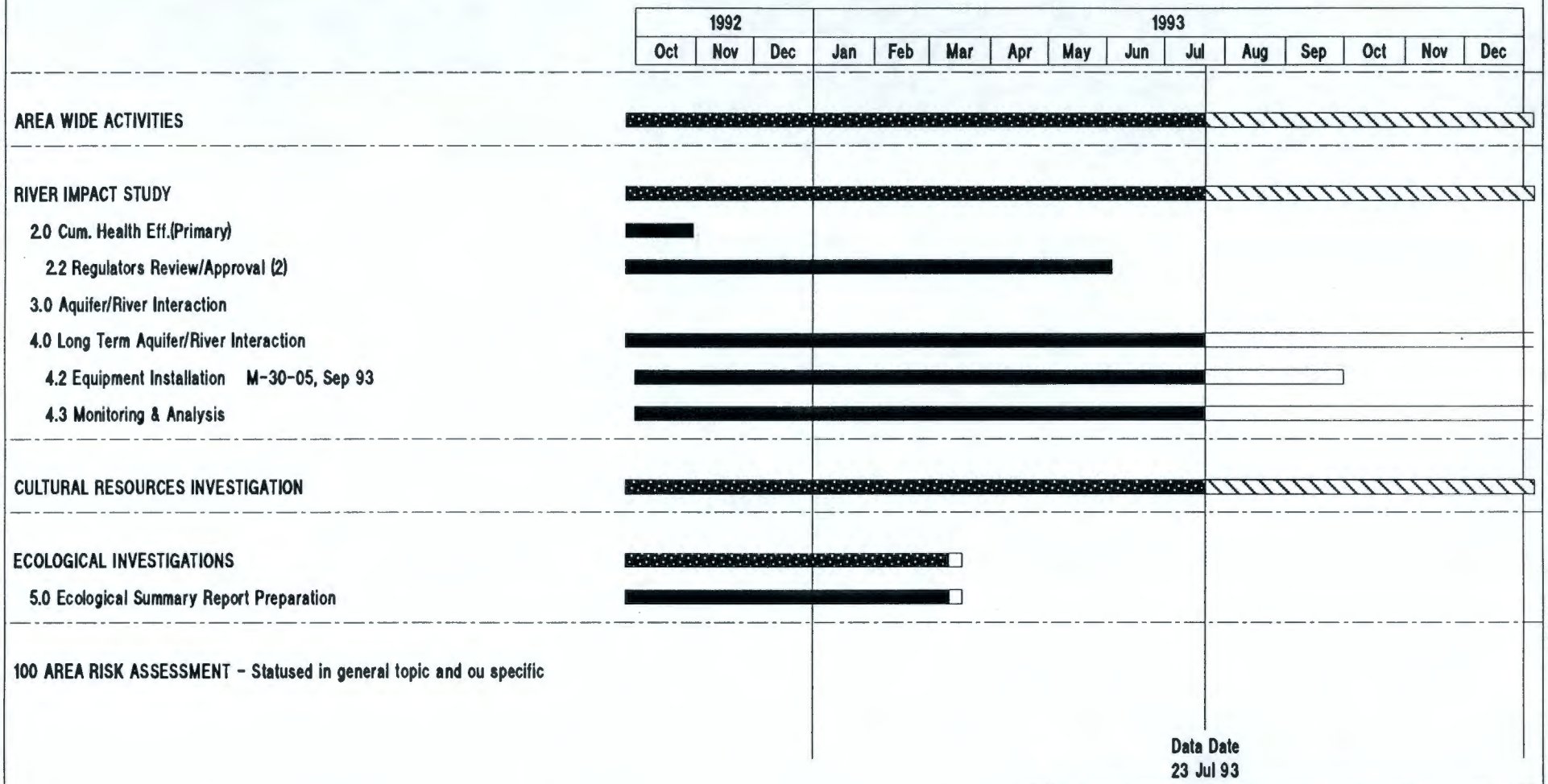
100-AREA WIDE ACTIVITIES



Project: 100-AREA WIDE	DOE-RL	Date: 23Jul93 13:30
100 AREA WIDE ACTIVITIES		
Page: 1	Drawn by ER Program Control-Scheduling	

SUMMARY
PROGRESS

100-BC-1 SOURCE OPERABLE UNIT WORK SUMMARY
July 20, 1993

Task 11 - Qualitative Risk Assessment:

The final document is being prepared for delivery to EPA and Ecology on July 31, 1993.

Task 13 - Limited Field Investigation (LFI) Report:

The final document is being prepared for delivery to EPA and Ecology on July 31, 1993.

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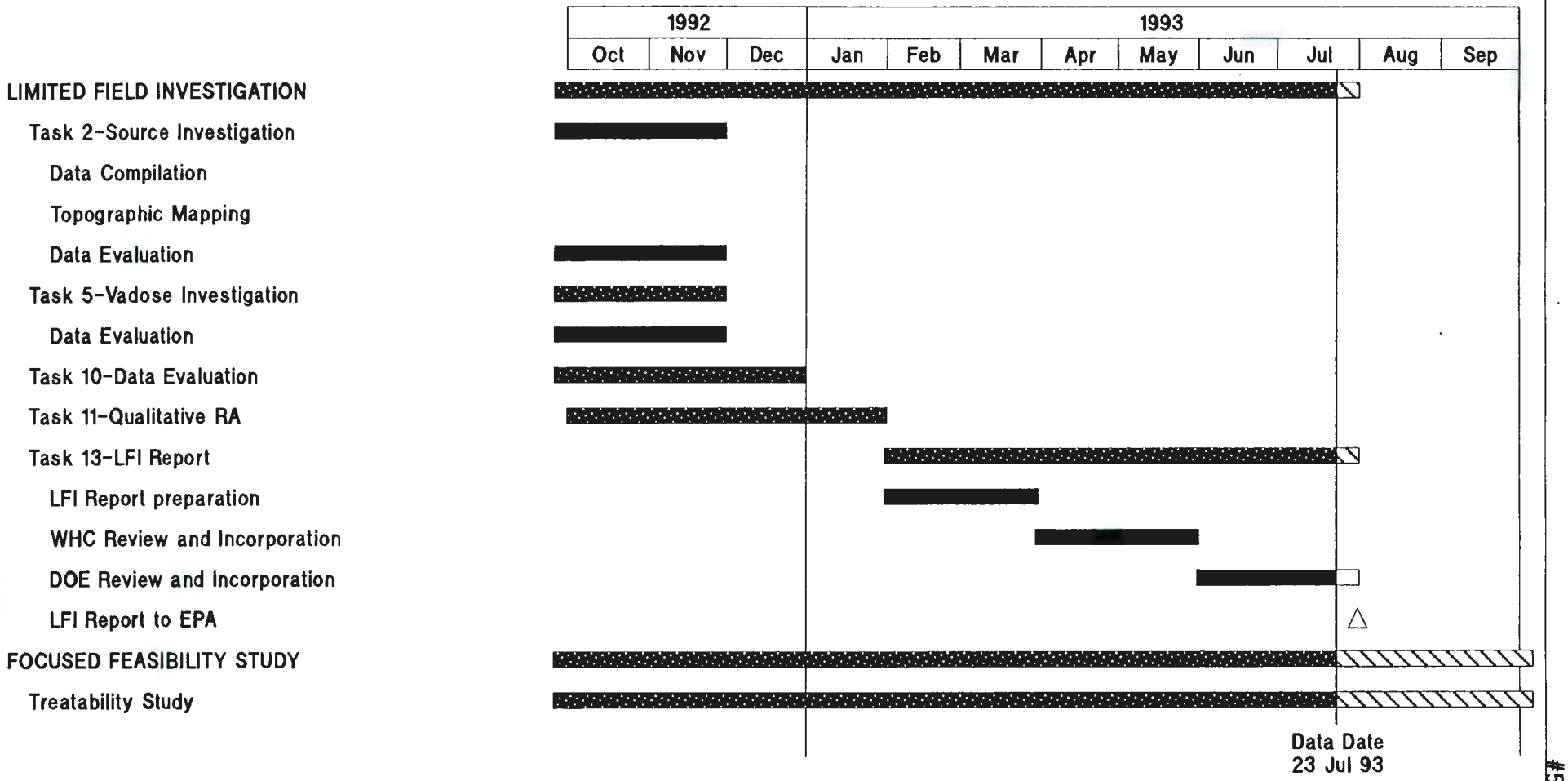
100-BC-1 OPERABLE UNIT



Project: 100-BC-1	DOE-RL 90-07, Rev 0	Date: 23Jul93 15:32
100-BC-1 Operable Unit Work Plan		
Page: 1	Drawn by ER Program Control-Scheduling	

Summary
Progress

100-BC-2 SOURCE OPERABLE UNIT WORK SUMMARY
July 20, 1993

RI/FS Work Plan:

Regulator comments are currently being incorporated.

Field Activites:

Vadose drilling at the 116-C-2A pluto crib is complete. The depth of the borehole is approximately 55 feet; radionuclides were identified by field screening from approximately 23 feet to approximately 40 feet. The maximum field screening result was about 2500 counts per minute on the GM. This maximum was from a silty layer near the bottom of the crib at about 23 feet.

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100-NR-1

100-NR-1 - Surface Radiation Survey: A surface radiation survey to complete the work initiated in FY'92, but canceled due to high background readings in the area, has been completed. A shielded detection system was used and was mounted on the new Rad Rover II. The system functioned well and located contamination which would not have otherwise been found.

Approximately 200 acres were surveyed. The survey found a total of 46 separate areas within the N Area which contain elevated levels of contamination with activity levels ranging from 200 CPM to 15 mR/hr above background. The elevated areas range in size from approximately 1 square foot to 500 square feet. Total affected area is approximately 1800 square feet. One of these areas, approximately 300 square feet, is a suspected orphan burial site. Field gamma spectrometer readings over this area indicate Cs-137 exclusively. Other elevated areas are identified as containing only Co-60. Elevated alpha readings were not detected in any of the areas.

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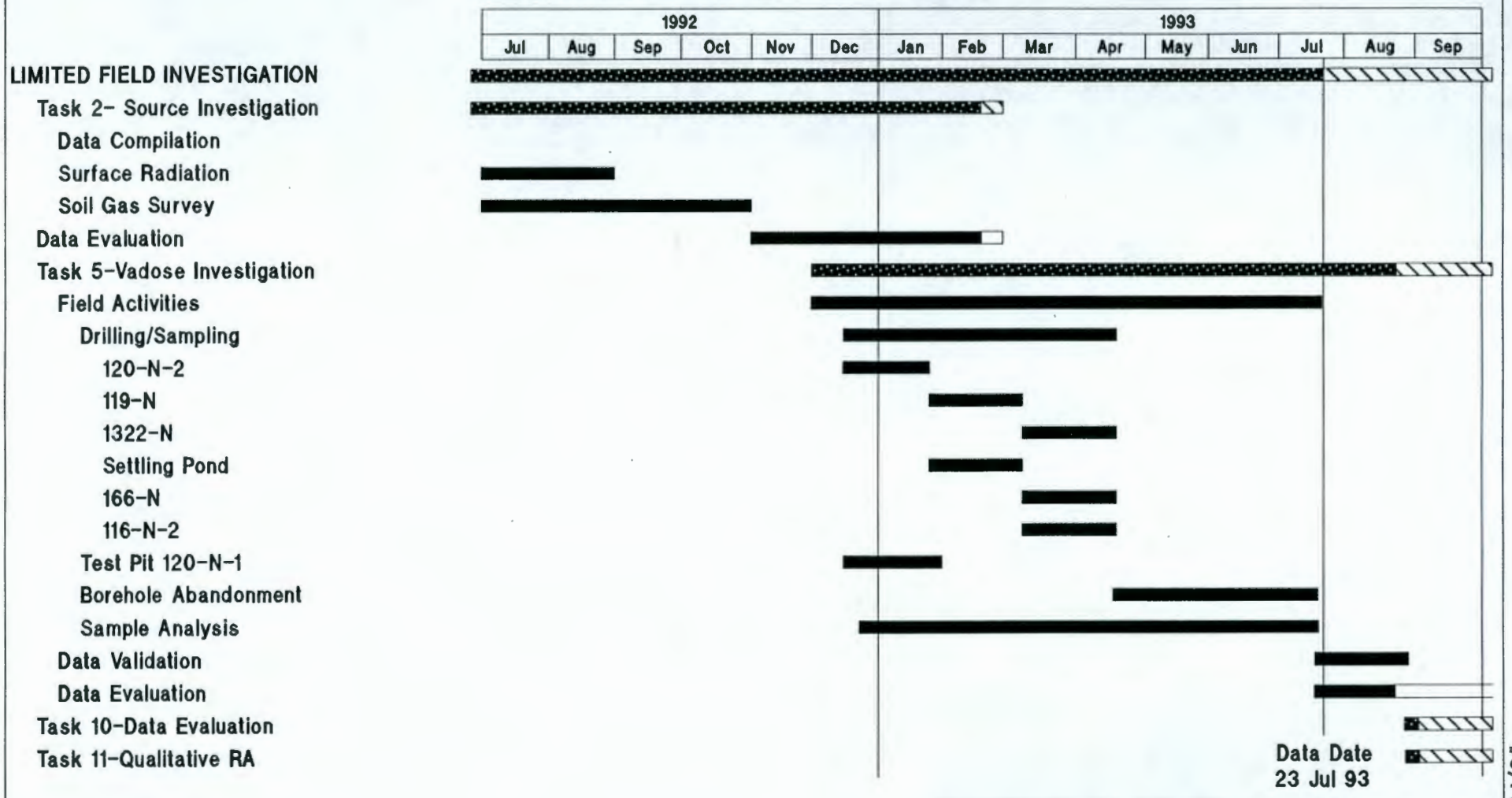
100-NR-1 OPERABLE UNIT



Project: 100-NR-1	DOE-RL	Date: 23Jul93 9:58
100-NR-1 OPERABLE UNIT WORK PLAN		
Page: 1	Drawn by ER Program Control-Scheduling	

Summary
Progress

FY 1993 ACTIVITIES FOR 100-KR-1

JULY 1993 STATUS REPORT
N.M. Naiknimbalkar

o	Four Vadose Boreholes		October/November 1992
	116-K-1	Effluent Crib	Completed
	116-K-2	Effluent Trench	Completed
	116-KE-4A	Retention Basin	Completed
	116-KW-3A	Retention Basin	Completed
o	Four Test Pits		
	116-KE-4B		Completed
	116-KE-4C		Completed
	116-KW-3B		Completed
	116-KW-3C		Completed
o	Sample Analysis		March 93
o	Data Validation		April 93

All vadose borehole and test pit sample validation data has been submitted to DOE-RL for distribution to Regulators.

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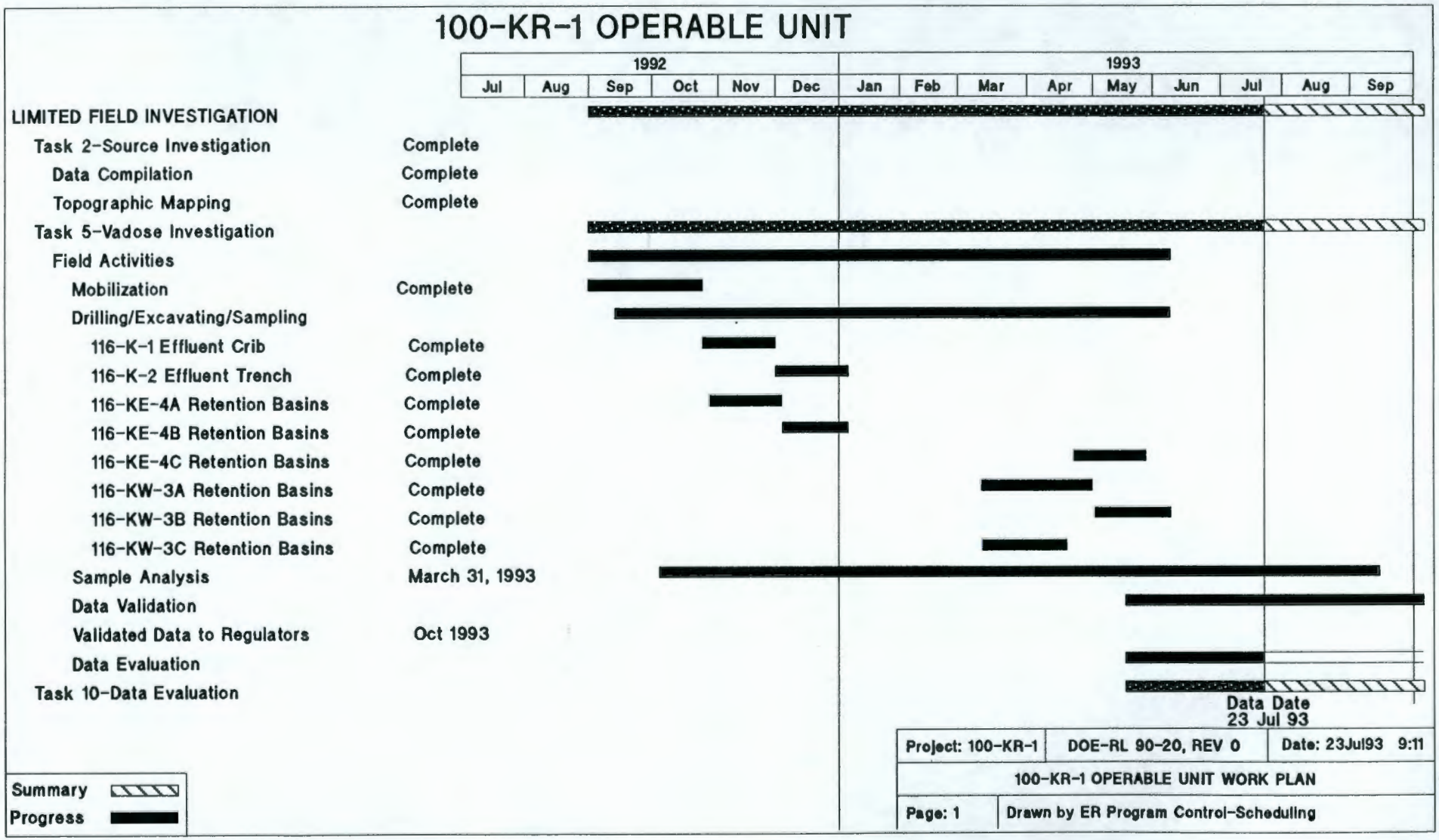
100-KR-1 OPERABLE UNIT



Project: 100-KR-1	DOE-RL 90-20, REV 0	Date: 23Jul93 9:11
100-KR-1 OPERABLE UNIT WORK PLAN		
Page: 1	Drawn by ER Program Control-Scheduling	

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

JUNE 1993 Status Report

100-DR-1 QUALITATIVE RISK ASSESSMENT STATUS

Qualitative Risk Assessment
Document Preparation:

SAIC/Golder has prepared this report.

- o Qualitative Risk Assessment Report is progressing as planned.

LFI Report

IT is preparing this document.

- o LFI Report Due to Regulators: 08-09-93.

100-DR-2 Work Plan

- o Scoping meetings were held with DOE-RL and the Regulators and agreement was reached for work scope to be included in the work plan. The work plan is progressing as planned.

  Description of Work for DR-2 is being prepared and is based on agreements between Regulators, DOE-RL and WHC. One borehole will be drilled through 116-DR-7 Inkwell Crib and one test pit each will be excavated at 116-DR-3 Trench and Sodium Dichromate Transfer Station. CLP analysis will be conducted for borehole samples. SW-846 analysis will be done for test pit samples.

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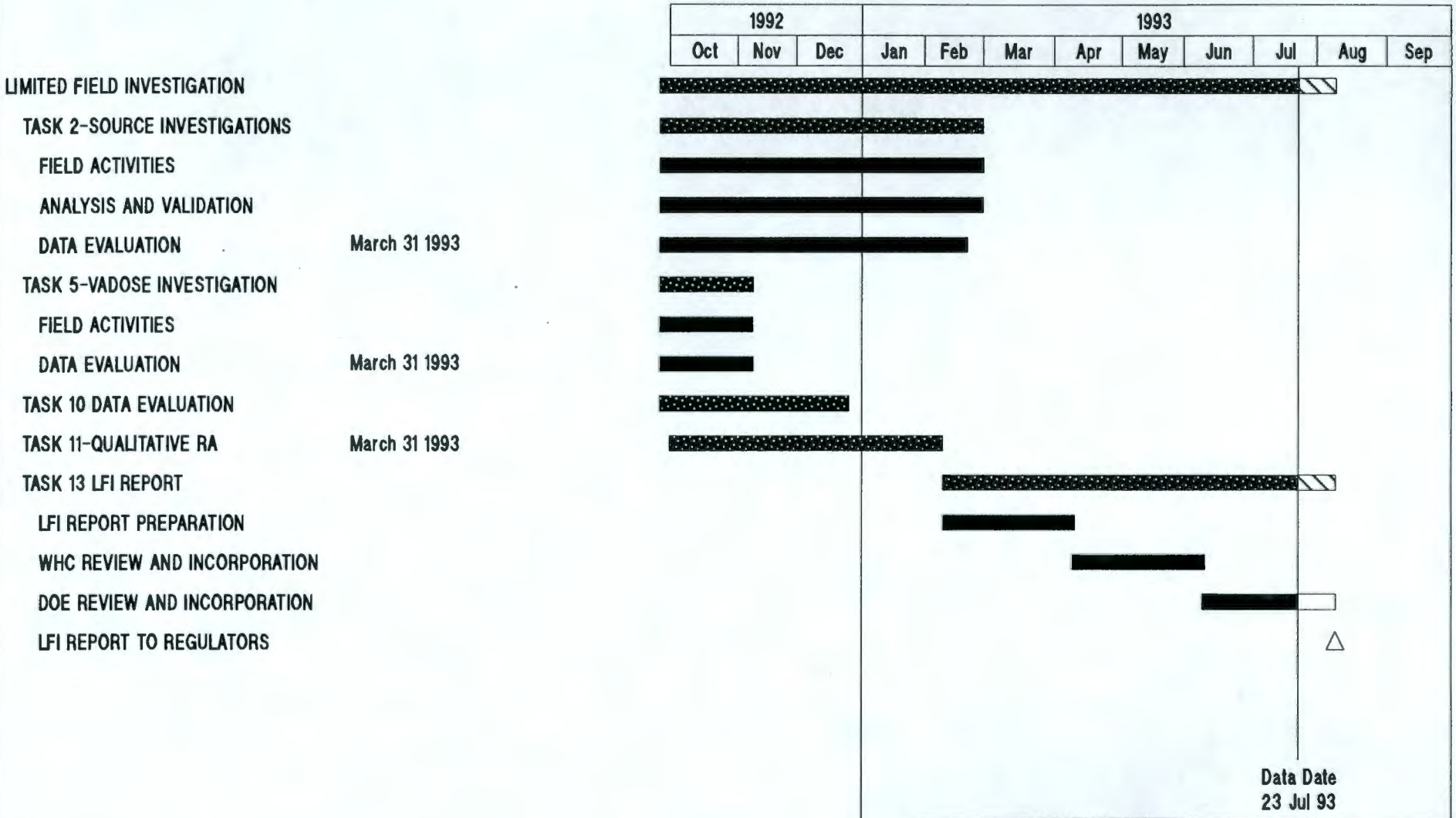
100-DR-1 OPERABLE UNIT



Project: 100-DR-1	DOE-RL 89-09, Rev 0	Date: 23Jul93 11:26
100-DR-1 Operable Unit Work Plan		
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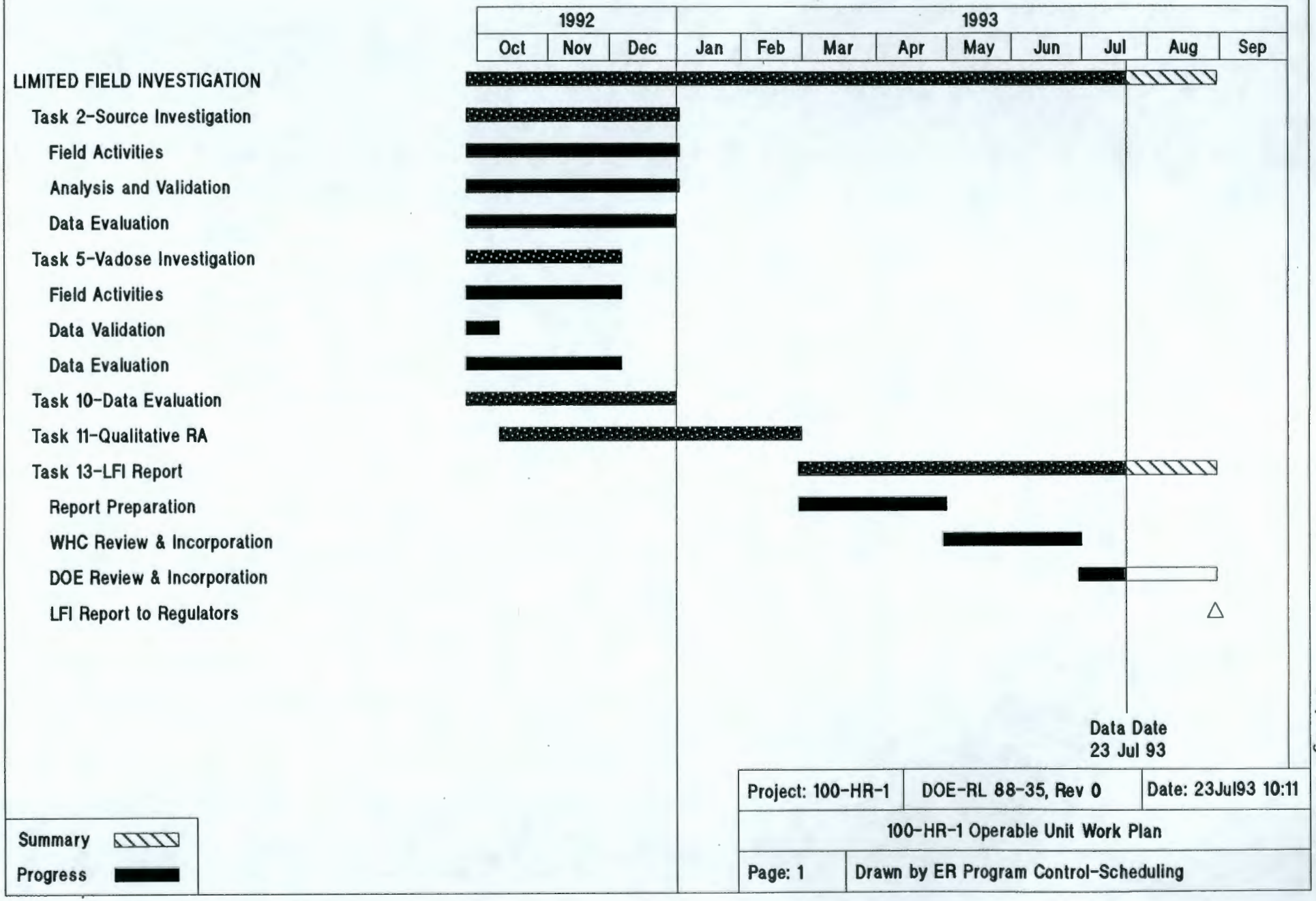
Summary
Progress

100-HR-1 OPERABLE UNIT



Project: 100-HR-1	DOE-RL 88-35, Rev 0	Date: 23Jul93 10:11
100-HR-1 Operable Unit Work Plan		
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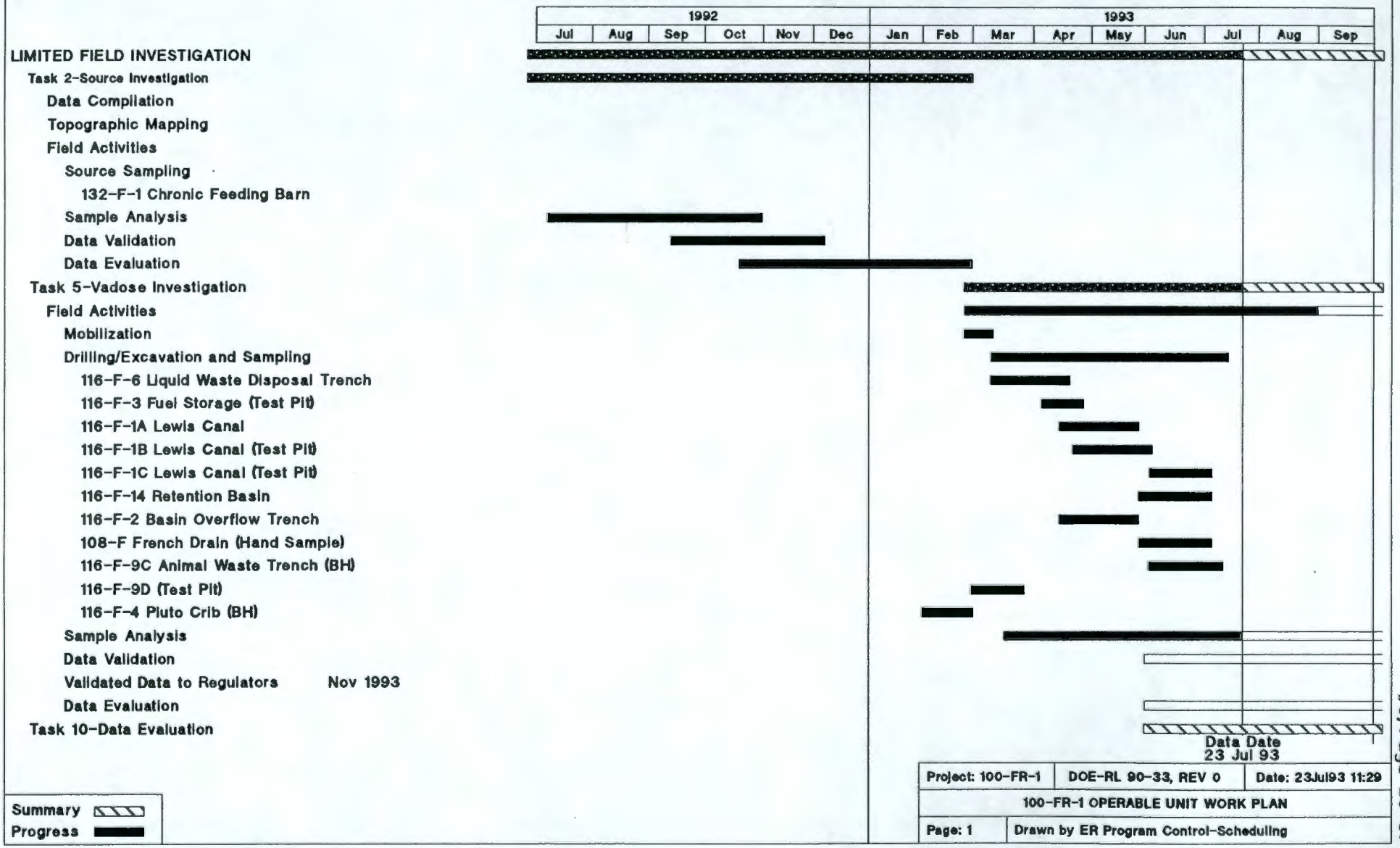
100-FR-1 OPERABLE UNIT



