START

0021752

Final

Meeting Minutes Transmittal/Approval
Unit Manager's Meeting: 200 Aggregate Area/200 Area Operable Units
Regular Session: 450 Hills, Richland, Washington
Special Session: WDOE Conference Room, Kennewick, Washington

April 23, 1992

FROM/APPROVAL: Allan Harris (signature) Date 5-28-92
Allan Harris, 200 Aggregate Area Unit Manager, RL (A5-19)

APPROVAL: Doug Sherwood (signature) Date 5-28-92
Doug Sherwood, 200 Aggregate Area Unit Manager, EPA (B5-01)

APPROVAL: Darci Teel (signature) Date 5-28-92
Darci Teel, 200 Aggregate Area Unit Manager, WA Dept of Ecology

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

| | | |
|---|---|---|
| Attachment #1 | - | Meeting Summary |
| Attachment #2 | - | Agenda |
| Attachment #3 | - | Attendance |
| Attachment #4 | - | Action Item Status List |
| Attachment #5 | - | Status of 200 Aggregate Area Management Study Program |
| Attachment #6 | - | 200 AAMS Geophysical Logging and Groundwater Sampling Field Activities Update |
| Attachment #7 | - | 200-UP-2 Work Plan Status |
| Attachment #8 | - | 200-UP-2 and 200-UP-1 Operable Unit Class II Change Request |
| Attachment #9 | - | Preliminary Analysis of Spectral Gamma-Ray Logging Data Collected at the 216-U-1 and 216-U-12 Cribs |
| Attachment #10 | - | 200-West Area Groundwater Aggregate Area Management Study |
| Attachment #11 | - | MEPAS-A Risk Computation Code for Ranking/Prioritization Applications |



Prepared by: Date:
Bill Fryer, Suzanne Clarke, GSSC

Concurrence by: (signature) Date: 5/20/92
Curt Wittreich, WHC Coordinator

Attachment #1
Meeting and Summary of Commitments and Agreements
Unit Manager's Meeting: 200 Aggregate Area/200 Area Operable Units

April 23, 1992

1. **SIGNING OF THE MARCH 200 AREA UNIT MANAGER'S MEETING MINUTES:**

   Minutes from the March 200 Areas Unit Manager's Meeting were reviewed and approved after changes were made to the status of action items (Attachment #4).

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

   No updates were made to existing Action Items.

3. **NEW ACTION ITEMS (INITIATED APRIL 23, 1992):**

| | |
|---|---|
| 2AAMS.6<br>Allan Harris | Allan Harris will meet with Mike Thompson to clarify what changes to the UP-1 and UP-2 units will be sought in a Level 2 Change Request. A new Change Request will be submitted after Allan meets with RL management and the TPA Project Manager Board. |

4. **STATUS 200 AGGREGATE AREA MANAGEMENT STUDIES**

   - The status of 200 Area Management Study Program is shown in Attachment 5.
   - The update of the 200 AAMS Geophysical Logging and Groundwater Sampling Field Activities is shown in Attachment #6.
   - Status of 200-UP-2 work plan was updated, see Attachment #7. A draft Change Request for revising the content and boundaries of the 200-UP-2 Operable Unit was distributed to the regulators, see Attachment #8.

   <u>Agreement</u>: Meeting to review regulator comments on the draft Z Plant AAMS scheduled for Monday 4/27/92 at EPA's Richland Office for RL, WHC and Ecology.

5. **SCREENING/LOGGING COMPARISONS:**

   - Randall Price presented preliminary borehole RLS logging data from the U Plant Aggregate Area. Viewgraphs from this presentation are reproduced in Attachment #9.

6. **INFORMATION ITEMS:**

   - Darci Teel is now the Ecology 200 Aggregate Area manager.

7. **200-WEST GROUNDWATER AGGREGATE AREA (Afternoon Session, WDOE Conference Room, Kennewick, Washington)**

   - A presentation of the outline and strategy for the development of the 200-West Groundwater Aggregate Area Management Study Report was presented by Ebasco (see Attachment 10) and the Multimedia Environmental Pollutant Assessment System (MEPAS) model was presented by PNL (see Attachment 11).

Attachment #2
Unit Manager's Meeting: 200 Aggregate Area/200 Area Operable Units
April 23, 1992

Agenda

- **200 AAMS Activities** - Curt Wittreich
  - Status of AAMSRs
  - Status of 200-UP-2 Work Plan
- **Special Session - 200 West Groundwater AAMS**
  - Introduction - Curt Wittreich
  - Overview of 200 West Groundwater AAMS (Chapters 1-4 and 6-9) - Ken Johnson
  - Overview of MEPAS Code - Jim Droppo
  - Use of MEPAS Code for 200 West Groundwater AAMS (Chapter 5) Ebasco

**Attachment #3a**

**Status of 200 AAMS Activities**, MORNING SESSION
**Official Attendance Record**
**April 22, 1992**

Please print clearly and use black ink

| PRINTED NAME | SIGNATURE | ORGANIZATION | O.U. ROLE | TELEPHONE |
|---|---|---|---|---|
| William Fryer | [signature] | SWEC | GSSC | 509-376-9536 |
| Brian Drost | [signature] | USGS | EPA Support | 206-593-6510 |
| Ward Staubitz | [signature] | USGS | EPA Support | 206-593-6510 |
| Doug Sherwood | [signature] | EPA | Unit Manager | 509-376-9529 |
| Jerry Shuster | [signature] | PRC | EPA Support | 206 624-2692 |
| RANDALL PRICE | [signature] | WHC | 100 AAMS 200 AAMS | 509-372-1120 |
| William J Mollio | [signature] | SWEC | GSSC | 509-376-8995 |
| Chuck Cline | [signature] | Ecology | Geologist | (206) 438-7555 |
| PAMELA INNIS | [signature] | EPA | UNIT MANAGER | 509/376-4919 |
| Hal Downey | [signature] | WHC | WHC Prog. Off. | 509/376-5537 |
| Jon Sprecher | [signature] | B&C | Ecology Support | (503) 244-7005 |
| RICH MULLEN | [signature] | PARAMETRIX | Ecology Support | (206) 455-2550 |
| Richard Hibbard | | Ecology | UNIT SUPPORT | (206) 493-9367 |
| [illegible] | [signature] | | | |
| DENNIS FAULK | [signature] | EPA | Unit Manager | 376-8631 |
| Laurence Gadbois | [signature] | EPA | Unit Manager | 376-9884 |
| Suzanne Clarke | [signature] | SWEC | GSSC | 372-0630 |
| MICHAEL J GALGOUL | [signature] | WHC | TECH COOR. | 376-2038 |
| M.A. Buckmaster | [signature] | WHC | 200 Area Support | 376-1792 |
| David B. Erb | [signature] | WHC | Tech Coord. | 372-1402 |
| Allan C. Harris | [signature] | DOE | Unit Manager | 376-4339 |
| Billie Mauss | [signature] | Ecology | U-Plant CERCLA | 546-2763 |
| Dave Teel | [signature] | Ecology | OU CERCLA | 546-2312 |
| CURT WITTREICH | [signature] | WHC | Tech. Coord | 376-1862 |
| Rich Carlson | [signature] | WHC | 200/300 Mgr | 376-9027 |

Attachment #3b

Status of 200 AAMS Activities, AFTERNOON SESSION
Official Attendance Record
April 22, 1992

Please print clearly and use black ink

| PRINTED NAME | SIGNATURE | ORGANIZATION | O.U. ROLE | TELEPHONE |
|---|---|---|---|---|
| WILLIAM FRYER | [signature] | SWEC | GSSC | 509 376 9830 |
| PAMELA INNIS | [signature] | EPA | UNIT MANAGER | 509/376-4919 |
| Ken Johnson | Kenneth H. Johnson | EBASCO | Subcontractor | 206/451-4618 |
| Dennis Faulk | [signature] | EPA | Unit Manager | 376-8631 |
| Allan C. Harris | [signature] | DOE | Unit Manager | 376-4339 |
| Brian Drost | [signature] | USGS | EPA Support | 206-593-6510 |
| MICHAEL CONNELLY | [signature] | WHC | GEOSCIENCE SUPPORT | 376-6864 |
| David Erb | [signature] | WHC | Tech Coord. | 372-1402 |
| Michael J Galgoul | [signature] | WHC | Tech Coord | 376-2038 |
| Dave McCormack | [signature] | Ebasco | Subcontractor | (206)451-4617 |
| James G Droppo | [signature] | PNL | Contractor | 509-376-7652 |
| Jerry Shuster | [signature] | PRC-EMI | EPA Contractor | (206)624-2692 |
| William J Mallio | William J Mallio | SWEC | GSSC | 509 376 6995 |
| Doug Sherwood | [signature] | EPA | Unit Manager | 509-376-9529 |
| Suzanne Clarke | Suzanne Clarke | SWEC | GSSC | 372-0630 |
| Hal Downey | [signature] | WHC | ER Programs | 376-5539 |
| | | | | |
| RA CARLSON | RA Carlson | WHC | 200/300 RI mgr. | 509 376-9027 |
| CD WITTREICH | [signature] | WHC | Tech Coord | 376-1862 |
| Mike Rosenfeld | Michael Rosenfeld | EBASCO | WHC Contractor | 206-451-4654 |
| | | | | |
| | | | | |

Attachment #4

Action Item Status List
Unit Manager's Meeting: 200 Aggregate Area/200 Area Operable Units
March 25, 1992

| Item No. | Action/Source of Action | Status |
|---|---|---|
| 2AAMS.1 | Identify and implement the actions that are required to install the calibration pits for the borehole logging equipment. Action: Allan Harris (9/19/91) | Open |
| 2AAMS.5 | DOE will initiate the paperwork for changing the content and/or boundaries of the 200-UP-2 OU. Action to Allan Harris (2/26/92). | Open |

# 200 AGGREGATE AREA MANAGEMENT STUDY PROGRAM

**Curtis D. Wittreich**
Technical Coordinator

**Randy K. Price**
Geophysics Team Lead

**Michael J. Galgoul**
200-UP-2 OU Work Plan Coordinator

April 23, 1992

# Status
# 200 Aggregate Area Management Study Program

04/23/92

| Area | Aggregate Area | AAMS Type | AAMS Report | Regulator Comments Due | M-27-00 Milestones |
|---|---|---|---|---|---|
| 200 West | U Plant | Source | Draft A Redlined Based on Regulator Review | 3/16/92 | 1/92 |
| | Z Plant | Source | Regulator Review Comments Received | 4/14/92 | 2/92 |
| | S Plant | Source | Draft A Submitted for Regulator Review | 5/15/92 | 3/92 |
| | T Plant | Source | Drafted-On Schedule | | 4/92 |
| | 200 West | Ground Water | Drafted-On Schedule | | 9/92 |
| 200 East | PUREX | Source | Drafted-On Schedule | | 5/92 |
| | B Plant | Source | Drafted-On Schedule | | 6/92 |
| | Semi-Works | Source | On Schedule | | 7/92 |
| | 200 East | Ground Water | | | 9/92 |
| 200 North | 200 North | Source | | | 8/92 |

Attachment #5

# 200 AAMS
# GEOPHYSICAL LOGGING AND GROUNDWATER SAMPLING FIELD ACTIVITIES UPDATE

Attachment #6

4/22/92

# GEOPHYSICS

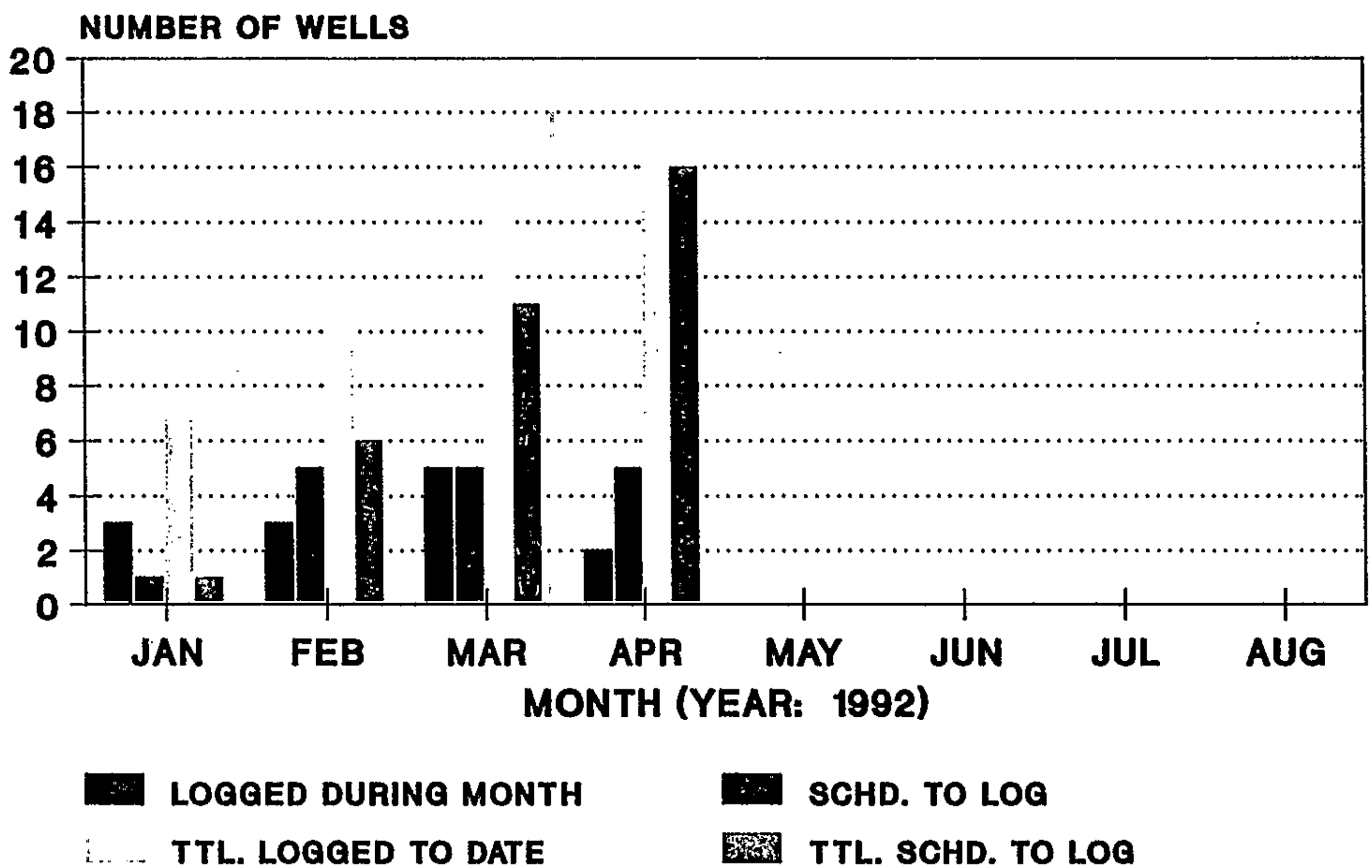
● SPECTRAL GAMMA-RAY LOGGING COMPLETED TO DATE:

| | | | |
|---|---|---|---|
| | 299-W22-75 | 216-S-21 CRIB | U PLANT |
| | 299-W23-4 | 216-U-12 CRIB | U PLANT |
| | 299-W19-9 | 216-U-2 CRIB | U PLANT |
| | 299-W18-10 | 216-Z-18 CRIB | Z PLANT |
| | 299-W15-63 | 216-Z-5 CRIB | Z PLANT |
| | 299-W15-8 | 216-Z-9 CRIB | Z PLANT |
| ➡ | 299-W15-7 | 216-Z-7 CRIB | Z PLANT |
| | 299-W22-21 | 216-S-13 CRIB | S PLANT |
| | 299-W22-32 | 216-S-7 CRIB | S PLANT |
| | 299-W22-74 | 216-S-20 CRIB | S PLANT |
| | 299-W26-1 | 216-S-5 CRIB | S PLANT |
| | 299-W26-51 | 216-S-6 CRIB | S PLANT |
| | 299-W11-18 | 216-T-35 CRIB | T PLANT |
| | 299-W11-70 | 216-T-26 CRIB | T PLANT |
| | 299-W14-4 | 216-T-28 CRIB | T PLANT |
| ➡ | 299-W11-11 | 216-T-18 CRIB | T PLANT |
| ➡ | 299-W15-4 | 216-T-19 CRIB | T PLANT |

➡ WELLS LOGGED SINCE LAST U.M.M.

9 2 1 2 6 4 3 1 6 6 0

# 200 AGGREGATE AREA MANAGEMENT STUDY
# SPECTRAL GAMMA-RAY LOGGING STATUS




DATE: 4/22/92

# GEOPHYSICS (CONTINUED)

- ANALYSIS OF SPECTRAL GAMMA-RAY LOGGING DATA CONTINUING
  - PRELIMINARY RESULTS TO BE PRESENTED AT THIS MEETING

# GROUNDWATER SAMPLING

- **CERCLA GROUNDWATER SAMPLING PROGRAM REACTIVATED**
  - **GROUNDWATER SAMPLING INITIATED APRIL 6.**
  - **200 AAMS GROUNDWATER SAMPLING SCHEDULED TO START MID-MAY**

# 200-UP-2 WORK PLAN STATUS -

- Work Plan Has Been Submitted For WHC Review

Attachment #7

DOE/RL-92-21
Predecisional Draft
CONTENTS

Attachment #8

## 200-UP-2 AND 200-UP-1 OPERABLE UNIT CLASS II CHANGE REQUEST

DESCRIPTION - HISTORY

The Federal Facility Agreement and Consent Order change request package M-12-90-4 provides for the assessment of an aggregate area and the need for refinement of operable unit boundaries. Specifically the M-12-15 Interim Milestone for submitting the 200-UP-2 work plan provides for defining the scope of the work plan based on the results of the U Plant Aggregate Area Management Study Report (AAMSR).

The U Plant AAMSR compiled and evaluated the existing body of knowledge to support the *Hanford Site Past-Practice Strategy* (DOE/RL-9104, March 1992) decision making process. Each waste management unit and unplanned release within the aggregate area was assessed to determine the most expeditious path for remediation within the statutory requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Resource Conservation Recovery Act (RCRA). A review of existing pertinent data regarding U Plant Aggregate Area waste management units and unplanned releases was summarized and evaluated in this study.

Recommended assessment paths for the waste management units and unplanned releases at the U Plant Aggregate Area were made. These recommendations are only proposed at this time and are subject to adjustment and change. Factors that may affect development of final recommendations include, but are not limited to, comments and advice from the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), or U.S. Department of Energy (DOE); identification and development of new information; and modification of the criteria used in the assessment path decision-making process. Changes in recommendations will be addressed, and more detail on recommended assessment paths for waste management units and unplanned releases will be included in work plans as they are developed for the actual investigation and remediation activities.

U PLANT AAMS CONCLUSIONS -

Redefinition of the 200-UP-1 and 200-UP-2 Operable Units (OUs) were suggested based on the data evaluation in U Plant AAMS. The geographic boundaries should be redefined to include the 216-U-14 Ditch, the 207-U Retention Basins and their associated unplanned releases in the 200-UP-1 OU.

# PRELIMINARY ANALYSIS OF SPECTRAL GAMMA-RAY LOGGING DATA COLLECTED AT THE 216-U-1 AND 216-U-12 CRIBS

DRAFT

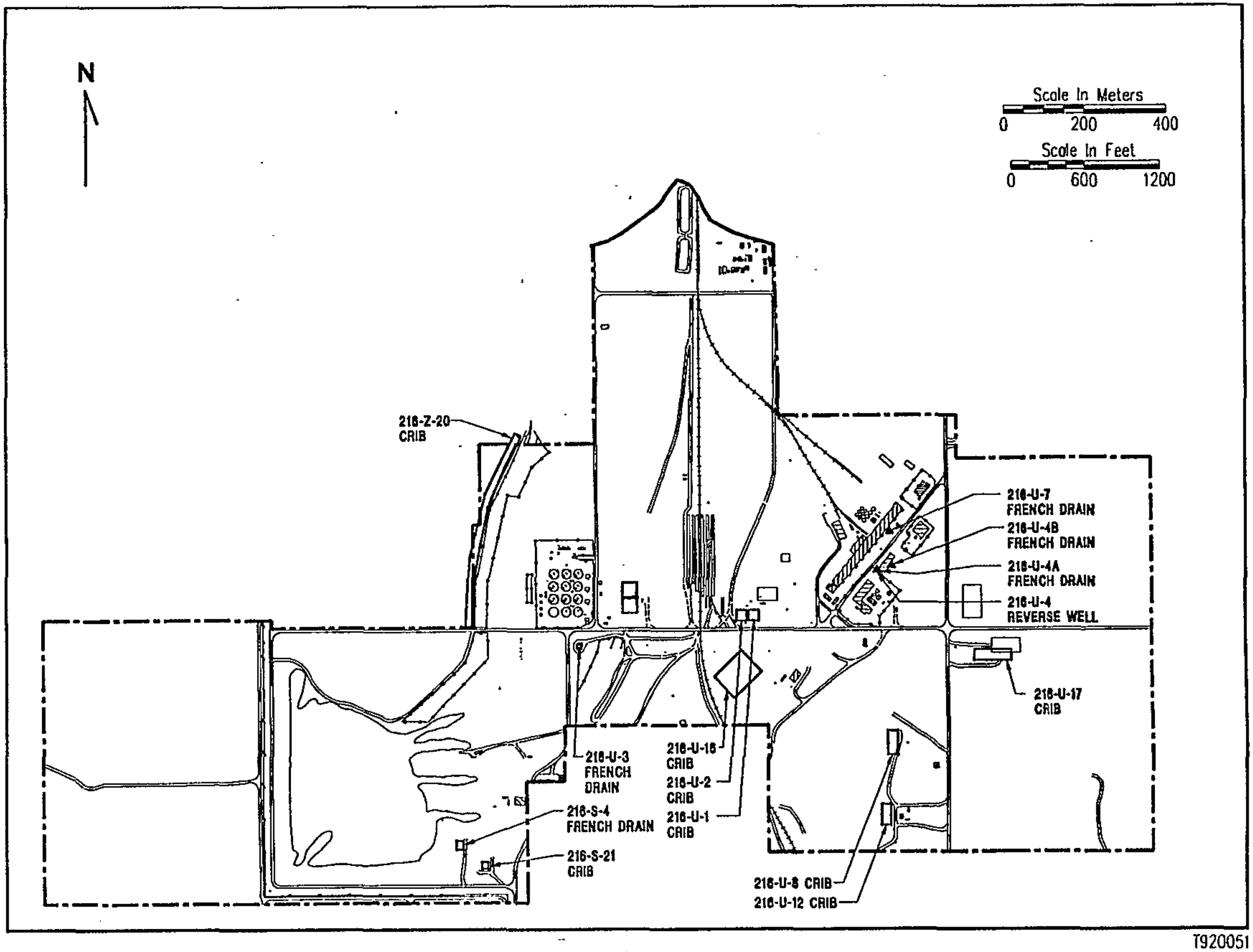
Attachment # 9

4/22/92
PAGE 1

# SCOPE OF 200 AAMS BOREHOLE LOGGING ACTIVITY

- SPECTRAL GAMMA-RAY LOGS OF 80 EXISTING BOREHOLES
- APPROXIMATELY 10 BOREHOLES PER AGGREGATE AREA
  - CRIBS 216-U-1 AND 216-U-12 TARGETED FOR LOGGING IN THE U PLANT AGGREGATE AREA BOREHOLE GEOPHYSICS SAMPLING AND ANALYSIS PLAN

DRAFT




Location of Cribs and Drains.

