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VOLUME II
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PROGRAM MANAGE

RMA CONTAMINATION CLEANUP

U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

ANNUAL GROUND WATER REPORT FOR 1988
JUNE 1989

FINAL REPORT

Volume II

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R.L. STOLLAR & ASSOCIATES, INC.

Harding Lawson Associates
Ebasco Services Incorporated
DataChem, Inc.
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COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

ANNUAL GROUND WATER REPORT FOR 1988
JUNE 1989

FINAL REPORT

Volume II

Prepared by:

**R. L. STOLLAR & ASSOCIATES INC.
HARDING LAWSON ASSOCIATES
EBASCO SERVICES INC.
DATACHEM, INC.
ENSECO-CAL LAB
MIDWEST RESEARCH INSTITUTE**

Prepared for:

**PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL**

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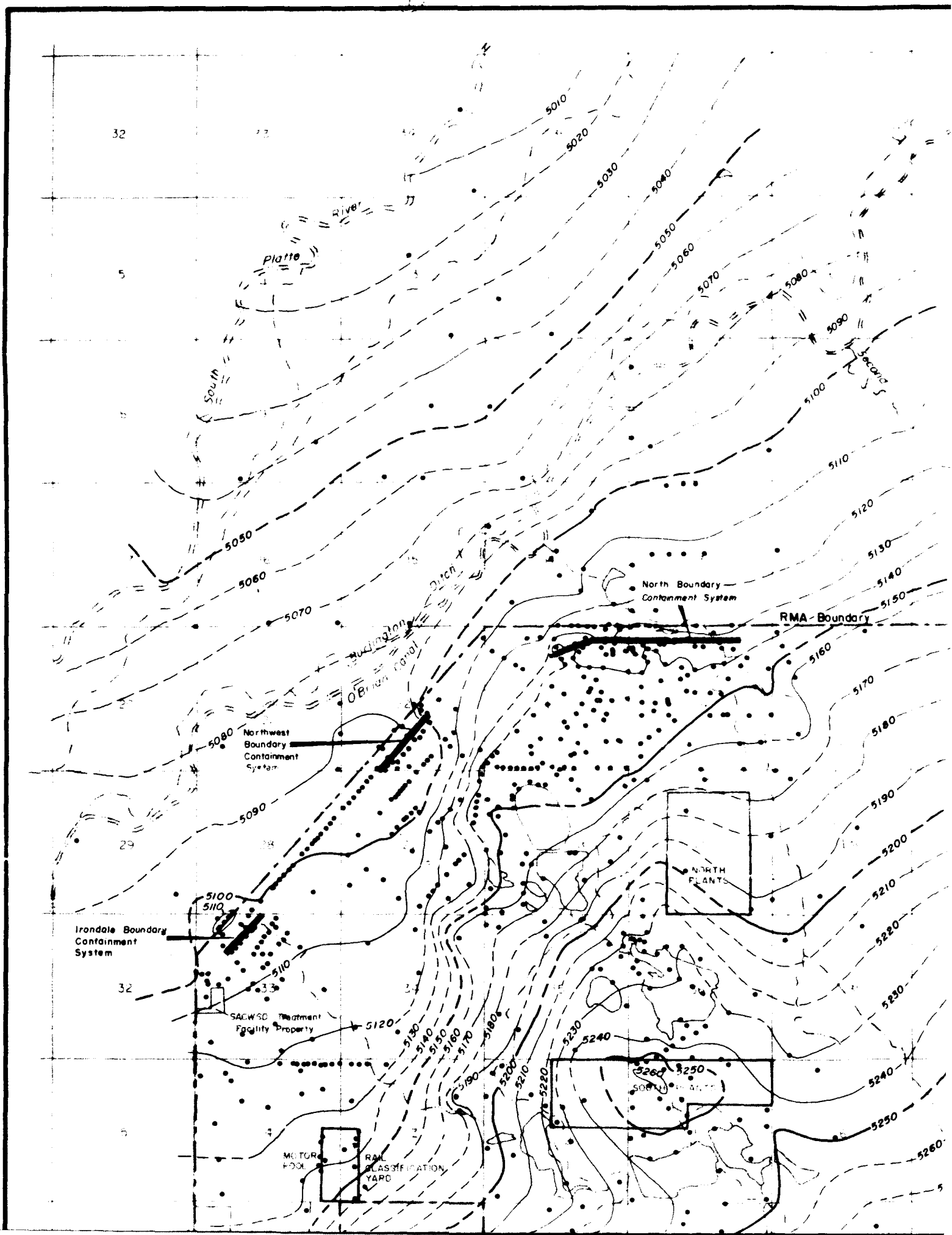
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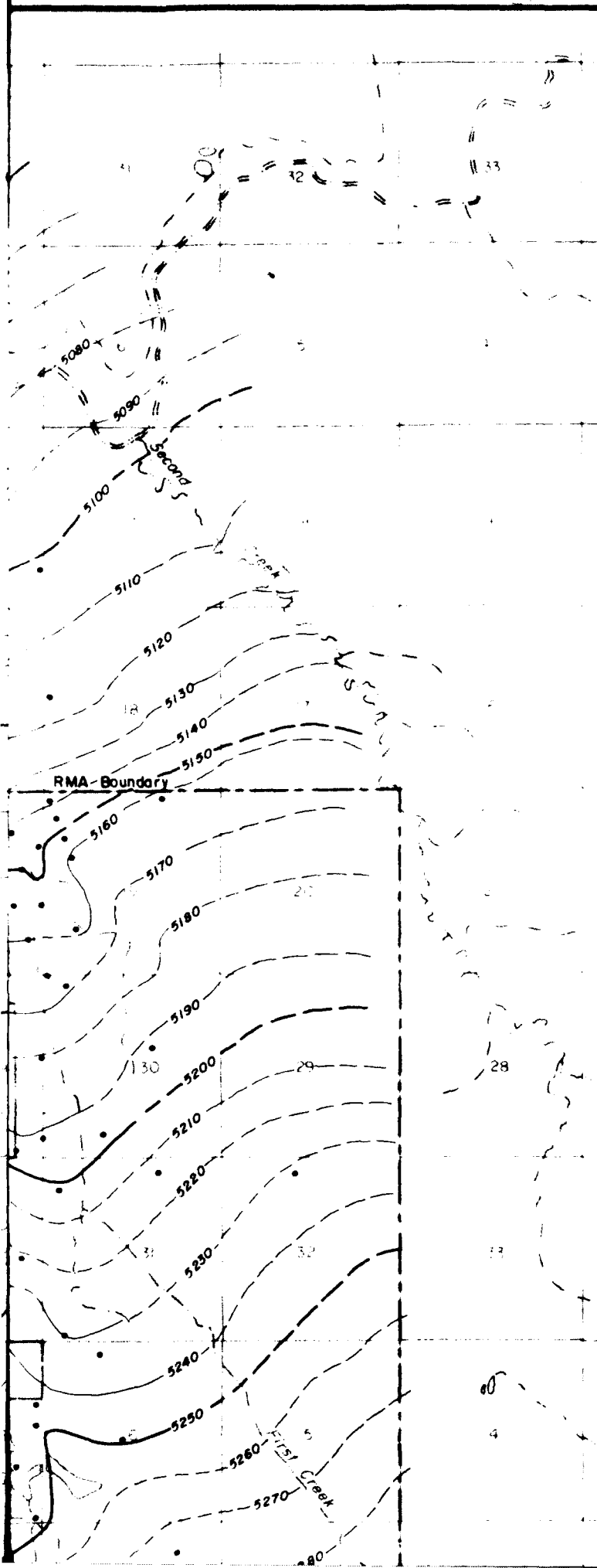
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 (on diskette - enclosed)
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 (on diskette - enclosed)





Explanation

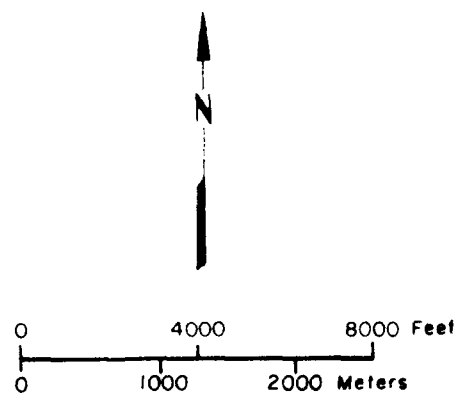
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Elevations in Feet

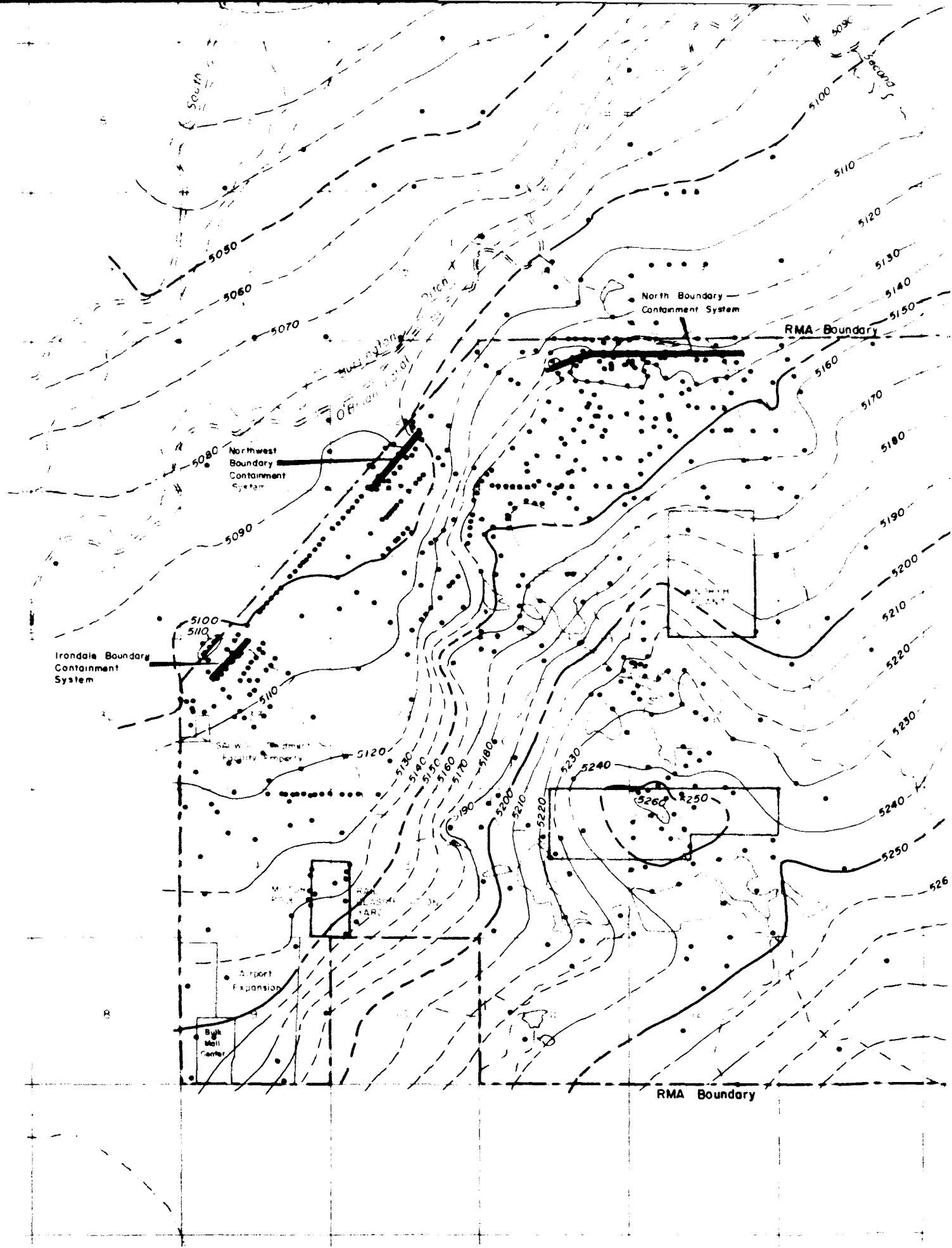
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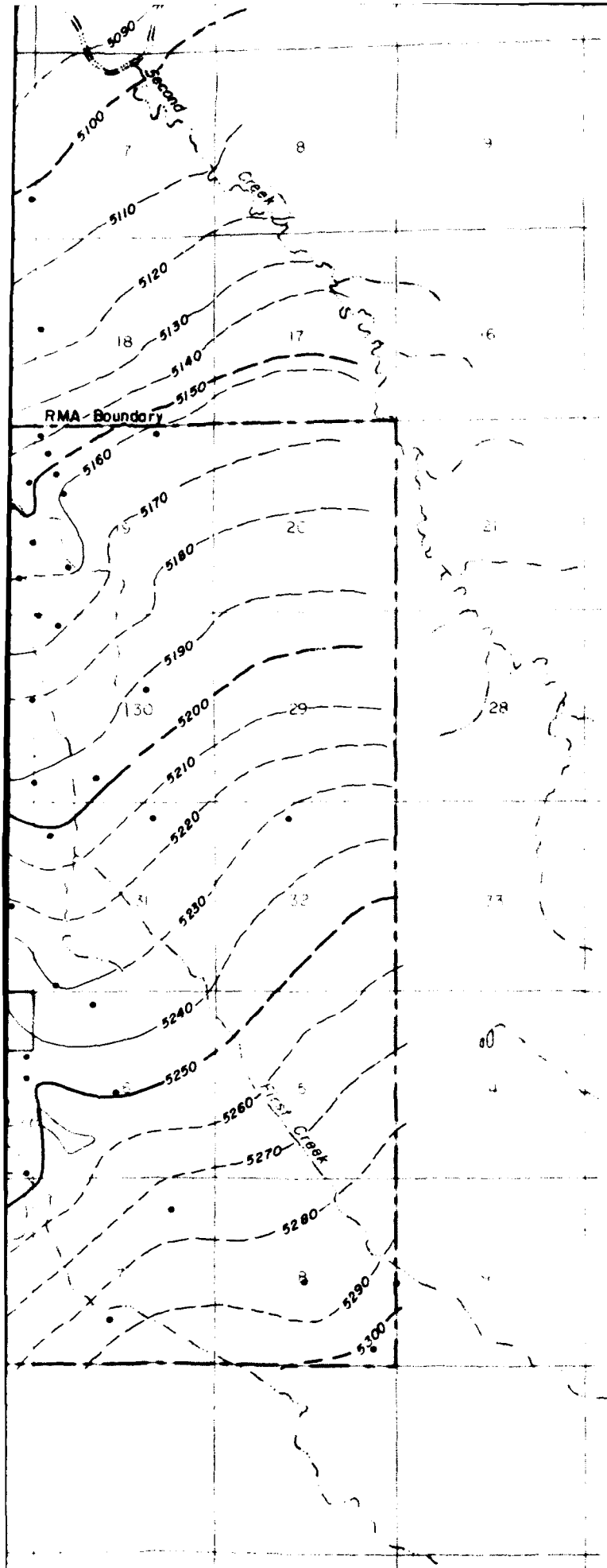
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• Well or Piezometer Location
yielding Unconfined Water Level
Elevations

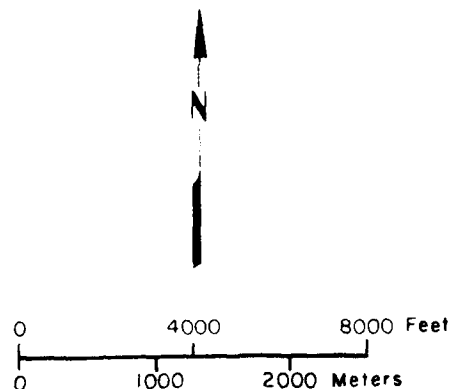


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• Well or Piezometer Location
yielding Unconfined Water Level
Elevations



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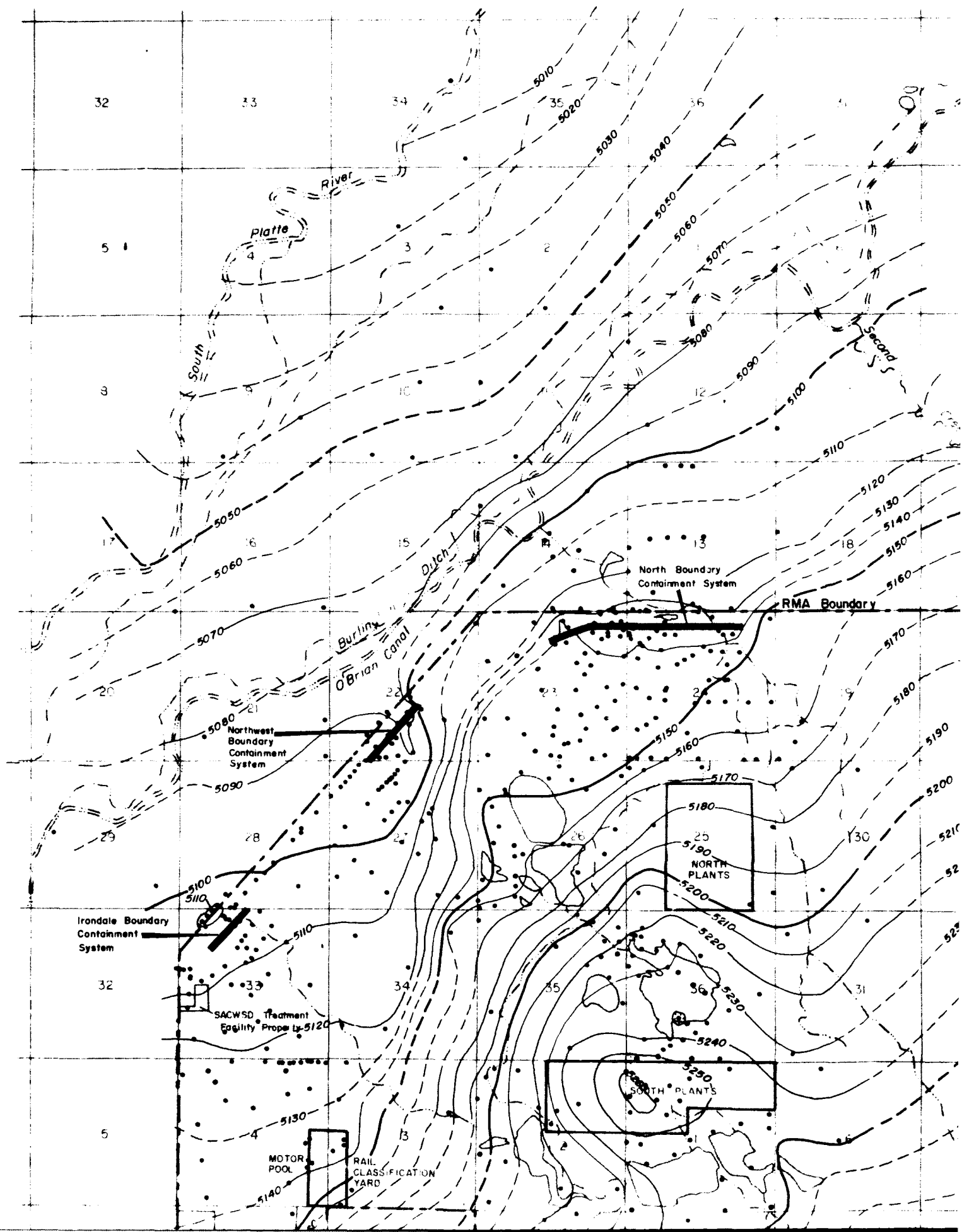
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Aberdeen Proving Ground, Maryland

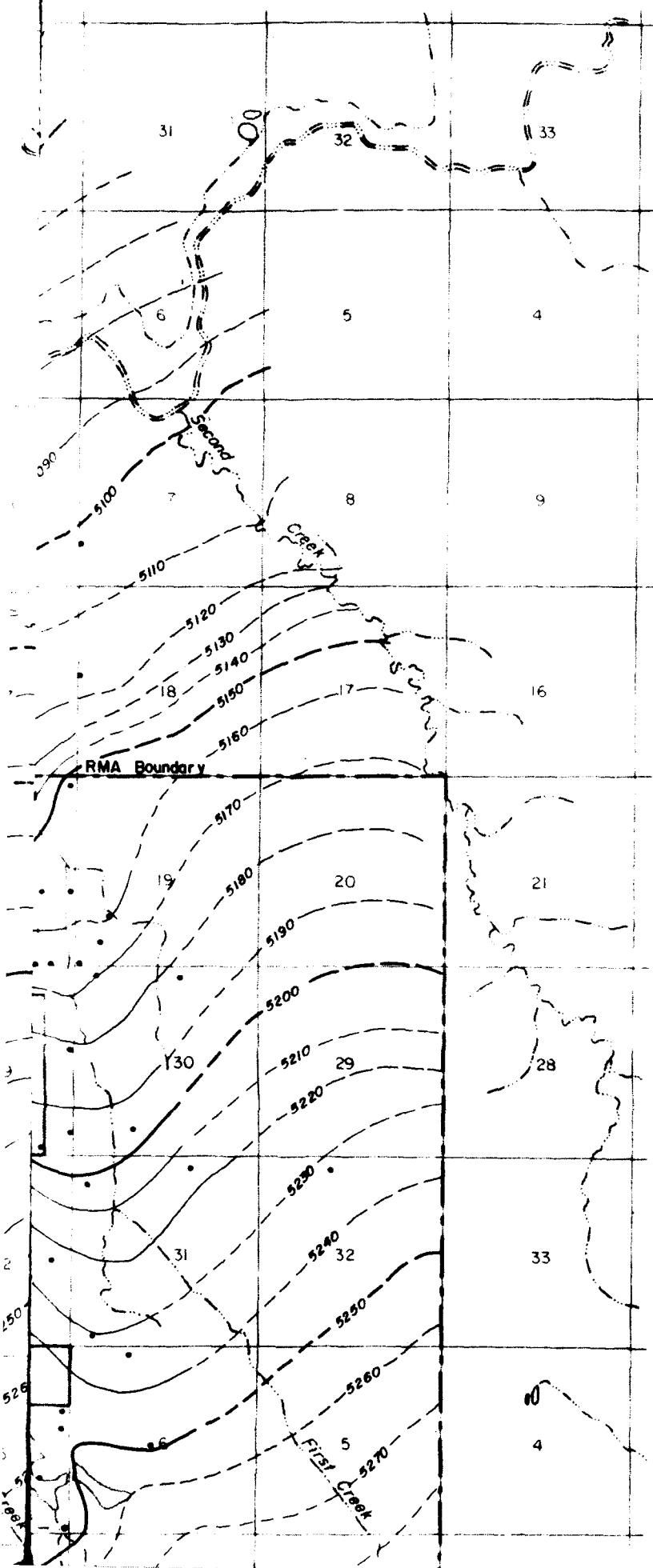
PLATE 4.1-1

Water Table Elevation Map of the
Unconfined Flow System, Winter 1987/88

CMP Ground-Water Monitoring Annual Report

Prepared by: R.L. Stollar & Associates Inc.
Harding Lawson Associates





Explanation

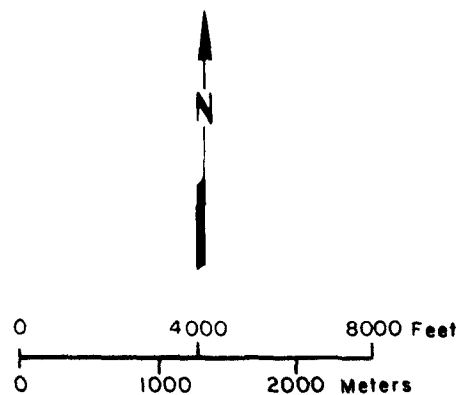
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Elevations in Feet

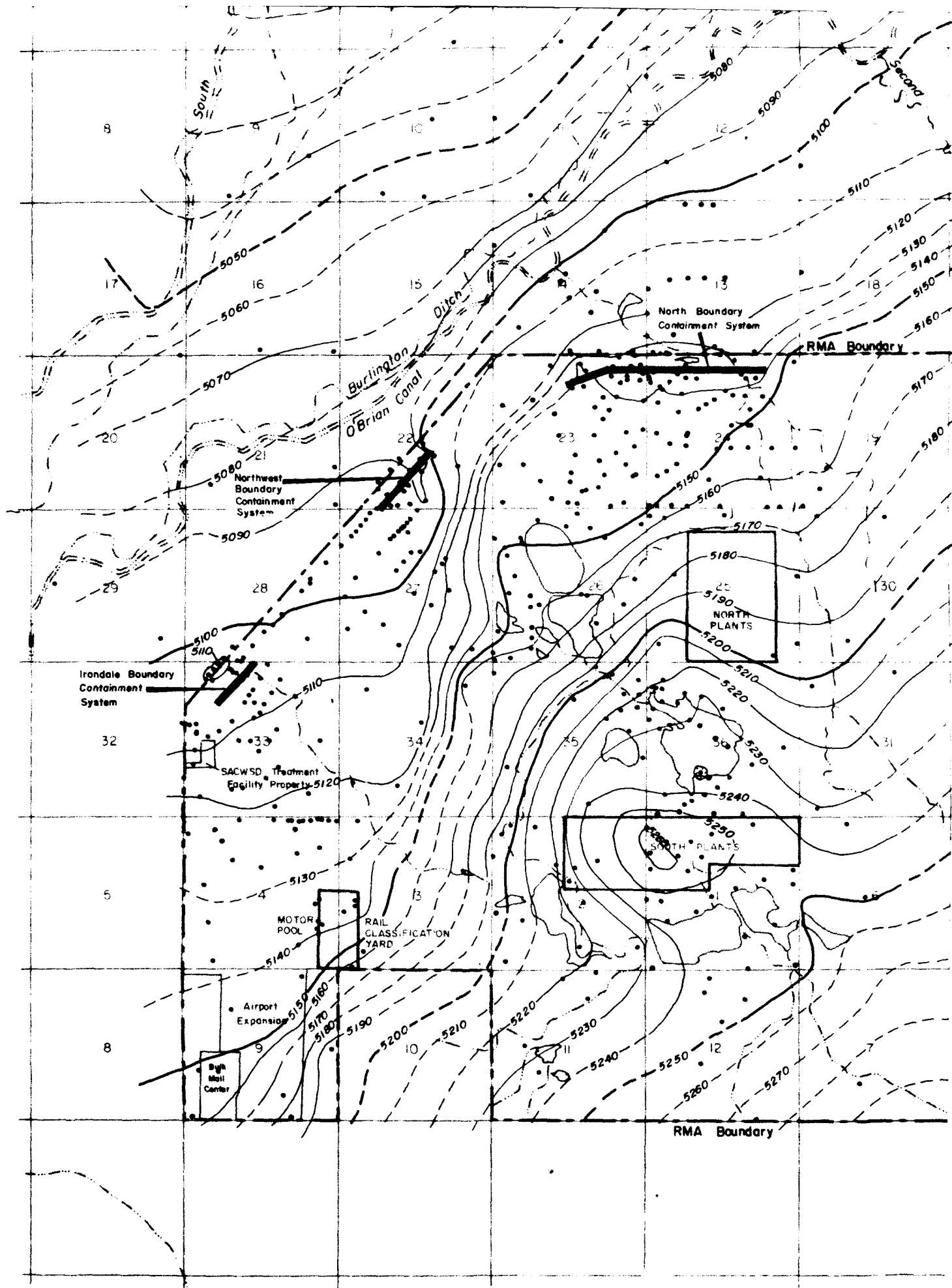
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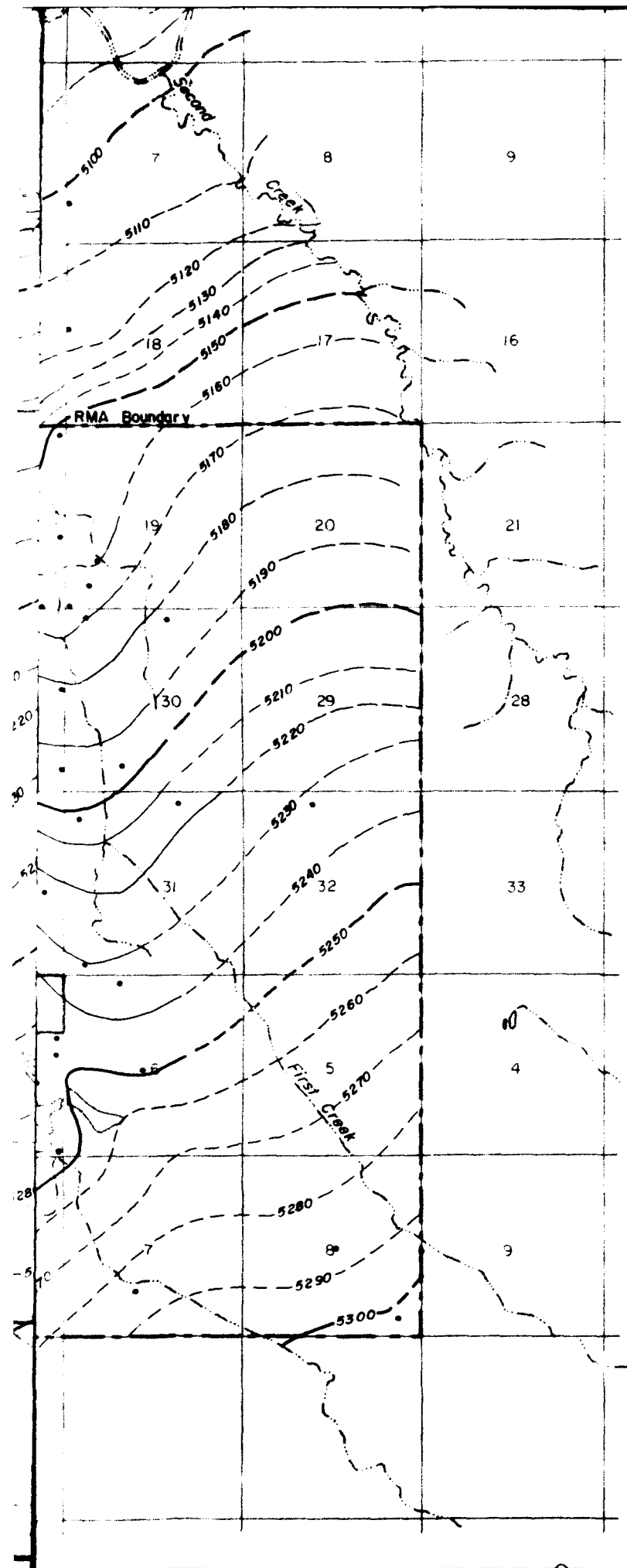
— 5120 — Equipotential Contour,
Dashed where Inferred

• Well or Piezometer Location
yielding Unconfined Water Level
Elevations

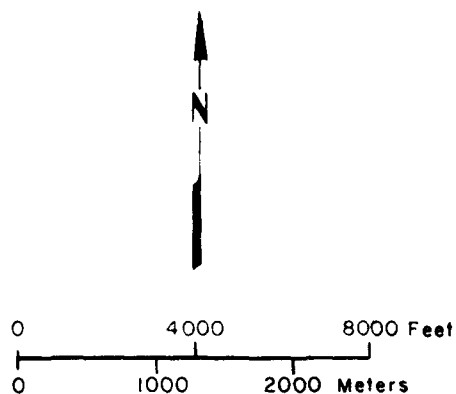


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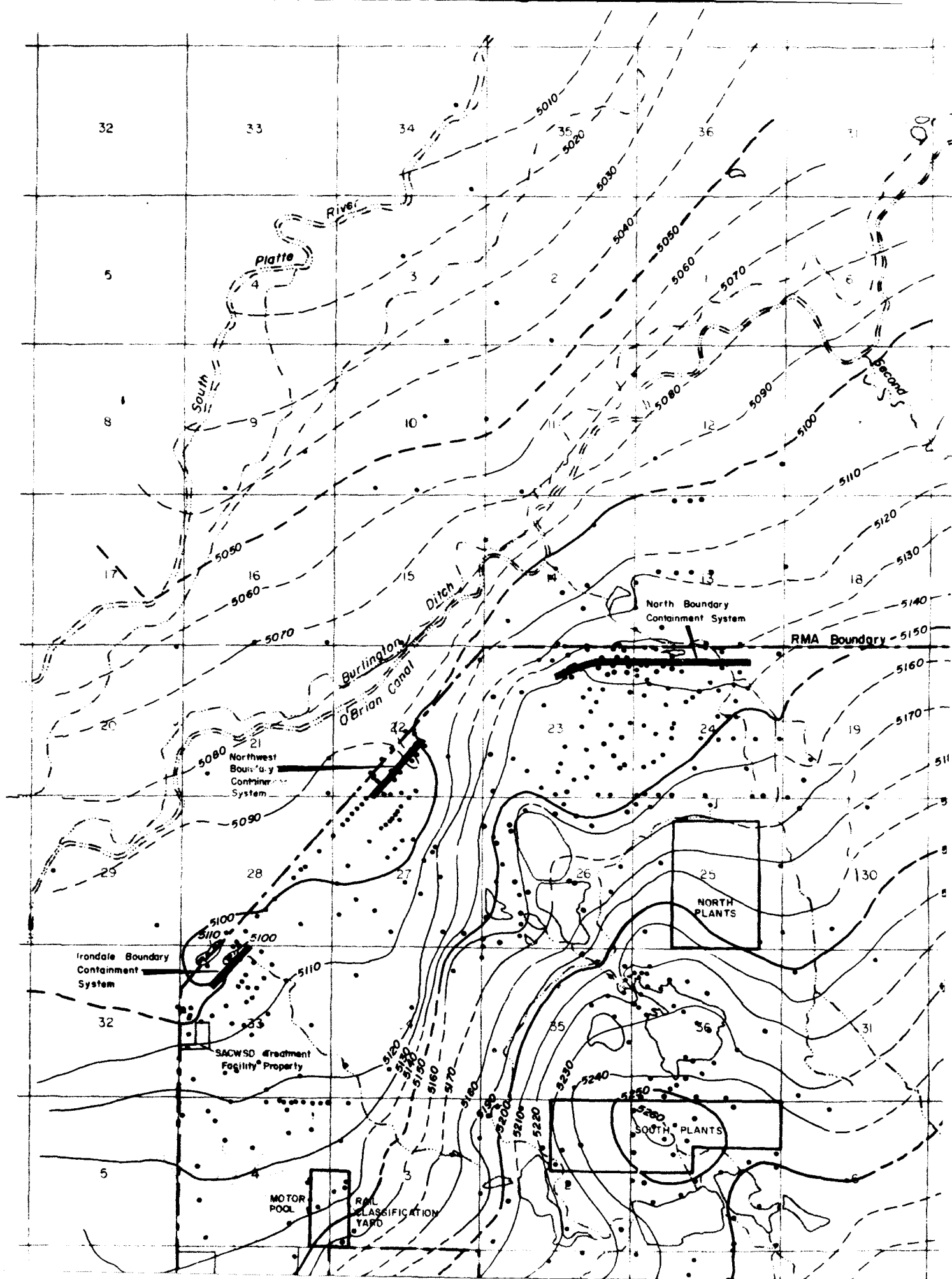
• Well or Piezometer Location
yielding Unconfined Water Level
Elevations

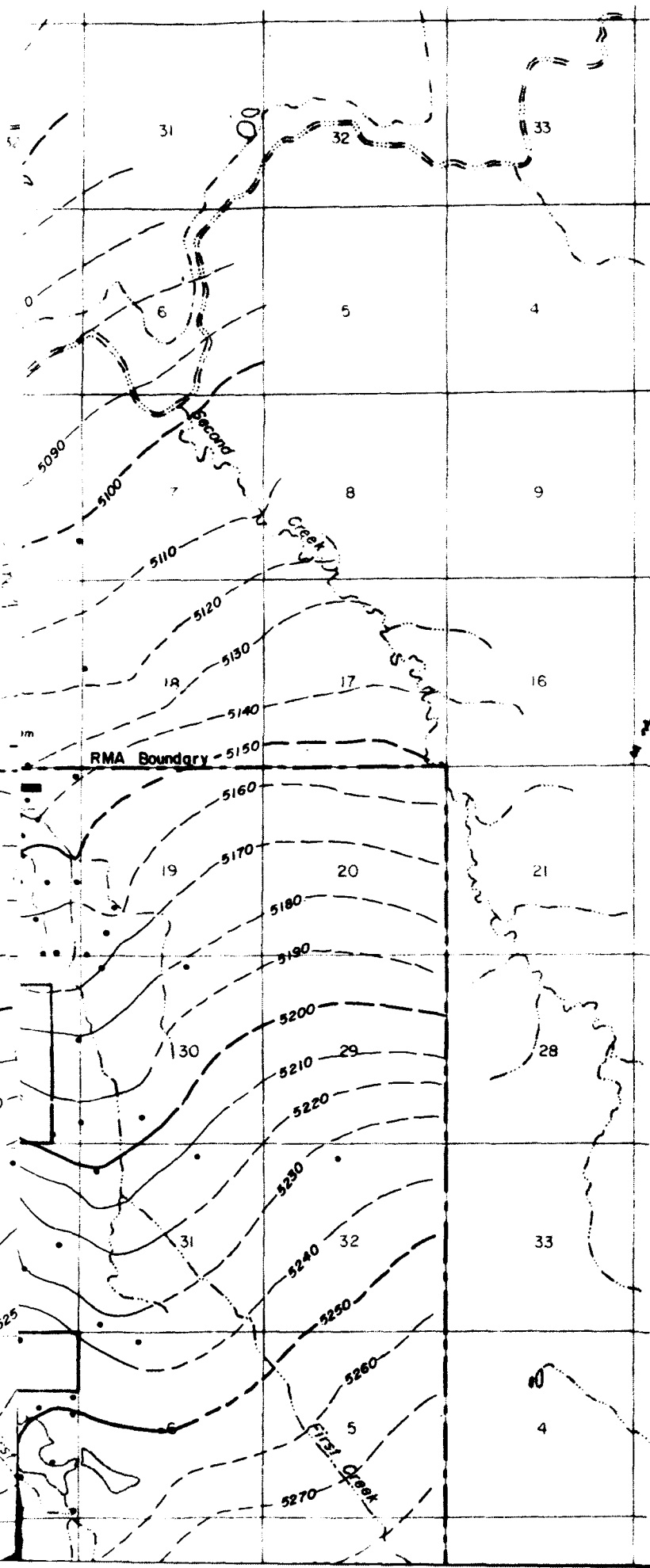


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PLATE 4.1-2
Water Table Elevation Map of the
Unconfined Flow System, Spring 1988
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Harding Lawson Associates





Explanation

Contour Interval Equals 10 Feet

Elevations in Feet

Datum Mean Sea Level

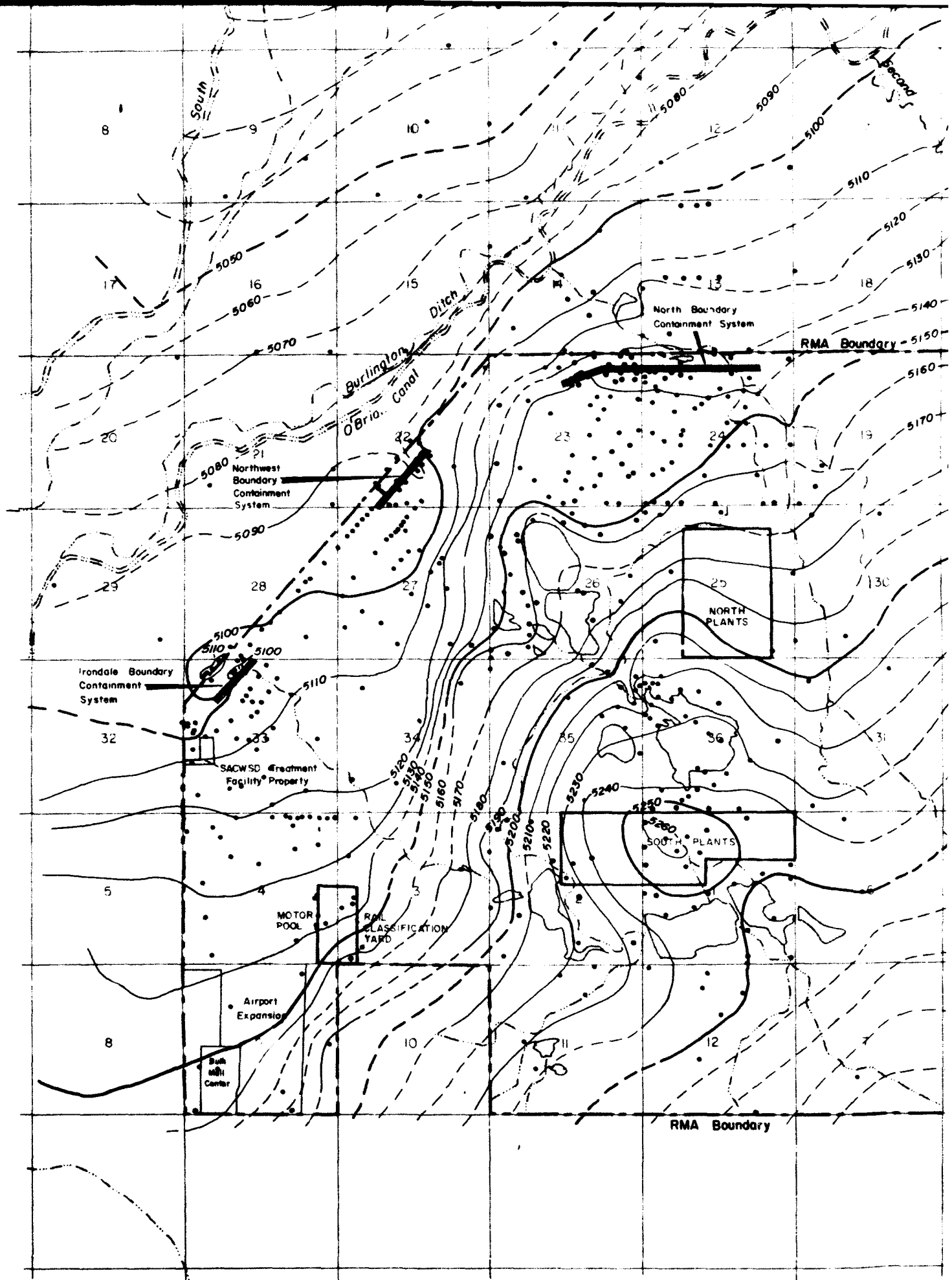
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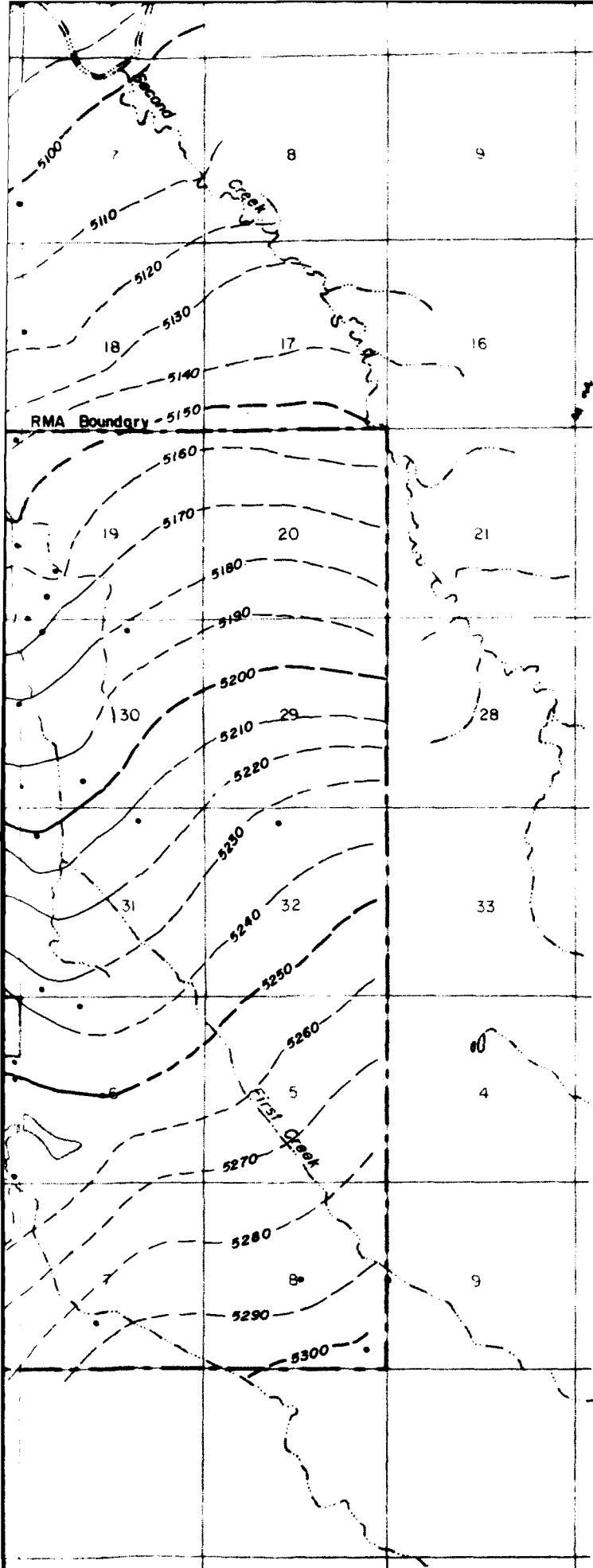
• Well or Piezometer Location
yielding Unconfined Water Level
Elevations



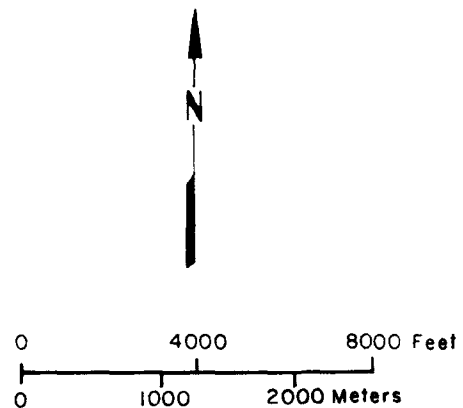
0 4000 8000 Feet
0 1000 2000 Meters

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• Well or Piezometer Location
yielding Unconfined Water Level
Elevations



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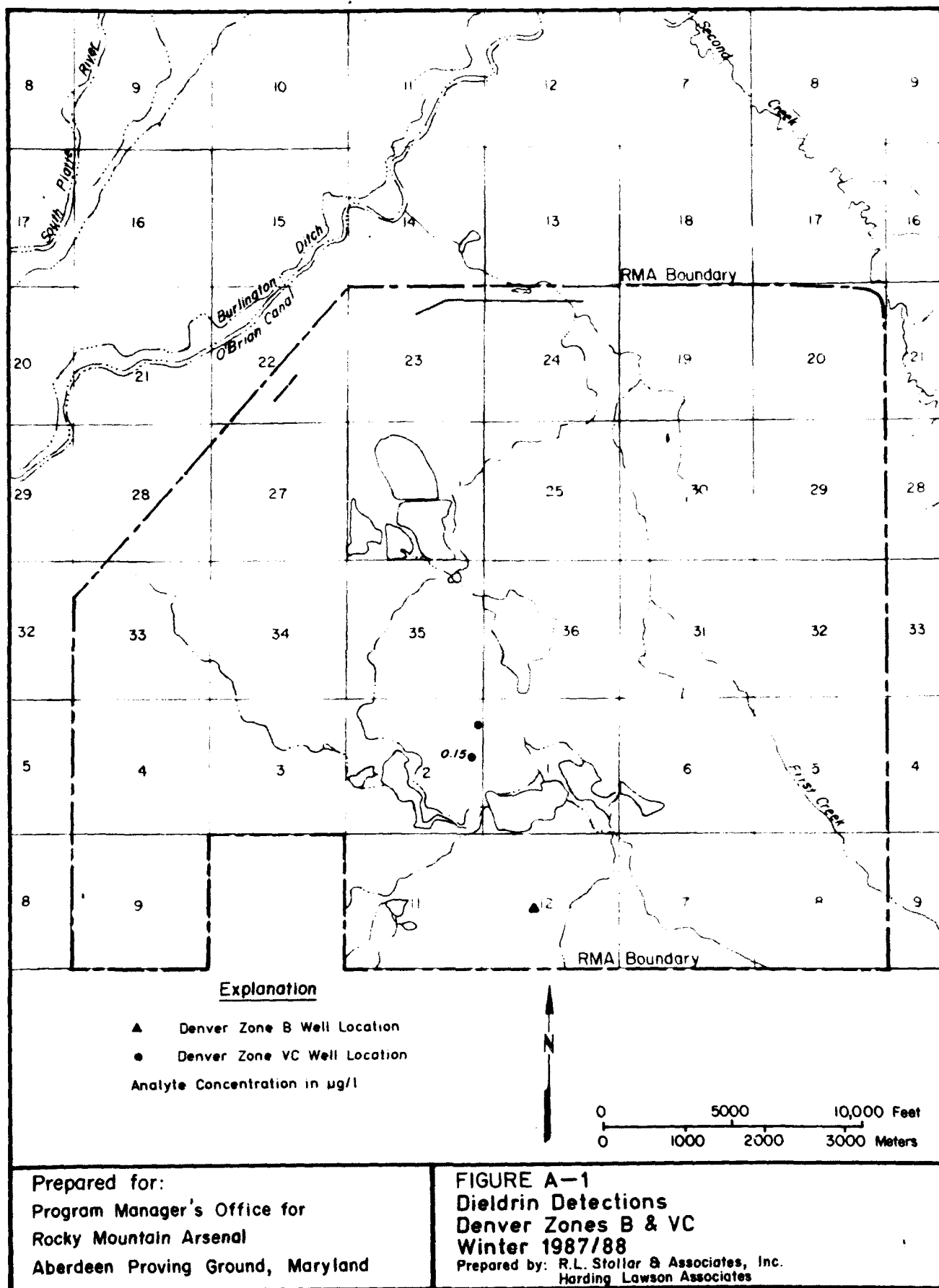
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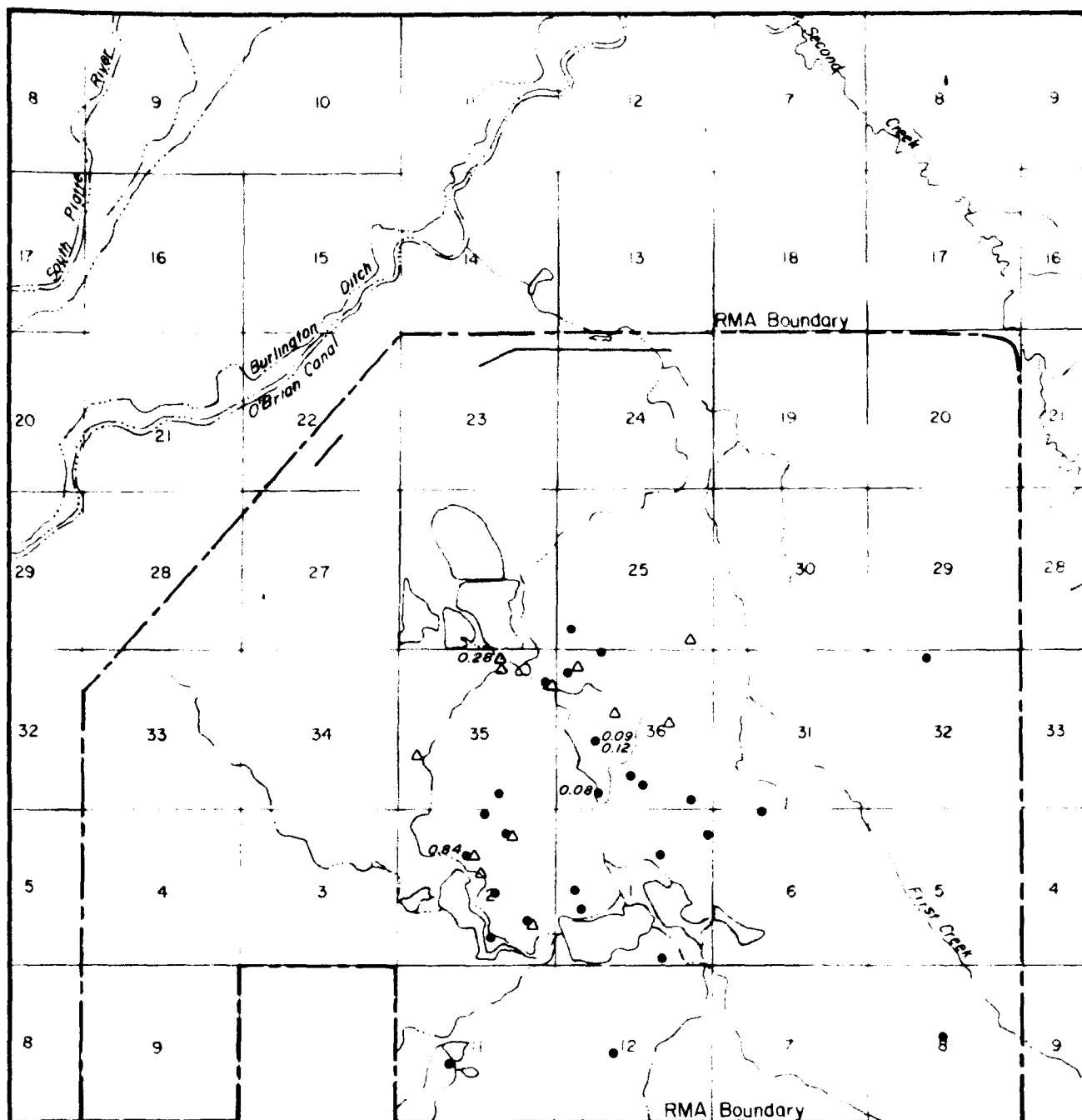
Water Table Elevation Map of the
Unconfined Flow System, Summer 1988
CMP Ground-Water Monitoring Annual Report
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APPENDIX A

MAPS SHOWING DISTRIBUTIONS OF CONTAMINANTS

IN THE CONFINED FLOW SYSTEM





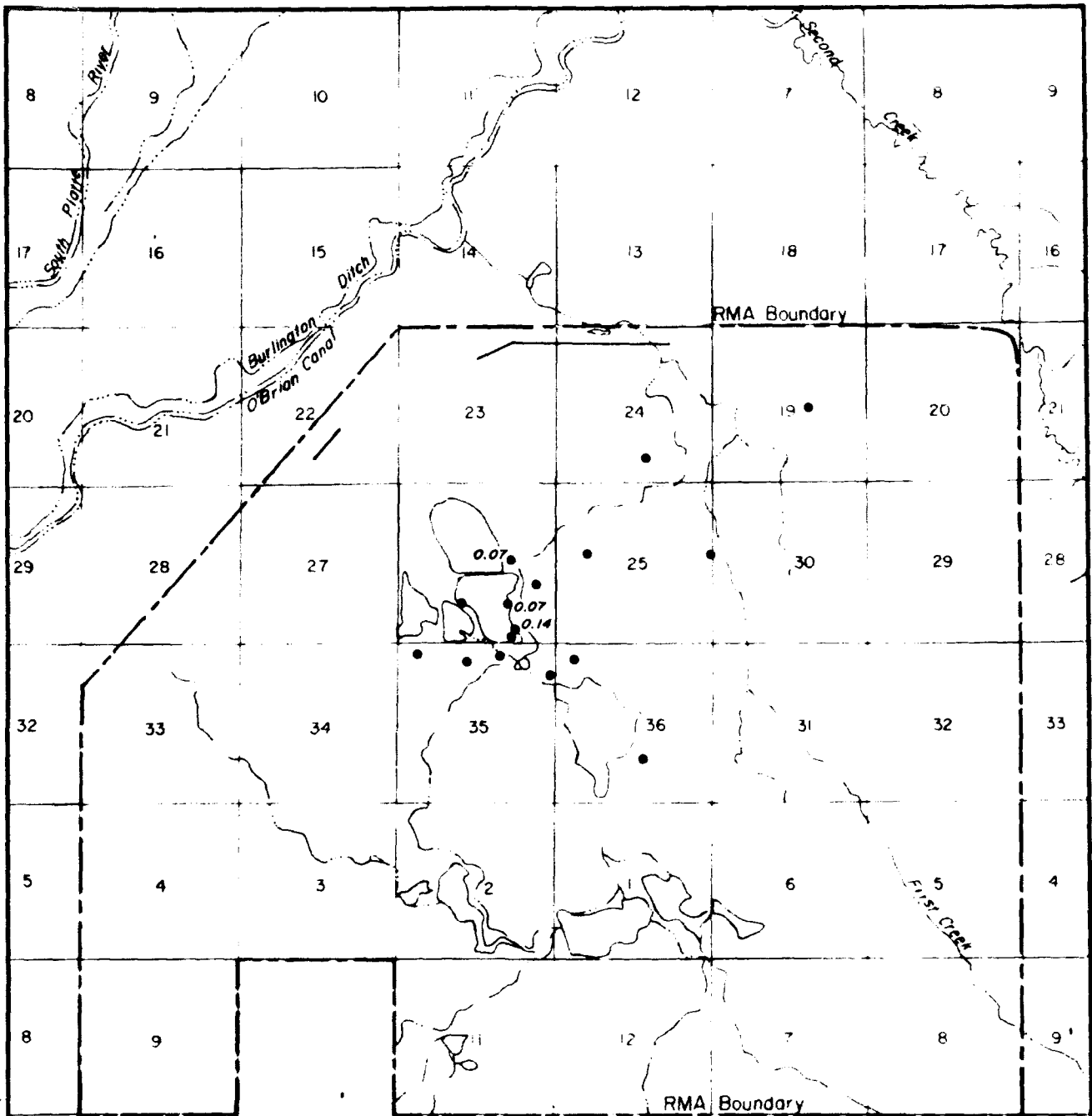
Explanation

- Denver Zone A Well Location
 - △ Denver Zone 1U Well Location
- Analyte Concentration in ug/l