100-BC-5 STATUS

- 1ST QUARTER (JULY), 2ND QUARTER (OCTOBER), 3RD QUARTER (JANUARY), 4TH QUARTER (APRIL) 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
- LFI AND QRA REPORT ACTIVITIES ON SCHEDULE

100-FR-3 STATUS

- ALL FY92 DRILLING ACTIVITIES COMPLETE (DECEMBER)
- 1ST QUARTER (DECEMBER), 2ND QUARTER (APRIL) GROUNDWATER SAMPLING COMPLETE
- 3RD QUARTER GW SAMPLING IN PROGRESS
- SAMPLE VALIDATION REPORT FOR DRILLING SAMPLE DATA SUBMITTED MARCH 12, 1993
- SAMPLE VALIDATION REPORT FOR 1ST QUARTER GW SUBMITTED JUNE 14, 1993

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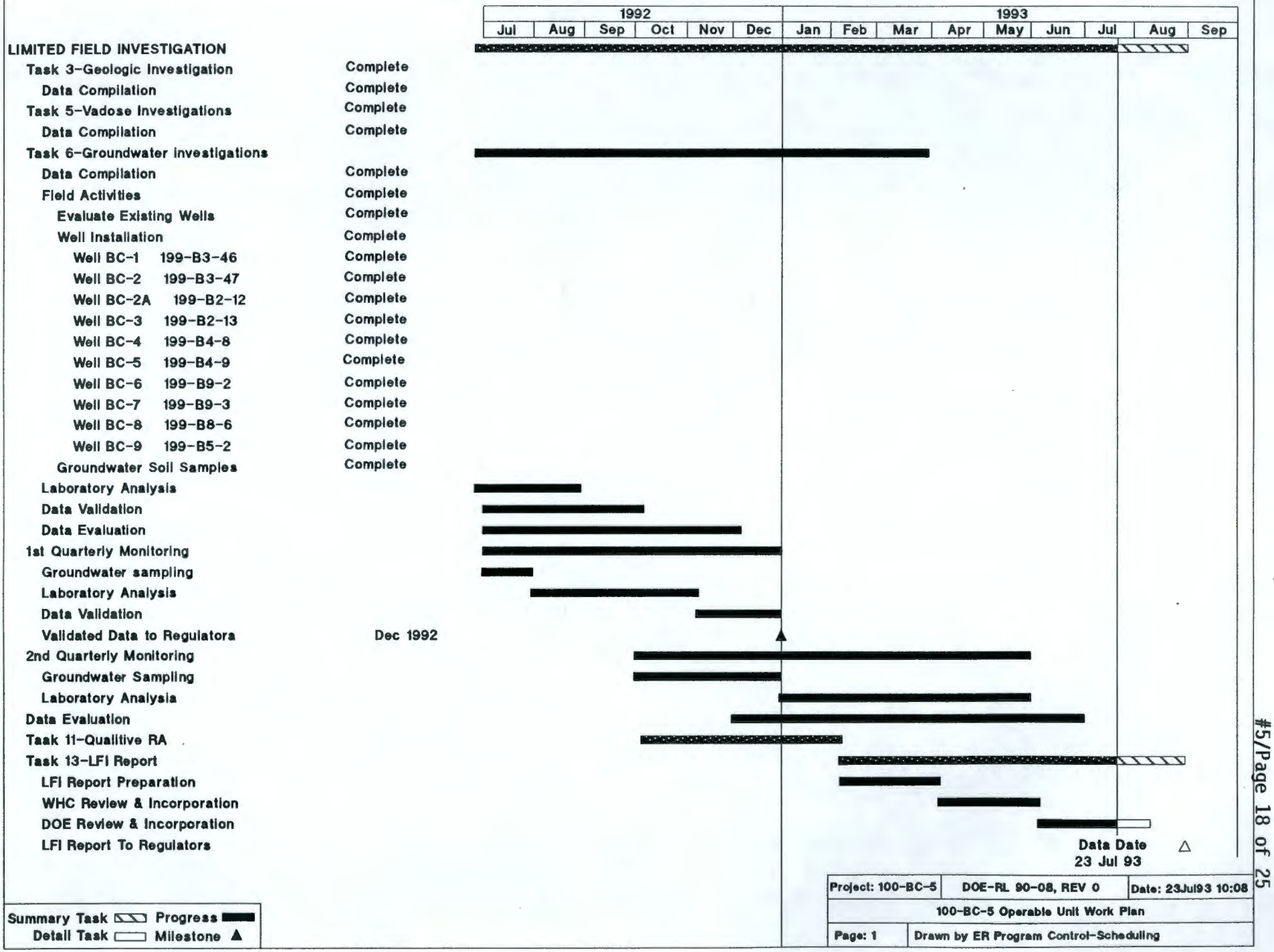
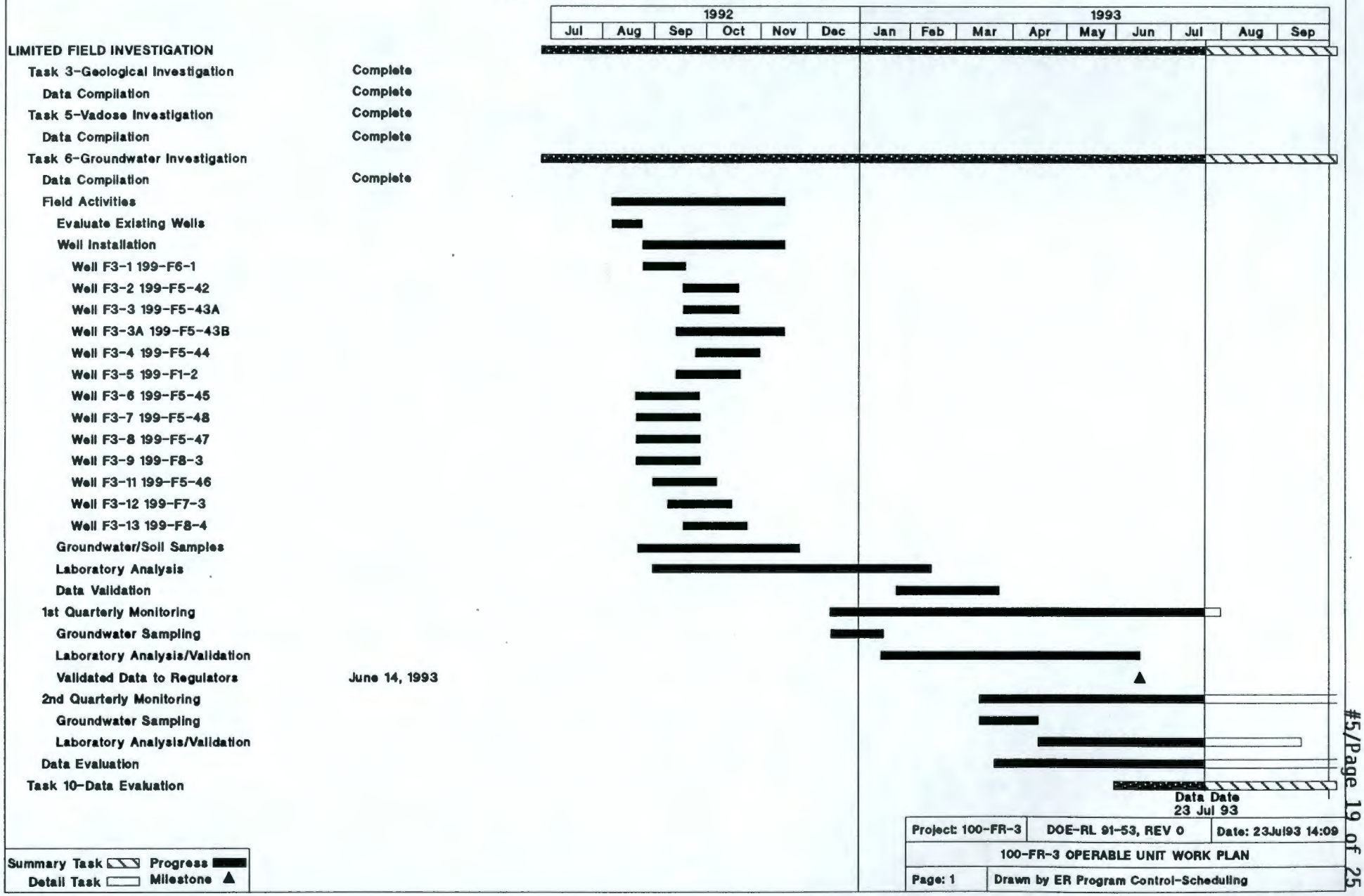
100-BC-5 OPERABLE UNIT



100-FR-3 OPERABLE UNIT



100-KR-4 STATUS

- 1ST QUARTER (SEPTEMBER), 2ND QUARTER (DECEMBER), 3RD QUARTER (MARCH), 4TH QUARTER (JULY) GROUNDWATER SAMPLING COMPLETE. SAMPLING WILL BE ON A SEMI-ANNUAL BASIS STARTING IN DECEMBER, 1993.
- SAMPLE VALIDATION REPORTS FOR DRILLING SAMPLE DATA AND 1ST QUARTER GW SUBMITTED MARCH 12, 1993
- SAMPLE VALIDATION REPORT FOR 2ND QUARTER GW SUBMITTED JULY, 1993.
- QUALITATIVE RISK ASSESSMENT IN PROGRESS

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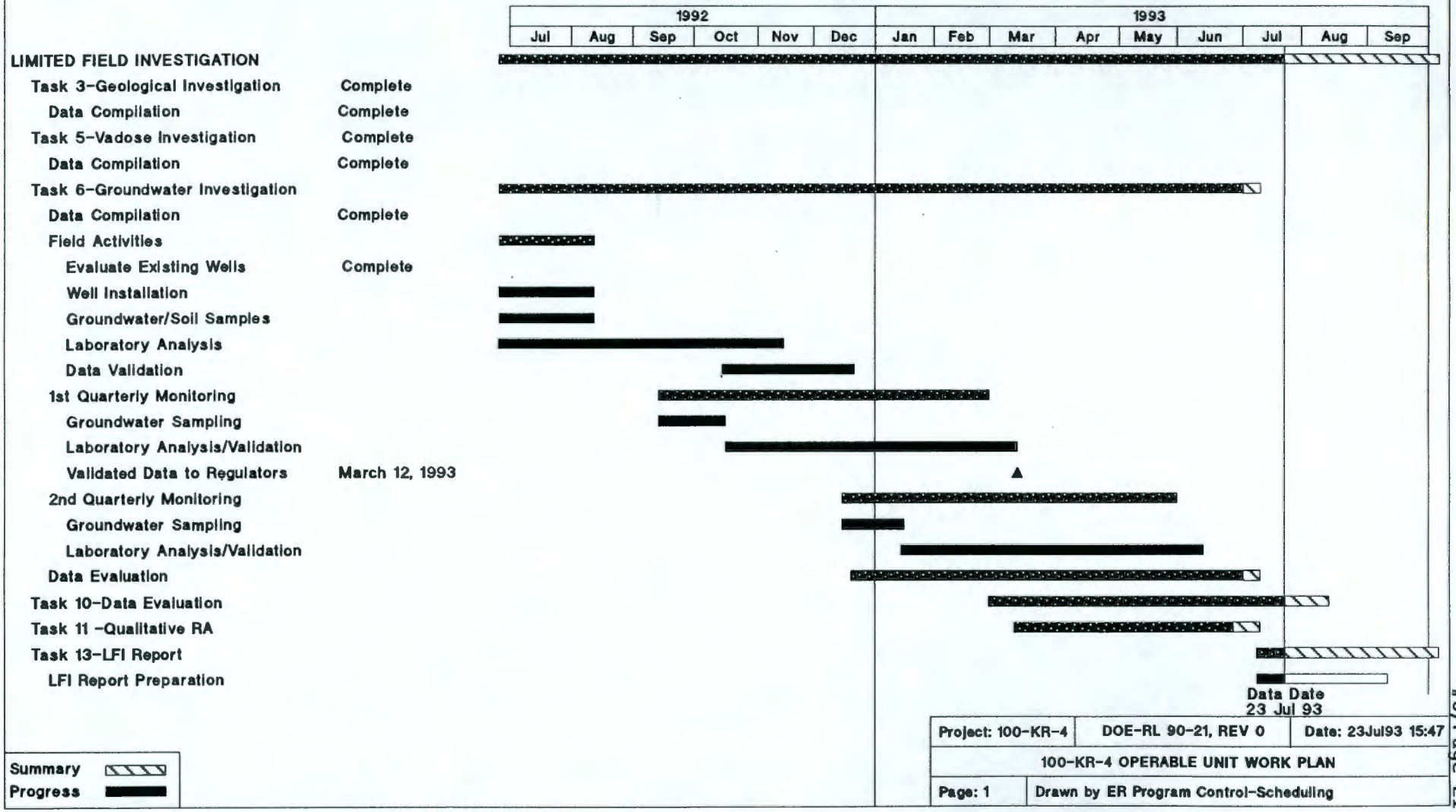
100-KR-4 OPERABLE UNIT



100 NR-2 GROUNDWATER OPERABLE UNIT
WORK SUMMARY 7/19/93

WORK PLAN

Progress has resumed on completing the 100 NR-2 Work Plan.

TASK 6 - GROUNDWATER INVESTIGATION

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

Data Validation - The soil data has been validated.

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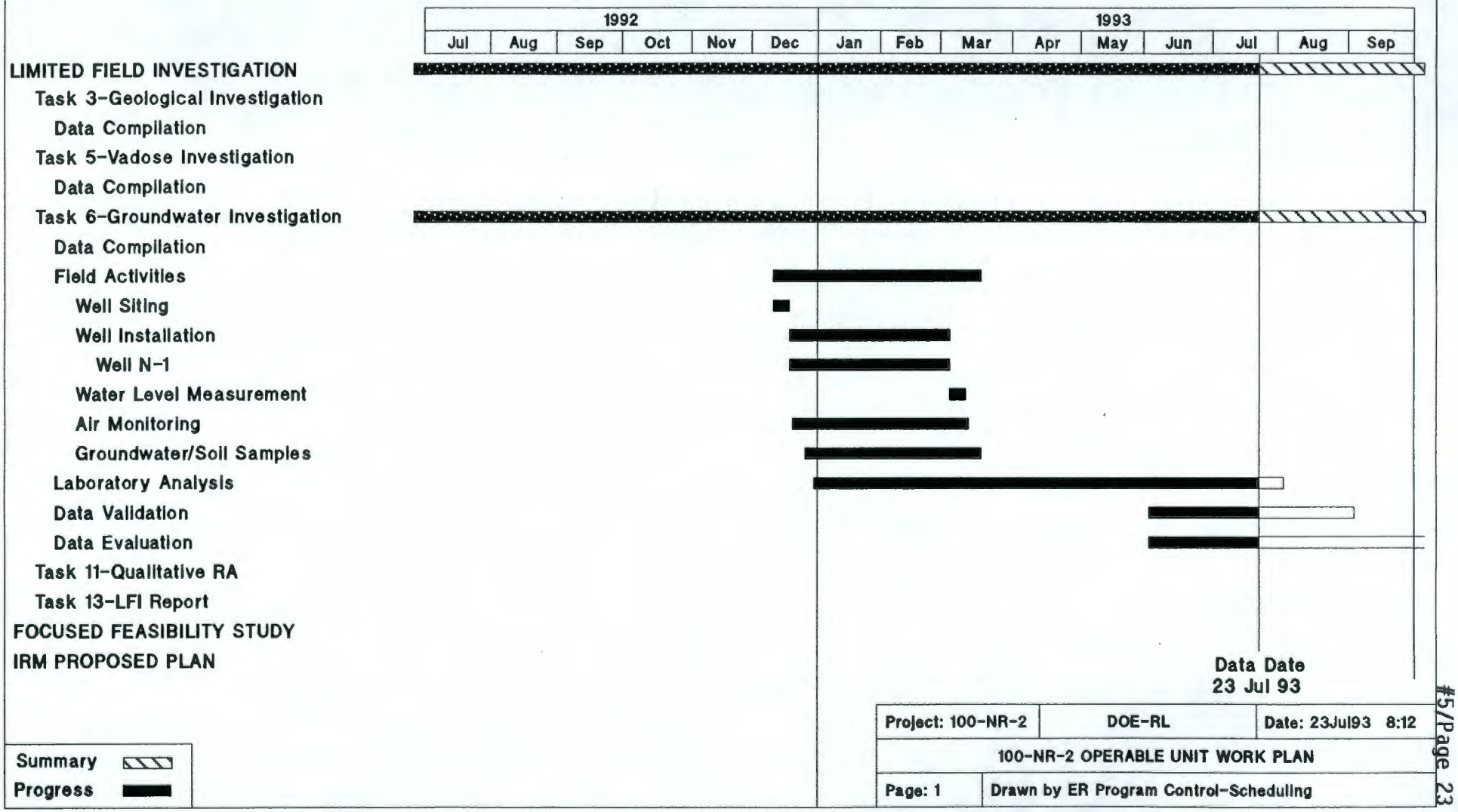
100-NR-2 OPERABLE UNIT



Project: 100-NR-2	DOE-RL	Date: 23Jul93 8:12
100-NR-2 OPERABLE UNIT WORK PLAN		
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100 HR-3 GROUNDWATER OPERABLE UNIT
WORK SUMMARY 7/19/93

TASK 6 - GROUNDWATER INVESTIGATION

Quarterly Monitoring - Four rounds of groundwater samples have been taken. The fifth round is scheduled for August 1993 and will sample for a reduced analyte list.

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

LFI Report - The LFI Report is in progress and will be submitted to DOE in August and to the regulatory agencies in October.

QRA Report - The QRA Report is in progress and will be submitted to DOE in August and to the regulatory agencies in October.

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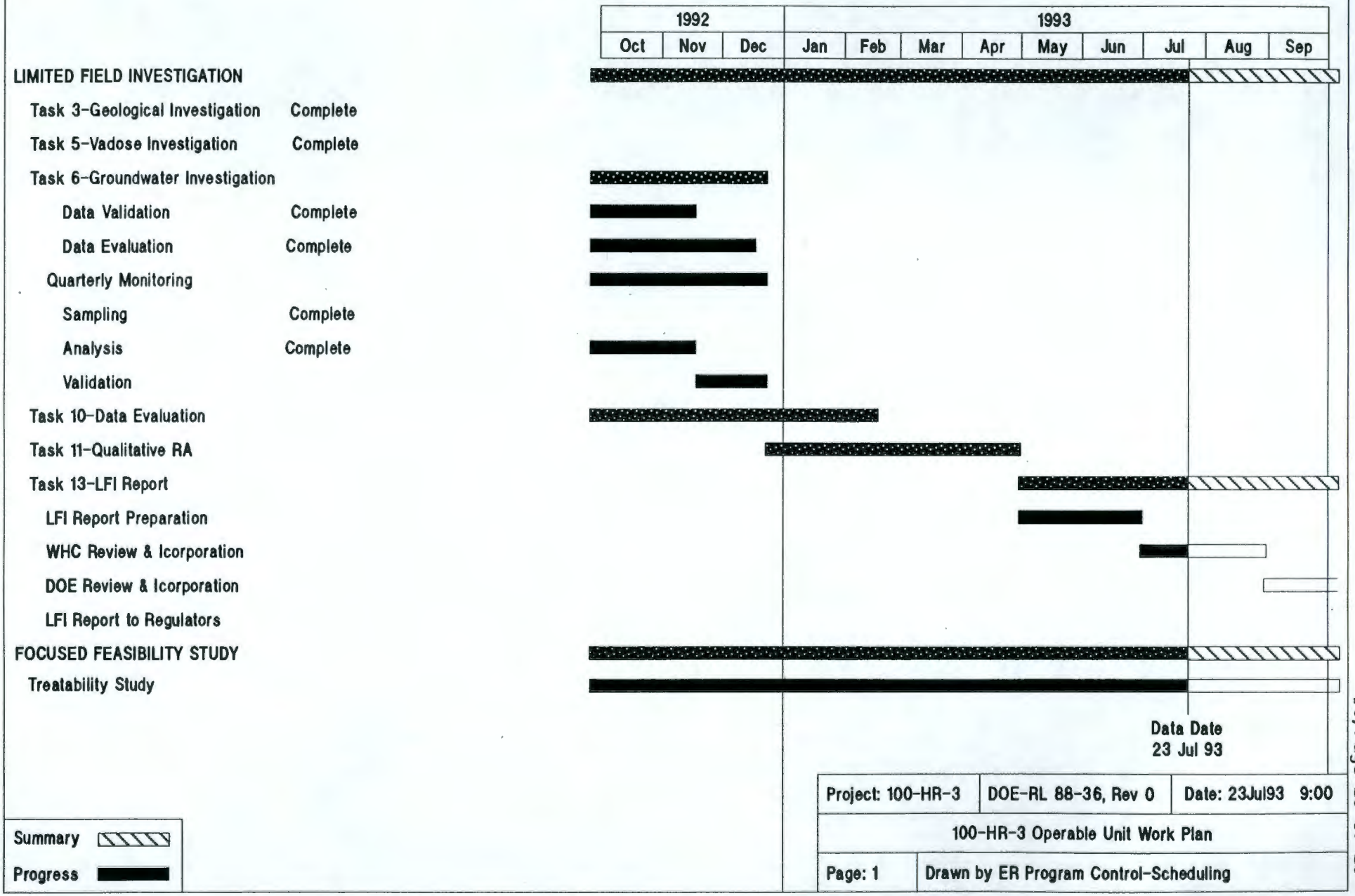
100-HR-3 OPERABLE UNIT



Project: 100-HR-3	DOE-RL 88-36, Rev 0	Date: 23Jul93 9:00
100-HR-3 Operable Unit Work Plan		
Page: 1	Drawn by ER Program Control-Scheduling	

100-NR-1 Surface Rad Survey

A surface radiation survey to complete the work initiated in FY'92, but canceled due to high background readings in the area has been completed. A shielded detection system was used and was mounted on the new Rad Rover II. The system functioned well and located contamination which would not have otherwise been found.

Approximately 200 acres were surveyed. The survey found a total of 46 separate areas within the N Area which contain elevated levels of contamination with activity levels ranging from 200 CPM to 15 mR/hr above background. The elevated areas range in size from approximately 1 square foot to 500 square feet. Total affected area is approximately 1800 square feet. One of these areas, approximately 300 square feet, is a suspected orphan burial site. Field gamma spectrometer readings over this area indicate Cs-137 exclusively. Other elevated areas are identified as containing only Co-60. Elevated alpha readings were not detected in any of the areas.

Planned Action

1. For all but the orphan site, D&D will remove contamination, contain it and transport to the appropriate low-level burial ground. After removal, HPTs will survey sight to verify status. Estimated completion date is September 30, 1993.

2. The orphan site will be sampled by D&D to determine if the colored surface material is the source of contamination. The site will be fenced and posted as Radiologically Controlled. The estimated completion date is September 30, 1993.

3. The orphan site will be evaluated and added to WIDs and the 100-NR-1 Operable Unit as appropriate. Estimated completion date September 30, 1993.

Comparison of USRADS Survey Methodology Vs. MSCM-II

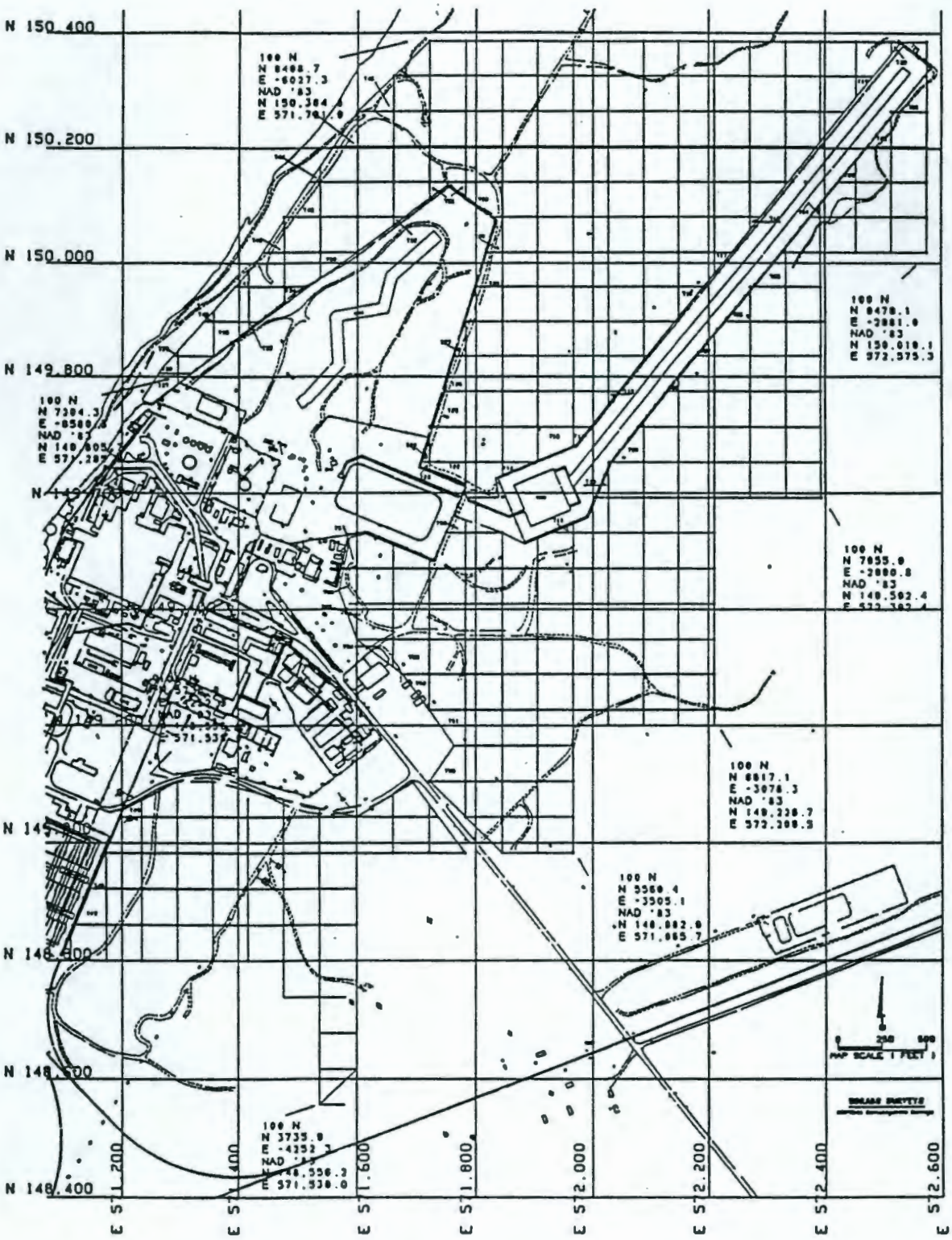
The previous survey was accomplished using the USRADS system interfaced to a Ludlum count rate meter outfitted with an unshielded NaI probe for gamma contamination detection and using a Ludlum uR meter for dose rate determination. Due to elevated radiation levels in the proximity of the two deactivated 100-N cribs and the "golf ball", it was not possible to survey near these areas and achieve any sort of statistically reliable results.

The MSCM-II is outfitted with 3 pairs of plastic scintillator detectors. Each pair consists of a bottom shielded radiation background detector and a downward looking contamination detector. The counting system controller software ratios the radiation background with the count detector level and should allow radiation/contamination surveying in areas with elevated background, albeit with a higher minimum level of detectable activity.