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# 200 AAMS BOREHOLE LOGGING DATA OBJECTIVES

- **PROVIDE VERTICAL DISTRIBUTION OF RADIOLOGICAL CONTAMINATION ALONG LENGTH OF BOREHOLE IN UNSATURATED ZONE**
- **IDENTIFY GAMMA-EMITTING RADIONUCLIDES**
- **QUANTIFY RADIOLOGICAL CONTAMINATION (RELATIVE)**

**** SCREENING LEVEL STUDY ****

DRAFT

# BOREHOLE LOGGING CONDITIONS

- **FIXED VELOCITY MODE LOGGING TECHNIQUE**
  - LOGGING SPEED OF 40 FT./MIN.
  - 0.5 FOOT STATIONS (INCREMENTS)
  - 30 SECOND COUNTING TIME AT EACH STATION

- **ZERO DEPTH SET AT GROUND SURFACE**
  - DETECTOR DEPTH DETERMINED BY THE ROTATION OF THE SHEAVE WHEEL SUSPENDING THE LOGGING CABLE

DRAFT

# FACILITY CHARACTERISTICS

## 216-U-1 CRIB

***-- WOODEN CRIB STRUCTURE IN SERVICE FROM 1951 TO 1968 --***

**DIMENSIONS:** **11.5 x 11.5 FEET (PLAN VIEW)**
**BOTTOM OF CRIB AT ~ 20 FEET BELOW GROUND SURFACE**

**TOTAL VOLUME DISCHARGED*: $4.62 \times 10^{7}$ LITRES**

**RAD. WASTE INVENTORY*:**

| | RADIONUCLIDE | CURIES |
|---|---|---|
| ⇨ | Co-60 | 0.00157 |
| | Sr-90 | 2.11 |
| ⇨ | Cs-137 | 4.36 |
| | Pu-239 | 2.43 |
| | Pu-241 | 0.656 |
| | Ru-106 | $6.0 \times 10^{-7}$ |
| ⇨ | Total U | 0.7020 |

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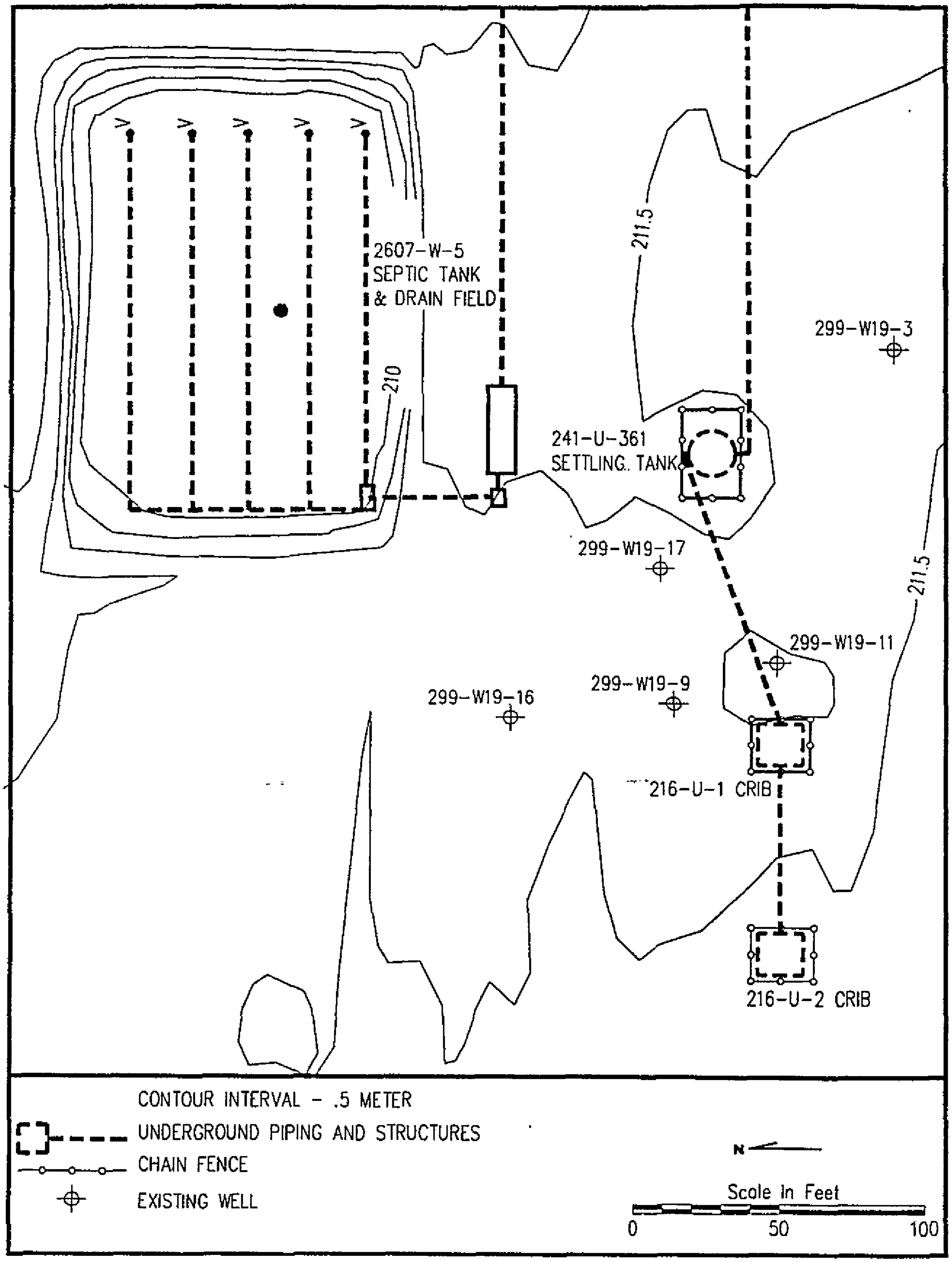
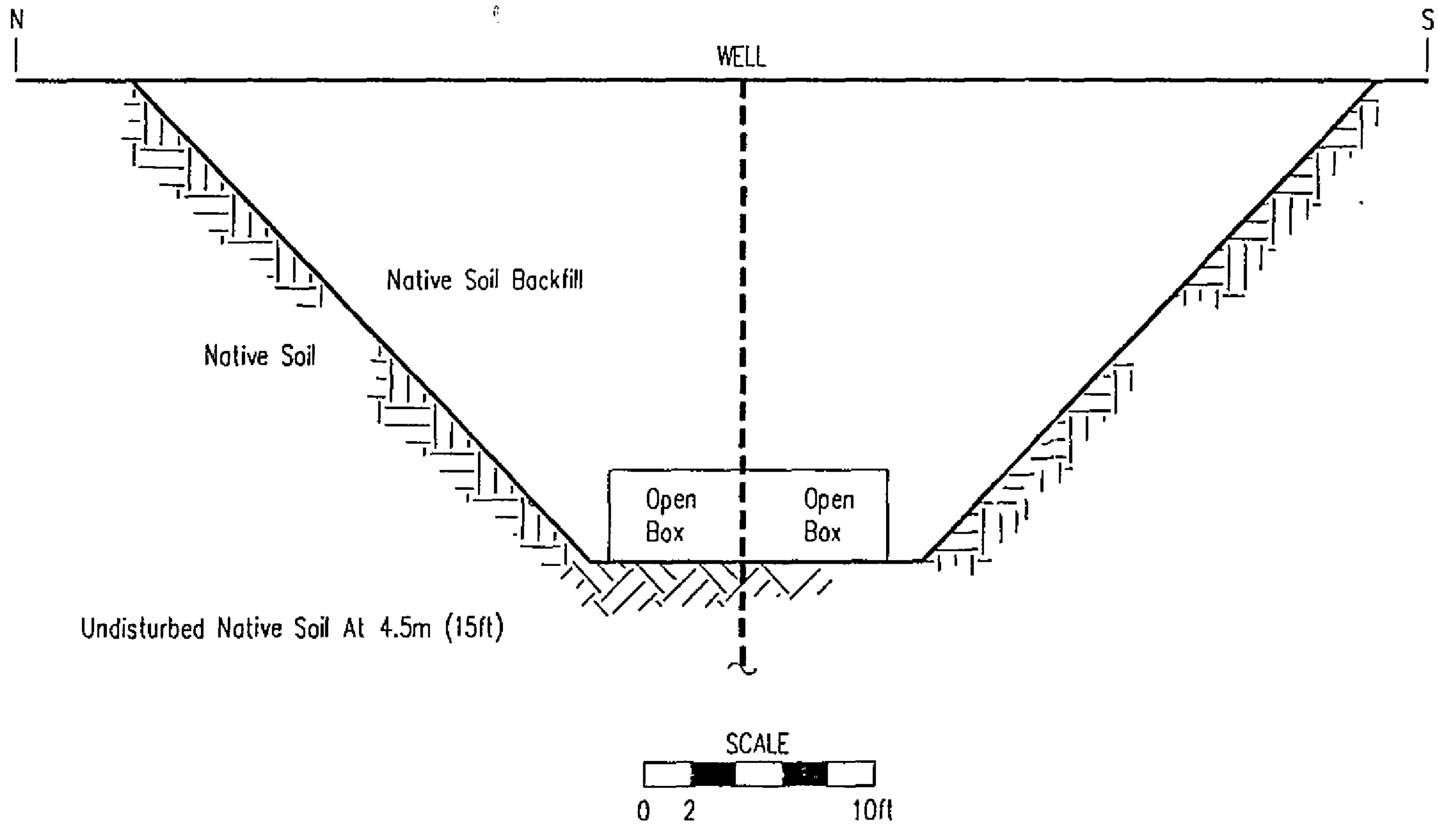
*DISCHARGE VOLUME AND WASTE INVENTORY FOR 216-U-1 AND 216-U-2

⇨ DETECTED BY RLS




Map of the 216-U-1/216-U-2 Crib Area.

NORTH-SOUTH CROSS SECTION ACROSS THE 216-U-1 CRIB

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# RLS SURVEY RESULTS FOR THE 216-U-1 CRIB

## -- SUMMARY OF RESULTS --

**WELL LOGGED:** **299-W19-11 (total depth 251 ft.)**

**MAN-MADE RADIONUCLIDES DETECTED:**

**Cs-137**
**Co-60**
**U-238**

**EXTENT OF CONTAMINATION AND RELATIVE CONCENTRATION:**

**Cs-137:**

1.5 TO 10 FEET -- <10 PCi/g
31 TO 34 FEET -- 4000 PCi/g (max)
34 TO 82 FEET -- 180 TO <10 PCi/g

**Co-60:**

31 TO 50 FEET -- <10 PCi/g

**U-238:**

33 TO 51 FEET -- 900 PCi/g (max)

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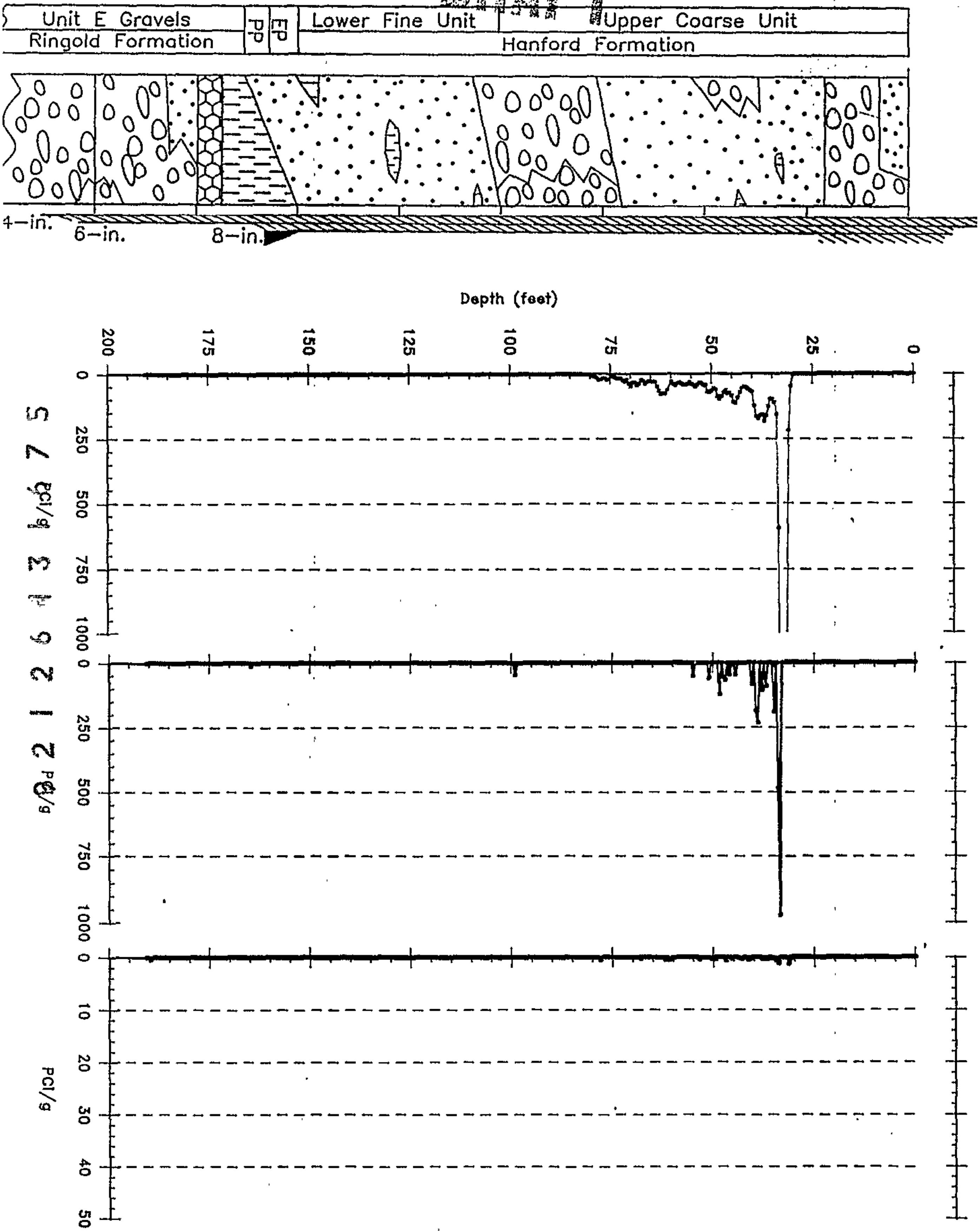
# SPECTRAL GAMMA-RAY BOREHOLE LOGGING SURVEY DATA: WELL 299-W19-11 (CRIB 216-U-1)



# FACILITY CHARACTERISTICS

## 216-U-12 CRIB

***- DRAIN FIELD CRIB STRUCTURE IN SERVICE FROM 1960 TO 1989 -***

**DIMENSIONS:** 98.4 x 9.8 FEET (PLAN VIEW)
BOTTOM OF CRIB AT ~ 20 FEET BELOW GROUND SURFACE

**TOTAL VOLUME DISCHARGED:** $1.50 \times 10^8$ LITRES

**RAD. WASTE INVENTORY:**

| RADIONUCLIDE | CURIES |
|---|---|
| Sr-90 | 55.9 |
| ⇨ Cs-137 | 0.0566 |
| Pu-239 | 0.0123 |
| Ru-106 | $2.18 \times 10^{-6}$ |
| ⇨ Total U | 0.6770 |
| Am-241 | 0.00645 |
| Tritium | 0.00188 |

⇨ DETECTED BY RLS

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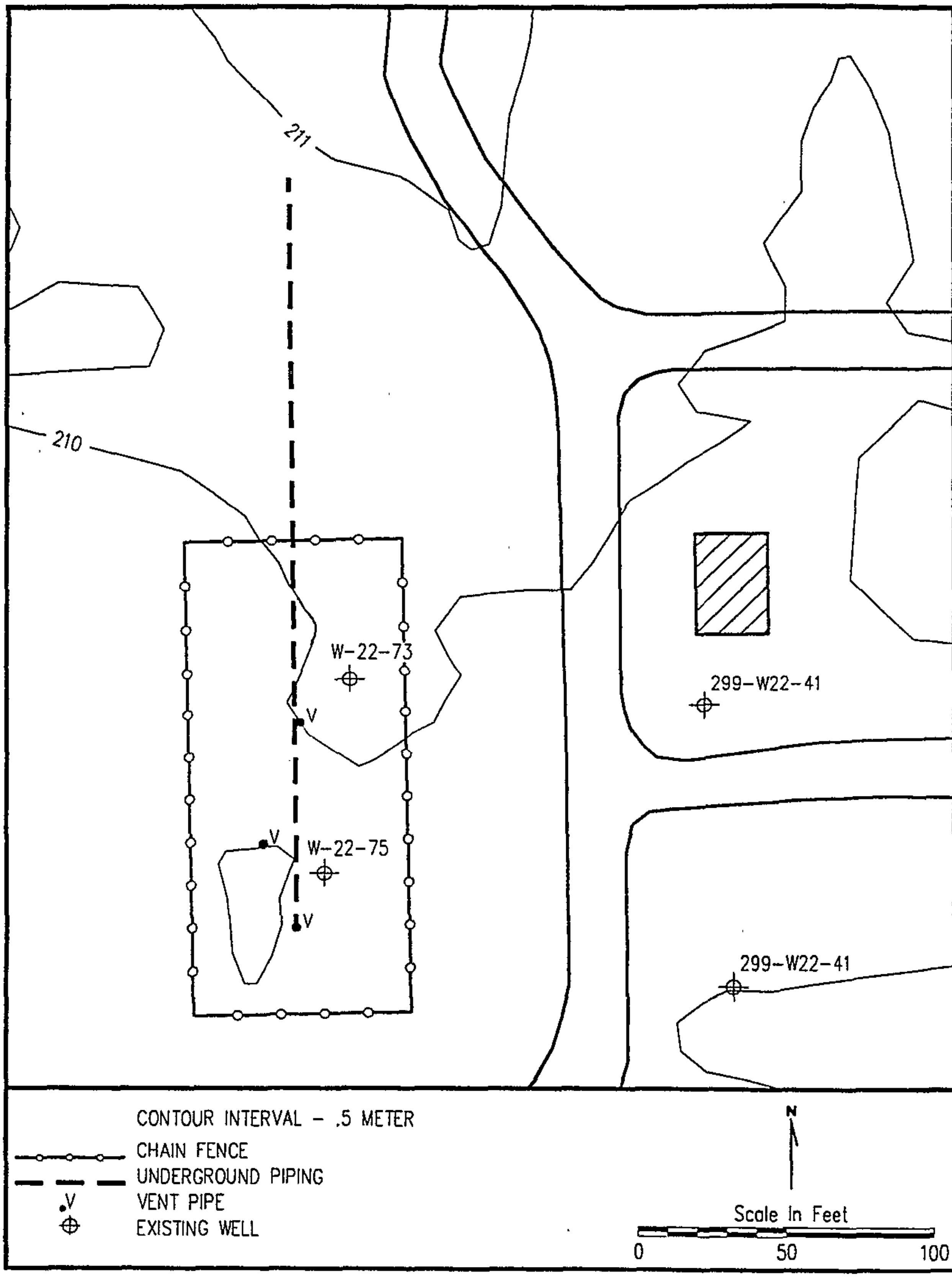
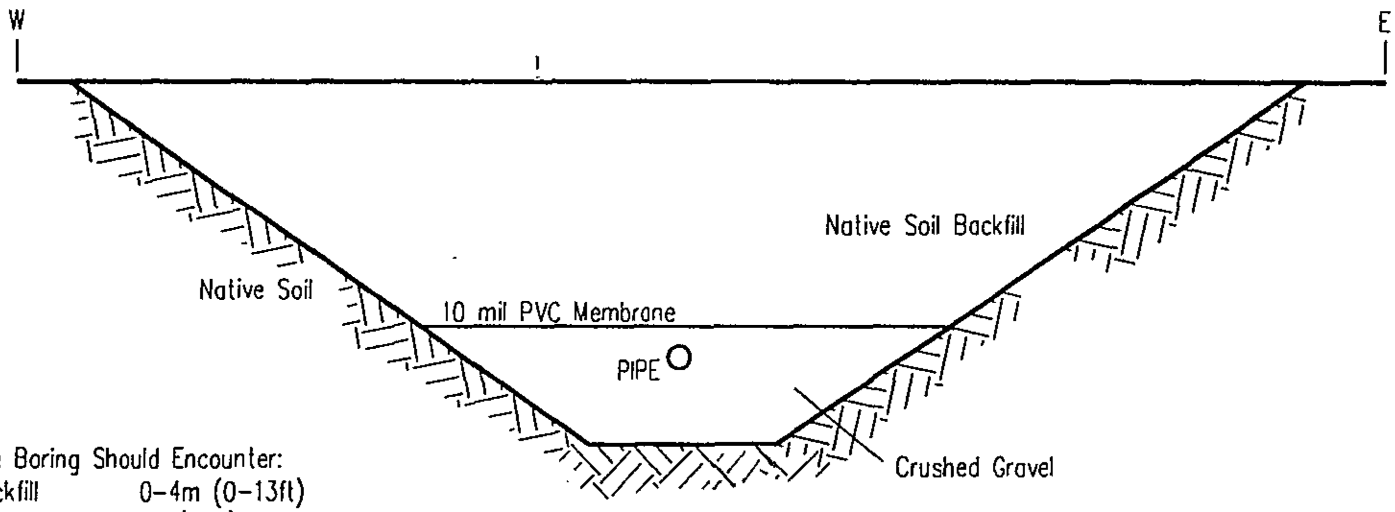



Map of the 216-U-12 Crib.