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FIGURE A-2
Dieldrin Detections
Denver Zones A & 1U
Winter 1987/88

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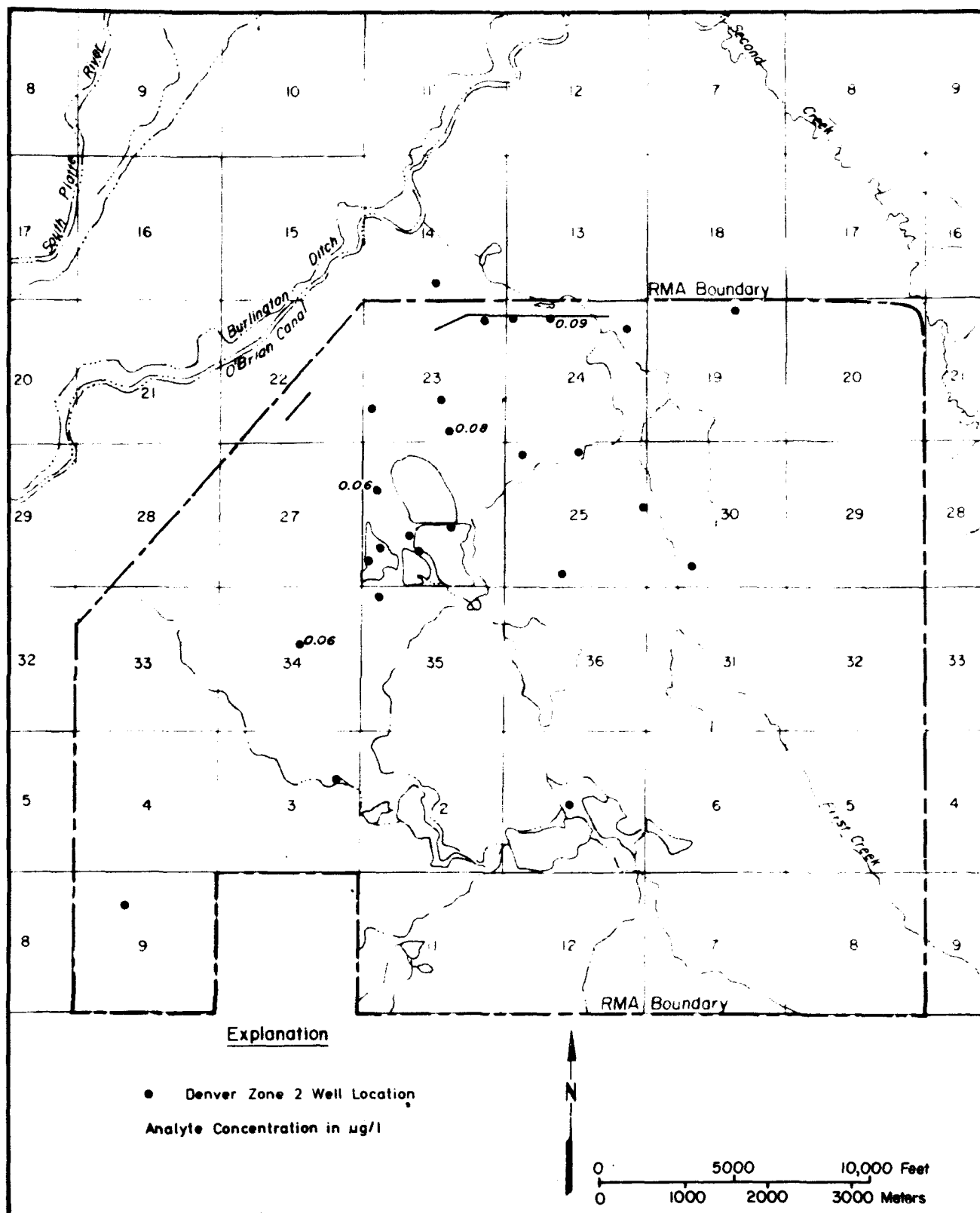
Explanation

- Denver Zone 1 Well Location
- Analyte Concentration in $\mu\text{g/l}$

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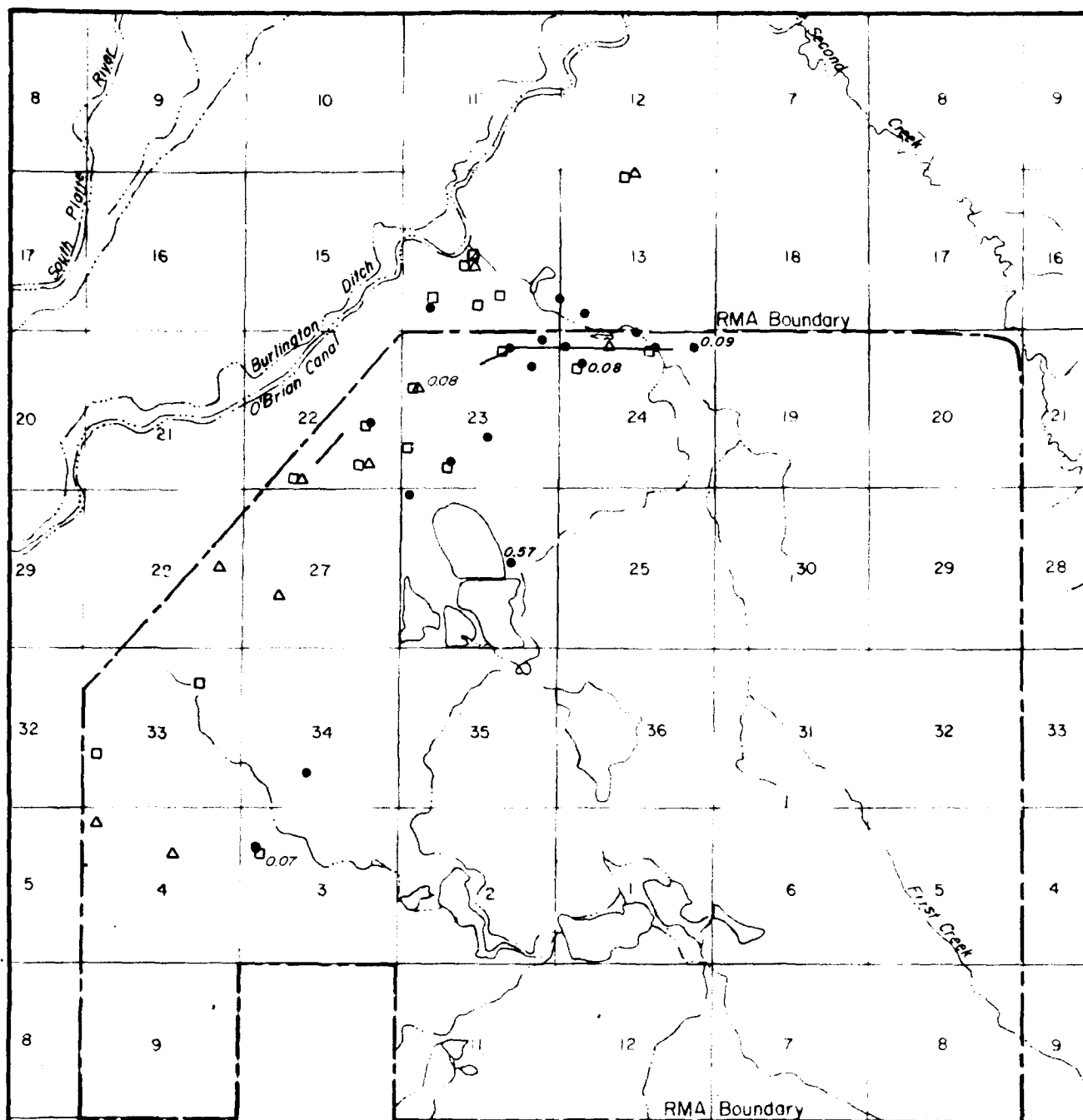
FIGURE A-3
Dieldrin Detections
Denver Zone 1
Winter 1987/88

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FIGURE A-4
Dieldrin Detections
Denver Zone 2
Winter 1987/88
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Explanation

- Denver Zone 3 Well Location
- Denver Zone 4 Well Location
- △ Denver Zone 5 Well Location

Analyte Concentration in ug/l



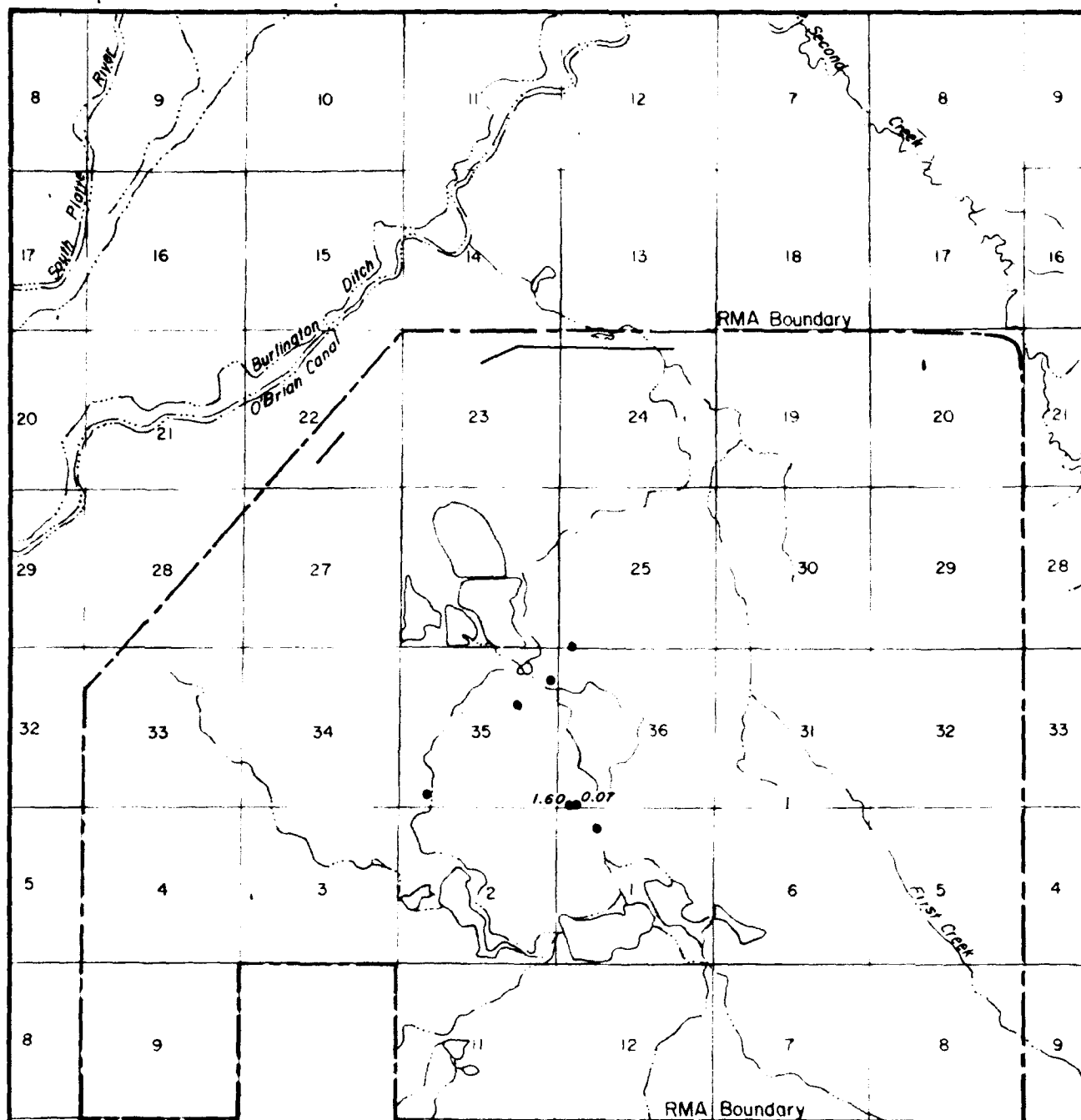
0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-5 Dieldrin Detections

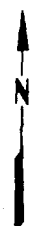
Denver Zone 3, 4 & 5
Winter 1987/88

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Explanation

- Denver Zone A Well Location
- Analyte Concentration in µg/l

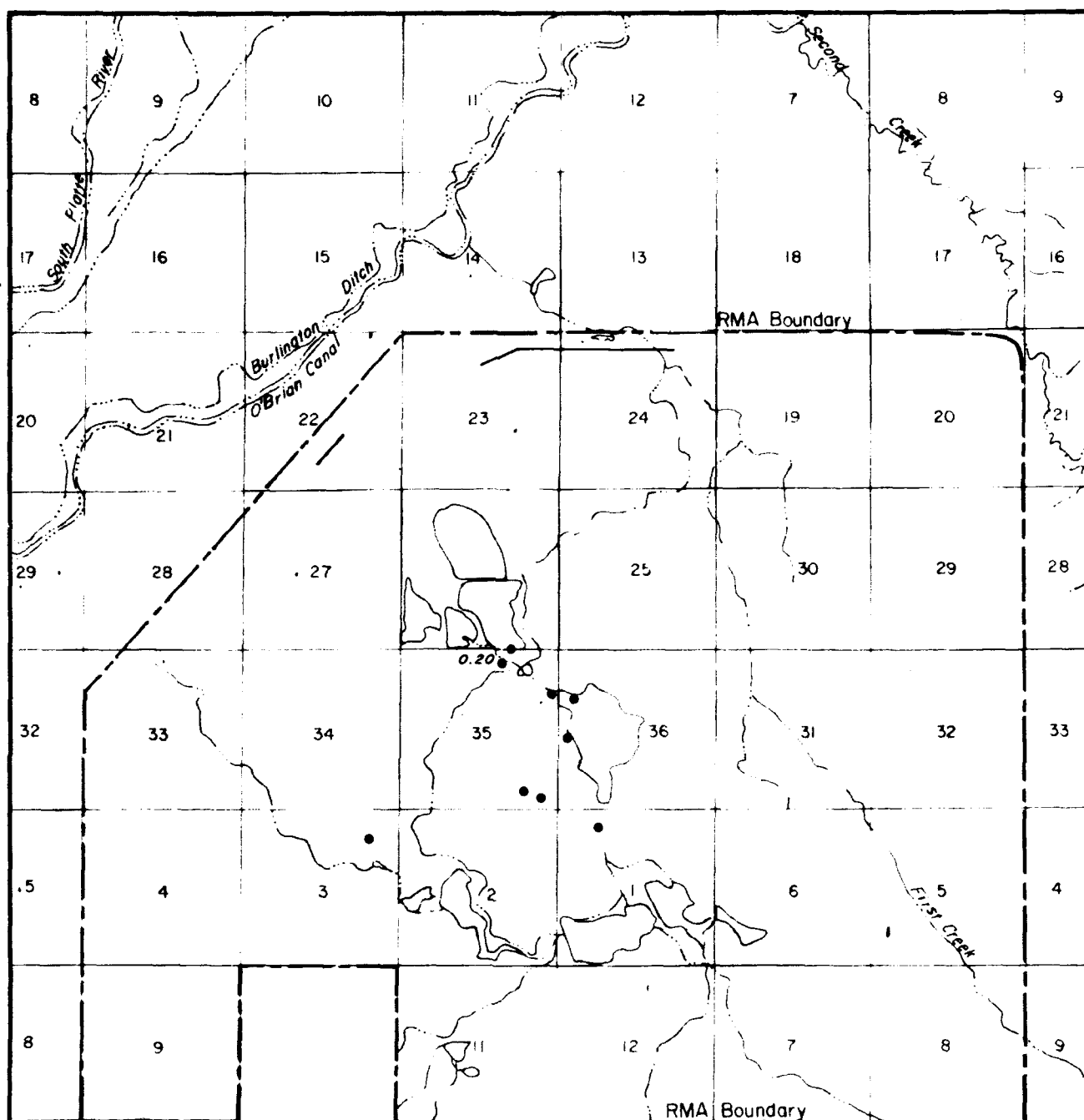


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-6
Dieldrin Detections
Denver Zone A
Spring 1988

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Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in ug/l

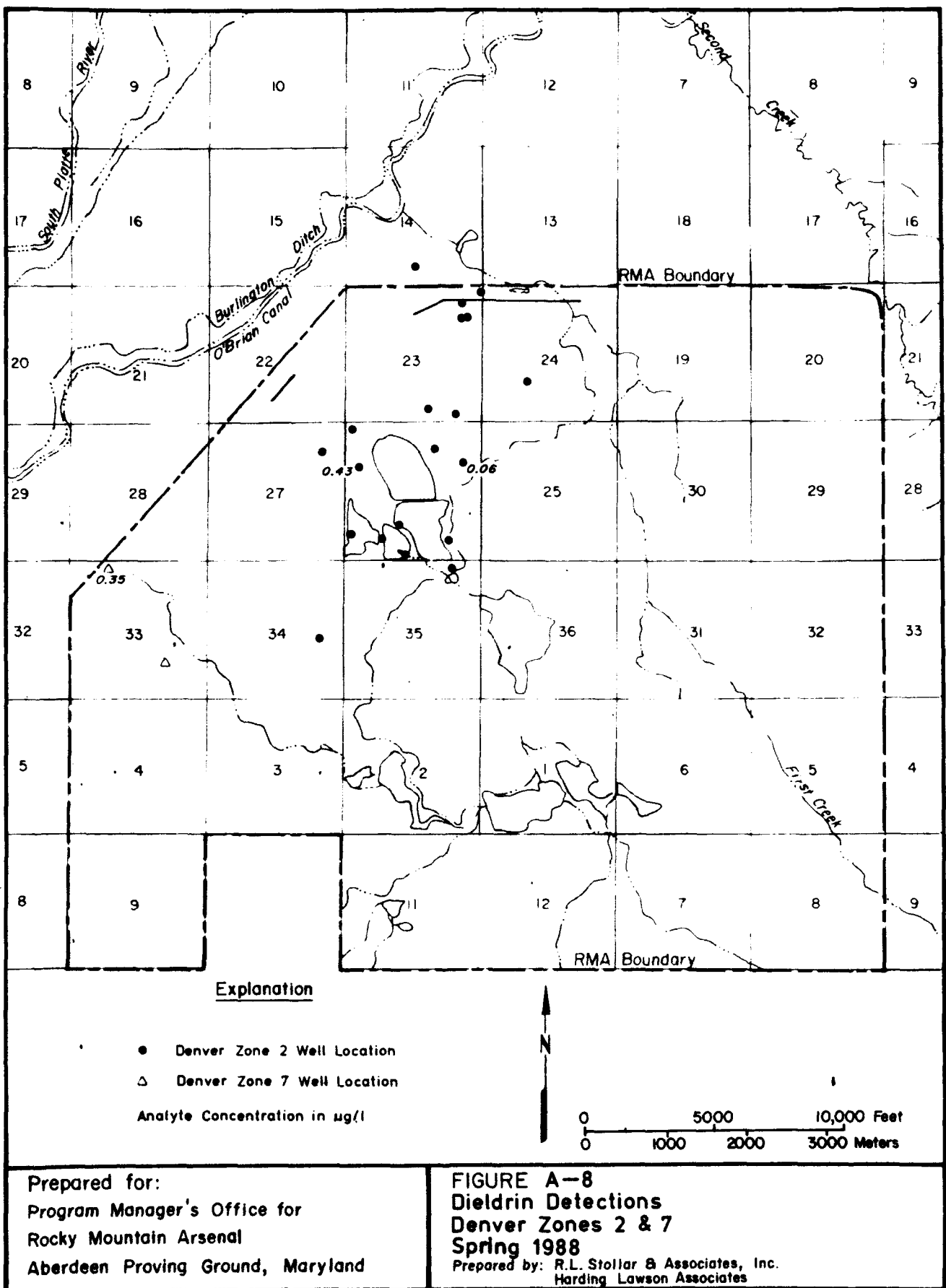


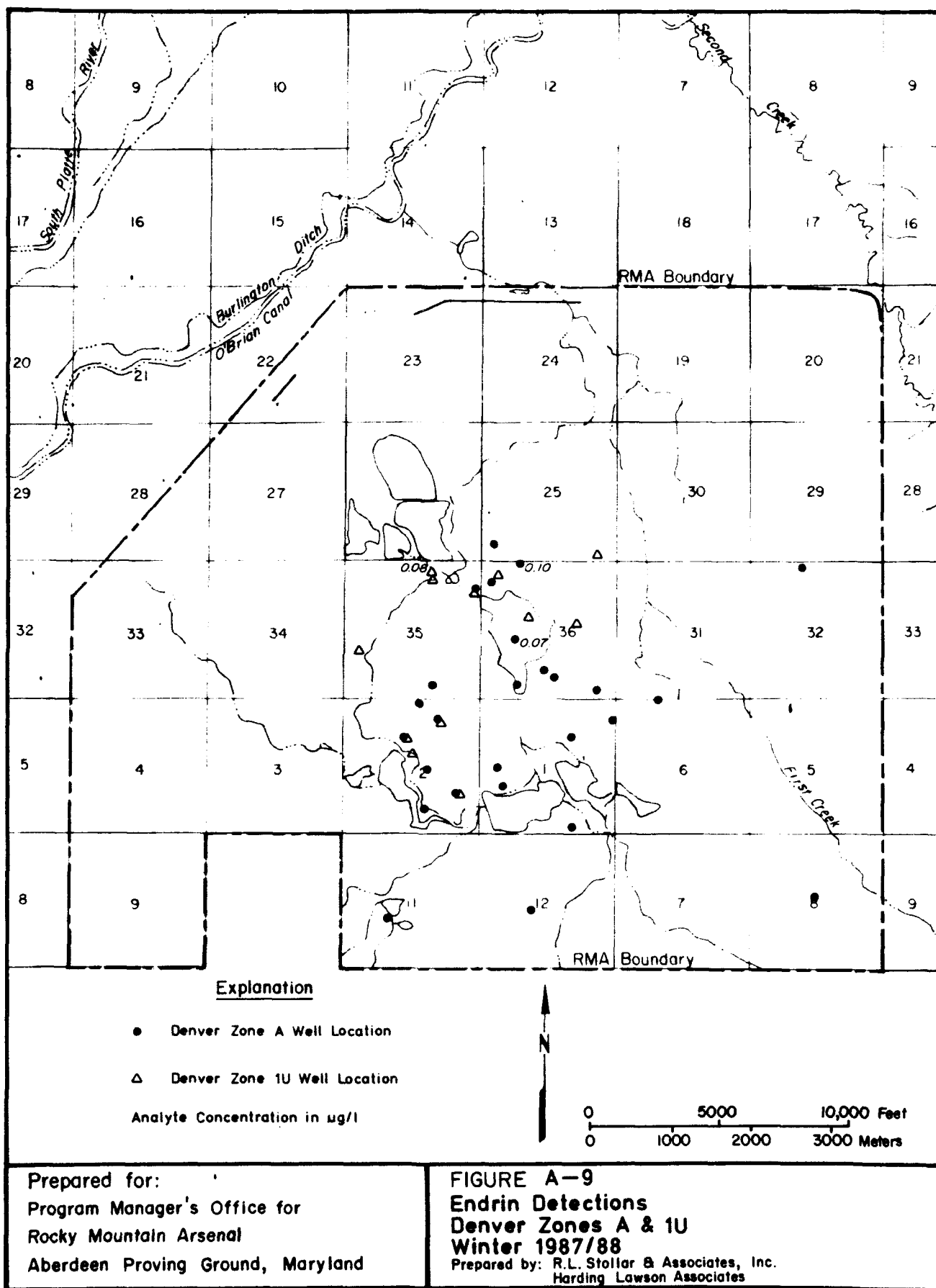
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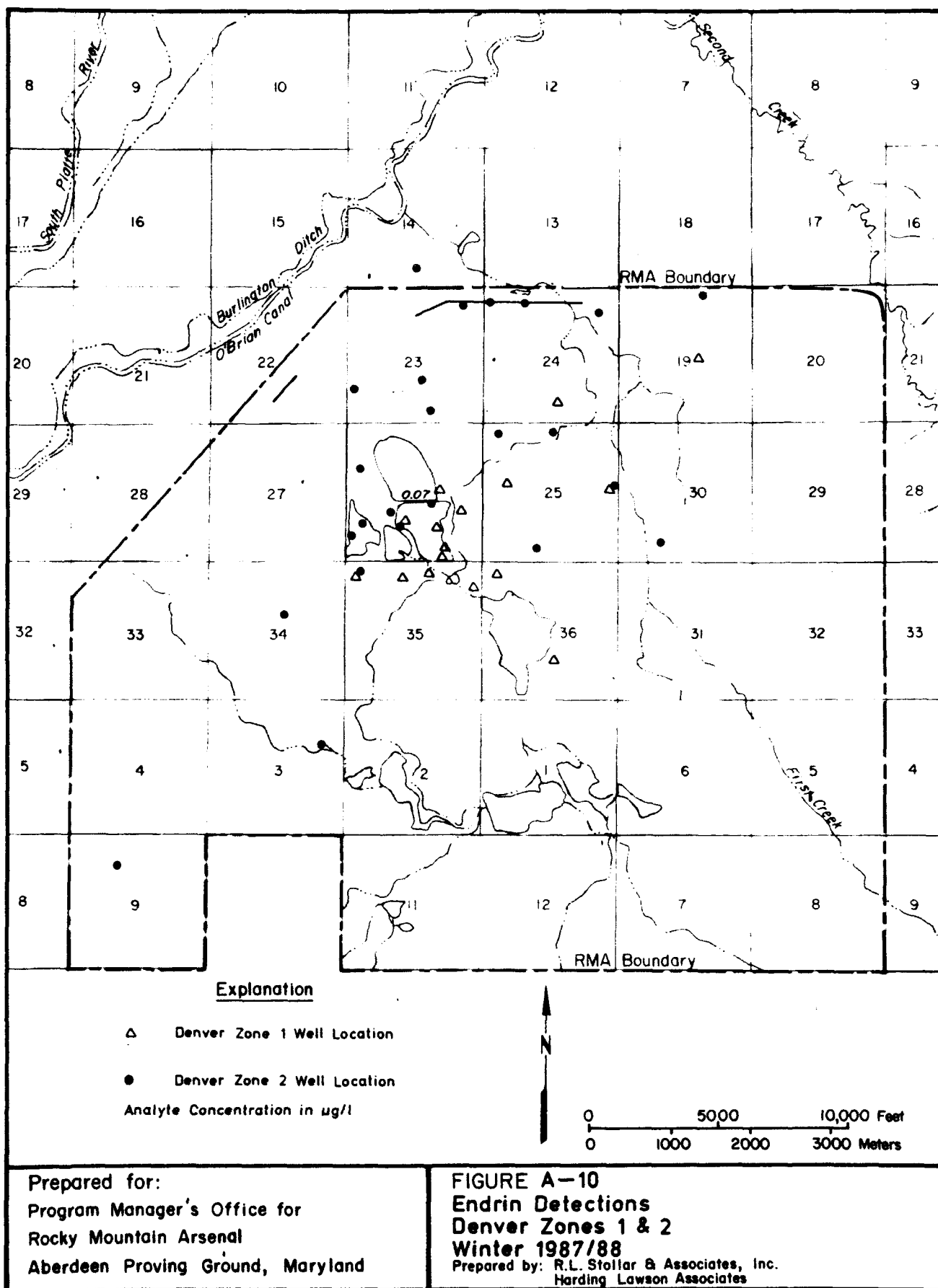
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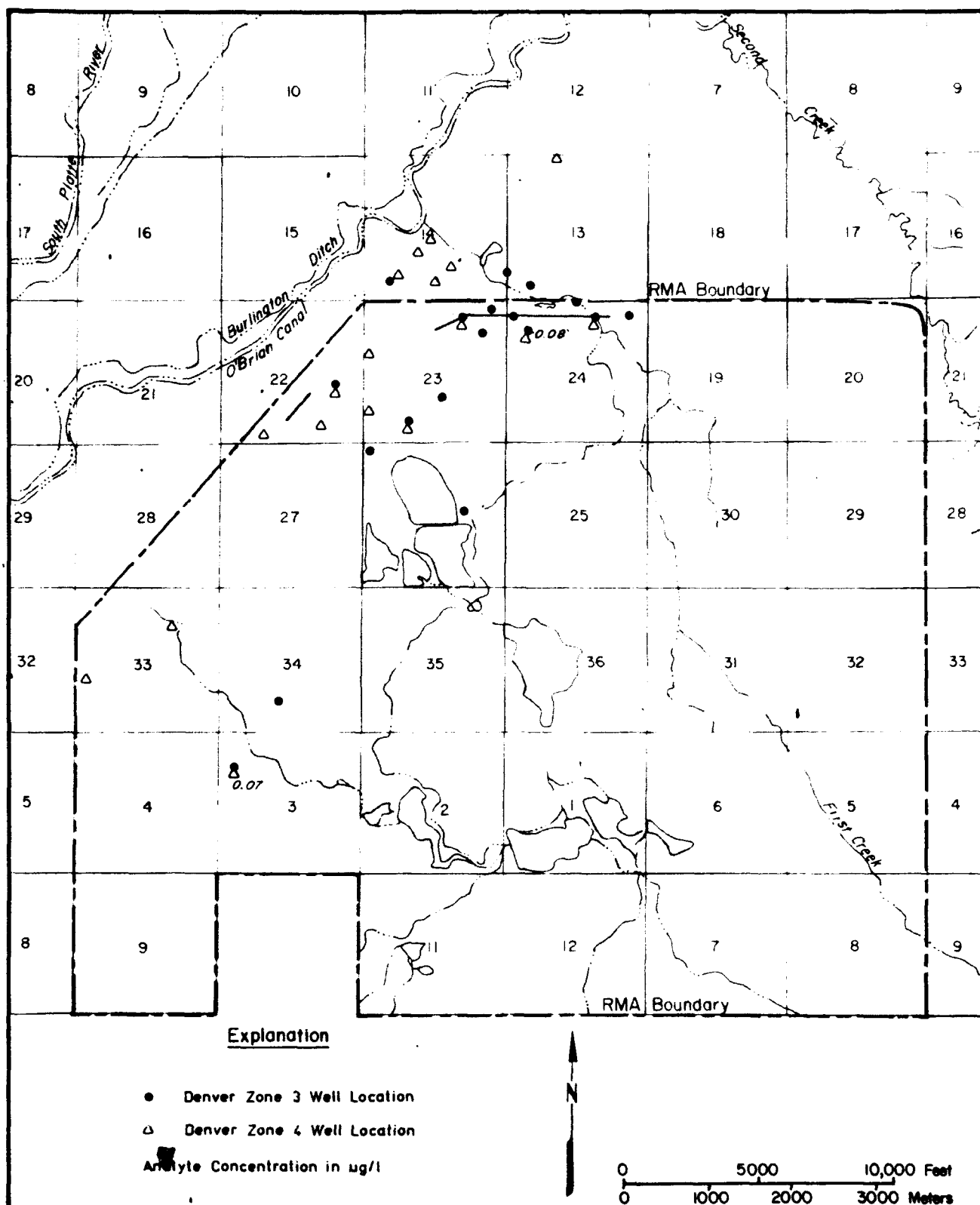
FIGURE A-7
Dieldrin Detections
Denver Zone 1U
Spring 1988

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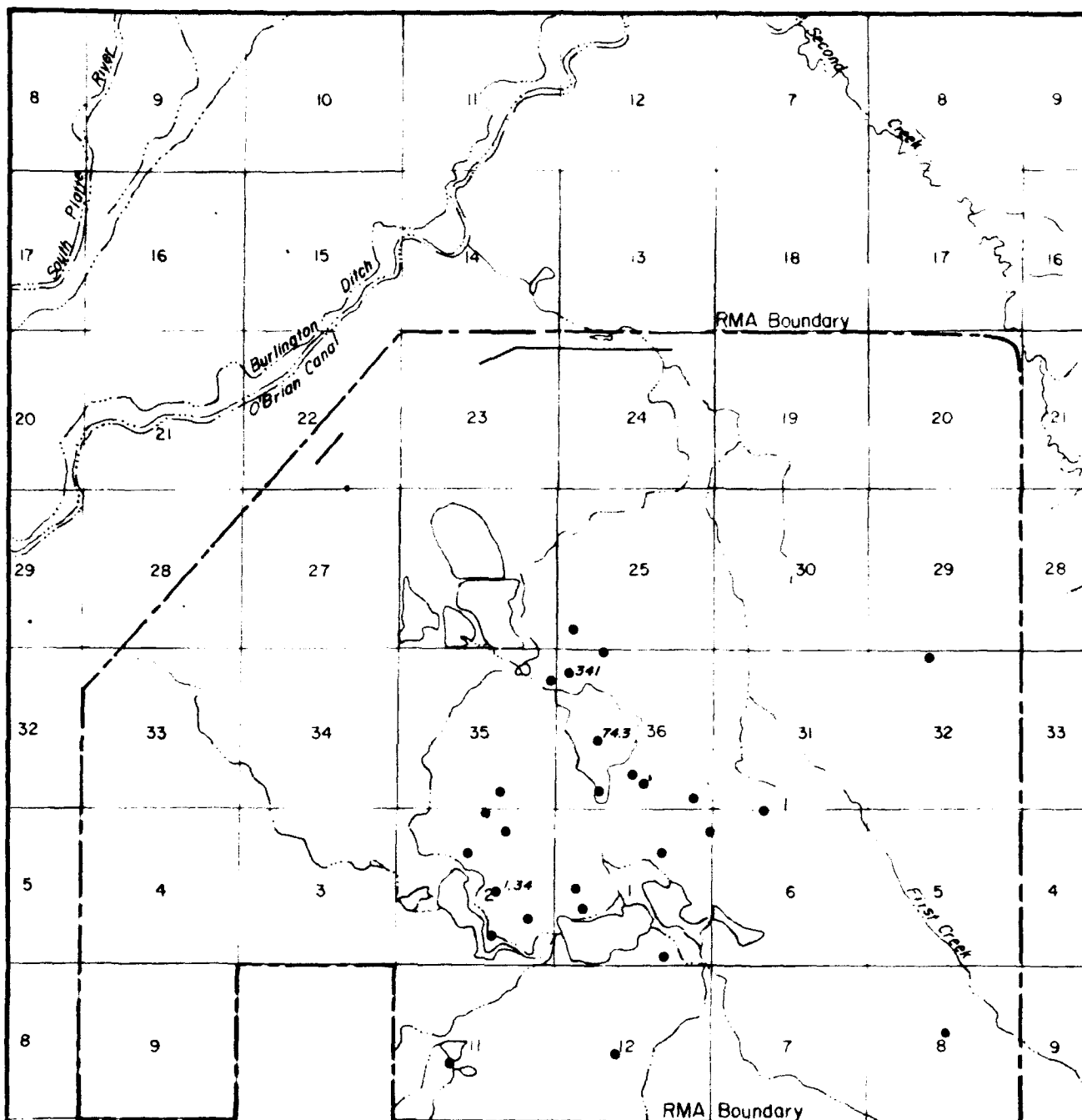






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FIGURE A-11
Endrin Detections
Denver Zones 3 & 4
Winter 1987/88
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Explanation

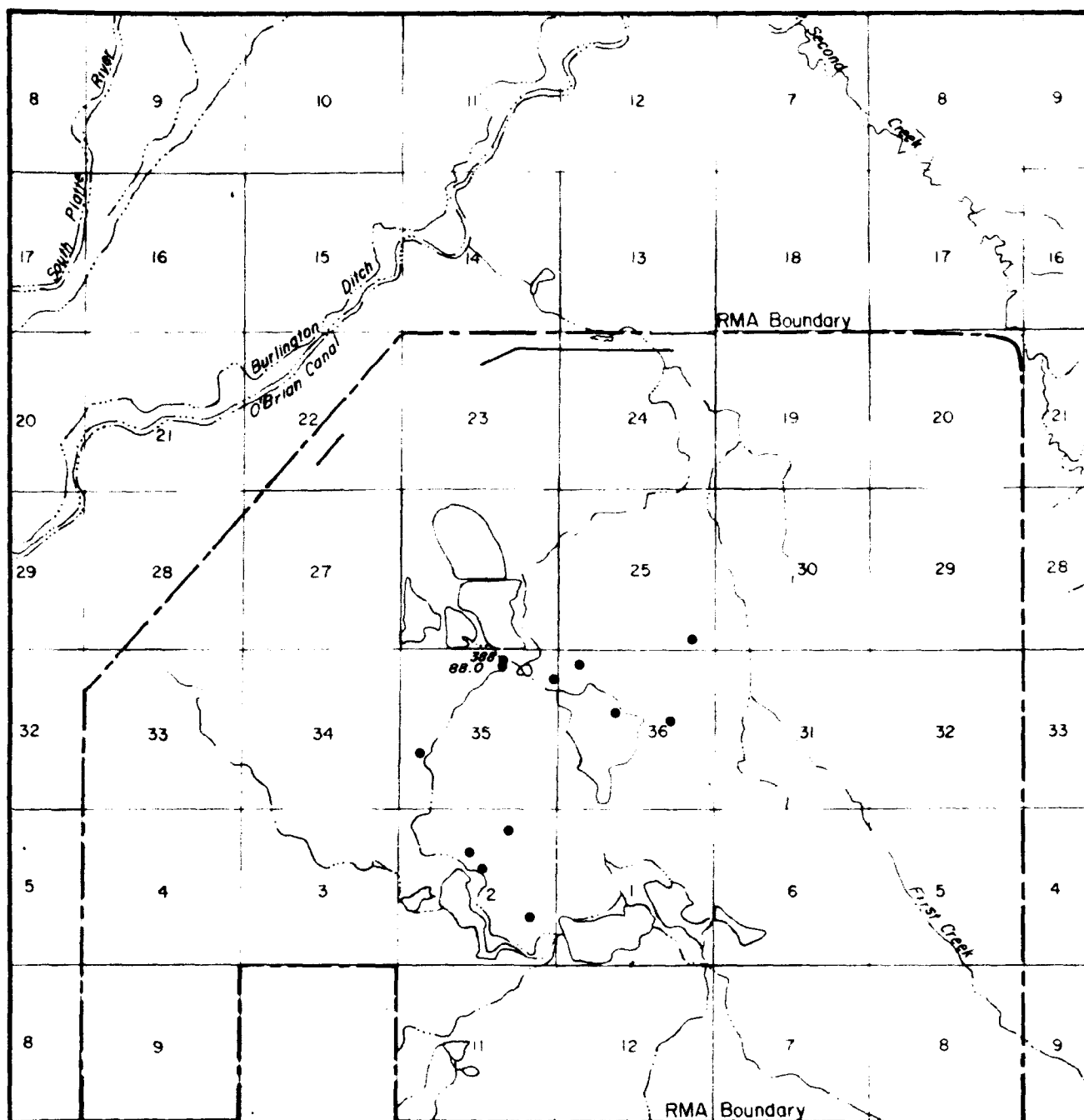
- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-12
Dithiane/Oxathiane Detections
Denver Zone A
Winter 1987/88
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Harding Lawson Associates



Explanation

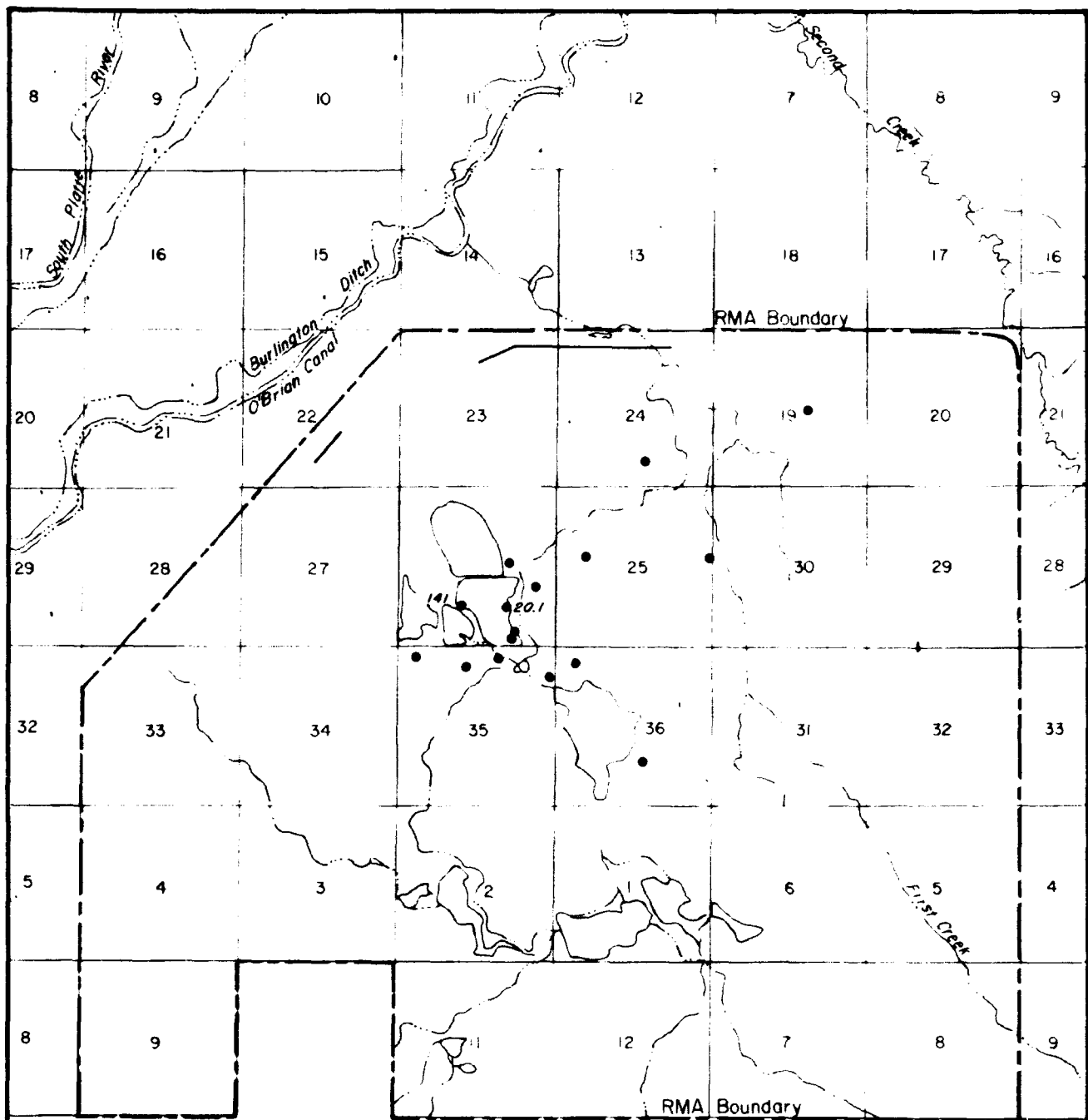
- Denver Zone 1U Well Location
- Analyte Concentration in ug/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

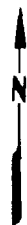
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FIGURE A-13
Dithiane/Oxathiane Detections
Denver Zone 1U
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

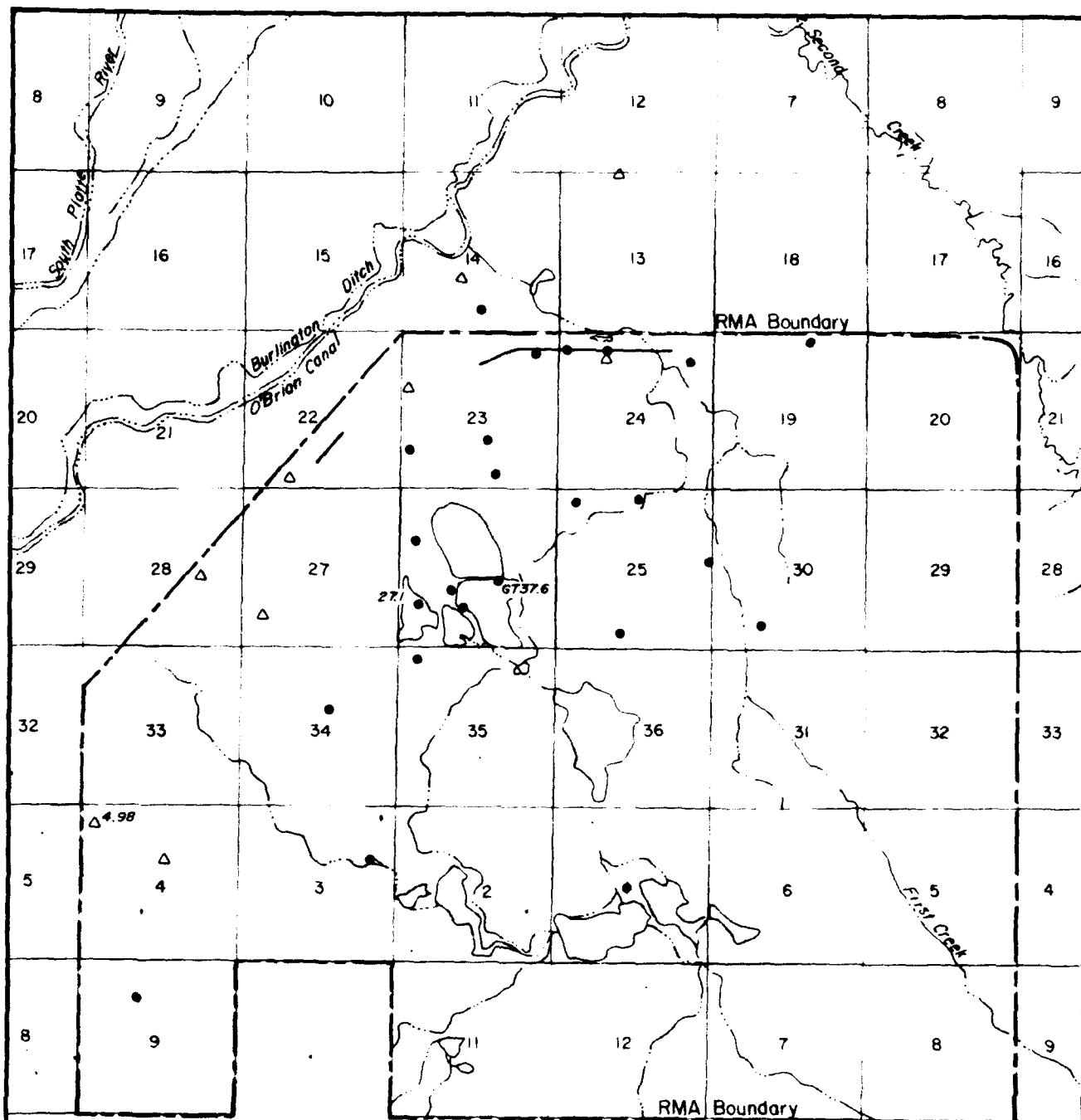
- Denver Zone 1 Well Location
- Analyte Concentration in ug/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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Aberdeen Proving Ground, Maryland

FIGURE A-14
Dithiane/Oxathiane Detections
Denver Zone 1
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

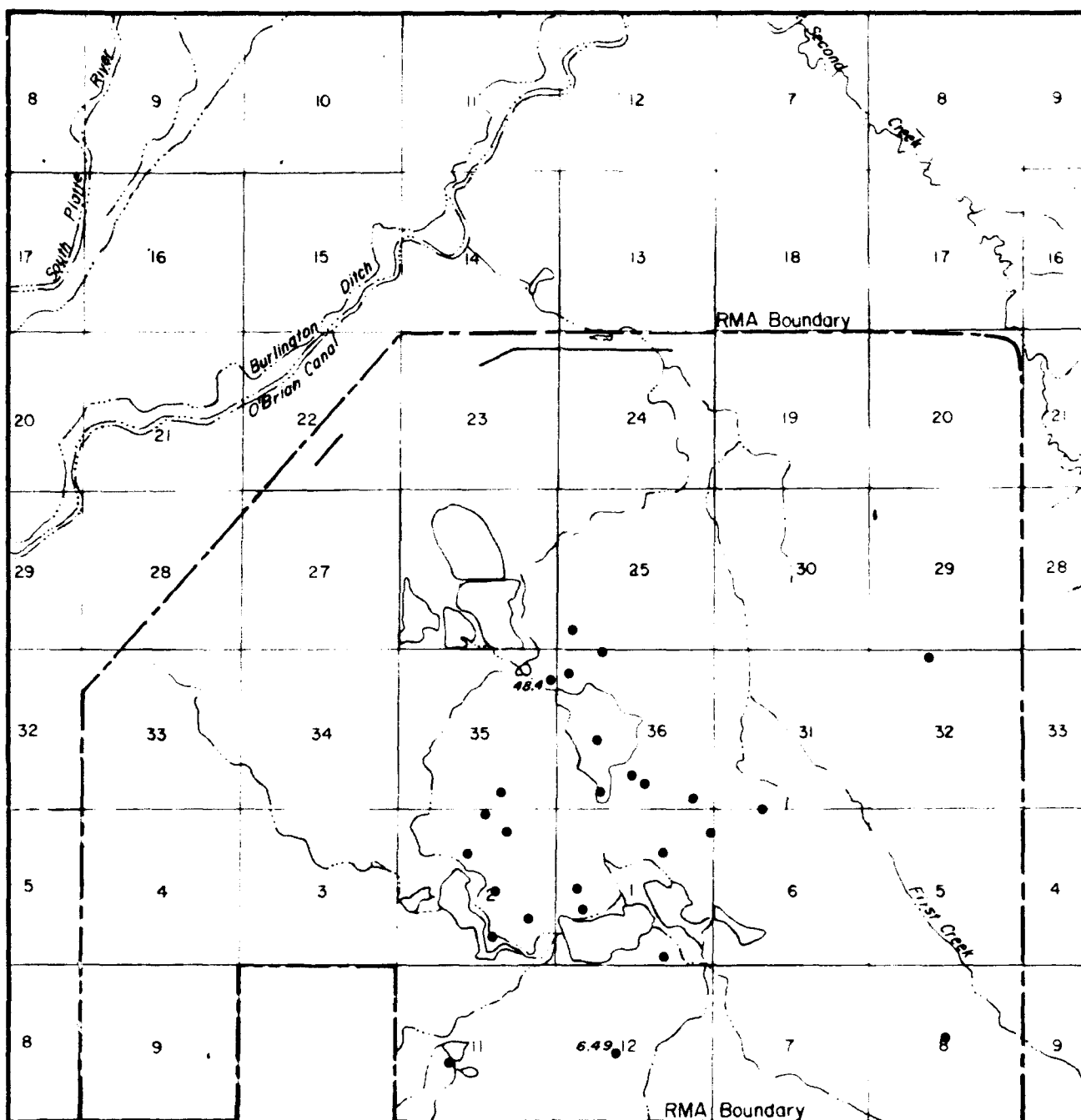
- Denver Zone 2 Well Location
- △ Denver Zone 5 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-15
Dithiane/Oxathiane Detections
Denver Zones 2 & 5
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

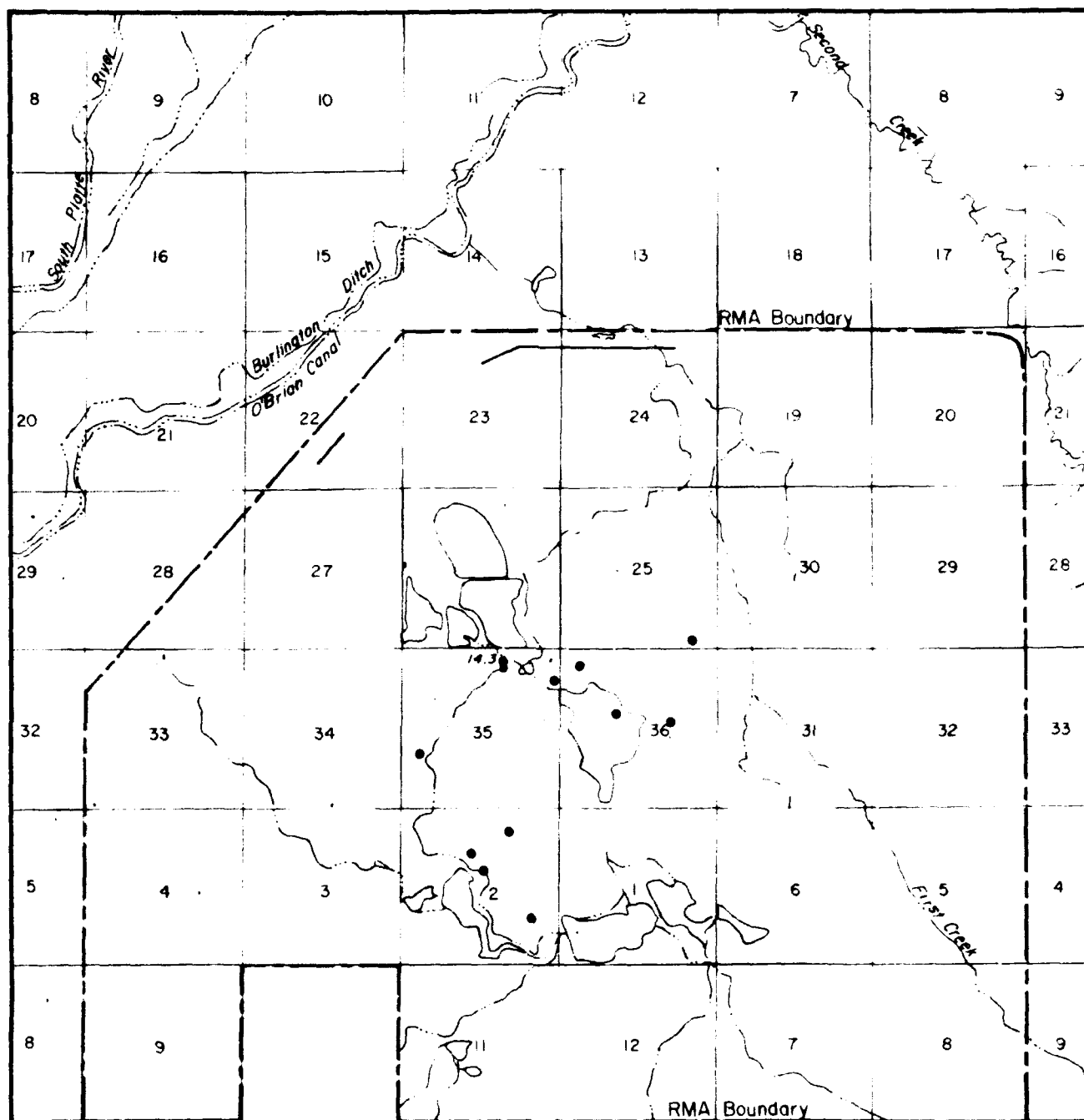


Explanation

- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$

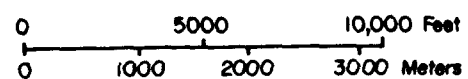
Prepared for:
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FIGURE A-16
Benzothiazole Detections
Denver Zone A
Winter 1987/88
 Prepared by: R.L. Stollar & Associates, Inc.
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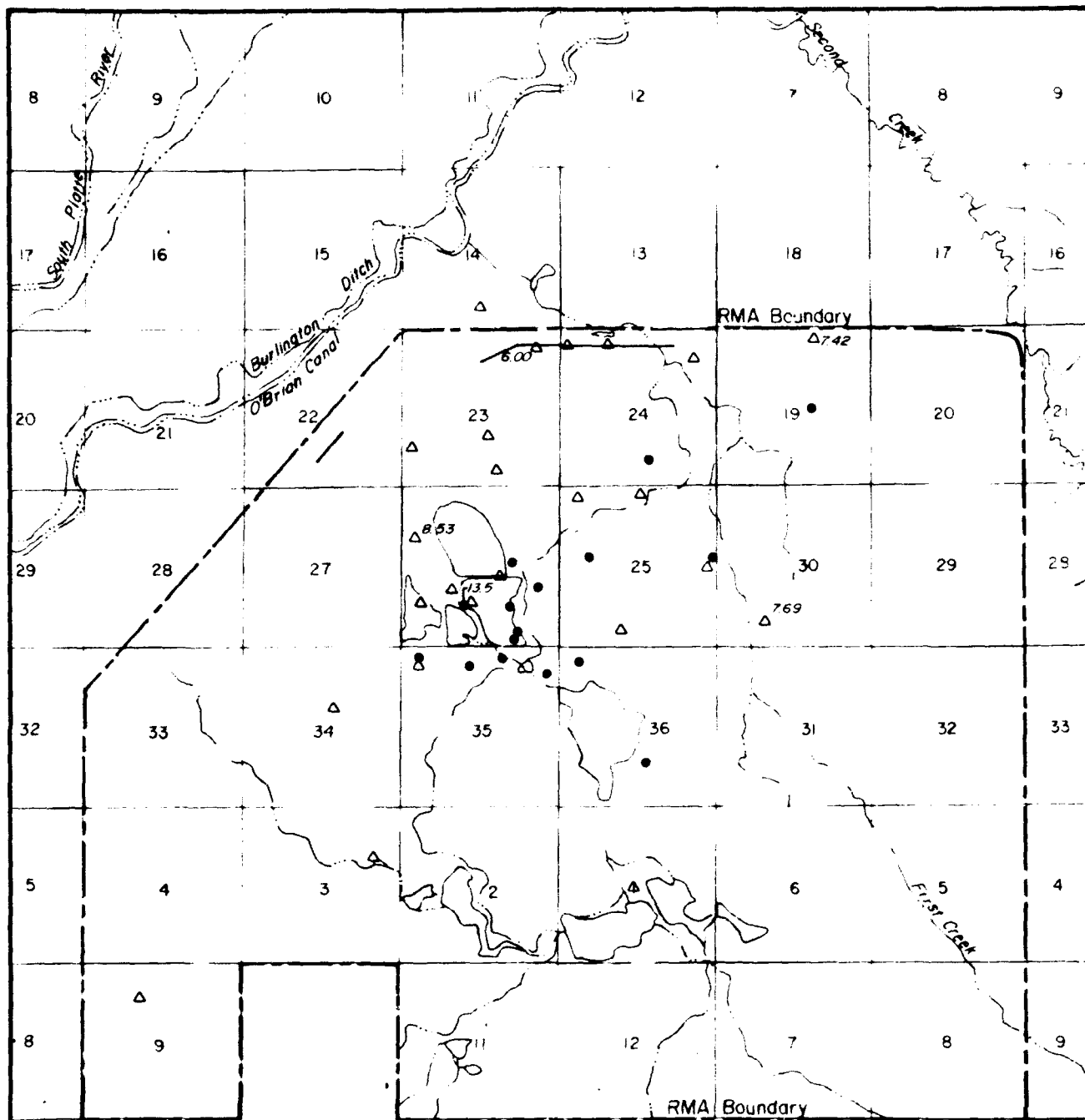
Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in ug/l