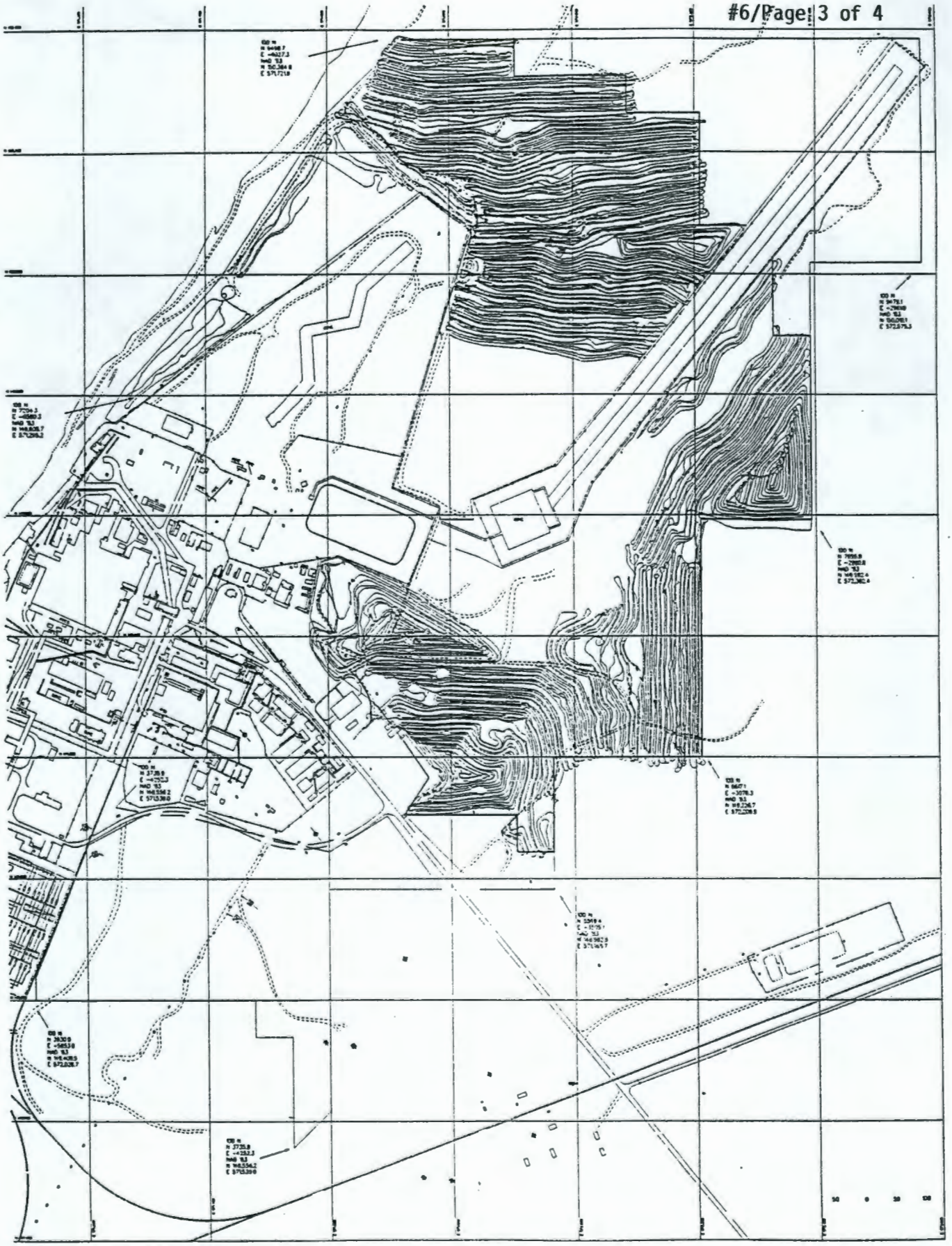
Another difference between the two systems, the USRADS provides positioning data using ultrasonics and the difference between the speed of sound and the speed of radio (speed of light). The MSCM-II utilizes the Global Positioning Satellite System and is differentially corrected for the skewing of positioning signal by the military.

9 3 1 3 0 2 6 0 0 4 5

Figure 1. 100-NR-1 Surface Radiation Survey.



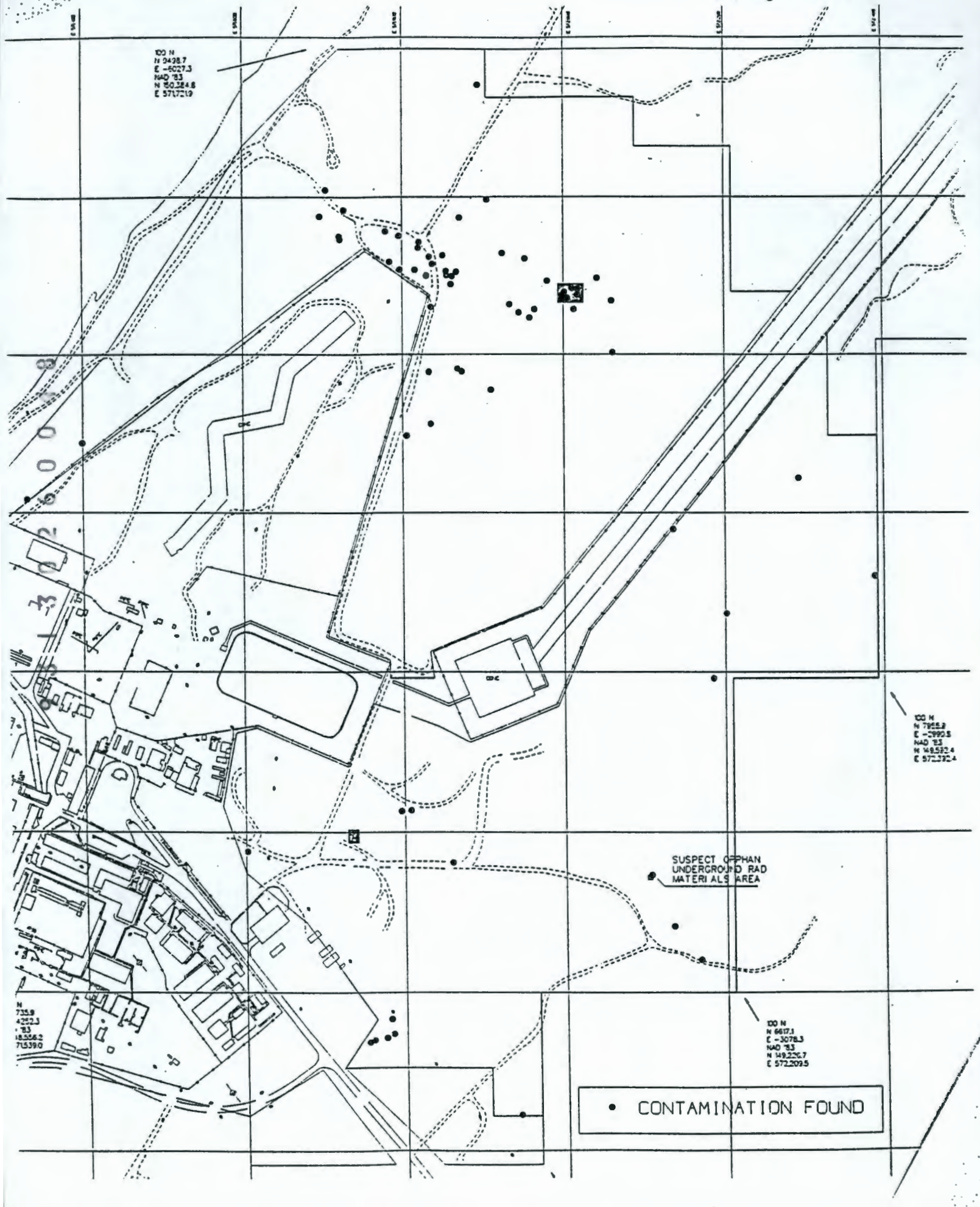
100-NR-1 OPERABLE UNIT 100N AREA



MSCM-II SURVEYS

ERHP/Site Investigative Surveys

9 3 1 3 0 2 6 0 0 4 7


100 N
N 9498.7
E -6027.3
NAD '83
N 150,384.8
E 571,721.9
100 N
N 7955.9
E -2990.5
NAD '83
N 149,592.4
E 572,392.4
SUSPECT ORPHAN
UNDERGROUND RAD
MATERIALS AREA
100 N
N 6617.1
E -3078.3
NAD '83
N 149,226.7
E 572,209.5
CONTAMINATION FOUND

100 D Island Radiological Characterization

A radiological survey over a partial area on the upstream end of the 100-D Island, hanford Site, Richland, Washington was conducted from April 2 through April 28, 1993. The survey methodology was based on utilization of the Ultrasonic Ranging and Data System (USRADS) for automated recording of the gross gamma radiation levels at or near six inches and at three feet from the surface soil. The surveys were conducted using both a digital count rate meter with a sodium iodide detector reporting in counts per minute and a dose rate meter reporting micro Roentgen per hour. The count rate meter was set for gross counting, i. e., window "out'. The window setting allows detection of low, intermediate and high energy photons.

Seventeen individual survey set ups were required to survey approximately 12.5 acres. Within this area a total of 67,306 data points were collected. Each of these data points represents two gross gamma radiation readings, counts per minute with a NaI detector at six inches and a dose rate with a micro-R meter at three feet, along with the coordinates of the reading.

Statistically elevated radiation/contamination readings were observed in each and every grid block surveyed. With a few exceptions, every area which was determined to be gamma elevated was sampled and the sampling removed the entire contamination present. In these locations extremely small "hot particles" were removed from the silt layer beneath the river rock. It should be noted that due to the size, location, and field readings observed from most of these particles that they would be difficult to locate with a standard GM/HP211 "walking stick" survey. No alpha contamination was encounter during the entire 100-D Island USRADS survey.

9 3 1 3 0 2 6 0 0 4 9

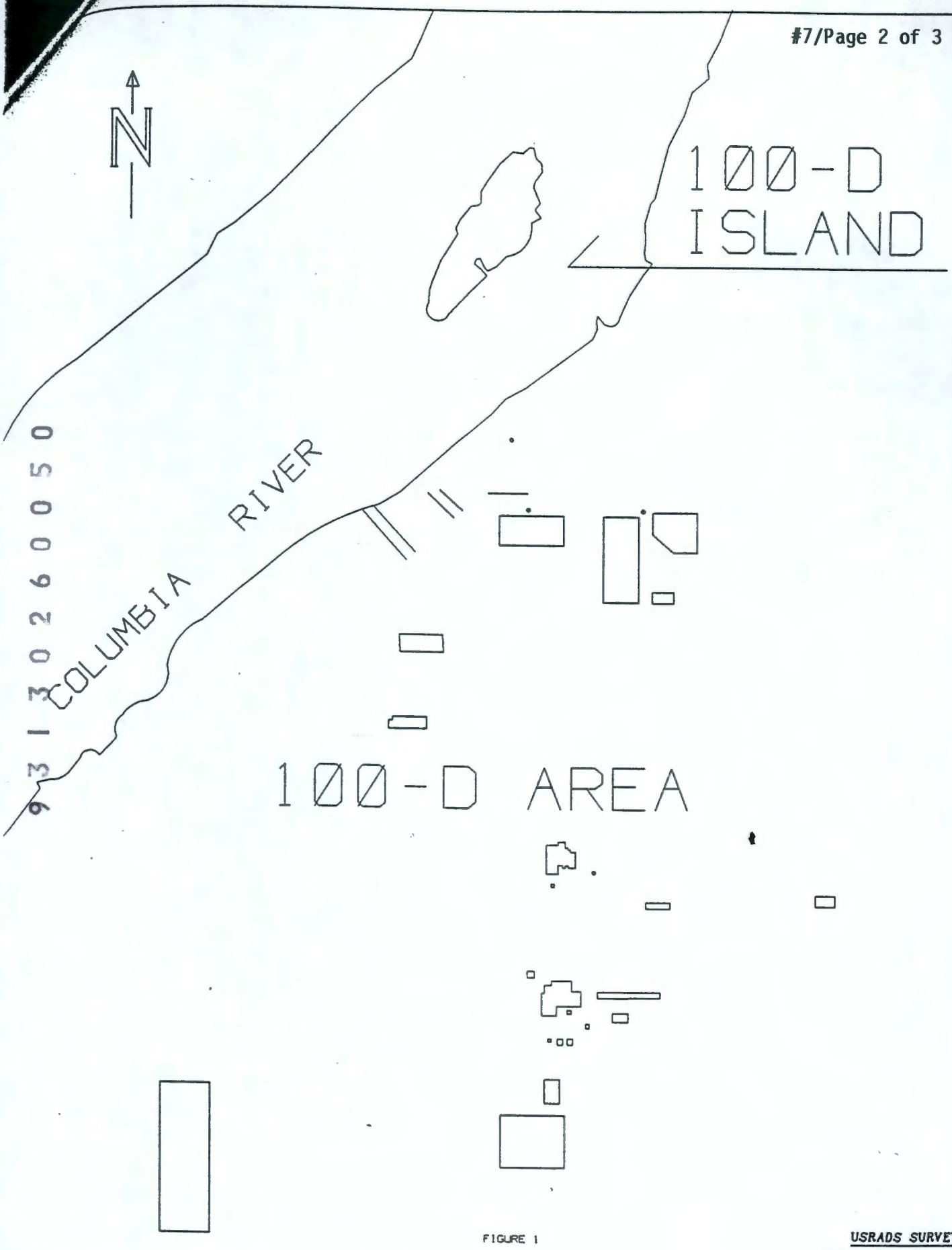


FIGURE 1

USRADS SURVEYS
ERMP/Site Investigative Surveys

9 3 1 3 0 2 6 0 0 5 0

D-ISLE USRADS SURVEY

AREAS WITH ELEVATED READINGS

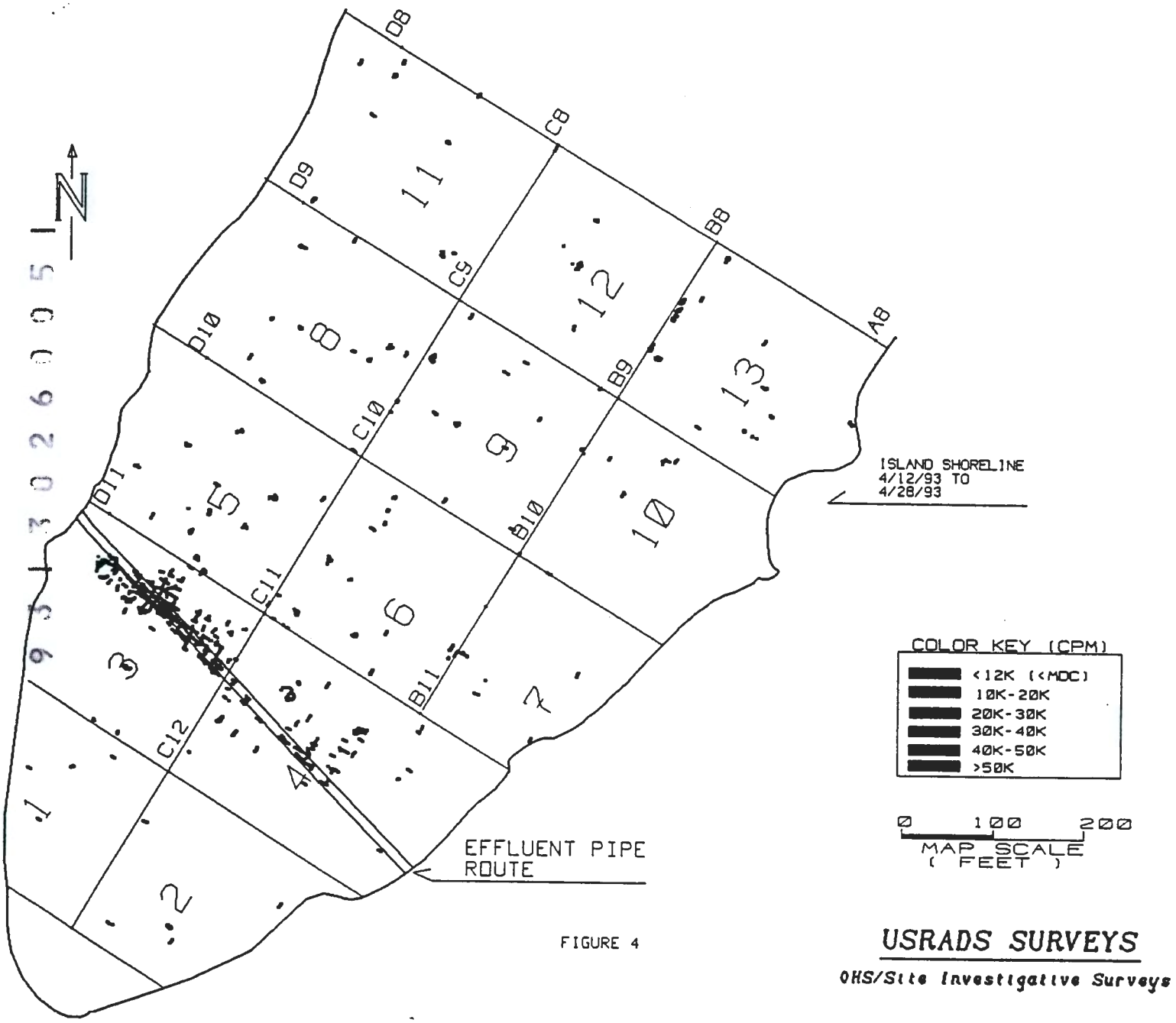


FIGURE 4

USRADS SURVEYS

OHS/Site Investigative Surveys

TRI-PARTY AGREEMENT MILESTONE M-30-05 . . .

" Install equipment and initiate monitoring activities to perform long-term evaluation of river/aquifer interaction . . . " (9/93)

R. E. Peterson, 376-5858
Westinghouse, Geosciences

9 3 1 3 0 2 6 0 0 5 2

- Summary of Recent Activities
- Core Network of Water Level Recorders
- Initial Results of Conductivity Monitoring
- Status of Milestone Completion

STATUS OF M-30-05 ACTIVITIES . . .

100 NPL Agreement: M-30-05 Obligations

- Plan attached to Agreement Form has been revised in response to comments from Ecology and EPA

Field Equipment Installations

- A core network of automated water level recording equipment is now installed and operating in each reactor area (List attached)

9 3 1 3 0 2 6 0 0 5 3

Automated Water Level Recorders (M-30-05)

Status as of 16 July 1993

REACTOR AREA: Phase I / Phase II	Station No.	Approximate Start Date	On Line ?	Approximate End Date	Comments
100-B AREA:					
River	114	03/11/92	Yes		
B3-1	31	09/27/91	No	05/93	Moved to B3-47
B4-1	41	09/23/91	Yes		
B4-4	44	09/27/91	No	05/93	Moved to B5-2
B2-12	191	05/27/93	Yes		
B2-13	143	05/29/93	Yes		
B3-46	192	05/28/93	Yes		
B3-47	191	05/28/93	Yes		
B5-2	141	05/31/93	Yes		
100-K AREA:					
K-18	183	05/21/93	Yes		
K-30	180	05/21/93	Yes		
K-31	181	05/21/93	Yes		
K-32A	182	05/21/93	Yes		
K-32B	182	05/21/93	Yes		
K-37	184	05/27/93	Yes		
100-N AREA:					
River			No		Planned FY93
100-D AREA:					
D5-13	171	05/21/93	Yes		
D5-15	170	05/19/93	Yes		
D5-20	172	05/19/93	Yes		
D8-54A	173	05/19/93	Yes		
D8-54B	173	05/19/93	Yes		
100-H AREA:					
River	125	12/05/91	Yes		Added conductivity
H3-2A	138	03/09/93	Yes		
H3-2C	138	11/10/92	Yes		
H4-7	124	09/16/91	Yes		
H4-9	123	09/26/91	Yes		
H4-10	160	06/14/93	Yes		
H4-11	137	05/06/93	Yes		Added conductivity
H4-12A	122	09/16/91	Yes		
H4-12C	122	02/11/93	Yes		
H6-1	161	05/28/93	Yes		
S153-1	139	06/16/93	Yes		Temper/Cond only

9 3 1 3 0 2 6 0 0 5 4

Automated Water Level Recorders (M-30-05)

Status as of 16 July 1993

REACTOR AREA: Phase I Phase II	Station No.	Approximate Start Date	On Line ?	Approximate End Date	Comments
100-F AREA:					
River	140	11/19/92	Yes		
F1-2	132	06/04/93	Yes		
F5-1	51	09/12/91	No	06/93	Moved to F5-43B
F5-4	54	09/12/91	No	06/93	Removed
F5-6	56	09/12/91	No	06/93	Moved to F5-44
F5-43A	151	06/04/93	Yes		
F5-43B	151	06/04/93	Yes		
F5-44	144	06/04/93	Yes		
F5-46	154	05/20/93	Yes		
F6-1	152	06/04/93	Yes		

9 3 1 3 0 2 6 0 0 5 5

Automated Water Level Recorders (300-FF-5)

Status as of 16 July 1993

AREA: Phase I Continuing	Station No.	Approximate Start Date	On Line ?	Approximate End Date	Comments
300 AREA:					
SWS-1	128	11/15/91	Yes		
1-1	101	01/29/92	Yes		
1-2	104	05/01/92	Yes		
1-7	109	01/09/92	Yes		
1-8	109	07/12/91	No		
1-9	109	07/12/91	No		
1-10B	117	01/24/92	No		Xfr to 100 Area
1-16B	116	07/23/91	Yes		
1-18A	118	07/23/91	No		Xfr to 100 Area
1-18B	118	07/23/91	No		Xfr to 100 Area
1-18C	118	07/23/91	No		Xfr to 100 Area
2-1	102	01/29/92	Yes		
2-2	103	09/16/92	No		Xfr to 100 Area
3-9	119	08/15/91	No		Xfr to 100 Area
3-12	113	02/13/92	No		Xfr to 100 Area
4-1	111	12/09/91	Yes		
4-7	112	12/09/91	Yes		
4-9	129	8/15/91	No		Xfr to 100 Area
5-1	105	8/13/92	No		Xfr to 100 Area
6-1	106	01/28/92	Yes		
8-1	120	05/01/92	Yes		
8-5A	115	01/23/92	No		Xfr to 100 Area
8-5B	115	01/23/92	No		Xfr to 100 Area
8-5C	115	01/23/92	No		Xfr to 100 Area
S19-E14(3A)	126	01/09/92	No		Xfr to 100 Area
S22-E9A(4A)	127	12/09/91	No		Xfr to 100 Area
S22-E9B(4B)	127	12/09/91	No		Xfr to 100 Area
S22-E9C(4C)	127	02/07/92	No		Xfr to 100 Area
S27-E9A(7A)	107	12/09/91	No		Xfr to 100 Area
S27-E9B(7B)	107	12/09/91	No		Xfr to 100 Area
S27-E9C(7C)	107	12/09/91	No		Xfr to 100 Area
S28-E12(8A)	108	01/09/92	Yes		
S29-E16A(1A)	121	12/09/91	No		Xfr to 100 Area
S29-E16B(1B)	121	12/09/91	No		Xfr to 100 Area
S29-E16C(1C)	121	12/09/91	No		Xfr to 100 Area

9 3 1 3 0 2 6 0 0 5 6

STATUS OF M-30-05 ACTIVITIES Continued . . .

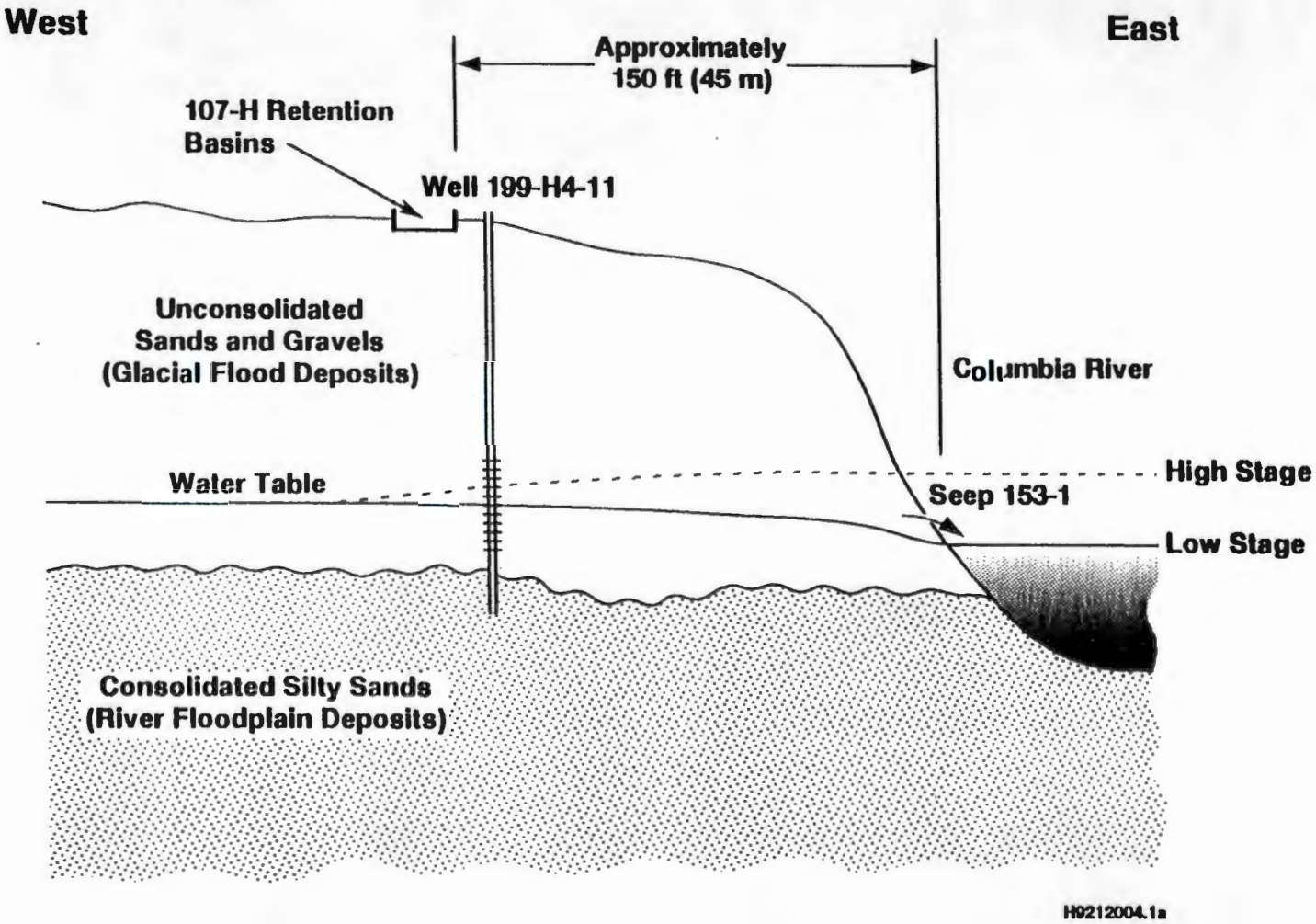
9 3 1 3 0 2 6 0 0 5 7

Monitoring Activities for Long-Term Evaluation

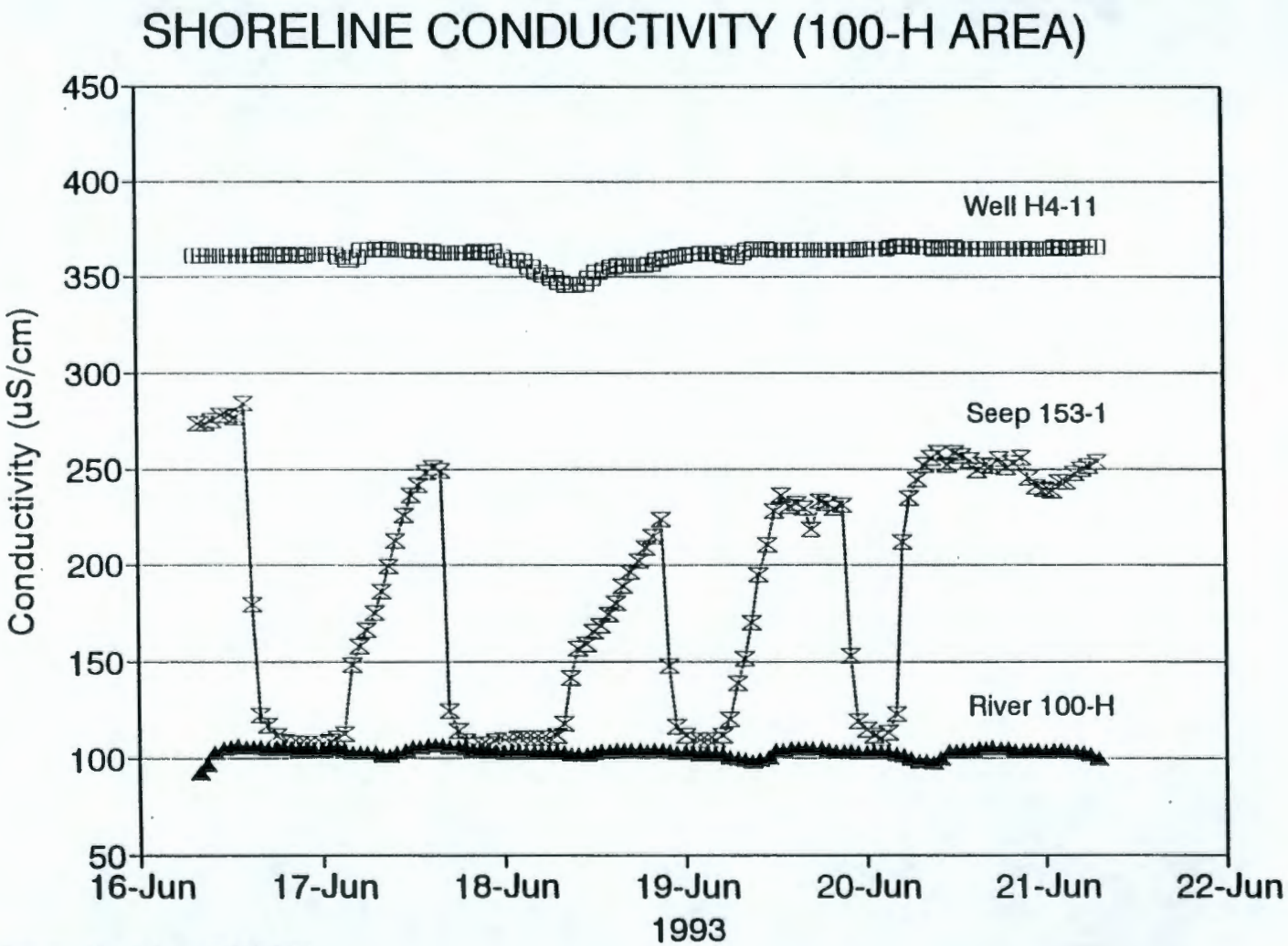
- Hourly conductivity measurements are being recorded at the 100-H Area in well H4-11, a riverbank seep, and nearshore in the river (Figure attached)

- Detailed cross-sections through each reactor area, including the river channel, are currently being prepared. Water level variability for Phase I data loggers will be portrayed on these sections (Interim report)

100-H Cross Section Through Shoreline:

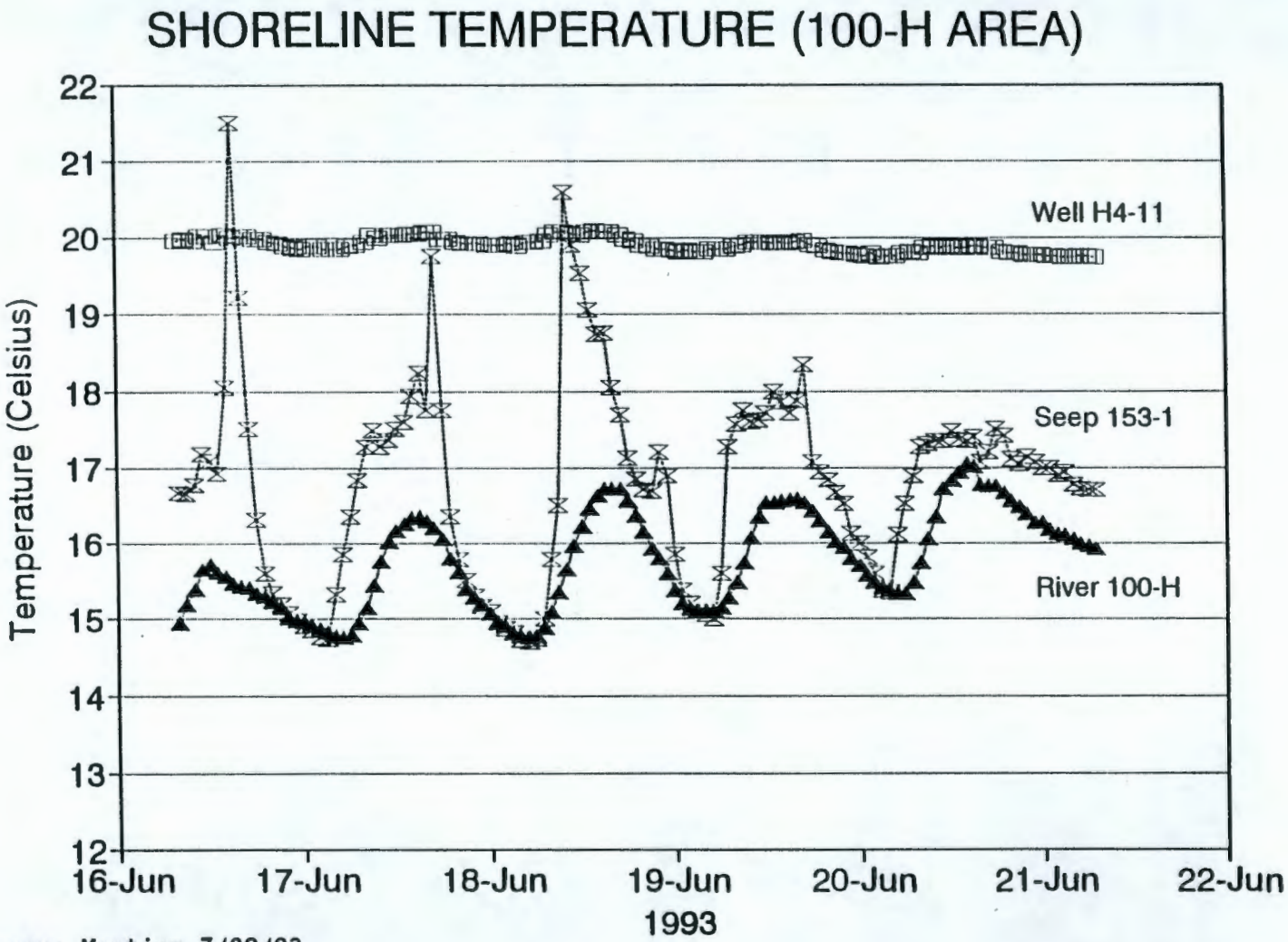


Shoreline Conductivity, June 1993:



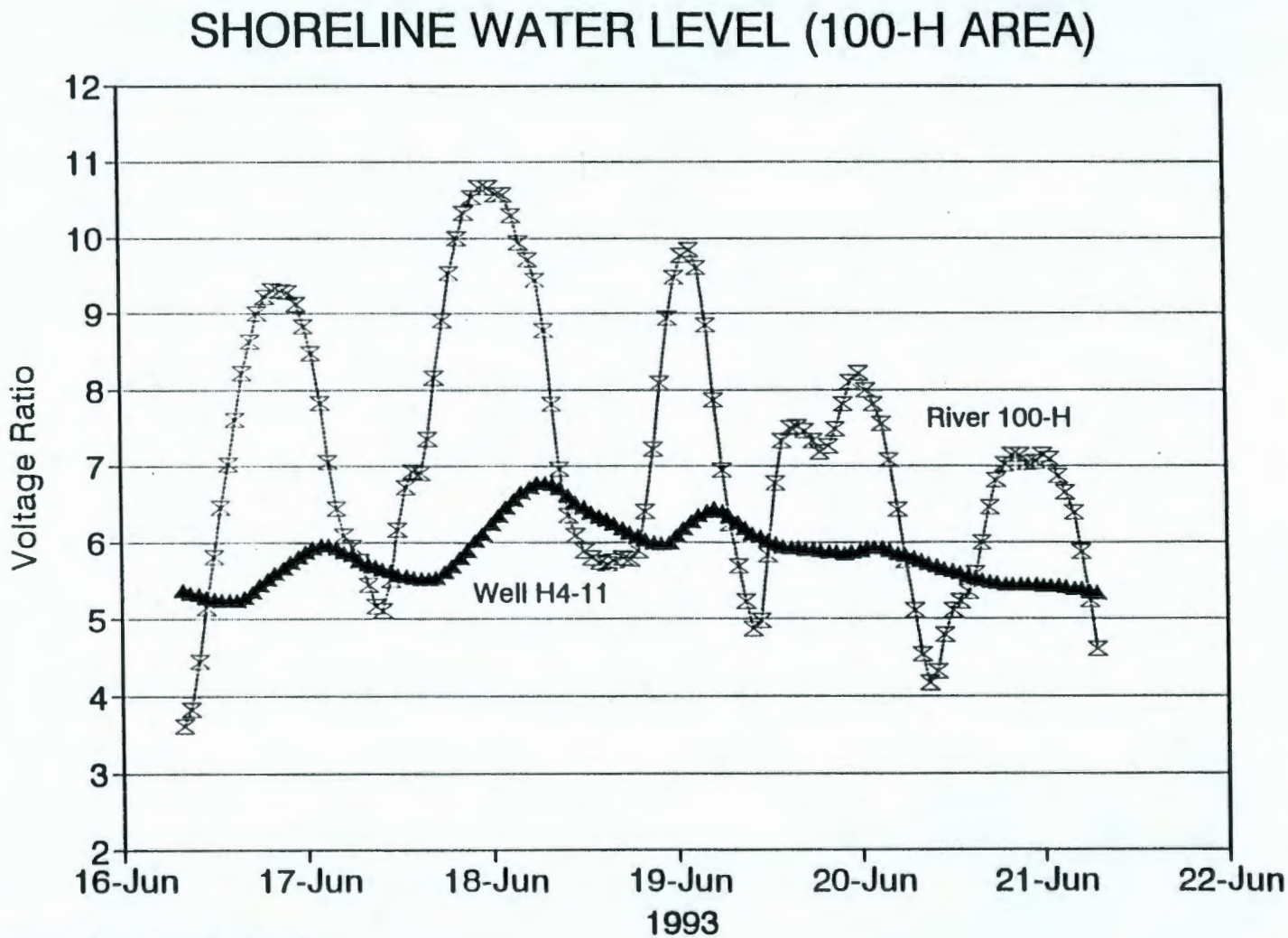
Unit Managers Meeting 7/28/93

Shoreline Temperature, June 1993:



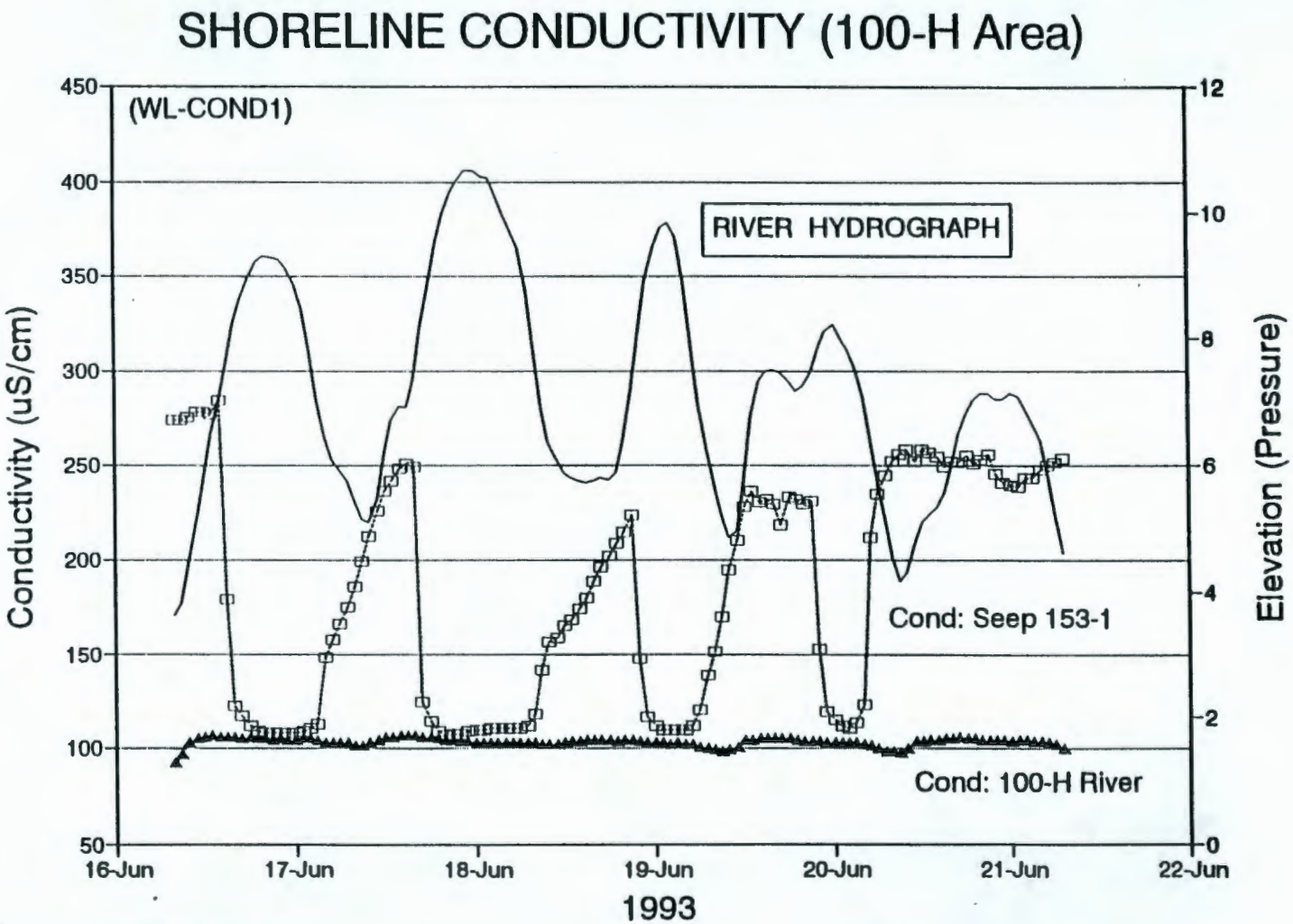
Unit Managers Meeting 7/28/93

Shoreline Water Levels, June 1993:



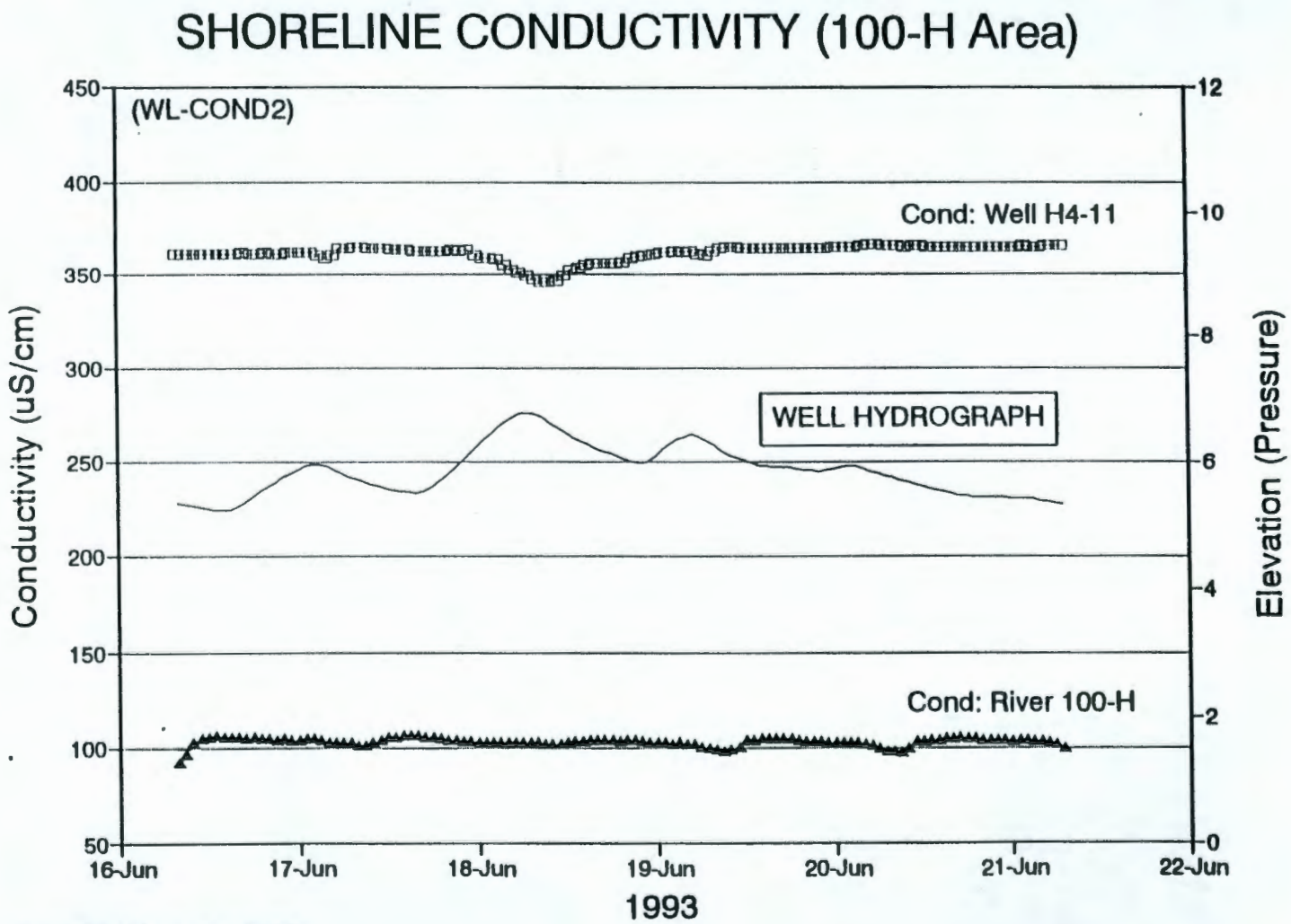
Unit Managers Meeting 7/28/93

Conductivity: Seep vs River Level:



Unit Managers Meeting 7/28/93

Conductivity: Well vs Water Table:



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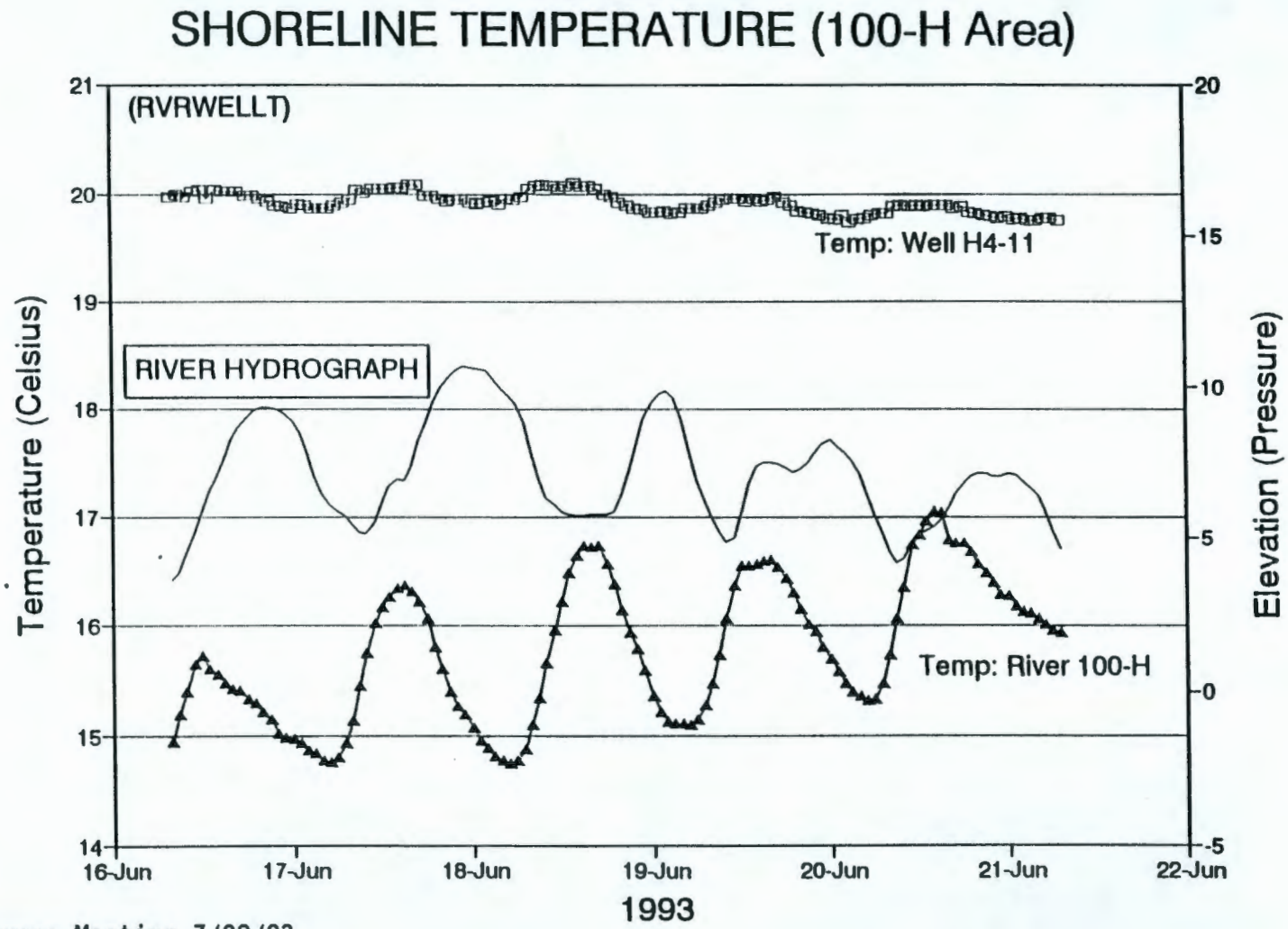
Temperature: Well vs River:



Unit Managers Meeting 7/28/93

SUMMARY: M-30-05 SCOPE AND SCHEDULE . . .

Install Field Equipment

- Automated water level recording equipment has been transferred from the 300 Area to the 100 Areas, as described in the 100 NPL Agreement

- September 1993 obligation will be complete upon replacement of manual river stage recorder at 100-N (planned for August)

9 3 1 3 0 2 6 0 9 6 5

SUMMARY: SCOPE AND SCHEDULE Continued . . .

Initiate Monitoring Activities

- Water level recorders are collecting hourly data in shoreline wells in all 100 Areas, (exception: 100-N, limited historical data are available)
- River stage recorders are operating at 100-B, 100-N, 100-H, and 100-F, as planned
- Conductivity data are being obtained to help describe the river's influence on nearshore water quality (includes river, bank seepage, and shoreline groundwater)
- Borehole velocity measurements at 100-H are scheduled for August/September to evaluate method for describing flow regime
- September 1993 obligation will be complete with the issuance of an activity plan that describes continuing program for long-term evaluation of river/aquifer interaction

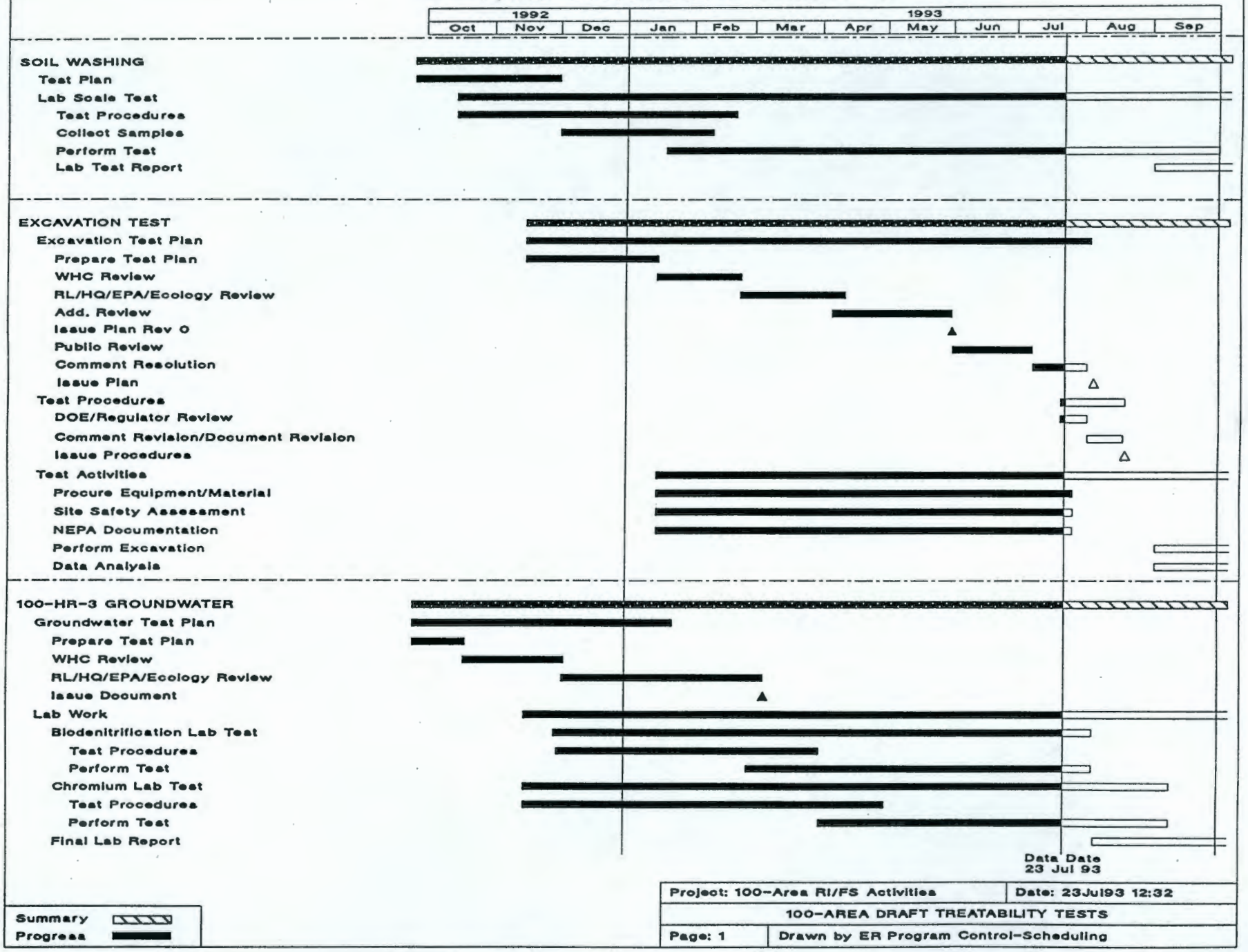
9 3 1 3 0 2 6 0 0 6 6

Progress on Planned M-30-05 Tasks:

```
                                          <---------------------------- 1993 ----------------------------> <----------- 1994
Task Description                          Mar   Apr   May   Jun   Jul   Aug   Sep | Oct   Nov   Dec   Jan   Feb   Mar
-----------------------------------------  ---   ---   ---   ---   ---   ---   ---  | ---   ---   ---   ---   ---   ---
  *Develop concensus on M-30-05            ========================= NPL==>          |
   obligations                                                  Agreement          |
1: Analyze existing information on                  <================== Interim======|=====================================
   groundwater direction and rate                                          Report   |
   of flow at each reactor area                                                     |
2: Deploy temporary transducers in                <=========>                       |
   wells that are presumed to be                                                    |
   influenced by short-term fluctuations                                            |
3: Install automated water level recording        <=========>                       |
   equipment in wells influenced by short-                                          |
   term river fluctuations                                                          |
4: Obtain steel tape water level            ==============================================|=====================================
   measurements to complement automated                                             |
   water level recorder networks                                                    |
5: Obtain borehole velocity measurements                                <==100-H===>|
                                                                                    |
6: Initiate field activities to describe                    <======Conductivity======>|
   the bank storage of river water and                                        Issue |
   its interaction with groundwater                                            Plan |
7: Maintain field systems capability,       ==============================================|===========================Annual====
   manage field data, interpret data,                                               |                           Report
   and report results                                                               |
                                             ---   ---   ---   ---   ---   ---   ---  | ---   ---   ---   ---   ---   ---
                                             Mar   Apr   May   Jun   Jul   Aug   Sep | Oct   Nov   Dec   Jan   Feb   Mar
```

Unit Managers Meeting 7/28/93

100-AREA TREATABILITY TESTS



LABORATORY SOIL WASHING TREATABILITY TESTS
100 AREA

JULY UNIT MANAGERS MEETING

WESTINGHOUSE HANFORD COMPANY
ENVIRONMENTAL RESTORATION ENGINEERING

100 Area Soil Washing Test Status

Completed:

- Particle Specific Gravity
- pH, Ion Exchange Measurements, TOC
- Wet sieving
- XRF analyses
- Attrition Scrubbing with water
- Sequential Extraction Tests

In Progress:

- Bulk Soils, Wet sieved soils and TCLP extract analyses
- Attrition scrubbing using surfactants
- Sequential Extraction Analyses
- Microscopic Investigations, X-Ray Diffraction

Two Week Backlog for Gamma Counting; Counter was down for repair

Example Trace Element Concentrations using XRF Analyses*

MEASUREMENT	116-C-1, I	116-C-1, II	116-D-1B
TOC (mg/kg)	1130.0	1640.0	600.0
pH	6.5	7.4	7.7
Sr-90 (pCi/g)	< 0.2	115.0	12.5
Cd (mg/kg)	< 12.0	< 13.0	< 14.0
Cr (Total, mg/kg)	56.0	236.0	58.0
Lead (mg/kg)	13.0	101.0	13.0
Zinc (mg/kg)	88.0	855.0	138.0

* All analyses used soils < 2 mm

** Other elements not shown were also analyzed

TCLP Analyses of 100 Area Soils

Element	Soil Samples		EPA Regulatory Level (mg/l)
	116-C-1 (mg/l)	116-D-1B (mg/l)	
Ag	0.03	BD	1.0
As	0.20	0.20	5.0
Ba	0.35	0.29	100.0
Cd	0.01	0.02	1.0
Cr	BD	BD	5.0
Pb	BD	BD	5.0
Se	BD	BD	1.0

Extractions Conducted on <2mm Material.
BD: Below Detection Limit.
The Detection Limits for Ag, Cr, Pb, and Se are 0.01, 0.02, 0.06, and 0.2 mg/l respectively.

S9306007.12

Radionuclide Data for 100 Area Soil Samples

Sample	^{40}K	^{60}Co	^{134}Cs	^{137}Cs	^{152}Eu	^{154}Eu	^{155}Eu
116-C-1 (Batch I)	16	7	<0.8	0.74	28	4.4	0.54
116-C-1 (Batch II)	<7	525	<10	5495	2320	337	*
116-D-1B (Batch III)	7	15	<2	205	177	17	1.4

* Reported Interference. Data review requested.

Reported values are averages of duplicate values.
All measurments conducted on <2 mm material

Future Laboratory Tests

- Autogenous Grinding
- Chemical Extraction
- Combined Systems
- Column\Heap Leaching
- Recycle Water Treatment

100-HR-3 GROUNDWATER TREATABILITY TESTS

UNIT MANAGERS MEETING

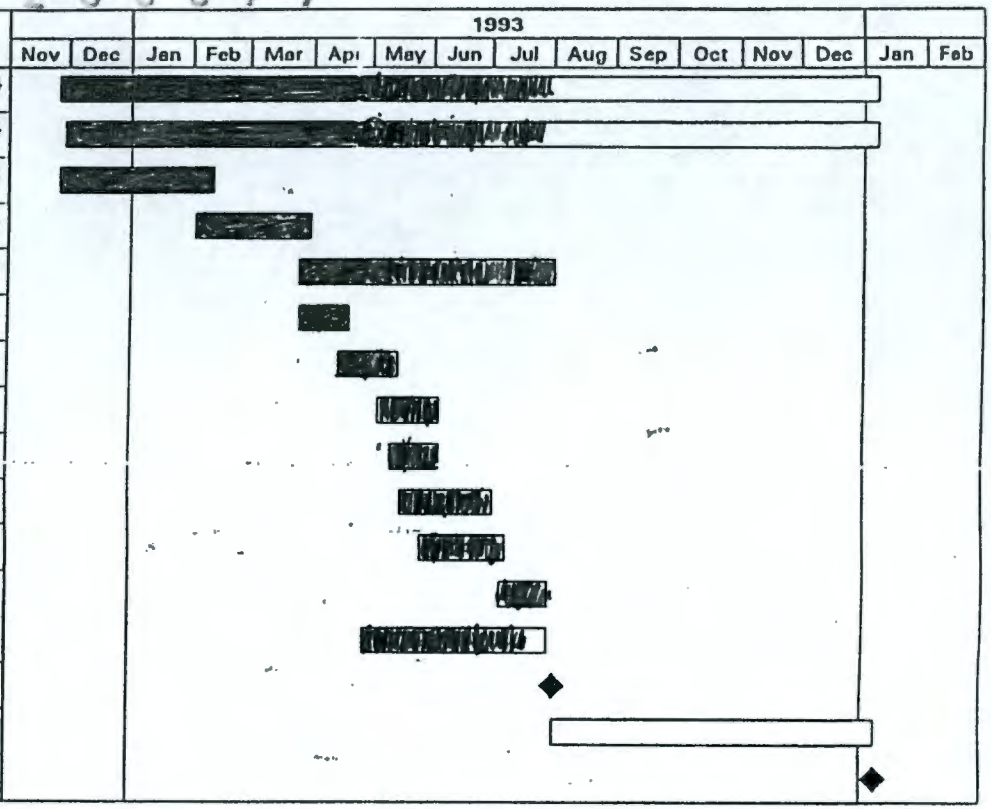
JULY 1993

BIODENITRIFICATION

- ALL TESTING IS COMPLETED
- SAMPLES SENT TO B325 FOR CHROMIUM, GROSS ALPHA AND GROSS BETA ANALYSIS.
- OTHER ANALYSES (MPN AND CARBON SOURCE) WILL BE COMPLETED IN TWO TO THREE WEEKS.
- TEN LITERS OF BIODENITRIFIED WATER TRANSFERED TO 222S LAB FOR ION EXCHANGE TESTS

04/30/93 10:45 ☎509 376 1867 324 BLDG PNL →→→ 740 STEVENS 1219 ☑002

ID	Name	Scheduled Start	Scheduled Finish
1	100-HR-3 BIODENITRIFICATION	11/26/92	1/7/94
2	QUALITY ASSURANCE	11/29/92	1/7/94
3	PREPARE TEST DOCUMENTS	11/26/92	2/10/93
9	TEST SET UP	2/2/93	3/30/93
16	TESTING	3/25/93	8/2/93
17	Task 3.4.1 InhibitionTests	3/25/93	4/19/93
24	Task 3.4.3 pH Tests	4/14/93	5/14/93
31	Task 3.4.2 Carbon Ratios	5/4/93	6/4/93
38	Task 3.4.4 Temperature	5/11/93	6/4/93
45	Task 3.4.5 Carbon Source	5/16/93	7/2/93
52	Task 3.4.6 Large Volume Denitrification	5/26/93	7/8/93
60	Task 3.4.7 Final Confirmation Tests	7/6/93	7/30/93
68	Data Analysis and Draft Final Report Preparation	4/27/93	7/30/93
69	Submit Draft Report to WHC	8/2/93	8/2/93
70	FINAL REPORT REVIEWS	8/2/93	1/7/94
76	ISSUE FINAL REPORT	1/7/94	1/7/94



Project: 100 Area Biodenitrification
Date: 4/30/93

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

ATTACHMENT 2

CHROMIUM & URANIUM PRECIPITATION ION EXCHANGE

- CHROMIUM AND URANIUM REDUCTION PRECIPITATION STUDIES COMPLETE

  - PIN FLOC FORMATION FROM CHROMIUM REDUCTION/PRECIPITATION

  - URANIUM PRECIPITATED WITH CALCIUM AS CO-PRECIPITATE, NOT EASILY SETTLEABLE.