## EAST-WEST CROSS SECTION ACROSS THE 216-U-12 CRIB




The Boring Should Encounter:

| | |
|---|---|
| Backfill | 0–4m (0–13ft) |
| Membrane | 4m (13ft) |
| Crushed Rock | 4–6m (13–19ft) |
| Native Soil | 6m (19ft) |

# RLS SURVEY RESULTS FOR THE 216-U-12 CRIB

## -- SUMMARY OF RESULTS --

**WELL LOGGED: 299-W22-75 (total depth 169 ft.)**

**MAN-MADE RADIONUCLIDES DETECTED:**

**Cs-137**
**U-235**
**U-238**

**EXTENT OF CONTAMINATION AND RELATIVE CONCENTRATION:**

**Cs-137:**

16 TO 58 FEET -- 5000 PCi/g (max)

**U-235:**

73 TO 80 FEET -- Concentration not estimated

**U-238:**

17 TO 20 FEET -- 300 PCi/g (max)
43 TO 80 FEET -- 400 PCi/g (max)



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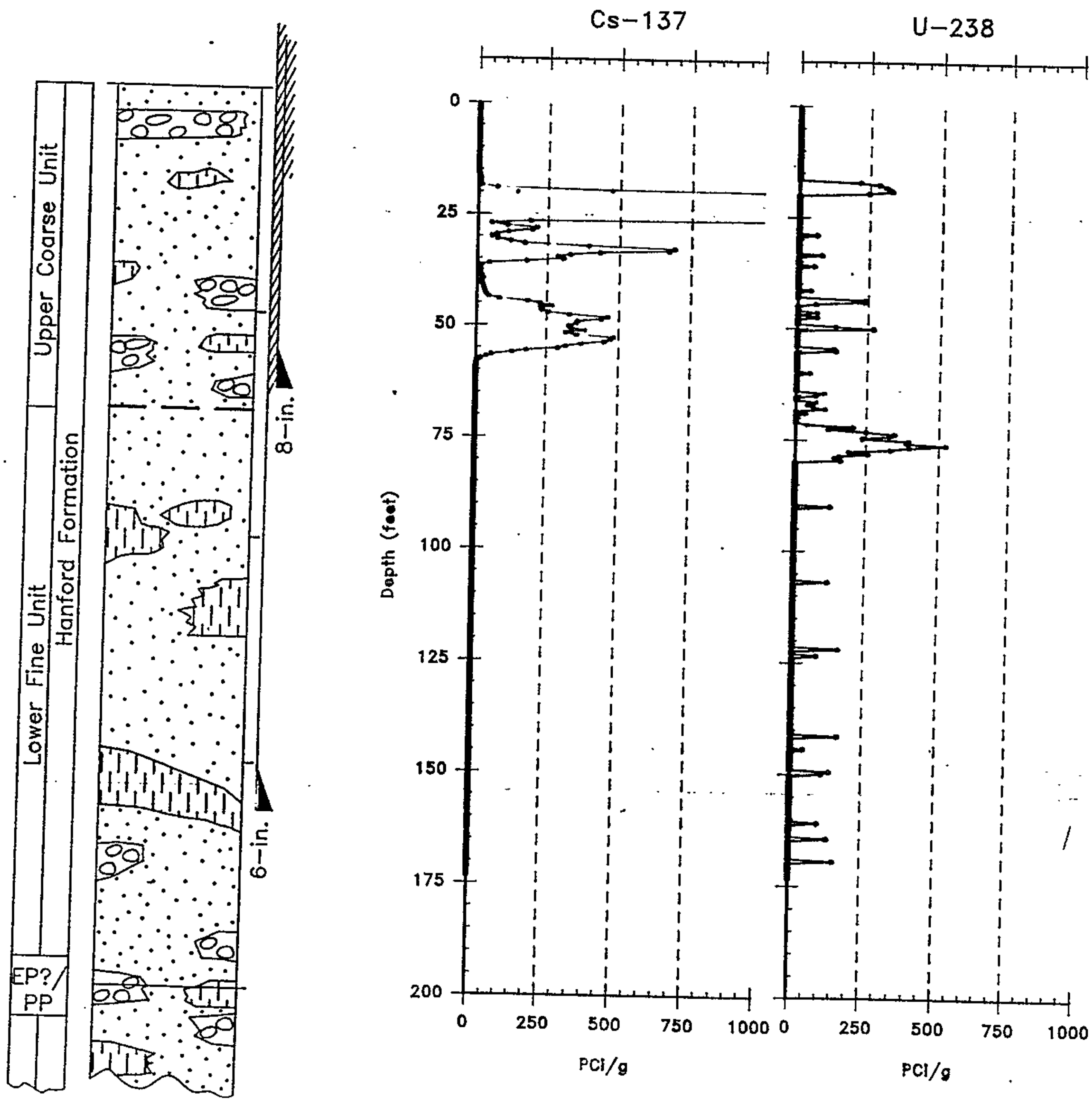
9 2 1 2 6 4 3 1 6 3 0

SPECTRAL GAMMA-RAY BOREHOLE LOGGING SURVEY DATA: WELL 299-W22-75 (CRIB 216-U-12)

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Attachment #10

# 200-West Area Groundwater Aggregate Area Management Study

**PRESENTATION**
**to**
**SPECIAL SESSION,**
**UNIT MANAGERS' MEETING**

**1:00-3:00 PM, Thursday, 23 April 1992**

Washington State Department of Ecology Offices
Clearwater Ave. & Columbia Center Blvd.
Kennewick, WA

Introduction . . . . . . . . . . . . . . . Curt Wittreich (WHC)

Overall Report,
Sections 1.0, 2.0, 3.0, 4.1 . . . . . Ken Johnson (Ebasco)

Sections 4.2, 5.0 . . . . . . . . . . . Dave McCormack (Ebasco)

Multimedia Environmental Pollutant Assessment
System (MEPAS) model . . . . . . Jim Droppo (PNL)

Sections 6.0, 7.0, 8.0, 9.0 . . . . . Ken Johnson (Ebasco)

Questions / Comments . . . . . . . Audience

## Outline of 200W GW AAMS Report

**1.0 INTRODUCTION**
- 1.1 Overview
- 1.2 200 NPL Site AAMS Program
- 1.3 Purpose, Scope, and Objectives
- 1.4 Quality Assurance
- 1.5 Organization of Report

**2.0 FACILITY/PROCESS DESCRIPTIONS AND OPERATIONAL HISTORY**
- 2.1 Location
- 2.2 History of Operations
- 2.3 Facilities and Structures Potentially Impacting Groundwater
- 2.4 Waste Generating Processes That Potentially Affect Groundwater Quality
- 2.5 Interactions with Other Aggregate Areas or Operable Units
- 2.6 Interactions with RCRA Programs
- 2.7 Interactions with Other Hanford Programs
- 2.8 Groundwater Monitoring Facilities

**3.0 SITE CONDITIONS**
- 3.1 Physiography and Topography
- 3.2 Meteorology
- 3.3 Surface Hydrology
- 3.4 Geology
- 3.5 Hydrogeology
- 3.7 Environmental Resources
- 3.8 Human Resources

**4.0 PRELIMINARY CONCEPTUAL MODEL**
- 4.1 Known and Suspected Contamination
- 4.2 Potential Impacts to Human Health

**5.0 GROUNDWATER CONTAMINANT SCREENING & PRIORITIZATION**
- 5.1 Conceptual Framework for Risk-Based Screening
- 5.2 Screening Process
- 5.3 Summary of Screening Results

**6.0 IDENTIFICATION OF POTENTIAL ARARs**
- 6.1 Introduction
- 6.2 Contaminant-Specific Requirements
- 6.3 Location-Specific Requirements
- 6.4 Action-Specific Requirements
- 6.5 Other Criteria and Guidance to be Considered
- 6.6 Point of Applicability
- 6.7 ARARs Evaluation

# 1.0 INTRODUCTION

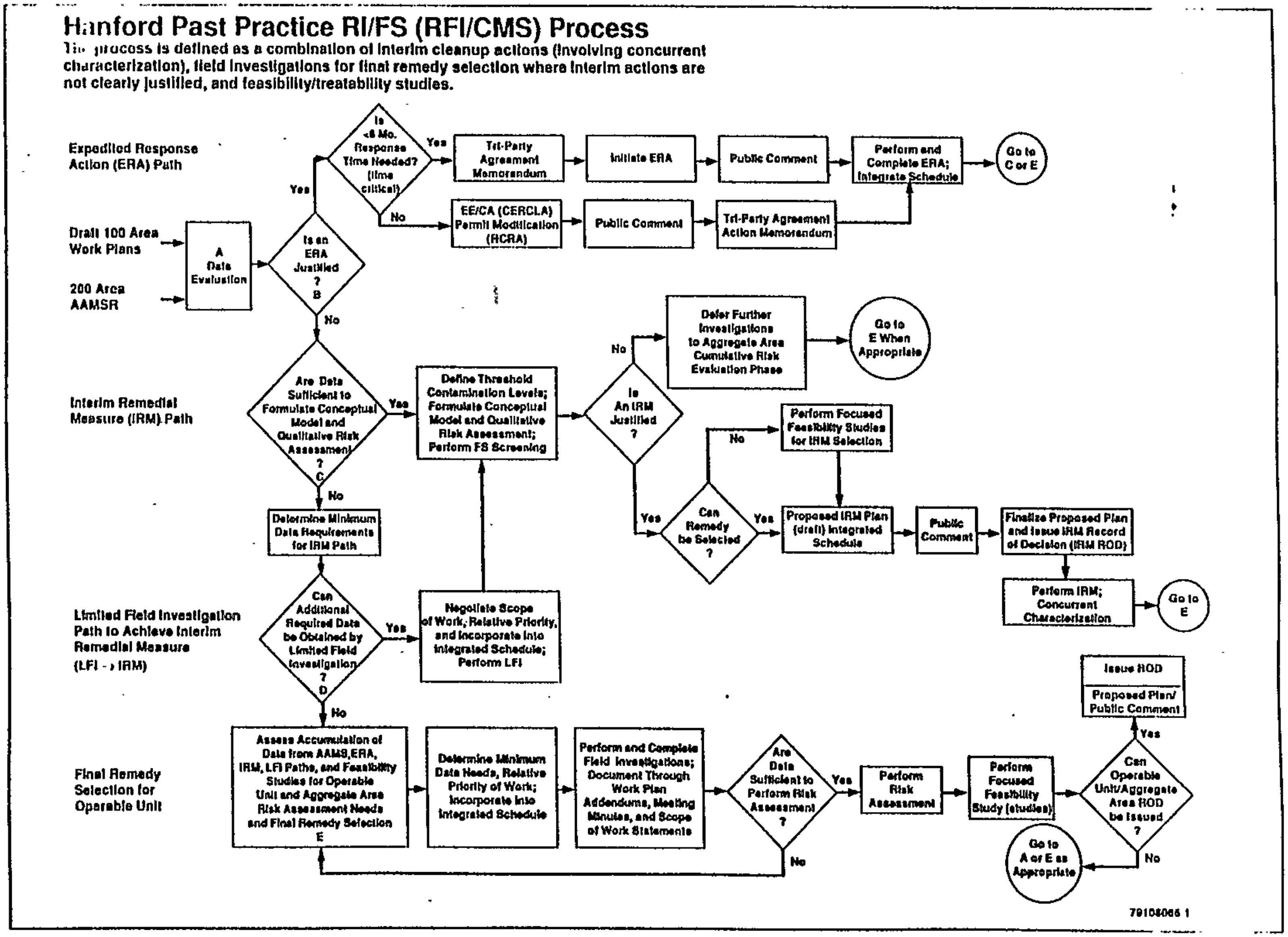


Figure 1-2. Hanford Site Past Practice Strategy Flow Chart. (DOE/RL 1992a)

# 2.0 FACILITY/PROCESS DESCRIPTIONS AND OPERATIONAL HISTORY

Table 2-4. Summary of Screening for Potential to Contribute Contaminants to Unconfined Aquifer.



| Liquid Discharge Source | Years In-Service | Potential Based on Pore Volume Screening (Table 2-2) | Potential Based on Geophysical Logs (Table 2-3) | Potential to Contribute Contaminants to Groundwater |
|---|---|---|---|---|
| U Plant Aggregate Area | | | | |
| 241-U-101 Single-Shell Tank | 1946-1959 | No | No | No |
| 241-U-102 Single-Shell Tank | 1946-1979 | No | No | No |
| 241-U-103 Single-Shell Tank | 1947-1978 | No | No | No |
| 241-U-104 Single-Shell Tank | 1947-1956 | No | No | No |
| 241-U-105 Single-Shell Tank | 1947-1978 | a/ | No | No |
| 241-U-106 Single-Shell Tank | 1948-1977 | - | No | No |
| 241-U-107 Single-Shell Tank | 1948-1980 | - | No | No |
| 241-U-108 Single-Shell Tank | 1949-1979 | - | No | No |
| 241-U-109 Single-Shell Tank | 1949-1978 | - | No | No |
| 241-U-110 Single-Shell Tank | 1946-1975 | No | No | No |
| 241-U-111 Single-Shell Tank | 1947-1980 | - | No | No |
| 241-U-112 Single-Shell Tank | 1947-1970 | No | No | No |
| 216-S-4 French Drain | 1953-1956 | Yes | No | Yes |
| 216-S-21 Crib | 1954-1969 | Yes | Yes | Yes |
| 216-U-1 and 216-U-2 Cribs | 1951-1967 | Yes | Yes | Yes |
| 216-U-3 French Drain | 1954-1955 | No | No | No |
| 216-U-4A French Drain | 1955-1970 | No | - | No |
| 216-U-4B French Drain | 1960-1970 | No | - | No |
| 216-U-8 Crib | 1952-1960 | - | No | No |
| 216-U-12 Crib | 1960-1968 | Yes | No | Yes |
| 216-U-16 Crib | 1984-1987 | No | No | No |

| Waste Management Unit | Quantity of Reported Radionuclides (Ci)[a] | | | | | | | | | | | | | | | Reported Waste |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $^{241}$Am | $^{60}$Co | $^{137}$Cs | $^{3}$H | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu | Total Pu[b] | $^{106}$Ru | $^{90}$Sr | $^{234}$U | Other Radio-nuclides | Alpha | Beta | Volume Received (L) |
| **U Plant Aggregate Area** | | | | | | | | | | | | | | | | |
| 216-S-4 French Drain | | | | 2.0E-2 | | | | | | | | | | | | 1.0E+6 |
| 216-U-21 Crib | | 3.33E-1[a] | 3.55E+1 | | | 1.19E-1[a] | 3.2E-2[a] | | 2.08E0 | 1.39E-6 | 2.18E+1 | 1.4E-3[a] | | 1.28E-1 | 2.08E+2 | 8.71E+7 |
| 216-U-1 & 216-U-2 Crib | | 1.57E-3[a] | 4.36E0 | | | 2.43E0[a] | 6.56E-1[c] | | 4.26E+1 | 6.0E-7 | 2.11E0 | 7.02E-1 | | 2.62E0 | 1.26E+1 | 4.62E+7 |
| 216-U-10 Pond | 4.92E-1 | | 1.1E+1 | 1.96E+2 | | 7.68E-2[a] | | | 8.0E+3 | 2.78E-5 | 1.1E+1 | 1.88E0 | | 5.05E+2 | 4.42E+1 | 1.65E+11 |
| 216-U-12 Crib | 6.45E-3 | | 5.66E-2 | 1.88E-3 | | 1.23E-2[a] | | | 1.0E0 | 2.18E-6 | 5.59E+1 | 6.77E-1 | | 1.05E-1 | 1.12E+2 | 1.5E+8 |
| 216-Z-20 Crib | 1.01E0 | | 8.64E-2 | | 1.53E-1 | 2.03E0 | | 2.51E0 | 1.48E-1 | 1.07E-4 | 6.3E-2 | | | 2.22E0 | 4.09E-1 | 3.8E+9 |
| **Z Plant Aggregate Area** | | | | | | | | | | | | | | | | |
| 216-Z-1 & 216-Z-2 Cribs | | 1.71E-2 | 4.0E-2<br>(1.65E-1) | | | 2.68E+3 | 9.92E+2 | | 7.0E+3 | 1.6E-11 | 3.7E-2<br>(1.59E-2) | 2.7E-2 | | | | 3.37E+7 |
| 216-Z-3 Crib | | | 4.8E-2 | | 1.7E-5 | 3.25E+2 | 8.78E+1 | | 5.7E+3 | 6.0E-9<br>(1.69E+1) | 4.5E-2<br>(9.7E-2) | 1.7E-5 | | | | 1.78E+8 |
| 216-Z-5 Crib | | 2.6E-3 | 3.6E0<br>(3.92E0) | | | 1.94E+1 | 5.24E0 | | 3.4E+2 | 5.2E-12 | 1.7E0<br>1.83E0 | 1.7E-5<br>2.0E-5 | | | | 3.1E+7 |
| 216-Z-7 Crib | | 7.65E-2 | 2.0E+2<br>(2.24E+2) | | | 1.14E+2 | 3.08E+1 | | 2.0E+3 | 5.1E-6 | 2.0E+2<br>(2.23E+2) | 1.5E-3 | | | | 7.9E+7 |
| 216-Z-12 Crib | | 5.15E-3 | 5.3E-2<br>(5.28E-2) | | | 1.43E+3 | 3.86E+2 | | 2.5E+4 | 9.3E-7 | 5.1E-2<br>(5.62E-2) | 1.7E-5 | | | | 2.81E+8 |
| 216-Z-16 Crib | | | | | | 4.09E0 | 1.1E0 | | 7.2E+1 | | | | | | | 1.02E+8 |
| 216-Z-8 French Drain | 1.37E+3 | | | | 1.3E-1 | 2.76E0 | 7.45E-1 | | 2.0E0 | | 5.62E-2 | | | | | 9.59E+3 |
| 216-Z-1A Tile Field | 3.43E+3 | | 1.6E-1 | | | 1.37E+2 | 3.7E+1 | | 5.7E+4 | 5.2E-6 | 1.5E-1 | | | | | 5.21E+6 |
| 216-Z-10 Reverse Well | 1.0E0 | | | | 1.4E-1 | 2.85E0 | 7.7E-1 | 2.0E0 | 5.0E+1 | | | | | | | 1.0E+6 |
| 216-Z-9 Trench | 8.58E+3 | 3.95E-3 | 5.2E-2<br>(5.56E-2) | | | 2.19E+3 | 5.9E+2 | | 4.8E+4 | 1.9E-8 | 4.9E-2<br>(5.35E-2) | 1.7E-5<br>2.0E-5 | | | | 4.09E+6 |
| 216-Z-17 Trench | | | | | 5.0E-5 | 2.87E0 | 2.25E-1 | | 5.0E+1 | | | 5.0E-5 | | | | 3.68E+7 |

Table 2-5. Radionuclide Waste Inventory Summary for Units Potentially Contributing Contaminants to Groundwater.