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FIGURE A-17
Benzothiazole Detections
Denver Zone 1U
Winter 1987/88
 Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

- Denver Zone 1 Well Location
 - △ Denver Zone 2 Well Location
- Analyte Concentration in $\mu\text{g/l}$

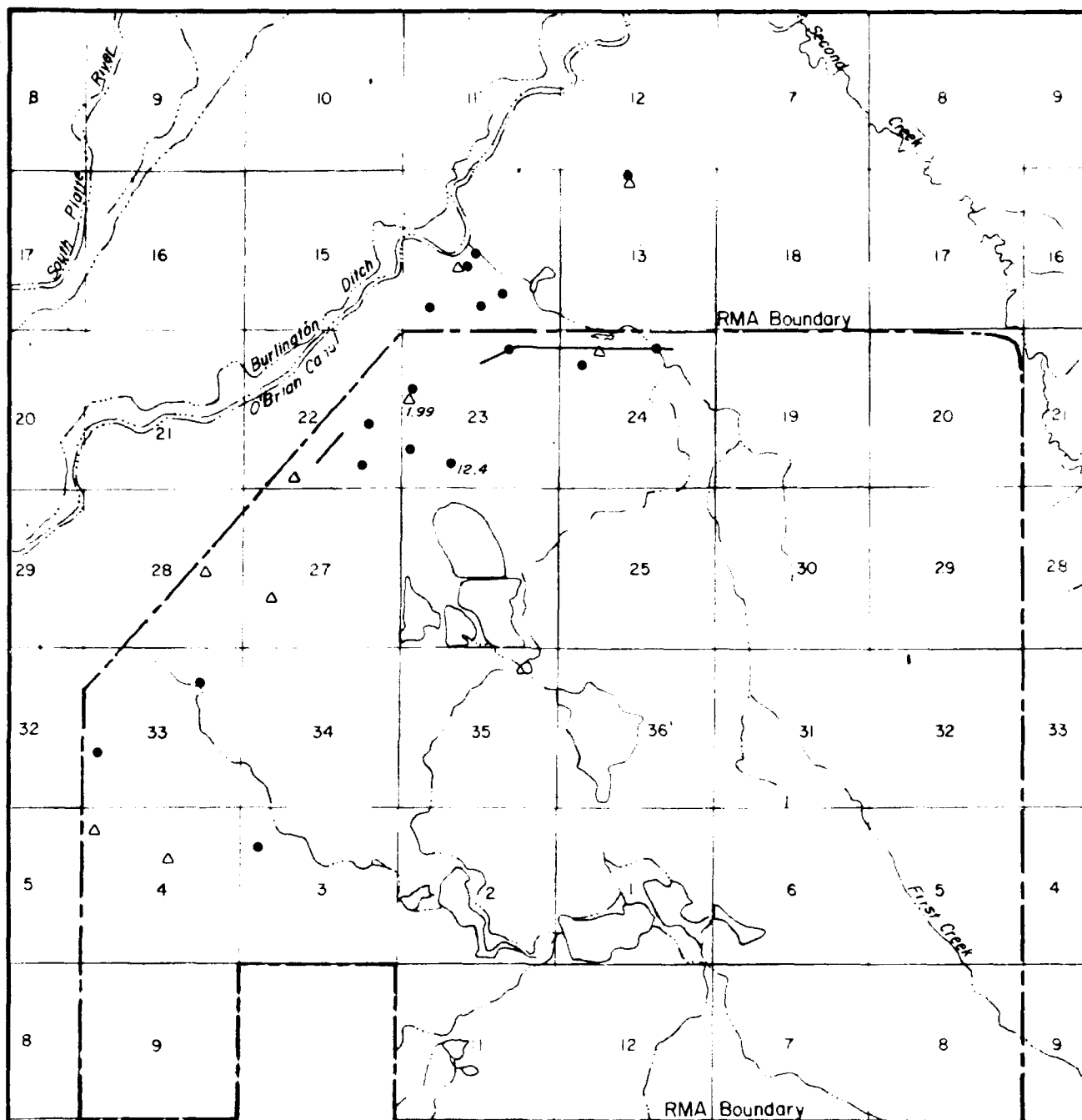


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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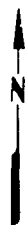
FIGURE A-18
Benzothiazole Detections
Denver Zones 1 & 2
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

- Denver, Zone 4 Well Location
 - △ Denver Zone 5 Well Location
- Analyte Concentration in $\mu\text{g/l}$

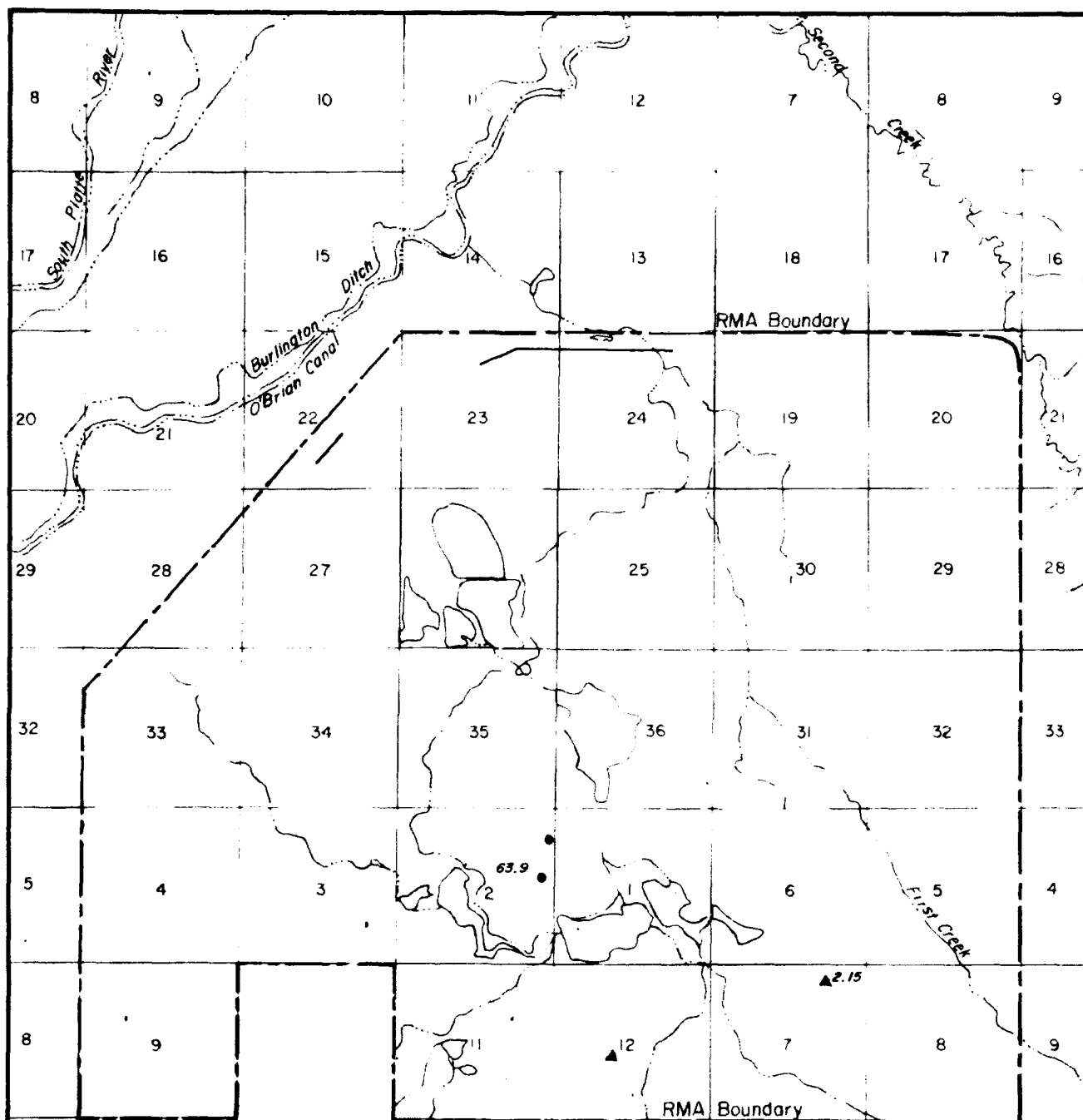


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-19
Benzothiazole Detections
Denver Zones 4 & 5
Winter 1987/88

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Harding Lawson Associates

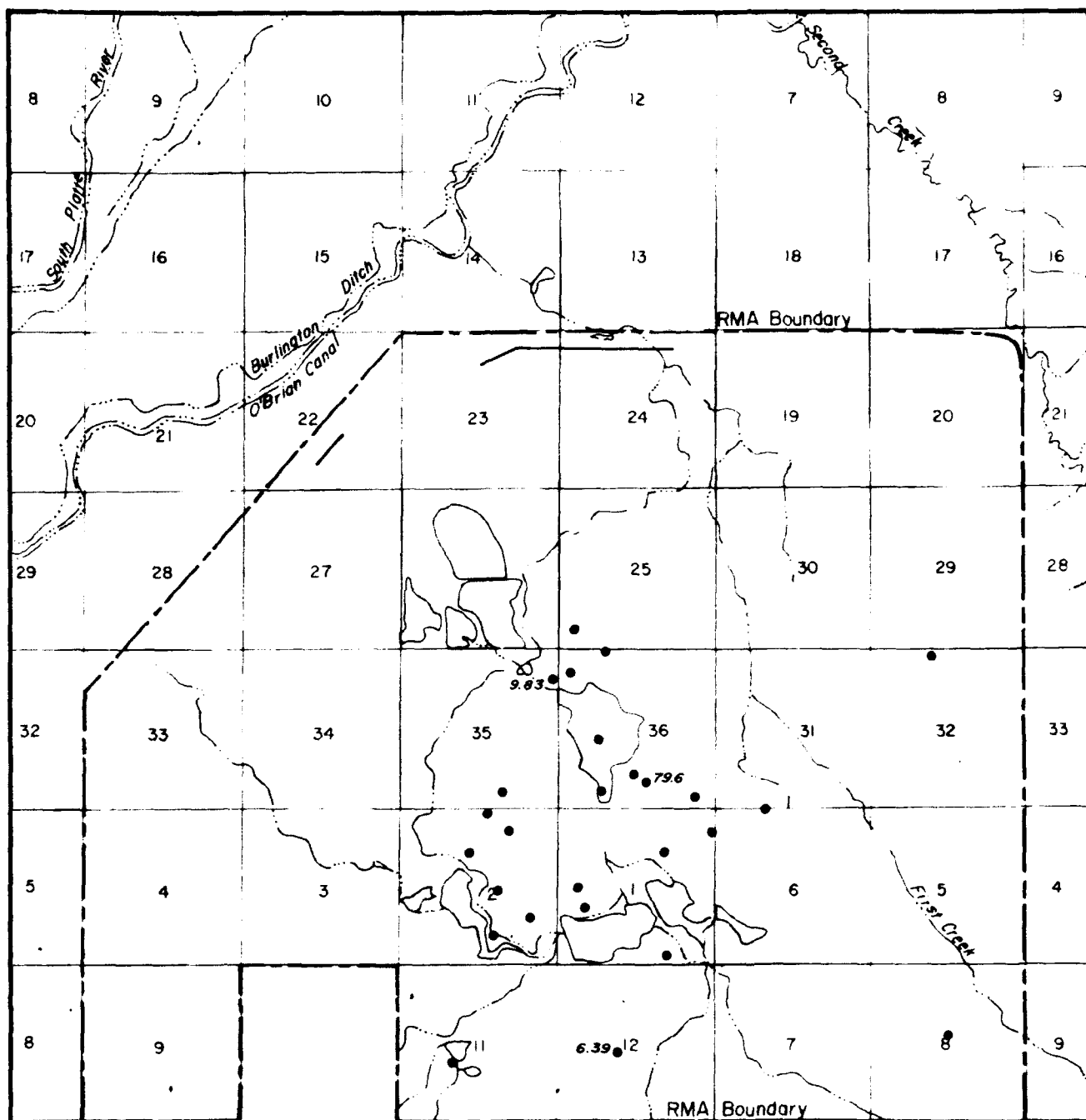


Explanation

- ▲ Denver Zone B Well Location
 - Denver Zone VC Well Location
- Analyte Concentration in ug/l

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FIGURE A-20
Summed Organosulfur Compound Detections
Denver Zones B & VC
Winter 1987/88
 Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates



Explanation

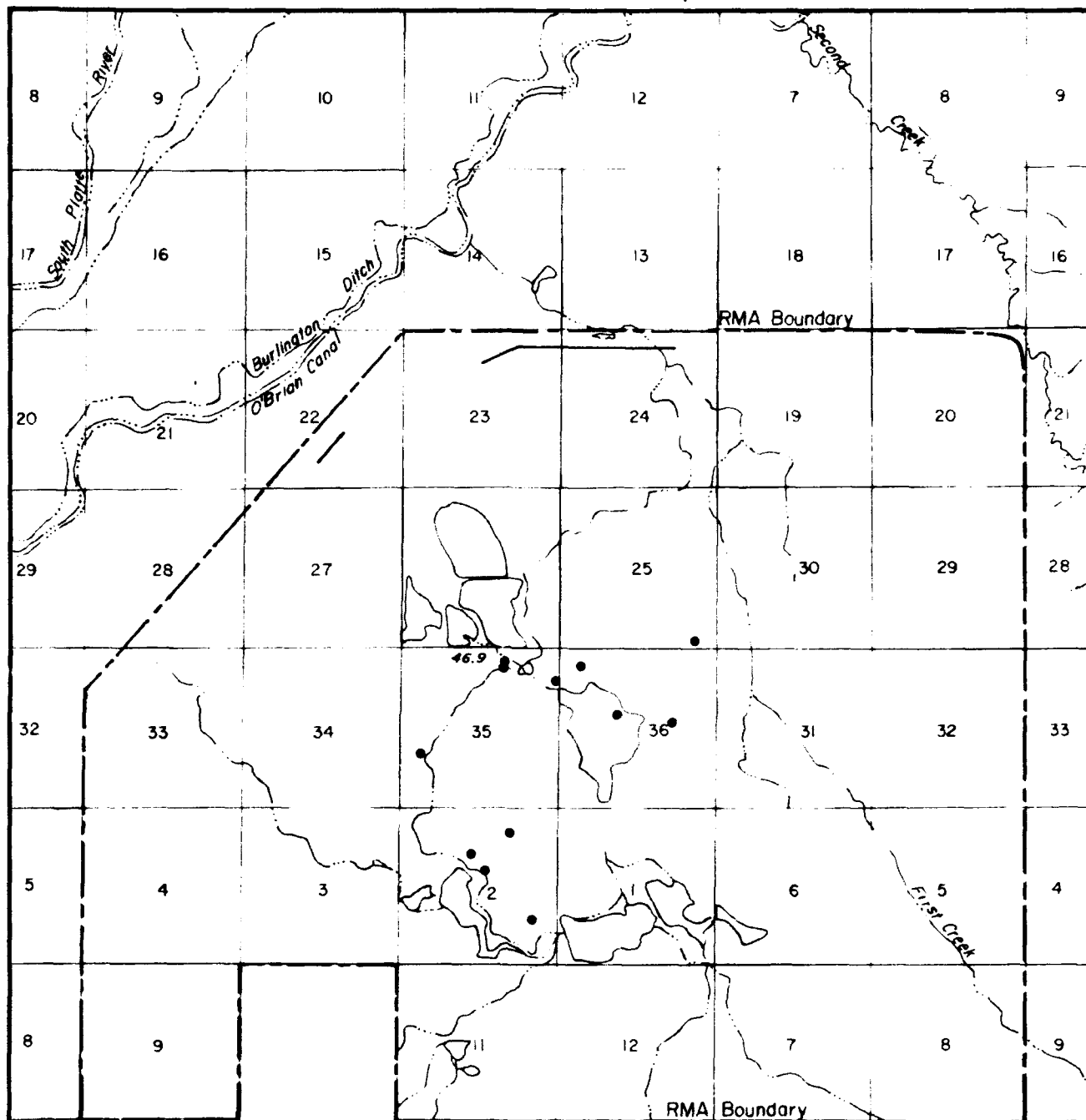
- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-21
Summed Organosulfur Compound Detections
Denver Zone A
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



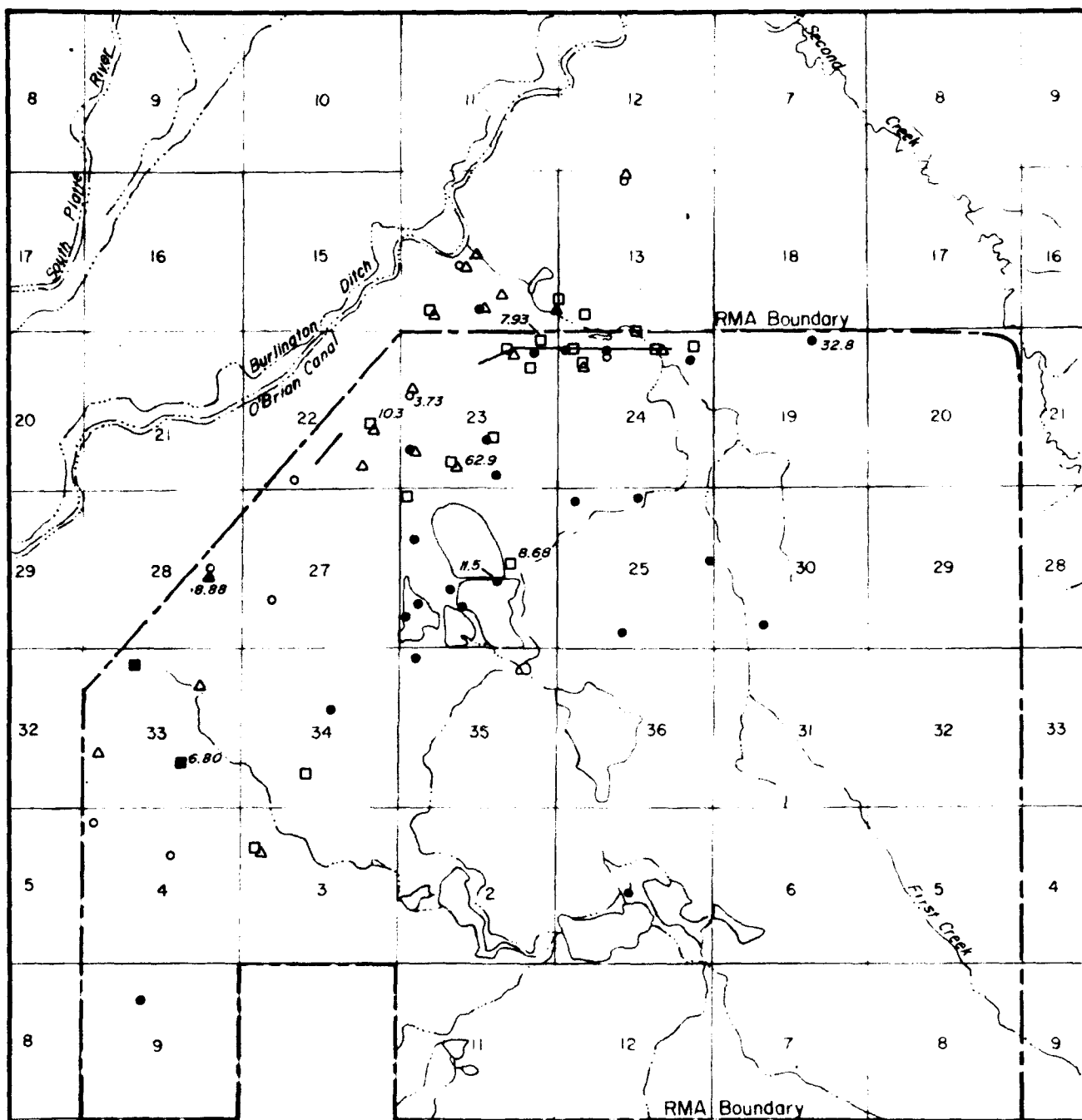
Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$

0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-22
Summed Organosulfur Compound Detections
Denver Zone 1U
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

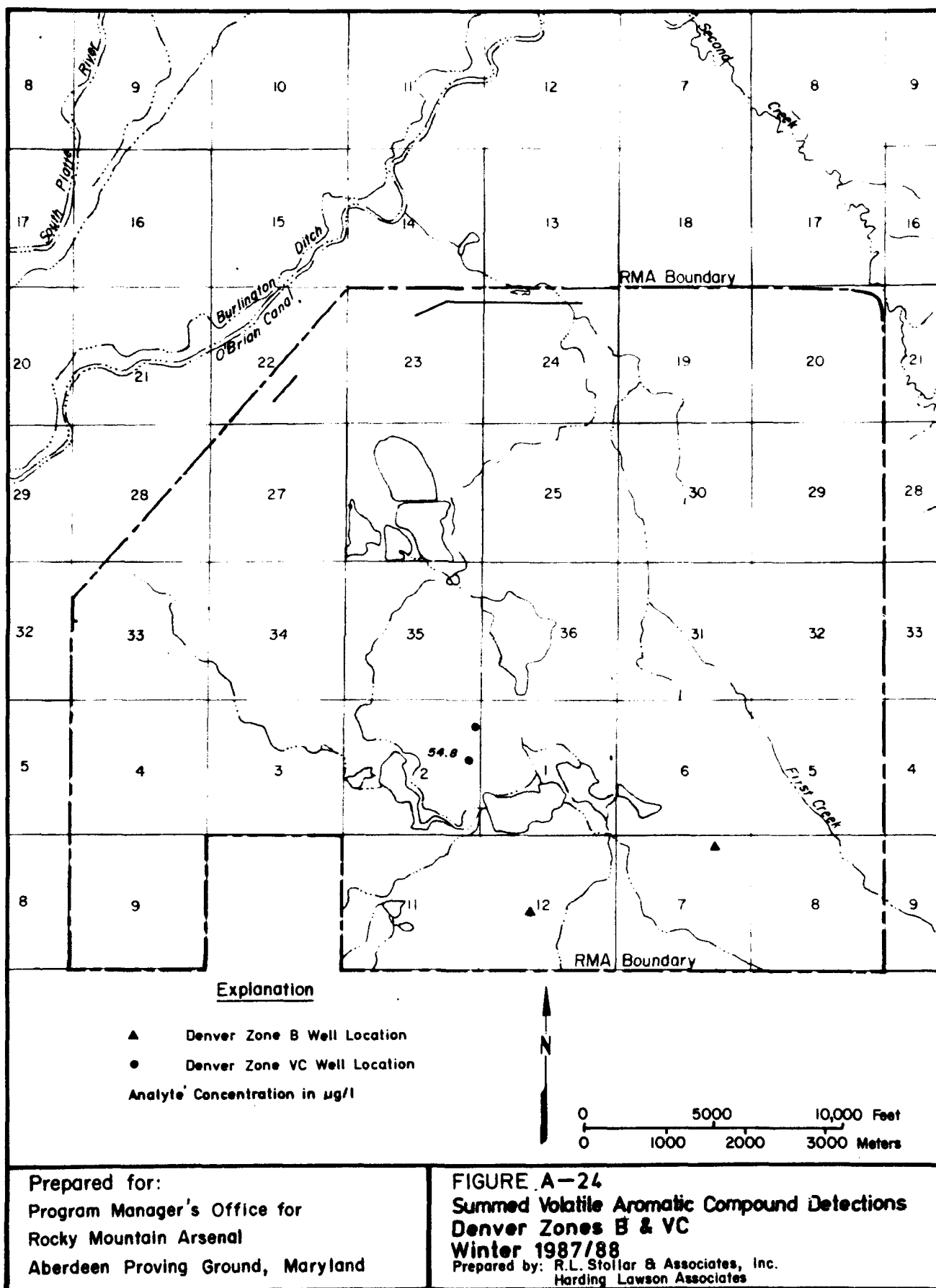
- Denver Zone 2 Well Location
 - Denver Zone 3 Well Location
 - △ Denver Zone 4 Well Location
 - Denver Zone 5 Well Location
 - ▲ Denver Zone 6 Well Location
 - Denver Zone 7 Well Location
- Analyte Concentration in $\mu\text{g/l}$

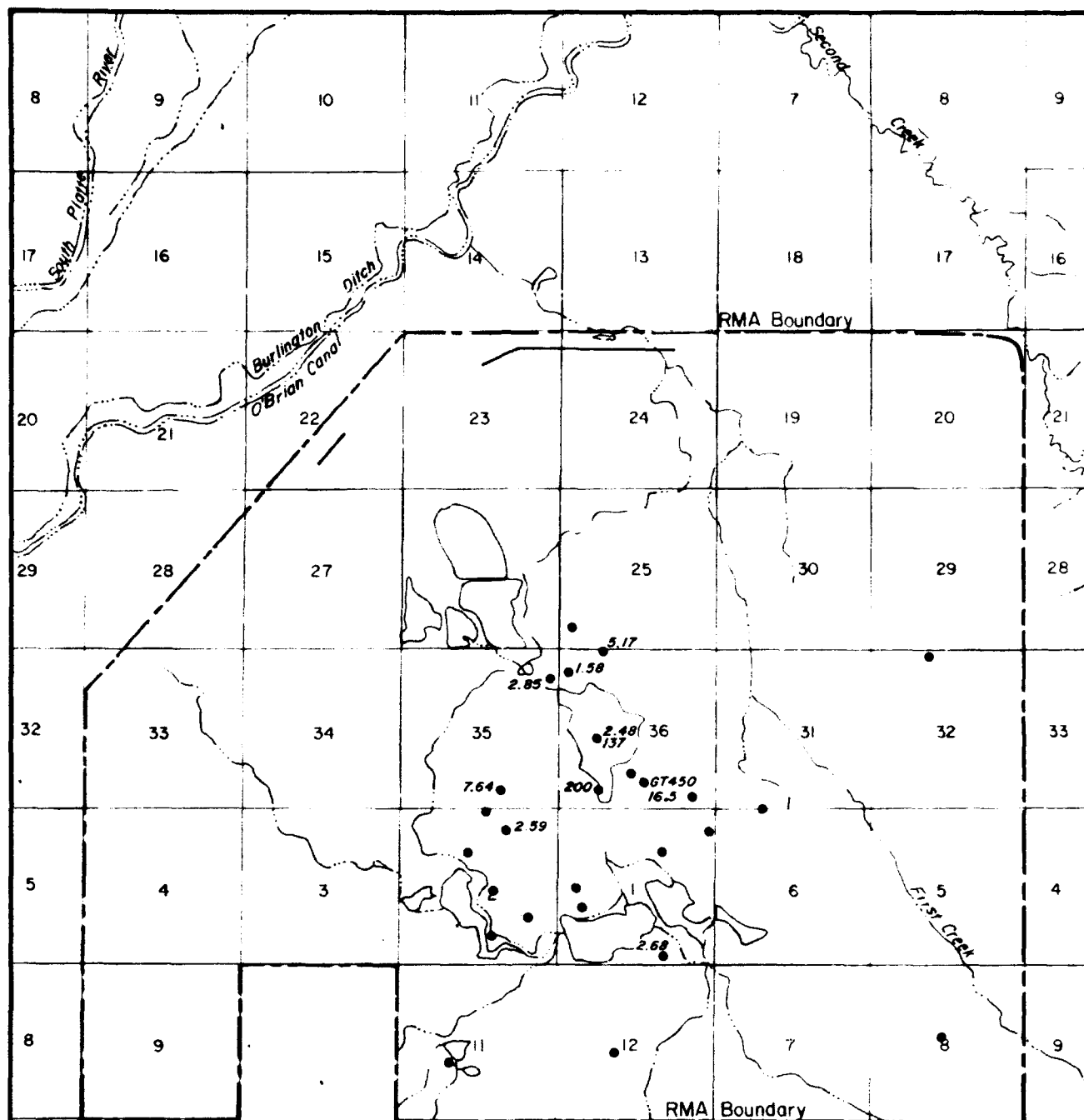


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-23
Summed Organosulfur Compound Detections
Denver Zones 2, 3, 4, 5, 6, & 7
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates





Explanation

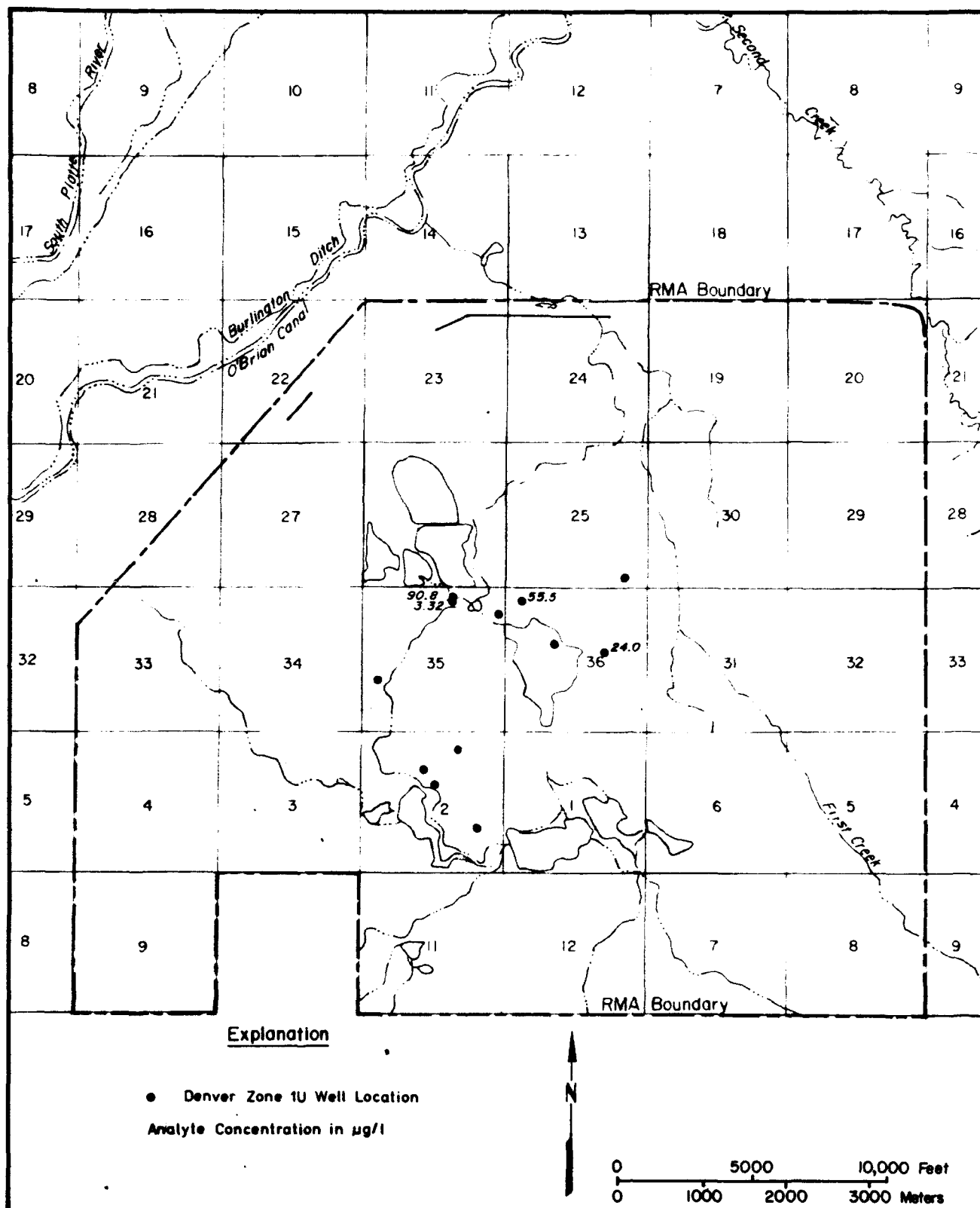
- Denver Zone A Well Location
- Analyte Concentration in ug/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

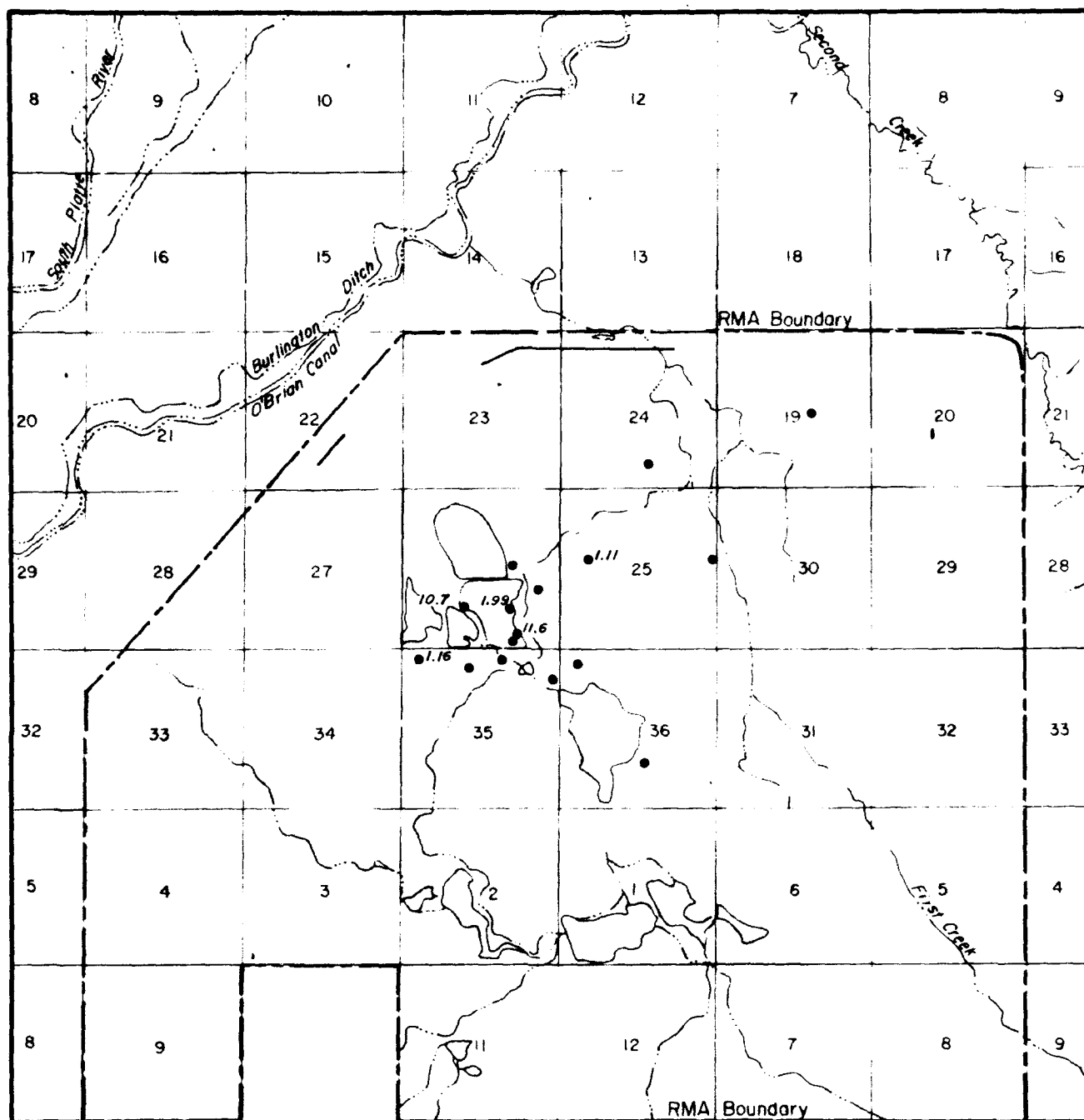
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Aberdeen Proving Ground, Maryland

FIGURE A-25
Summed Volatile Aromatic Compound Detections
Denver Zone A
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
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FIGURE A-26
Summed Volatile Aromatic Compound Detections
Denver Zone 1U
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

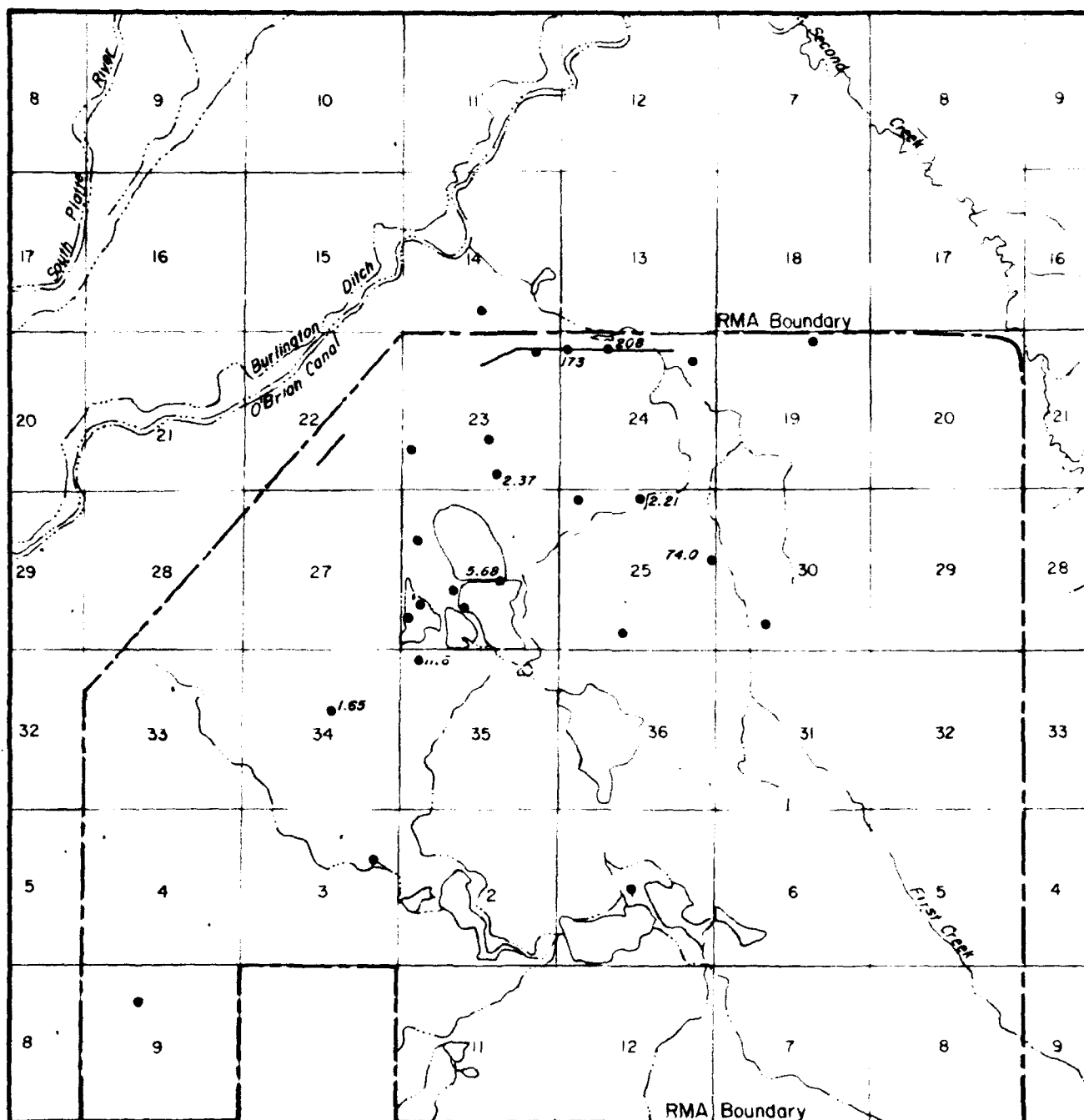
- Denver Zone 1 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

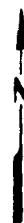
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FIGURE A-27
Summed Volatile Aromatic Compound Detections
Denver Zone 1
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

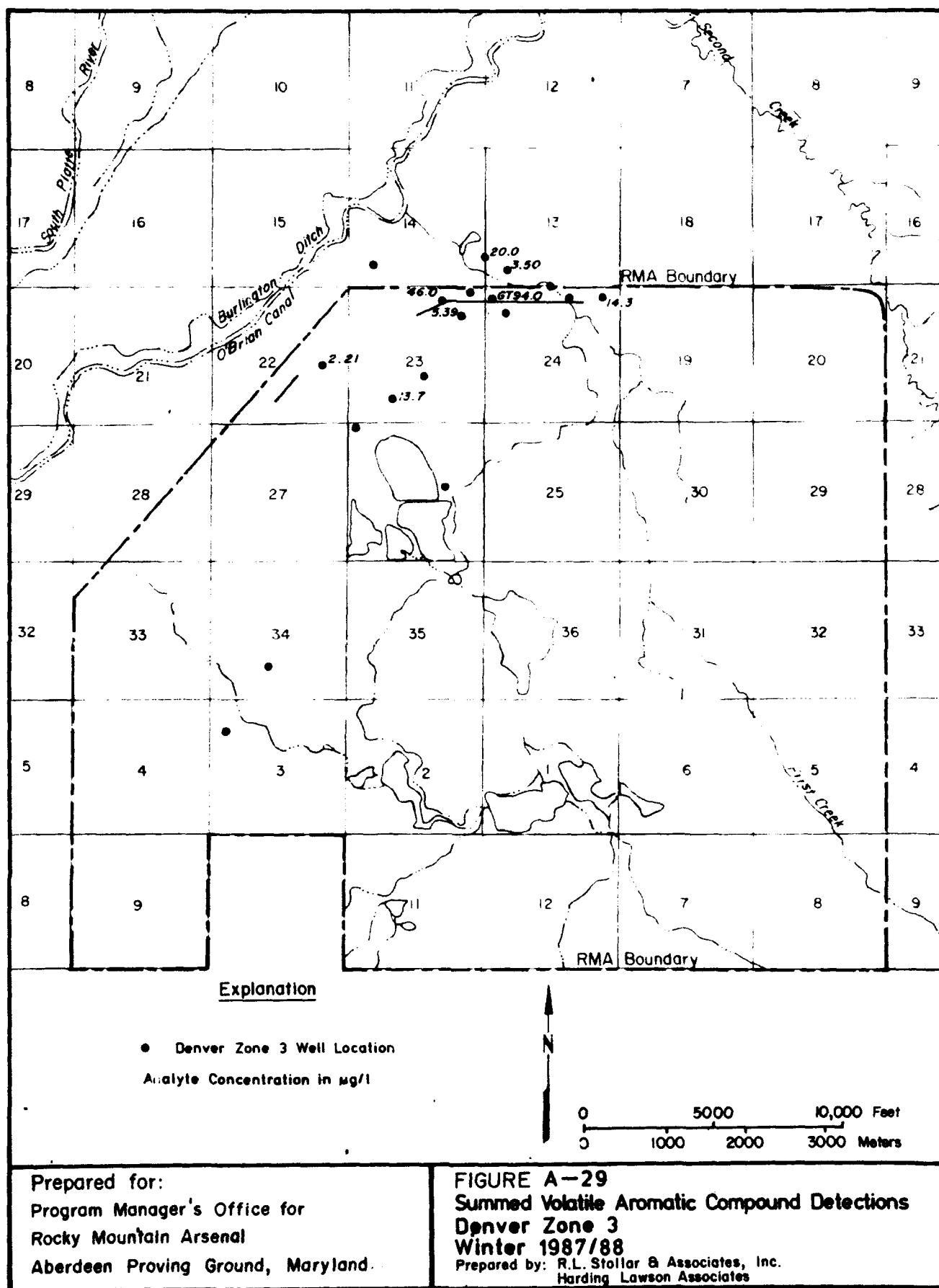
- Denver Zone 2 Well Location
- Analyte Concentration in $\mu\text{g/l}$

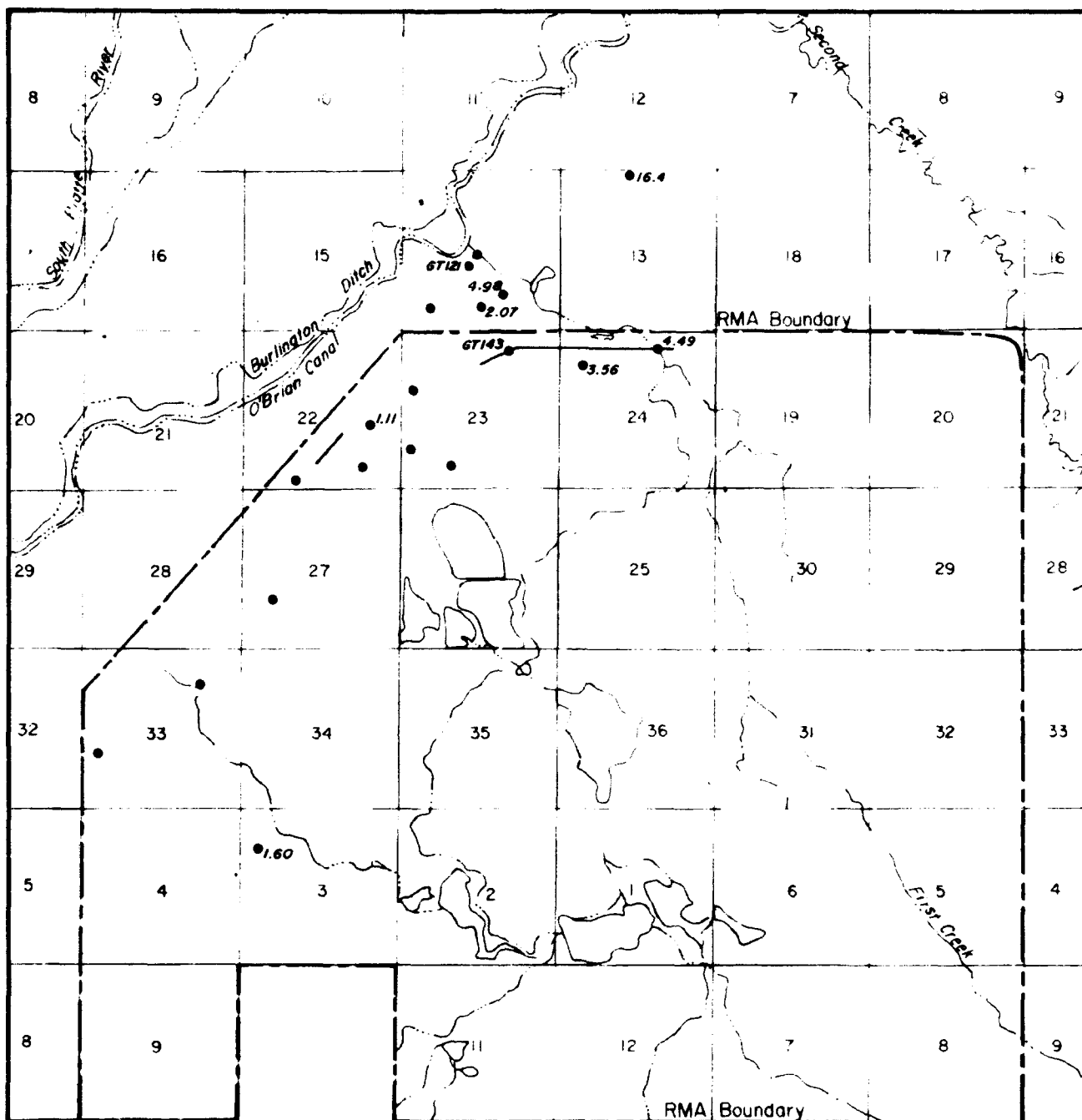


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-28
Summed Volatile Aromatic Compound Detections
Denver Zone 2
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

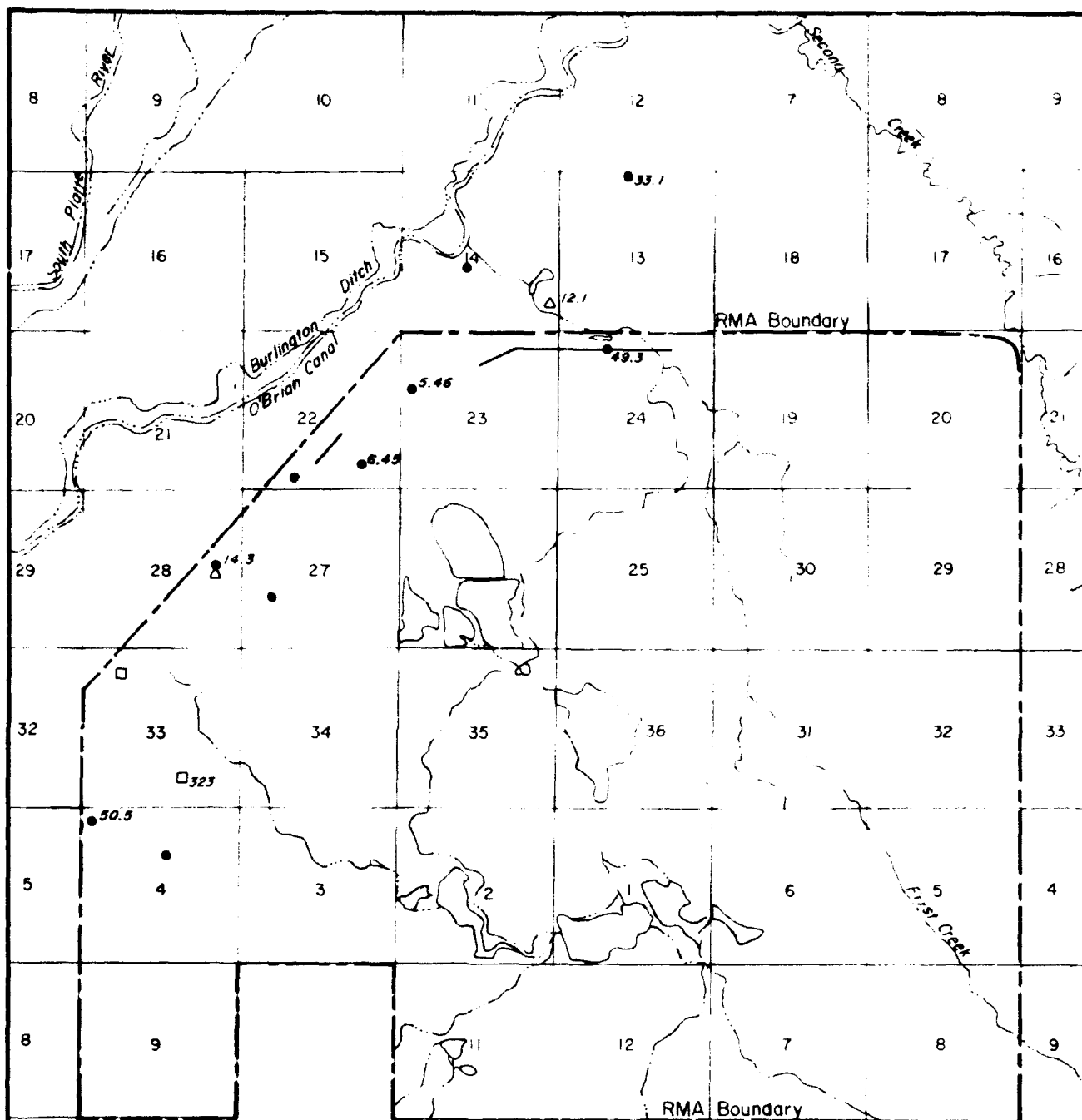
- Denver Zone 4 Well Location
- Analyte Concentration in µg/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-30
Summed Volatile Aromatic Compound Detections
Denver Zone 4
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