- KINETIC STUDIES AS IDENTIFIED IN WHC PROCEDURES WILL NOT BE CARRIED OUT BECAUSE THE PIN FLOC WILL NOT SETTLE BY GRAVITY AND CANNOT COLLECT KINETIC DATA.

- TO FLOCCULATE PIN FLOC, A EFFORT IS BEING CARRIED OUT USING A PLOYMER FLOCCULANT AID (CATFLOC) AS PER WHC LETTER DATED JUNE 18, 1993.

- THIS STUDY WILL GIVE KINETIC DATA ON FLOC SETTLING AND DATA ON CHEMISTRY (NITRATES, CHROMIUM, URANIUM, GROSS ALPHA AND GROSS BETA).

CHROMIUM & URANIUM PRECIPITATION ION EXCHANGE (CONT'D)

- ION EXCHANGE
  - COMPLETED DISTRIBUTION COEFFICIENT STUDIES ON ALL RESINS.
  - PRELIMINARY DATA INDICATE DECONTAMINATION FACTORS (DF's) OF:

	DOWEX 21K	AMBERLITE 402	AMBERLITE 410
NITRATE	40	6	12
CHROME	>50	>50	>50
URANIUM	>100	>100	>100

  - CYCLING TESTS ARE CURRENTLY BEING CARRIED OUT FOR BREAKTHROUGH

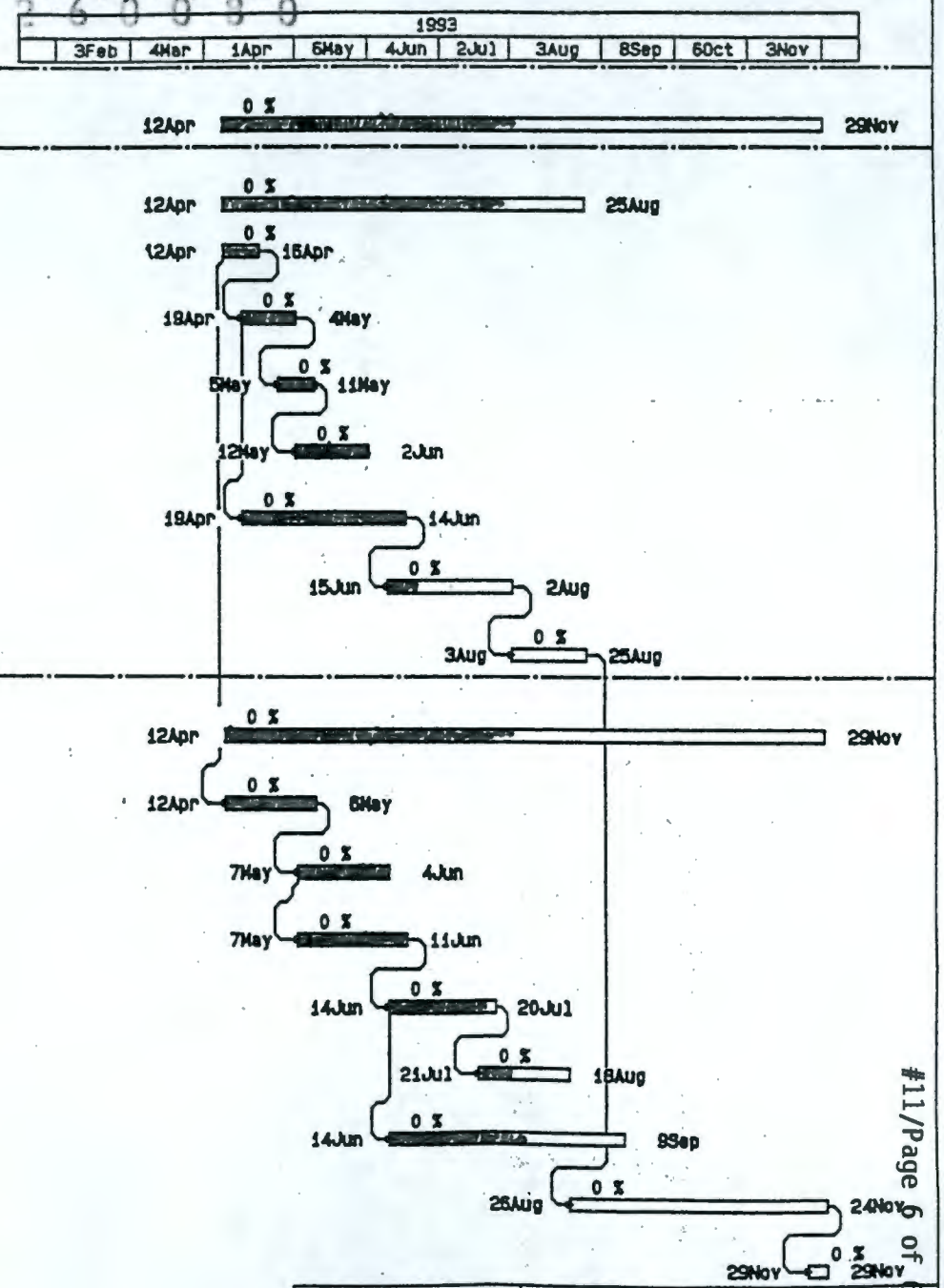
Ex situ removal of chromate, Nitrate, & Uranium (VI)

Actual setup began January 27, 1993.

9 3 1 3 0 2 6 0 0 9 0

CODE1

09				
09	GROUNDWATER TREATABILITY TESTS	160.00D		12Apr – 29Nov
0901				
0901	PppTn TESTS	95.00D		12Apr – 25Aug
090101	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	5.00D	M. BECK	12Apr – 16Apr
090102	FeSO4-Na2S	12.00D	M. BECK	19Apr – 4May
090103	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	5.00D	M. BECK	5May – 11May
090104	Na2HPO4	15.00D	M. BECK	12May – 2Jun
090105	ANALYSIS (U, Cr, NO3)	40.00D	T. DALE	19Apr – 14Jun
090106	KINETIC STUDY/CONFIRMATORY TESTS	33.00D	M. BECK	15Jun – 2Aug
090107	ANALYSIS (U, Cr, NO3)	17.00D	T. DALE	3Aug – 25Aug
0902				
0902	ANION TESTS	160.00D		12Apr – 29Nov
090201	SET UP (CENTRIFUGE, PUMPS, AND OTHER APPARATUS)	19.00D	M. BECK	12Apr – 6May
090202	CONTACTING TESTS	20.00D	M. BECK	7May – 4Jun
090203	ANALYSIS (U, Cr, NO3)	25.00D	T. DALE	7May – 11Jun
090204	BREAKTHROUGH/CONFIRMATORY TESTS	25.00D	M. BECK	14Jun – 20Jul
090205	CYCLING TESTS	21.00D	M. BECK	21Jul – 18Aug
090207	ANALYSIS (U, Cr, NO3)	61.00D	T. DALE	14Jun – 9Sep
090208	WRITE REPORT	64.00D	M. BECK	26Aug – 24Nov
090209	ISSUE REPORT	1.00D	M. BECK	29Nov – 29Nov



Legend

Early CPM

Project: GWTT	GWTT	Date: 9Apr93 11:52
GROUNDWATER TREATABILITY TESTS		
Page: 1	Drawn by GWIKNET Graphics	

#11/Page 6 of 6

ATTACHMENT 1

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

DATE: July 28, 1993

TO: P. R. Beaver B5-01
D. Goswami Ecology

FROM: E. D. Goller EDG A5-19
Telephone: 376-7326

cc:

SUBJECT: 100-HR-3 GROUNDWATER TREATABILITY TEST

The following identifies modifications to the chromium and uranium precipitation testing program. These modifications are being driven by the results of the testing conducted to date.

The testing to date shows the reduction reaction of $FeSO_4/Na_2S$ produces a pin-floc which does not settle within a reasonable time (several hours rather than 15 to 30 minutes). The $CaCl_2/NaH_2PO_4$ uranium precipitation reaction also produces a fine floc which takes many hours to settle. Because of this, it is determined that conducting kinetic studies as currently planned would not produce relevant data. The kinetic studies were identified in the test procedures as the next set of testing to be conducted. Based on the above information, the kinetics testing as identified in the procedures will not be conducted.

Another approach has been identified, using a polymer flocculation aid (CATFLOC), to allow the gravitational settling of the pin floc formed by the above chemistry. Standard jar tests (utilized in the water treatment industry) will be conducted to determine the amount of polymer needed to induce precipitation and the kinetics associated with the gravitational settling of the floc. These tests will be conducted in accordance with the attached WHC Internal Memo and will obtain the following data:

- kinetics of polymer aided flocculation to the above chemical methodology (Ferric chloride will also be tested)
- amount of solids generated (grams/liter)
- determination of the effect of a cationic polymer on uranium (VI).

There will be no impact to the overall schedule as these tests are currently being conducted in the 222S laboratory.

Attachment

9 3 1 3 1 2 6 0 0 3 1

Westinghouse Hanford Company **Internal Memo**

From: Environmental Engineering Support Group 81340-93-019
Phone: 2-0896
Date: June 18, 1993
Subject: REQUEST FOR LABORATORY SPACE AND SUPPORT

To: JR Jewett, Ph.D. T6-09

cc: MR Adams H6-01
WW Baird T6-51
RP Henckel H6-02
EJ Kosiancic T6-16
JP Sloughter T6-07
JG Woolard H6-05
JBD File/LB

Raman, M. "Polymers to Clear Water", CHEMTECH, April 1981, 252-255.

Weber, W. J., Physicochemical Processes for Water Quality control, 1972, Wiley and Sons, New York.

Sawyer, C. and P. McCarty, Chemistry for Environmental Engineering, 1978, McGraw-Hill, Inc., New York.

Koolik, S. I., "Chromium Removal from Groundwater Using Simple Physical/Chemical Treatment", Remediation, Winter, 1992/1993, 39-54.

Hudson, H., Water Clarification Processes -- Practical Design and Evaluation, 1981, Van Nostrand Reinhold Co., New York.

American Water Works Association, Standard Methods For the Examination of Water and Wastewater, 14th Ed., 1975, Published by the American Public Health Association, Washington, D.C.

INTRODUCTION

The removal of colloids and colloidal flocs (due to incomplete agglomeration and relatively small nucleation) has been a part of water and wastewater treatment for decades.

The solid-liquid separation involves two stages: coagulation (charge neutralization and microfloc formation) and flocculation (Raman). Coagulation (which may be accomplished with iron salts -- $FeSO_4$, $Fe_2(SO_4)_3$, and $FeCl_3$) is merely the negation of influence of the diffuse layer of counter-ions around the negatively charged colloid (Sawyer-McCarty).

9 3 1 3 0 2 6 0 0 8 2

The action of a polymer in flocculation is to accelerate the gravitational forces overcoming inertial forces by adsorption and interparticle bridging (Weber).

In treating chromium contaminated water from a perched aquifer, the use of $FeSO_4$, in conjunction with a cationic polymer, reduced the amount of total chromium from 203 ppb to less than 2 ppb (Koolik).

According to Hudson, the jar test (using a Phipps-Bird or equivalent paddle mixer) has been and is the most widely used method employed to evaluate coagulation-flocculation processes (Hudson).

9 3 1 3 0 2 6 0 0 8 3

PROCEDURE

The procedure follows that outlined by Hudson in the chapter on jar testing and utilization of jar test data (Hudson).

The test will use Hanford groundwater samples and is as follows:

A. Volume of Flocculation as a function of Polymer Concentration (this procedure will allow the most efficacious choice of reductant/polymer):

The variables for this test are the amount of chemicals and percent polymer.

1. 500 mL of groundwater will be placed in a 1 liter beaker (4 beakers per run) and placed under the paddle stirrer (Figure 1).
2. The mixer will be turned to the maximum rpm (>100) and the coagulant introduced via pipette under the paddle. Coagulant addition will be the same concentration as in the procedure by M. Beck and C. Delegard. Introduction of 12 mg S^-/L, as Na_2S followed 30 seconds later (for dispersion and contact with sulfide) with 10 mg Fe^{2+}/L, as $FeSO_4$.
3. Mix for 2 minutes at maximum rpm.
4. Reduce to 20 rpm and add the CATFLOC polymer (Attachment 1 and 2 are specification sheets and MSDS's for CATFLOC L and TL respectively).
5. After 2 minutes of mixing, stop and remove paddles.
6. Let the floc settle for 15 minutes and begin turbidity measurements. Notice the floc density and clearing time at 5 minute intervals.

Once the most efficacious combination of reductants, precipitants and flocculation aids are established, sludge parameters need to be delineated. This is accomplished by one or two runs.

B. Sludge Parameters:

1. Rerun steps 1 to 6 from above with a 1000 mL of water in a 1 L beaker.
2. The following tests are to be carried out on the resulting sludge:
   A. Zone Settling Rate -- Standard Methods For the Examination of Water and Wastewater, 14th Ed., Method 213D (Attachment 3).
   B. Total Residue -- Standard Methods For the Examination of Water and Wastewater, 14th Ed., Method 208A (Attachment 4).

C. Chemical Analysis:

1. The following analysis are requested to be performed on the supernatant and the sludge -- with the exception of the pH, the analysis will need to be performed by PAL Analytical Operations. It is estimated that a total of 60 samples will be analyzed.
   A. Chrome (Total)
   B. Uranium
   C. Nitrate
   D. Radioactivity (The water to be used has maximum activities of 28pCi/l alpha and 49pCi/L beta.)
      Total Alpha
      Total Beta
   E. pH
   G. Total residue of the sludge

EQUIPMENT

Provided by Environmental Engineering Support:

Turbidimeter (HACH)
Paddle Stirrer

All other lab materials and supplies provided from Process Chemistry Laboratory. These include beakers, pH meter and probe, evaporating dish, muffle furnace, hot air oven (110°C), mettler balance, and other common wet laboratory items.

Required chemicals: $FeSO_4$, Na_2S -- Supplied by Process Chemistry Laboratory.
Polymer (CATFLOC T & CATFLOC TL) -- Supplied by Environmental Engineering Support.

IMPACT LEVEL: 4

Hazardous wastes will be handled as per LO-106-156, Part A. Chemical handling as per WHC Chemical Hygiene Plan, WHC-SD-CP-HSP-001.

Concurrence: _____
JR Jewett, Ph.D.

JB Duncan, Ph.D.
Principal Engineer
Environmental Engineering Support Group

Attachments: 4

9 3 1 3 0 2 6 0 0 8 4

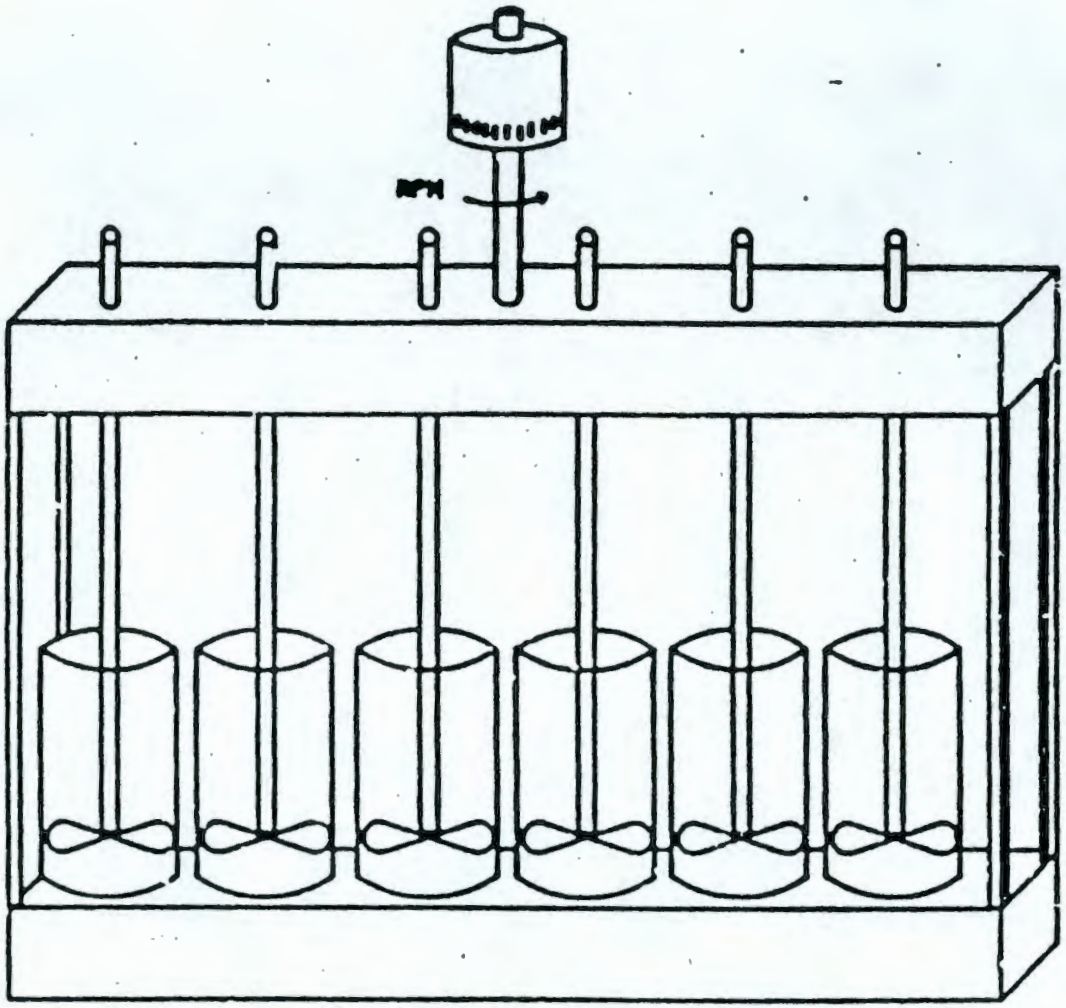


Figure 1. Jar Test Apparatus.

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.

WATER MANAGEMENT DIVISION

MUNICIPAL PRODUCTS & SERVICES

CAT-FLOC® L
LIQUID CATIONIC POLYMER

DESCRIPTION

Calgon® Cat-Floc L is a medium molecular weight low monomer cationic polyelectrolyte used as a primary coagulant or coagulant aid in water clarification. It is highly effective as a replacement for, or can be used in conjunction with, inorganic coagulants such as ferric salts or alum. Cat-Floc L is chlorine resistant and effective over a broad pH range.■

REGULATORY STATUS

1.) E.P.A.: Cat-Floc L is accepted by the Environmental Protection Agency for treating drinking water supplies at concentrations not exceeding 50 mg/L.

2.) F.D.A: Cat-Floc L meets Reg. 176.170 for manufacture of paper for indirect food contact.

PRODUCT FEATURES	BENEFITS
• Completely water soluble	• Can be diluted for optimum use
• Chlorine resistant	• Product performance is not adversely affected by chlorination
• Effective over a broad pH range	• Applicable to systems with wide pH swings
• Does not affect finished water pH	• Can eliminate the need for pH adjustment chemicals
• Produces a compact, easily dewatered sludge	• Reduced sludge volume and sludge handling costs
• Low monomer content (less than 1%)	• More rapid and complete coagulation, lower dosage and reduced risk of coagulant carryover

PRINCIPAL USES

- Primary coagulant, raw water clarification
- Coagulant aid with inorganic treatments
- Inorganic coagulant reduction
- Direct filtration
- Wastewater clarification

APPLICATION AREAS

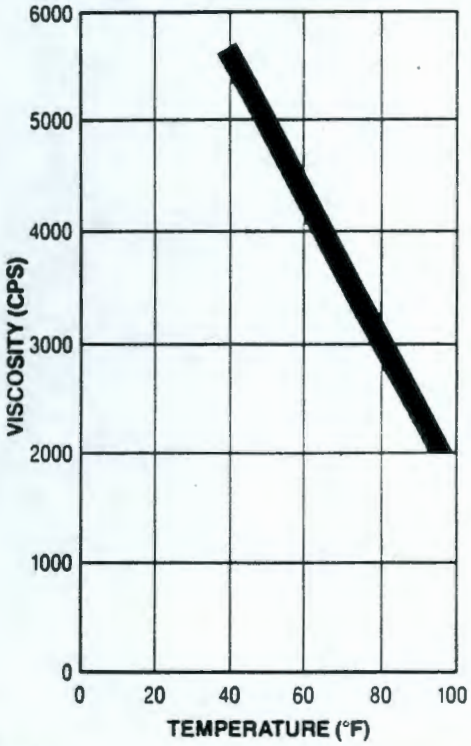
- Industrial and municipal raw water clarifiers
- Industrial and municipal wastewater clarifiers
- Wet scrubber thickeners
- Mineral processing thickeners
- Lime/soda softeners

TYPICAL PROPERTIES

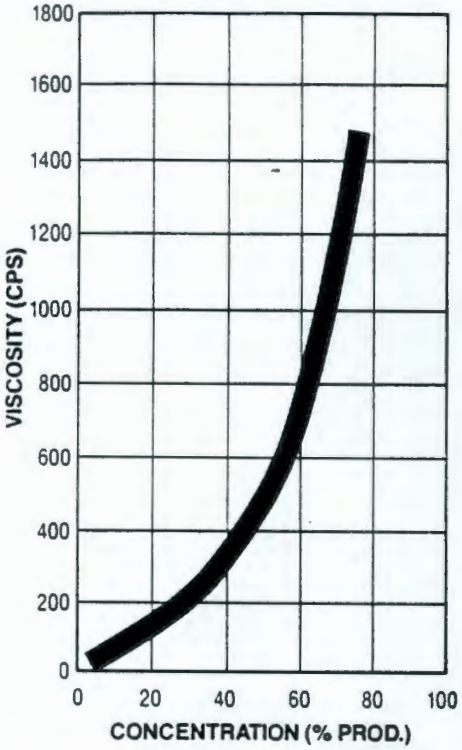
Appearance	Clear to pale yellow liquid
Solubility	Soluble in water in all proportions
Density, lbs/gal	8.6
Flash Point	Noncombustible
Freezing Point, °F	27
pH (as supplied)	7.0±1.0
Viscosity @ 75° F, supplied	See graphs

9 3 1 3 0 2 6 0 0 8 6

NEAT PRODUCT
Viscosity vs. Temperature



DILUTE PRODUCT
Viscosity vs. Concentration



PACKAGING

Cat-Floc L is available in non-returnable plastic drums, disposable liquibins, and bulk. Freight Classification: Resin compounds, synthetic.■

STORAGE/FEED EQUIPMENT

Store Cat-Floc L in heated buildings or heat-traced tanks to prevent freezing. Although this product is freeze-thaw stable, stratification may occur upon freezing. Cat-Floc L will become homogeneous again upon agitation.

Undiluted Cat-Floc L is moderately corrosive to iron and copper, including their alloys. Storage tanks, chemical feed systems, and piping should be constructed of high density (HDPE) or crosslinked (XLPE) polyethylene, fiberglass (FRP) with polyester or vinylester resins, epoxy or vinylester lined steel.

Pump liquid ends and piping should be constructed of polyethylene, propylene, PVC, CPVC, Kynar•, 216 stainless steel, Viton•, or Hypalon•.■

MAKEDOWN/ FEED SOLUTION

Cat-Floc L may be fed neat, however dilution to 1% as product is recommended to assure better contact of the coagulant with the impurities in the water. A Calgon SD, P-18, or LPB (Liquid Polymer Blender) feed system is recommended.■

• ® Trademark of Du Pont
• ® Trademark of Penwalt

Information concerning human and environmental exposure may be reviewed on the Material Safety Data Sheet and label for this product.

For additional information regarding incidents involving human and environmental exposure, call (412) 777-8000 and ask for the Health and Environmental Affairs Department.

For more information, contact your local Calgon Representative or write:
Water Management Division, Calgon Corporation, P.O. Box 1346, Pittsburgh, PA 15230.

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO. INC.

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MATERIAL SAFETY DATA SHEET

CALGON CORPORATION

SUBSIDIARY OF MERCK & CO., INC.

Calgon Corporation
P.O. Box 1346
Pittsburgh, PA 15230-1346

24 Hour Emergency Telephone–(412)777-8000

Section 1. PRODUCT IDENTIFICATION

PRODUCT NAME: **Cat-Floc L**

CHEMICAL DESCRIPTION: Aqueous solution of cationic polymer
PRODUCT CLASS: Water treatment
MSDS CODE: 0170-10-22-91

Section 2. HAZARDOUS INGREDIENTS AND EXPOSURE LIMITS

Chemical Name	CAS Number	% by Weight	OSHA PEL	ACGIH TLV

No ingredients listed in this section

HAZARD COMMUNICATION STATUS: This product is not considered to be hazardous according to the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

Section 3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********

This product poses little or no immediate hazard.

****

PRIMARY ROUTES OF ENTRY: None

TARGET ORGANS: None

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Unknown

Continued on Page 2

9 3 1 3 0 2 6 0 0 8 8

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: This product would not be expected to produce irritation upon contact with the eye.

SKIN CONTACT: The product is not expected to cause skin irritation upon contact. Data indicate that this product will not produce an allergic skin reaction or be absorbed through the skin in harmful amounts.

INGESTION: This product would be expected to be practically non-toxic by ingestion.

INHALATION: This product is not expected to present an inhalation hazard.

SUBCHRONIC, CHRONIC:
In a subchronic toxicity study using rats, the active ingredient of this product was administered orally at doses of 5, 50, and 500 mg/kg. Animals in the 50 mg/kg group showed decreased weight gain, decreased food consumption and increased sleeping time. Animals in the 500 mg/kg group showed decreased weight gain, decreased food consumption, and alterations in red blood cells and blood proteins. Animals in the 5 mg/kg group showed no effects. Twelve-month feeding studies using rats and dogs given 2 and 200 ppm active ingredient in drinking water showed no significant adverse effects.

A similar product has been shown not to be mutagenic by the Ames assay. A teratology study in rabbits and a two-generation reproduction study in rats showed this product did not produce birth defects or affect reproduction.

CARCINOGENICITY:
NTP:
No ingredients listed in this section
IARC:
No ingredients listed in this section
OSHA:
No ingredients listed in this section

9 3 1 3 0 2 6 0 0 8 9

Section 4. FIRST AID MEASURES

EYE CONTACT: Not expected to require first aid measures.

SKIN CONTACT: Not expected to require first aid measures.

INGESTION: Not an expected route of overexposure.

INHALATION: Not an expected route of overexposure.

Section 5. FIRE-FIGHTING MEASURES

FLASH POINT: > 200°F This product is not flammable or combustible.

LOWER FLAMMABLE LIMIT: Not available UPPER FLAMMABLE LIMIT: Not available

AUTO-IGNITION TEMPERATURE: Not available

Continued on Page 3

EXTINGUISHING MEDIA: Use extinguishing media appropriate for the surrounding fire.

FIRE-FIGHTING INSTRUCTIONS: Exercise caution when fighting any chemical fire. A self-contained breathing apparatus and protective clothing are essential.

FIRE & EXPLOSION HAZARDS: Product emits toxic gases under fire conditions.

DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, hydrogen chloride, ammonia, oxides of nitrogen.

NFPA RATINGS: Health = 0 Flammability = 0 Reactivity = 0 Special Hazard = None

Hazard rating scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Section 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Wearing appropriate personal protective equipment, contain spill, collect onto inert absorbent and place into suitable container. Hose spill area well since product can make floors slippery.

Section 7. HANDLING AND STORAGE

HANDLING: As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the product and ensure prompt removal from eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed when not in use.

STORAGE: Product must be maintained at 38°F or higher. Protect from low temperatures.

Section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT:

EYE/FACE PROTECTION: Chemical splash goggles recommended as a good industrial hygiene practice.
SKIN PROTECTION: No special requirement.
RESPIRATORY PROTECTION: None required.

ENGINEERING CONTROLS: No specific recommendations.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: > 212°F (> 100°C)

SOLUBILITY IN WATER: Complete

VAPOR PRESSURE: Similar to water

SPECIFIC GRAVITY: 1.02 - 1.04

VAPOR DENSITY (air = 1): Similar to water

pH: 6.0 - 8.0

Continued on Page 4

9 3 1 3 0 2 6 0 0 9 0

% VOLATILE BY WEIGHT: ~ 80 FREEZING POINT: Not available

APPEARANCE AND ODOR: Viscous, clear, colorless to pale yellow liquid

Section 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: No specific information.