Table 2-7. Summary of Waste-Producing Processes in the 200 West Area. Page 1 of 4

| Process | Waste Generated | Major Chemical Constituents | Ionic Strength | pH | Organic Concentration | Radioactivity |
|---|---|---|---|---|---|---|
| **U Plant Aggregate Area** | | | | | | |
| Uranium recovery | Process waste | Nitric acid, bismuth phosphate, NaOH | High | Acidic (neutralized before disposal) | Low | High |
| | Wastewater | Nitrates | Low | Acidic to neutral/basic | Low | Low |
| $UO_3$ conversion | Wastewater | Nitrates | Low | Acidic to neutral | Low | Low |
| Solvent treatment | Spent solvents | Tributyl phosphate, normal paraffin hydrocarbons | Low | Acidic to neutral | High | Intermediate |
| | Carbonate scrub solution | Carbonate, tributyl phosphate, normal paraffin hydrocarbons | Low | Acidic to neutral | High | Intermediate |
| Analytical laboratory | Laboratory process waste | Unknown | Unknown | Acidic | Low | Unknown |
| | Used or discarded reagents | Unknown | Unknown | Acidic | Low | Unknown |
| | Wastewater | Unknown | Low | Acidic to basic | Low | Low (Pu and TRU) |
| Tank farm condensate | Wastewater | Unknown | Low | Neutral/basic | Low | Low |
| **Z Plant Aggregate Area** | | | | | | |
| Plutonium Finishing Plant (PFP) | Process waste | Nitric acid, nitrate salts, fluoride | High | Acidic (pH 2) neutralized before disposal | Low | Low (Pu and TRU) |
| | Wastewater | Sodium, fluoride, sulfate | Low | Neutral | Low | Trace alpha |
| RECUPLEX | Aqueous process waste | Nitric acid, fluorides, nitrates, phosphate | High | Acidic | Low | Low |
| | Organic solvent waste | $CCl_4$, TBP, DBBP | Low | Slightly acidic | High | Intermediate (Pu and TRU) |

# 3.0 SITE CONDITIONS

3.1 Physiography and Topography

3.2 Meteorology

3.3 Surface Hydrology

3.4 Geology

3.5 Hydrogeology

3.7 Environmental Resources

3.8 Human Resources

# 3.4 GEOLOGY

## 3.4.1 Regional Tectonic Framework

## 3.4.2 Regional Stratigraphy

3.4.2.1 Regional Columbia River Basalt Group

3.4.2.2 Regional Ellensburg Formation

3.4.2.3 Regional Ringold Formation

3.4.2.4 Regional Plio-Pleistocene Unit

3.4.2.5 Regional Early "Palouse" Soil

3.4.2.6 Regional Hanford Formation

3.4.2.7 Holocene Surficial Deposits

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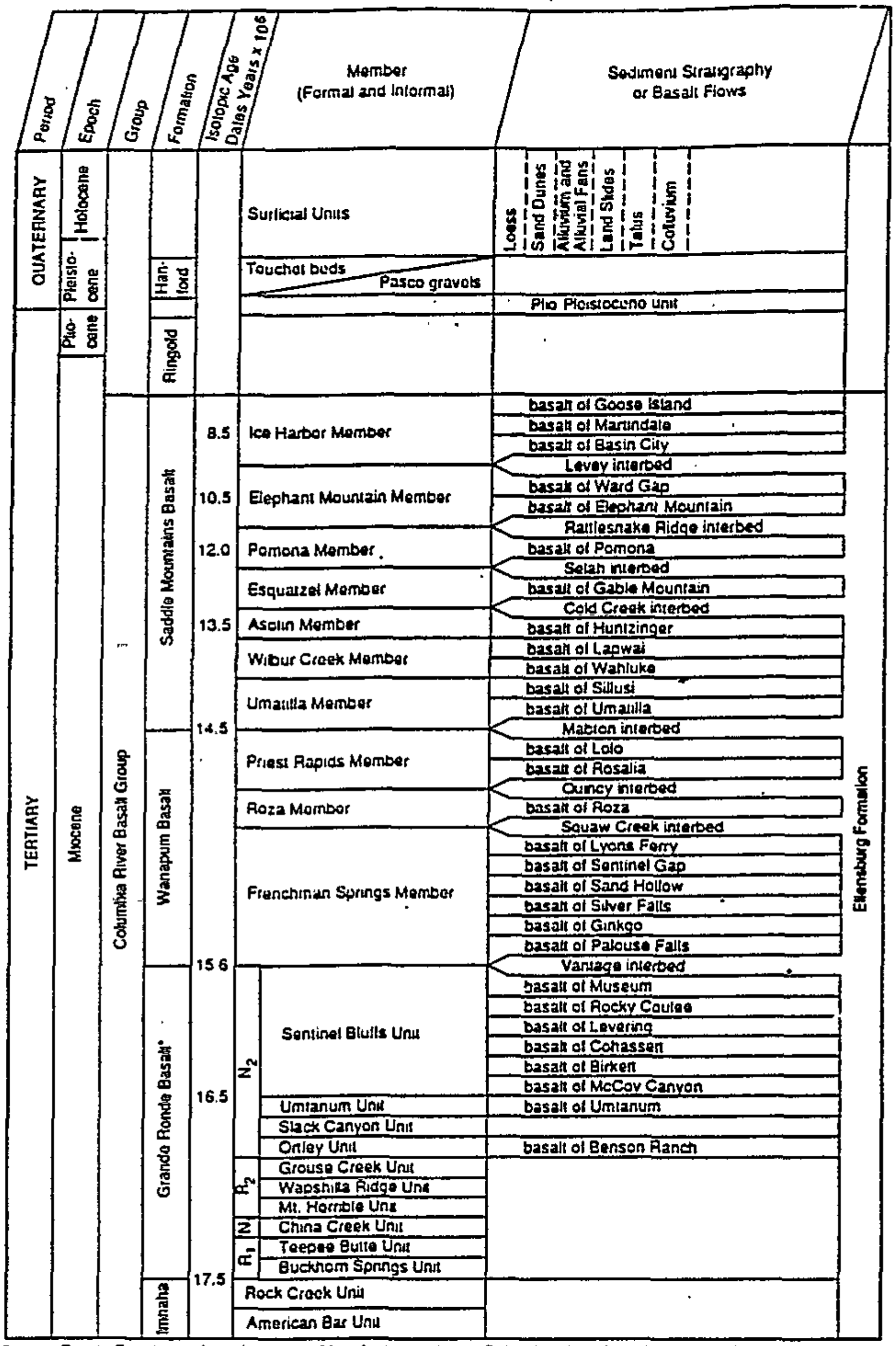



*The Grande Ronde Basalt consists of at least 120 major basalt flows. Only a few flows have been named.
$N_2$, $R_2$, $N_1$ and $R_1$ are magnetostratigraphic units.

H9102029.6

**Figure 3-12.** Generalized Stratigraphy of the Hanford Site.

## 3.4.3 Known or Suspected Faulting in the West-Central Portion of the Hanford Site

3.4.3.1 Umtanum Ridge-Gable Mountain Anticline

3.4.3.2 Yakima Ridge Anticline

3.4.3.3 Cold Creek Syncline

## 3.4.4 200 West Area Geology

### 3.4.4.1 Local Saddle Mountains Basalt

### 3.4.4.2 Local Ellensburg Formation

### 3.4.4.3 Local Ringold Formation

### 3.4.4.4 Local Plio-Pleistocene Unit

### 3.4.4.5 Local Pre-Missoula Gravels

### 3.4.4.6 Local Early "Palouse" Soil

### 3.4.4.7 Local Hanford Formation

### 3.4.4.8 Local Holocene Surficial Deposits

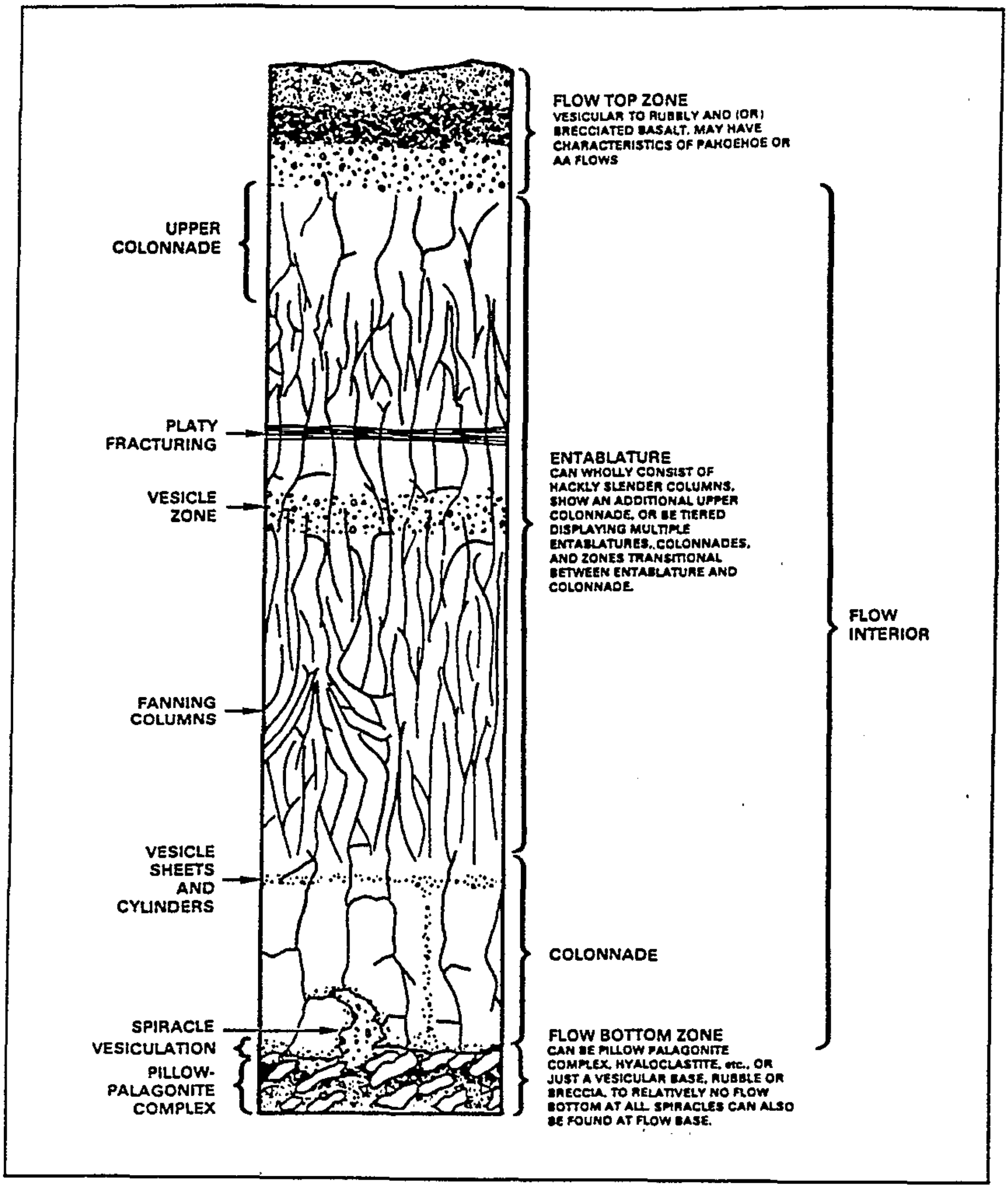
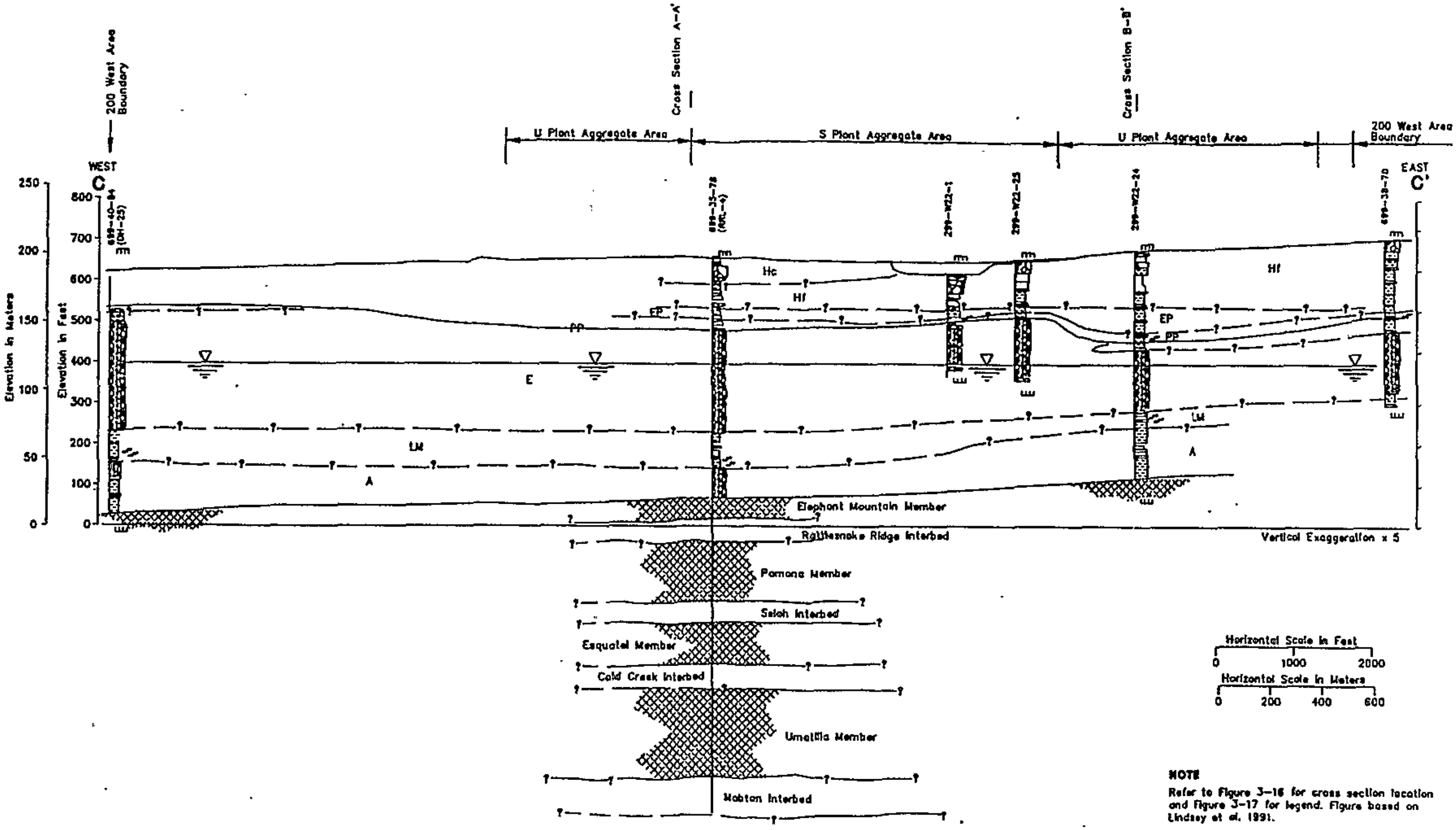



**Figure 3-15.** Idealized Columnar Section Showing the Variety of Intraflow Structures Possible in Columbia River Basalt Flows (DOE 1988).




**NOTE**
Refer to Figure 3-16 for cross section location and Figure 3-17 for legend. Figure based on Lindsey et al. 1991.

**Figure 3-20.** 200 West Area Geologic Cross Section C-C'.

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#10/Page 17 of 55

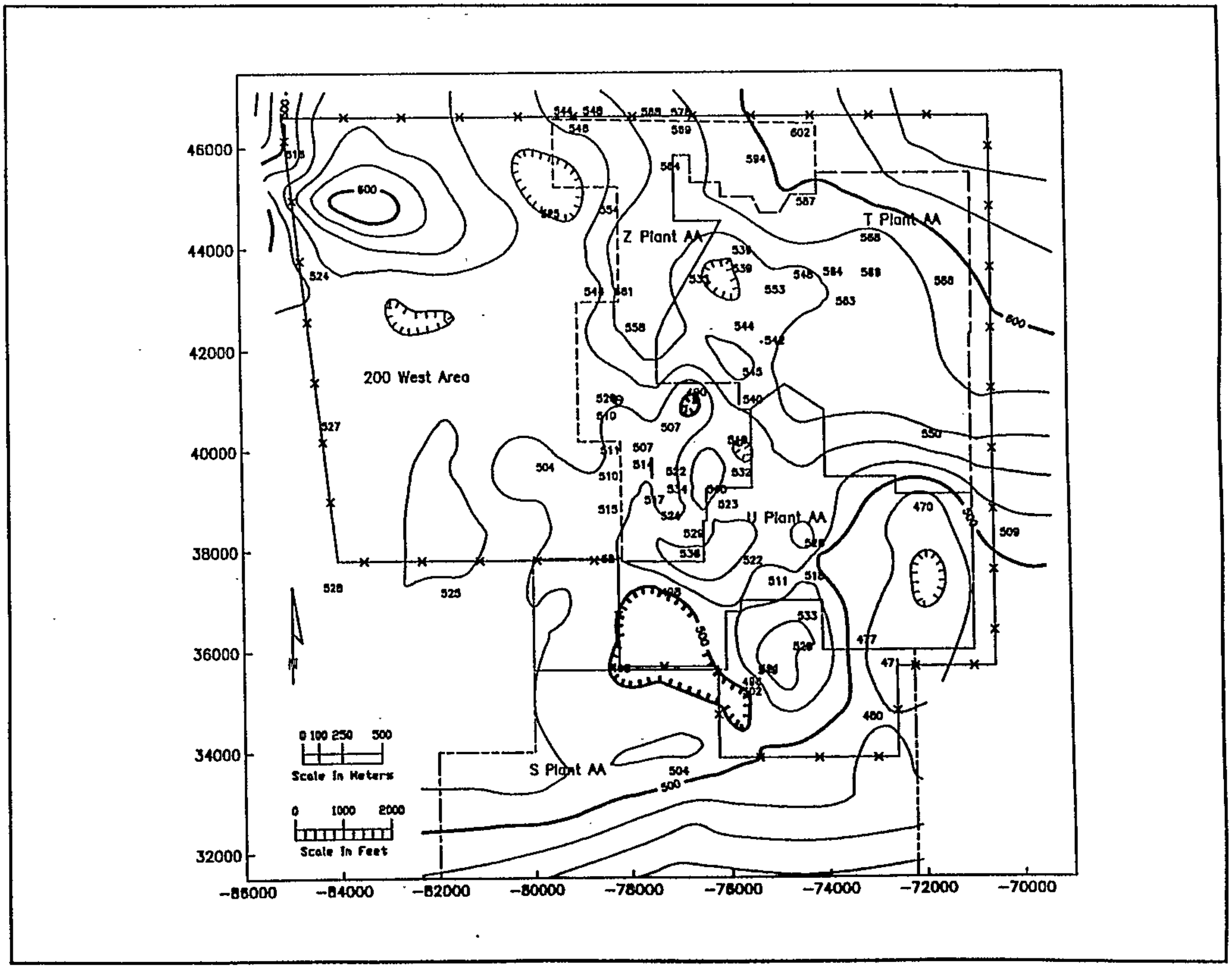


Figure 3-31. Structure Map of the Ringold Gravel Unit E.