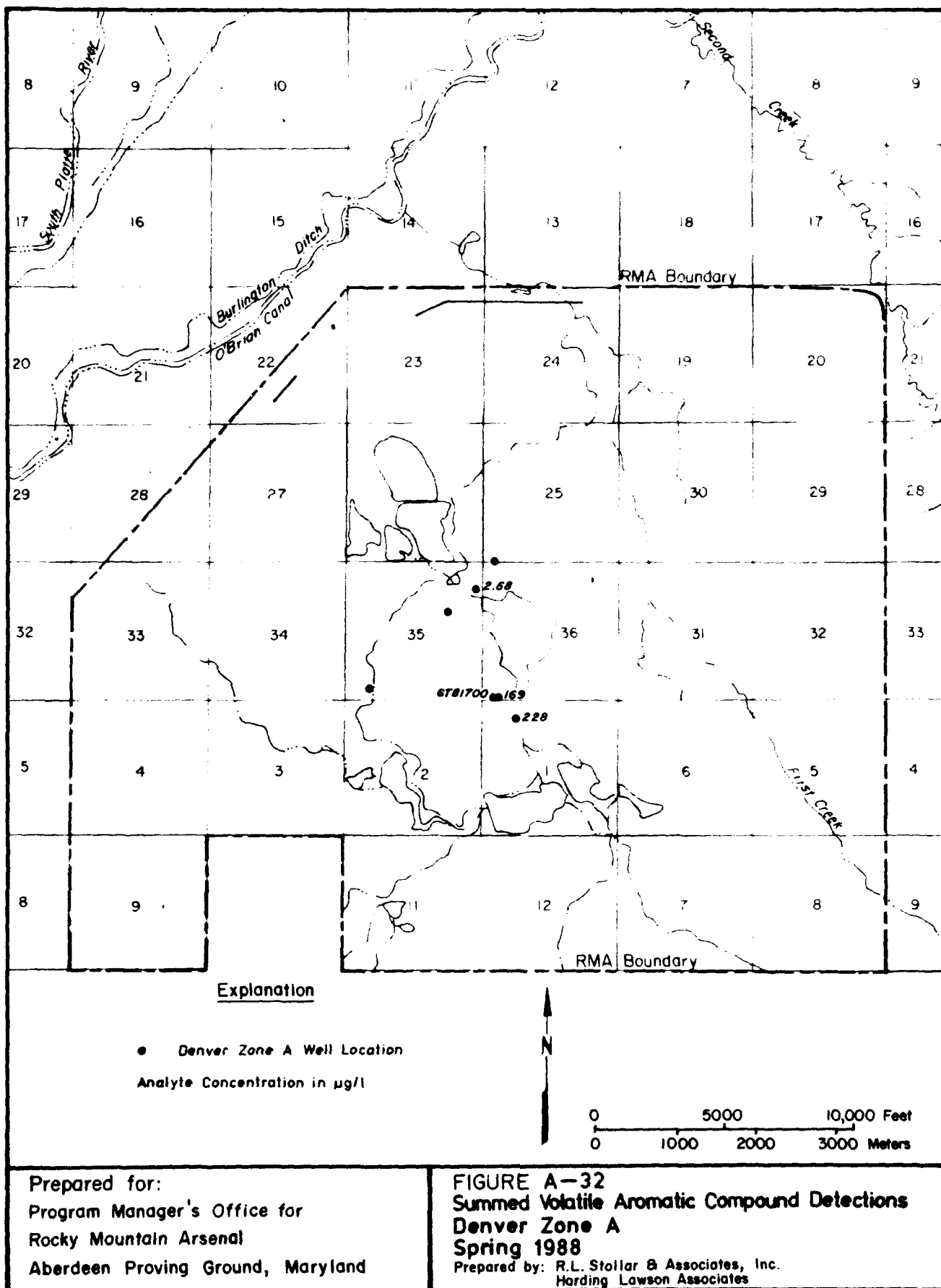


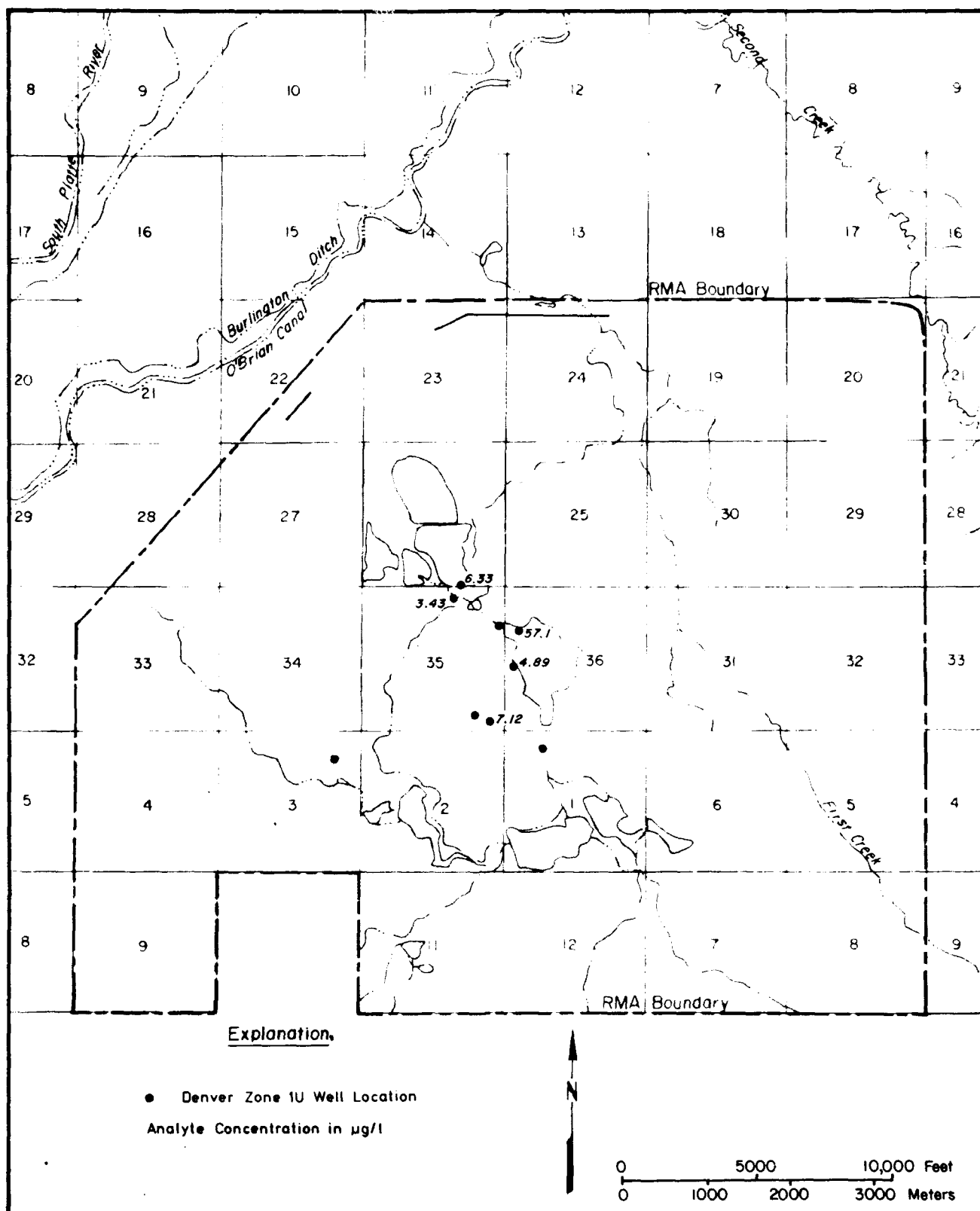
Explanation

- Denver Zone 5 Well Location
 - △ Denver Zone 6 Well Location
 - Denver Zone 7 Well Location
- Analyte Concentration in µg/l

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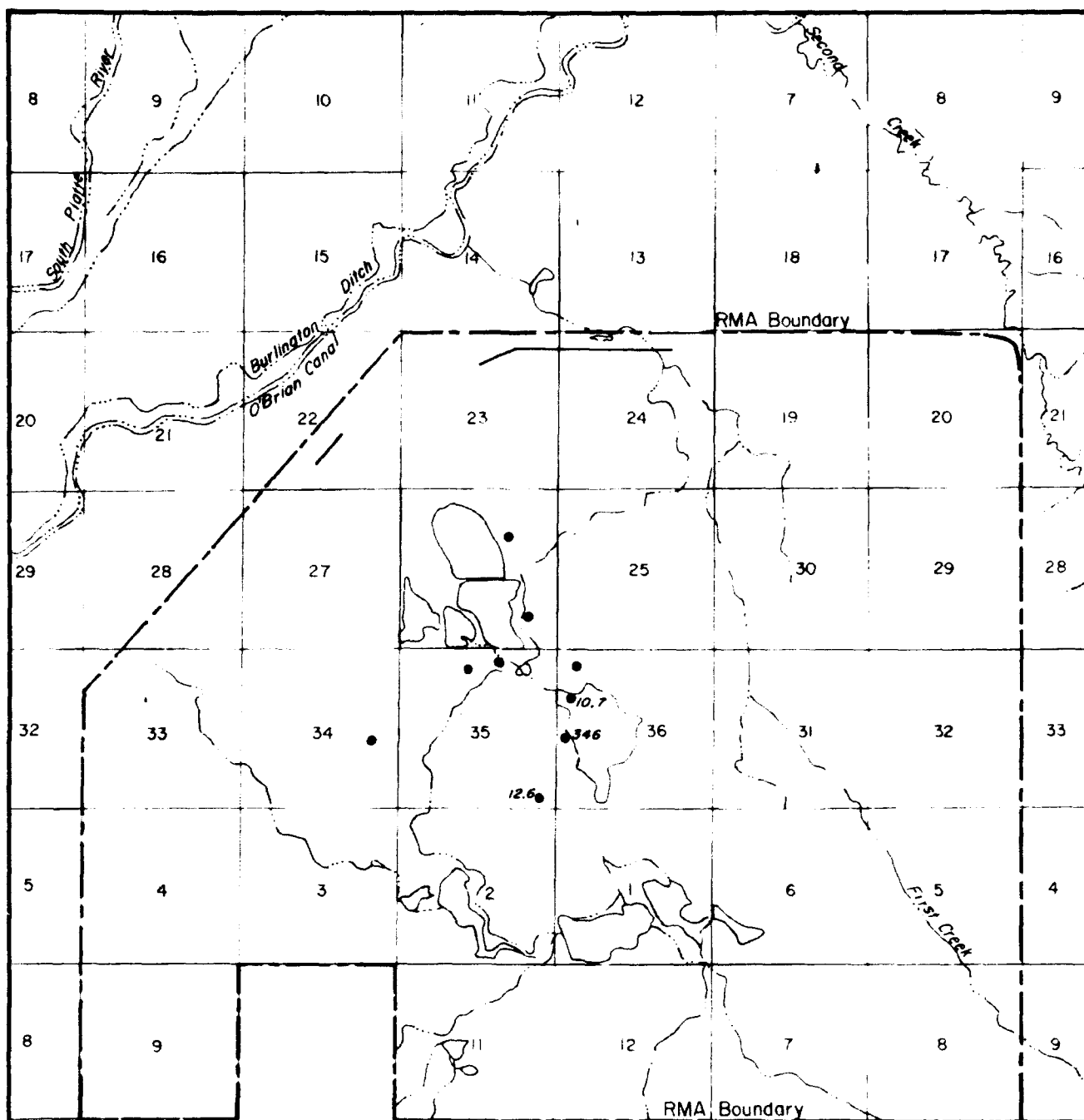
FIGURE A-31
Summed Volatile Aromatic Compound Detections
Denver Zones 5, 6, & 7
Winter 1987/88
 Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates





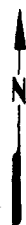
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 Aberdeen Proving Ground, Maryland

FIGURE A-33
Summed Volatile Aromatic Compound Detections
Denver Zone 1U
Spring 1988
 Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates



Explanation

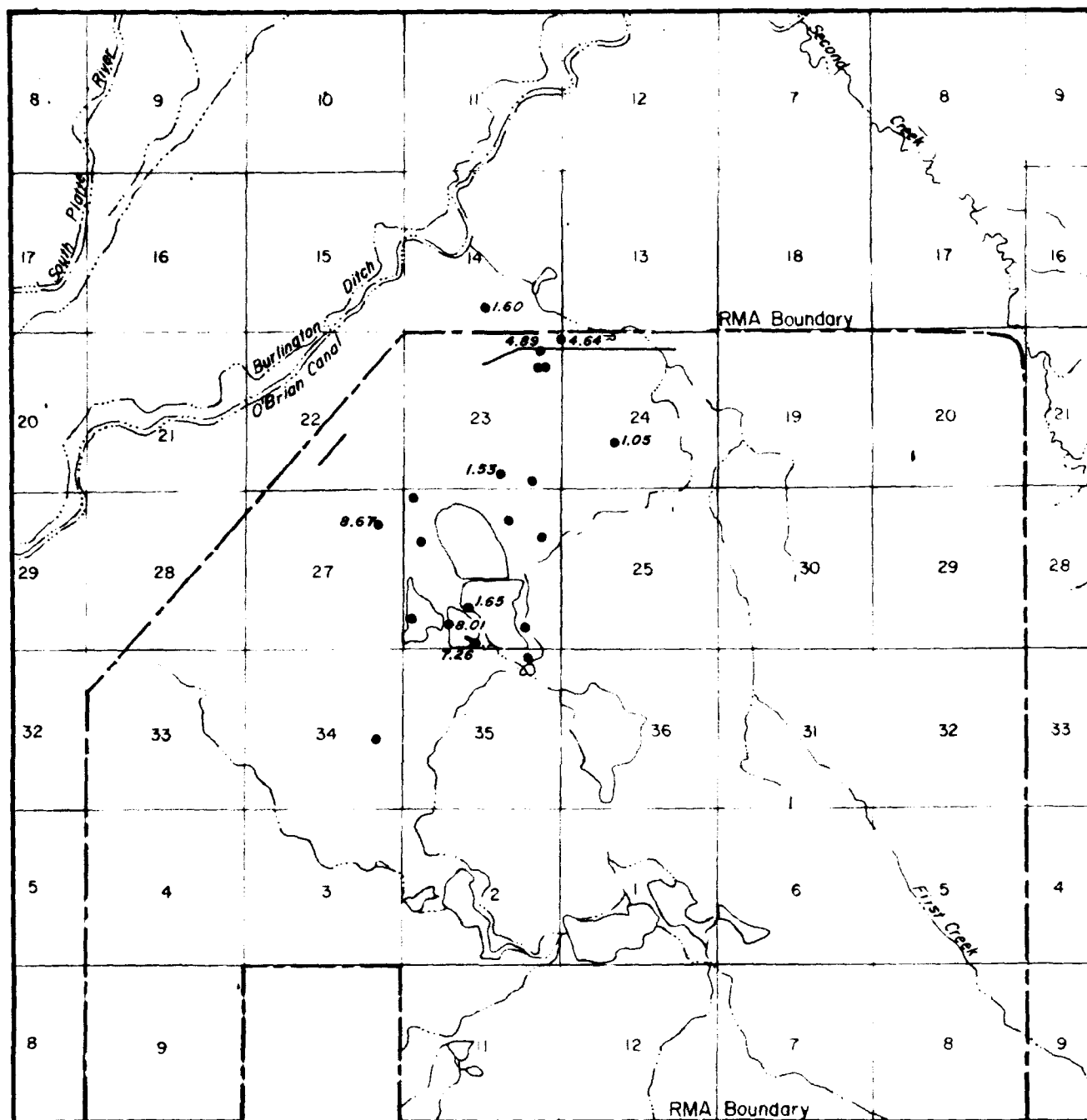
- Denver Zone 1 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-34
Summed Volatile Aromatic Compound Detections
Denver Zone 1
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

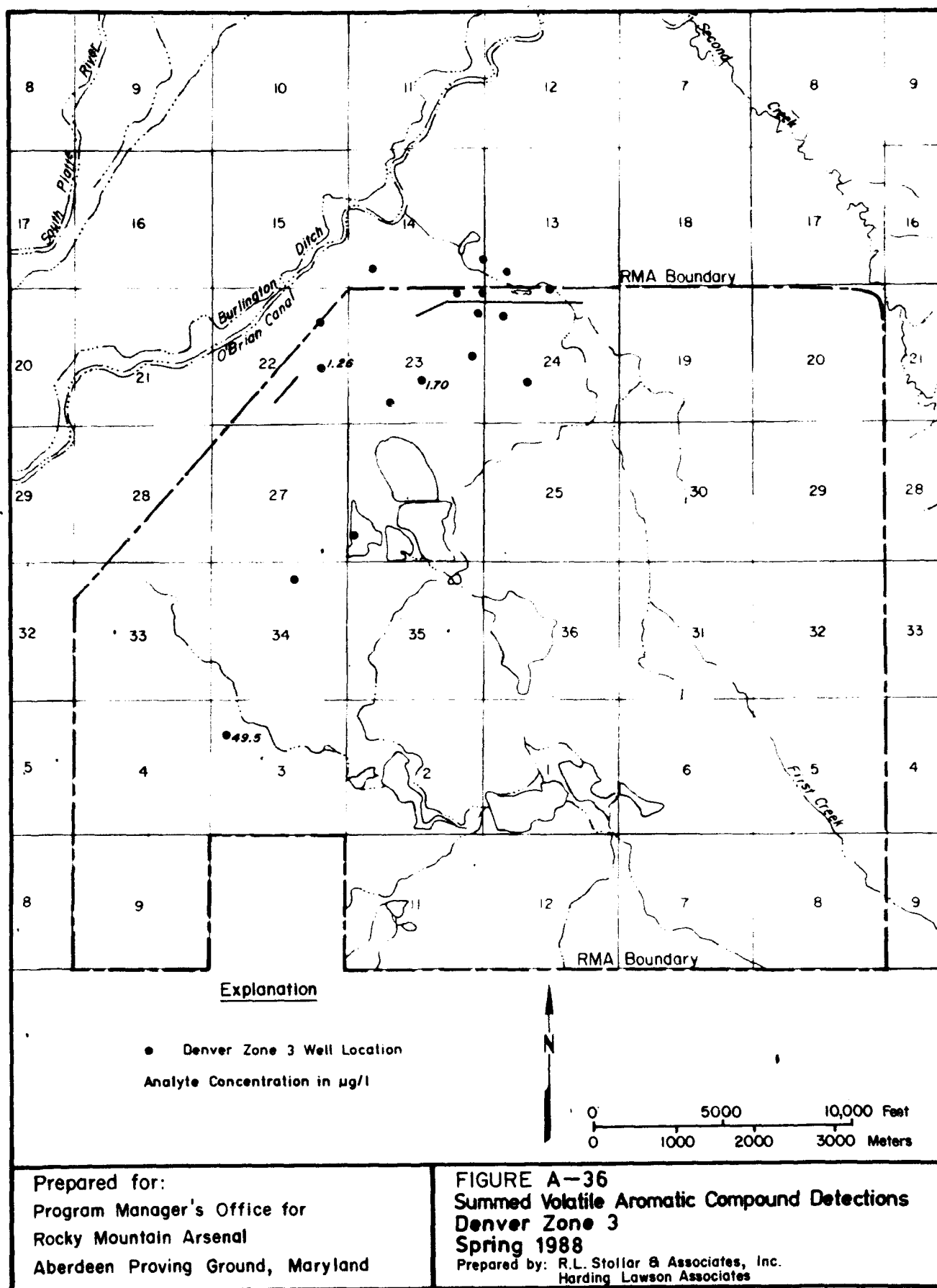


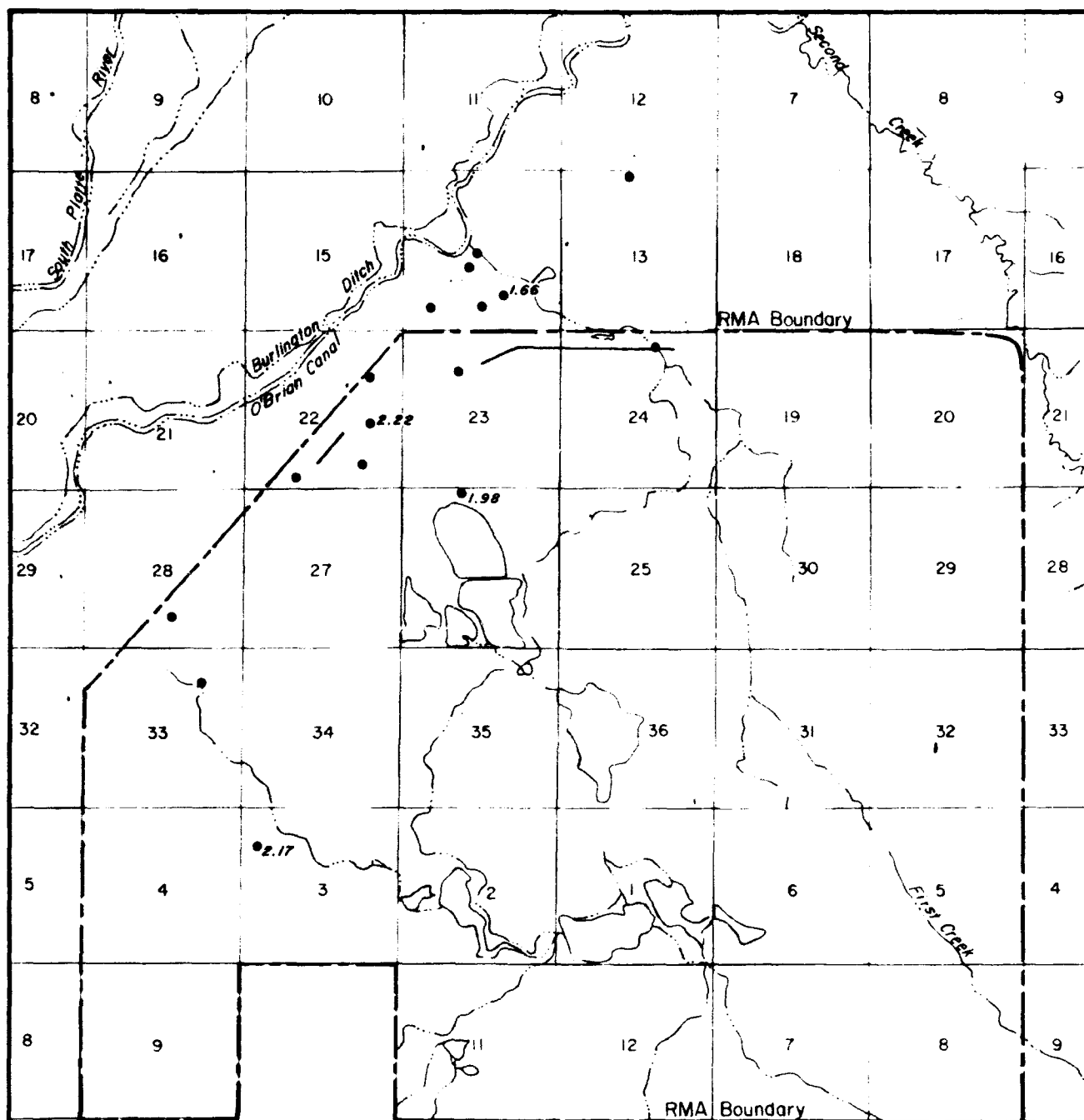
Explanation

- Denver Zone 2 Well Location
- Analyte Concentration in µg/l

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FIGURE A-35
Summed Volatile Aromatic Compound Detections
Denver Zone 2
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
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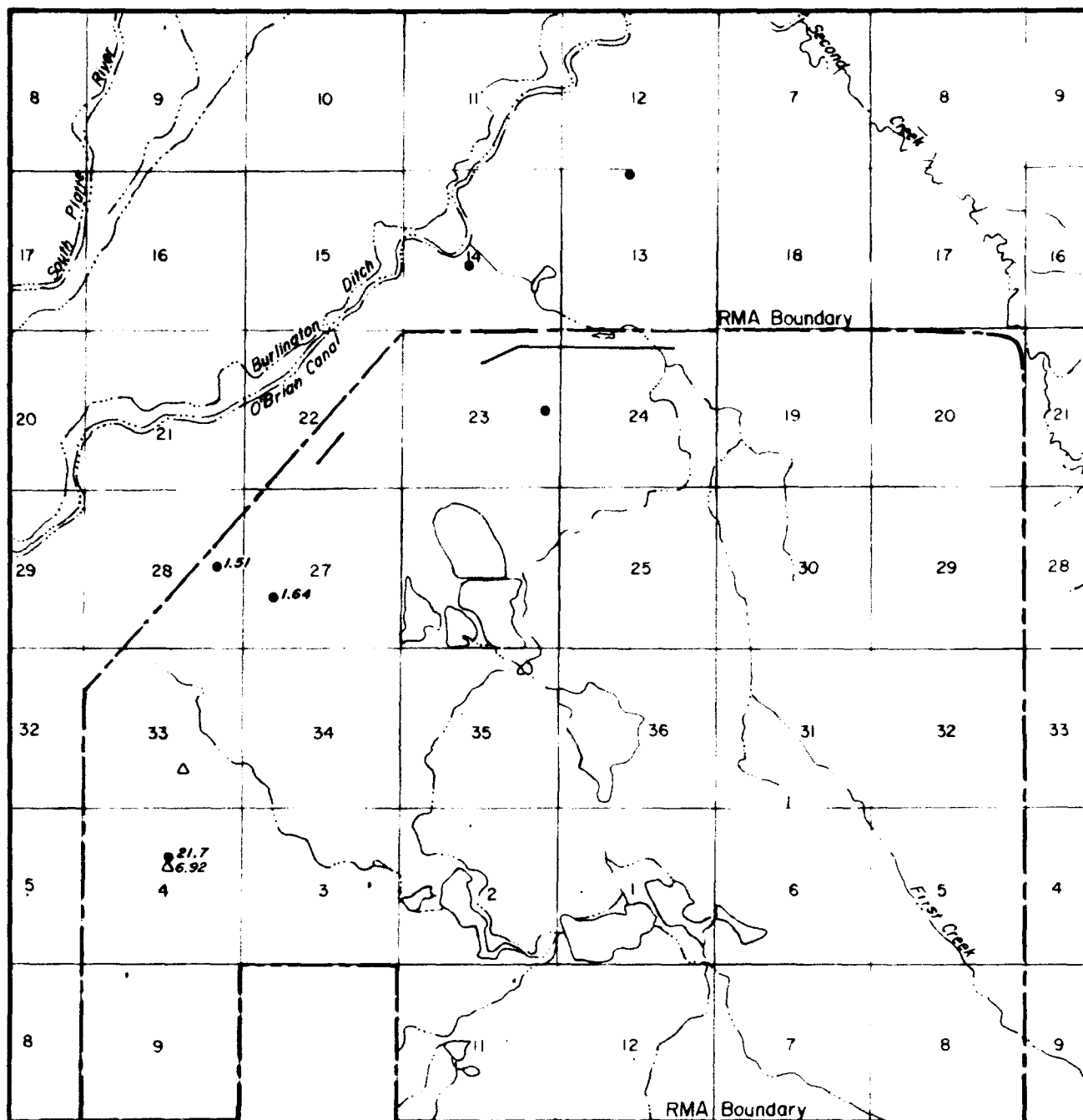


Explanation

- Denver Zone 4 Well Location
- Analyte Concentration in µg/l

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FIGURE A-37
Summed Volatile Aromatic Compound Detections
Denver Zone 4
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

● Denver Zone 5 Well Location

△ Denver Zone 6 Well Location

Analyte Concentration in µg/l

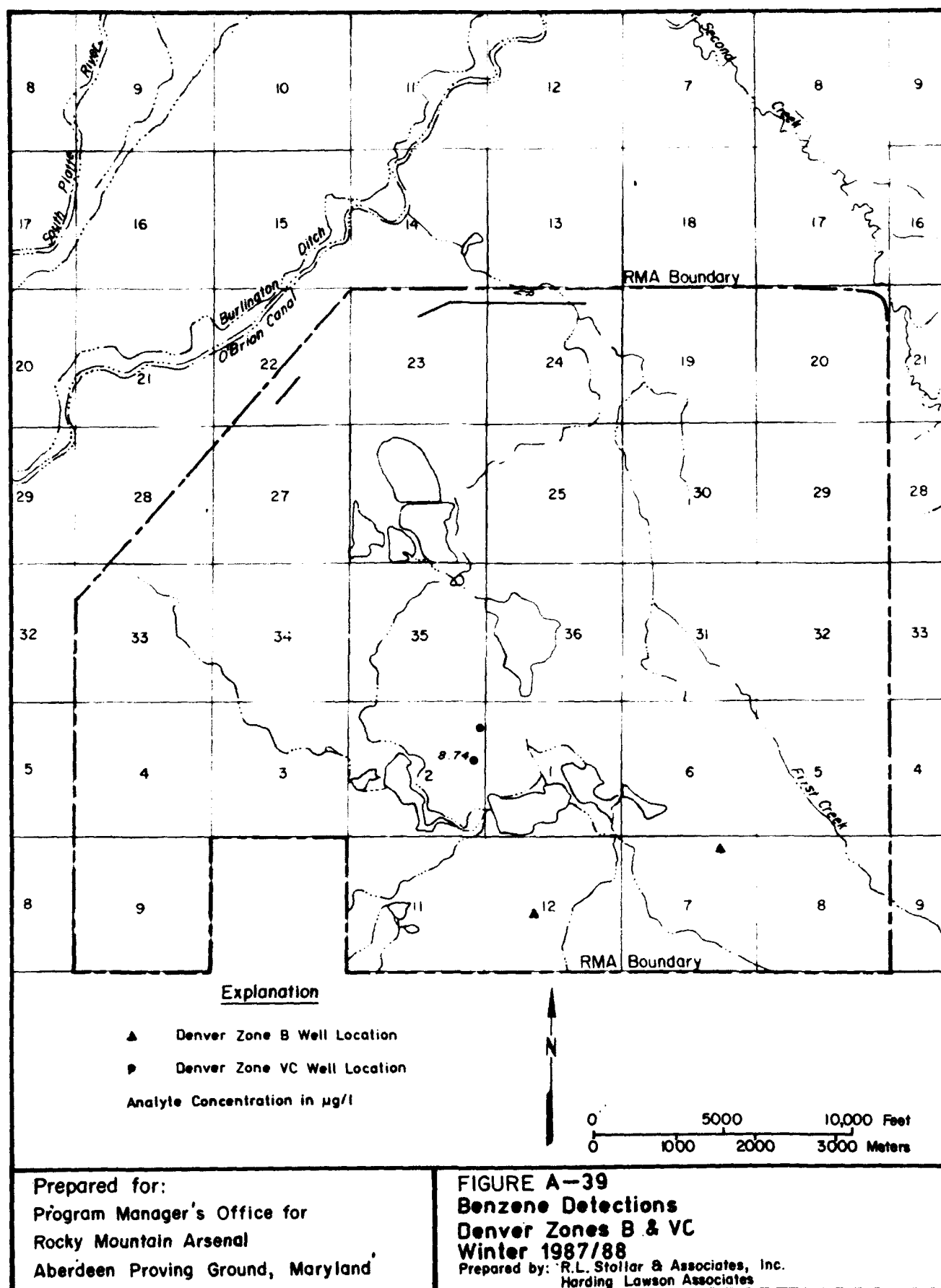


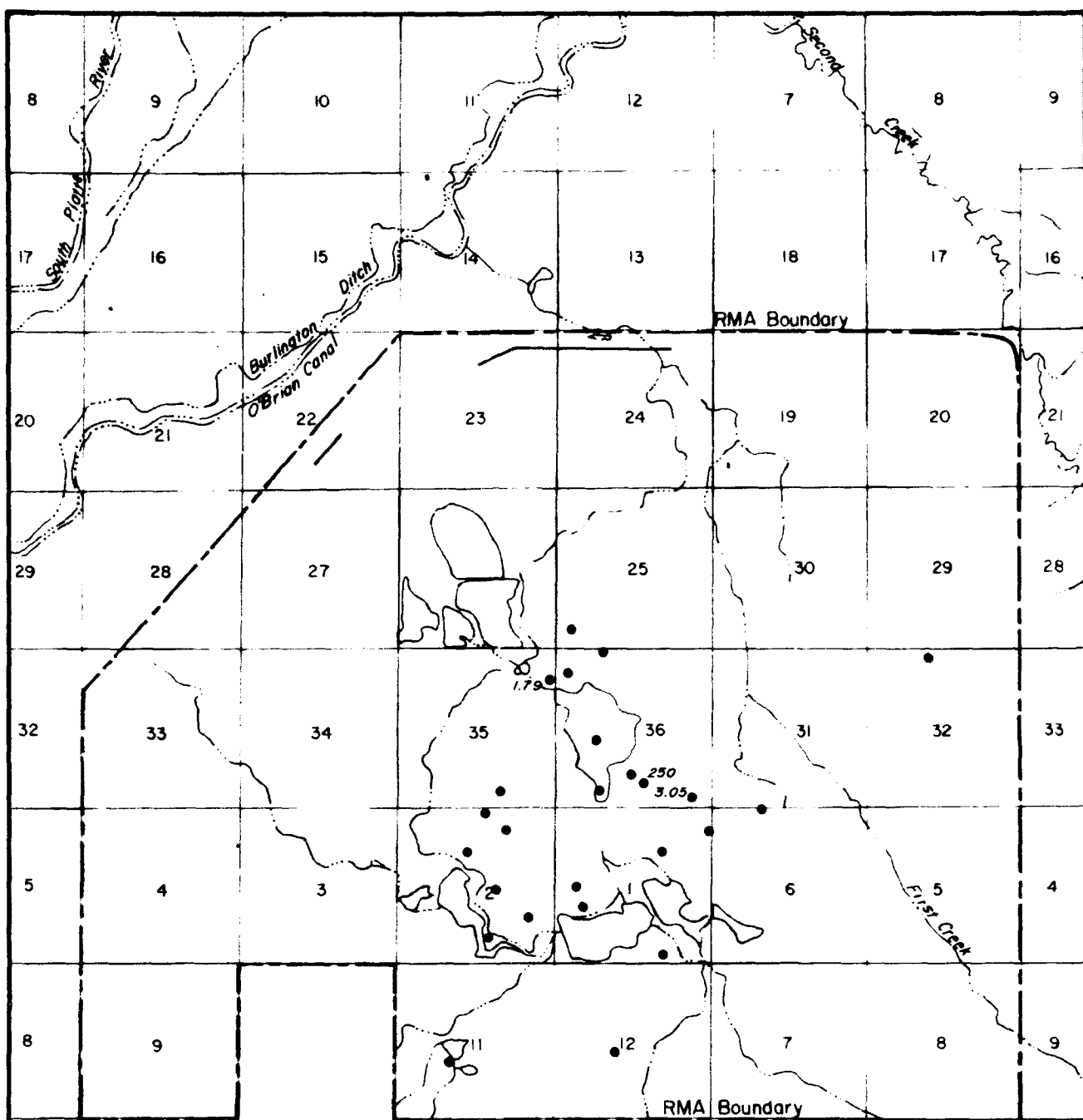
0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-38
Summed Volatile Aromatic Compound Detections
Denver Zones 5 & 6
Spring 1988

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Explanation

• Denver Zone A Well Location

Analyte Concentration in µg/l

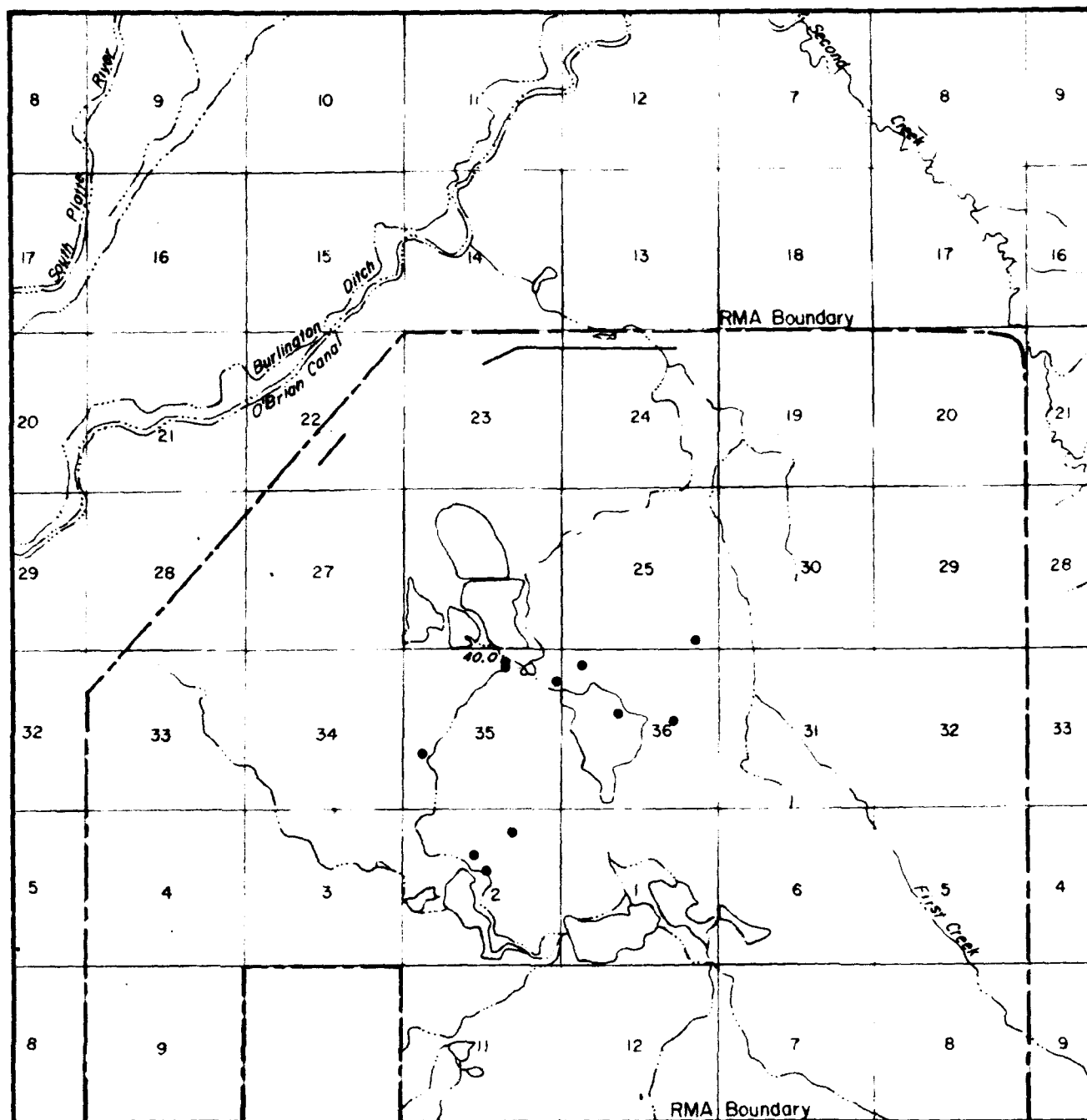


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-40
Benzene Detections
Denver Zone A
Winter 1987/88

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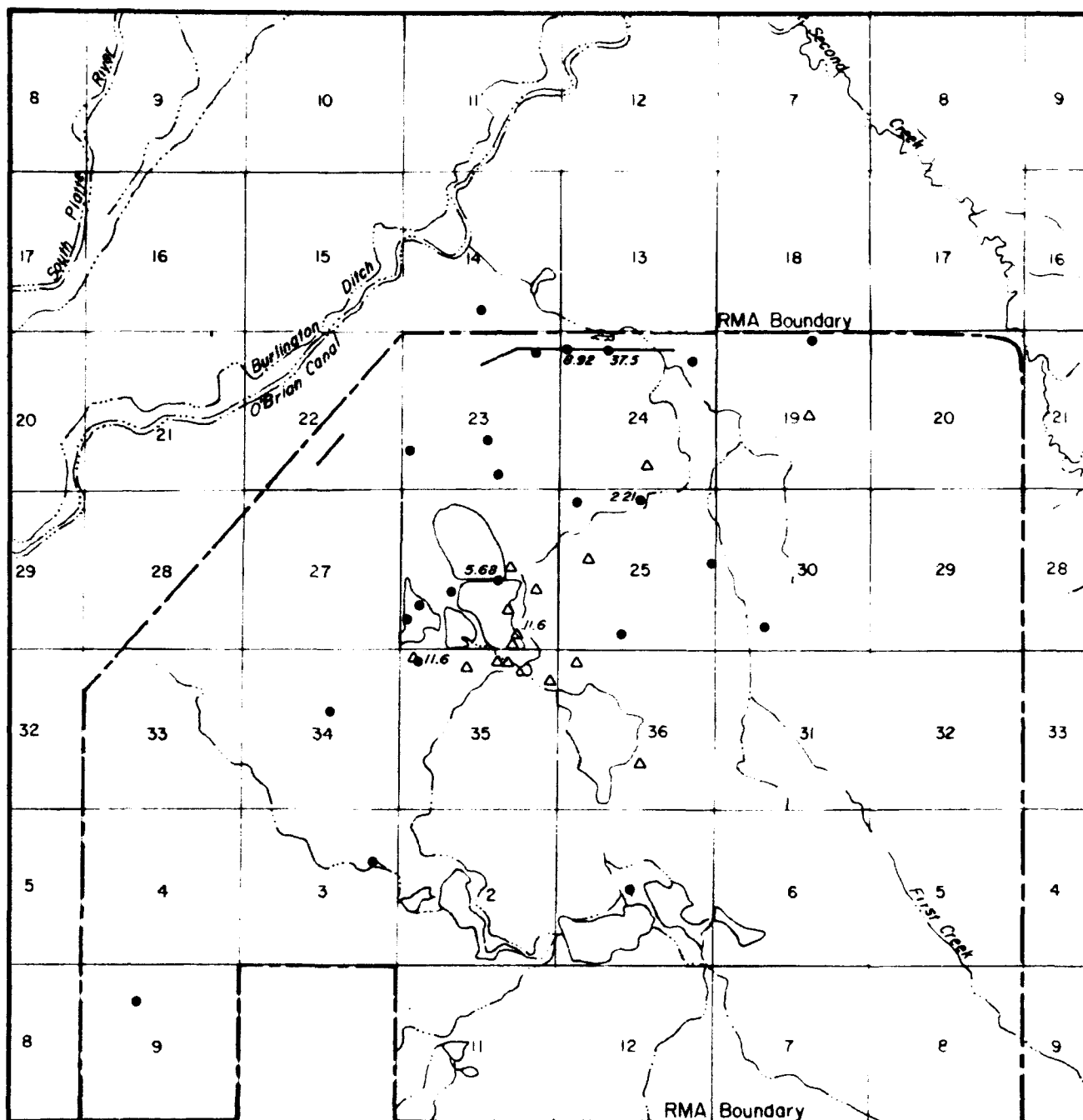
Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$

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FIGURE A-41
Benzene Detections
Denver Zone 1U
Winter 1987/88

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Explanation

- △ Denver Zone 1 Well Location
- Denver Zone 2 Well Location
- Analyte Concentration in $\mu\text{g/l}$

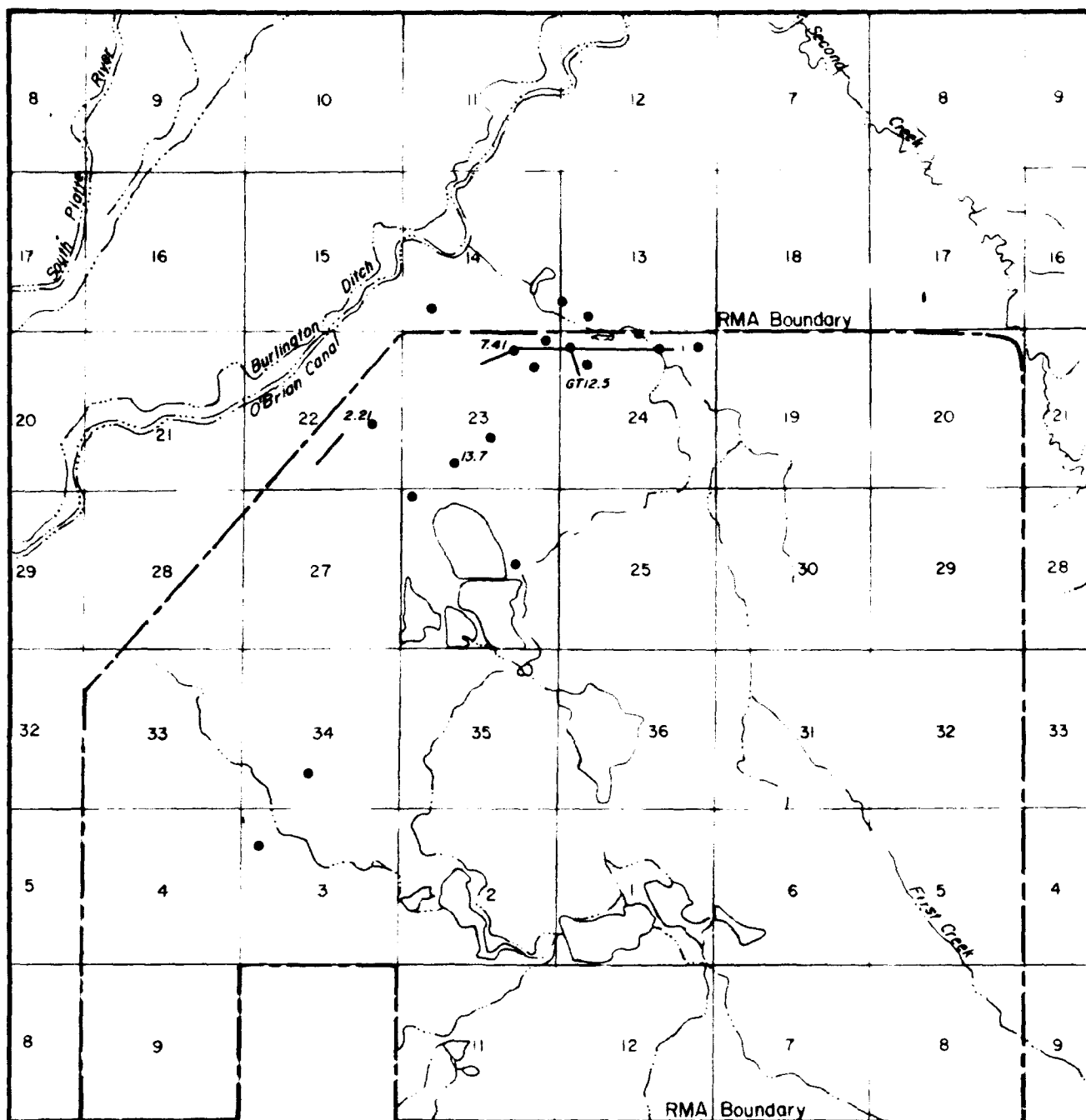


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-42
Benzene Detections
Denver Zones 1 & 2
Winter 1987/88

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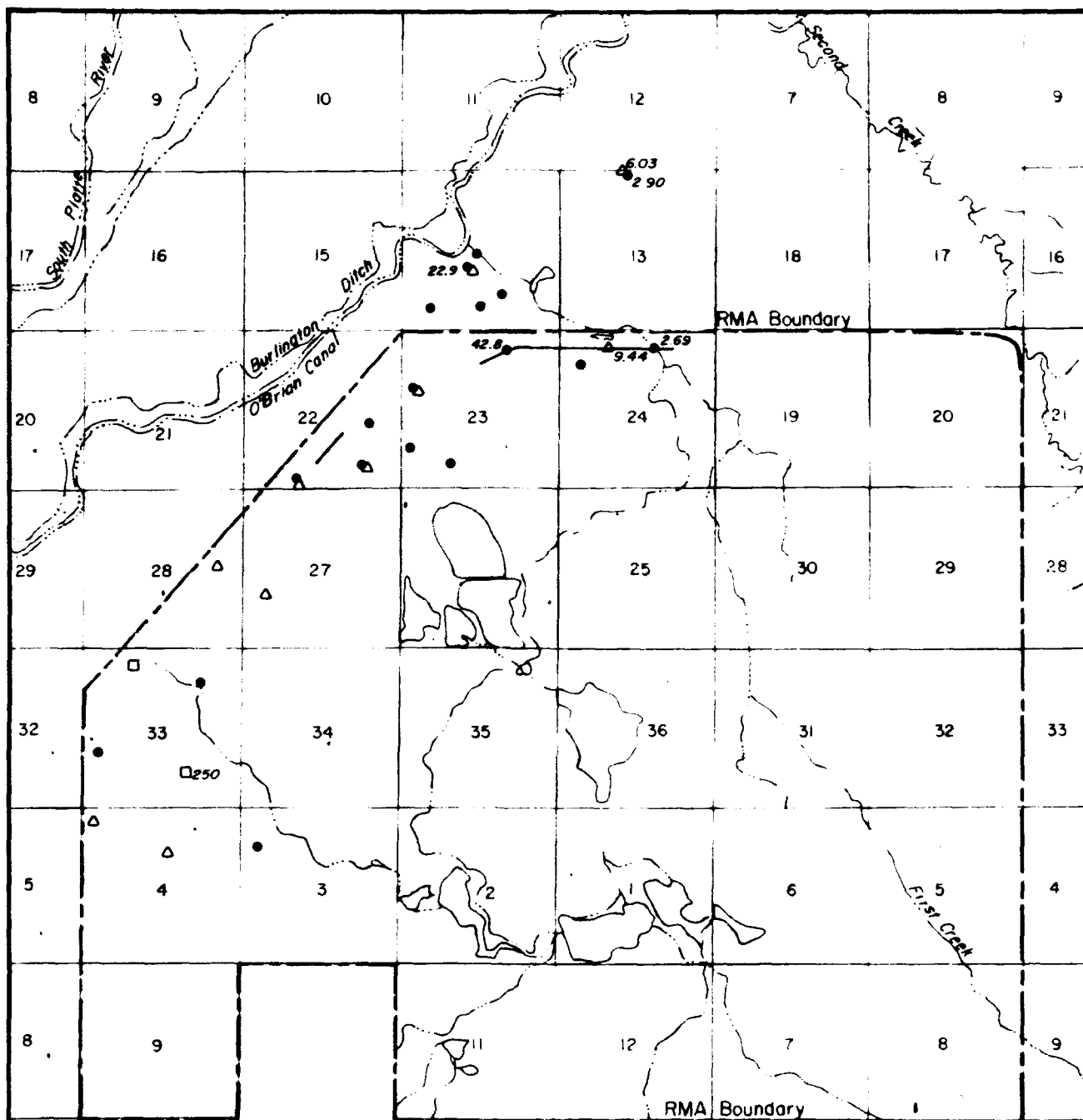
Explanation

- Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$

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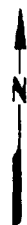
FIGURE A-43
Benzene Detections
Denver Zone 3
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates



Explanation

- Denver Zone 4 Well Location
- △ Denver Zone 5 Well Location
- Denver Zone 7 Well Location
- Analyte Concentration in $\mu\text{g/l}$

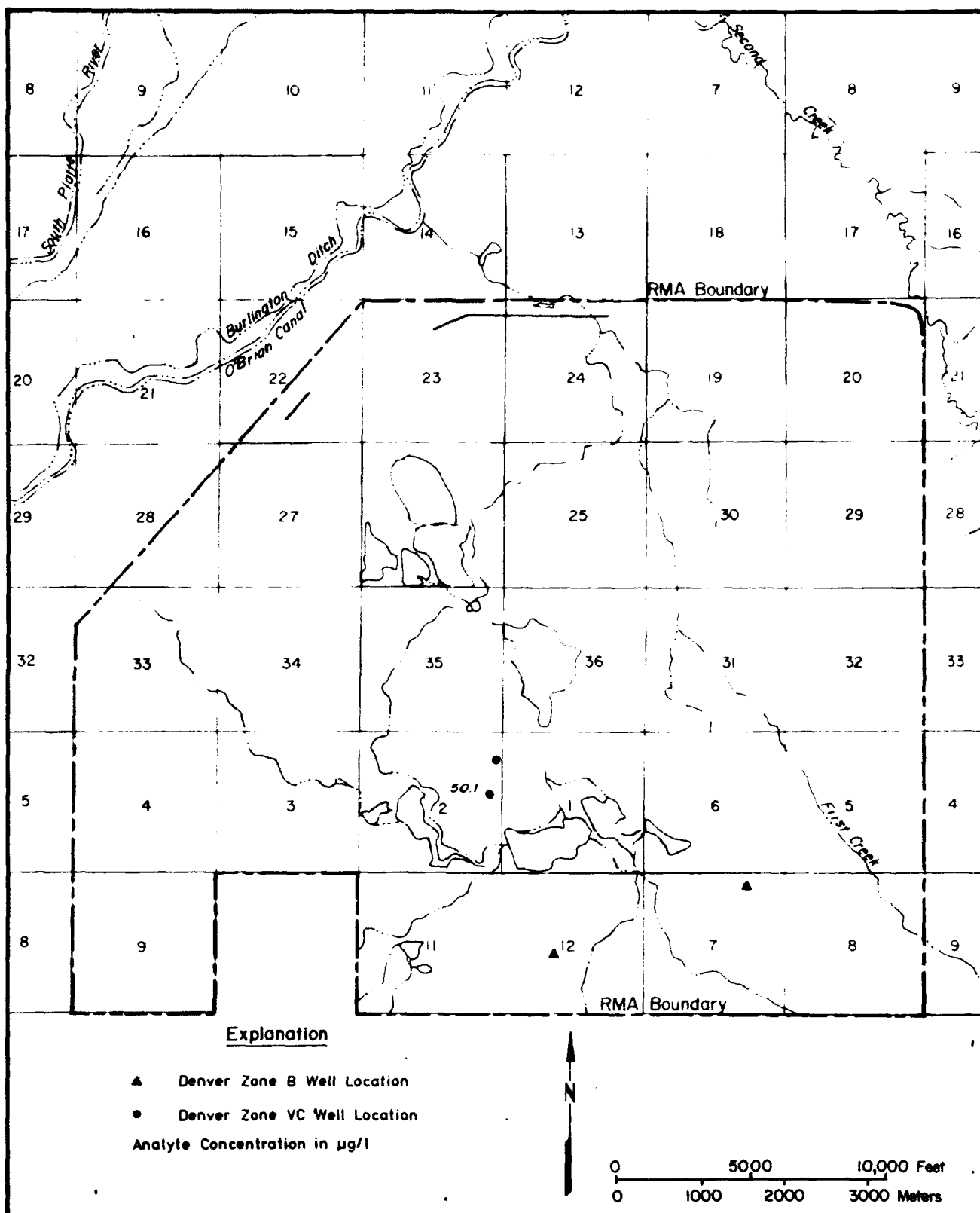


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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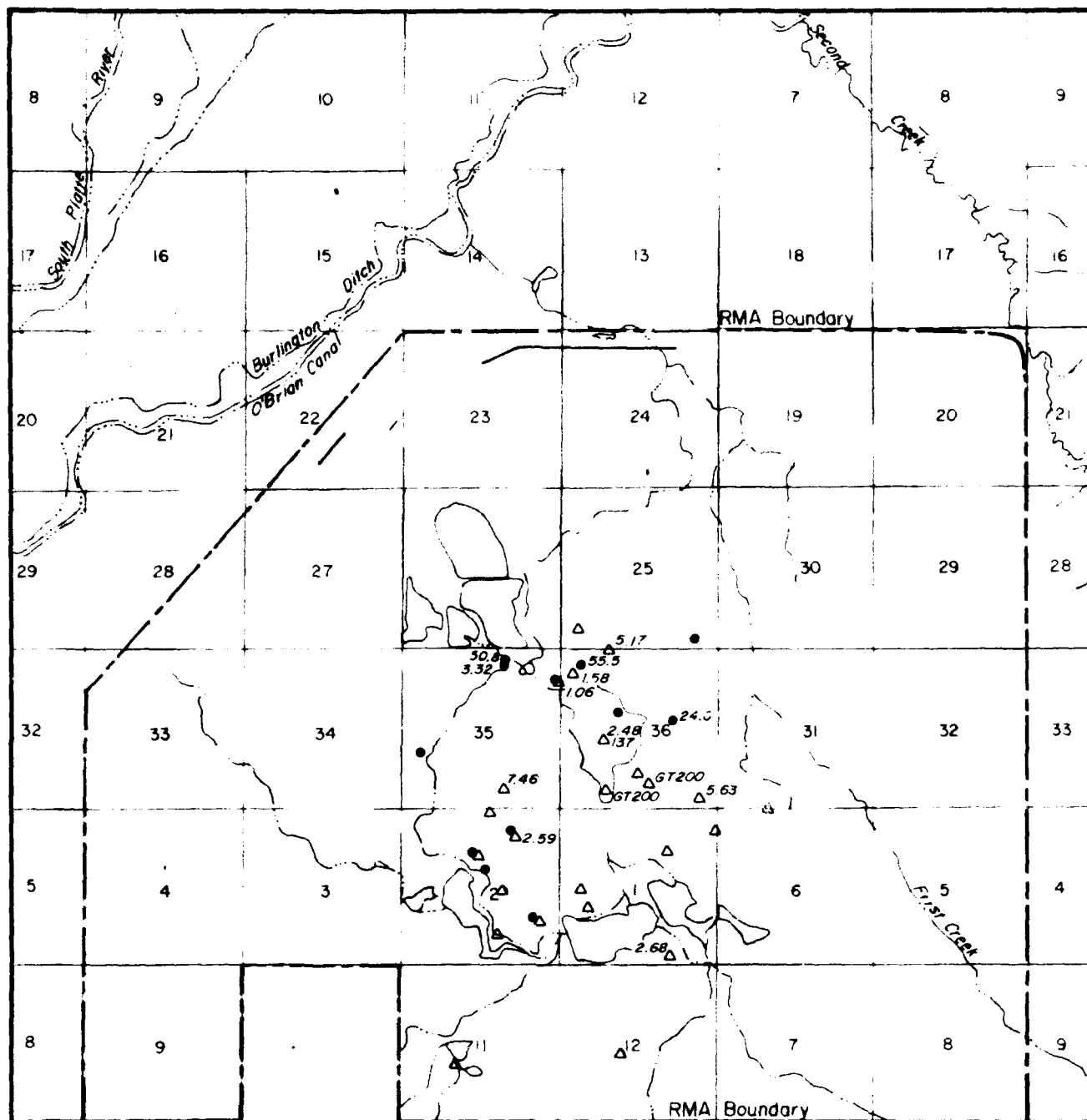
FIGURE A-44
Benzene Detections
Denver Zones 4, 5, & 7
Winter 1987/88

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FIGURE A-45
Chlorobenzene Detections
Denver Zones B & VC
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