INCOMPATIBILITY: Strong acids and bases, carbon steel, copper

DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, hydrogen chloride, ammonia, oxides of nitrogen.

Section 11. TOXICOLOGICAL INFORMATION

ON PRODUCT:
Oral LD50 (rat): 14.6 g/kg
Dermal LD50 (rabbit): > 20 g/kg (testing on a 40% solution of the polymer)
Eye irritation: A 40% solution of the polymer when instilled in rabbit eyes did not produce any ocular irritation during the 7-day observation period with the exception of one test eye in the no wash group at 24 hours which showed slight conjunctival effects.
Skin irritation: The primary skin irritation index (rabbits) for 40% solution of the polymer was found to be 1.0/8. **Skin sensitization:** Human patch testing on a higher molecular weight version of the polymer has shown that it is not a skin sensitizer.

ON INGREDIENTS:

Chemical Name	Oral LD_{50} (rat)	Dermal LD_{50} (rabbit)	Inhalation LC_{50} (rat)
No ingredients listed in this section			

Section 12. ECOLOGICAL INFORMATION

ON PRODUCT:
See information on polymer below.

ON INGREDIENTS:

Chemical Name	Aquatic Toxicity Data
Poly(dimethyldiallylammonium chloride)-40% solution	96 hr LC50 (bluegill sunfish): 0.82 - 1.3 ppm 96 hr LC50 (rainbow trout): 0.37 ppm 48 hr LC50 (Daphnia magna): 0.9 ppm (in clear water) 48 hr LC50 (Daphnia magna): 1.2 - 2.5 ppm (in 50 ppm clay suspension) 48 hr LC50 (Daphnia magna): 24.8 ppm (in 1000 ppm clay suspension) Note a substantial reduction in toxicity is observed under turbid conditions.

Continued on Page 5

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Section 13. DISPOSAL CONSIDERATIONS

RCRA STATUS: Discarded product, as sold, would not be considered a RCRA Hazardous Waste.

DISPOSAL: Dispose of in accordance with local, state and federal regulations.

Section 14. TRANSPORT INFORMATION

DOT CLASSIFICATION:
Hazard Class: Not restricted
Proper Shipping Name: Not applicable
ID Number: Not applicable
Label: None

Section 15. REGULATORY INFORMATION

OSHA Hazard Communication Status: Nonhazardous
TSCA: The ingredients of this product are listed on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory.
CERCLA reportable quantity of EPA hazardous substances in product:

Chemical	RQ
No ingredients listed in this section	

Product RQ: Not applicable (Notify EPA of product spills exceeding this amount.)

SARA TITLE III:

Section 302 Extremely Hazardous Substances:

Chemical Name	CAS #	RQ	TPQ
No ingredients listed in this section			

Section 311 and 312 Health and Physical Hazards:

Immediate	Delayed	Fire	Pressure	Reactivity
[no]	[no]	[no]	[no]	[no]

Section 313 Toxic Chemicals:

Chemical Name	CAS #	% by Weight
No ingredients listed in this section		

Continued on Page 6

ATTACH. 1

9 3 1 3 0 2 6 0 0 9 2

Section 16. OTHER INFORMATION

HMIS RATINGS: Health = 0 Flammability = 0 - Reactivity = 0
Personal Protective Equipment = A

Hazard rating scale: 0=Minimal 1=Slight 2=Moderate 3=Serious 4=Severe

MSDS REVISION SUMMARY:

This MSDS has been revised in Section 9.

While this information and recommendations set forth herein are believed to be accurate as of the date hereof, CALGON CORPORATION MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

PREPARED BY: P.J. Maloney/J.P. Myers

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ATTACH 1

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.

WATER MANAGEMENT DIVISION

POLYMER PRODUCTS & SERVICES

Bulletin No. 4-82

CAT-FLOC® TL
LIQUID CATIONIC POLYMER

DESCRIPTION

Calgon® Cat-Floc TL is a medium molecular weight low monomer cationic polyelectrolyte used as a primary coagulant or coagulant aid in water clarification. It is highly effective as a replacement for, or can be used in conjunction with, inorganic coagulants such as ferric salts or alum. Cat-Floc TL is chlorine resistant and effective over a broad pH range.

REGULATORY STATUS

1.) E.P.A.: Cat-Floc TL is accepted by the Environmental Protection Agency for treating drinking water supplies at concentrations not exceeding 50 mg/L.

2.) F.D.A.: Cat-Floc TL meets Reg. 176.170 for manufacture of paper for indirect food contact.

PRODUCT FEATURES	BENEFITS
• Completely water soluble	• Can be diluted for optimum use
• Chlorine resistant	• Product performance is not adversely affected by chlorination
• Effective over a broad pH range	• Applicable to systems with wide pH swings
• Does not affect finished water pH	• Can eliminate the need for pH adjustment chemicals
• Produces a compact, easily dewatered sludge	• Reduced sludge volume and sludge handling costs
• Low monomer content (less than 1%)	• More rapid and complete coagulation, lower dosage and reduced risk of coagulant carryover

PRINCIPAL USES

- Primary coagulant, raw water clarification
- Coagulant aid with inorganic treatments
- Inorganic coagulant reduction
- Direct filtration
- Wastewater clarification

APPLICATION AREAS

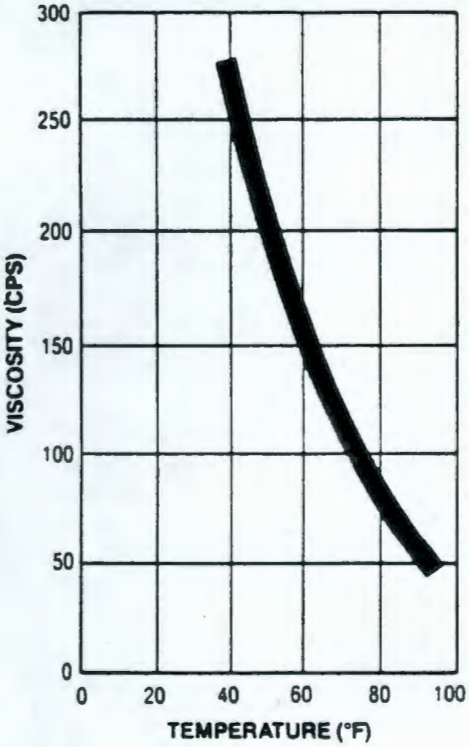
- Industrial and municipal raw water clarifiers
- Industrial and municipal wastewater clarifiers
- Wet scrubber thickeners
- Mineral processing thickeners
- Lime/soda softeners

TYPICAL PROPERTIES

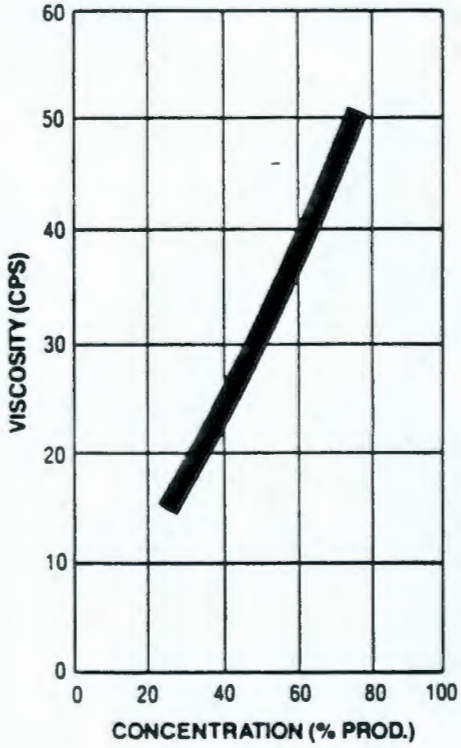
Appearance	Clear to pale yellow liquid
Solubility	Soluble in water in all proportions
Density	8.6 lbs./gal.
Flash Point	Noncombustible
Freezing Point	27° F
pH (as supplied)	3.5±0.2
Viscosity @ 75° F, supplied	See graphs

9 3 1 3 0 2 6 0 0 9 4

NEAT PRODUCT
Viscosity vs. Temperature



DILUTED PRODUCT
Viscosity vs. Concentration



PACKAGING

Cat-Floc TL is available in non-returnable plastic drums, disposable liquibins, and bulk. Freight Classification: Resin compounds, synthetic.

STORAGE/FEED EQUIPMENT

Store Cat-Floc TL in heated buildings or heat-traced tanks to prevent freezing. Although this product is freeze-thaw stable, stratification may occur upon freezing. Cat-Floc L will become homogeneous again upon agitation.

Undiluted Cat-Floc TL is moderately corrosive to iron and copper, including their alloys. Storage tanks, chemical feed systems, and piping should be constructed of high density (HDPE) or crosslinked (XLPE) polyethylene, fiberglass (FRP) with polyester or vinylester resins, epoxy or vinylester lined steel.

Pump liquid ends and piping should be constructed of polyethylene, propylene, PVC, CPVC, kynar, 316SS, viton, or hypalon.

MAKEDOWN/FEED SOLUTION

Cat-Floc TL may be fed neat, however dilution to 1% as product is recommended to assure better contact of the coagulant with the impurities in the water. A Calgon SD, P-18, or LPB (Liquid Polymer Blender) feed system is recommended.

Information concerning human and environmental exposure may be reviewed on the Material Safety Data Sheet and label for this product.

For additional information, regarding incidents involving human and environmental exposure, call (412) 777-8000 and ask for the Regulatory and Trade Affairs Department.

9 3 1 3 0 2 6 0 0 9 5

MATERIAL SAFETY DATA SHEET

CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., IN

Calgon Corporation
P.O. Box 1346
Pittsburgh, PA 15230-1346

24 Hour Emergency Telephone--(412)777-8000

Section 1. PRODUCT IDENTIFICATION

PRODUCT NAME: **Cat-Floc TL**

CHEMICAL DESCRIPTION: Aqueous solution of cationic polymer
PRODUCT CLASS: Water treatment
MSDS CODE: 0171-10-22-91

Section 2. HAZARDOUS INGREDIENTS AND EXPOSURE LIMITS

Chemical Name	CAS Number	% by Weight	OSHA PEL	ACGIH TLV

No ingredients listed in this section

HAZARD COMMUNICATION STATUS: This product is not considered to be hazardous according to the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

Section 3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********

This product poses little or no immediate hazard.

****

PRIMARY ROUTES OF ENTRY: None

TARGET ORGANS: None

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Unknown

Continued on Page 2

9 3 1 3 0 2 6 0 0 9 6

ATTACH 2

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: This product would not be expected to produce irritation upon contact with the eye.

SKIN CONTACT: The product is not expected to cause skin irritation upon contact. Data indicate that this product will not produce an allergic skin reaction or be absorbed through the skin in harmful amounts.

INGESTION: This product would be expected to be practically non-toxic by ingestion.

INHALATION: This product is not expected to present an inhalation hazard.

SUBCHRONIC, CHRONIC:
In a subchronic toxicity study using rats, the active ingredient of this product was administered orally at doses of 5, 50, and 500 mg/kg. Animals in the 50 mg/kg group showed decreased weight gain, decreased food consumption and increased sleeping time. Animals in the 500 mg/kg group showed decreased weight gain, decreased food consumption, and alterations in red blood cells and blood proteins. Animals in the 5 mg/kg group showed no effects. Twelve-month feeding studies using rats and dogs given 2 and 200 ppm active ingredient in drinking water showed no significant adverse effects.

A similar product has been shown not to be mutagenic by the Ames assay. A teratology study in rabbits and a two-generation reproduction study in rats showed this product did not produce birth defects or affect reproduction.

CARCINOGENICITY:
NTP:
No ingredients listed in this section
IARC:
No ingredients listed in this section
OSHA:
No ingredients listed in this section

9 3 1 3 0 2 6 0 0 9 7

Section 4. FIRST AID MEASURES

EYE CONTACT: Not expected to require first aid measures.

SKIN CONTACT: Not expected to require first aid measures.

INGESTION: Not an expected route of overexposure.

INHALATION: Not an expected route of overexposure.

Section 5. FIRE-FIGHTING MEASURES

FLASH POINT: > 200°F (TCC) This product is not flammable or combustible.

LOWER FLAMMABLE LIMIT: Not available UPPER FLAMMABLE LIMIT: Not available

AUTO-IGNITION TEMPERATURE: Not available

Continued on Page 3

EXTINGUISHING MEDIA: Use extinguishing media appropriate for the surrounding fire.

FIRE-FIGHTING INSTRUCTIONS: Exercise caution when fighting any chemical fire. A self-contained breathing apparatus and protective clothing are essential.

FIRE & EXPLOSION HAZARDS: Product emits toxic gases under fire conditions.

DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, hydrogen chloride, ammonia, oxides of nitrogen.

NFPA RATINGS: Health = 0 Flammability = 0 Reactivity = 0 Special Hazard = None

Hazard rating scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Section 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Wearing appropriate personal protective equipment, contain spill, collect onto inert absorbent and place into suitable container. Hose spill area well since product can make floors slippery.

Section 7. HANDLING AND STORAGE

HANDLING: As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the product and ensure prompt removal from eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed when not in use.

STORAGE: Store product in heated buildings or heat-traced tanks to prevent freezing. Although this product is freeze-thaw stable, stratification may occur upon freezing. The product will become homogeneous again upon agitation.
Do not store in stainless steel bulk tanks.

Section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT:

EYE/FACE PROTECTION: Chemical splash goggles recommended as a good industrial hygiene practice.
SKIN PROTECTION: No special requirement.
RESPIRATORY PROTECTION: None required.

ENGINEERING CONTROLS: No specific recommendations.

SATISFACTORY MATERIALS OF CONSTRUCTION: Storage tanks, chemical feed systems, and piping should be constructed of high density or crosslinked polyethylene, fiberglass with polyester, or vinylester resins, epoxy or vinylester lined steel. Pump liquid ends and piping should be constructed of polyethylene, polypropylene, PVC, kynar, 316SS, viton, or hypalon.

UNSATISFACTORY MATERIALS OF CONSTRUCTION: Undiluted product is moderately corrosive to iron and copper, including their alloys.

Continued on Page 4

9 3 1 3 0 2 6 0 0 9 8

ATTACH 3

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: > 212°F (> 100°C)

SOLUBILITY IN WATER: Complete

VAPOR PRESSURE: Similar to water

SPECIFIC GRAVITY: 1.02 - 1.04

VAPOR DENSITY (air = 1): Similar to water

pH: 3.0 - 4.0

% VOLATILE BY WEIGHT: ~ 80

FREEZING POINT: 27°F

APPEARANCE AND ODOR: Slightly viscous, clear, colorless to pale yellow liquid

Section 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: No specific information.

INCOMPATIBILITY: Strong acids and bases, carbon steel, copper

DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, hydrogen chloride, ammonia, oxides of nitrogen.

Section 11. TOXICOLOGICAL INFORMATION

ON PRODUCT:

Oral LD50 (rat): 14.6 g/kg
Dermal LD50 (rabbit): > 20 g/kg (testing on a 40% solution of the polymer)
Eye irritation: A 40% solution of the polymer when instilled in rabbit eyes did not produce any ocular irritation during the 7-day observation period with the exception of one test eye in the no wash group at 24 hours which showed slight conjunctival effects.
Skin irritation: The primary skin irritation index (rabbits) for 40% solution of the polymer was found to be 1.0/8. **Skin sensitization:** Human patch testing on a higher molecular weight version of the polymer has shown that it is not a skin sensitizer.

ON INGREDIENTS:

Chemical Name	Oral LD_{50} (rat)	Dermal LD_{50} (rabbit)	Inhalation LC_{50} (rat)
No ingredients listed in this section			

Section 12. ECOLOGICAL INFORMATION

ON PRODUCT:

See information on polymer below.

Continued on Page 5

ATTACH 2

9 3 1 3 0 2 6 0 0 9 9

ON INGREDIENTS:

Chemical Name	Aquatic Toxicity Data
Poly(dimethyldiallylammonium chloride)-40% solution	96 hr LC50 (bluegill sunfish): 0.82 - 1.3 ppm 96 hr LC50 (rainbow trout): 0.37 ppm 48 hr LC50 (Daphnia magna): 0.9 ppm (in clear water) 48 hr LC50 (Daphnia magna): 1.2 - 2.5 ppm (in 50 ppm clay suspension) 48 hr LC50 (Daphnia magna): 24.8 ppm (in 1000 ppm clay suspension) Note a substantial reduction in toxicity is observed under turbid conditions.

Section 13. DISPOSAL CONSIDERATIONS

RCRA STATUS: Discarded product, as sold, would not be considered a RCRA Hazardous Waste.

DISPOSAL: Dispose of in accordance with local, state and federal regulations.

Section 14. TRANSPORT INFORMATION

DOT CLASSIFICATION:
Hazard Class: Not restricted
Proper Shipping Name: Not applicable
ID Number: Not applicable
Label: None

Section 15. REGULATORY INFORMATION

OSHA Hazard Communication Status: Nonhazardous
TSCA: The ingredients of this product are listed on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory.
CERCLA reportable quantity of EPA hazardous substances in product:

Chemical	RQ
No ingredients listed in this section	

Product RQ: Not applicable (Notify EPA of product spills exceeding this amount.)

SARA TITLE III:

Section 302 Extremely Hazardous Substances:

Chemical Name	CAS #	RQ	TPQ
No ingredients listed in this section			

Section 311 and 312 Health and Physical Hazards:

Immediate	Delayed	Fire	Pressure	Reactivity
[no]	[no]	[no]	[no]	[no]

Continued on Page 6

ATTACH 2

93130260100

Section 313 Toxic Chemicals:

Chemical Name	CAS #	% by Weight
No ingredients listed in this section		

Section 16. OTHER INFORMATION

HMIS RATINGS: Health = 0 Flammability = 0 Reactivity = 0
Personal Protective Equipment = A

Hazard rating scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

MSDS REVISION SUMMARY:

This MSDS has been revised in Section 9.

While this information and recommendations set forth herein are believed to be accurate as of the date hereof, CALGON CORPORATION MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

PREPARED BY: P.J. Maloney

93130260101

213 D. Zone Settling Rate

1. General Discussion

The zone settling rate of activated sludges is used in the design of final sedimentation tanks and in the assessment of operating condition changes. Activated sludge zone settling rate varies in response to changes in both process loading level and mixed liquor suspended solids concentration. Zone settling rate also varies with changes in nutrient levels, mixed liquor temperature, pH, turbulence, and the application of flocculents and flocculent aids. Zone settling rate can be a sensitive indicator of process condition changes as well as a useful tool in the design of treatment facilities and the interpretation of routine operating data.

2. Apparatus

a. Settling vessel: One of the following is required:

1) *Graduated cylinder*, 1 l, recalibrated to read in inches and fractions thereof, and fitted with a stirring mechanism.

2) *Cylindrical battery jar*, calibrated in inches and fractions thereof, and having a 2- to 3-l capacity. Stirring mechanisms are not used commonly with a battery jar.

b. Stirring mechanism, with multiple vertical elements long enough to extend to near the cylinder bottom when inserted in a filled graduated cylinder. The stirring mechanism is connected directly to the output shaft of a clock motor or other drive mechanism capable of rotating it 12 rph.

3. Procedure

a. Fill the settling vessel with mixed liquor.

b. Insert a stirring mechanism into the test vessel if a 1-l cylinder is used. Activate the stirring mechanism.

c. Record the height of the sludge-liquid interface at 1-min intervals for at least 10 min or until enough data have been recorded to permit the construction of the required plot.

4. Calculation

Construct an arithmetic plot of sludge-liquid interface height in inches versus time in minutes. Draw a line of best fit through the straight-line portion of the graph. Determine the zone settling rate as the slope of the line. Express the test results in terms of feet per hour, computed as:

$$\text{Zone settling rate} = \frac{\text{Slope, in./min} \times 60 \text{ min/hr}}{12 \text{ in./ft}}$$

5. Precision and Accuracy

Zone settling rate is a function of mixed liquor suspended solids concentration. The reproducibility of zone settling rate determinations at a given solids concentration depends on the type of activated sludge being tested and the skill of the analyst in maintaining constant conditions from one set of tests to another. The zone settling rate of activated sludges having high sludge volume indices (more than 100 ml/g) sometimes will change in an erratic manner while activated sludges with low sludge volume indices usually give acceptable reproducibility.

It is advisable to run zone settling rate determinations in triplicate and average the results. Results of nine replicate determinations on a series of activated sludge samples with low sludge volume indices gave values for the standard deviations that were less than 20% of the respective mean values.

9 3 1 3 0 2 6 0 1 0 2

ATTACHMENT 3

208 A. Total Residue Dried at 103-105 C

1. General Discussion

a. Principle: A well mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103 to 105 C. The increase in weight over that of the empty dish represents the total residue, which is an arbitrary quantity defined by the procedure followed. The determined values may not check with the theoretical value for solids calculated from the chemical analysis of water. Approximate methods for correlating the chemical analysis with the residue are available.[1] Although the results may not represent the weight of actual dissolved and suspended solids in wastewater samples, the determination serves a useful purpose for plant control. In some instances, correlation may be improved by adding 1 *N* sodium hydroxide to wastewater samples with a pH below 4.3 and maintaining the pH of 4.3 during evaporation. Correct the final calculation for the added sodium.

b. Interferences: Exclude large, floating particles or submerged agglomerates of nonhomogeneous materials from the sample. Disperse visible floating oil and grease with a blender before withdrawing a sample portion for analysis.

2. Apparatus

a. Evaporating dishes: Dishes of 100-ml capacity made of the following materials:

1) Porcelain, 90-mm diam.

2) Platinum—Generally satisfactory for all purposes.

3) Vycor*

b. Muffle furnace for operation at 550±50 C.

c. Steam bath.

d. Drying oven, equipped with a thermostatic control capable of maintaining the temperature within a 2 C range.

e. Desiccator, provided with a desiccant containing a color indicator of moisture concentration.

f. Analytical balance, 200-g capacity, capable of weighing to 0.1 mg.

3. Procedure

a. Ignite the clean evaporating dish at 550±50 C for 1 hr in a muffle furnace.

b. Cool, desiccate, weigh, and store the dish in a desiccator until ready for use.

c. Transfer the measured sample to the preweighed dish and evaporate to dryness on a steam bath or in a drying oven. Choose a sample volume that will yield a minimum residue of 25 mg to 250 mg. Estimate the volume from the conductivity. If necessary, add successive portions of sample to the same dish. When evaporating in a drying oven, lower the temperature to approximately 98 C to prevent boiling and splattering.

d. Dry the evaporated sample for at least 1 hr at 103 to 105 C.

e. Cool the dish in a desiccator and weigh.

f. Repeat the cycle of drying at 103 to 105 C, cooling, desiccating, and weighing until a constant weight is obtained, or until loss of weight is less than 4% of the previous weight, or 0.5 mg, whichever is less.

4. Calculation

$$\text{mg/l total residue} = \frac{(A-B)\times 1{,}000}{\text{ml sample}}$$

where A = weight of sample + dish and B = weight of dish.

5. Precision and Accuracy

The precision of the method is about ±4 mg or ±5%. When the residue from a 50- to 100-ml sample of raw sewage was weighed, the standard deviation of the weighing was found to be 1.9 mg ($n=3$; 60×10), but the data are considered statistically unreliable because of sampling errors. On settled effluents, a standard deviation of 0.9 mg ($n=1$; 5×20) was found and is statistically reliable.

*A product of Corning Glass Works, Corning, N.Y.

ATTACHMENT A

9 3 1 3 0 2 6 0 1 0 3

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

DATE: July 28, 1993

TO: Dib Goswami, Ecology Kennewick
Paul Beaver, EPA B5-01

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

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

SUBJECT: 100-HR-3 OU LFI GROUNDWATER INVESTIGATION VALIDATED DATA

Attached please find a document reporting validated data summaries from the 100-HR-3 OU LFI groundwater investigations. The document title and WHC identification number is:

WHC-SD-EN-TI-183 Data Validation Report for the 100-HR-3 Operable Unit First Quarter 1993 Groundwater Samples, rev 0.

Please feel free to contact me with any comments or questions regarding this document. In addition, comments or questions regarding the technical elements of this document can be directed to Bob Henckel (376-2091) or Alan Krug (376-5634).

9 3 1 3 2 2 6 0 1 0 4

Ex Situ Soil Vitrification

John Ludowise
Environmental Engineering Support
Westinghouse Hanford Company

July 28, 1993

Agenda

- Treatability Testing
  - Crucible tests
    - ✓ Pacific Northwest Laboratories (PNL) capabilities, approach
  - Continuous "bench scale" tests
    - ✓ Minimum Additive Waste Stabilization (MAWS) pilot plant, Fernald Environmental Restoration Management Corporation (FERMCO)
    - ✓ Vitreous State Laboratory (VSL), Catholic University of America
- DOE ex situ soil vitrification programs
  - PNL - Terra-Vit
  - Vortec combustion and melter system (CMS) demonstration program

Treatability Testing

Crucible Tests

- Crucible testing generally used to determine process parameters

  - Glass formulation
  - Temperature versus viscosity curve
  - Electrical conductivity

- Glass from crucible tests can be used to determine glass material characteristics

  - Leachability, TCLP
  - Glass microstructure

Continuous Melter Tests

- Bench or pilot scale units, depending on technology
- Tests depend on melter type using scaled down version of actual melter
- Tests cannot be provided by crucible tests
  - Off-gas system design
  - Effect of "cold caps"
  - Recycle of components recovered in off-gas

PNL Crucible Testing Program

- Capability to conduct crucible tests on both clean and contaminated materials

- Possible approach for 1 sample
  - Analyze soil (if necessary)
  - Prepare surrogate soil or use soil from non-contaminated region of Hanford
  - Approximately 12 vitrification tests on this soil to determine glass formulation
  - Crucible melt using this formulation and contaminated soil - viscosity & electrical conductivity of molten glass; TCLP of product
  - QA for these analyses at a low level, higher level of QA used on glass samples produced from actual pilot plant

Fernald Environmental Restoration Management Corp. (FERMCO)

- 300 kg/day bench scale Joule-heated ceramic melter (JHCM) being constructed as part of Minimum Additive Waste Stabilization (MAWS) Program

- MAWS includes soil washing, water treatment and vitrification processes

- MAWS pilot plant designed to handle contaminated materials

- FERMCO has a proposal to do testing of waste from other DOE sites at the MAWS pilot plant
  - Need local approval to receive off-site waste for processing
  - May need variance to treatability exclusion rule

Vitreous State Laboratory

- Can perform a wide range of tests from crucible size to small scale continuous melters
- Fernald has a contract in place - strong probability this will be opened up to other DOE sites
- Capability to handle contaminated (radioactive and hazardous) materials

DOE Ex Situ Vitrification Programs

Representative Melter Systems

- PNL - Terra-Vit
- Vortec - Combustion and Melting System (CMS)

Terra-Vit (PNL)

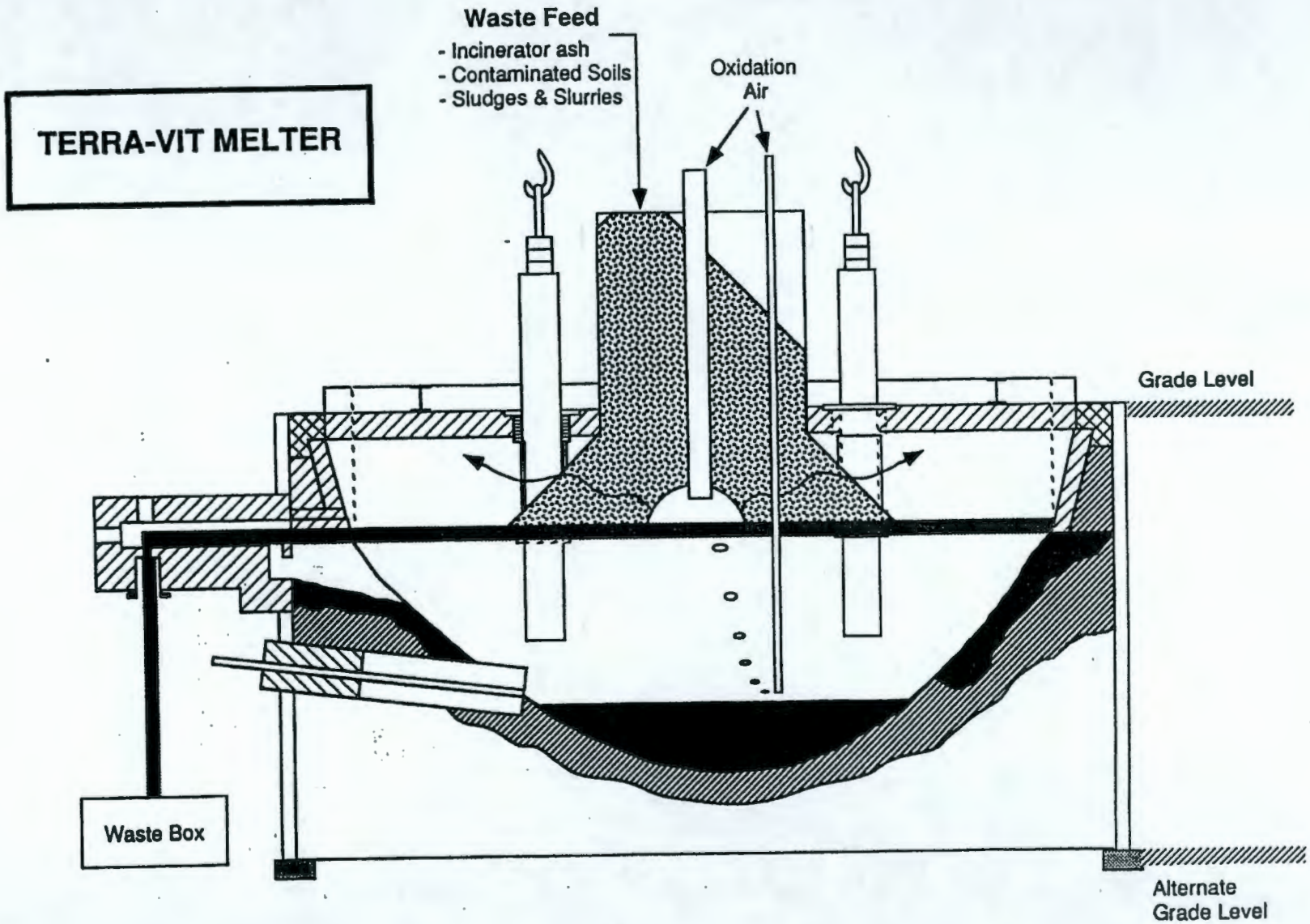
- Similar to in situ vitrification (ISV)
  - Excavate pit
  - Line with native refractory stone or more glass resistant refractory
  - Assemble refractory roof
  - Assemble refractory lined discharge section
  - Insert electrodes