# 3.5 HYDROGEOLOGY

## 3.5.1 Regional Hydrogeology

3.5.1.1 Regional Hydrostratigraphy

3.5.1.2 Regional Groundwater Recharge

3.5.1.3 Regional Groundwater Flow

## 3.5.2 200 West Area Hydrogeology

3.5.2.1 200 West Area Hydrostratigraphy

3.5.2.2 200 West Area Groundwater Recharge

3.5.2.3 200 West Area Groundwater Flow

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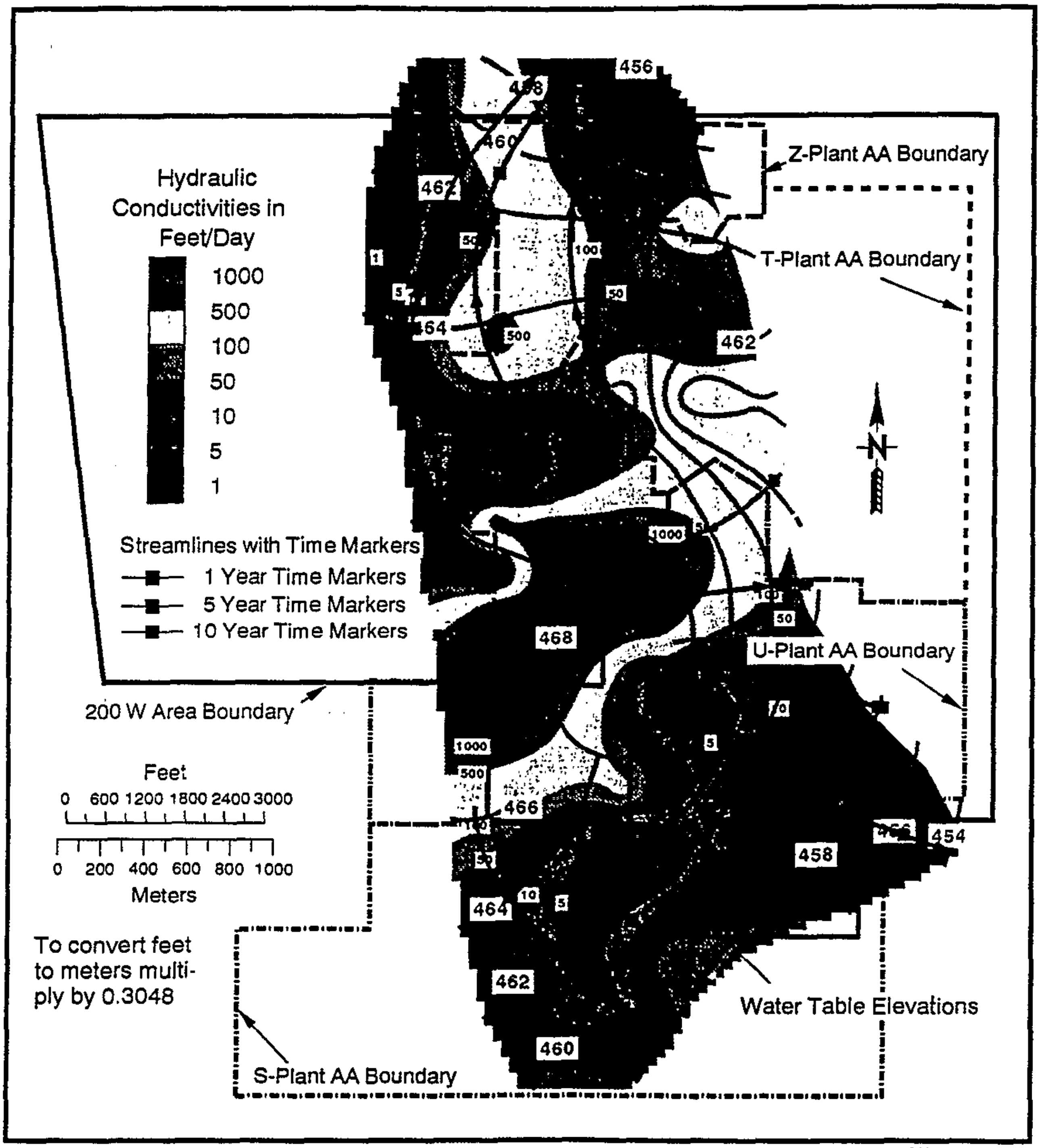



**Figure 3-60.** Hydraulic Conductivity Map for the 200 West Area.
(source: Connelly et al. 1992)

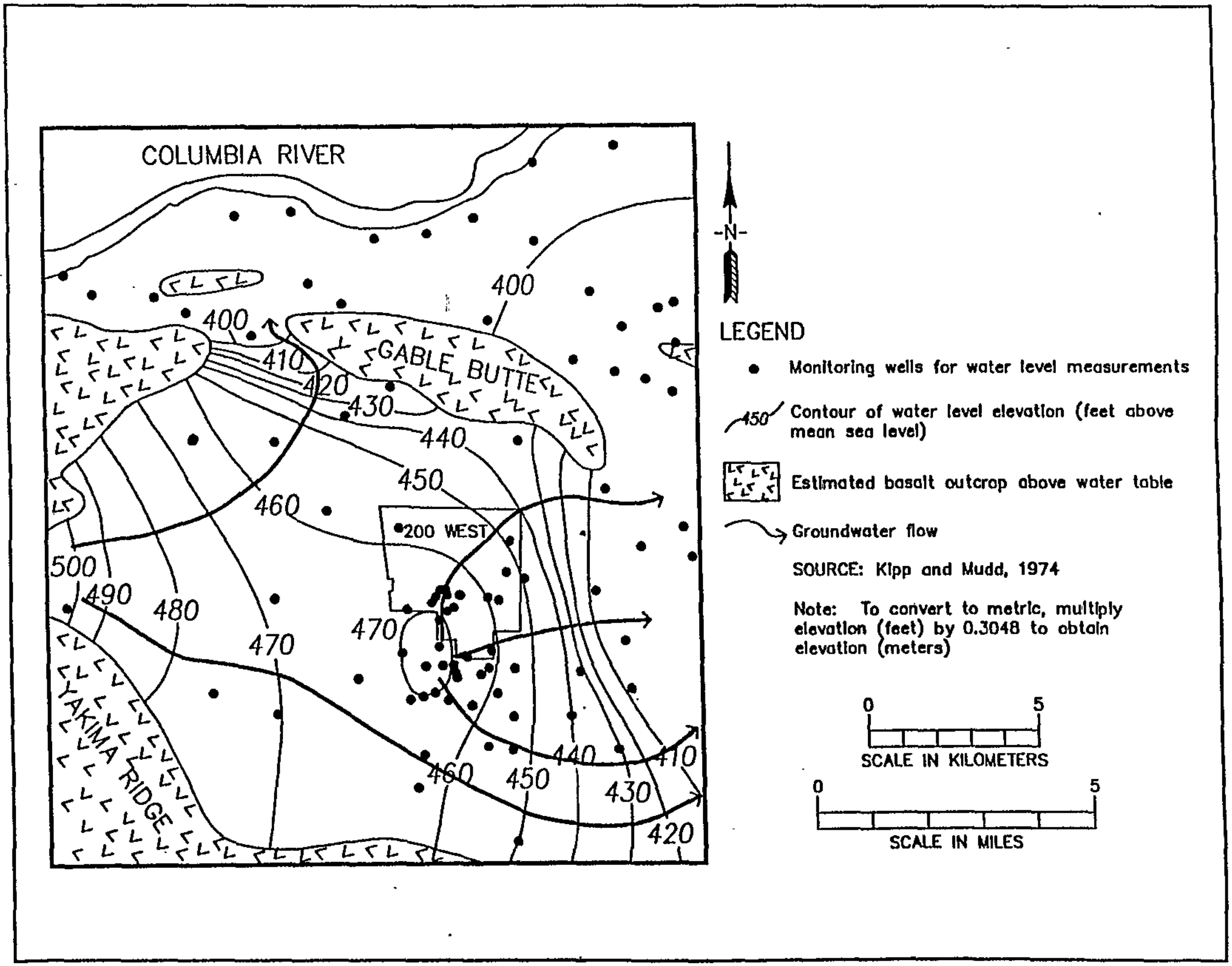



**Figure 3-67.** Water Table and Groundwater Flow in the Region of the 200 West Area for 1987.

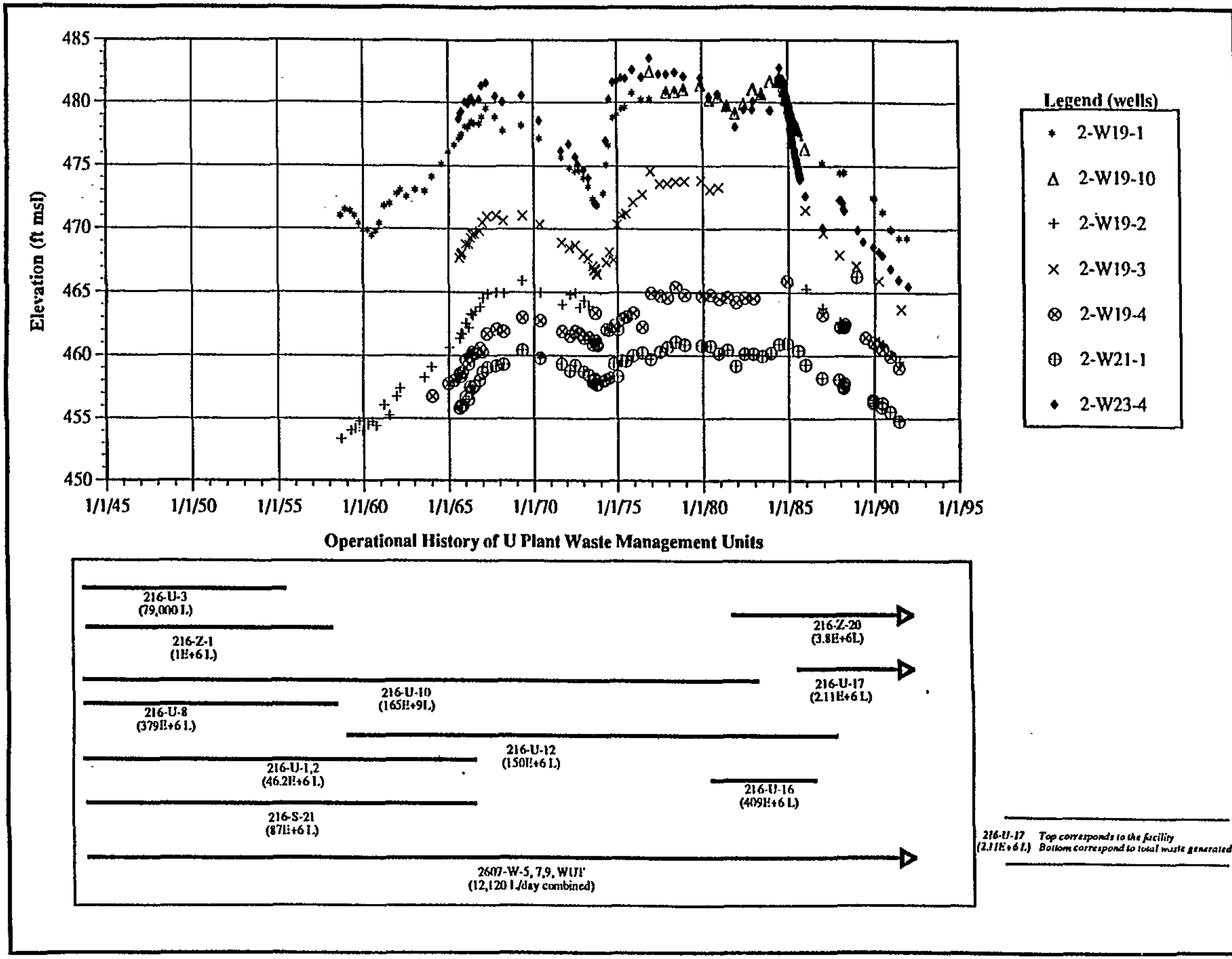



Figure 3-68. Well Hydrographs for the U Plant Aggregate Area.

# 4.0 PRELIMINARY CONCEPTUAL MODEL

## 4.1 Known and Suspected Contamination

## 4.2 Potential Impacts to Human Health

# 4.1 KNOWN AND SUSPECTED CONTAMINATION

## 4.1.1 Results of Groundwater Quality Monitoring

**Table 4-1.** Maximum Contaminant Concentrations
200 West Groundwater Aggregate Area.
(January 1988 - March 1991)

Page 2 of 3

| Chemical Compounds Volatile Organic | Monitoring Well | Waste Site[a/] Adjacent to Monitoring Well | Concentration | | | No. Detect | No. BDL | No. Wells |
|---|---|---|---|---|---|---|---|---|
| | | | Maximum | Minimum | Average | | | |
| **Radionuclides (pCi/L)** | | | | | | | | |
| Alpha | 2-W19-18 | 216-U-1,2 | 3710 | 1000 | 2308 | 17 | 0 | 110 |
| Gross beta | 2-W19-25 | | 5110 | 1910 | 3272 | 16 | 0 | 125 |
| Tritium | 2-W22-9 | 216-U-17 | 7560000 | 5880000 | 6773333 | 3 | 0 | 89 |
| Carbon-14 | 6-35-70 | | 19.6 | 3.05 | 12.5 | 6 | 1 | 2 |
| Cobalt-60 | 2-W15-7 | 216-Z-7 | 14 | 13 | 13.5 | 2 | 0 | 29 |
| Nickel-63 | 6-43-88 | | 9.18 | 9.18 | 9.2 | 1 | 0 | 2 |
| Strontium-90 | 2-W22-10 | 216-S-1,2 | 29.8 | 13.1 | 22.0 | 6 | 0 | 15 |
| Technetium-99 | 2-W19-24 | 216-U-17 | 41000 | 27.2 | 26975 | 15 | 0 | 48 |
| Ruthenium-106 | 2-W18-15 | 216-U-10 | 48.2 | 10.6 | 31.4 | 5 | 4 | 18 |
| Silver-110 Metastable | 2-W14-10 | 216-W-LWC | 5.38 | 5.38 | 5.4 | 1 | 0 | 1 |
| Iodine-129 | 6-35-70 | | 87.8 | 10.3 | 26.6 | 5 | 0 | 29 |
| Cesium-137 | 2-W22-2 | 216-S-1,2 | 17.2 | -1.88 | 4.4 | 6 | 4 | 11 |
| Radium | 2-W10-8 | 241-T | 6.42 | 6.42 | 6.4 | 1 | 0 | 43 |
| Uranium | 2-W19-18 | 216-U-1,2 | 1130 | 1130 | 1130 | 1 | 0 | 82 |
| Uranium-234 | 2-W19-18 | 216-U-1,2 | 1890 | 1320 | 1605 | 2 | 0 | 22 |
| Uranium-235 | 2-W19-11 | 216-U-1,2 | 102 | 102 | 102 | 1 | 0 | 22 |
| Uranium-238 | 2-W19-18 | 216-U-1,2 | 2040 | 1420 | 1730 | 2 | 0 | 22 |
| Plutonium-238 | 2-W15-8 | | 0.139 | 0.139 | 0.139 | 1 | 0 | 5 |
| Plutonium-239/40 | 2-W15-8 | | 8.27 | 8.27 | 8.27 | 1 | 0 | 9 |
| Americium-241 | 2-W18-17 | 216-Z-20 | 0.12 | 0.12 | 0.12 | 1 | 0 | 7 |
| **Inorganics (ppb)** | | | | | | | | |
| Aluminum | 2-W7-6 | | 38700 | 1060 | 17675 | 6 | 0 | 25 |
| Aluminum, filtered | 2-W7-6 | | 328 | 150 | 234 | 4 | 2 | 2 |
| Arsenic | 2-W10-8 | 241-T | 101 | 101 | 101 | 1 | 0 | 13 |
| Arsenic, filtered | 2-W15-4 | 216-T-19 | 24 | 24 | 24 | 1 | 0 | 8 |
| Barium | 2-W10-8 | 241-T | 732 | 732 | 732 | 1 | 0 | 68 |
| Barium, filtered | 2-W19-26 | 216-U-17 | 279 | 279 | 279 | 1 | 0 | 21 |
| Cadmium | 2-W19-1 | | 94 | 94 | 94 | 1 | 0 | 16 |

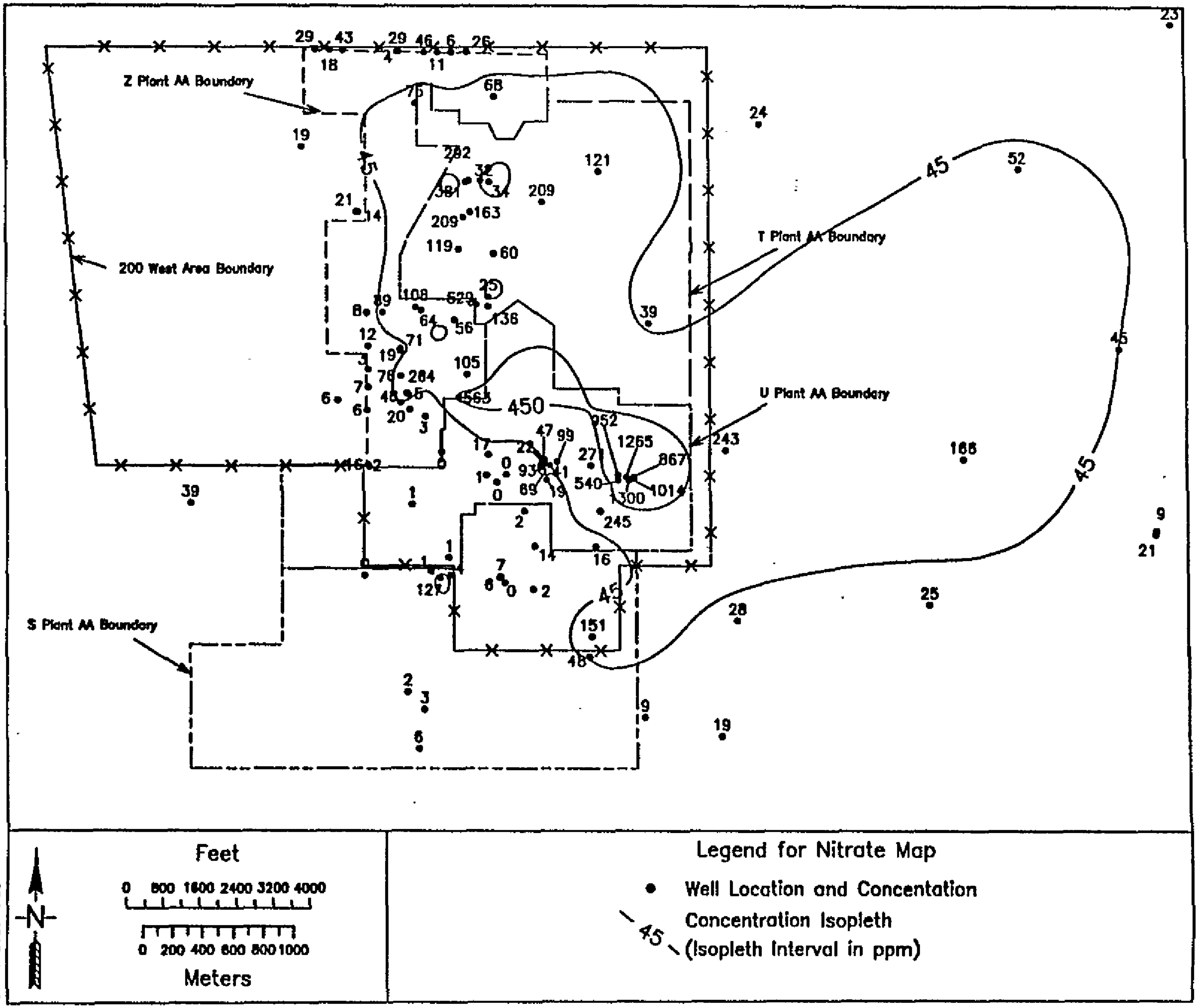



Figure 4-5. Nitrate Groundwater Plume Map.
(source: Connelly et al. 1992)

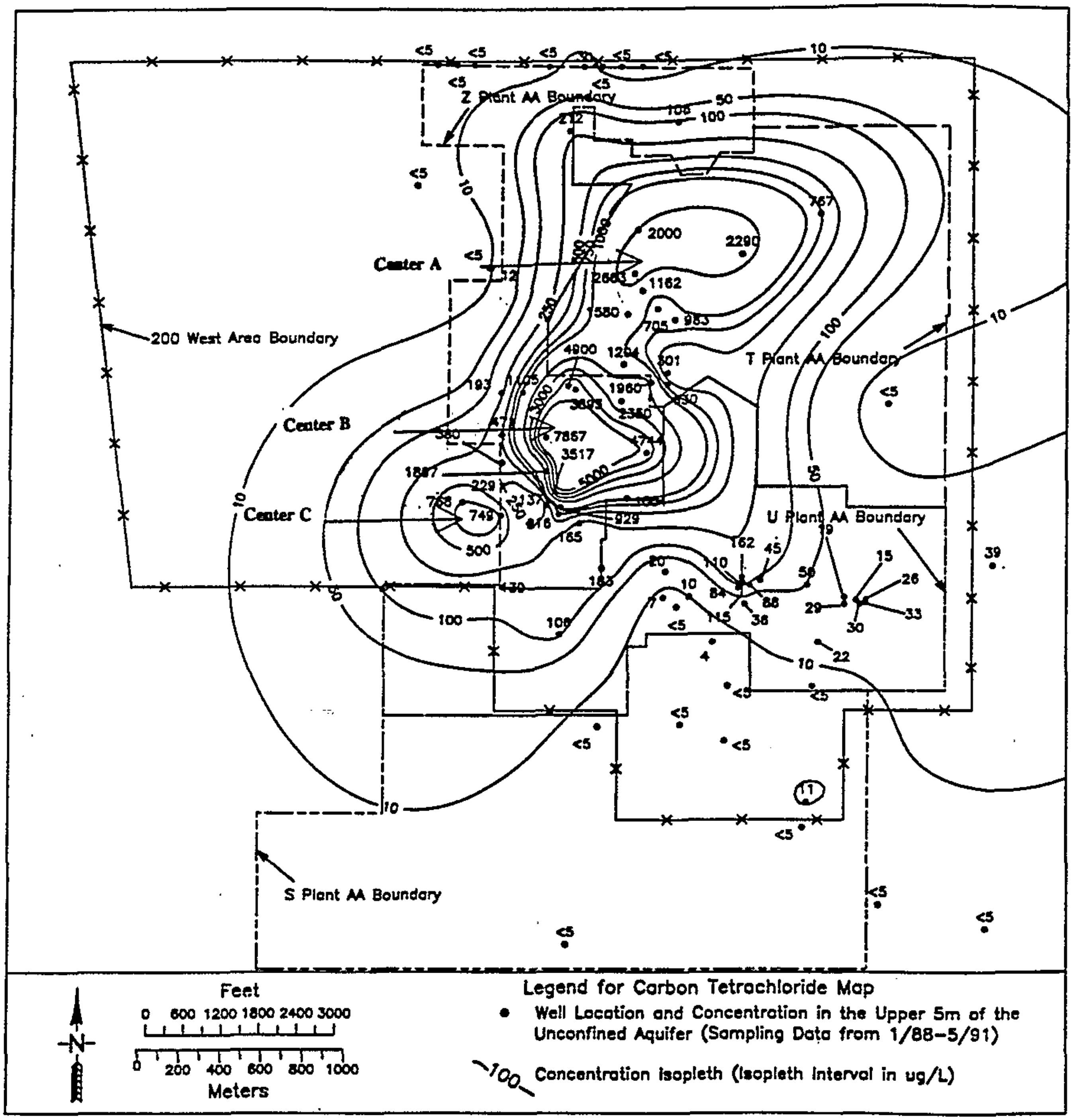



**Figure 4-6.** Carbon Tetrachloride Groundwater Plume Map.
(source: Connelly et al. 1992)

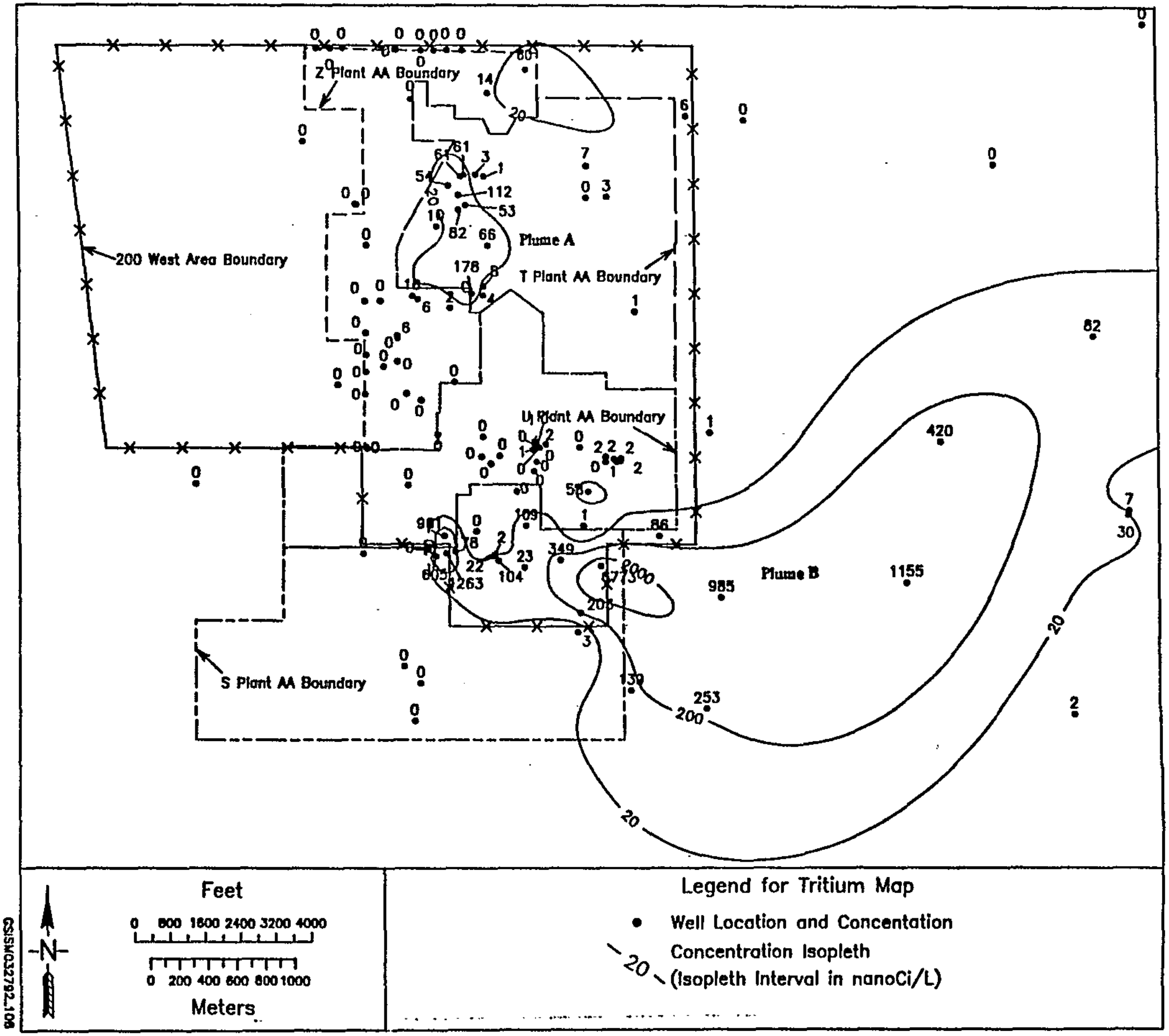



**Figure 4-11. Tritium Groundwater Plume Map.**

(source: Connelly et al. 1992)