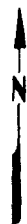


Explanation

△ Denver Zone A Well Location

● Denver Zone 1U Well Location

Analyte Concentration in µg/l

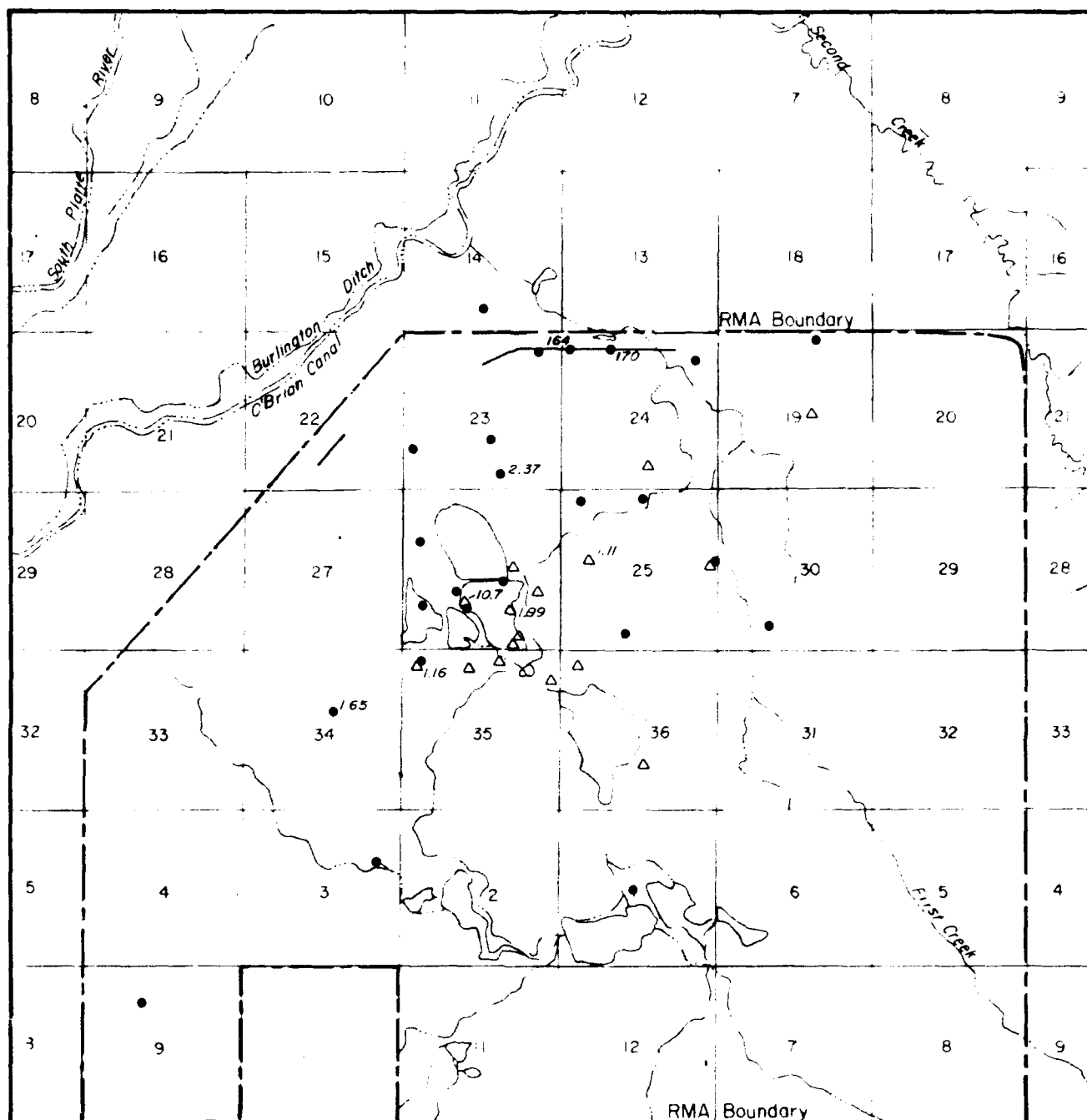


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-46
Chlorobenzene Detections
Denver Zones A & 1U
Winter 1987/88

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Harding Lawson Associates



Explanation

△ Denver Zone 1 Well Location

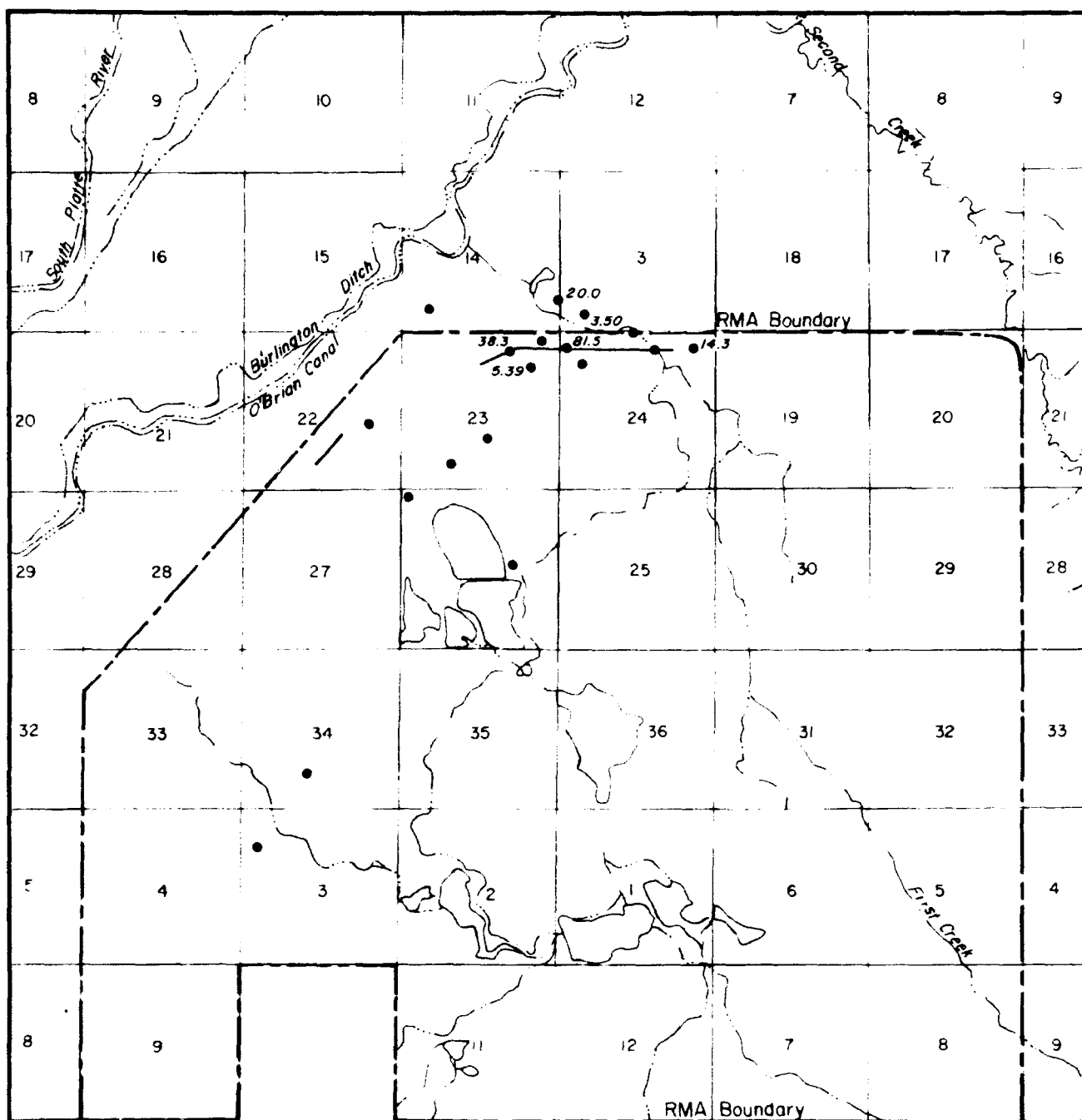
● Denver Zone 2 Well Location

Analyte Concentration in µg/l

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FIGURE A-47
Chlorobenzene Detections
Denver Zones 1 & 2
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 3 Well Location
- Analyte Concentration in µg/l

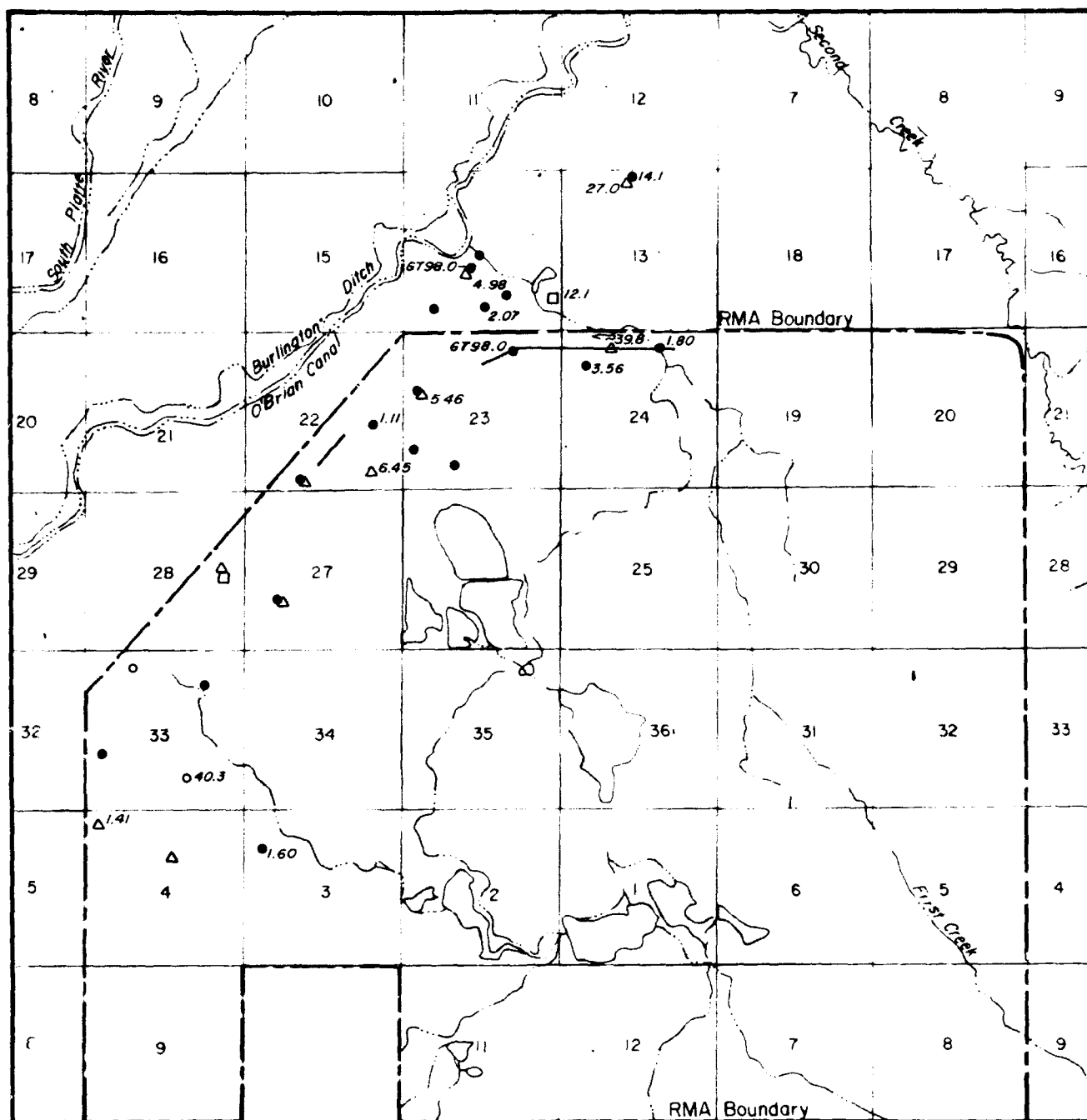


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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Aberdeen Proving Ground, Maryland

FIGURE A-48
Chlorobenzene Detections
Denver Zone 3
Winter 1987/88

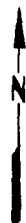
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 4 Well Location
- △ Denver Zone 5 Well Location
- Denver Zone 6 Well Location
- Denver Zone 7 Well Location

Analyte Concentration in ug/l

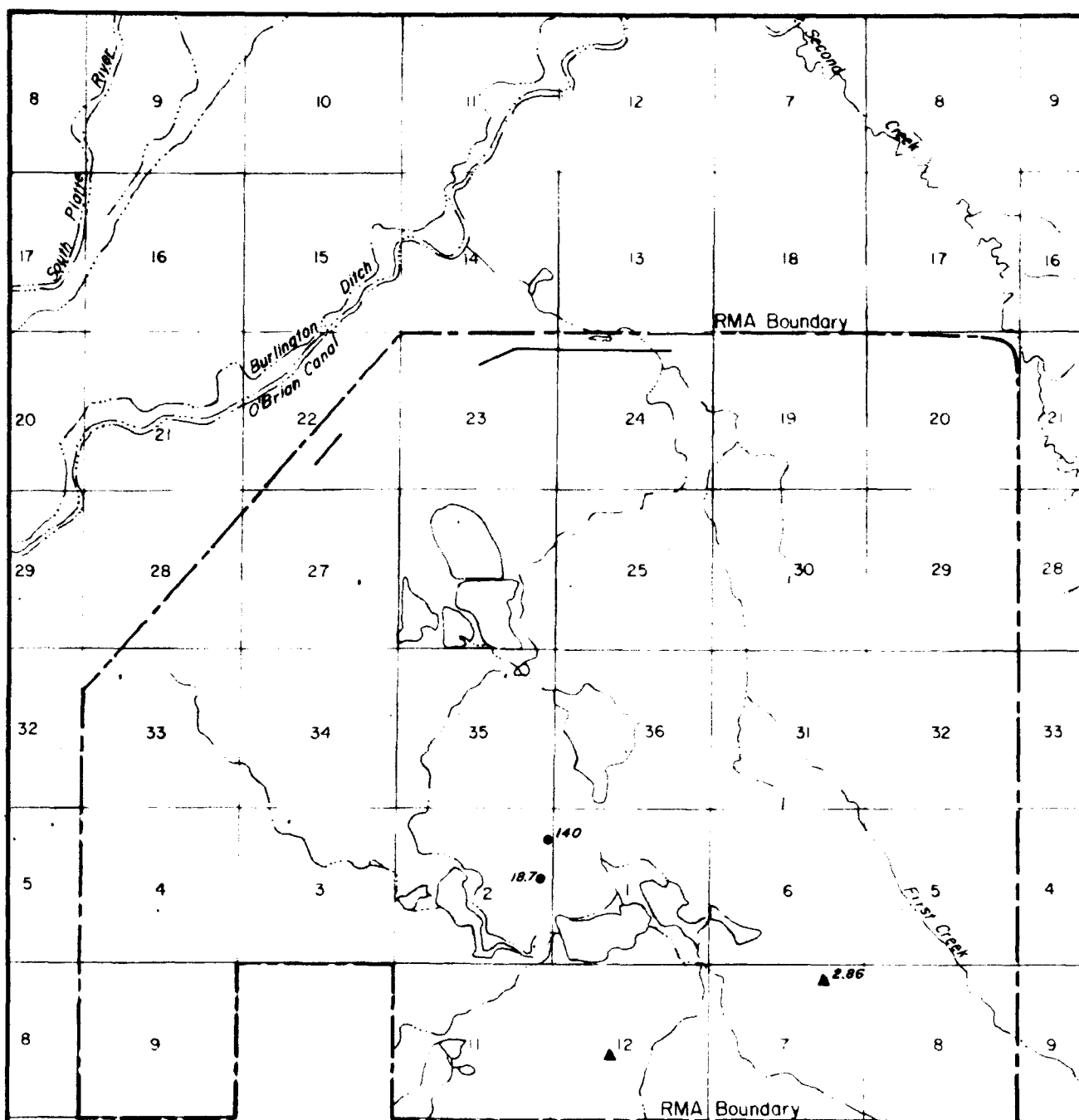


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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Aberdeen Proving Ground, Maryland

FIGURE A-49
Chlorobenzene Detections
Denver Zones 4, 5, 6, & 7
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

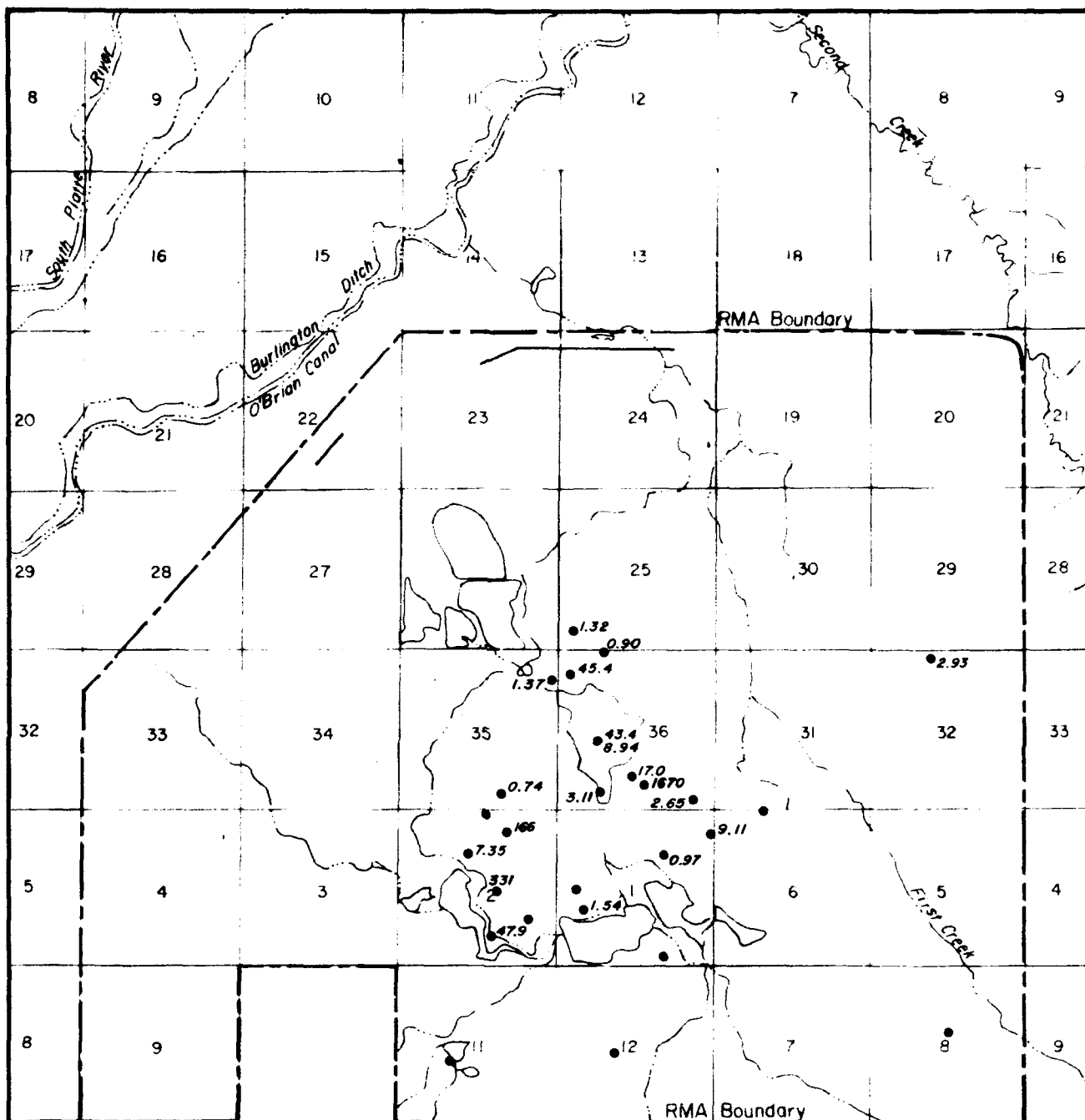
- ▲ Denver Zone B Well Location
 - Denver Zone VC Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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FIGURE A-50
Summed Organohalogen Compound Detections
Denver Zones B & VC
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

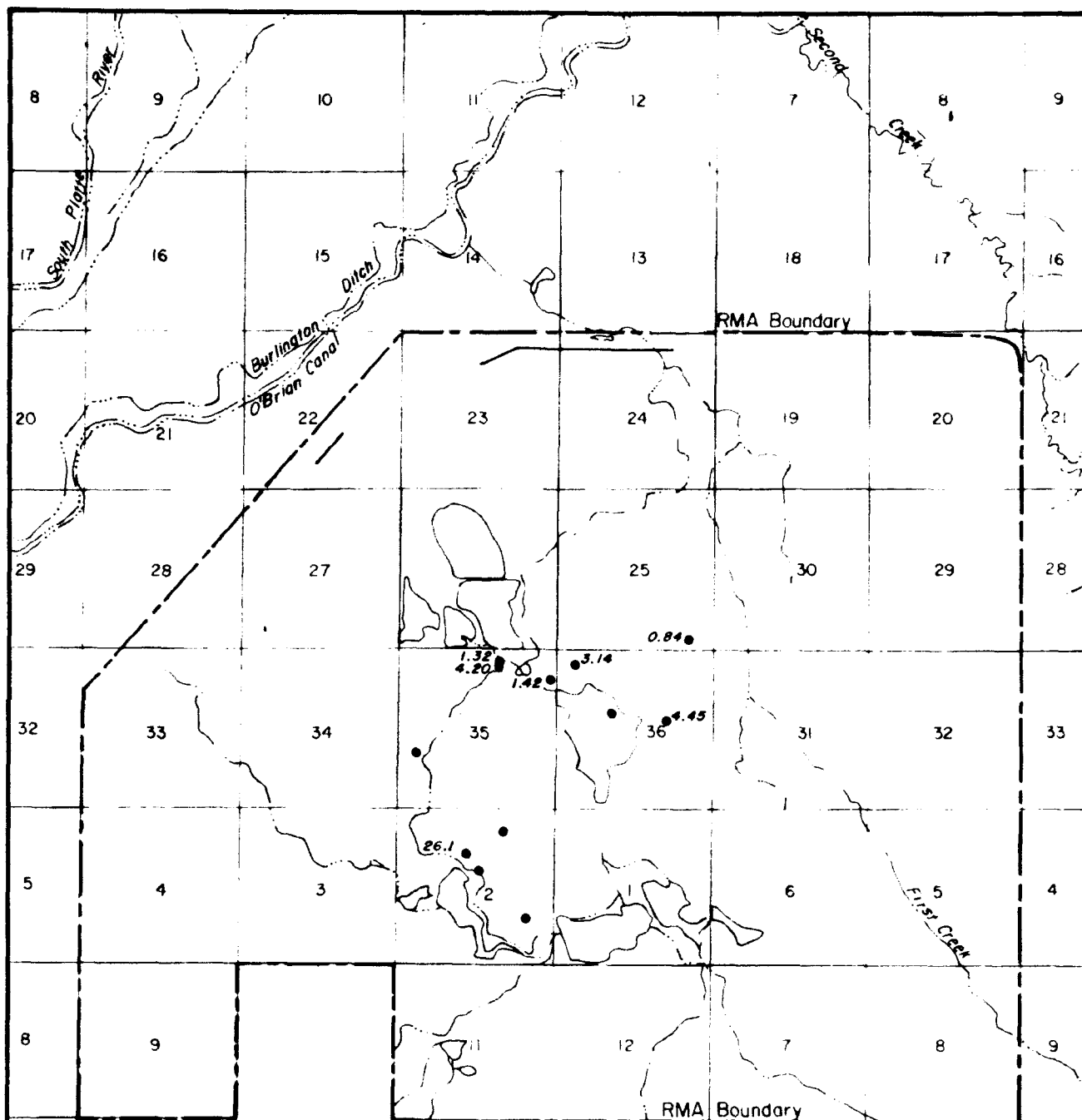
- Denver Zone A Well Location
- Analyte Concentration in µg/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

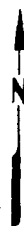
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FIGURE A-51
Summed Organohalogen Compound Detections
Denver Zone A
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

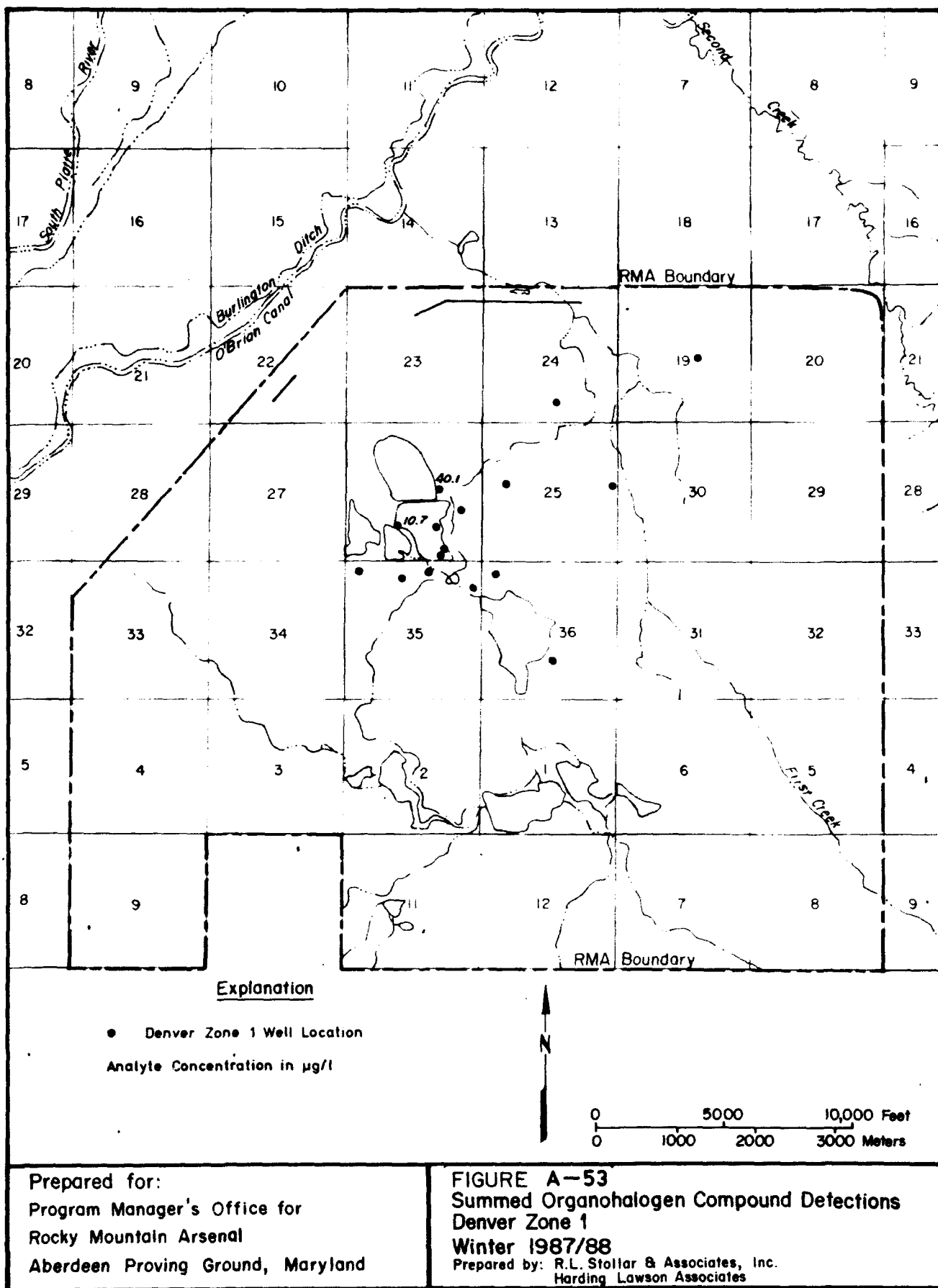
- Denver Zone 1U Well Location
- Analyte Concentration in µg/l

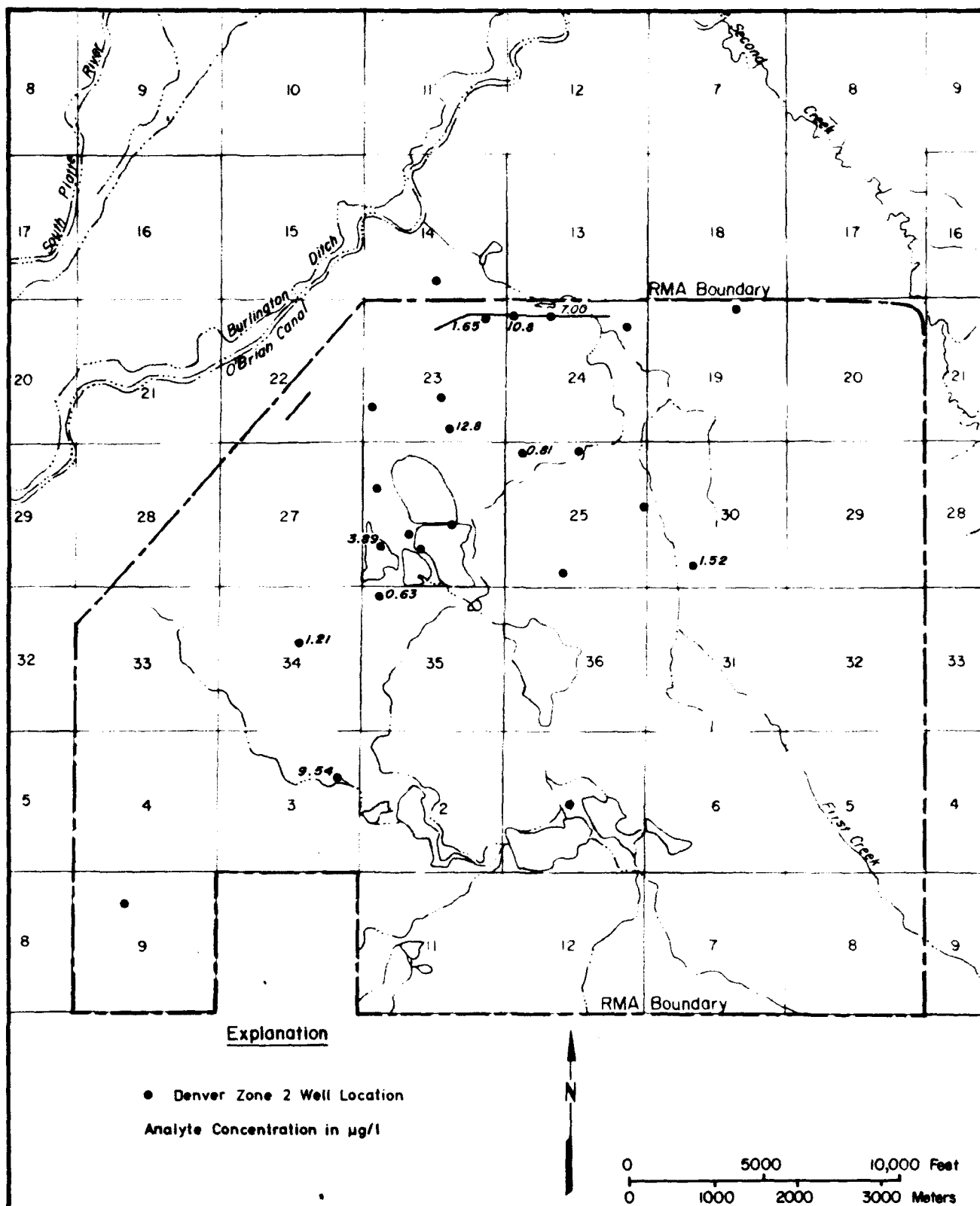


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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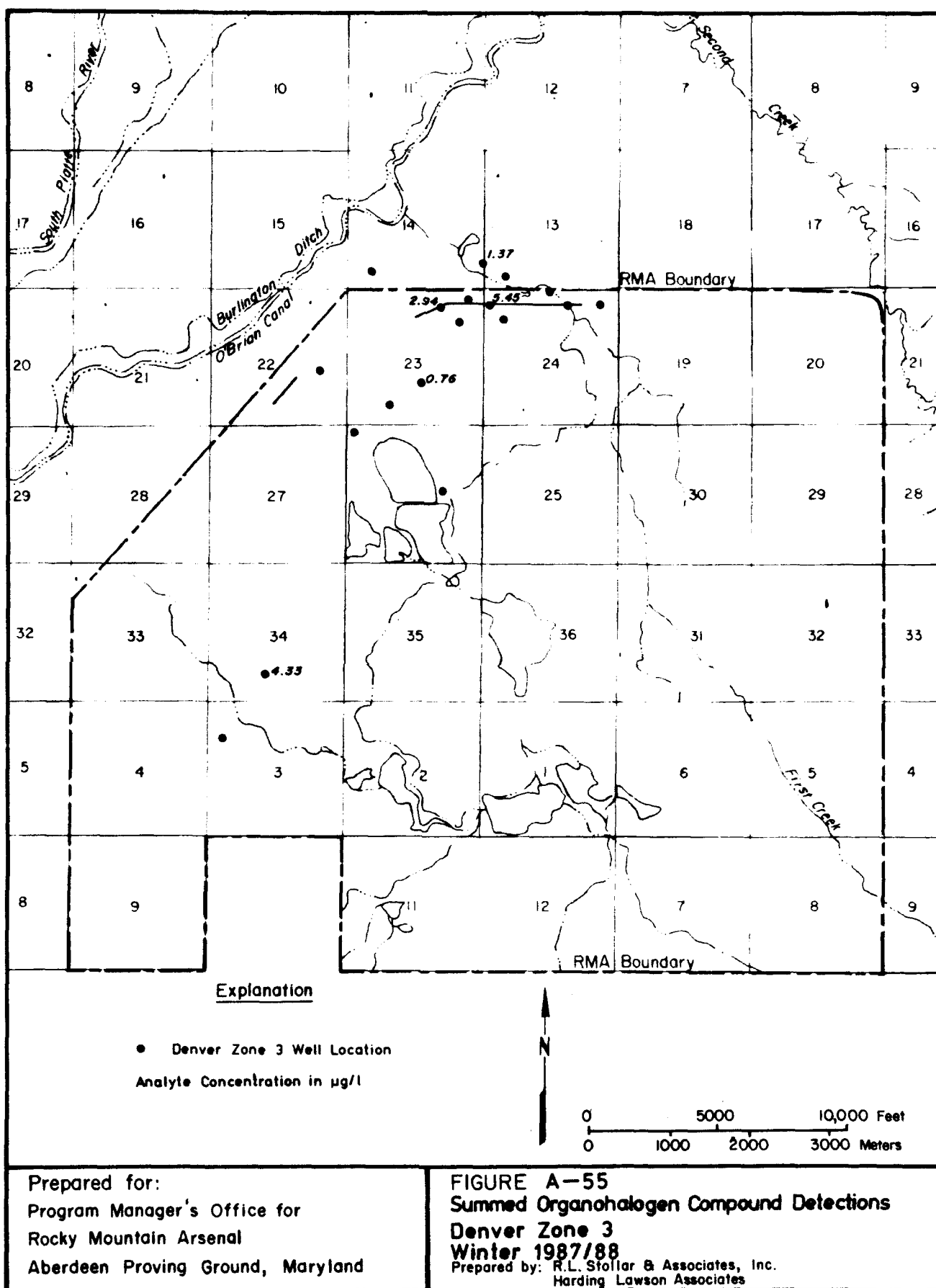
FIGURE A-52
Summed Organohalogen Compound Detections
Denver Zone 1U
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

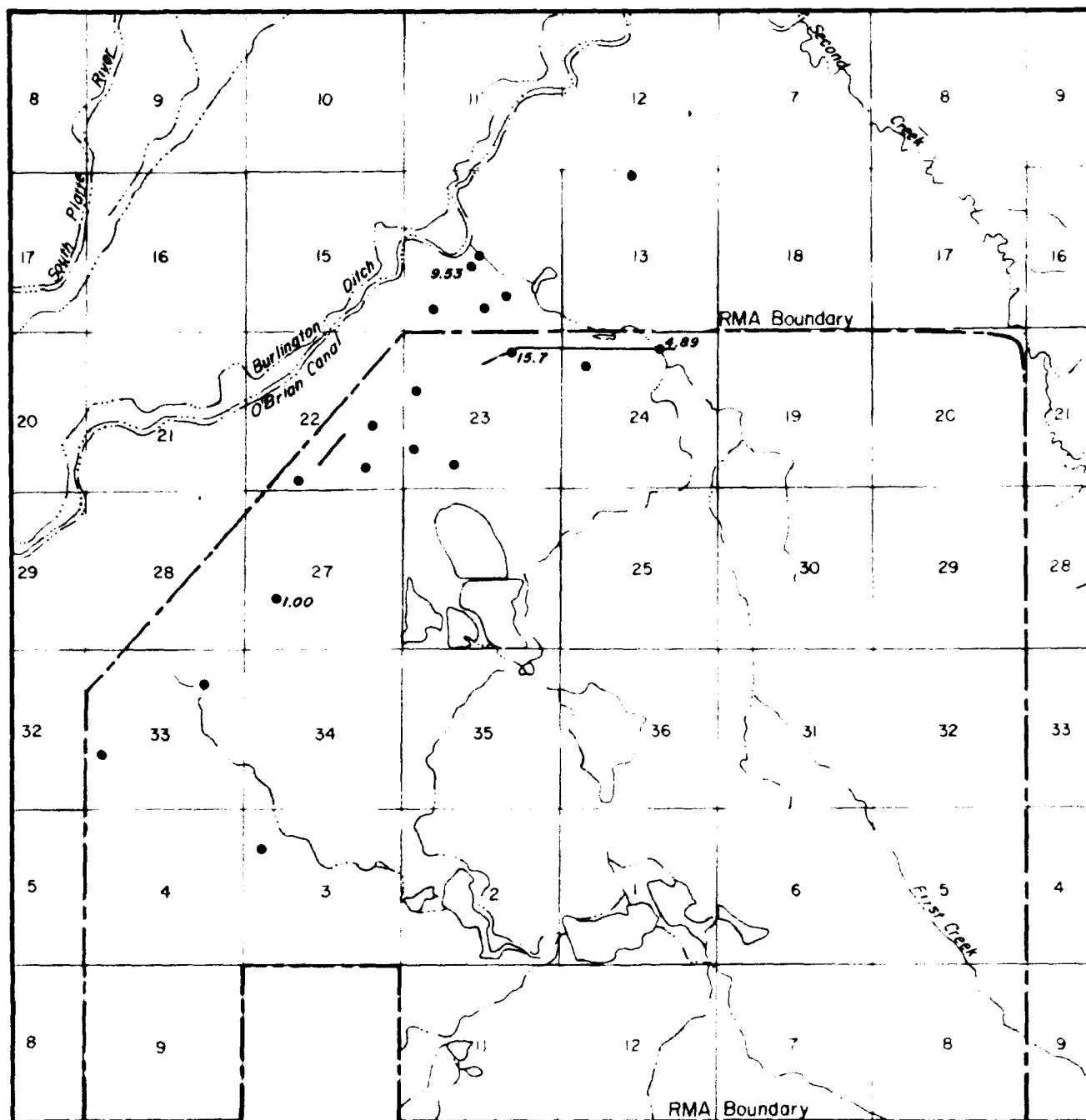




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FIGURE A-54
Summed Organohalogen Compound Detections
Denver Zone 2
Winter 1987/88
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Explanation

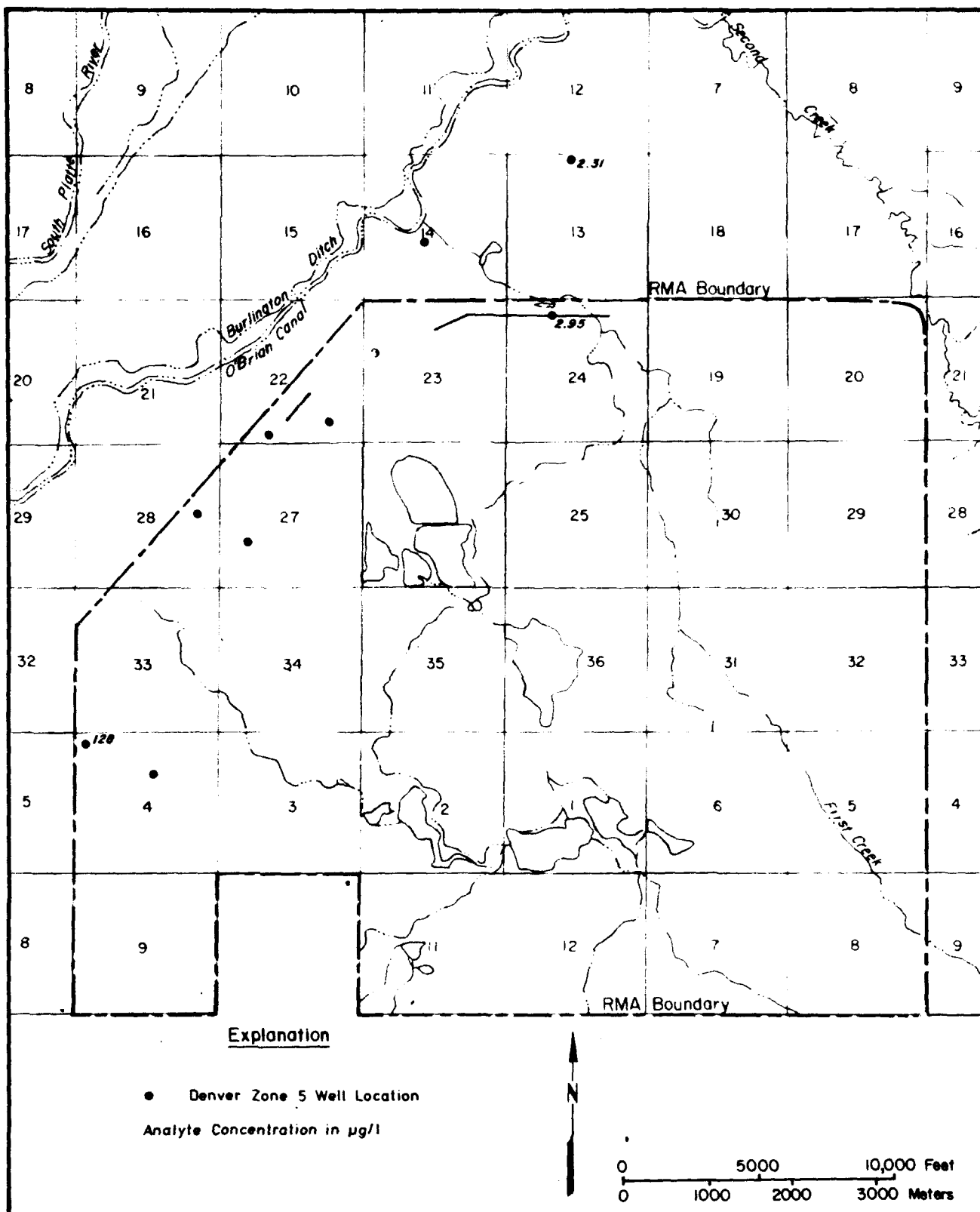
- Denver Zone 4 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

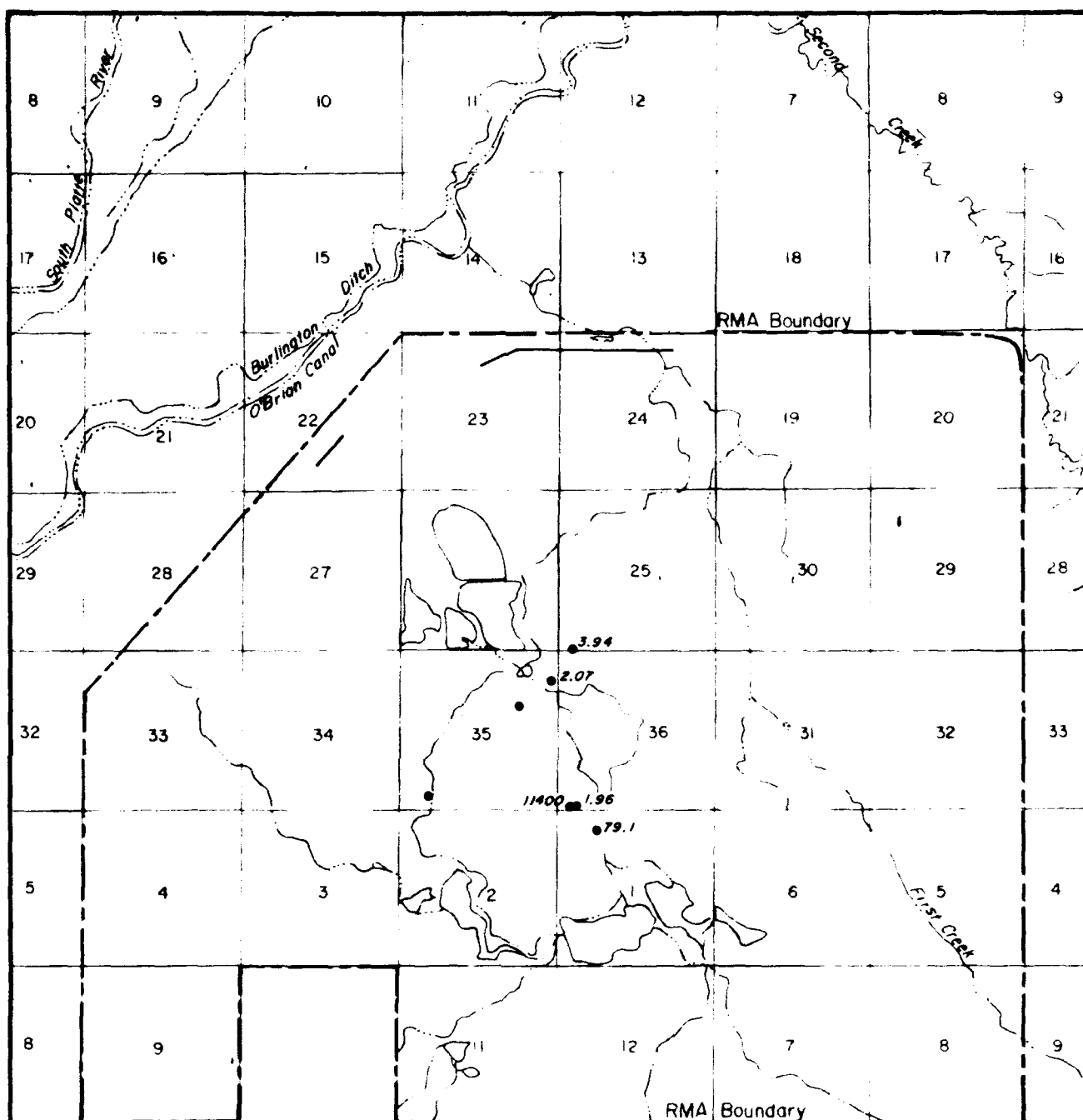
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Aberdeen Proving Ground, Maryland

FIGURE A-56
Summed Organohalogen Compound Detections
Denver Zone 4
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
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FIGURE A-57
Summed Organohalogen Compound Detections
Denver Zone 5
Winter 1987/88
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 Harding Lawson Associates



Explanation

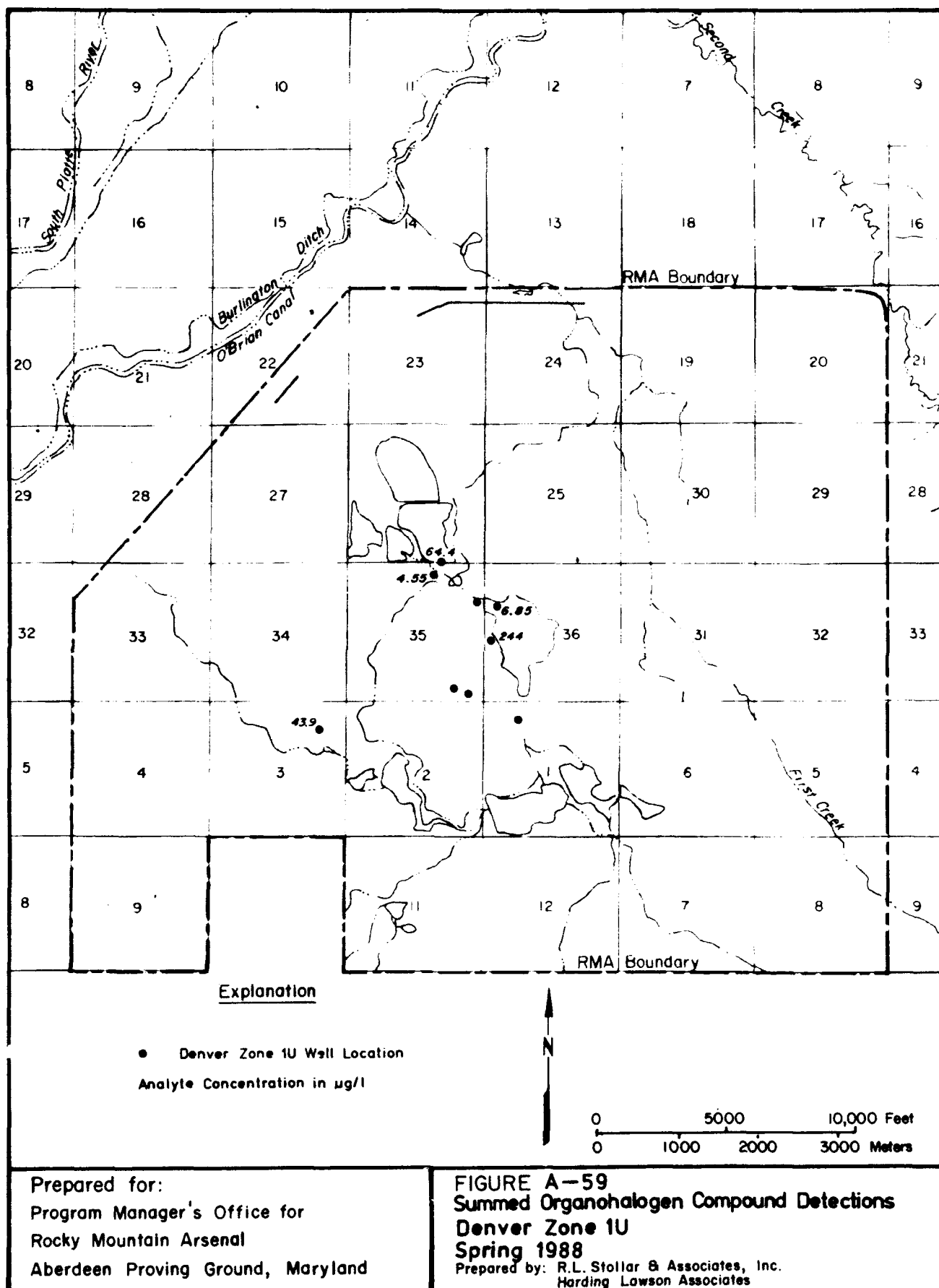
- Denver Zone A Well Location
- Analyte Concentration in µg/l

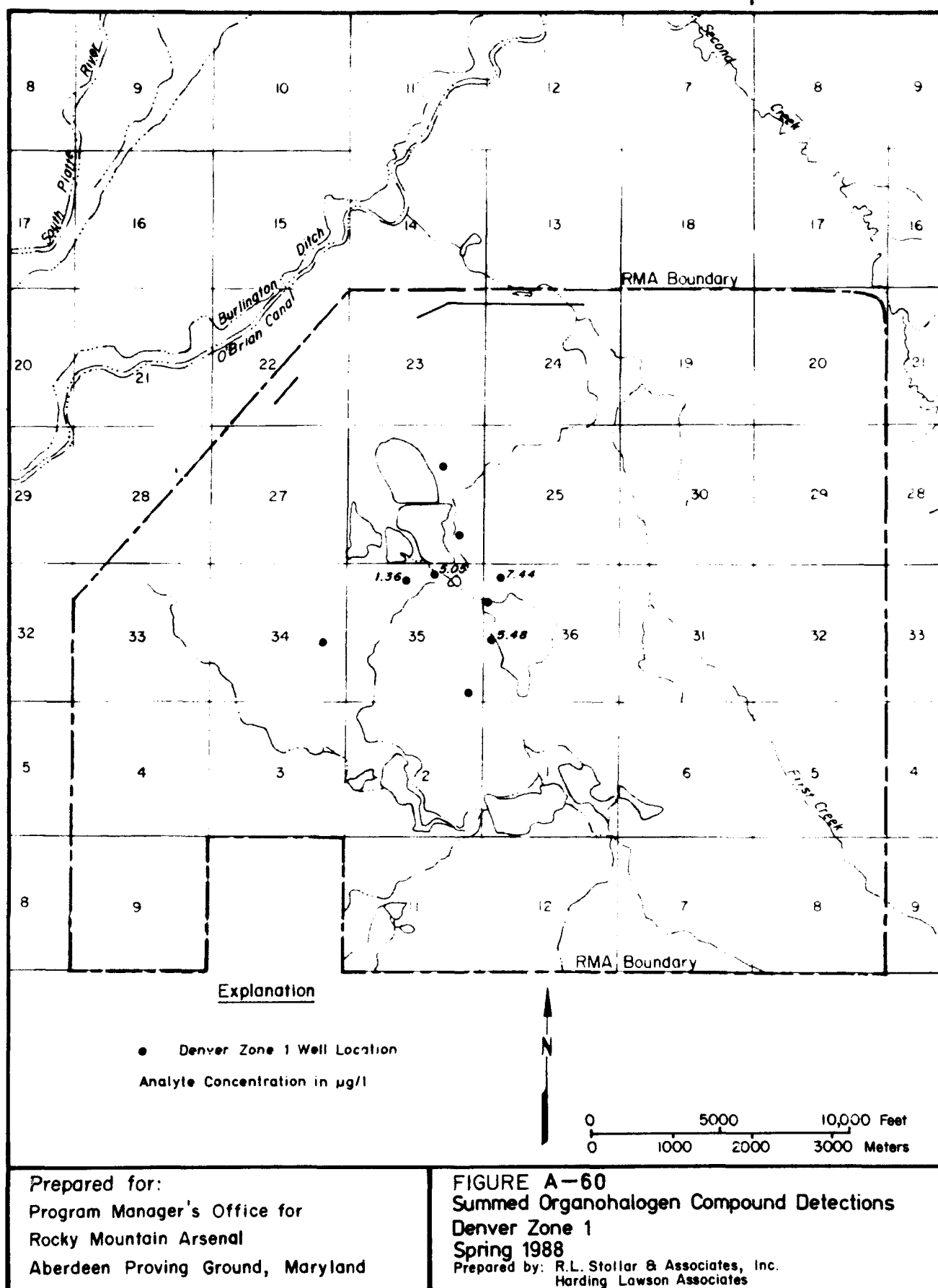


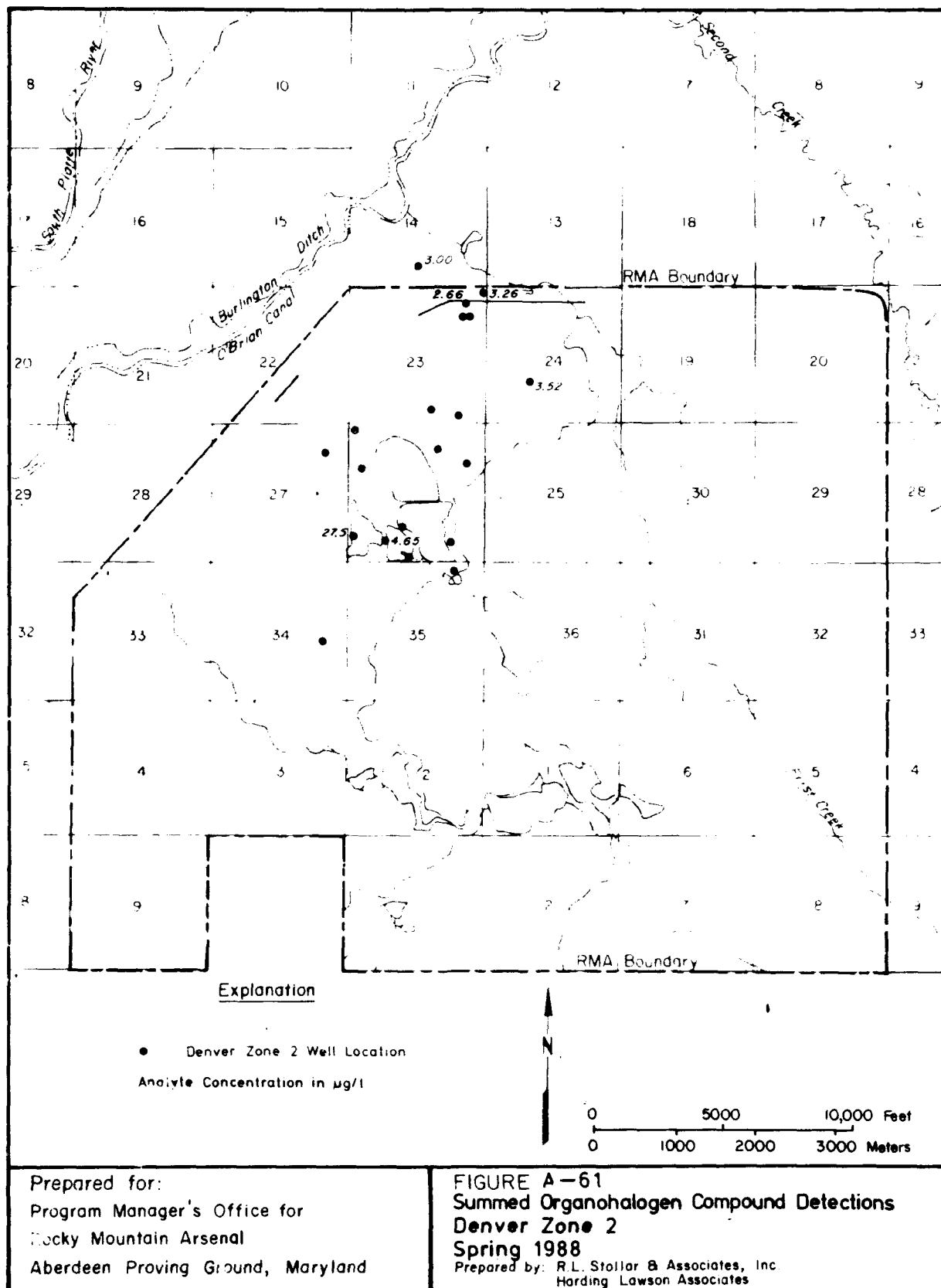
0 5000 10,000 Feet
0 1000 2000 3000 Meters