- Melter is continuously fed with overflow of glass product to a mold or container

- Residence time of several days

- PNL expects to conduct pilot scale <u>proof of principle</u> test by end of September 1993

Terra-Vit Melter



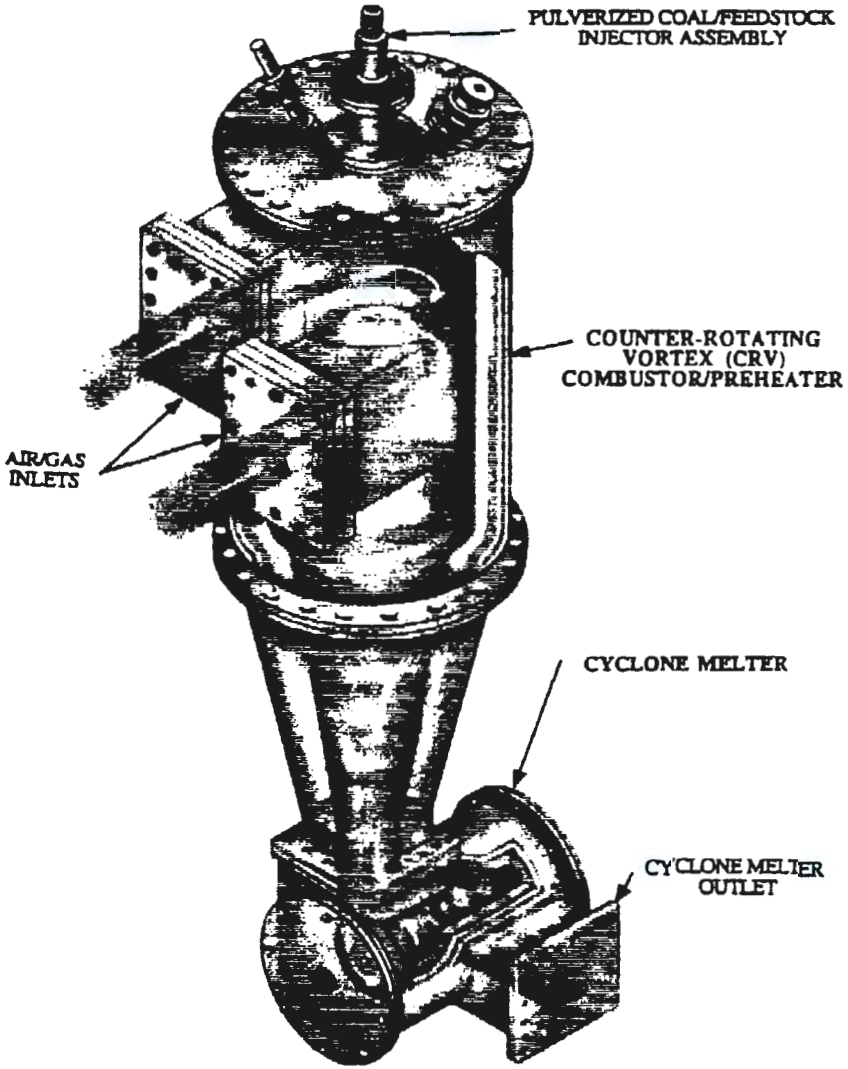
Vortec Combustion and Melting System (CMS)

- CMS is a proprietary system comprised of two main parts
  - Combustor/Preheater - vertically mounted counter rotating vortex (CRV) that provides a high convective heat transfer to the feed particles
  - Fossil fuel fired (coal, natural gas, heating oil, etc.)
  - Cyclone melter - mounted horizontally and collects glass on the walls
  - Residence time 5 minutes

- Vitrified surrogate samples of Hanford low level tank waste July 15, 1993

- Contract to vitrify surrogate high level tank waste by September 1993

Vortec CMS


PULVERIZED COAL/FEEDSTOCK
INJECTOR ASSEMBLY
COUNTER-ROTATING
VORTEX (CRV)
COMBUSTOR/PREHEATER
AIR/GAS
INLETS
CYCLONE MELTER
CYCLONE MELTER
OUTLET

Morgantown Energy Technology Center (METC) Program

- Vortec awarded contract funded by EM-50 and administered by METC: demonstrate remediation of soils containing radioactive and/or hazardous constituents

- Three phase program

  - Phase 1 - Pilot plant studies using surrogate soils in Pittsburgh (complete by Oct. 31, 1993)

  - Phase 2 - 15 to 25 ton/day integrated CMS facility at a DOE site for ~30 days (testing to begin in early FY 1995)

  - Phase 3 - 50 to 100 ton/day integrated CMS facility at a DOE site for ~180 days

Selection of the Vortec Demonstration Site

- Representatives of Vortec visited Hanford in mid June to discuss potential for demonstrating CMS
- The fines fraction from soil washing is expected to be of a size and chemical nature that should be an ideal feed for the Vortec CMS
- Vortec CMS demonstration at Hanford would fit well with existing plans to demonstrate an integrated approach to contaminated soil remediation
- Vortec will recommend a demonstration site by the end of July 1993

Pacific Northwest Laboratory

100 AREA ISV PILOT-SCALE TREATABILITY STUDY FOR RETRIEVED BURIAL GROUND WASTE

JA-KAEL LUEY

9 3 1 3 1 2 5 0 1 2 1

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OUTLINE

- Background
- What is ISV
- Benefits and limitations of ISV
- Conceptual remedy alternative with ISV
- Fit into RI/FS process
- Treatability study overview
- Expected results

BACKGROUND

Problem - 100 Area burial ground waste

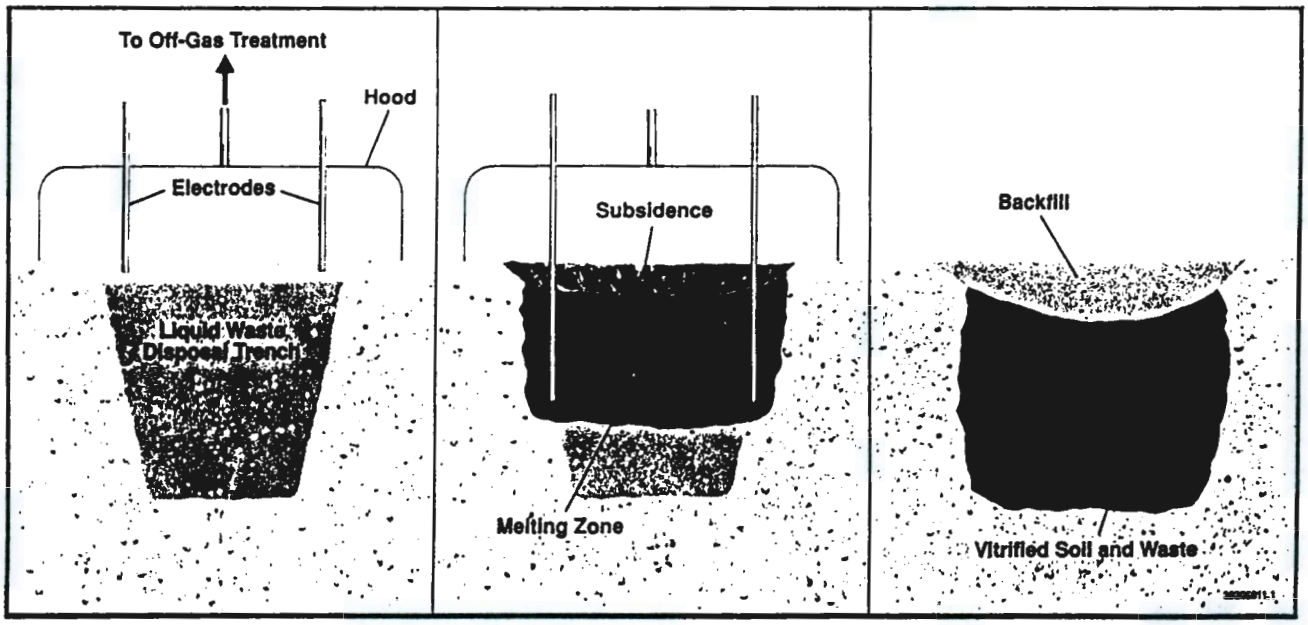
Remedy alternative - Retrieve, treatment, and disposal

Issue - Long-term subsidence

Need - Method to stabilize solid waste

Potential solution - ISV on staged waste sites

ISV Operating Sequence



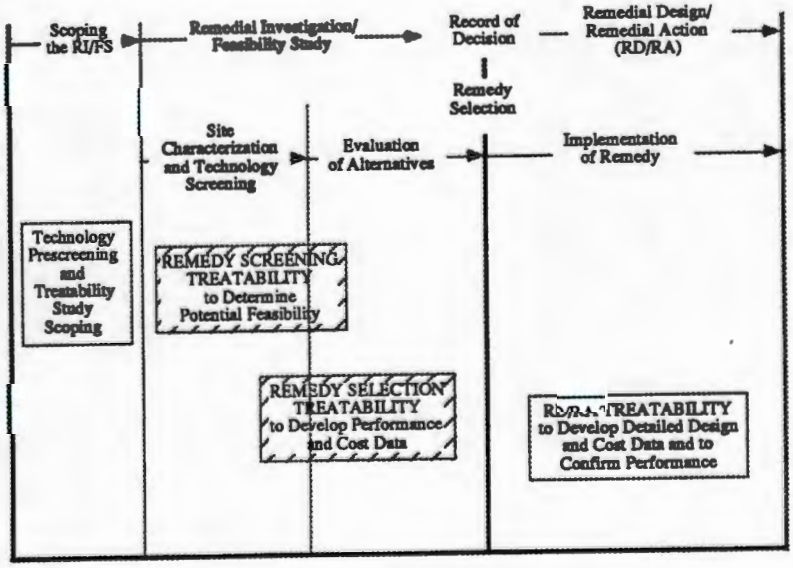
BENEFITS OF ISV

- Waste volume reduction (up to %70)
- Incorporation of inorganics into a durable product
- Destruction and/or capture of organics
- Ability to process heterogeneous wastes
- Commercially available for contaminated soils

ISV LIMITATIONS

- Demonstrated at depths up to 19 ft
- Not applicable for a recharged aquifer
- Minimum alkali content of 1.4 wt% needed
- Not applicable for confining situtations (e.g., tanks and drums)
- Demonstrated for 25 wt% metal

INTEGRATION OF ISV WITH 100 AREA RETRIEVAL AND DISPOSAL



9 3 1 3 0 2 6 0 1 2 4

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ISV TREATABILITY STUDY

- Pilot-scale ISV demonstration
- Performed on staged site
- Utilizes nonhazardous and nonradioactive material

- Will provide:
  data to evaluate ISV as physical stabilization
  data to develop conceptual full-scale scenario
  data to estimate application costs

- Will NOT provide:
  data on contaminant distribution in product
  data on leachability
  data on fate of contaminants

9 5 1 3 1 3 6 0 1 2 5

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MAJOR TEST PLAN SECTIONS

PROJECT DESCRIPTION
REMEDIAL TECHNOLOGY DESCRIPTION
TEST OBJECTIVES
EXPERIMENTAL DESIGN AND PROCEDURES
SITE LAYOUT
SAMPLING AND ANALYSIS
DATA MANAGEMENT
DATA ANALYSIS AND INTERPRETATION
HEALTH AND SAFETY
WASTE MANAGEMENT
COMMUNITY RELATIONS
REPORTS
SCHEDULE
MANAGEMENT AND STAFFING
TEST SPECIFIC PROCEDURES
REFERENCES

DEMONSTRATION TEST OBJECTIVES

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Demonstrate ISV as a stabilization technique for retrieved burial ground waste

KEY CRITERIA

Minimize void space in final product

Destroy and/or remove combustible material

9 3 1 3 1 2 6 0 1 2 6

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Define the ISV operating envelope for application to combustible and compactable waste

KEY CRITERIA

Identification of waste composition range

Identification of waste configuration

Identification of operating parameters

9 3 1 3 0 2 6 0 1 2 7

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Demonstrate ISV on a Site that Contains Significant Quantities of Combustible Materials

KEY CRITERIA

No molten soil displacement events

Verification of computational model predictions

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EXPECTED RESULTS

Data collected from pilot-scale treatability study will support evaluation of ISV as a stabilization technique for retrieved burial ground waste. The major criteria that will be used for this evaluation are EFFECTIVENESS, IMPLEMENTABILITY, and COST.

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EXAMPLE OF INFORMATION TO SUPPORT EVALUATION

EFFECTIVENESS
- Elimination of subsidence mechanisms
- Product characteristics

IMPLEMENTABILITY
- Staging requirements
- Processable waste forms and compositions
- Identified equipment modifications

COST
- Processing rates
- Power requirements
- Secondary waste
- Equipment costs

STATUS OF 100-NR-1 AND 100-NR-2 OU WORK PLANS

1. DOE/Ecology/EPA meeting held on June 29, 1993 to discuss status.

   - NR-1 had four unresolved comments related to schedule and integration and NR-2 had 2 such comments.

   - General agreement to resolve the impasse by rewording the comment disposition and work plan text to be flexible. Try to allow for at least one IRM to start early.

   - Recommendation to Ecology to withdraw issue position papers.

   - Jack Donnelly to check with D. Goswami to see if NR-2 can proceed as NR-1.

   - WHC to revise text and comment dispositions.

2. NR-1 work plan, Draft C and NR-2 work plan Draft B to be available in mid-August to verify incorporation of all previous comments.

3. Revised text, dispositions and schedules for previously unresolved comments to be available in mid-August.

FIELD ACTIVITY REPORT - CABLE TOOL RIG

Page 1 of 2

Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-14-93	199-B9-4 ~~116-C-2A~~ mm 7/14/93	BE 22	HO-H mm 7/14/93 22-5211	ER3931	081666	1

Purpose	Reference	Location
Establish the extent of Vertical Contamination	WHC-SD-EN-AP-126 Rev. 0	116-C-2A Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth	
8"	NA	Reverse Threads	L=0.75' OD=0.75' ID=0.65'	0'	11'	Start Time 0700 mm 7/14/93
				Depth Started 0	Depth Ended 10'	End Time ~~0~~ 1530
Reference/Measuring Point: Ground Surface				Total Shift Footage: 10'		Contractor Time 8 hrs
						Total Time 8.5 hrs

Materials Used
5.77' of 8" o.c.s. threaded casing (with shoe)
5.0' of 8" o.c.s. threaded casing
5.02' of 8" o.c.s. threaded casing.

Contract Line Items
0.5 hour lunch
N A

Personnel
Operator: [signature] Lic No. 1271
DRLR: L. Watkins
HLPR: ~~J. Kelley~~ K. Olson mm 7/14/93
Other:
FTL: T. Spicer
SSO: M. Baker
CE: K. Kytola
HPT: B. Hetzer
Sampler: L. Rogers
GEO: M. Mehlhorn

Depth (feet) From	Depth (feet) To	Drilling Method HT DB ST	Description of Operations/Remarks
			0930 Geologist on site.
			0950 Geologist calibrates Ludlum #5684; B (probe number 083679) =
			7500 cpm, γ (probe #083077) = 7000 cpm. Site set up continues. OVM
			#027 is not calibrated because of malfunctioning read out. Drilling
			is delayed because ~~of drums and~~ mm 7/14/93 drums and a functional OVM
			are not on site.
			1150 Geologist and C.E. measure background values at background
	N A		site, which are: OVM #015: 0.0 ppm, Ludlum ~~#8~~ mm 7/14/93 5684: ~~B=1.25~~
		JWA 7-15-93	~~cpm~~, γ = 2800 cpm JWA 7/15/93
			1228 Drums and generator are on site.
			1232 FTL on site.
			1304 Pre-job meeting begins.
			1311 Pre-job meeting ends.
			1320 Site background is: γ = 2,000 cpm, B = 0.0 cpm, OVM = 0.0 ppm
			; Action levels: 4800 cpm γ, ~~1.25 cpm B.~~ JWA 7-15-93
0		DB	1322 Drilling begins.

Report By: Monty Mehlhorn
Title: Geologist
Signature: Monty Mehlhorn

Reviewed By: T.W. Spicer
Title: FTL
Date: 7-15-93
Signature: T.W. Spicer

DISTRIBUTION: White - File Custodian Yellow - Group Files

BC-6000-290 (3/93)

9313026013 0

FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Page 2 of 2

Date	Well Number	Continuation of Report No.
7-14-93	199-B9-4 ~~116-C-2A~~	1

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
	2	DB	1325 Geologist inspects casing, drill rig, and tool decon, they pass
	2	DB	1330 Drillers add 5.77' of ø c.s. reverse threaded casing (includes shoe)
2		DB	1336 Drilling resumes
	5	DB	~~1442~~ 1342 mm 7/14/93 1 archive sample, field screening: OVM = 0.0ppm, 2400 cpm ~~B~~ γ mm 7/14/93, 0 cpm B
	5	DB	~~1450~~ 1350 Drillers add 5' of 8" ø c.s. threaded casing
5		DB	~~1457~~ 1357 Drilling resumes.
	7	DB	~~1501~~ 1401 Field screening: OVM = 0.0 ppm, 2500 cpm γ, 0 cpm B
	10	DB	1420 1 archive and HPT sample, Field screening: OVM = 0.0 ppm, 3000 cpm γ 0 cpm B
	N	A	1425 Drillers add 5.02' of 8" ø c.s. casing.
10		DB	1430 Drilling/Casing driving begins.
	10	DB	1436 Drilling ends with 4.79' of stickup.
			1438 Geologist tranfers 5', 10' HPT samples to the HPT (B. Hetzer)
			1440 Drillers off site.
			1457 Geologist challenges Ludlum # 5684; B(#083679) = 7500 cpm, γ(#083077) = 7000 cpm.
			1500 Geologist off site.
			Summary:
	N A		1. The total daily footage was 10', and the hole was advanced from 0' to 10'.
			2. Three sections of 8" ø c.s. threaded casing were used (1-5.77' section (with shoe), 1-5.0' section, and 1-5.02' section), giving a casing total of 15.79'.
			3. Action levels for chemical sampling are (Using Ludlum #5684): 4800 cpm γ, ~~1.25 cpm B~~ JWS 7-15-93, and OVM = 5 ppm (using OVM #015). mm 7/14/93
			4. ~~Fi~~ Field screening levels did not exceed action levels. mm 7/14/93
			N A

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-15-93
Signature T.W. Spicer

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BC-6000-397 (3/93)

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-15-93	199-B9-4	BE22	HO-22-5211	ER 3931	081666	2

Purpose	Reference	Location
Establish the Extent of Vertical Contamination	WHC-SP-EN-AP-126 Rev. 0	116-C-2A Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	NA	ø c.s. reverse threads	L=0.75' ID=0.65' OD=0.75'	~11'	29.01'

Depth Started	Depth Ended
10'	31'

Reference/Measuring Point	Total Shift Footage
Ground Surface	21'

Start Time	0700
End Time	1530
Contractor Time	8hrs
Total Time	8.5hrs

Materials Used
5.02' of 8"ø c.s. threaded casing
5.0' of 8"ø c.s. threaded casing
5.02' of 8"ø c.s. threaded casing

Contract Line Items
0.5 hr lunch

Personnel
Operator: [illegible] Lic No. 1271
DRLR: L. Watkins
HLPR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: B. Hetzer
GEO: M. Mehlhorn
Samplers: K. Hulse, L. Rogers

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0659 Geologist calibrates OVM #022 with 102 ppm calibration gas lot # CC17M49, reads 103.1 ppm.
	N/A		0735 Geologist, SSO, drill crew, and HPT's on site.
			0737 Geologist calibrates Ludlum #5684 with Coleman mantle, reads: γ (#083077) = 7000 cpm, β (#083679) = 8000 cpm.
			0750 We hold a brief pre-job meeting to outline project.
10		DB	0804 Drilling begins. The site background is 2000 cpm γ, 0 cpm β, OVM = 0.0 ppm.
	11 (7-15-93)	DB	0807 Field screening: 2500 cpm γ, 0 cpm β, OVM = 0.0 ppm
	~~15~~ mm	~~DB~~	0813 ~~Archive Sample, Field screening:~~ Sample not taken because of drive barrel deflection off of cobble, casing advances. JWA 7-16-93
	17'	DB	0820 Archive Sample, Field screening: 2600 cpm γ, 0 cpm β, OVM = 0.0 ppm.
	19'	DB	0835 Field screening: 2200 cpm γ, 0 cpm β, OVM = 0.0 ppm. SSO reports 0 ppm
	18'	DB	0839 Drillers add 5.02' of 8"ø c.s. threaded casing.
18'	19'	DB	0844 Drilling resumes.

Report By: Monty Mehlhorn	Reviewed By: T.W. Spicer
Title: Geologist	Title: FTL
Signature: Monty Mehlhorn	Signature: T.W. Spicer
	Date: 7-16-93

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

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Date	Well Number	Continuation of Report No.
7-16-93	199-B7-4	2

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
	18.5	DB	0855 Field screening: 1800cpm α, 0 cpm β, 0.0 ppm = OVM
	18.5	DB	0856 Driller hits concrete slab, casing driving is very difficult @ 18.21';
			Drilling stops, and drillers grind tools.
	N/A		0900 SSO measures borehole gasses with P.I.D. and gets 0.0ppm; drillers
			~~change~~ add split tube. mm 7/16/93
			0911 Drillers measure bottom of void at 22.9'.
22.9'		~~DB~~ ST mm 7/16/93	0913 Begin split tube sampling, blows per 6": 7, 5, 10, 13, 12, 23, 20 mm 7/16/93
	26.9	ST	0920 Sampling is complete, was driven 4'. Chemical sample # B08G95 mm 7/16/93
			0925 HPT reports 40000 counts with GM
			0935 Drill crew/geologist/HPT's clear zone to don PPE.
			1045 Drillers/samplers enter zone and uncover hole.
			1049 Drillers remove St sample, and add Drive Barrel.
			1056 Drillers add 5.0' of 8" ø c.s. threaded casing, T.C. = 25.79'
	N/A		1100 Drillers drive casing through slab.
			1102 Sampler reports 100% Recovery for Chemical sample
			1104 Drill hole is sealed, stickup on the 8" ø c.s. casing is 1.95'.
			1106 Drillers leave zone, samplers open split tube for sampling.
			1147 Sampling is complete; Geologist and sampler leave zone.
			1245 Geologist, drill crew, and HPT don PPE.
26.9		DB	1256 Drillers enter zone. Drilling begins
	26.9'	DB	1312 Drillers add 5.02' of 8" ø c.s. casing; T.C. = 30.81'. Field screening:
			OVM = 0 ppm, 2800 cpm α, 0 cpm β.
	26.9'	DB	1315 Drilling resumes.
	27.5'	DB	~~1322~~ 1326 mm 7/15/93 Field Screening: 0.0 ppm = OVM, 10000 cpm α, 0 cpm β.
			1333 Drillers change tools to ST.
27.5'		ST	1340 Split-tube sampling begins. Chemical sample # B08R98 mm 7/15/93
			Blows per 6": ~~10~~ 13, 13, 16, 19, 24
	30'	ST	1344 Split-tube sampling ends. Sampler was driven 30".
			1347 Drillers remove split tube sampler, SSO measures borehole gasses,
	N/A		report 0.1 ppm with P.I.D..
			1351 Drillers drive casing.

Report By Monty Mehlhorn	Reviewed By T.W. Spicer
Title Geologist	Title FTL Date 7-16-93
Signature Monty Mehlhorn	Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Date	Well Number	Continuation of Report No.
7-15-93	199-B7-4	2

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
30		DB	1354 Drilling resumes.
			1356 Drilling stops
	30	DB	1405 Field screening: OVM = 0ppm, 13000 cpm γ, 0 cpm β
			1407 Drilling/casing driving resumes.
	30.5	DB	1413 Field screening: 4500 cpm γ, 0 cpm β, OVM = 0.0 ppm
	31	DB	1417 Field screening: 6000 cpm γ, 0 cpm β, OVM =
			1420 Drilling stops, the borehole is sealed, and there is 1.8' of stickup on the 8"φ c.s. threaded casing.
			1432 Geologist leaves zone.
			1503 Geologist challenges OVM #022, reads 105.1 ppm with 101 ppm calibration gas, Ludlum #5684 Reads 7000 cpm γ (probe #083077), 7500 cpm β (probe #083679).
			1520 Geologist leaves site.
			Summary:
			1. The total shift footage was 21', and the hole was advanced from ~~29~~ 10' to 31'. mm 7/15/93
	N A		2. Three sections of 8"φ c.s. threaded casing were added (1-5.02' section, 1-5.0' section, 1-5.02' section), giving a casing total of 30.81' (8"φ c.s. threaded), and the casing was advanced from 11' to 29.01'.
			3. Contractor time consisted of a 0.5 hr. lunch.
			4. Two split tube samples (chemical) were taken; 1 from 22.9'-26.9'; the D-liner (24.9-25.4') was sampled as sample #B08R95, and 1 from 27.5'-30', D-liner (28'-28.5') was sampled as sample # B08R98.
			N A

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL Date 7-16-93
Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

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Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-16-93	199-B9-4	BE 22	110-22-5211	ER 3931	081666	3

Purpose	Reference	Location
Establish The Vertical Extent of contamination	WHC-SP-EN-AP-126, Rev. 0	116-C-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	NA	8" ⌀ c.s. reverse threads	L=0.75' ID=0.65 OD=0.75'	29.01'	45.6'
				Depth Started 31'	Depth Ended 48'

Reference/Measuring Point	Total Shift Footage
Ground Surface	17'

Start Time	0700
End Time	1530
Contractor Time	4.5hrs
Total Time	8.5hrs

Materials Used
5.02' of 8" ⌀ c.s. threaded casing
5.0' of 8" ⌀ c.s. threaded casing
5.02' of 8" ⌀ c.s. threaded casing

Contract Line Items
0.5hr. lunch
3.5hr. afternoon HPT meeting
N A

Personnel
Operator [signature] Lic No. 1871
DRLR: L. Watkins
HB PR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: B. Helzer
Sampler: K. Hulse, L. Rogers
GEO: M. Mehlhorn

Depth (feet) From	To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0655 Geologist and drill crew on site.
			0712 FTL and sampler on site.
			0718 SSO on site.
			0723 Geologist calibrates OVM #022 with 101 ppm calibration gas
	N A		, reads 101.9 ppm, Ludlum #5684 using Coleman mantle reads:
			γ (probe #083077) = 7000 cpm , β (probe #083779) = 7000 cpm,
			HPT's on site.
			0745 Geologist, HPTs, and drill crew don PPE.
			0805 Geologist enters zone, and driller reports 0.36 ppm with P.I.D.
31		DB	0809 Drilling begins. Site background: 2300 cpm γ, 0 cpm β, OVM = 0 ppm
	33	DB	0813 Field screening: 4000 cpm γ, 0 cpm β, OVM = 0.0 ppm
	33	DB	0818 Drillers add 5.02' of 8" ⌀ c.s. threaded casing.
	33.5'	DB	0831 Field screening: OVM = 0.0 ppm, 0 cpm β, 5000 cpm γ
	33.5'	DB	0834 Field screening: 4000 cpm γ, 0 cpm β, OVM = 0.0 ppm.
	34'	DB	0852 Field screening: 3000 cpm γ, 0 cpm β, OVM = 0.0 ppm.
	35'	DB	0857 Field screening: 3000 cpm γ, 0 cpm β, OVM = 0.0 ppm

Report By Monty Mehlhorn	Reviewed By T. W. Spicer
Title Geologist	Title FTL Date 7-19-93
Signature Monty Mehlhorn	Signature T. W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Date	Well Number	Continuation of Report No.
7-16-93	199-B4-4	3

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
	NA		0900 Drillers change to split tube.
35 ~~30~~	mm 7/16/93	ST	0904 Split tube sampling begins, blows per 6": 14, 20, 17, 15, 13
	37.5	ST	0906 Split tube sampling ends, sampler was driven 30". 100% Recovery
			0911 Drillers add drive barrel; split tube sampler is removed and opened.
37.5		DB	0912 Drilling and casing driving resumes.
	37.5	DB	0918 Drilling stops, drillers add 5.02' 8" ø c.s. threaded casing; Field screening: 2000 cpm γ, 0 cpm β, OVM=0 ppm
37.5'		DB	0924 Drilling resumes.
	37.5'	DB	0932 Field screening: OVM = 0.0 ppm, 2300 cpm γ, 0 cpm β.
	38.5'	DB	0941 Field screening: OVM = 0.0 ppm, 1900 cpm γ, 0 cpm β
	40'	DB	0947 Field screening: OVM = 0.0 ppm, 1800 cpm γ, 0 cpm β
	41'	DB	0956 Field screening: OVM = 0.0 ppm, 1800 cpm γ, 0 cpm β
	42'	DB	1001 Field screening: OVM = 0.0 ppm, 2000 cpm γ, 0 cpm β
			1002 Drillers remove drive barrel, add split tube.
42'		ST	1008 Split tube sampling begins. Blows per 6": 11, 16, 16, 10, 4
	44.5'	ST	1012 Split tube sampling ends. Sampler was driven 30", 85% Recovery
	NA		1016 Drillers add drive barrel.
~~44.5~~	mm 7/16/93 ~~44'~~	~~DB~~	1022 Drillers add 5' of 8" ø c.s. threaded casing.
44.5		DB	1033 Drilling resumes.
	43	DB	1035 Field screening: 2000 cpm γ, 0 cpm β, OVM = 0.0 ppm
	44	DB	1044 Field screening: ~1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
	46	DB	1056 Field screening: ~1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
	47	DB	1107 Field screening: ~1900 cpm γ, 0 cpm β, OVM = 0.0 ppm
	48	DB	1111 Field screening: ~1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
			1119 Drillers leave zone. There is ~0.25' of stickup (8" ø c.s. threaded casing).
			1145 HPTs off site
			1149 Samplers, SSO offsite.
	NA		1154 Geologist challenges OVM #022, reads 97.3 ppm with 101.0 ppm calibration gas. Ludlum #5684 reads γ (probe #083077) = 6500 cpm, β (probe #083679) = 7000 cpm. mm 7/16/92
			1209 Geologist leaves site.
			NA

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-19-93
Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Date	Well Number	Continuation of Report No.
7-16-93	199-B9-4	3

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			Summary:
			1. A total of 17' was drilled today, and the hole was advanced from 31' to 48'.
			2. Three sections of 8"Ø c.s. threaded casing were added to the hole (1-5.02' section, 1-5.02' section, 1-5.0' section), giving a casing total of 45.85'. The 8"Ø c.s. threaded casing was advanced from 29.01' to 45.60'.
			3. Contractor time consisted of a 0.5 hr lunch, and a 3.5 hr. afternoon HPT meeting.
			4. Two chemical samples were taken: Sample #B08RB1 was taken from 35' to 37.5', and D (35.5'-36'), and B (36.5'-37') liners were sampled, and sample #B08RB2 was taken from A (~~2100 cpm γ~~ mm 7/16/93 44'-44.5'), B (43.5'-44'), and C (43'-43.5') liners.
			5. Radiological contamination gradually decreases downhole, and was 1800 cpm γ, 0 cpm β, with out any chemical contamination being detected.
	N/A		
			N/A

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-19-93
Signature TW. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

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Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-19-93	199-B9-4	BE 22	40-22-5211	ER3931	081666	4

Purpose	Reference	Location
Establish The Vertical Extent of Contamination	WHC-SD-EN-AP-126, Rev.0	116-C-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	~~NA~~ 54.2'	8" c.s, Reverse Threads	L=0.75' OD=0.75' ID=0.605'	45.6'	54.2'
				Depth Started 48'	Depth Ended 56.5'

Reference/Measuring Point	Total Shift Footage
Ground Surface	8.5'

Start Time	0700
End Time	1530
Contractor Time	7.25 hrs
Total Time	8.5 hrs

Materials Used
4.96' of 8" ø c.s. threaded casing
4.99' of 8" ø c.s. threaded casing

Contract Line Items
0.5 hr lunch
0.75 HPT delay
N A

Personnel
Operator: [illegible] Lic No. 1271
DRLR: L. Watkins
HLPR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: B. Hetzer
Sampler: K. Hulse, L. Rogers
Geo: M. Mehlhorn

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0702 Geologist and drill crew on site.
			0705 SSO on site.
			0717 FTL, samplers on site.
			0720 Geologist calibrates OVM #022, reads 102.6 ppm with 101 ppm calibration gas; Ludlum # 5684 reads with Coleman Mantle:
			γ (#083077) = 7000 cpm, β (#083679) = 7500 cpm
	N	A	0753 HPT on site, drilling is delayed because of lack of HPT's
			0757 Tailgate Meeting begins.
			0803 We ON ppe.
			~~080~~ 0818 Drillers enter zone, and measure borehole gasses with P.I.D., which are: 0 ppm.
			0825 Drillers add 4.96' of 8" ø c.s. threaded casing.
			0832 Geologist measures site background, which is: 2200 cpm γ, 0 cpm β, OVM = 0.0 ppm.
48'		DB	0833 Drilling begins.
	48.5	DB	0840 Field screening: 1800 cpm γ, 0 cpm β, OVM = 0.0 ppm.