9 2 1 2 5 4 3 1 7 0 9

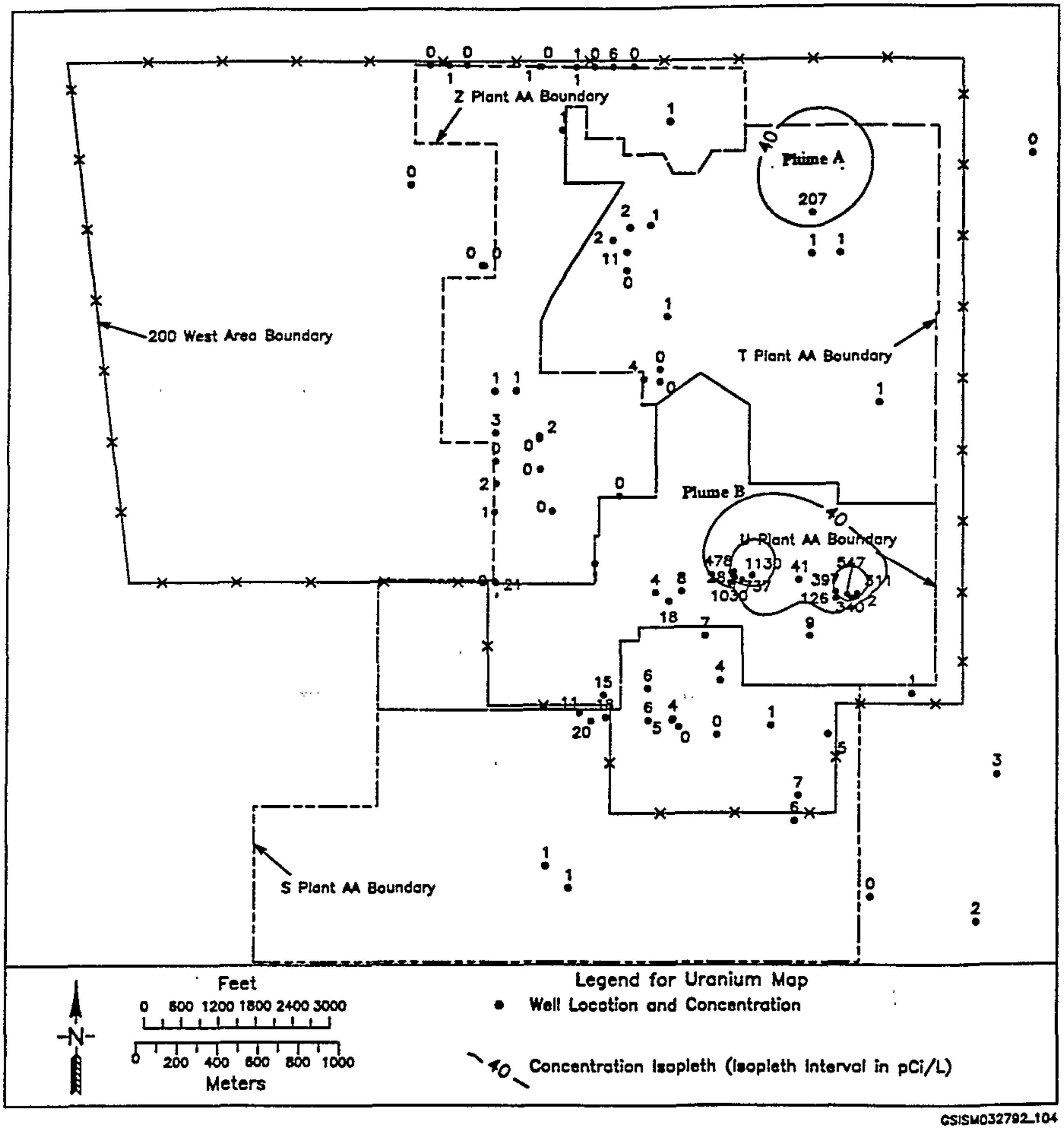



**Figure 4-14.** Uranium Groundwater Plume Map.
(source: Connelly et al. 1992)

### 4.1.2 Known Releases from 200 West Facilities

#### 4.1.2.1 Factors Contributing to Groundwater Contamination

#### 4.1.2.2 Source and Mobility of Chemicals Released to Vadose Zone

### 4.1.3 Potential Future Contaminant Plumes

#### 4.1.3.1 Anticipated Changes in Groundwater Flow

#### 4.1.3.2 Anticipated Releases from Vadose Zone

#### 4.1.3.3 Projected Contaminant Plumes

### 4.1.4 Interactions of Study Area Groundwater with Other Areas

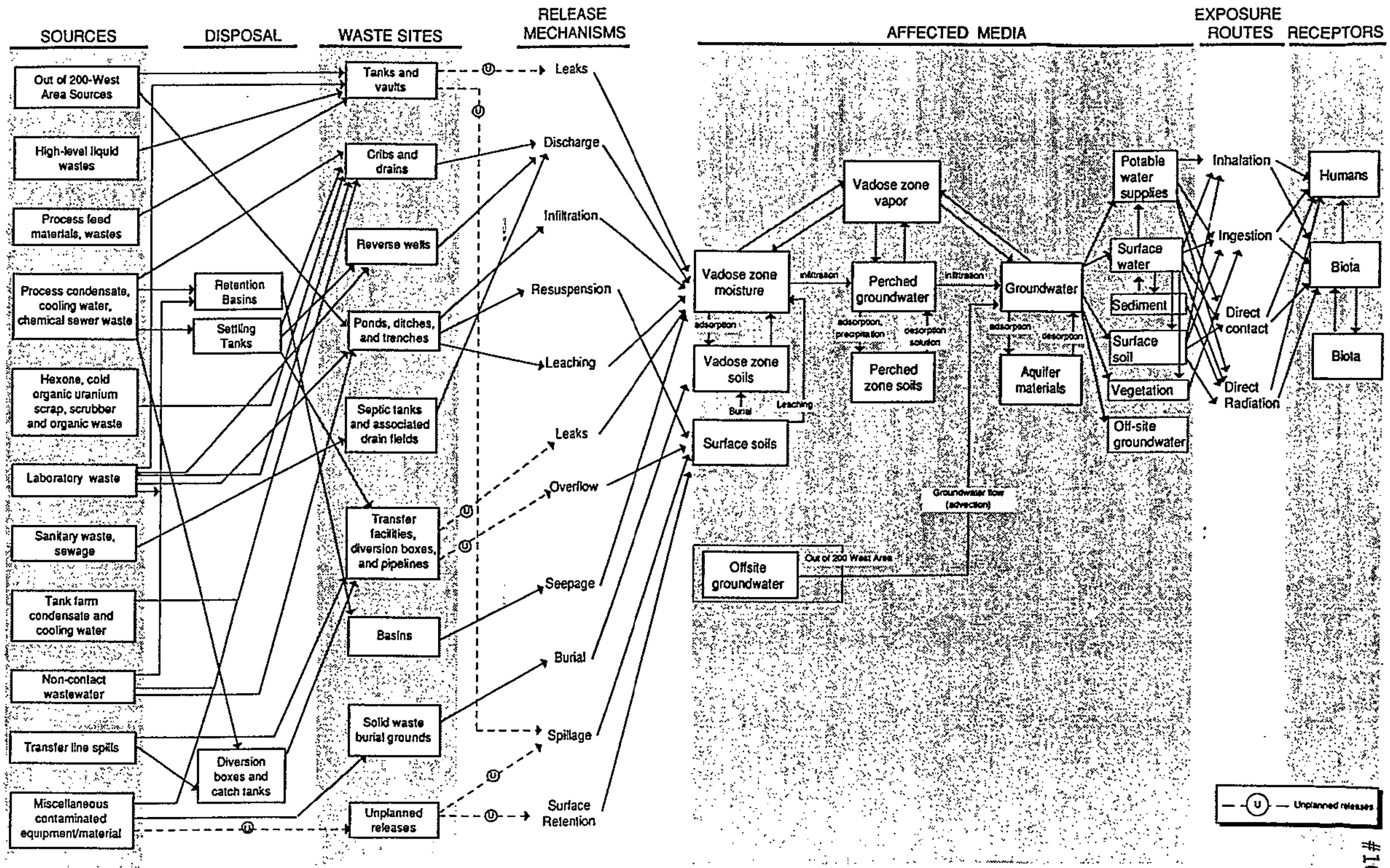



Figure 4-18. Conceptual Model of the 200 West Groundwater Aggregate Area.

# CONTAMINANTS OF POTENTIAL CONCERN

- DETECTED IN 200 WEST GROUND WATER 1989-1991
- REPORTED IN WASTE DISPOSAL INVENTORIES, OR TRAC INVENTORY FOR KNOWN OR ASSUMED LEAKING SST
- RADIONUCLIDE DAUGHTERS OF CONTAMINANTS REPORTED IN ABOVE SOURCES
- KNOWN OR SUSPECTED CARCINOGEN OR TOXIN

# CONTAMINANT RANKING

- **OBJECTIVES**

  **INPUT TO DECISION MAKING AND RECOMMENDATION PROCESS**

  - **PRIORITIZATION OF ERA AND IRM**

  - **DEFINING AREAL EXTENT OF ERA, IRM, AND GW OPERABLE UNITS**

# RANKING CONSIDERATIONS

- TOXICITY
- CONCENTRATION
- ENVIRONMENTAL MOBILITY
- PERSISTENCE

# RANKING CRITERIA

- CONSISTENT TREATMENT OF CHEMICAL AND RADIOLOGICAL CONTAMINANTS
- CONSIDER FULL RANGE OF ENVIRONMENTAL PATHWAYS AND EXPOSURE ROUTES
- INPUT REQUIREMENTS ARE CONSISTENT WITH AVAILABLE DATA
- DOCUMENTED

# RANKING ALTERNATIVES

- SINGLE PARAMETER
- MULTIPLE PARAMETERS
- SITE SPECIFIC ALGORITHM
- ESTABLISHED RANKING METHODS
- FULL RISK ASSESSMENT

# MEPAS

Dr. JAMES G. DROPPO Jr.

PACIFIC NORTHWEST LABORATORY

# CONCEPTUAL FRAMEWORK FOR RANKING

- CONCENTRATIONS OF CONTAMINANTS CURRENTLY MEASURED IN GROUNDWATER
    - DIRECT INPUT
    - TRANSPORT WITHIN AQUIFER, ESTIMATED OFFSITE CONCENTRATIONS
- STANDARD FULL-SCOPE EXPOSURE PATHWAYS
- CONSISTENT EVALUATION/RANKING OF CONTAMINANTS - NOT AN EXPOSURE SETTING/ SCENARIO

# RESULTS AND CONCLUSIONS

- PLOTS OF RRI "PLUMES"
- CONSISTENT WITH CONCENTRATION DATA AND EXPECTATIONS

# 6.0 POTENTIAL ARARs

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic and Organic Contaminants of Concern.



| | SDWA DRINKING WATER STANDARDS | | RCRA TCLP DESIGNATION LIMIT | RCRA LDR LIMITS FOR WASTEWATERS | MTCA GROUNDWATER CLEANUP LEVELS | RCRA PROPOSED CORRECTIVE ACTION LEVELS [a] |
|---|---|---|---|---|---|---|
| | MCL | SMCL | | CCW | METHOD A | WATER |
| | mg/L | mg/L | mg/L | mg/L | ug/L | mg/L |
| **INORGANICS: METALS** | | | | | | |
| Arsenic (III) | 0.05 | — | 5.0 | 5.0 | 5.0 | 0.05 |
| Arsenic (V) | 0.05 | — | 5.0 | 5.0 | 5.0 | 0.05 |
| Barium | 1.0 | — | 100.0 | 100.0 | — | 1.0 |
| Beryllium | — | — | — | 0.82 | — | 0.000008 |
| Boron | — | — | — | — | — | — |
| Cadmium | 0.01 | — | 1.0 | 1.0 | 5.0 | 0.01 |
| Chromium (VI) | 0.05 | — | 5.0 | 5.0 | 50.0 | 0.05 |
| Chromium (III) | 0.05 | — | 5.0 | 5.0 | 50.0 | — |
| Copper | — | 1.0 | — | 1.3 | — | — |
| Lead | 0.05 | — | 5.0 | 5.0 | 5.0 | 0.05 |
| Manganese | — | 0.05 | — | — | — | — |
| Mercury | 0.002 | — | 0.2 | 0.2 | 2.0 | 0.002 |
| Nickel | — | — | — | 0.55 | — | 0.7 |
| Silver | — | 0.1 | 5.0 | 5.0 | — | 0.05 |
| Uranium | — | — | — | — | — | — |
| Vanadium | — | — | — | 0.042 | — | — |
| Zinc | — | 5.0 | — | 1.0 | — | — |

# 7.0 PRELIMINARY REMEDIAL ACTION TECHNOLOGIES

7.1 Preliminary Remedial Action Objectives

7.2 Preliminary General Response Actions

7.3 Technology Screening

7.4 Preliminary Remedial Action Alternatives

7.5 Innovative Technologies

7.6 Preliminary Remedial Action Alternatives

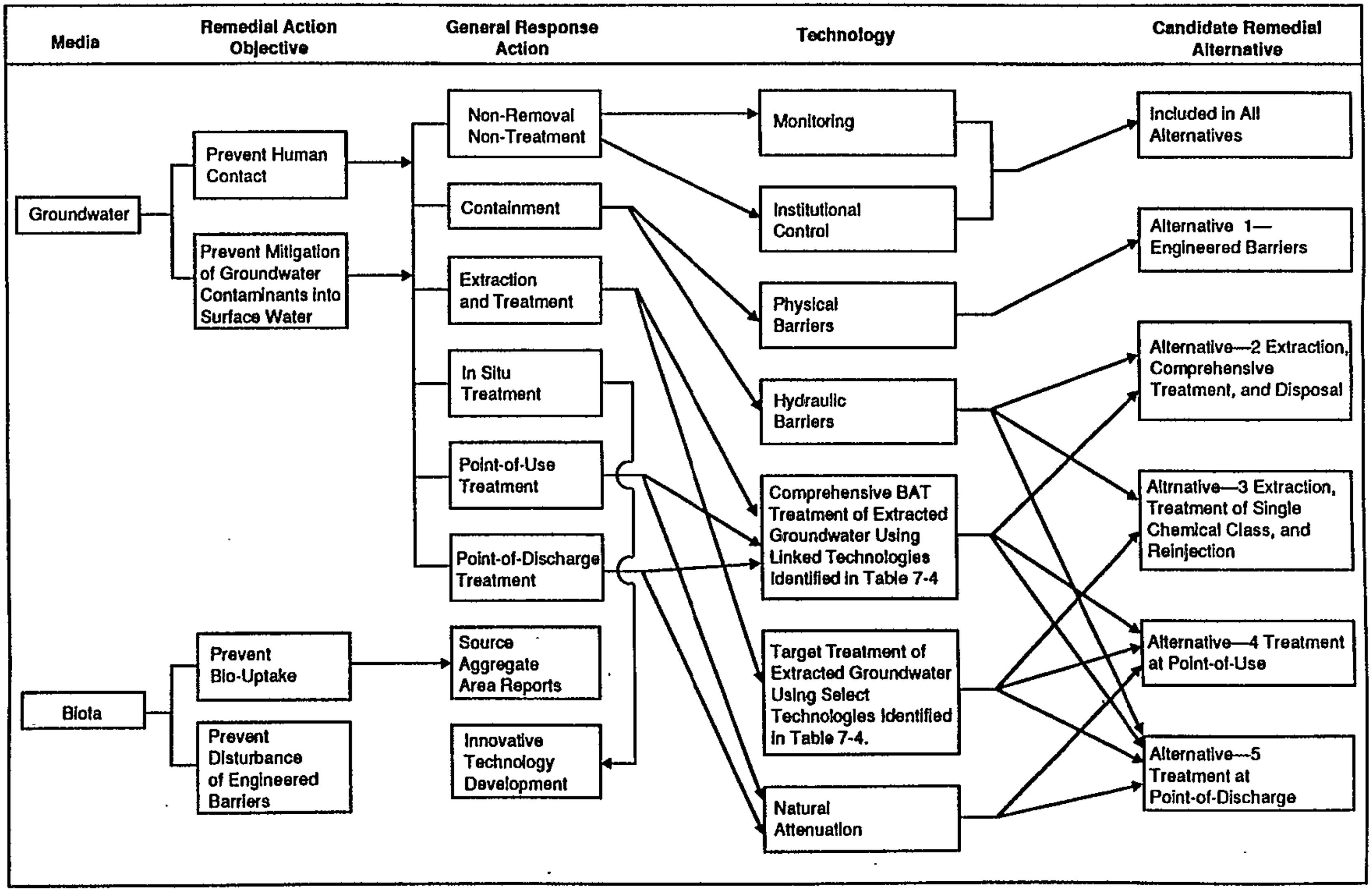



**Figure 7-1.** Development of Candidate Remedial Alternatives for 200 West Groundwater Aggregate Area.

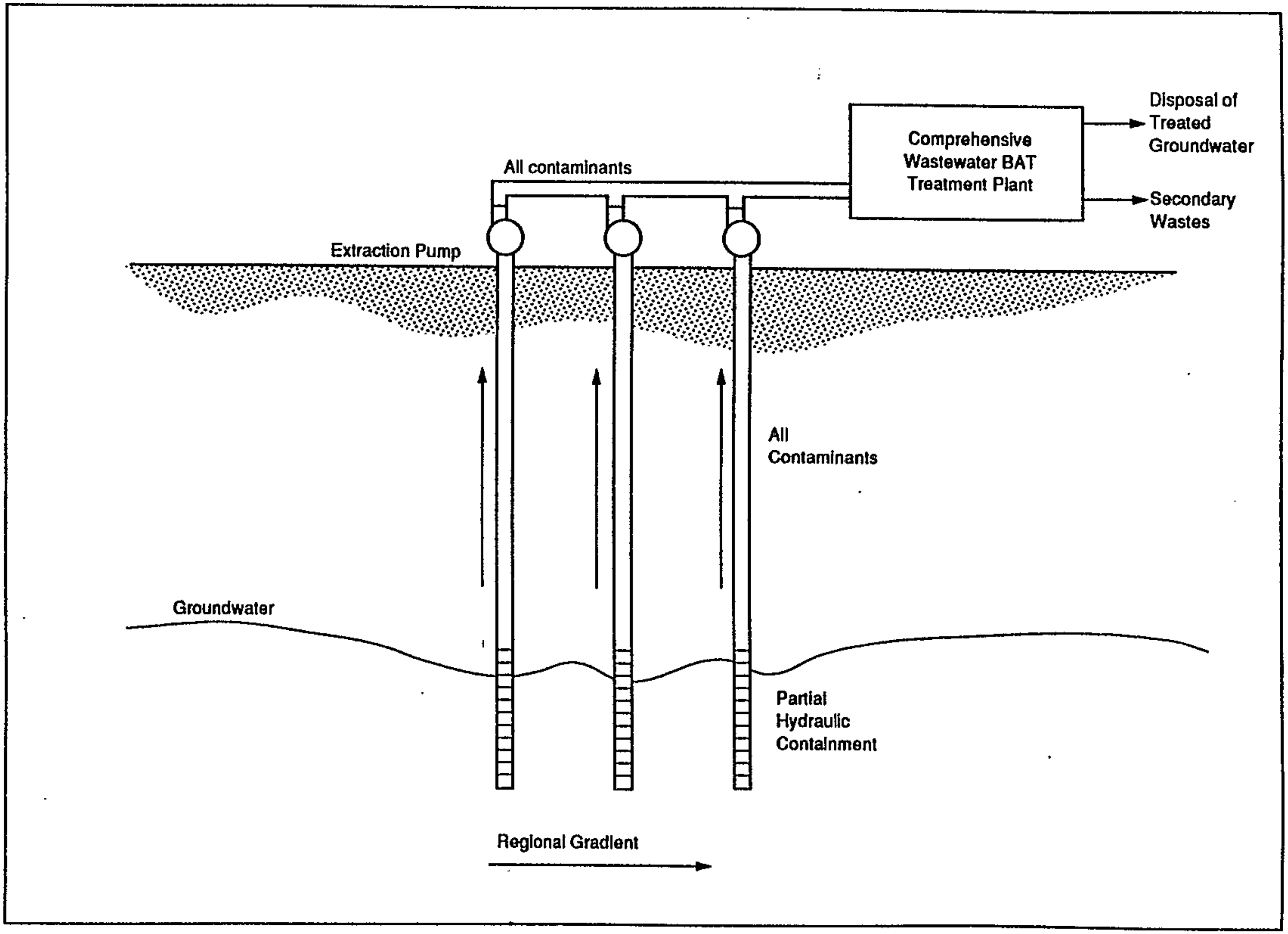



Figure 7-3. Alternative 2—Groundwater Extraction, Comprehensive Treatment, and Disposal.