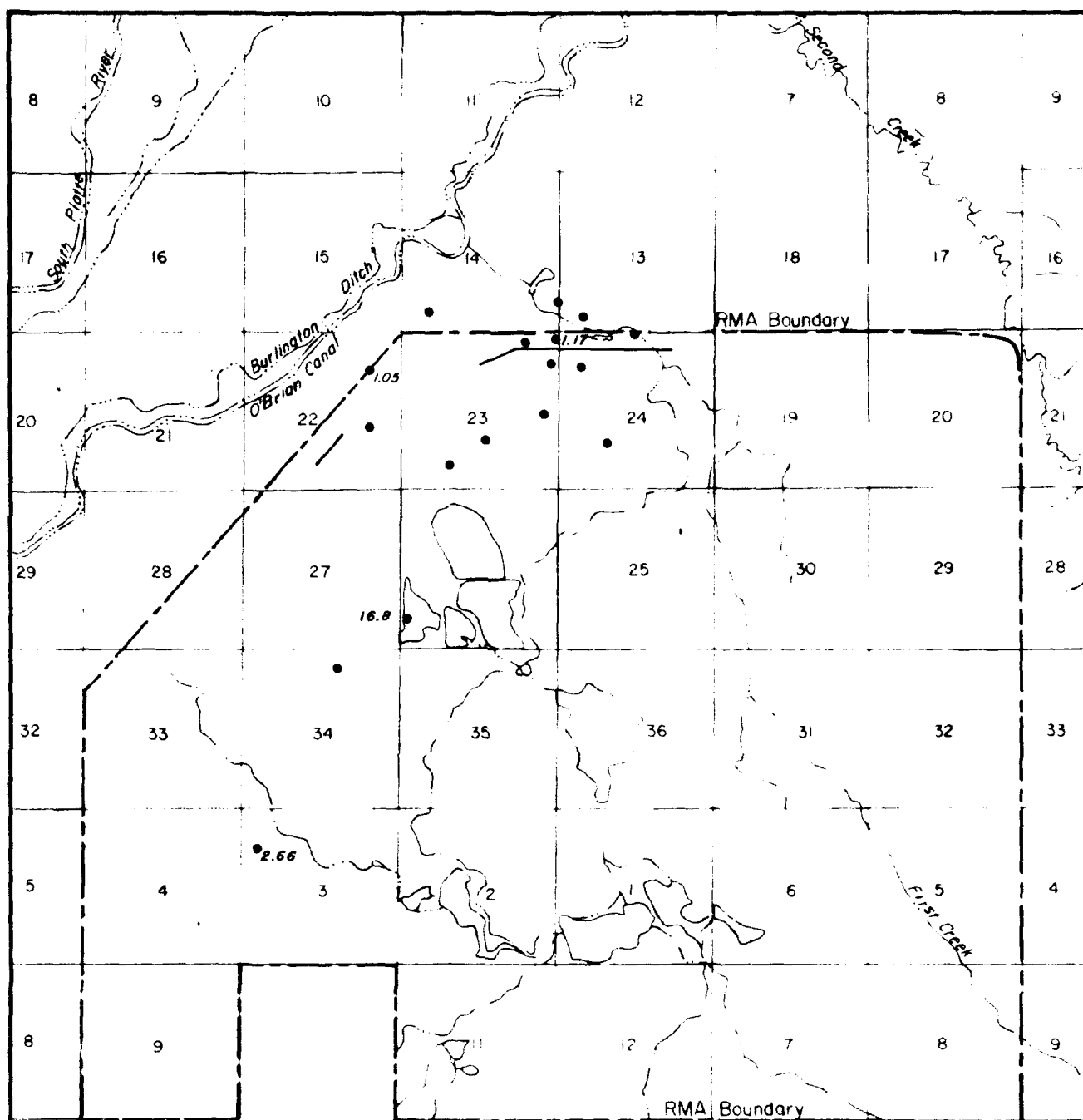
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FIGURE A-58
Summed Organohalogen Compound Detections
Denver Zone A
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
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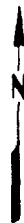






Explanation

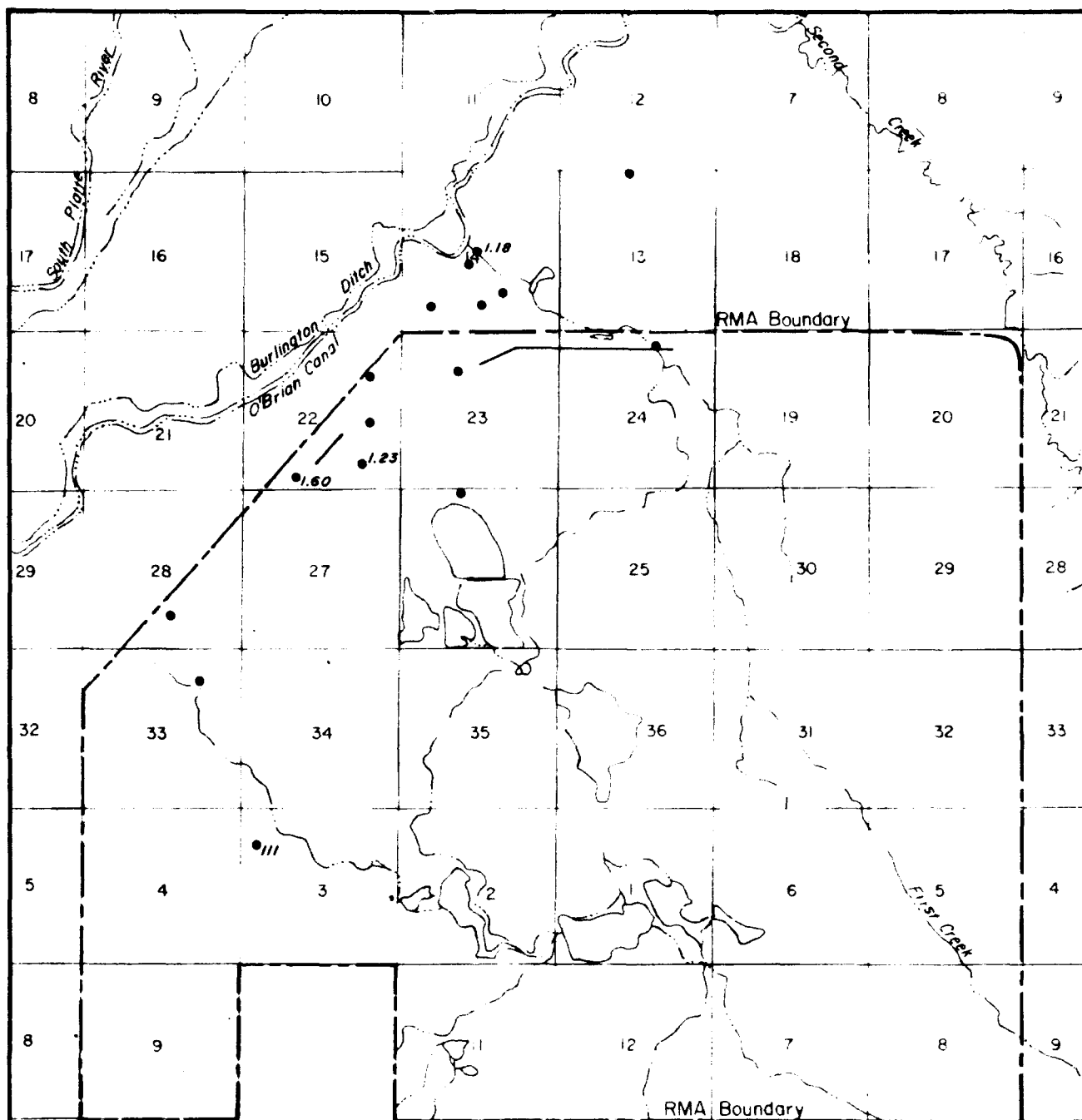
- Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-62
Summed Organohalogen Compound Detections
Denver Zone 3
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

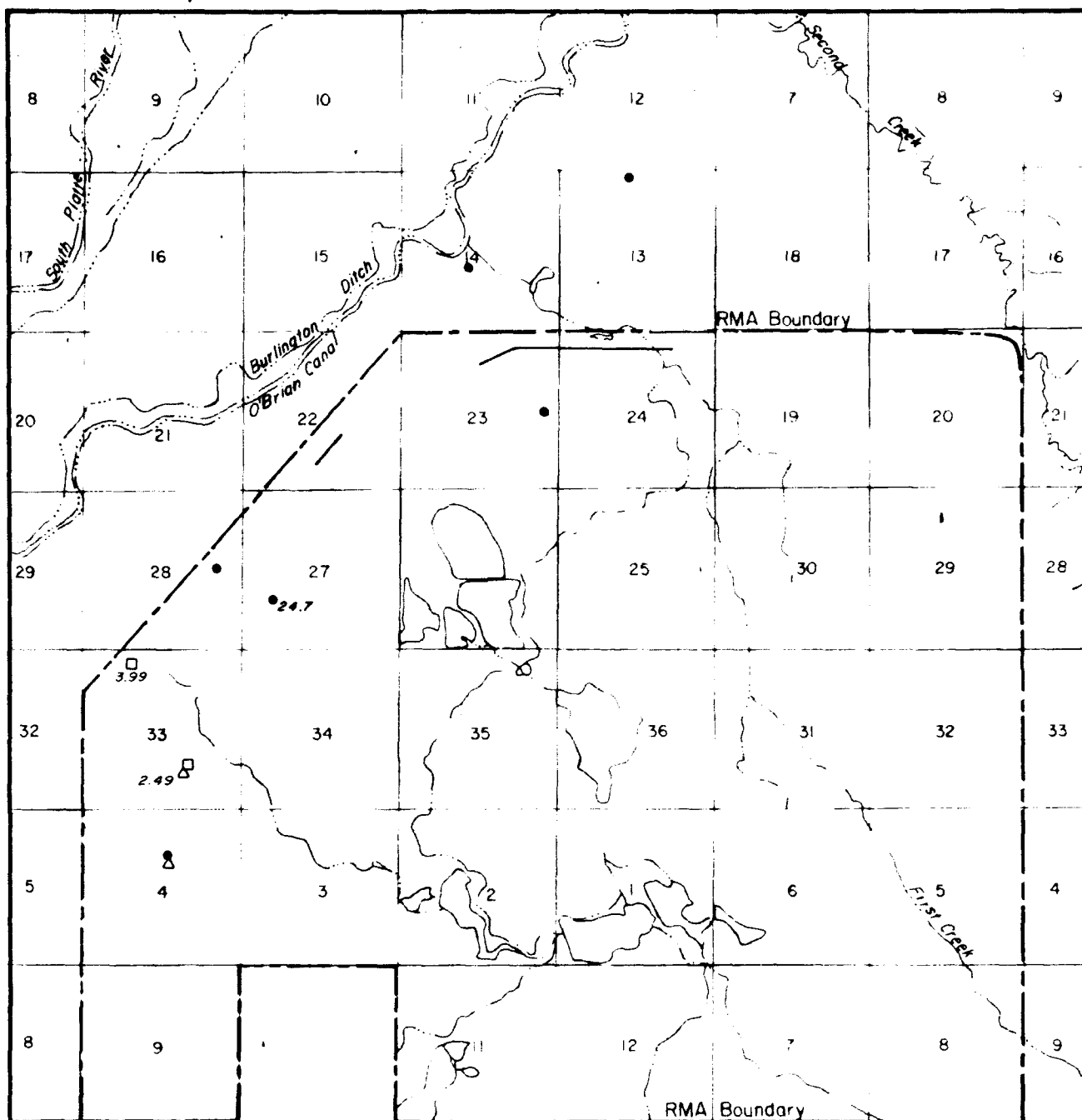
- Denver Zone 4 Well Location
- Analyte Concentration in µg/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-63
Summed Organohalogen Compound Detections
Denver Zone 4
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

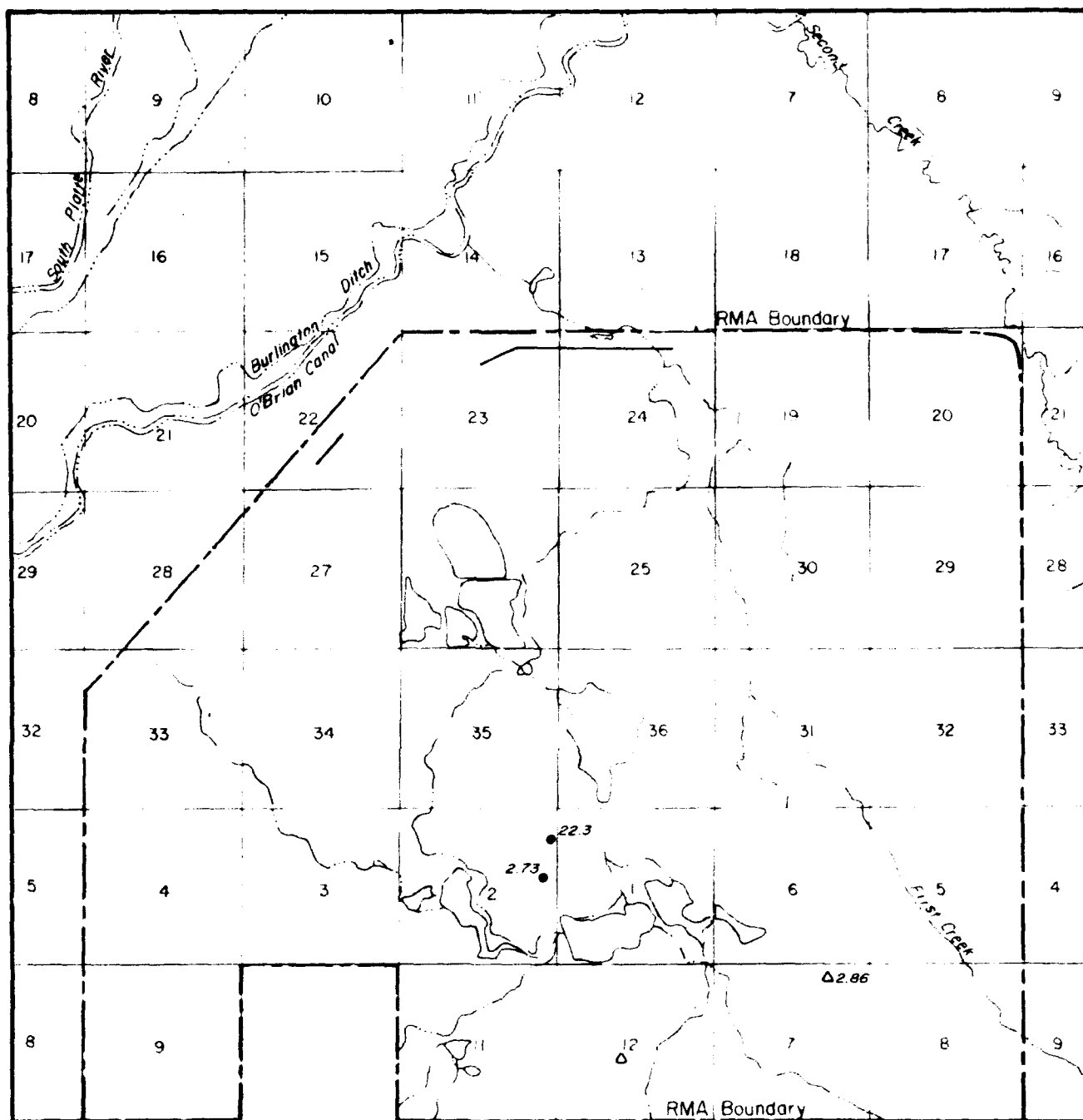
- Denver Zone 5 Well Location
 - △ Denver Zone 6 Well Location
 - Denver Zone 7 Well Location
- Analyte Concentration in µg/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-64
Summed Organohalogen Compound Detections
Denver Zones 5, 6, & 7
Spring 1988
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Explanation

△ Denver Zone B Well Location

● Denver Zone VC Well Location

Analyte Concentration in µg/l

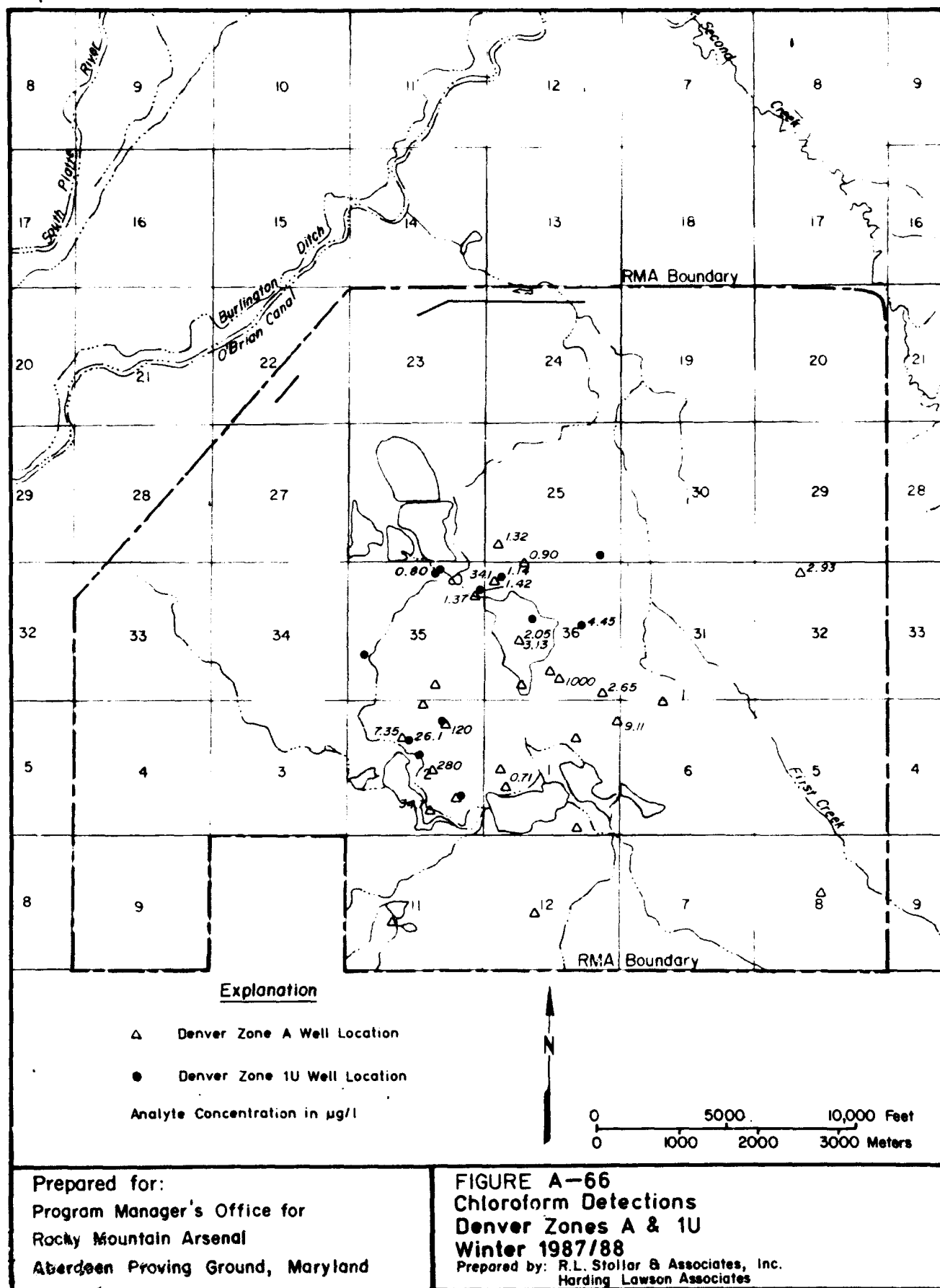


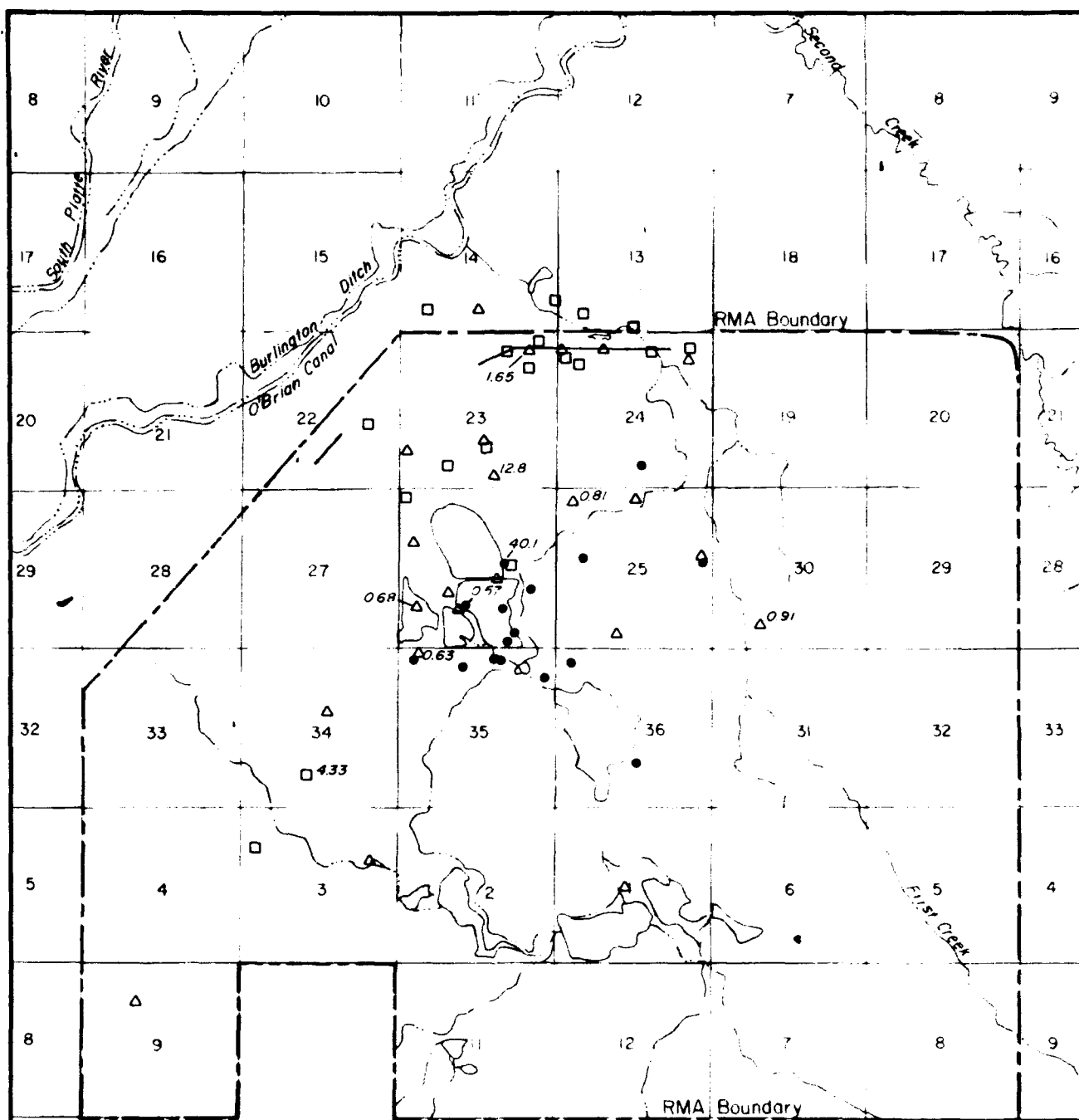
0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-65
Chloroform Detections
Denver Zones B & VC
Winter 1987/88

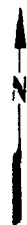
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

- Denver Zone 1 Well Location
 - △ Denver Zone 2 Well Location
 - Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$

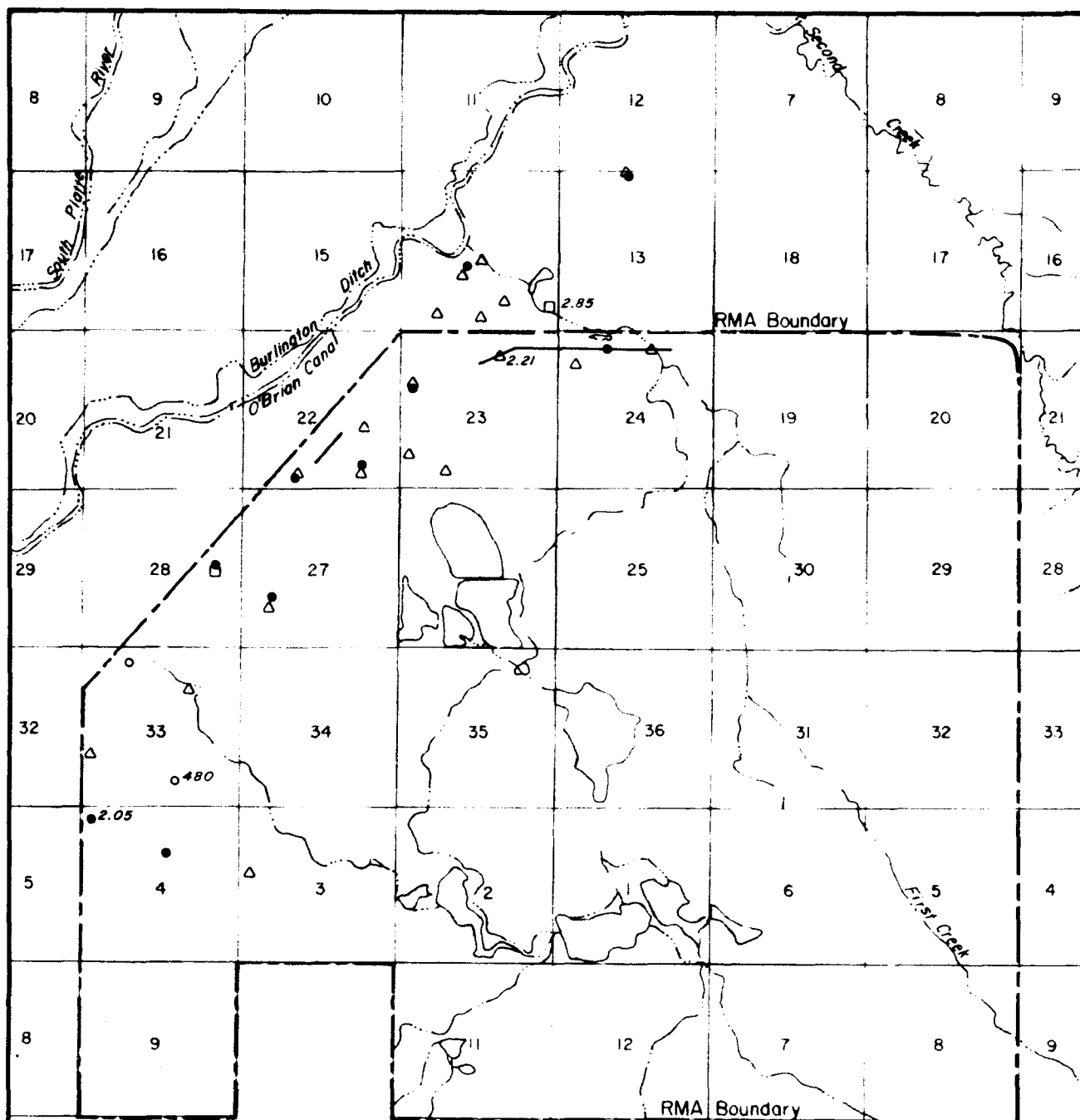


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-67
Chloroform Detections
Denver Zones 1, 2, & 3
Winter 1987/88

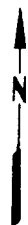
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

- △ Denver Zone 4 Well Location
- Denver Zone 5 Well Location
- Denver Zone 6 Well Location
- Denver Zone 7 Well Location

Analyte Concentration in µg/l

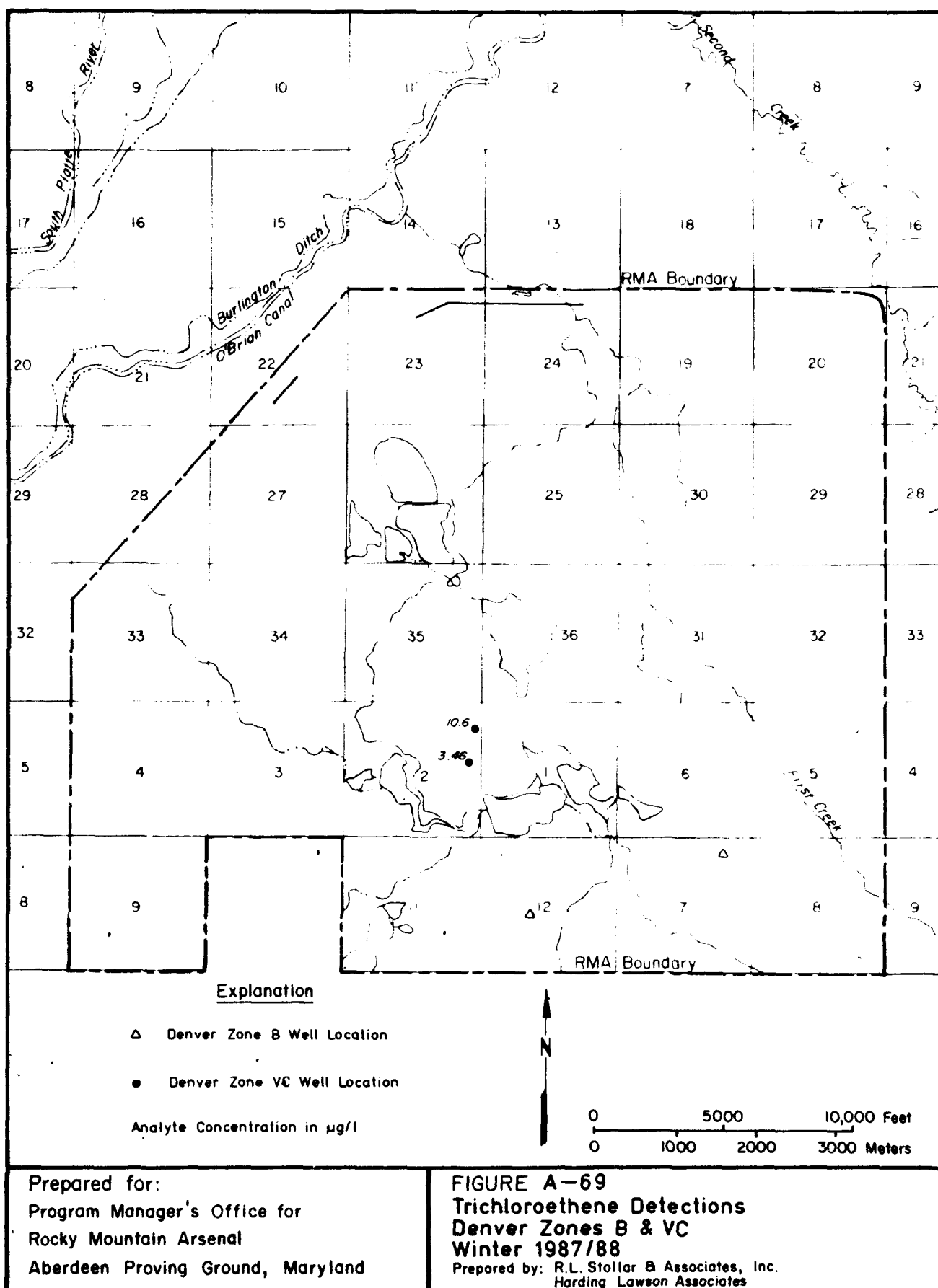


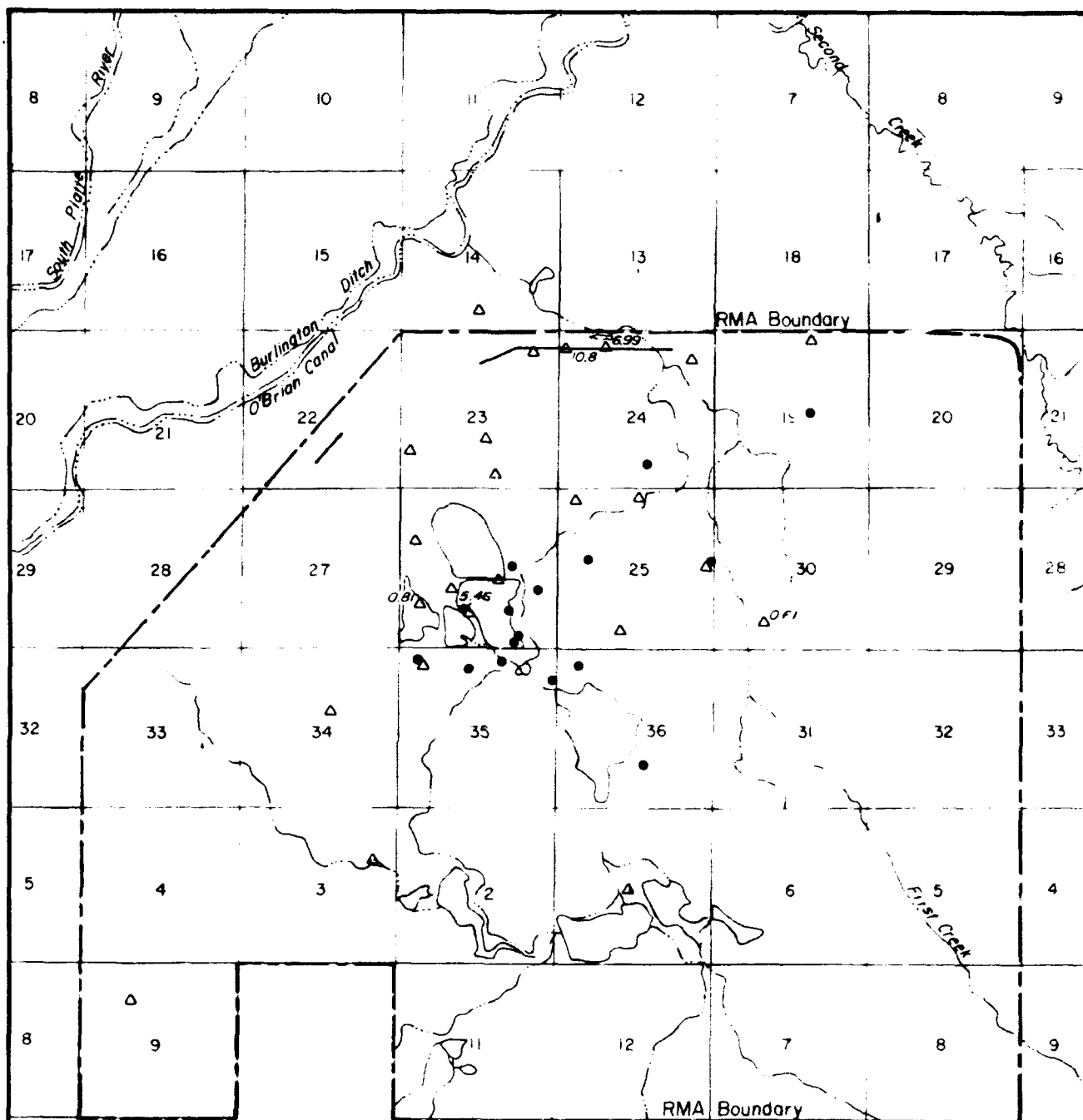
0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-68
Chloroform Detections
Denver Zones 4, 5, 6, & 7
Winter 1987/88

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Explanation

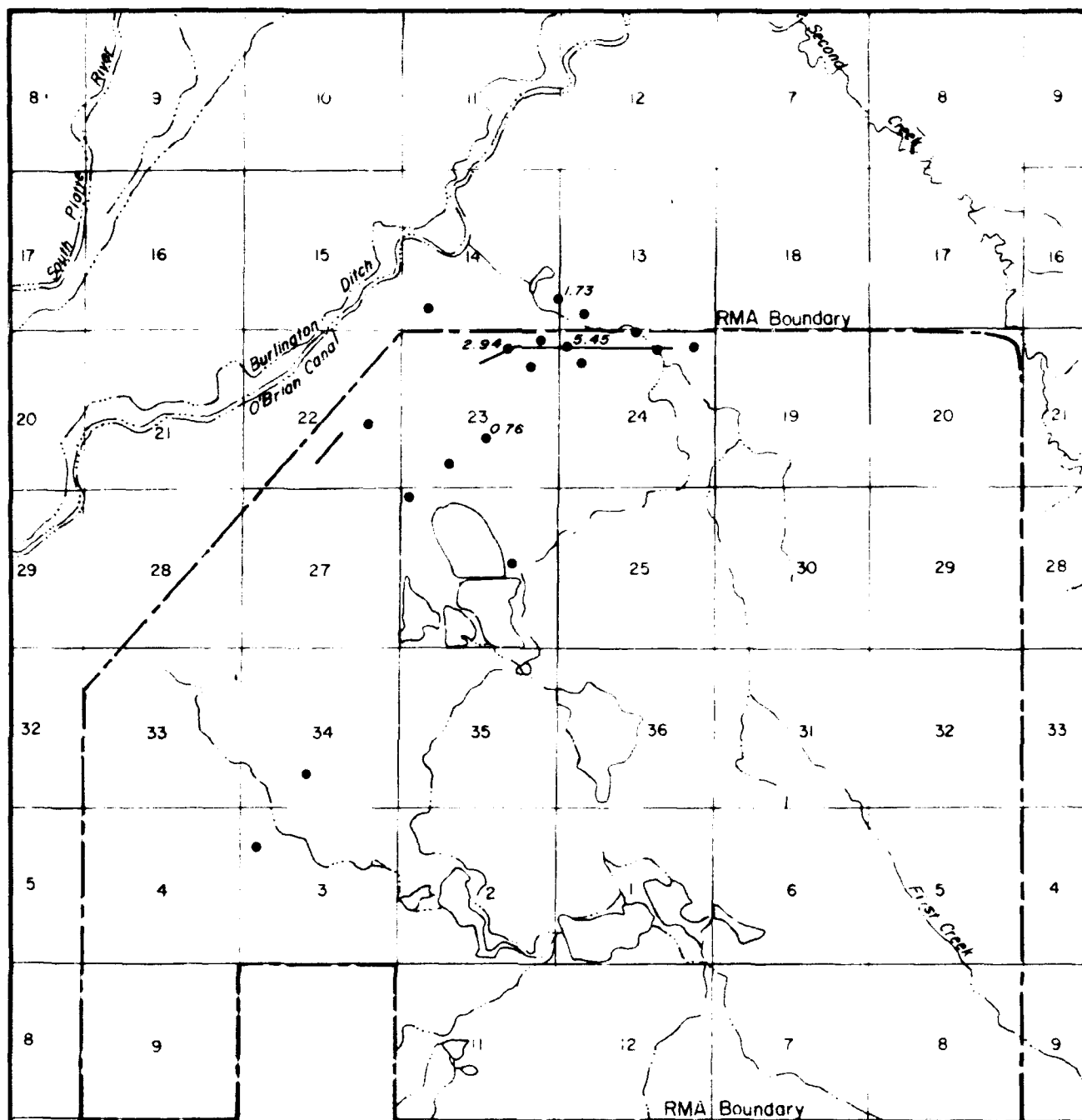
- Denver Zone 1 Well Location
- △ Denver Zone 2 Well Location

Analyte Concentration in $\mu\text{g/l}$

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FIGURE A-71
Trichloroethene Detections
Denver Zones 1 & 2
Winter 1987/88

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Explanation

- Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$

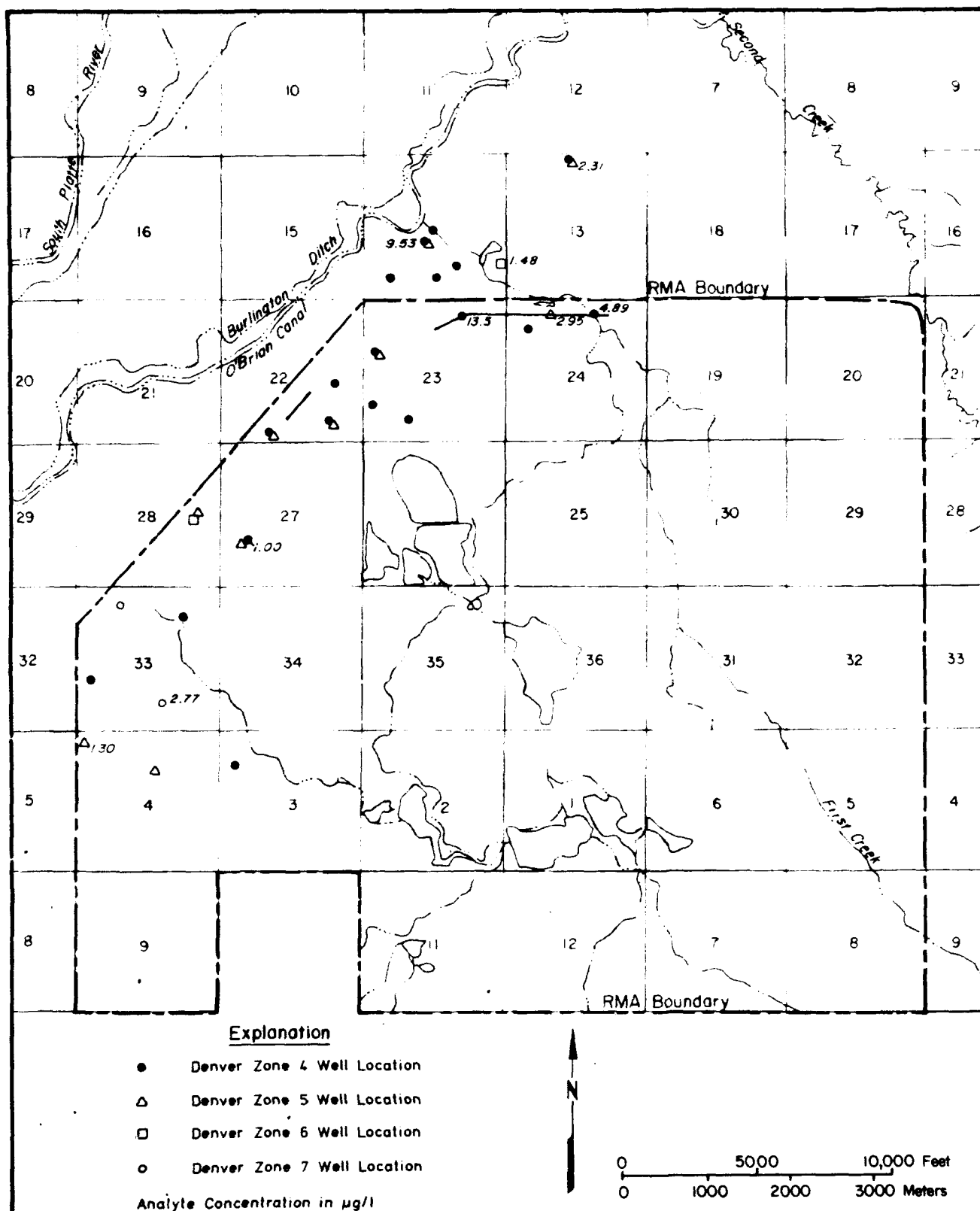


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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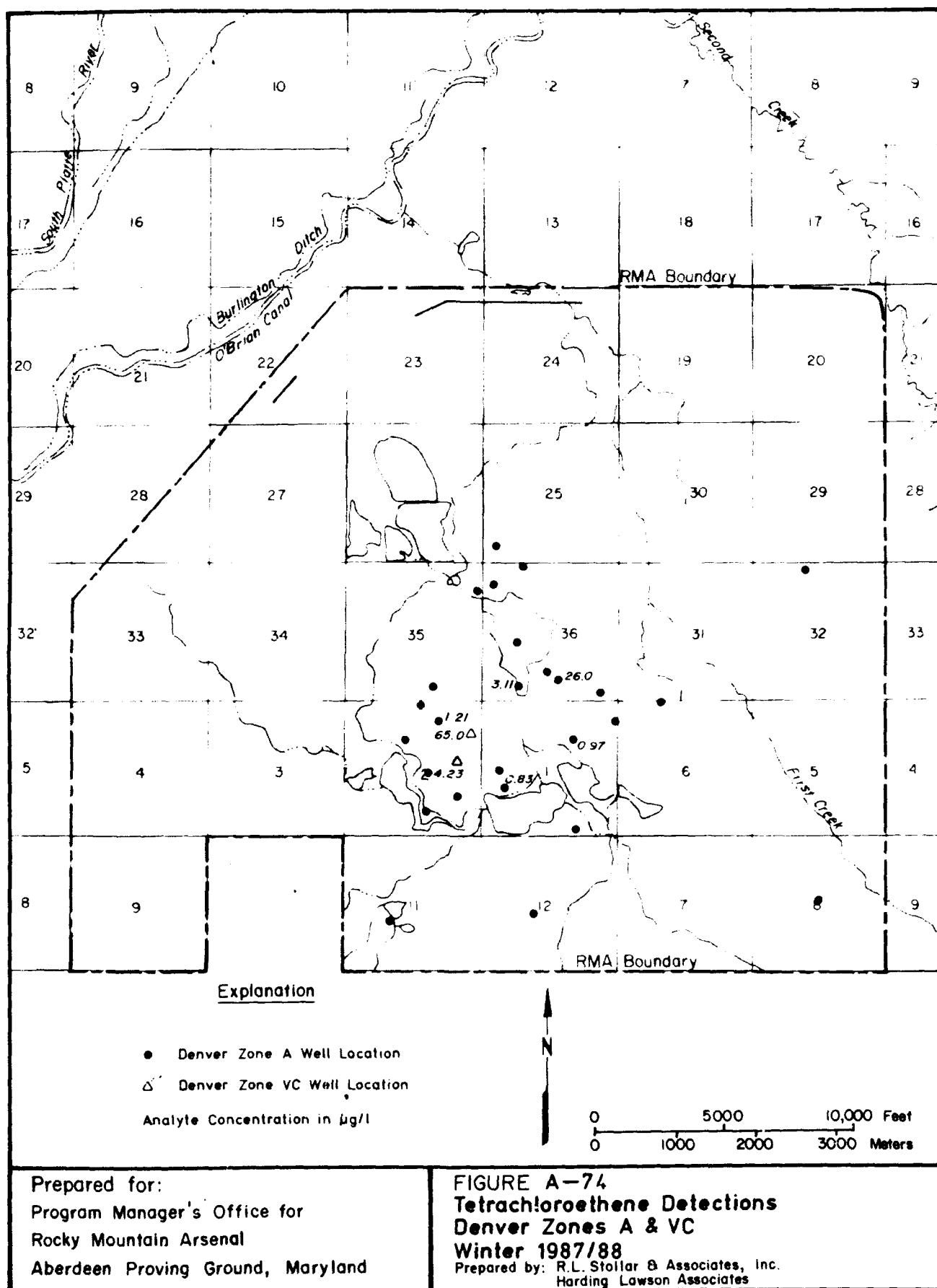
FIGURE A-72
Trichloroethene Detections
Denver Zone 3
Winter 1987/88

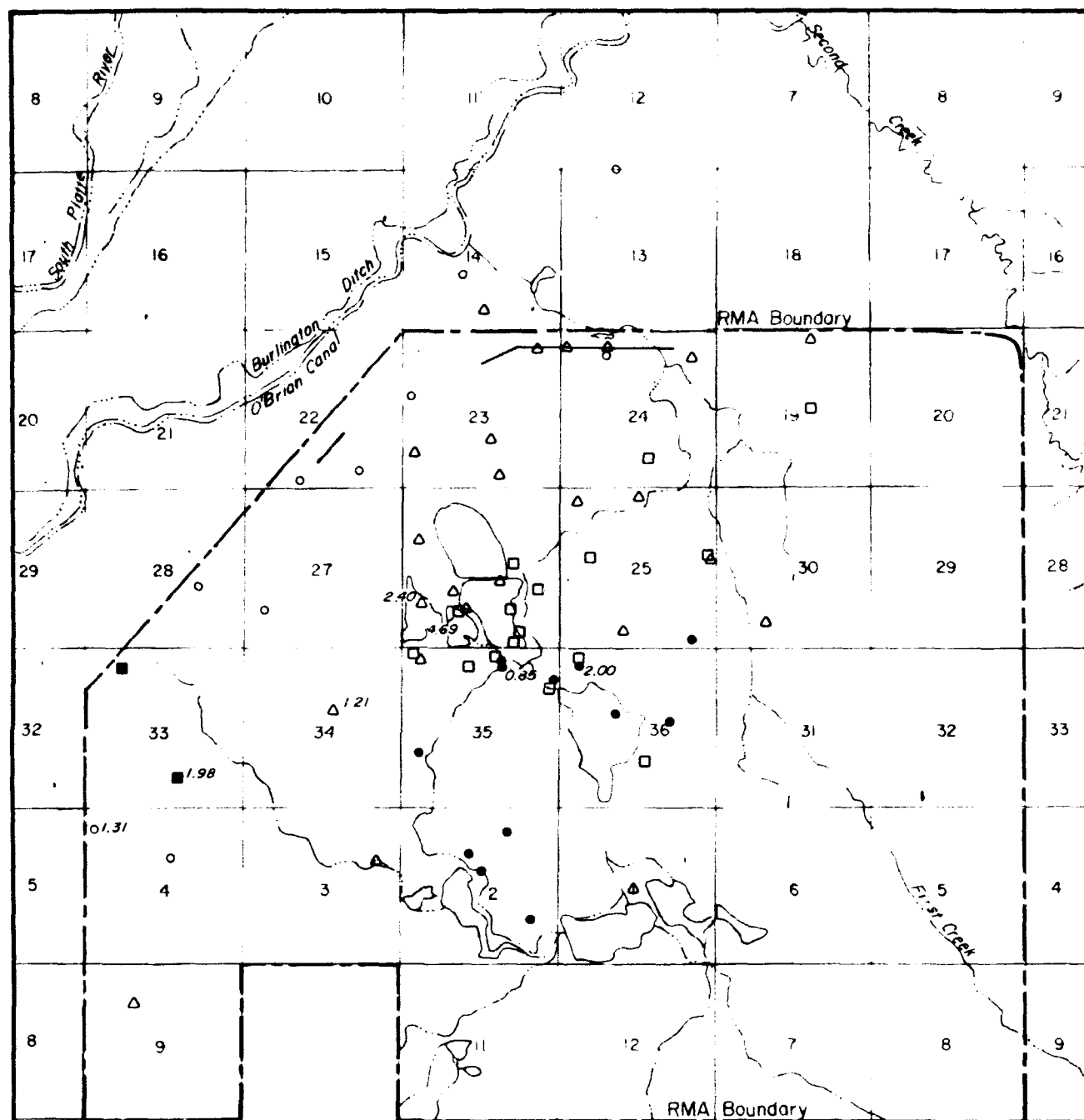
Prepared by: R.L. Stollar & Associates, Inc.
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FIGURE A-73
Trichloroethene Detections
Denver Zones 4, 5, 6, & 7
Winter 1987/88
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Explanation

- Denver Zone 1U Well Location
- Denver Zone 1 Well Location
- △ Denver Zone 2 Well Location
- Denver Zone 5 Well Location
- Denver Zone 7 Well Location

Analyte Concentration in $\mu\text{g/l}$

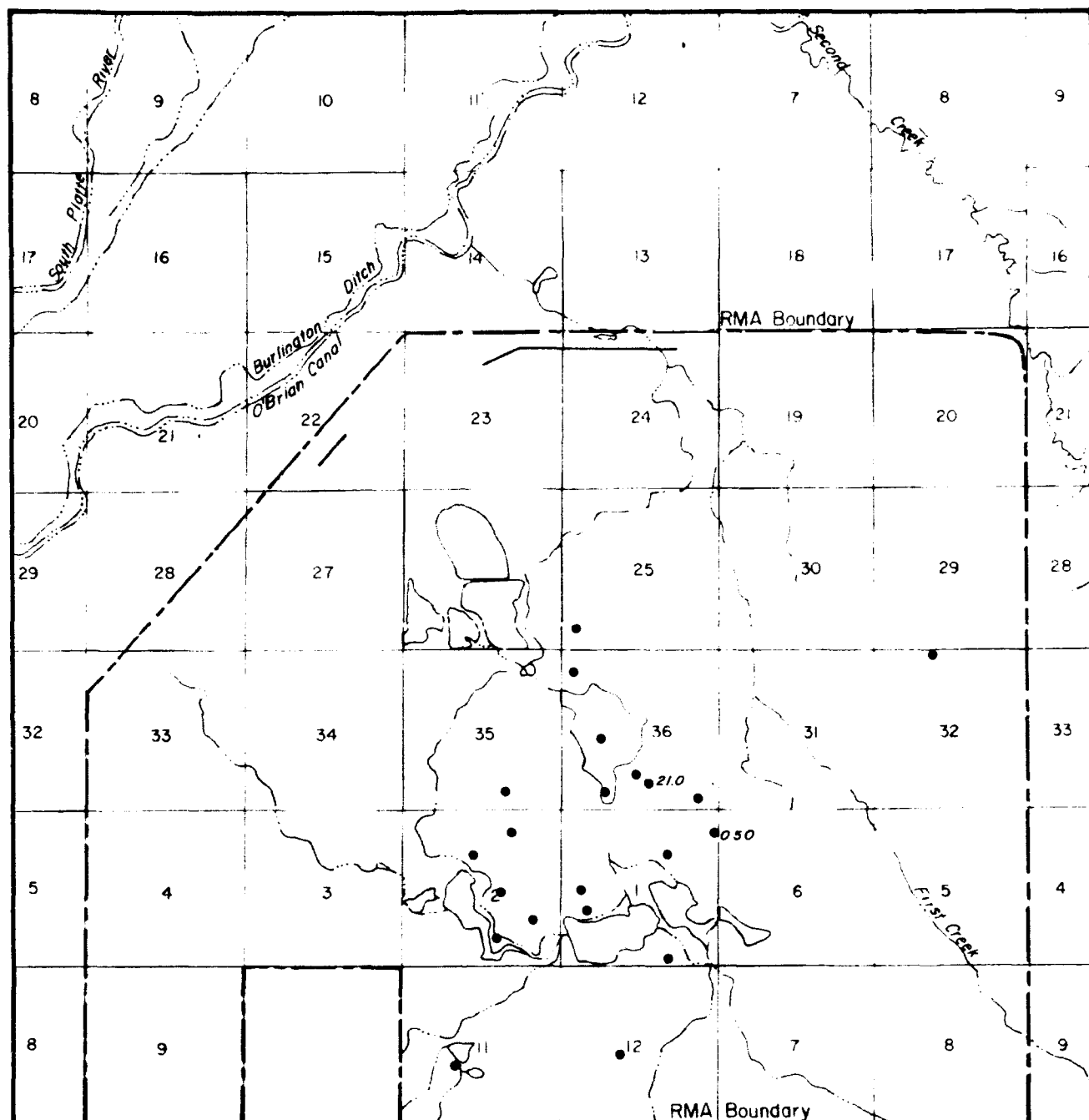


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-75
Tetrachloroethene Detections
Denver Zones 1U, 1, 2, 5, & 7
Winter 1987/88