Report By: Monty Mehlhorn
Title: Geologist
Signature: Monty Mehlhorn

Reviewed By: T. W. Spicer
Title: FTL
Date: 7-21-93
Signature: T. W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Page 2 of 3

Date	Well Number	Continuation of Report No.
7-19-93	199-B9-4	4

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
	NA		0841 Drillers add split tube sampler
48.2	~~Nt~~ mm 7/19/93	ST	0845 Split tube sampling begins. Blows per 6": 14, 20, 21, 13, 20
	50.7	ST	0848 Split tube sampling ends. Sampler was driven 30'. Chemical
		A	sample #B08~~BR~~RB3 mm 7/19/93, archive, and HPT sample taken. 85% recovery
	N		0852 Drillers add drive barrel.
50.7		DB	0854 Drilling / ~~cam~~ casing driving begins. mm 7/19/93
	50.7	DB	0908 Field screening: 1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
	51.5	DB	0912 Field screening: 1600 cpm γ, 0 cpm β, OVM = 0.0 ppm, drillers add
	NA		4.99' of ~~8~~ 8" c.s. threaded casing. JWS 7/21/93
	52.5	DB	0928 Field screening: 1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
	53.5	DB	0939 Field screening: 1700 cpm γ, 0 cpm β, OVM = 0.0 ppm
	54	DB	0947 Field screening: 1700 cpm γ, 0 cpm β, OVM = 0.0 ppm
	55'	DB	0956 Drillers ~~tabc~~ tag hole at 55'; 1 archive, 1 HPT sample; field
	N A		screening: 1800 cpm γ, 0 cpm β, OVM = 0.0 ppm
			1000 Drillers add split-tube sampler.
55		ST	1002 Split tube sampling begins. Blows per 6": 12, 50, 122
	56.5	ST	1007 Split tube sampling ends, sampler was refused at 56.5',
			50% recovery, Chemical sample #B08RB4. ~~B~~ The casing (8" c.s. mm 7/19/93
			threaded) is bottomed at 54.2', has a ~~total length of~~ stickup mm 7/19/93
			of 1.6'.
			1026 Drillers tag the hole at 55.7'.
			1030 Gamma loggers lower probe into hole and begin logging.
			1035 Geologist / drill crew leave zone.
	N A		1130 Drillers break for lunch
			1205 Drillers return to work; gamma logging continues.
			1218 Westinghouse Q.A. on site.
			1221 Westinghouse Q.A. off site.
			1235 Geologist begins Cr^{6+} test.
			1335 Geologist completes Cr^{6+} test; Cr^{6+} is less than 500 ppb.
			1337 Gamma logging is complete.
			1412 Geologist challenges OVM #022, which ~~read~~ reads 99.6 ppm mm 7/19/93

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T. W. Spicer
Title FTL
Date 7-21-93
Signature T. W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Date	Well Number	Continuation of Report No.
7-19-93	199-B9-4	4

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			with 101 ppm calibration gas. Ludlum # 5684 reads with Coleman mantle: γ(#083077) = 7000 cpm, β(#083179) = 7500 cpm, all work within zone is complete.
			1430 Geologist leaves site.
			Summary:
			1. The total shift footage was 8.5', and the hole was advanced from 48' to 56.5' (total depth).
			2. Two sections of 8" ~~Ø~~ WA 7/21/93 c.s. threaded casing were added (1-4.96' section, 1-4.59' section), bringing the casing total to ~~55.8'~~ 55.82' mm 7/21/93. The 8" p.c.s. casing was advanced from ~~48~~ mm 7/19/93 45.6' to a final depth of 54.2', with a stickup of 1.6'.
			3. Contactor time consisted of a 0.5 hr lunch, and a 0.75 hr HPT delay.
N	A		4. Two chemical samples were taken: 48.2'-50.7': Sample #B08 RB3 (D(48.7'-49.2') and C(49.2'-49.7')-liners were sampled, and Sample #B08RB4: 55'-56.5'; sampling intervals were shortened due to split tube sampler refusal (possible cobbles); all liners were sampled.
			5. Gamma logging occurred from 1030 to 1337.
			6. The Cr^{6+} content of the sediments of 56.5' is less ~~than~~ than mm 7/19/93 500 ppb.
			N A

Report By Monty Mehlhorn	Reviewed By T.W. Spicer
Title Geologist	Title FTL Date 7-21-93
Signature Monty Mehlhorn	Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

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Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-20-93	199-B9-4	BE 22	40-22-5211	ER 3931	081666	5

Purpose	Reference	Location
Establish the Vertical Extent of Contamination	WHC-SD-EN-AP-126 Rev. 0	116-C-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	54.2"	8" O.C.S. Reverse Threads	L=0.75' OD=0.75' ID=0.65'	54.2'	54.2'
				Depth Started 56.5	Depth Ended 56.5

Reference/Measuring Point	Total Shift Footage
Ground Surface	NA

Start Time 0700
End Time 1530
Contractor Time 0hrs
Total Time 8.5 hrs

Materials Used: N A

Contract Line Items: 8.5 hr. annual refresher; N A

Personnel
Operator [illegible] Lic No. 1771
DRLR: L. Watkins
HLPR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: B. Hetzer
Sampler: K. Hulse, L. Rogers
Geo: M. Mehlhorn

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0700 work did not occur at this site today because the driller and helper took an 8 hr. annual refresher course.
	N A		N A

Report By	Reviewed By
Report By: Monty Mehlhorn	Reviewed By: T. W. Spicer
Title: Geologist	Title: FTL
Signature: Monty Mehlhorn	Signature: T. W. Spicer
	Date: 7-21-93

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

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Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-21-93	199-B9-4	BE22	HO-22-5211	ER 3931	081666	6

Purpose	Reference	Location
Establish the Vertical Extent of Contamination	WHC-SD-EN-AP-126 Rev. 0	116-C-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	54.2'	8"ϕ C.S. Reverse Threads	L=0.75' OD=0.75' ID=0.65'	54.2'	20.38'
				Depth Started 55.85'	Depth Ended 22.2'

Reference/Measuring Point: Ground Surface

Total Shift Footage: 33.65'

Start Time 0700
End Time 1530
Contractor Time 3.5 hrs
Total Time 8.5 hrs

Materials Used: 24-50 lb bags of bentonite hole plug

Contract Line Items:
- 2.25 hr. morning delay
- 0.75 hr. lunch
- 2 hr. afternoon delay
- N A

Personnel
Operator L. Watkins Lic No. 1271
DRLR: L. Watkins
HR PR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: K. Northrup
Samplers:
Geo: M. Mehlhorn

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			~~0746~~ 0700 Geologist and drill crew on site.
			0706 SSO on site.
			0720 FTL on site.
			0734 HPT on site.
			0735 We hold tailgate meeting to discuss hole abandonment options.
			0748 FTL and driller leave site to discuss casing backpulling procedure to advance casing past crib void.
	N A		0809 FTL and driller return. We continue to discuss options for hole abandonment.
			0828 FTL leaves site to talk to K. Kytola about hole abandonment options.
			0848 FTL is back on site.
			0915 Drillers don PPE and enter zone to prepare for hole abandonment.
			0922 FTL leaves site.
			0930 Drillers set up casing decon pad inside zone.

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-22-93
Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Page 2 of 3

Date	Well Number	Continuation of Report No.
7-21-93	199-B9-4	6

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			0947 Driller tags hole bottom at 55.85', the bottom of the casing is 54.22'
			0950 HPTs arrive on site.
			0956 FTL on site.
			0958 Drillers add 10 bags of bentonite ~~hole plug~~ crumbles the stickup (8"Φ c.s. threaded casing), ~~the~~ MM 7/21/93 is 2.25', and the hole bottom is now 34.05', with an overlap of 20.17'. JWS 7/22/93
			1004 Pull 4.99', total casing = 51.5' (with drive head), 50.83' without drive head;
			1017 Hole depth is 36.5', stickup is 1.9', overlap = 13.1', casing bottom is 49.6'.
			1023 Pull 4.96', total casing = 46.54' (with drive head), 45.87' with out drive head.
			~~1027 Driller tags hole bottom at (with~~ MM 7/21/93 ~~is~~ MM 7/21/93 ~~; tape reading = 39.9'~~
			1029 Drillers add 10 bags of bentonite ~~hole plug~~ crumbles. JWS 7/22/93
	N/A		1032 Tag hole at 15.05' (stickup = 2.15'), bottom of casing: 44.39', overlap = 29.34'. MM 7/21/93
			1034 Pull 5.00', total casing = 41.54' (with drive head), 40.87' without drive head, casing bottom = 39.44'
			1037 Drillers tag hole at 16.5' (stickup = 2.1'), overlap = ~~27.89'~~ 22.94'. MM 7/21/93
			1041 Pull 5.02', total casing = 36.54' (with drive head), 35.85' without drive head, bottom of casing = 33.62', stickup = 2.9' MM 7/21/93
			1047 Tag hole at 18.9', overlap = 14.72'
			1049 Pull 5.02', total casing = 31.5' (with drive head), 30.83' without drive head, bottom of casing = 28.85, stickup = 2.65'
			1055 Tag hole at: 19.95', overlap = 8.9'
			1056 Drillers cover hole and prepare to leave zone.
			1116 Drill crew breaks for lunch.
			1212 Drill crew dons PPE.
			1227 Drillers enter zone, pull 5.02', total casing = 26.48' (with drive head), 25.81' without drive head, bottom of casing = 24.25', stickup = 2.25', casing removal is delayed because of HPT.

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-22-93
Signature J.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Date	Well Number	Continuation of Report No.
7-21-93	199-B9-4	6

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			1327 FTL on site; drillers prepare to pull casing.
			1250 Driller tags hole at 21.05', overlap = 3.18'.
			1253 Drillers add 4 bags of bentonite ~~hole plug~~ crumbles. JWA 7/22/93
			1255 Tag hole at 11.75', overlap = 12.5'.
			1257 Pull 1.6'; tag hole at 12.25'; bottom of casing = 22.63', overlap = 10.38'; stickup = 3.85'.
			1302 Pull 1.75', ~~stickup = 10.38'~~ overlap, stickup = ~~3.85'~~ 5.56', Tag hole at 22.24', casing bottom = 20.92', overlap = -1.32'.
			1307 Pull 1.65', total casing = 21.48' (with drive shoe), total casing = 20.81' (without drive head), stickup = 1.1', bottom of casing = 20.38', overlap = -1.82', work is delayed until FTL can proceed with proper void bridging material.
			1323 FTL is back on site.
			1325 Driller tags hole at 22.2'
N	A		1328 Work on site is stopped until a 6" section of casing arrives on site to bridge space in crib.
			1335 Drillers leave zone. We are waiting for a 6" wide hole plug (steel ~~cast~~ casing).
			1400 HPT's are off site.
			1440 Geologist leaves site; instruments were not used today for sample screening purposes.
			Summary:
			1. The borehole was abandoned from 56.5' to 22.2'; further advance awaits resolution of void-space material to be used.
			2. The total amount of 8" o.c.s. casing remaining in the hole is 21.48' (with drive shoe), and has a stickup of 1.1'.
			3. A total of 24 bags of bentonite ~~hole plug~~ crumbles were used (50lb sacks). JWA 7/22/93
			4. Contractor time consisted of a 2.25 hr. morning delay, a 0.75 hr. Lunch, and a 2 hr. afternoon delay.

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-22-93
Signature T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

Page 1 of 5

Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-22-93	199-B9-4	BE 22	HO-22-5211	ER 3931	08166	7

Purpose	Reference	Location
Establish the Extent of Vertical Contamination	WHC-SD-EN-AP-126 Rev. 0	116-C-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
8"	NA	8"ø c.s. threaded	L=0.75' OD=0.75' ID=0.65'	20.38'	0'
				Depth Started	Depth Ended
				22.2'	0'

Start Time	0700
End Time	1530
Contractor Time	3.0
Total Time	8.5 hrs

Reference/Measuring Point: Ground Surface

Total Shift Footage: JWS 7/23/93 ~~22.2~~ 0

Materials Used
7.01' of 6"ø c.s. casing with shoe
2 bags of bentonite chips (50 lb.)
17 bags of bentonite hole plug (50 lb.)
3/4 bag of Portland cement (90 lb)

Contract Line Items
2.5 hr. morning Teamster delay.
0.5 hr. lunch
1.5 hr. afternoon delay
N A

Personnel
Operator: L. Watkins Lic No. 1271
DRLR: L. Watkins
HLPR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
HPT: K. Northrup
GEO: M. Mehlhorn

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0700 Geologist and drill crew on site.
			0710 SSO on site.
			0725 HPT's on site.
			0740 FTL on site, we meet to discuss solution for plugging hole and are waiting on teamster to deliever bentonite chunks and 6" casing.
			0830 FTL on site.
	N	A	0920 Teamsters are on site
			0934 Geologist measures dimensions of steel pipe, which are: L=7.01', W= ~~5~~ 0.55' (mm 7/22/93), Drive shoe dimensions: L=0.82', OD=0.62', ID=0.50', drillers prepare to modify casing so that it may be removed if it does not work.
			0945 Drillers don PPE.
			0957 Drillers enter zone.
			1001 Drillers place 6"ø c.s. casing into hole, and the overlap between the 6"ø c.s. casing and the 8"ø c.s. casing is 3.38'

Report By: Monty Mehlhorn
Title: Geologist
Signature: Monty Mehlhorn

Reviewed By: T.W. Spicer
Title: FTL
Date: 7-23-93
Signature: T.W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

mm 7/22/93 Page ~~2~~ 2 of 5

Date	Well Number	Continuation of Report No.
7-22-93	199-B9-4	7

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			1010 Pull 2.8'; overlap between the 6"ø c.s. casing and the 8"ø c.s. casing is: 0.58'
			1012 Drillers add 2 bags of Bentonite crumbles, overlap = -1.32'
			1015 Drillers add ~~2~~ 1 bags of Bentonite ~~chips~~ crumbles, overlap = 2.58' mm 7/22/93
			1018 Drillers add 2 bags of Bentonite ~~crumbles~~ chips, overlap = 6.48' JWS 7-23-93
			1020 Drillers add 1 bag of Bentonite crumples, overlap = 8.78' JWS 7-23-93
			1026 Drillers add ~~3~~ 2 bags of Bentonite crumbles, overlap = -0.32' mm 7/22/93
			1030 The overlap between the 8"ø c.s. casing and the 6"ø c.s. casing is 0.42'. The bentonite appears to be falling around the 6"ø c.s. casing into the crib.
			1050 Drillers place large bag and 2 bags of bentonite into hole.
			1055 Drillers tag hole bottom at 11.15, overlap = 5.53
			1057 Pull 1', drillers remove 5.02' casing, overlap = 2.96'.
			1106 Drillers add 1 bags of bentonite, 1 plastic sack, overlap = 4.86
N	A		1108 Pull 1.1', overlap = 2.76', hole bottom: 10.7'
			1111 Add 1 bag of crumbles, hole bottom: 7.2'
			1112 Add 5 bags of crumbles, ~~pull~~ Remove 5.02' of 8"ø c.s. casing, over-lap = 6.0'. mm 7/22/93
			1121 Add 2 bags of bentonite crumbles ~~hole plug~~. JWS 7/23/93
			1125 Drillers leave zone for lunch.
			1211 Drillers don PPE.
			1224 Drillers enter zone; work is delayed because the HPT is not in the zone.
			1235 HPT enters zone, drillers remove 5' of 8"ø c.s. casing
			1240 Drillers pull the remaining 5.77' of 8"ø c.s. casing, hole abandonment is complete. Drillers add 1 bag of bentonite crumbles to complete the hole. Drillers begin to dismantle drill rig and other equipment present in the zone.
			1319 Drillers leave zone. SCA zone is downgraded to an RCA.
			1330 Drillers enter zone and decontaminate equipment.
			1405 Drillers leave zone after setting up equipment for decon.

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-23-93
Signature T.W. Spicer

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9 3 1 3 0 2 6 0 1 4 6

FIELD ACTIVITY REPORT - CABLE TOOL RIG - CONTINUATION PAGE

Page 3 of 5

Date	Well Number	Continuation of Report No.
7-22-93	199-B9-4	7

Depth (feet) From	Depth (feet) To	Drilling Method (HT) (DB) (ST)	Description of Operations/Remarks
			1425 HPTs leave site.
			Summary:
			1. The hole was advanced from 22.2' to 0', and the borehole abandonment was complete. The remaining 21.48' of 8"ø c.s. threaded casing was removed from the hole.
			2. Materials used include 7.01' of 6"ø c.s. casing, 2-50lb. bags of bentonite chips, 17 bags of bentonite hole plug, and 3/4 bag of Portland cement (90lb).
			3. Contractor time consisted of a 2.5hr. teamster delay, a 0.5hr lunch, ~~and a 1.5 hr afternoon delay.~~ JWS 7-23-93
	N	A	
			N A

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T.W. Spicer
Title FTL
Date 7-23-93
Signature T.W. Spicer

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FIELD ACTIVITY REPORT - DRAWING CONTINUATION PAGE

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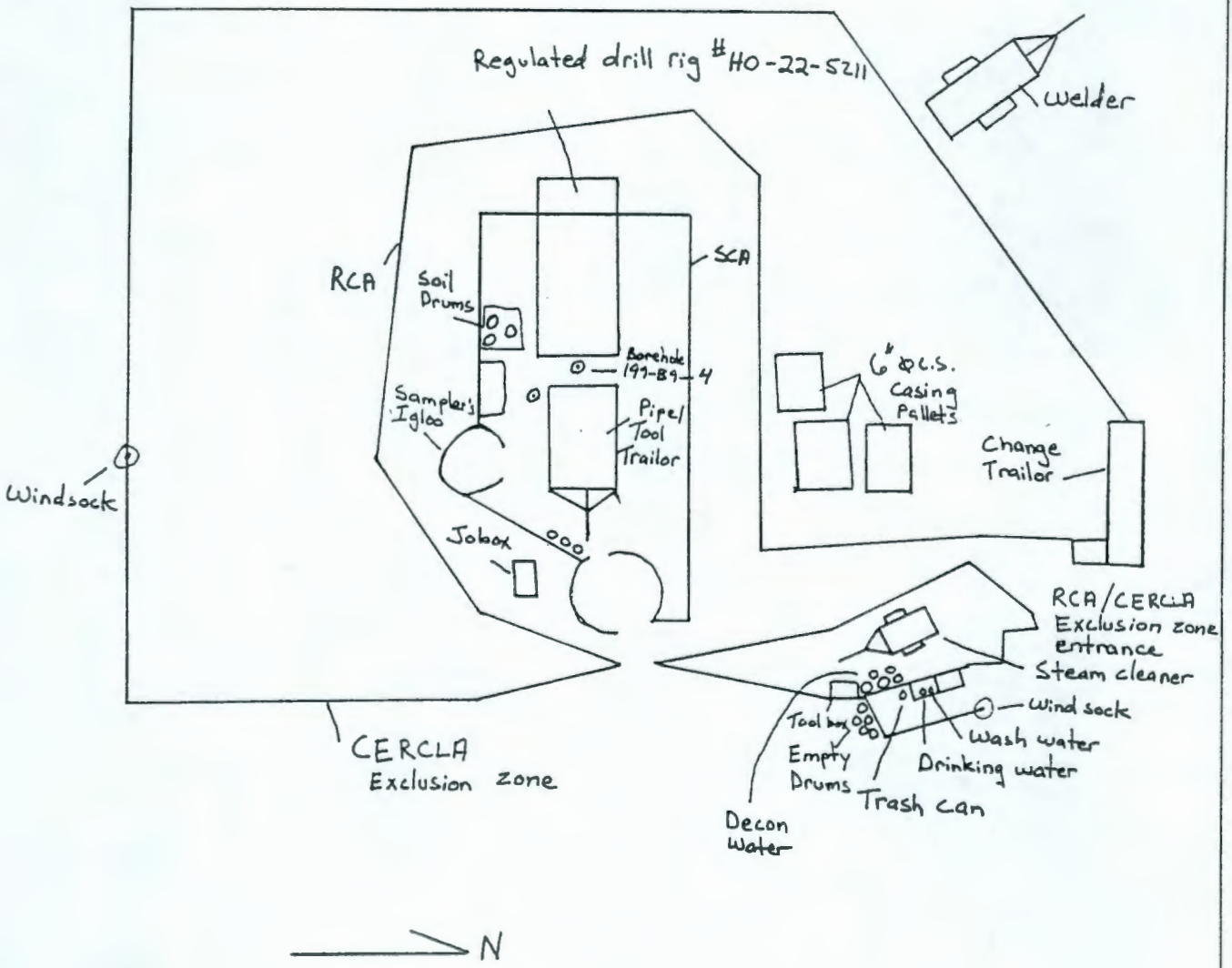
Date	Well Number	Continuation of Report No.
7-22-93	199-B9-4	7



199-B9-4 Borehole Site, Project #100-BC-2, 116-C-2a Crib

Not to scale

Report By Monty Mehlhorn	Reviewed By T.W. Spicer
Title Geologist	Title F.T.L. Date 7-23-93
Signature Monty Mehlhorn	Signature T.W. Spicer

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FIELD ACTIVITY REPORT - TUBULAR GOODS TALLY

Page 5 of 5

Date	Well Number	Continuation of Report No.
7-22-93	199-B9-4	7

Jt. No.	Length (in feet)	Jt. No.	Length (in feet)	Jt. No.	Length (in feet)	Jt. No.	Length (in feet)	Jt. No.	Length (in feet)
1	5.77'(w/shoe)	21	N/A	41	N/A	61	N/A	81	N/A
2	5.00'(10.77')	22		42		62		82	
3	5.02'(15.79')	23		43		63		83	
4	5.02'(20.81')	24		44		64		84	
5	5.0'(25.81')	25		45		65		85	
6	5.02'(30.83')	26		46		66		86	
7	5.02'(35.85')	27		47		67		87	
8	5.02'(40.87')	28		48		68		88	
9	5.00'(45.87')	29		49		69		89	
10	4.96'(50.83')	30		50		70		90	
11	4.99'(55.82')	31		51		71		91	
12	.67'(56.49')	32		52		72		92	
13	N/A	33		53		73		93	
14		34		54		74		94	
15		35		55		75		95	
16		36		56		76		96	
17		37		57		77		97	
18		38		58		78		98	
19		39		59		79		99	
20		40		60		80		100	
TOTAL	56.49'	TOTAL		TOTAL		TOTAL		TOTAL	

REMARKS 8" a.c.s. threaded casing.
7-19-93, There is 1.6' of stickup on the 8" a.c.s. threaded casing, which is set at 54.22'

Total for Page:	1	56.49 FT
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Total for Page:		N/A FT
Total (All)		56.49 FT

TALLY PAGE NO. 1

Report By Monty Mehlhorn
Title Geologist
Signature Monty Mehlhorn

Reviewed By T. W. Spicer
Title FTL
Date 7-23-93
Signature T. W. Spicer

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FIELD ACTIVITY REPORT - CABLE TOOL RIG

Date	Well No.	Rig Model	Rig No.	Contract/Work Order No.	Start Card No.	Report No.
7-23-93	199-B9-4	BE 22	HO-22-5211	ER 3931	081666	8

Purpose	Reference	Location
Establish the Vertical Extent of Contamination	WHC-SD-EN-AP-126, Rev. 0	116-Z-2a Crib

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
NA				NA	NA
				Depth Started	Depth Ended
				NA	NA

Reference/Measuring Point: Ground Surface

Total Shift Footage: NA

Start Time: 0700

End Time: 1530

Contractor Time: ~~3.5~~ 3.0 hrs (JWA 7/26/93)

Total Time: 8.5hrs

Materials Used: N A

Contract Line Items:
- 1 hr. morning training (K.E.H.)
- 3.5 hr. K.E.H. safety meeting
- 0.5 hr. Lunch
- N A

Personnel:
Operator: L. Watkins Lic No. 1271
DRLR: L. Watkins
HLPR: K. Olson
Other:
FTL: T. Spicer
SSO: M. Baker
GEO: M. Mehlhorn
HPT: K. Hartelius

Depth (feet) From	Depth (feet) To	Drilling Method (HT DB ST)	Description of Operations/Remarks
			0700 Geologist and drill crew on site.
			0722 FTL on site.
			0800 Drillers begin work outside of zone.
			0815 HPT on site. Drillers continue ~~de~~ mobilization actities and
			begin decontaminating 8" o.c.s. threaded casing.
			0938 Driller informs me that casing decon is delayed
			because of steam cleaner problems.
	N	A	1023 Drillers leave site for K.E.H. safety meeting; Casing decon is
			complete.
			1030 HPTs leave site.
			1120 Geologist leaves site.
			N A

Report By: Monty Mehlhorn
Title: Geologist
Signature: Monty Mehlhorn

Reviewed By: T.W. Spicer
Title: FTL
Date: 7-26-93
Signature: T. W. Spicer

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BC-6000-290 (3/93)

9313026011 50

Control Number	100 NPL Agreement/Change Control Form	Date Submitted
54	__ Change X Agreement __ Information Operable Unit(s) _____	6/23/93 Date Approved

Document Number & Title:	Date Document Last Issued
100 HR-3 Reduced Sample List	N/A

Originator	Phone
S. E. Vukelich	376-5158

Summary Description

See Attached.

Justification and Impact of Change

Steve Vukelich Steve Vukelich 6/23/93 6/23/93
WHC Operable Unit Coordinator Date

6/24/93
DOE Unit Manager Date

6/30/93
Lead Regulatory Unit Manager Date

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

9313026015 1

June 18, 1993

100 HR-3
REDUCED SAMPLE LIST

Introduction Groundwater wells in the 100 HR-3 Operable Unit have been sampled for 3 rounds for a full list of analytes. This list included volatile and semi-volatile organics, pesticides/PCB's, cyanide, mercury, metals, radionuclides, anions and hydrazine. The results of these 3 rounds of analyses have identified constituents not present in the groundwater and identified contaminants of concern in the 100 HR-3 Operable Unit. This reduced sample list proposes to only sample for the contaminants of concern within each reactor area within the Operable Unit.

Proposed Sample List

Analyte	D/DR Reactor	H Reactor	600 Area
ICP Metals	X	X	X
Anions/Cations	X	X	X
Gross Alpha	X	X	X
Gross Beta	X	X	X
Tritium	X	X	X
Strontium-90	X	X	X
Technetium-99		X	
Uranium-235		X	
Uranium-238		X	

9 3 1 3 0 2 6 0 1 5 2

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Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units
July 28, 1993

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Dennis Faulk . . . . . 100 Aggregate Area Manager, EPA (B5-01)
Ward Staubitz, USGS . . . . . Support to EPA
Audree DeAngeles, PRC . . . . . Support to EPA

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Chris Widrig, PNL (Please route to:) . . . . . (K1-21)
- Wayne Martin, PNL . . . . . (K1-19)
- Mark Hanson, PNL . . . . . (K1-51)
- Roy Gephart, PNL . . . . . (K1-22)
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