# 8.0 DATA QUALITY OBJECTIVES

8.1 Decision Types

8.2 Data Uses and Needs

8.3 Data Collection Program

# 8.0 DATA QUALITY OBJECTIVES

*QA information on existing GW data; identify data gaps and deficiencies as well as broad data needs for site characterization to improve conceptual model and to better define ARARs; establish DQOs; set data priorities*

## 8.1 DECISION TYPES

### 8.1.1 Data Users

### 8.1.2 Available Information

### 8.1.3 Evaluation of Existing Data

### 8.1.4 Conceptual Models

### 8.1.5 AAMS Objectives and Decisions

# 8.2 DATA USES AND NEEDS

### 8.2.1 Data Uses

### 8.2.2 Data Needs

### 8.2.3 Data Gaps

# 8.3 DATA COLLECTION PROGRAM

### 8.3.1 General Rationale

### 8.3.2 General Strategy

### 8.3.3 Investigation Methodology

### 8.3.4 Data Evaluation and Decision Making

**Table 8-1.** Data Requirements for Modeling Flow and Transport.

Page 1 of 2

C.1 CLIMATIC DATA

- 1.1 Precipitation Data (from Meteorological Measurements)
  - 1.1.1 Rainfall
  - 1.1.2 Snowmelt
  - 1.1.3 Runoff from Precipitation Events (Field-Measured)
- 1.2 Potential Evapotranspiration Data (From Meteorological Measurements)
  - 1.2.1 Air Temperature
  - 1.2.2 Relative Humidity (Wet and Dry Bulk)
  - 1.2.3 Wind Speed
  - 1.2.4 Solar Radiation

C.2 PLANT AND VEGETATION DATA

- 2.1 Transpiration Function (Field-Measured)
  - 2.1.1 Plant Type and Depth of Root System
  - 2.1.2 Plant Density
- 2.2 Plant Cover
  - 2.2.1 Leaf Area Index (Field-Measured)

C.3 FLOW DOMAIN CHARACTERISTICS

- 3.1 Size of Flow Domain (Based on Field Data)
  - 3.1.1 Spatial Discretization (Numerical Input)
  - 3.1.2 Temporal Discretization (Numerical Input)
- 3.2 Boundary Conditions
  - 3.2.1 Flow (Field-Measured Moisture Contents of Fluxes)
  - 3.2.2 Contaminant Transport (Field-Measured Concentration or Mass Fluxes for Various Species)
- 3.3 Initial Conditions
  - 3.3.1 Flow (Field-Measured Moisture Contents or Pressure Potentials)
  - 3.3.2 Contaminant Transport (Field-Measured Concentrations for Various Contaminant Species)
- 3.4 Depth to Water Table (Field-Measured)
- 3.5 Thickness and Hydraulic Properties of the Unconfined Aquifer (Field-Measured)
- 3.6 Location and Rates of Pumping/Injection Wells (Field Data)

C.4 SOIL CHARACTERISTICS (These are considered to be the critical hydrologic parameters)

- 4.1 Heterogeneity and Anisotrophy (Field-Measured)
  - 4.1.1 Layering (Thickness and Continuity of Various Layers)
  - 4.1.2 Anisotropic Characteristics of Various Layers

# 9.0 RECOMMENDATIONS

9.1 Decision Making Criteria

9.2 Path Recommendations

9.3 Groundwater Operable Unit Definition and Prioritization

9.4 Feasibility Study

9.5 Treatability Studies

# 9.0 RECOMMENDATIONS

## 9.1 DECISION MAKING CRITERIA

### 9.1.1 Expedited Response Action Path

### 9.1.2 Limited Field Investigation and Interim Remedial Measure Paths

### 9.1.3 Final Remedy Selection Path

9 2 1 2 6 4 3 1 7 3 1



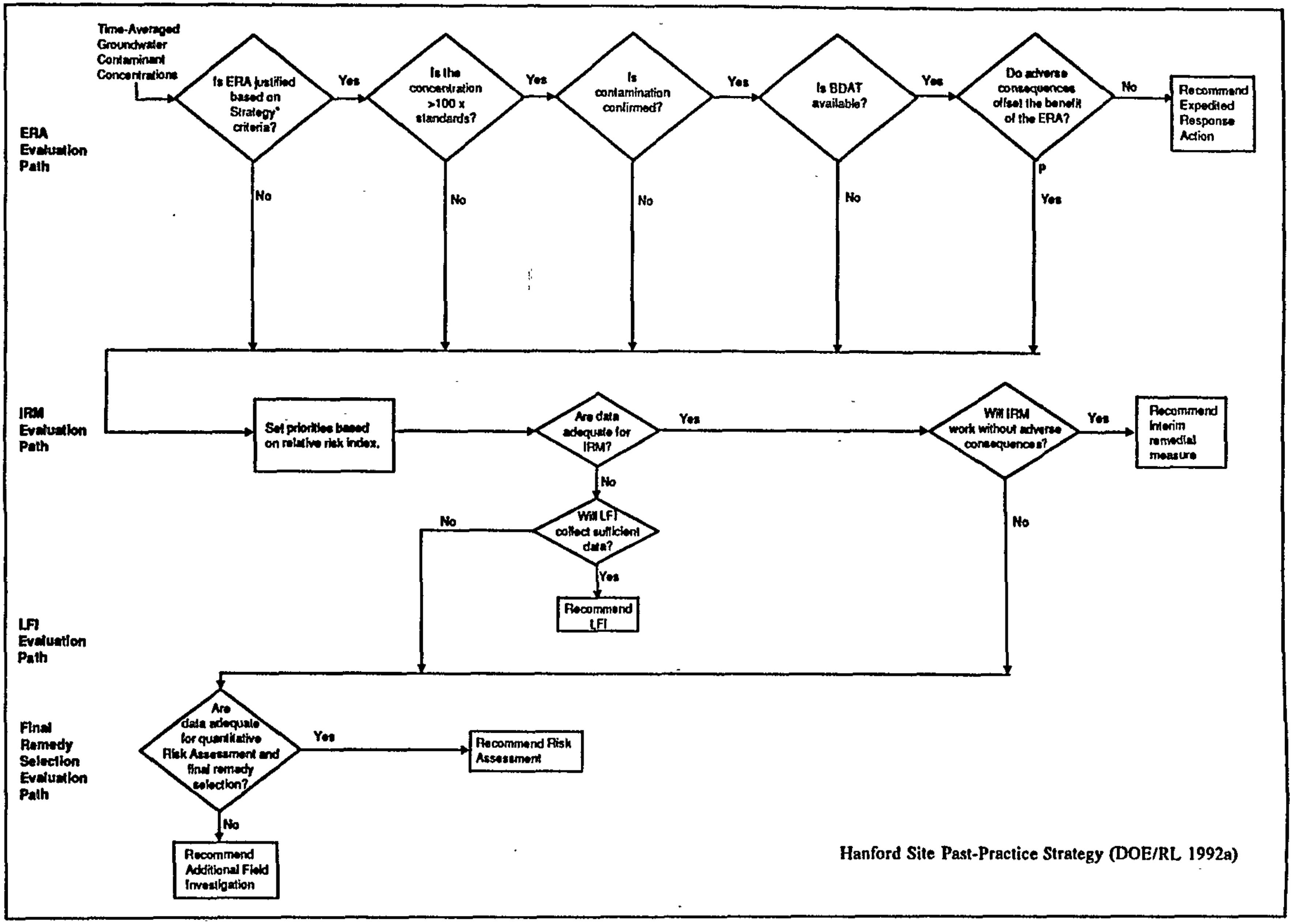



**Figure 9-1.** Groundwater Aggregate Area Management Study Data Evaluation Process.

# 9.2 PATH RECOMMENDATIONS

9.2.1 Proposed Plumes for Expedited Response Actions

9.2.2 Proposed Plumes for Interim Remedial Measures

9.2.3 Proposed Plumes for Limited Field Activities

9.2.4 Proposed Plumes for Final Remedy Selection

9.2.4.1 Proposed Plumes for Remedial Investigation

9.2.4.2 Proposed Plumes for Risk Assessment

**Table 9-1. Summary of the Results of Data Evaluation Process Pathway Assessment.** Page 3 of 3

| Plume | ERA | IRM | LFI | RA | RI | Remarks |
|---|---|---|---|---|---|---|
| $^{90}$Sr | | X | X | | | |
| $^{99}$Tc | | X | | | | Associated with uranium |
| $^{106}$Ru | | | | | X | |
| $^{110m}$Ag | | | | | X | |
| $^{129}$I | | X | X | | | |
| $^{137}$Cs | | | | | X | |
| Ra | | X | X | | | |
| U | X | | | | | |
| $^{234}$U | X | | | | | ERA due to total uranium |
| $^{235}$U | X | | | | | ERA due to total uranium |
| $^{238}$U | X | | | | | ERA due to total uranium |
| $^{238}$Pu | | | | | X | |
| $^{239,240}$Pu | | X | X | | | |
| $^{241}$Am | | | | | X | |

ERA - Expedited Response Action
RI - Remedial Investigation/Feasibility Study
LFI - Limited Field Investigation
RA - Risk Assessment
IRM - Interim Remedial Measure

**Table 9-2. 200 West Groundwater Aggregate Area Data Evaluation Decision Matrix.** Page 3 of 4

| | ERA Evaluation Path | | | | | | | | RRI Rank | | | | IRM Path | | | | Final Remedy Path | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Current | | Future | | | | | | | | |
| Detected Constituent | Max Conc | HSPPS justfd? | GW Std | >100 *Std? | conf? | BDAT avail? | Adv Cnsq? | ERA? | C | NC | C | NC | Data Adeq? | LFI? | Adv Cnsq? | IRM? | Data Adeq? | RA? | LFI? |
| Radionuclides (pCi/L) | | | | | | | | | | | | | | | | | | | |
| Alpha | 2308 | Y | 15 | Y | Y | Y | N | Y | | | | | | | | | | | |
| Beta | 3272 | Y | na | N | | | | N | | | | | N | Y | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Tritium ($^3H$) | 6.8E7 | Y | 20,000 | Y | Y | N | | N | 5 | | 4 | | Y | | Y | N | Y | Y | |
| $^{14}C$ | 12 | Y | 2800 | N | | | | N | 20 | | | | N | N | | | N | | Y |
| $^{60}Co$ | 13 | Y | 200 | N | | | | N | 19 | | | | N | N | | | N | | Y |
| $^{63}Ni$ | 9 | Y | 12,000 | N | | | | N | 22 | | | | N | N | | | N | | Y |
| $^{90}Sr$ | 22 | Y | 8 | N | | | | N | 12 | | | | N | Y | | | | | |
| $^{99}Tc$ | 26,975 | Y | 4000 | N | | | | N | 2 | | 1 | | Y | N | N | Y | | | |
| $^{106}Ru$ | 31 | Y | 240 | N | | | | N | 15 | | | | N | N | | | N | | Y |
| $^{110m}Ag$ | 5 | Y | 400 | N | | | | N | nr | | | | N | N | | | N | | Y |
| $^{129}I$ | 27 | Y | 20 | N | | | | N | 10 | | 3 | | N | Y | | | N | | Y |
| $^{137}Cs$ | 4 | Y | 120 | N | | | | N | 18 | | | | N | N | | | N | | Y |
| | | | | | | | | | | | | | | | | | | | |
| Ra | 6 | Y | 5 | N | | | | N | 11 | | | | N | Y | | | | | |
| U | 1130 | Y | 24 | Y | Y | Y | N | Y | | | | | | | | | | | |
| $^{234}U$ | 1605 | Y | 20 | N | | | | Y | 3 | | L | | | | | | | | |
| $^{235}U$ | 102 | Y | 24 | N | | | | Y | 9 | | L | | | | | | | | |
| $^{238}U$ | 1730 | Y | 24 | N | | | | Y | 3 | | L | | | | | | | | |

# 9.3 GROUNDWATER OPERABLE UNIT DEFINITION AND PRIORITIZATION

## 9.3.1 Groundwater Operable Unit Definition

## 9.3.2 Investigation Prioritization

## 9.3.3 RCRA Facility Interface

# 9.4 FEASIBILITY STUDY

## 9.4.1 Focused Feasibility Study

## 9.4.2 Final Feasibility Study

# 9.5 TREATABILITY STUDIES

# MEPAS - A Risk Computation Code For Ranking/Prioritization Applications

## April 23, 1992

Dr. James G. Droppo Jr.
Pacific Northwest Laboratory

Attachment #11

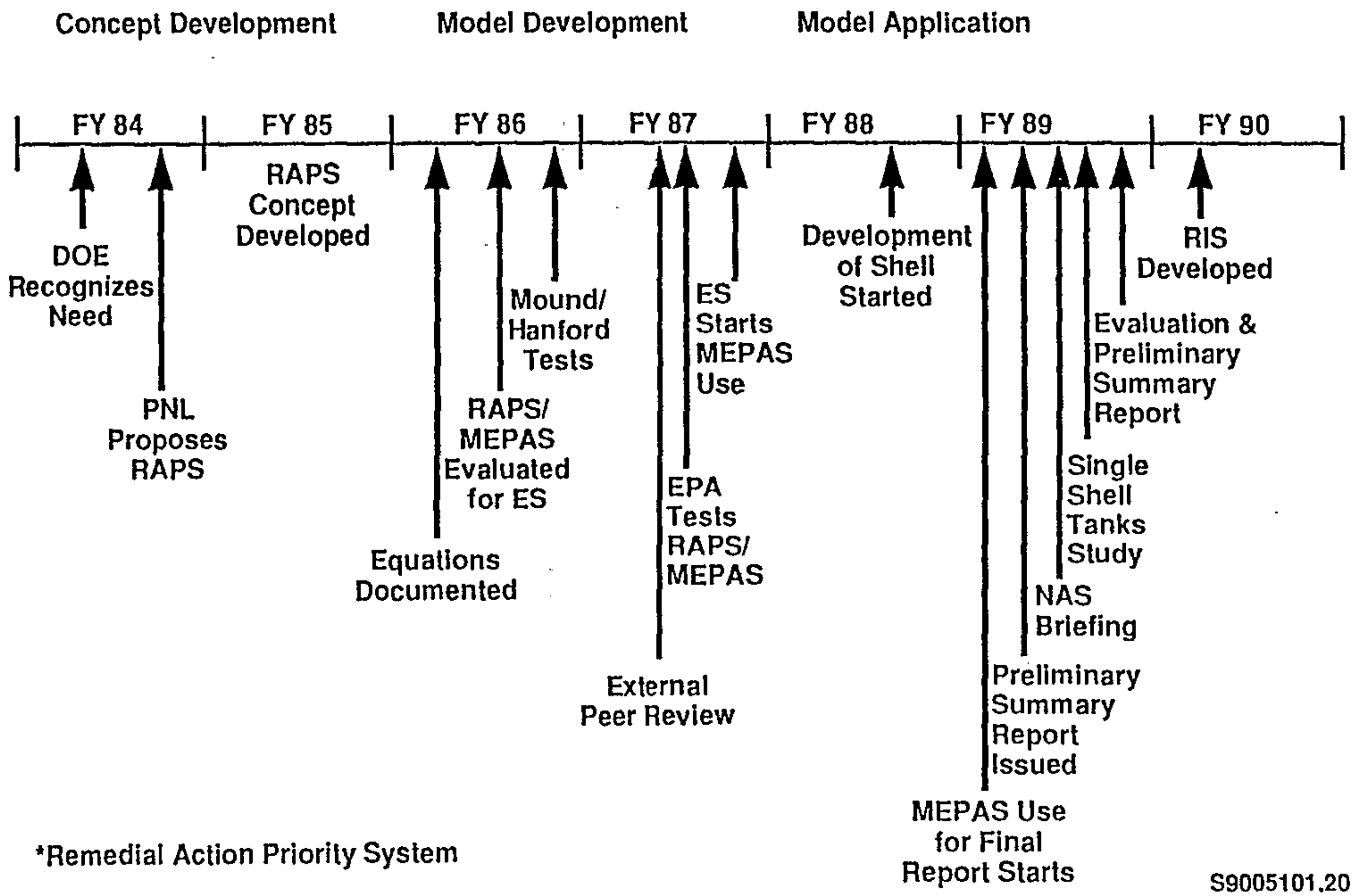
# This Presentation Describes:

- The MEPAS risk computation model
- Model history, formulations, applications, and status

# MEPAS - Acronyms

- Multimedia Environmental Pollutant Assessment System
- Earlier version had the name Remedial Action Priority System (RAPS)
- Both models developed for DOE at Hanford by Battelle between FY1984 and present.