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Explanation

- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$

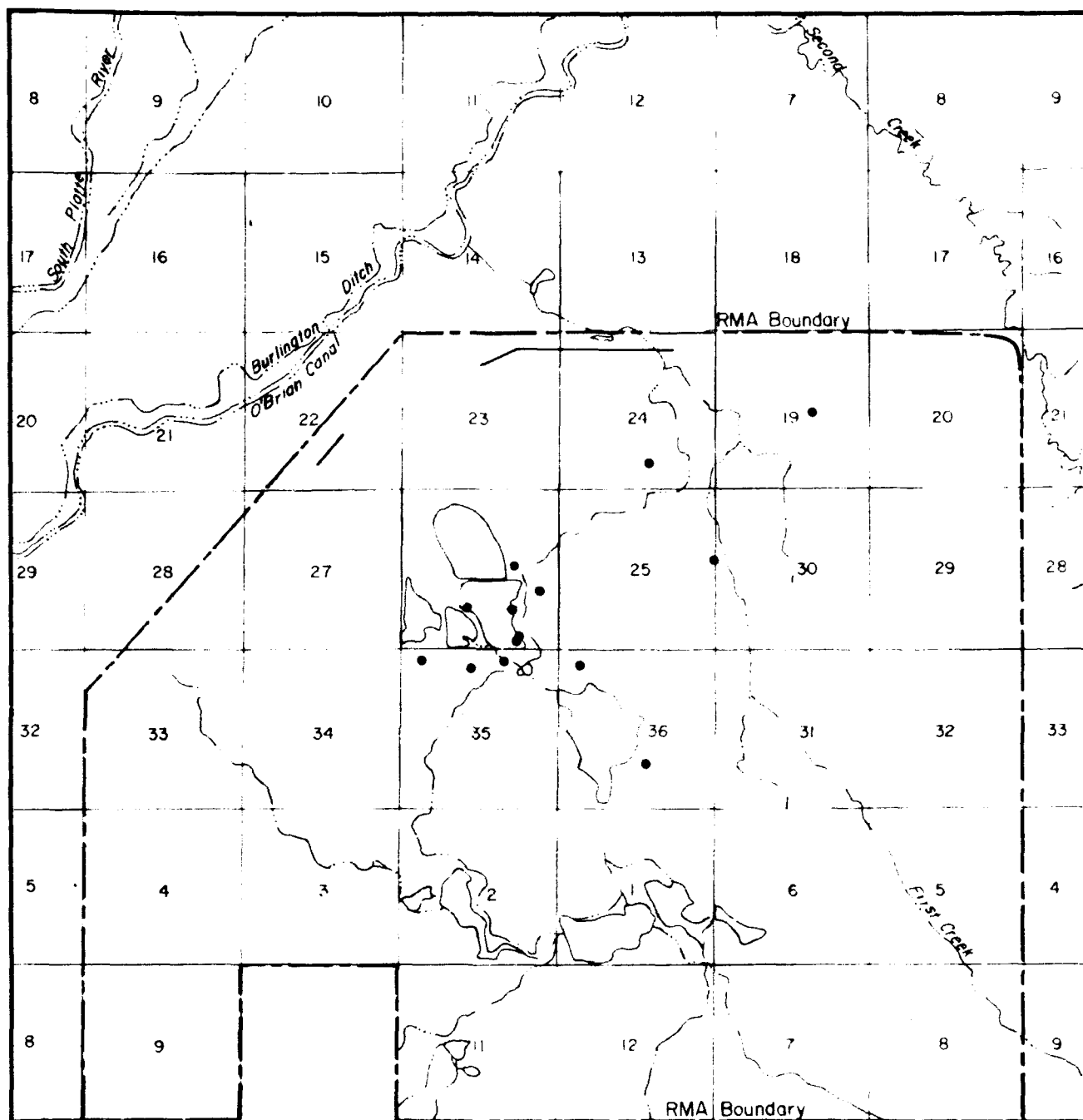


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-76
Dibromochloropropane Detections
Denver Zone A
Winter 1987/88

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Explanation

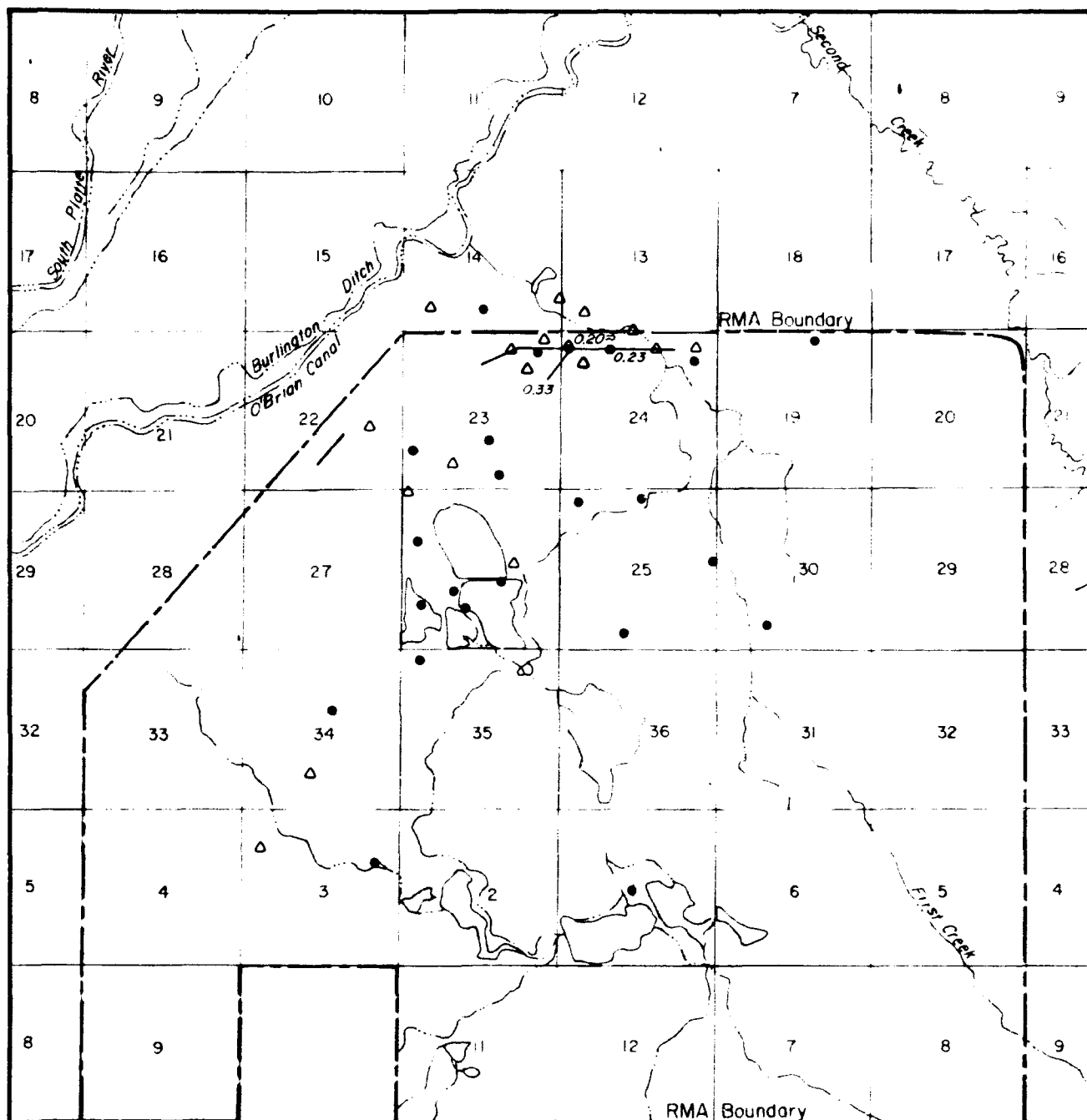
- Denver Zone 1 Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-77
Dibromochloropropane Detections
Denver Zone 1
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

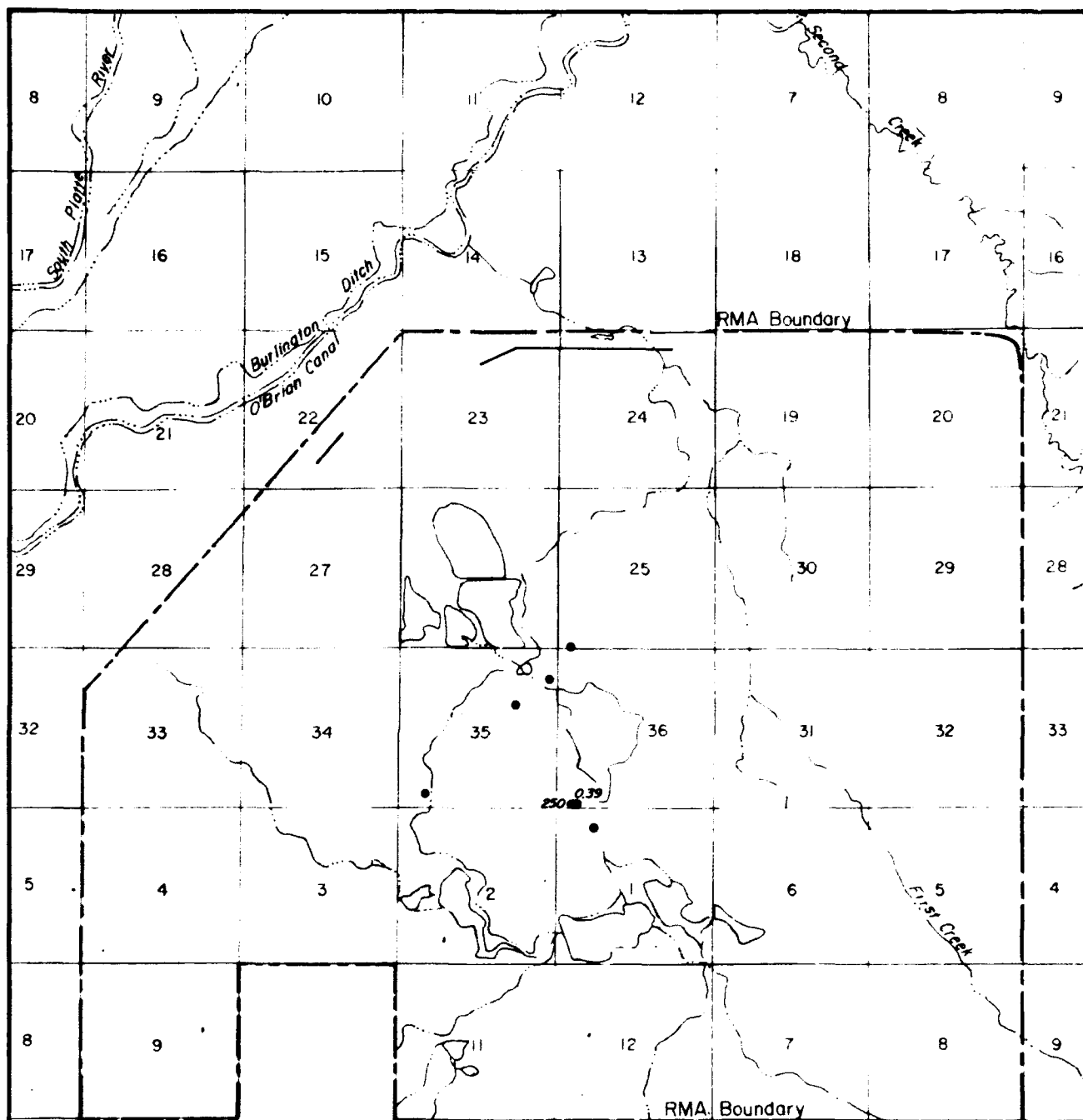
- Denver Zone 2 Well Location
- △ Denver Zone 3 Well Location
- Analyte Concentration in ug/l



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-78
Dibromochloropropane Detections
Denver Zones 2 & 3
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

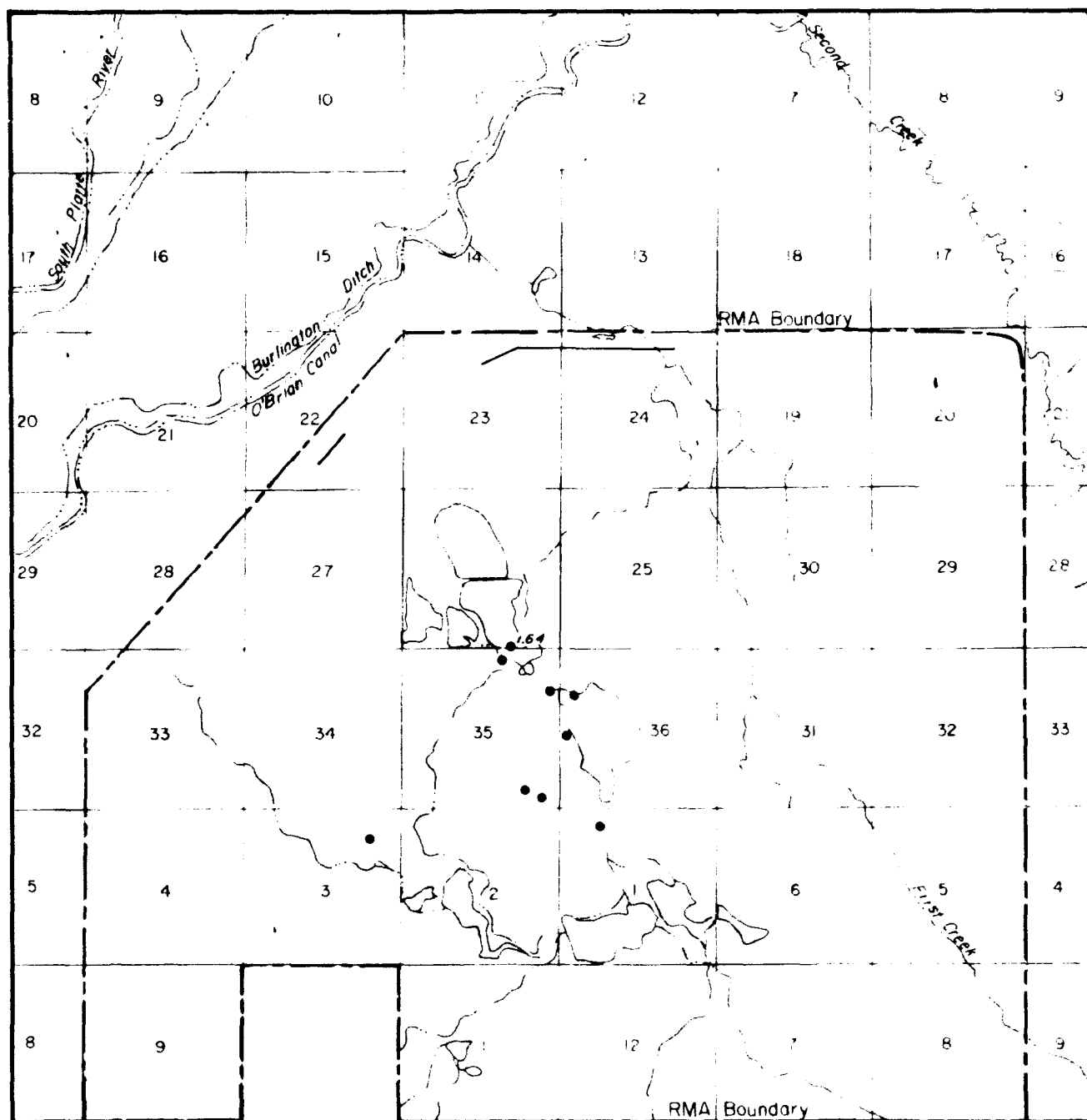
- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-79
Dibromochloropropane Detections
Denver Zone A
Spring 1988
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

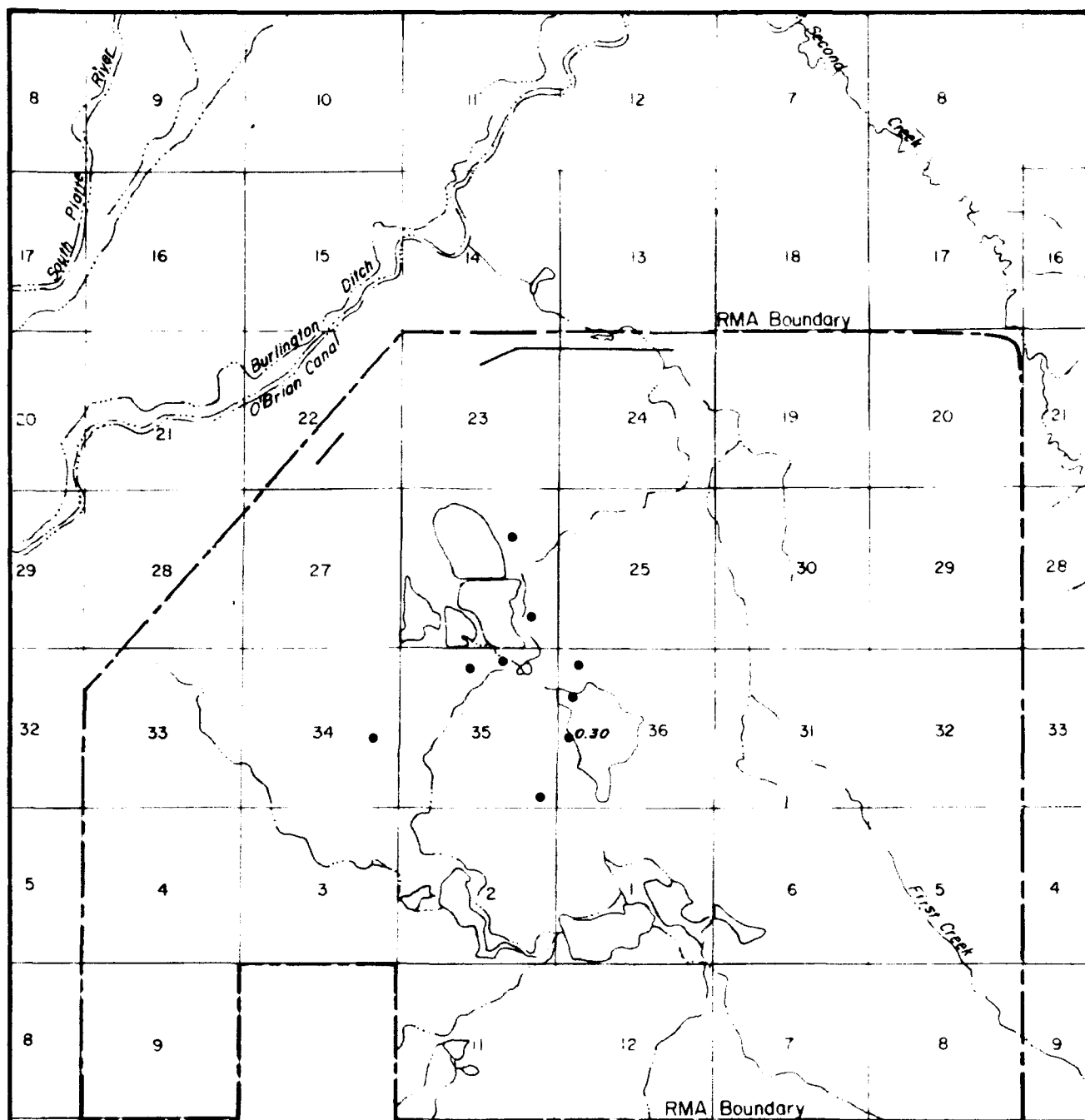
- Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$



0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-80
Dibromochloropropane Detections
Denver Zone 1U
Spring 1988
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Explanation

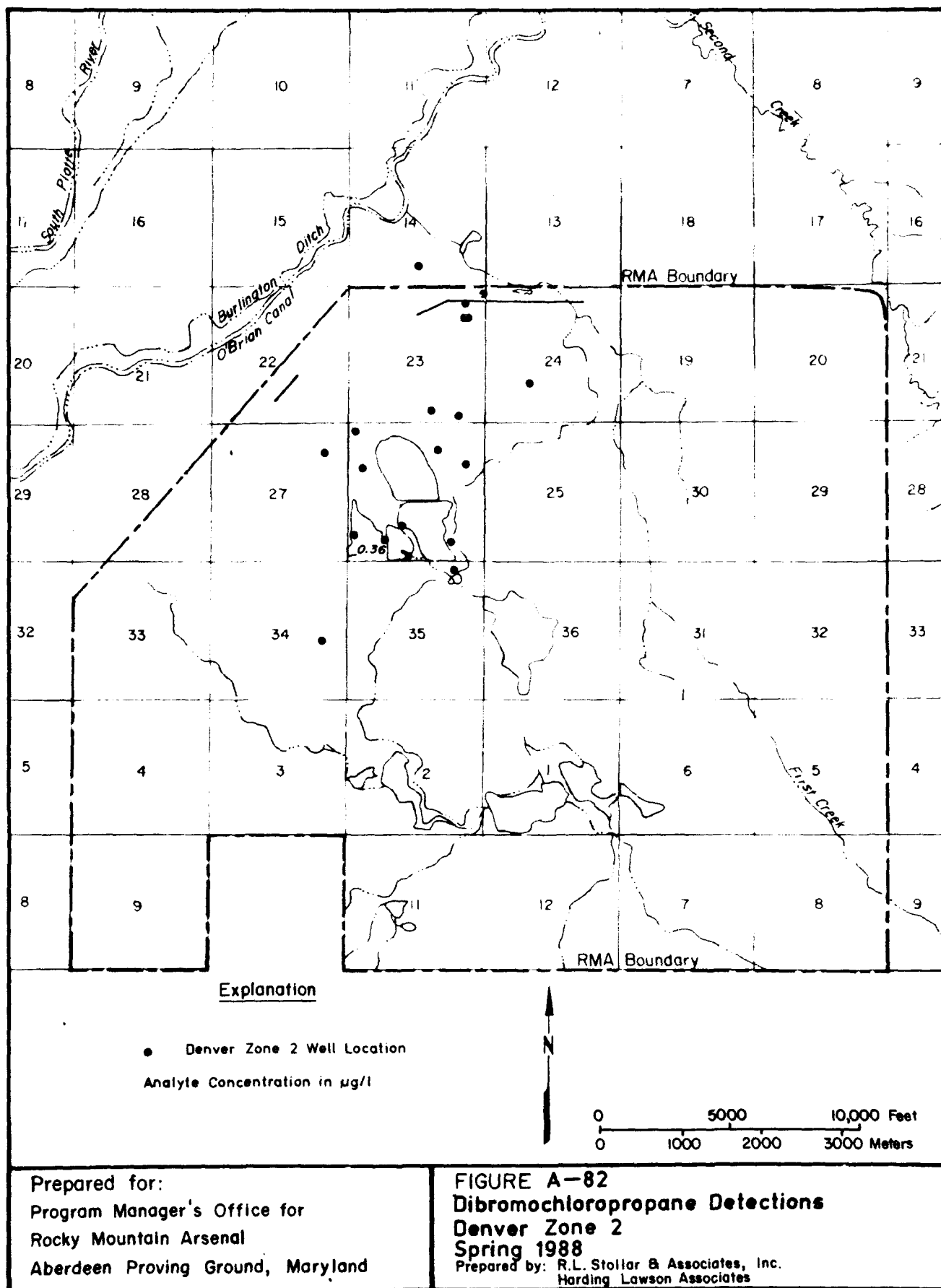
- Denver Zone 1 Well Location
- Analyte Concentration in µg/l

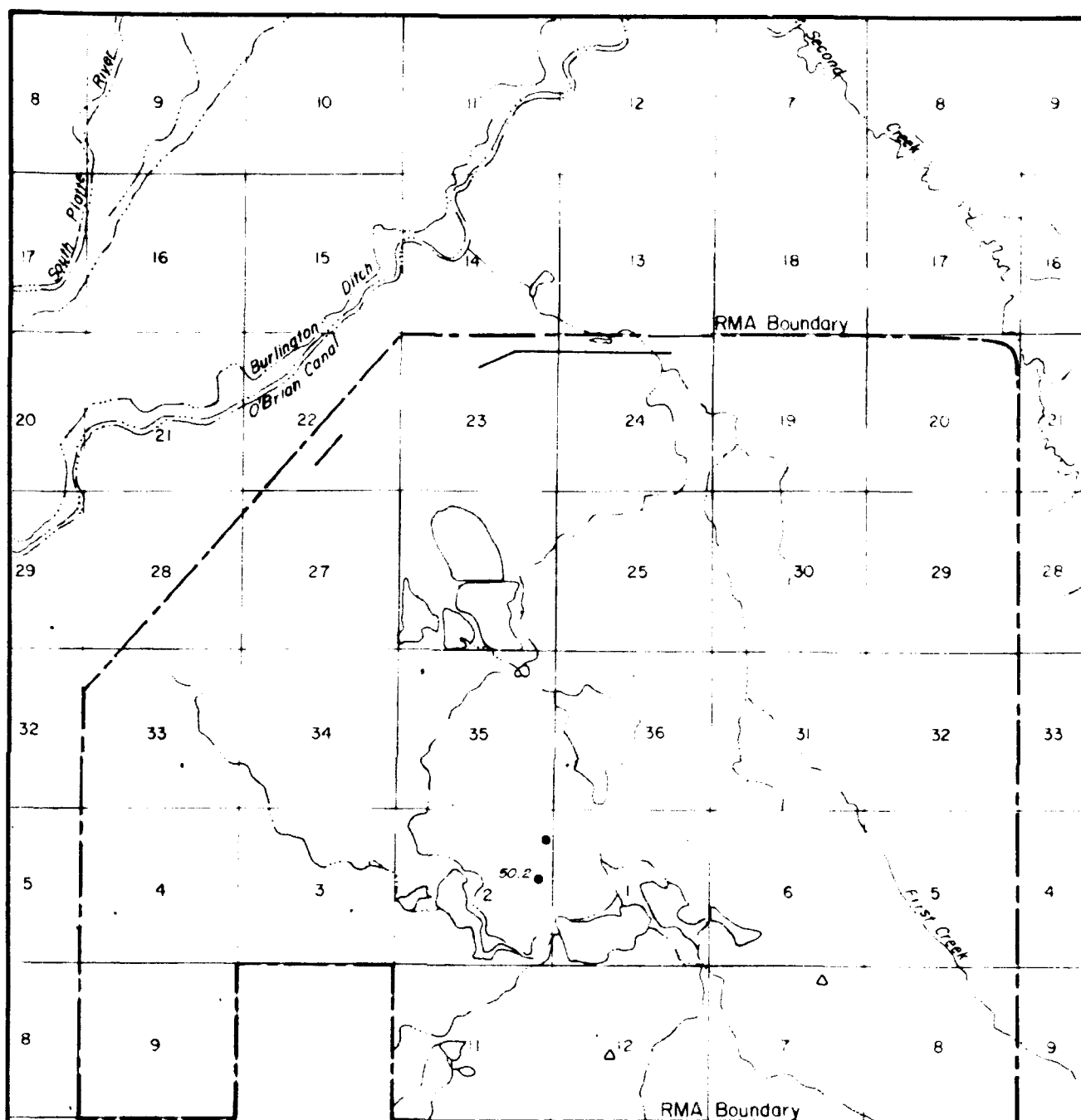


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-81
Dibromochloropropane Detections
Denver Zone 1
Spring 1988
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Explanation

- △ Denver Zone B Well Location
- Denver Zone VC Well Location

Analyte Concentration in $\mu\text{g/l}$

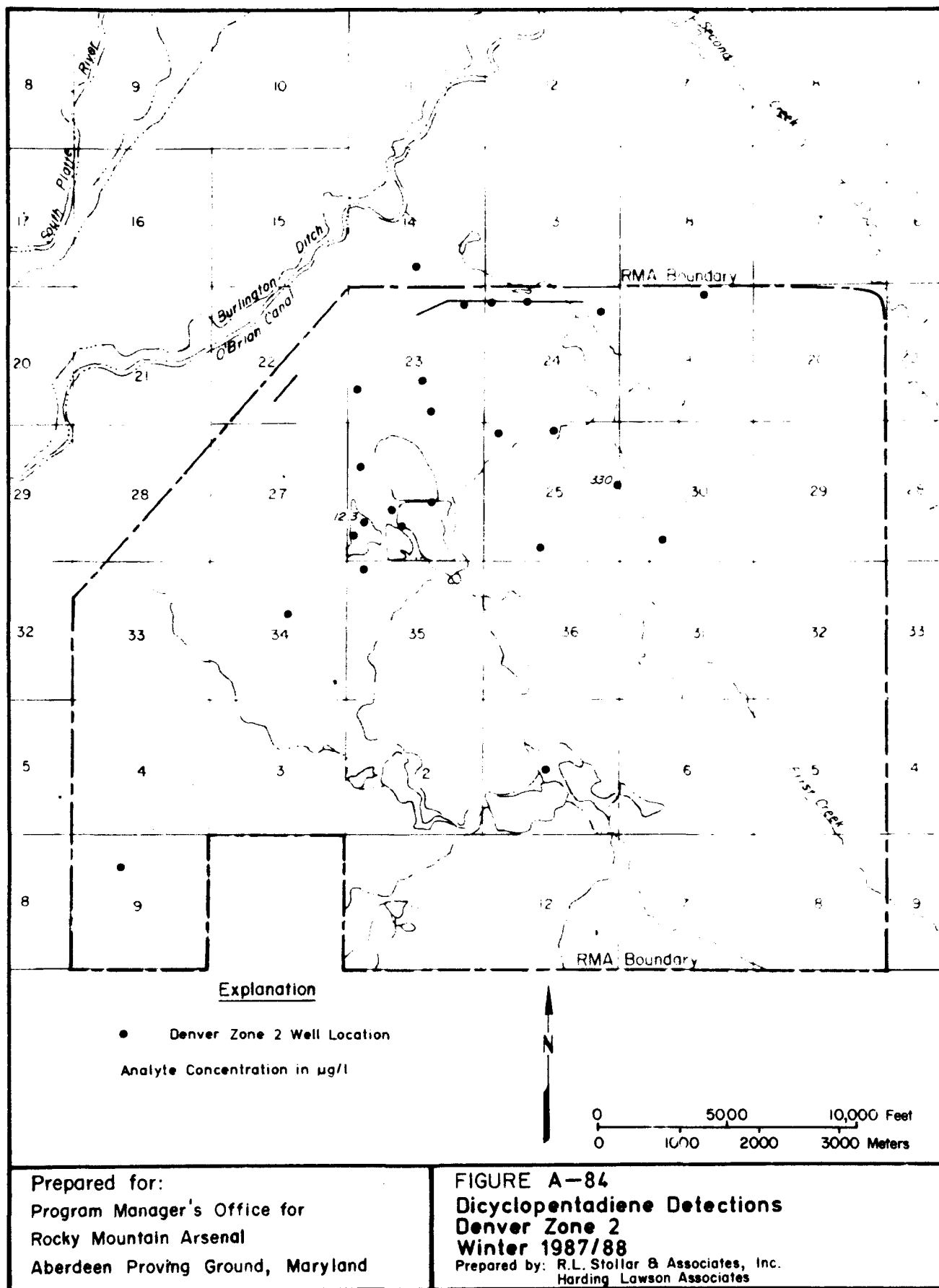


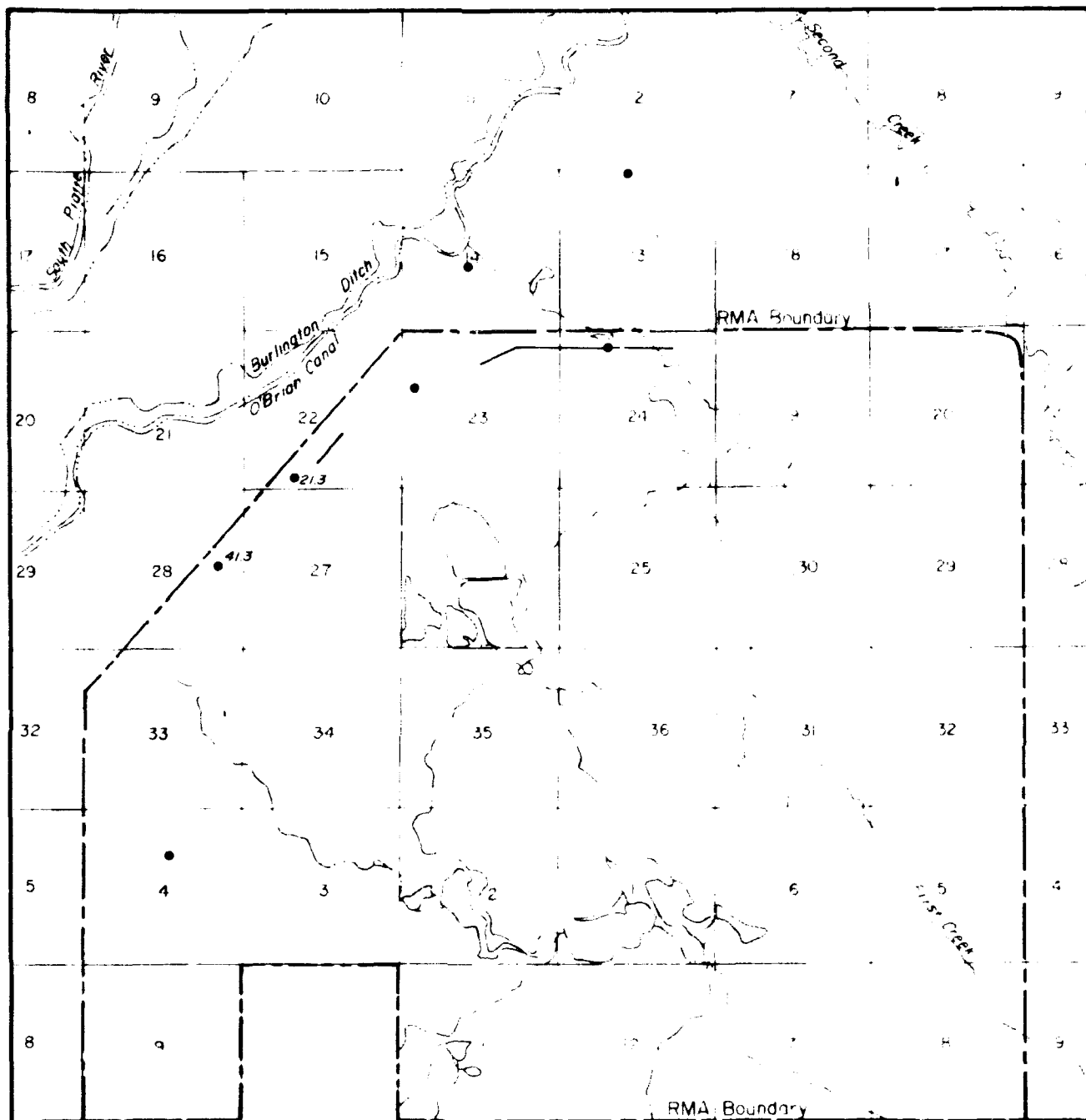
0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-83
Dicyclopentadiene Detections
Denver Zones B & VC
Winter 1987/88

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Explanation

● Denver Zone 5 Well Location

Analyte Concentration in $\mu\text{g/l}$

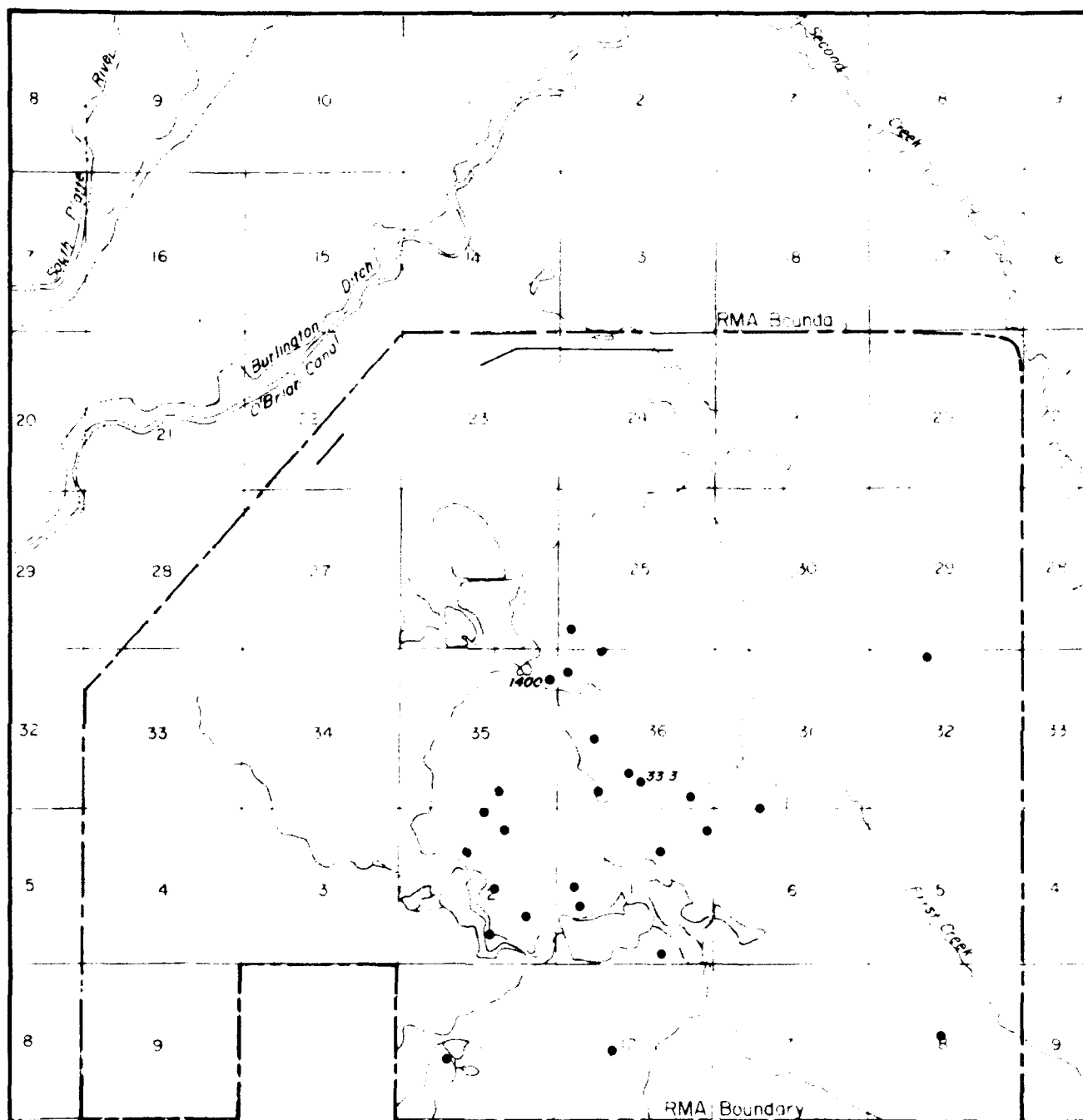


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-85
Dicyclopentadiene Detections
Denver Zone 5
Winter 1987/88

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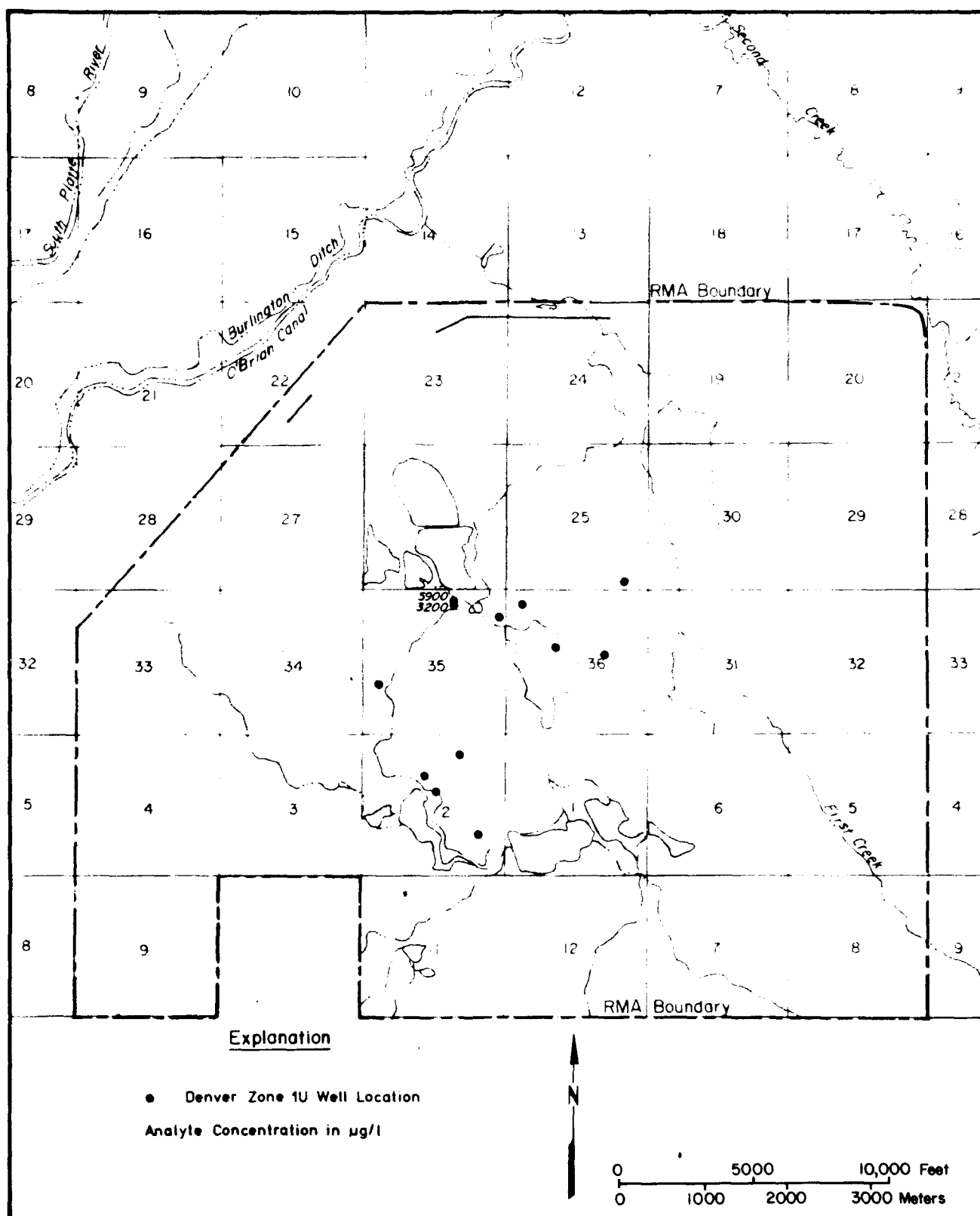


Explanation

- Denver Zone A Well Location
- Analyte Concentration in $\mu\text{g/l}$

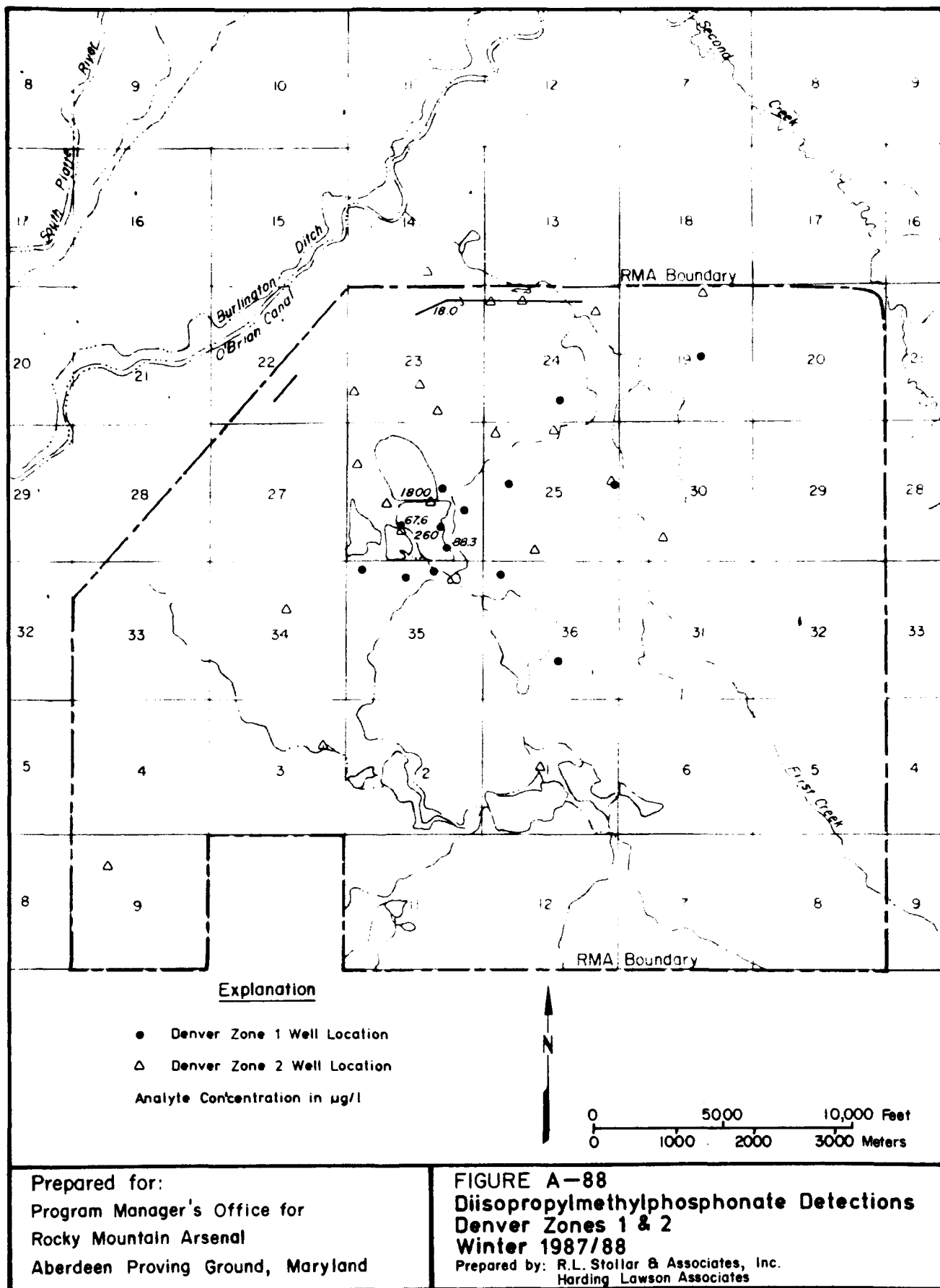
Prepared for:
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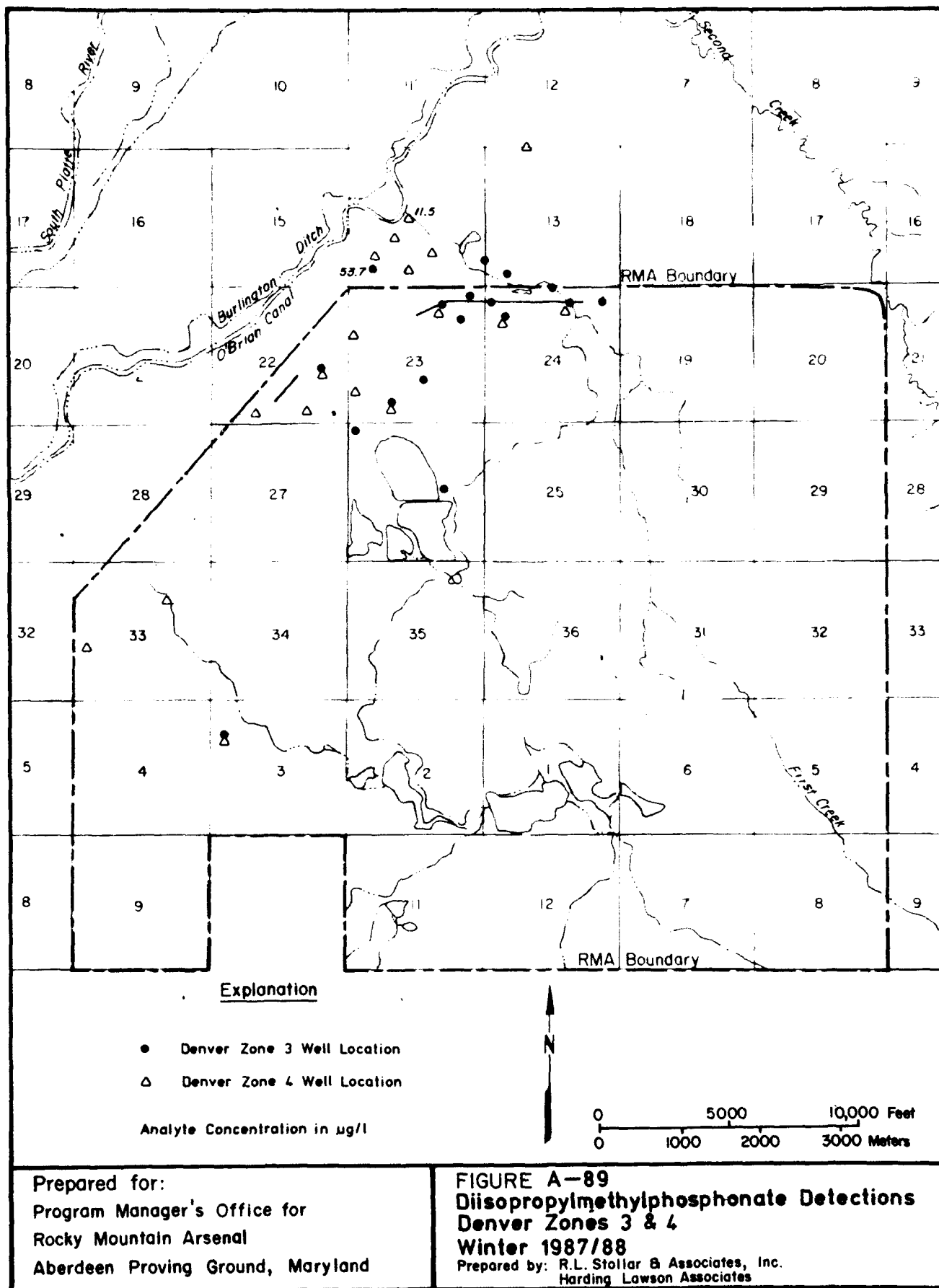
FIGURE A-86
Diisopropylmethylphosphonate Detections
Denver Zone A
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates

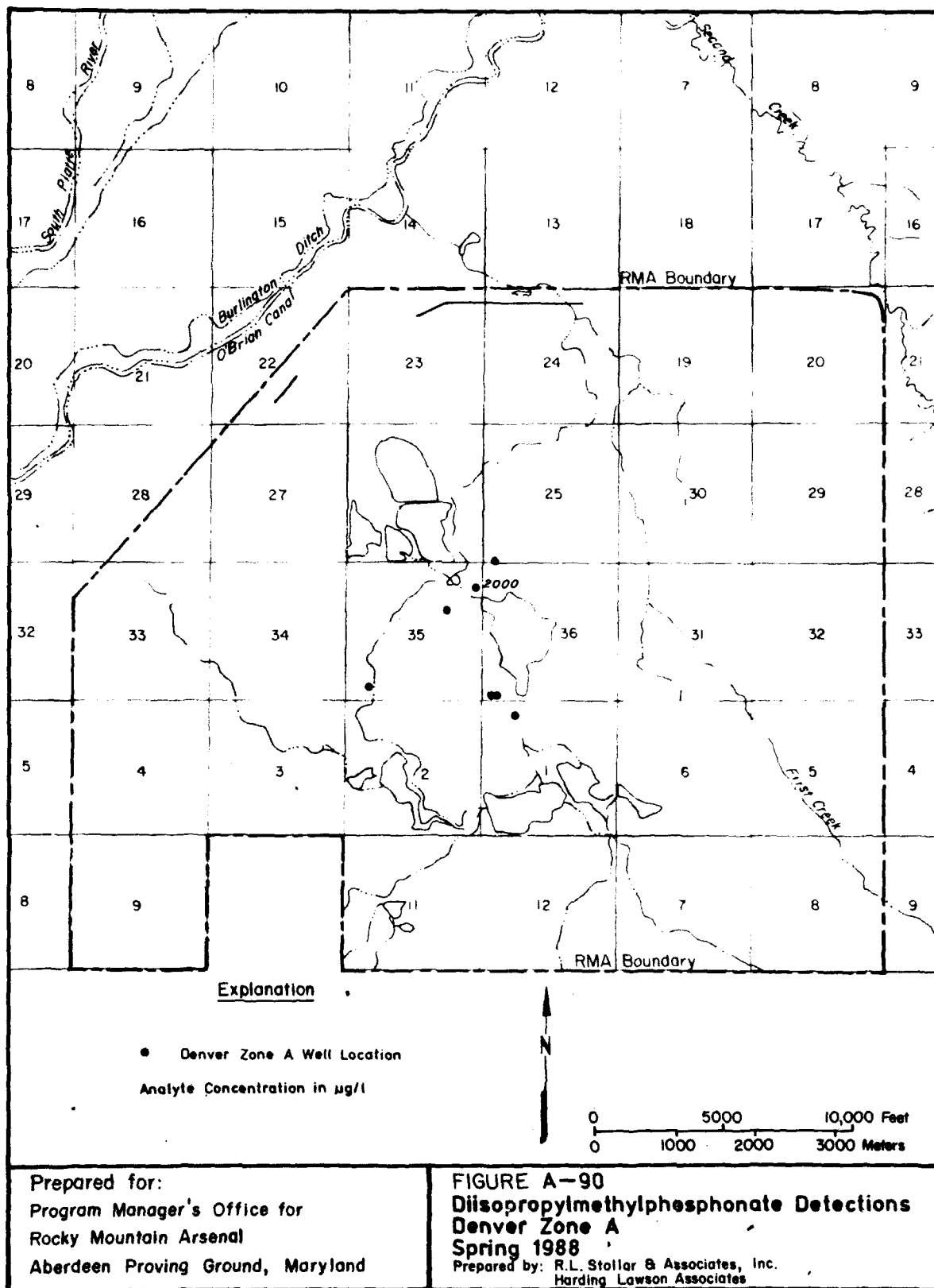


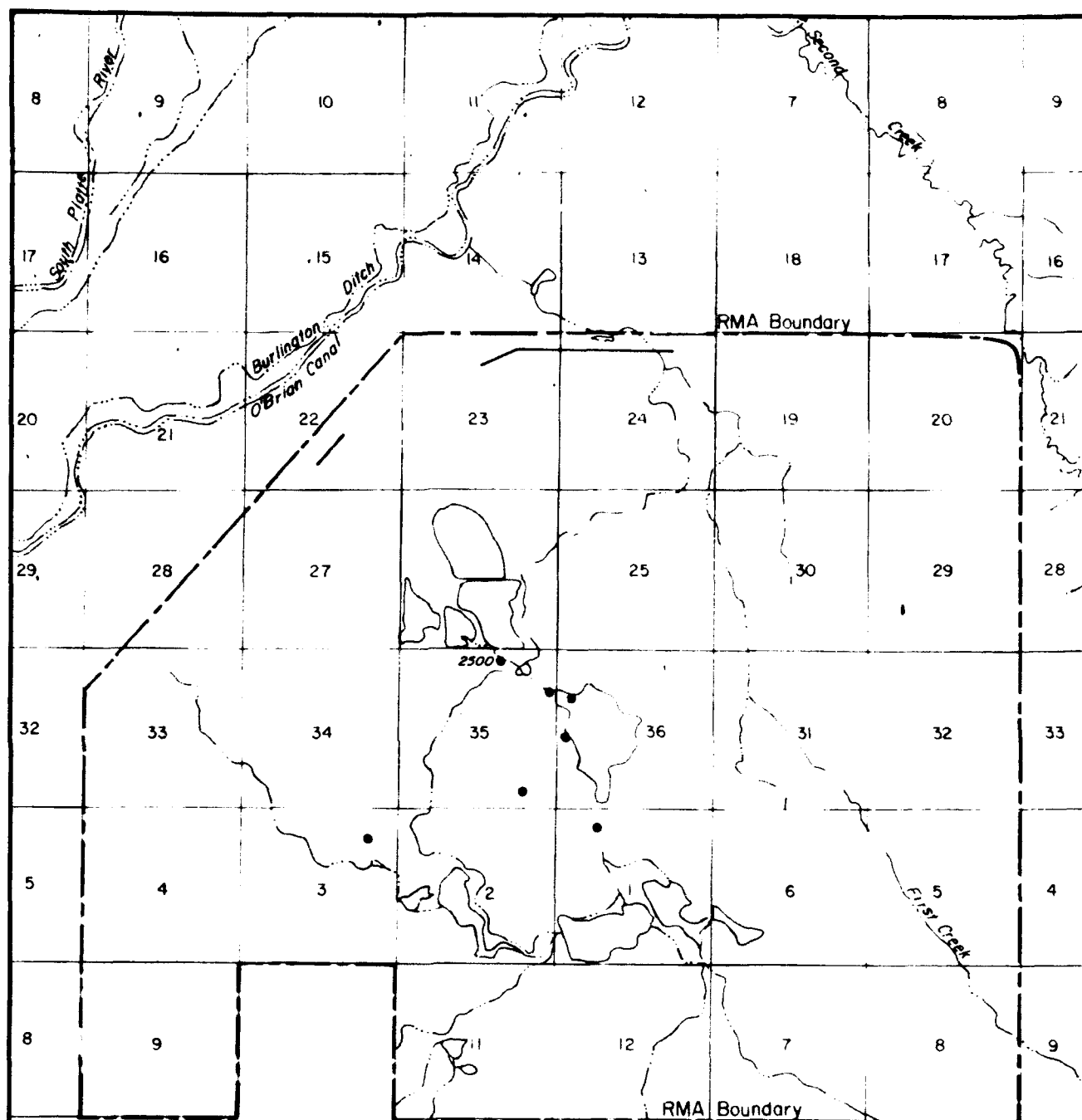
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FIGURE A-87
Diisopropylmethylphosphonate Detections
Denver Zone 1U
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
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Explanation