# A History of RAPS*/ MEPAS




*Remedial Action Priority System

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# MEPAS Development Objectives

- System to be used as health-based screening tool
- Consider both radioactive and nonradioactive long-term impacts
- Account for site-specific linkages between releases and exposures

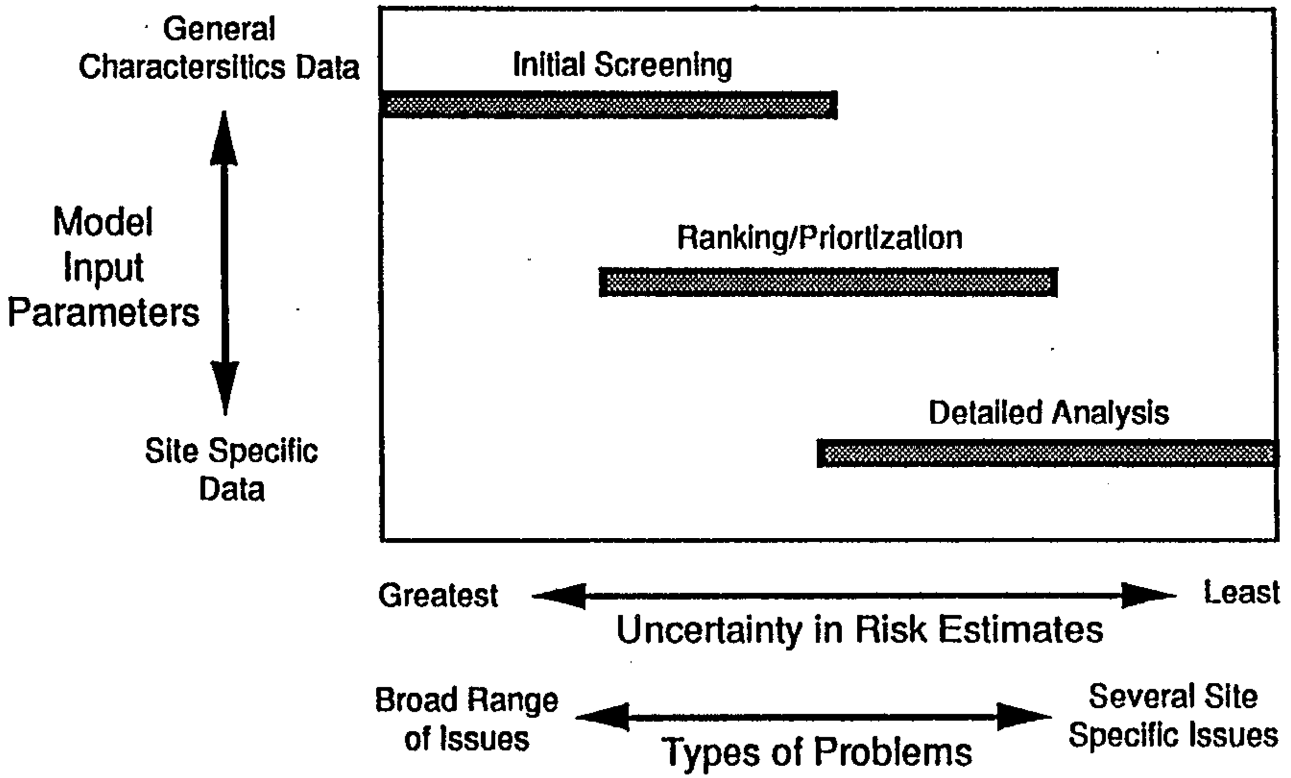
# MEPAS Development Emphasis

- Only require readily available environmental setting data as input
- Provide as good as possible relative comparisons between sites, pollutants, and different types of impacts

# MEPAS APPROACH

- Consider Long-Term Impacts
- Use Standard Computation Methods
- Balanced Coverage of All Major Exposure Pathways

9 2 1 2 6 4 3 1 7 4 3

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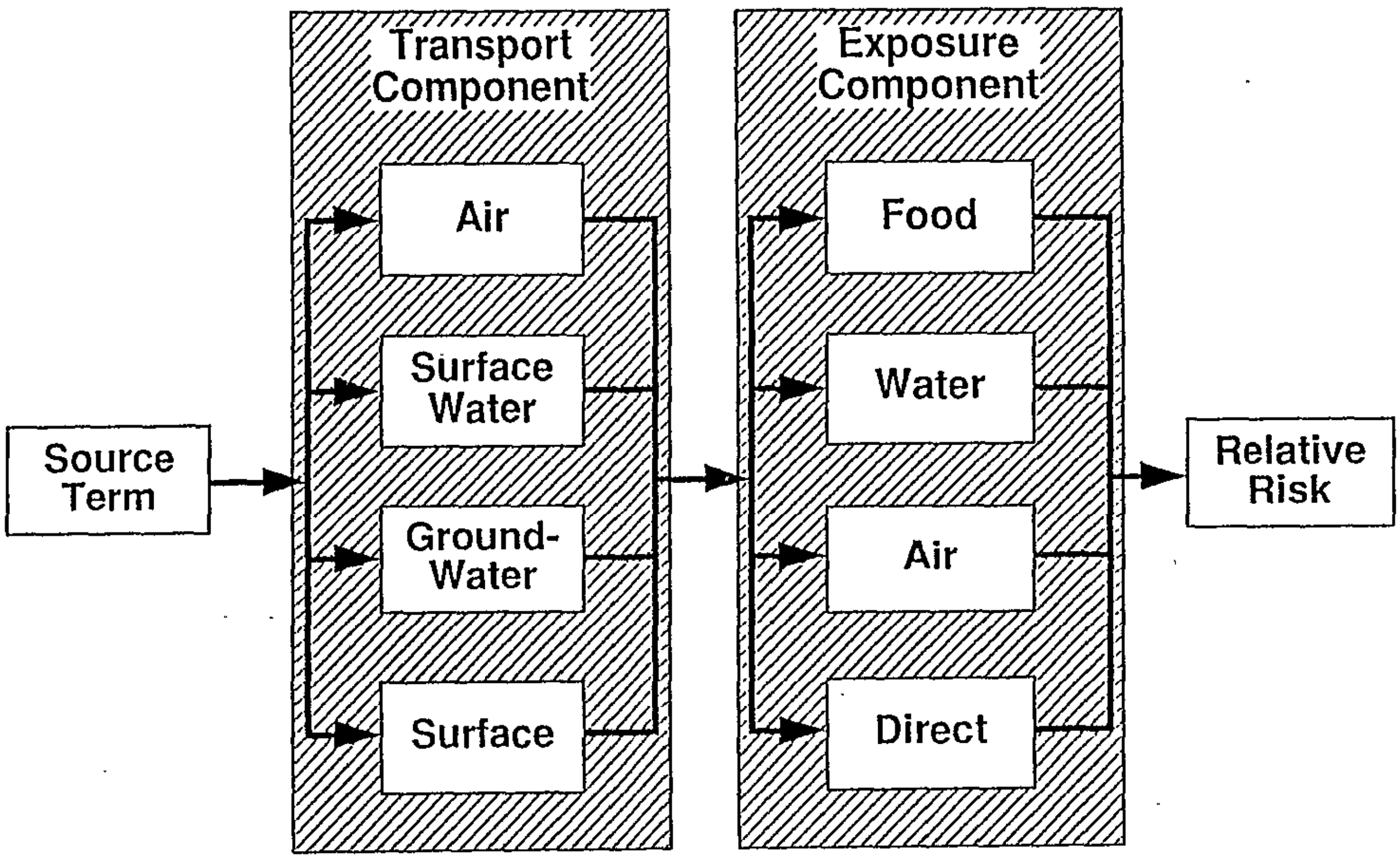
# Structure of MEPAS

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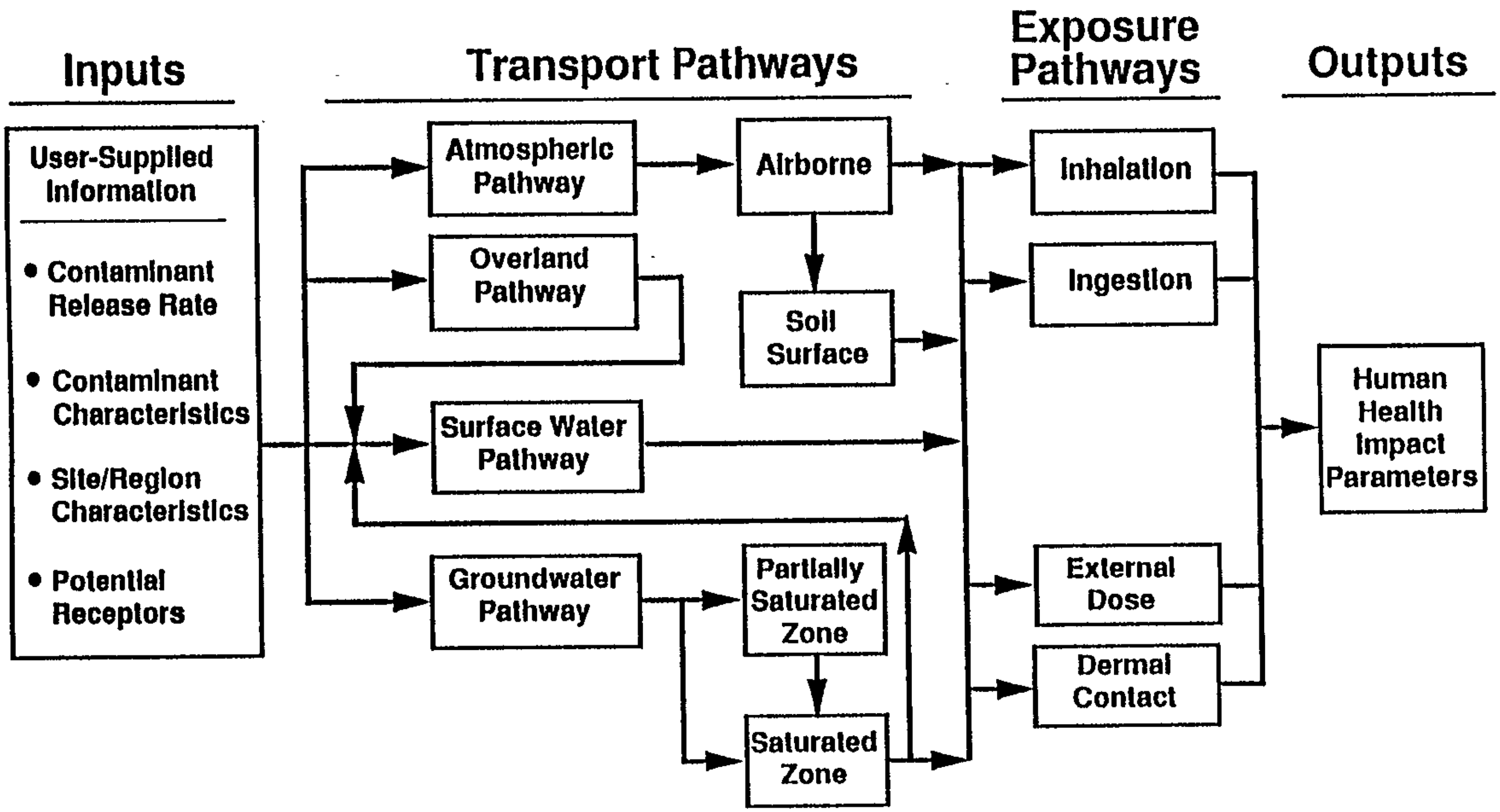
Inputs
Transport Pathways
Exposure Pathways
Outputs
User-Supplied Information
• Contaminant Release Rate
• Contaminant Characteristics
• Site/Region Characteristics
• Potential Receptors
Atmospheric Pathway
Overland Pathway
Surface Water Pathway
Groundwater Pathway
Airborne
Soil Surface
Partially Saturated Zone
Saturated Zone
Inhalation
Ingestion
External Dose
Dermal Contact
Human Health Impact Parameters

S9107015.20

# Source Term

- Direct input to model
  - Stack emission rates
  - Leach rate
  - Known source at receptor

- Computed by model
  - Volatilization
  - Resuspension
  - Flux

- Back calibration from environmental data

# Exposure Pathways

- Water: Aquatic foods, drinking water, farm products (irrigation), recreation (dermal contact, external exposure), showering
- Soil: Ingestion, farm products, external, resuspension, inhalation
- Air: Inhalation, farm products, external exposure

# Human Health Risk Parameters

1. Individual/population exposure
2. Average/maximum exposure
3. Time of impact

# SELECTED MEPAS APPLICATIONS

- EPA comparison - 20 EPA Superfund Sites
- Environmental Survey - 35 DOE facilities approximately 900 exposure scenarios
- Hanford Applications
  - One of sites used for model validation runs
  - SST Characterization Planning
  - Grout Nonradioactive Effects Evaluation
  - 200 West Groundwater AAMS
- ORNL Risk Evaluations at various DOE facilities nationwide

# SELECTED HANFORD MEPAS MODEL VALIDATION EXAMPLES (PNL-7102)

- Deep-Drainage Rates at the Hanford Facility; Observed Versus Simulated Evapotranspiration at Burial Waste Test Facility Site (Figure 5.11)

- Concentration Variation With Depth Comparisons in the Partially Saturated Zone at Sites 216-Z-1A and 216-Z-8 (Figures 5.26, 5.27, 5.28, 5.29, and 5.33).

- Hanford Data from BC Cribs and other sites used in surface particulate suspension model tests (Figure 6.6).

# MEPAS DOCUMENTATION

- Series of reports and articles (MEPAS Bibliography attached)

- Nine Reports

    Formulations (2)
    Constituent Database
    Validation
    User's Guides (3)
    Sensitivity Study
    Ranking Issues Analysis

# STATUS OF MEPAS

- Mature well-tested baseline risk version available with documentation.

- Remediation version under development for use in evaluating cleanup alternatives.

The mathematical formulations composing the framework for the RAPS (and subsequently, MEPAS) methodology are given.

Whelan, G., B. L. Steelman, D. L. Strenge, and J. G. Droppo, Jr. 1986. "Overview of the Remedial Action Priority System (RAPS)." In Pollutants in a Multimedia Environment, ed. Y. Cohen, Plenum Publishing, New York.

This chapter in a book on multimedia transport gives a overview of the mathematical basis of the RAPS/MEPAS methodology.

## Methodology Guidance and Database Documents

Buck, J. W., B. L. Hoopes, and D. R. Friedrichs. 1989. Multimedia Environmental Pollutant Assessment System (MEPAS): Getting Started with MEPAS. PNL-7126, Pacific Northwest Laboratory, Richland, Washington.

This report helps the user with the initial startup of MEPAS.

Droppo, J. G., Jr., D. L. Strenge, J. W. Buck, B. L. Hoopes, R. D. Brockhaus, M. B. Walter, and G. Whelan. 1989. Multimedia Environmental Pollutant Assessment System (MEPAS) Application Guidance Volume 1 - User's Guide. PNL-7216, Pacific Northwest Laboratory, Richland, Washington.

Guidance is provided for the process of defining a problem for analysis by MEPAS.

Droppo, J. G., Jr., D. L. Strenge, J. W. Buck, B. L. Hoopes, and G. Whelan. 1989. Multimedia Environmental Pollutant Assessment System (MEPAS) Application Guidance Volume 2 - Guidelines for Evaluating MEPAS Input Parameters. PNL-7216, Pacific Northwest Laboratory, Richland, Washington.

Detailed instructions are given on the definition of each input parameter.

Strenge, D. L., and S. R. Peterson. 1989. Chemical Data Bases for the Multimedia Environmental Pollutant Assessment System (MEPAS): Version 1. PNL-7145, Pacific Northwest Laboratory, Richland, Washington.

The MEPAS methodology uses a constituent data base containing standard values of physical, chemical, and exposure parameters. These data values are listed along with the source (reference or footnote) for each parameter.

## Sensitivity and Evaluation Documents

Doctor, P. G., T. B. Miley, and C. E. Cowan. 1990. Multimedia Environmental Pollutant Assessment System (MEPAS) Sensitivity Analysis of Computer Codes. PNL-7296, Pacific Northwest Laboratory, Richland, Washington.

The results of a sensitivity study of MEPAS model inputs are presented.

Droppo, J. G., Jr. 1989. "Use of Environmental Monitoring Data in Evaluation of Atmospheric Modeling Results." In Proceeding on the 28th Hanford Symposium on Health and the Environment, October 16-19, 1989, Richland, Washington.

Case studies of comparisons of atmospheric monitoring data and MEPAS predicted values are discussed.

Droppo, J. G., Jr., J. W. Buck, D. L. Strenge, and M. R. Siegel. 1990. Analysis of Health Impact Inputs to the U.S. Department of Energy's Risk Information System. PNL-7432, Pacific Northwest Laboratory, Richland, Washington.

This document provides an overview of the DOE Risk Information System as well as the results of an analysis of the preliminary application of MEPAS to potential environmental problems at 16 DOE facilities (DOE 1988).

EPA. 1988. Analysis of Alternatives to the Superfund Hazard Ranking System. Prepared by Industrial Economics, Incorporated, Cambridge, Massachusetts.

This document, as part of EPA's revision of their Hazardous Ranking System, evaluated several screening models for hazardous waste sites, including RAPS/MEPAS, by comparing their results to an expert panel to determine the strengths and weaknesses of these models.

Morris, S. C., and A. F. Meinhold. 1988. Report of Technical Support for the Hazardous Waste Remedial Action Program on Health and Environmental Risks of Inactive Hazardous Waste Sites. BNL-42339, Brookhaven National Laboratory, Long Island, New York.

This document evaluates the MEPAS methodology for use in support of the Hazardous Waste Remedial Action Program.

Strenge, D. L., and J. W. Buck. 1989. "Chemical Exposure Evaluation in the Multimedia Environmental Pollutant Assessment System (MEPAS)." In Proceeding of the 28th Hanford Symposium on Health and the Environment, October 16-19, 1989, Richland, Washington.

This paper presents analysis of several ranking parameters provided by the MEPAS methodology. This analysis includes comparing and combining parameters to help assess environmental problems.

## Model Testing Documents

Whelan, G., D. L. Strenge, and J. G. Droppo, Jr. 1988. "The Remedial Action Priority System (RAPS): Comparison Between Simulated and Observed Environmental Contaminant Levels." In Superfund '88, Proceedings of 9th National Conference, November 28-30, 1988, Washington, D.C.

This paper presents results from comparison of monitoring data from DOE sites to simulated values from the MEPAS methodology.

Whelan, G., J. G. Droppo, Jr., D. L. Strenge, M. B. Walter, and J. W. Buck. 1989. A Demonstration of the Applicability of Implementing the Enhanced Remedial Action Priority System (RAPS) for Environmental Releases. PNL-7102, Pacific Northwest Laboratory, Richland, Washington.

This report documents the component testing effort conducted for the RAPS/MEPAS effort. Although published under the RAPS name, this document includes testing of the MEPAS active releases components.

## Application Documents

Buck, J. W., and R. J. Aiken (U.S. DOE). 1989. "Applications of the Multimedia Environmental Pollutant Assessment System (MEPAS)." In Proceedings of HAZTECH International Conference, September 27-29, 1989, San Francisco.

The application of the MEPAS methodology to DOE's Environmental Survey and other applications is discussed.

Buck, J. W., M. S. Peffers, and S. T. Hwang. 1991. Preliminary Recommendations on the Design of the Characterization Program for the Hanford Site Single-Shell Tanks -- A System Analysis: Volume 2 -- Closure-Related Analyte Priorities, Concentration Thresholds, and Detection Limit Goals Based on Public Health Concerns. PNL-7573, Pacific Northwest Laboratory, Richland, Washington.

This document describes the development of data quality objectives (DQOs) for the Hanford Site Single-Shell Tank Waste Characterization Program. These DQOs include priority of analytes, concentrations at which analytes are significant risk contributors (concentration threshold concept [CT]), and detection limit goals (DLGs) for analytical methods. The MEPAS code was used to evaluate public health risk for these DQOs based on site- and constituent-specific data.

DOE. 1988. Environmental Survey Preliminary Summary Report of the Defense Production Facilities. DOE/EH-0072, U.S. Department of Energy; Environment, Safety, and Health; Office of Environmental Audit; Washington, D.C.

This report presents the results of a preliminary application of MEPAS to ranking environmental problems at 16 of DOE's defense waste facilities.

Droppo, J. G., Jr., and J. W. Buck. 1988. "Characterization of the Atmospheric Pathway at Hazardous Waste Sites." In Proceedings of DOE Model Conference, October 3-7, 1988, Oak Ridge, Tennessee.

This paper compares the atmospheric model rankings from DOE's Environmental Survey to the groundwater and surface water pathway rankings to determine biases.

Droppo, J.G, Jr, J.W. Buck, J.S. Wilbur, D.L. Strenge, and M.D. Freshley. 1991. Single-Shell Tanks Constituent Rankings for Use in Preparing Waste Characterization Plans. PNL-7572. Pacific Northwest Laboratory, Richland, Washington.

This document describes the use of the MEPAS code to prioritize the large number of analytes of interest for the Hanford Single-Shell Tanks (SSTs) Waste Characterization Project. The analysis divides the SST analytes into carcinogen and noncarcinogenic groups. These groups are then ranked to indicate the highest risk analytes in the SSTs. Sensitivity analysis runs were made for varying infiltration rates and adsorption coefficients. This work was done for Hanford Westinghouse Company, which operated the Hanford Site for the U.S. Department of Energy.

Droppo, J.G, Jr, D.L. Strenge, and J.W. Buck. 1991. "A Risk Computation Model for Environmental Restoration Activities". Presented at Environmental Remediation '91 Conference. Pacific Northwest Laboratory, Richland, Washington.

This paper describes the different types of models used for environmental restoration activities and the place that the MEPAS code fills as an integrated source term, transport, and exposure system for ranking a broad range of problems and constituents (radioactive and hazardous). Current applications of the MEPAS code for Environmental Restoration Projects are briefly discussed.

Ecology. 1990. Draft Environmental Impact Statement - Cleanup Standards. Prepared by Toxics Cleanup Program, Washington State Department of Ecology, Olympia, Washington.

This document discusses proposed additions to the Model Toxics Control Act Cleanup Regulation in Washington State (Chapter 173-340 WAC). The regulation specifies basic requirements for cleanup actions, along with criteria for selecting among alternative cleanup actions, and establishes the requirements for leaking underground storage tank corrective actions. The MEPAS methodology was used to evaluate alternative actions with respect to the cleanup criteria. The MEPAS applications are discussed in the technical appendices associated with this document.

Hartz, K. E., and G. Whelan. 1988. "MEPAS and RAPS Methodologies As Integrated into the RI/EA/FS Process." In Superfund '88, Proceedings of 9th National Conference, November 28-30, 1988, Washington, D.C.

The integration of the MEPAS methodology into the RI/EA/FS process required by the Superfund program is discussed.

Whelan, G., R. D. Brockhaus, D. L. Strenge, J. G. Droppo, Jr., M. B. Walter, and J. W. Buck. 1987. "Application of the Remedial Action Priority System To Hazardous Waste Sites." In Superfund '87, Proceedings of 8th National Conference, November 28-30, 1987, Washington, D.C.

The MEPAS methodology application to Superfund hazardous waste sites is described. This effort was conducted in support of the model comparison effort described in EPA (1988).

## Distribution

**Unit Manager's Meeting: 200 Aggregate Area/200 Area Operable Units**
**April 23, 1992**

| | |
|---|---|
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| Ronald E. Gerton | DOE-RL, TFP (A4-02) |
| Mike Thompson, | DOE-RL, EAP/RPB (A5-15) |
| Diane Clark, | DOE-RL, TSD/SSB (A5-55) |
| Mary Harmon, | DOE-HQ (EM-442) |
| Suzanne Clarke, | SWEC, GSSC to DOE-RL (A4-35) |
| | |
| Doug Sherwood | 200 Aggregate Area Manager, EPA (B5-01) |
| Ward Staubitz, | USGS, Support to EPA |
| Donna Lacombe, | PRC, Support to EPA |
| | |
| Darci Teel | 200 Aggregate Area Manager, WDOE, (Kennewick) |
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| Mel Adams, | WHC, (H4-55) |
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| Rich Carlson, | WHC, (H4-55) |
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