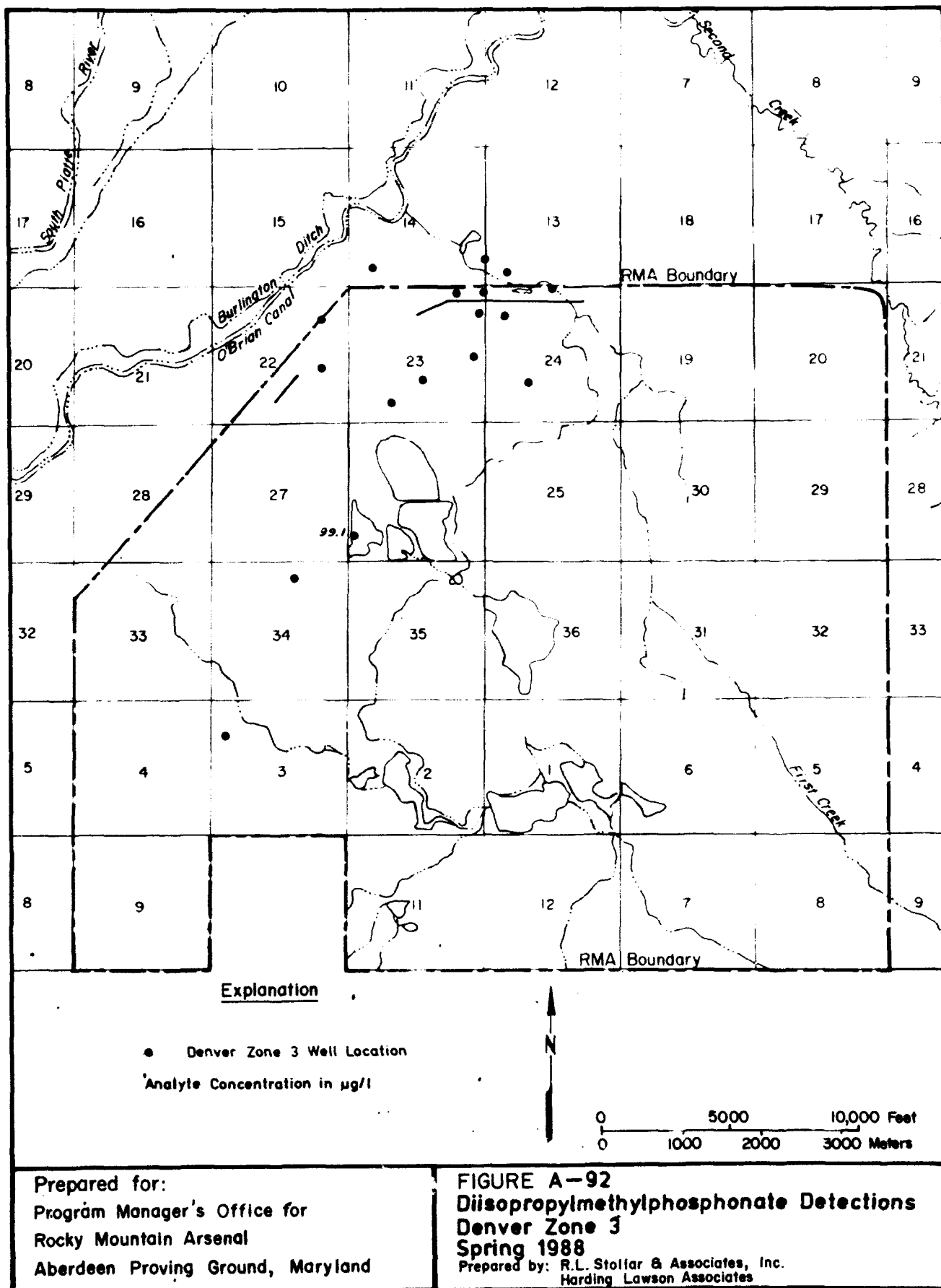
- Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$

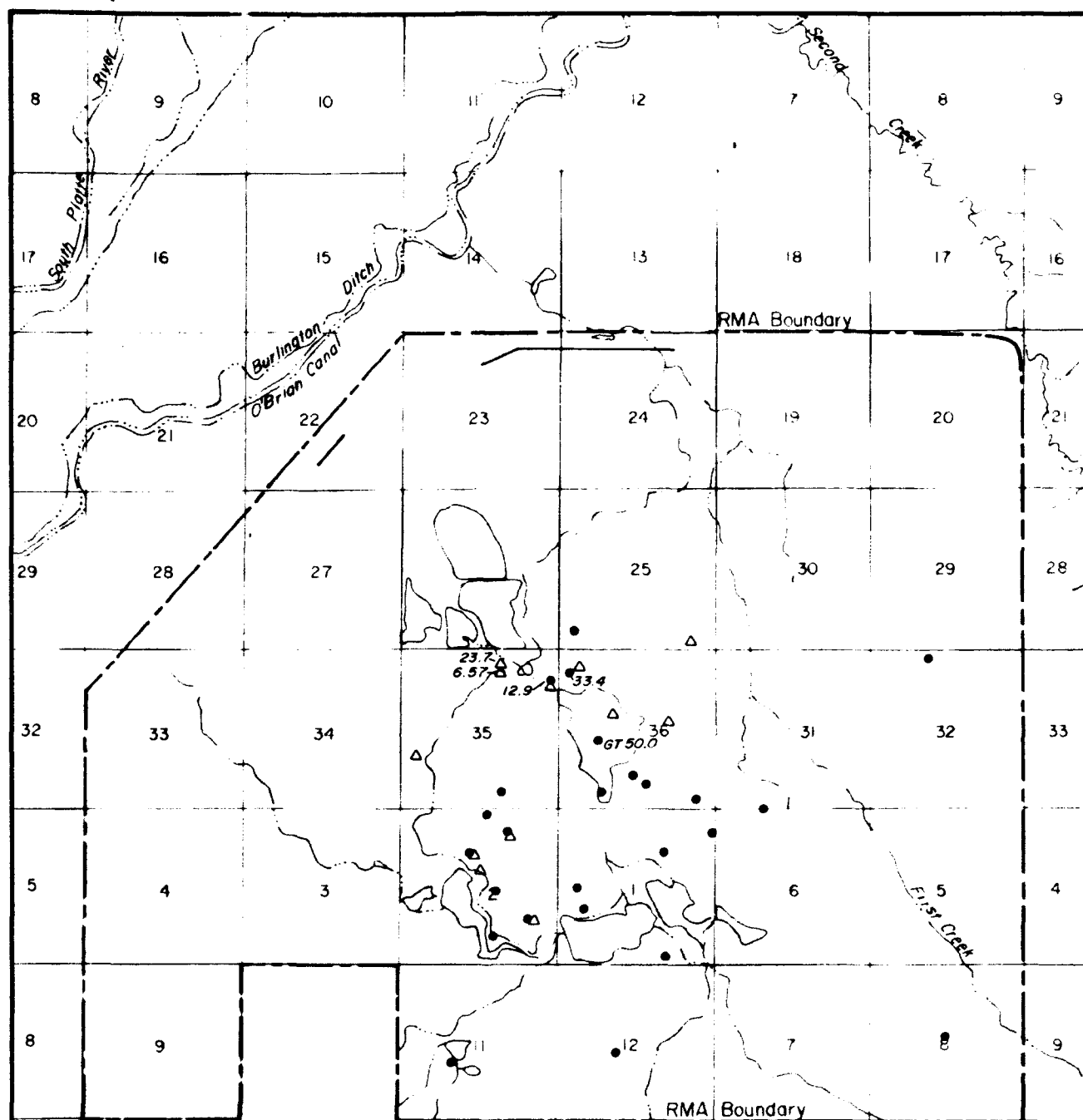


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-91
Diisopropylmethylphosphonate Detections
Denver Zone 1U
Spring 1988
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Explanation

- Denver Zone A Well Location
 - △ Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$

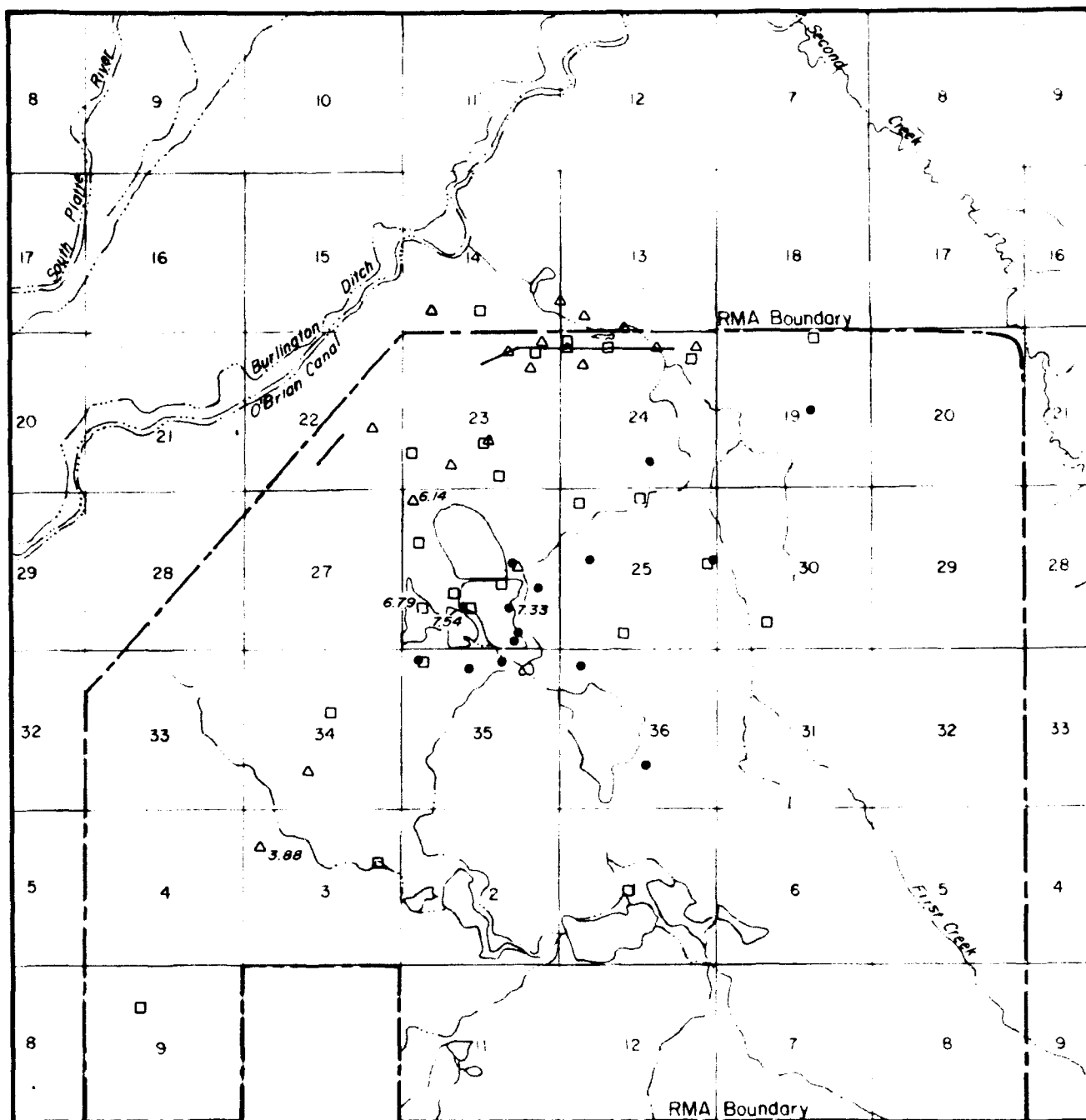


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-93
Arsenic Detections
Denver Zones A & 1U
Winter 1987/88

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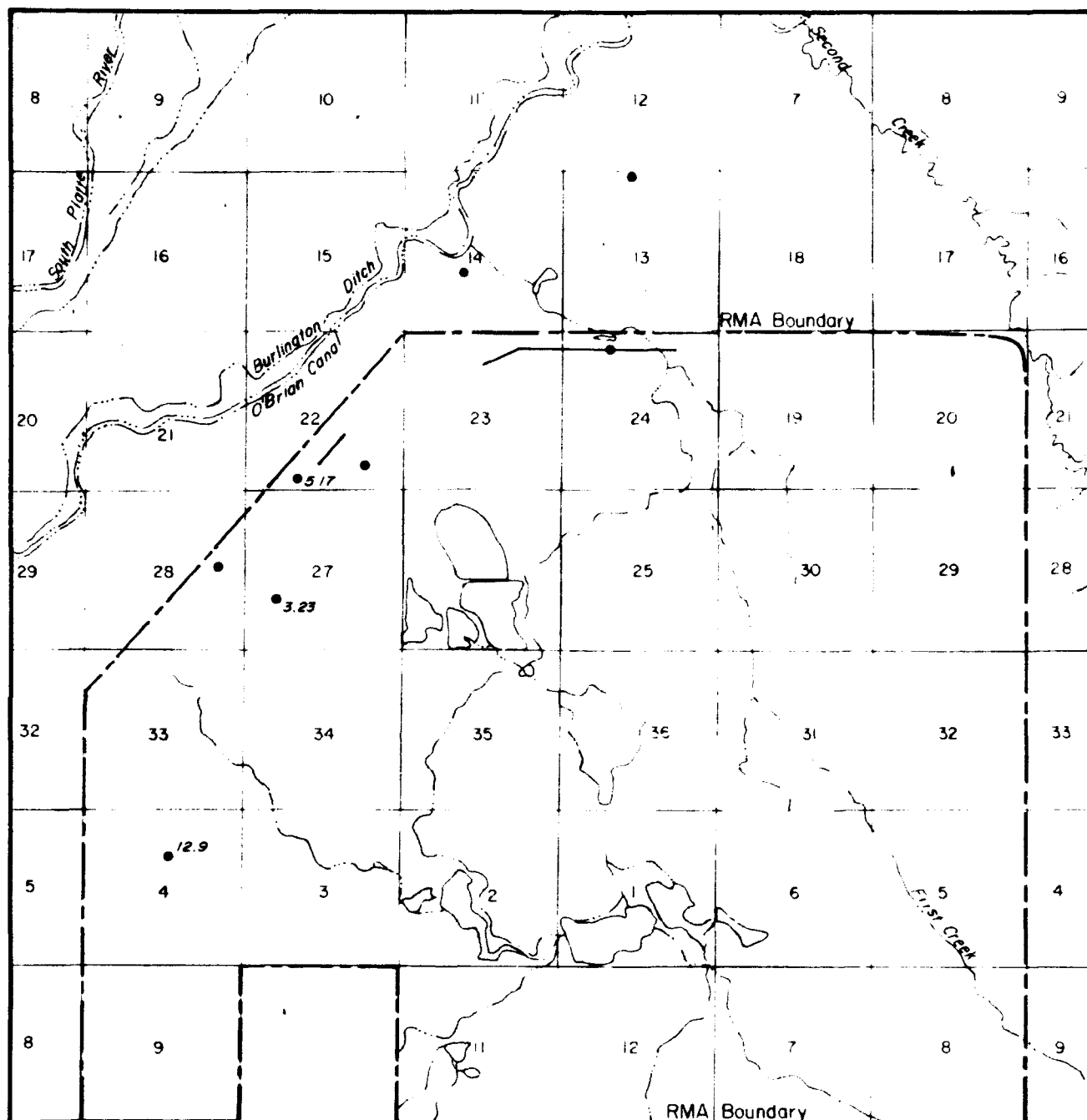
Explanation

- Denver Zone 1 Well Location
 - Denver Zone 2 Well Location
 - △ Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$

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FIGURE A-94
Arsenic Detections
Denver Zones 1, 2, & 3
Winter 1987/88

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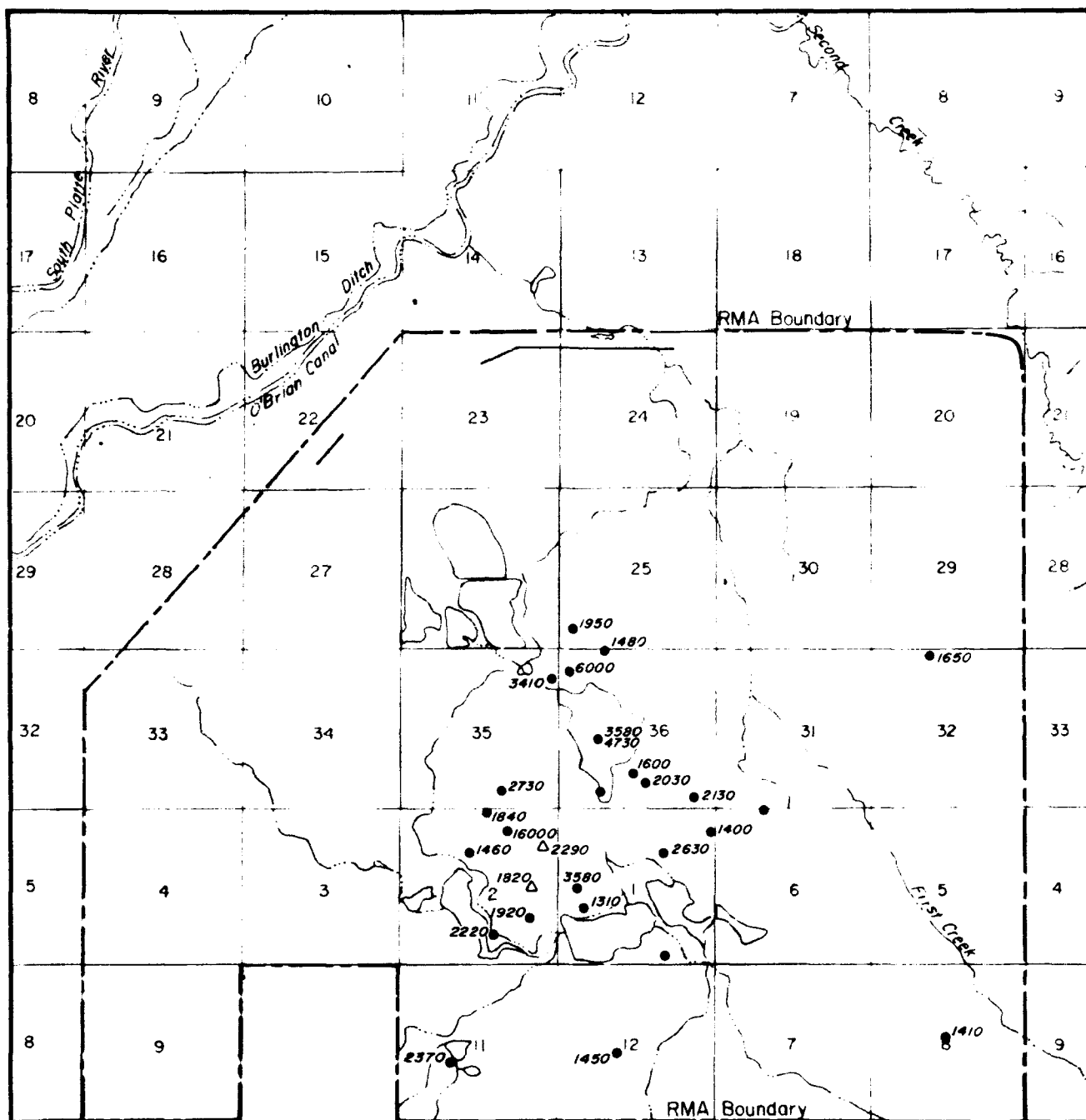
Explanation

- Denver Zone 5 Well Location
- Analyte Concentration in µg/l

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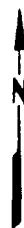
FIGURE A-95
Arsenic Detections
Denver Zone 5
Winter 1987/88

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 Harding Lawson Associates



Explanation

- Denver Zone A Well Location
- △ Denver Zone VC Well Location
- Analyte Concentration in µg/l

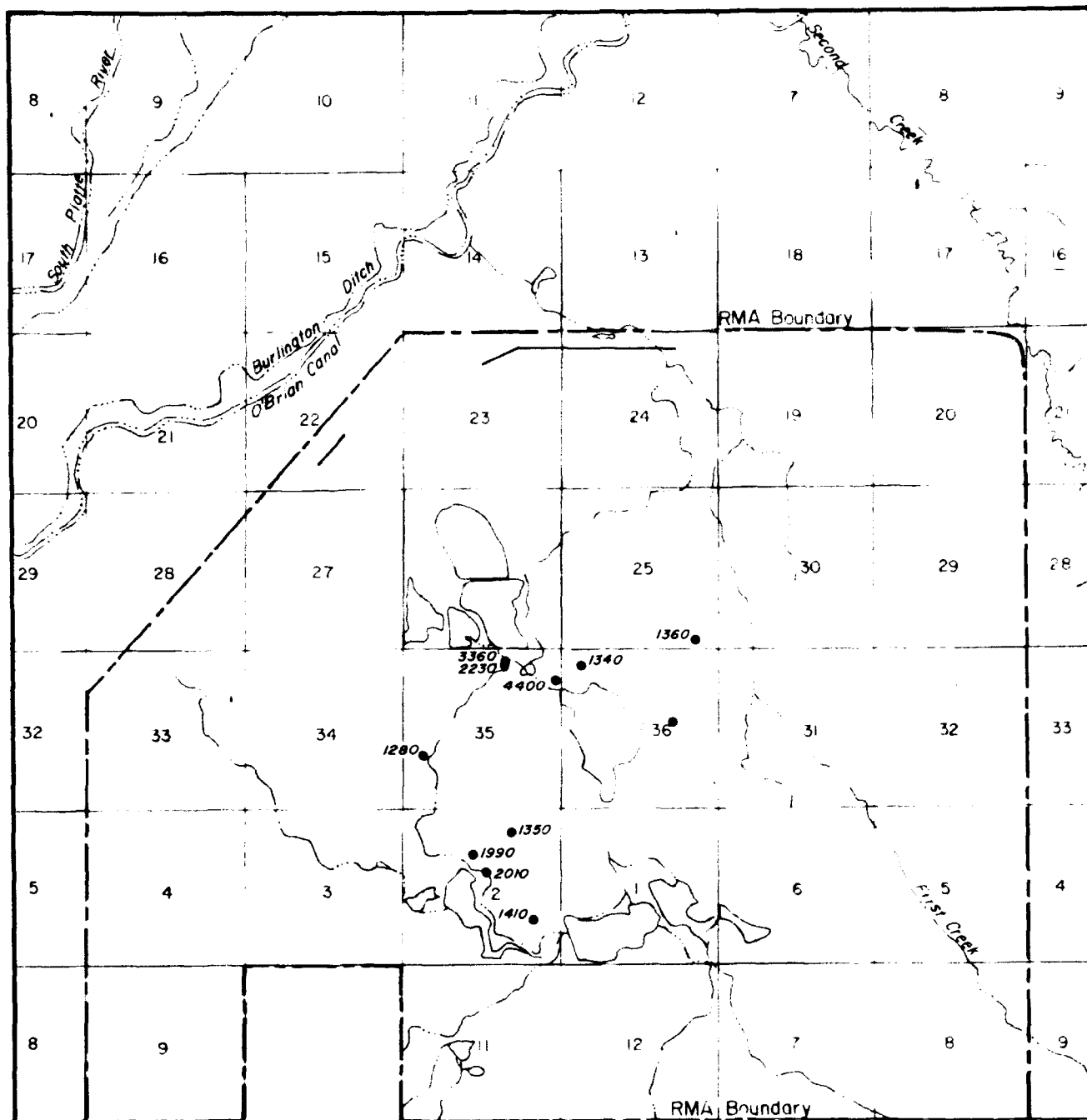


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-96
Fluoride Detections
Denver Zones A & VC
Winter 1987/88

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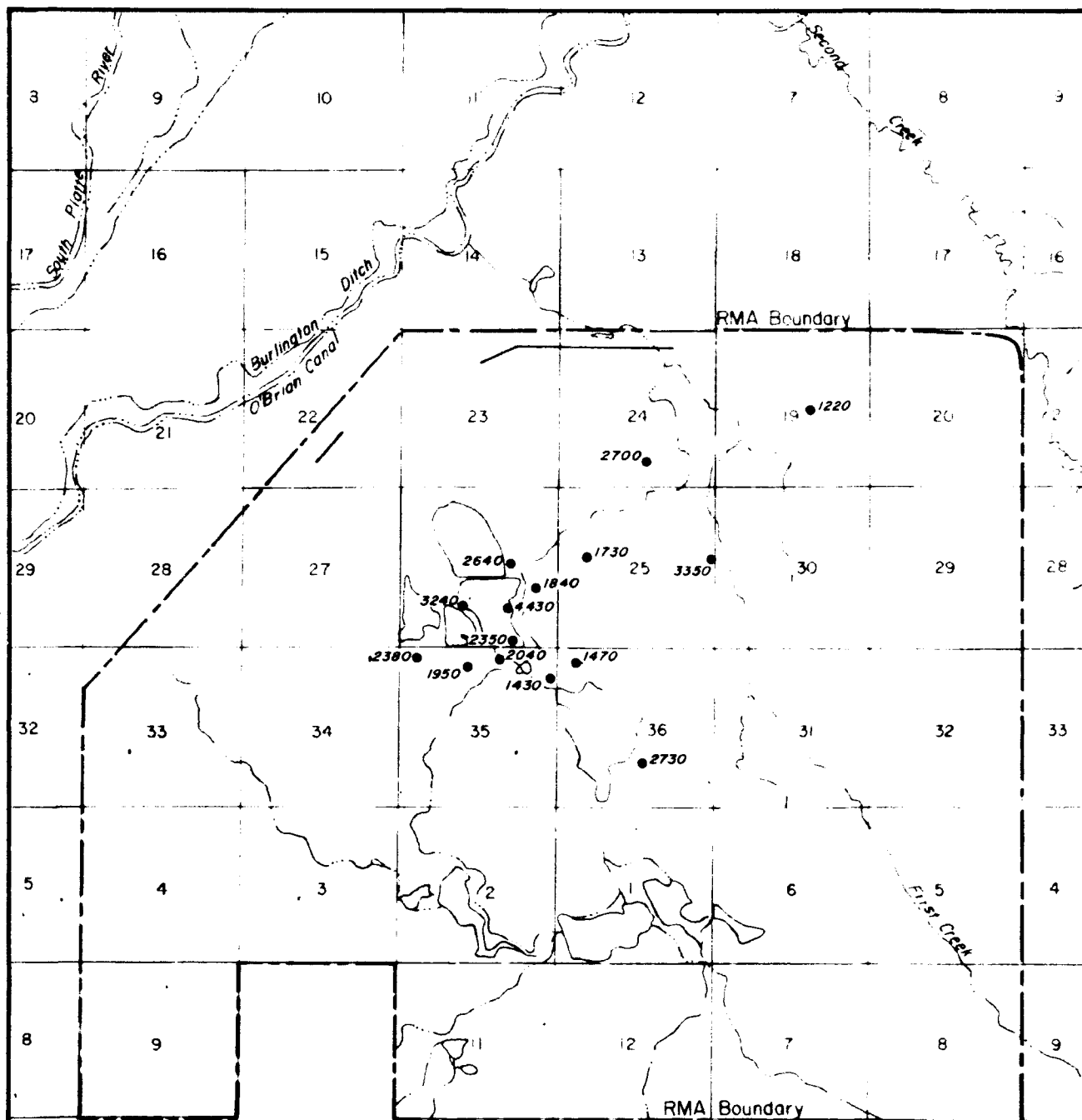
Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in $\mu\text{g/l}$

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FIGURE A-97
Fluoride Detections
Denver Zone 1U
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

• Denver Zone 1 Well Location

Analyte Concentration in µg/l

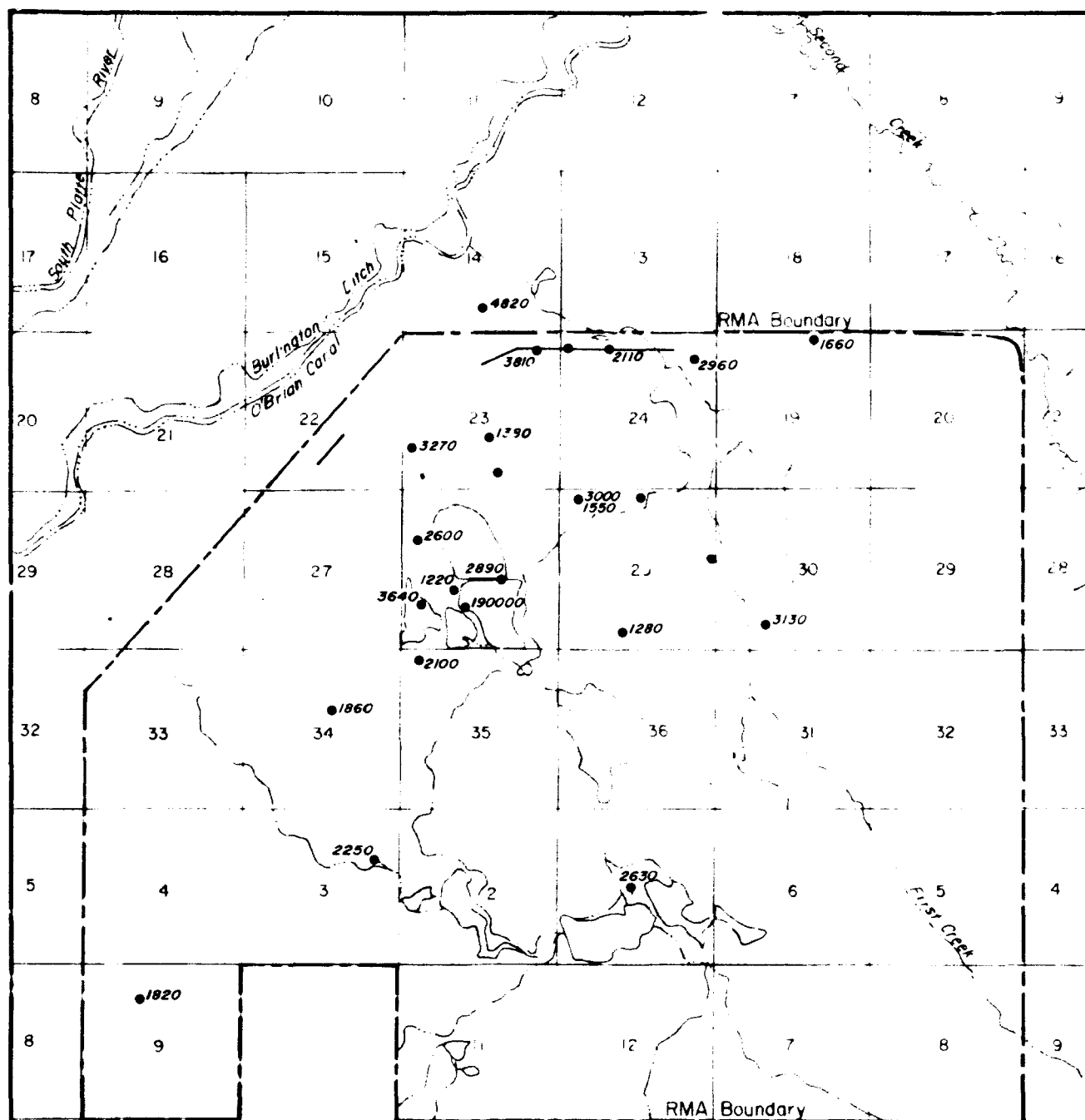


0 5000 10,000 Feet
0 1000 2000 3000 Meters

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FIGURE A-98
Fluoride Detections
Denver Zone 1
Winter 1987/88

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Explanation

• Denver Zone 2 Well Location

Analyte Concentration in µg/l

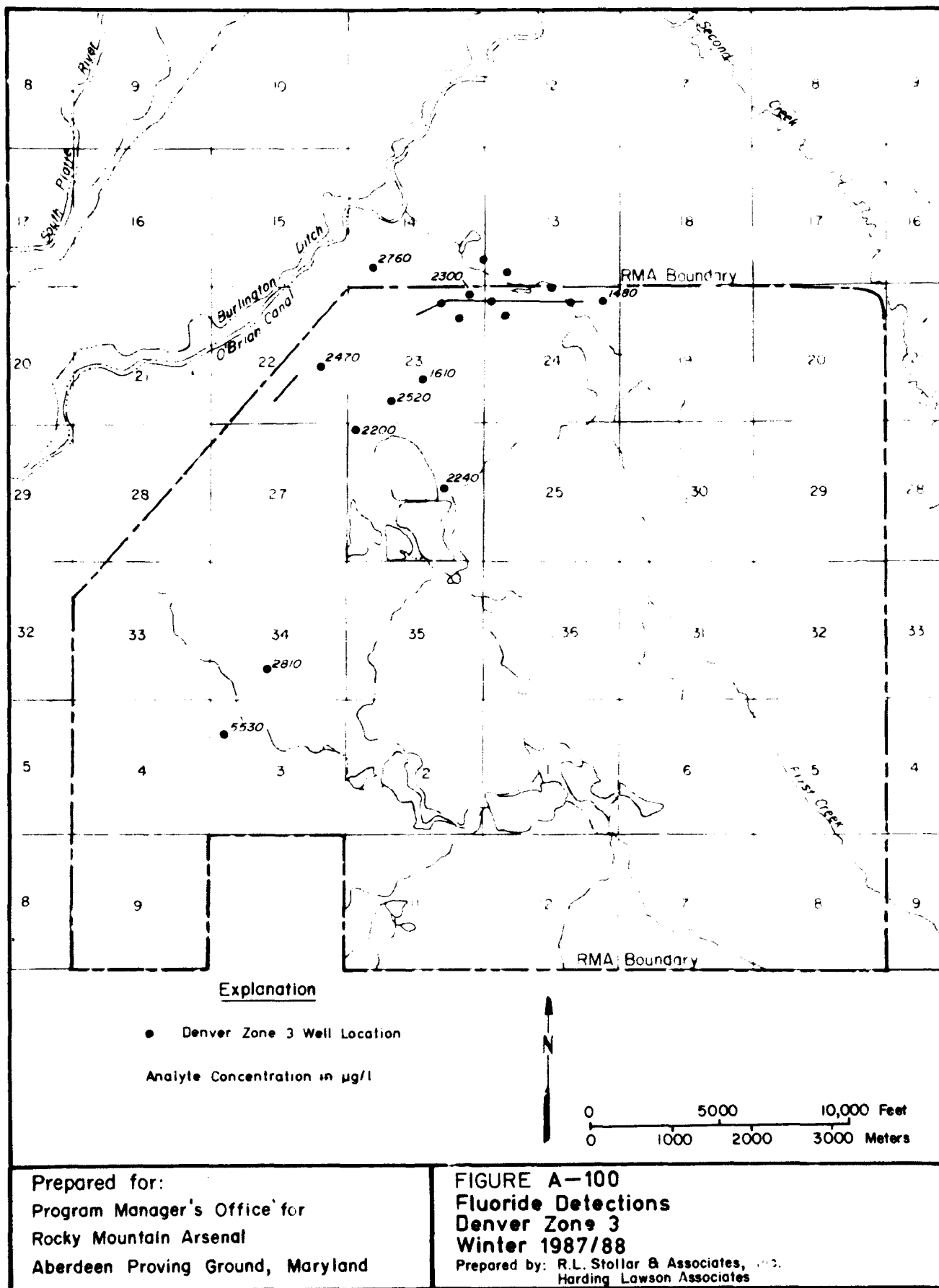


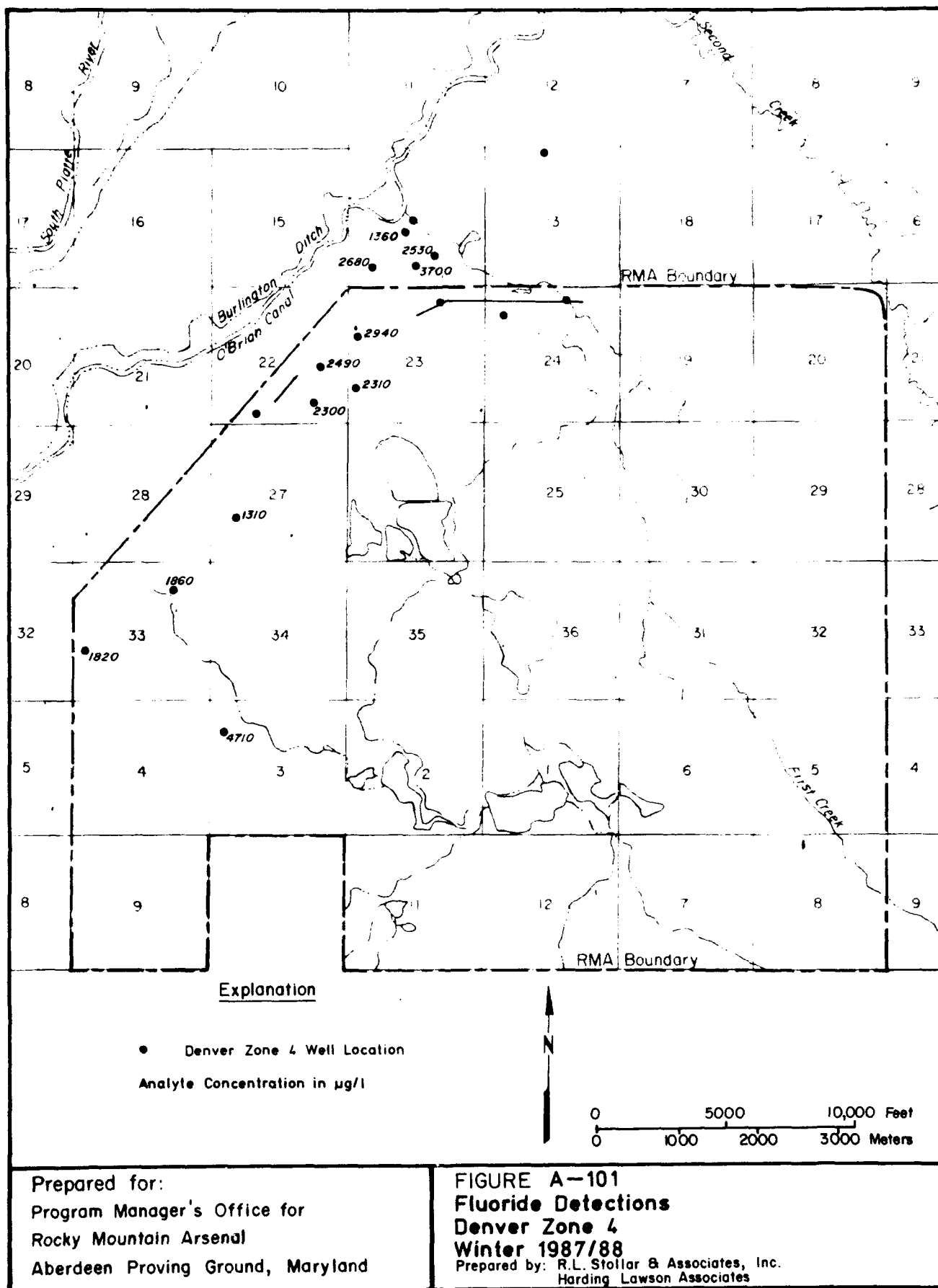
0 5000 10,000 Feet
0 1000 2000 3000 Meters

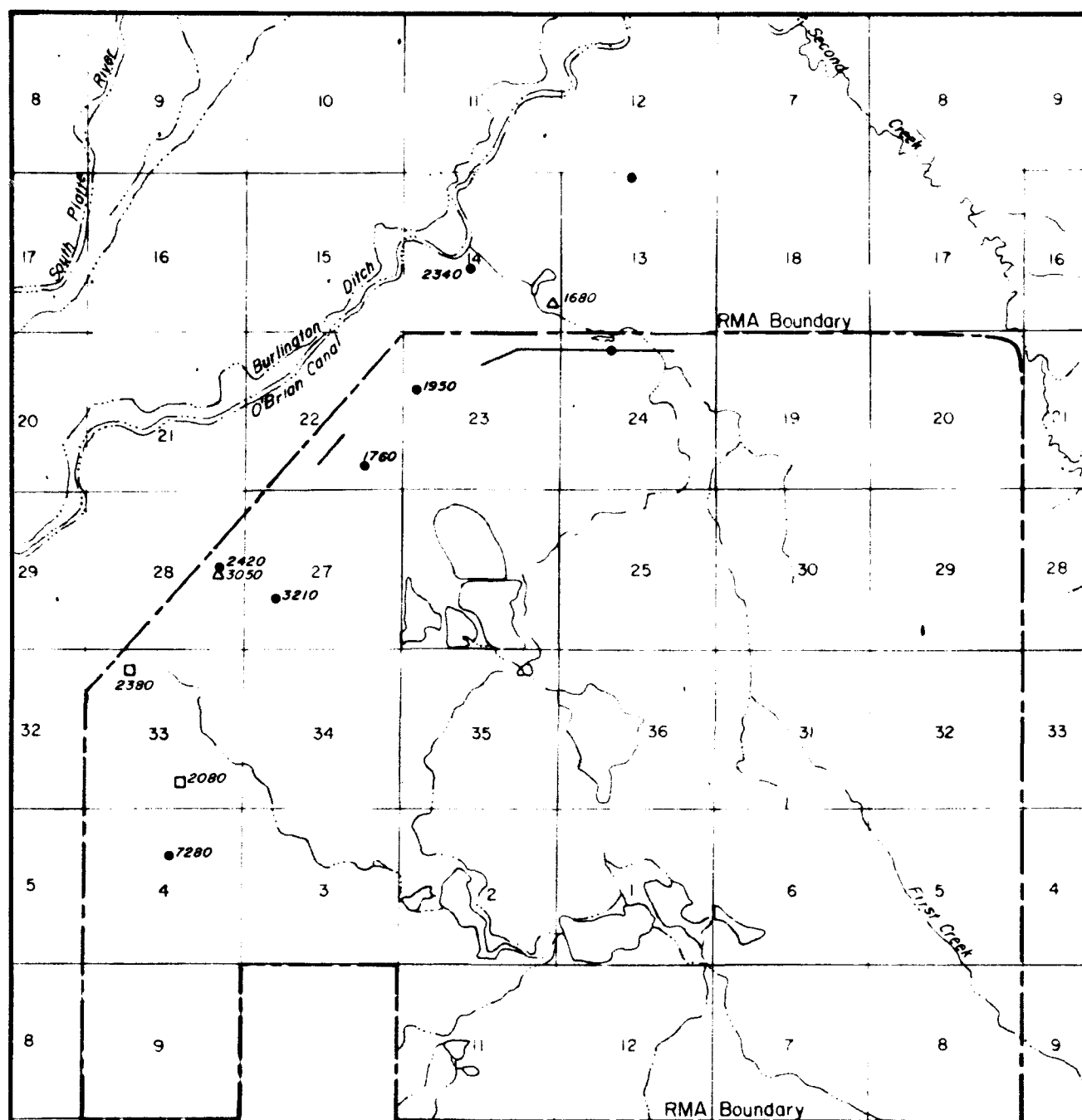
Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-99
Fluoride Detections
Denver Zone 2
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates







Explanation

- Denver Zone 5 Well Location
 - △ Denver Zone 6 Well Location
 - Denver Zone 7 Well Location
- Analyte Concentration in µg/l

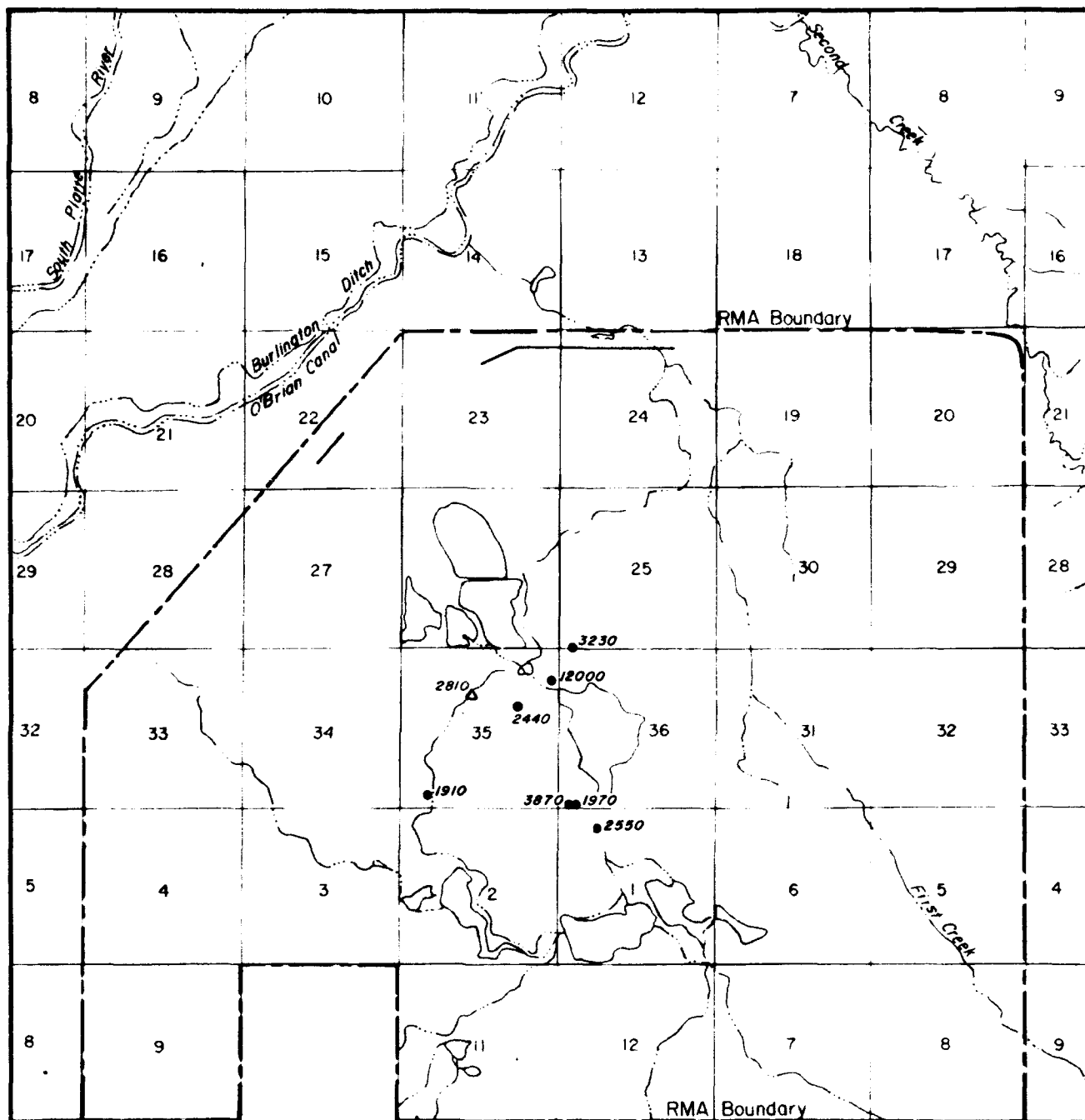


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-102
Fluoride Detections
Denver Zones 5, 6, & 7
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- , Denver Zone A Well Location
- △ Denver Zone VC Well Location
- Analyte Concentration in µg/l

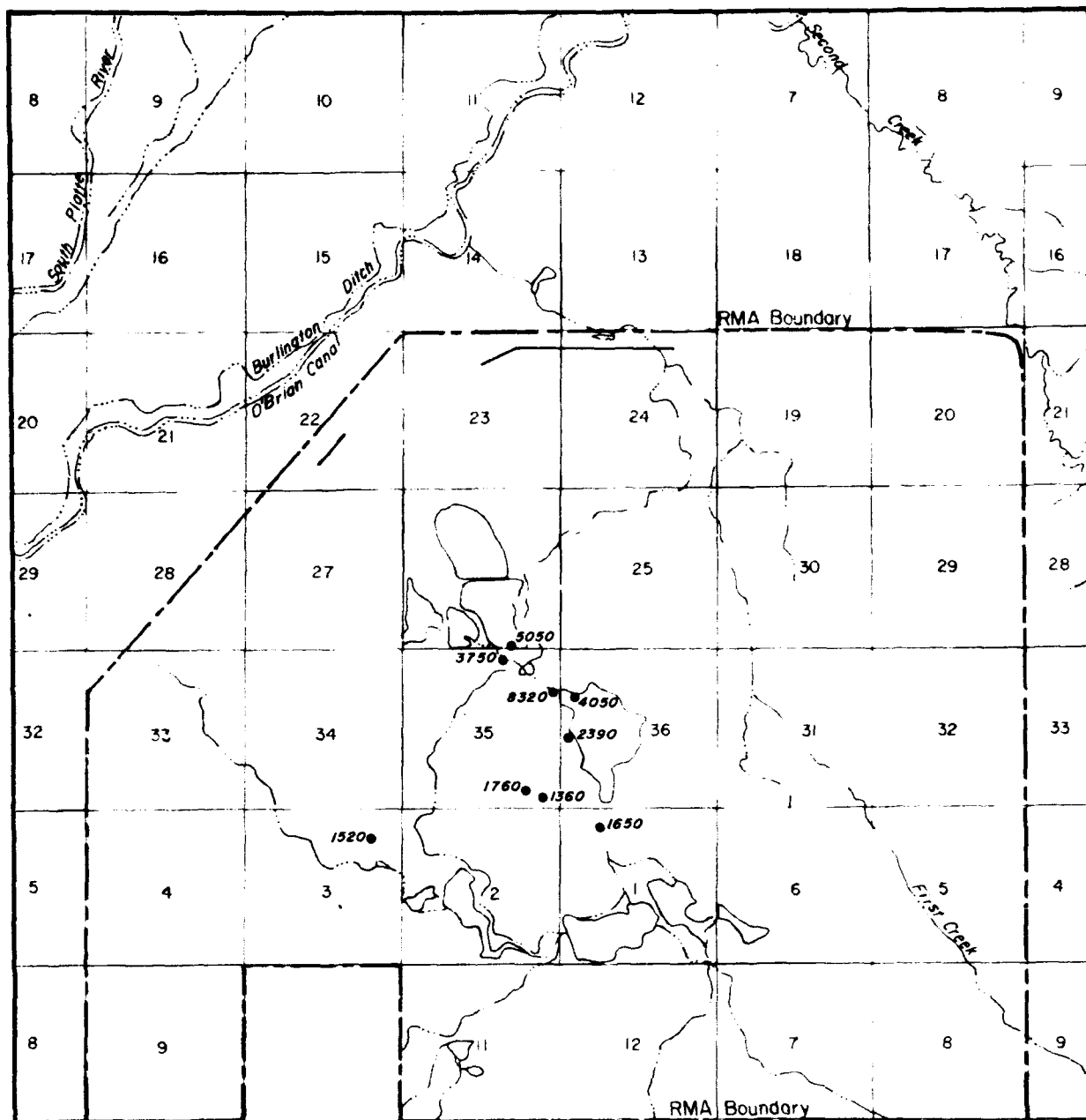


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-103
Fluoride Detections
Denver Zones A & VC
Spring 1988

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 1U Well Location
- Analyte Concentration in µg/l

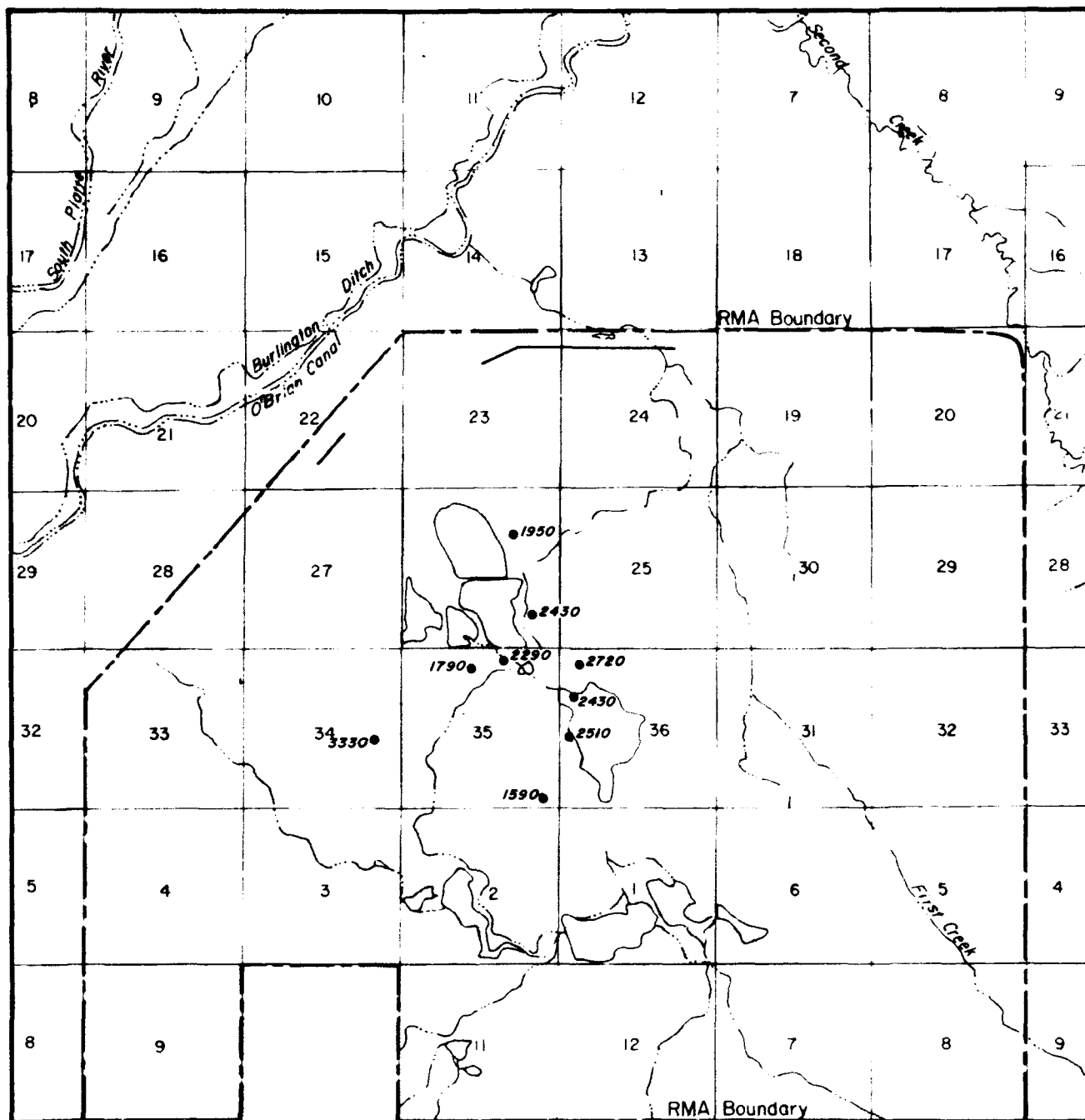


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-104
Fluoride Detections
Denver Zone 1U
Spring 1988

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

• Denver Zone 1 Well Location

Analyte Concentration in $\mu\text{g/l}$

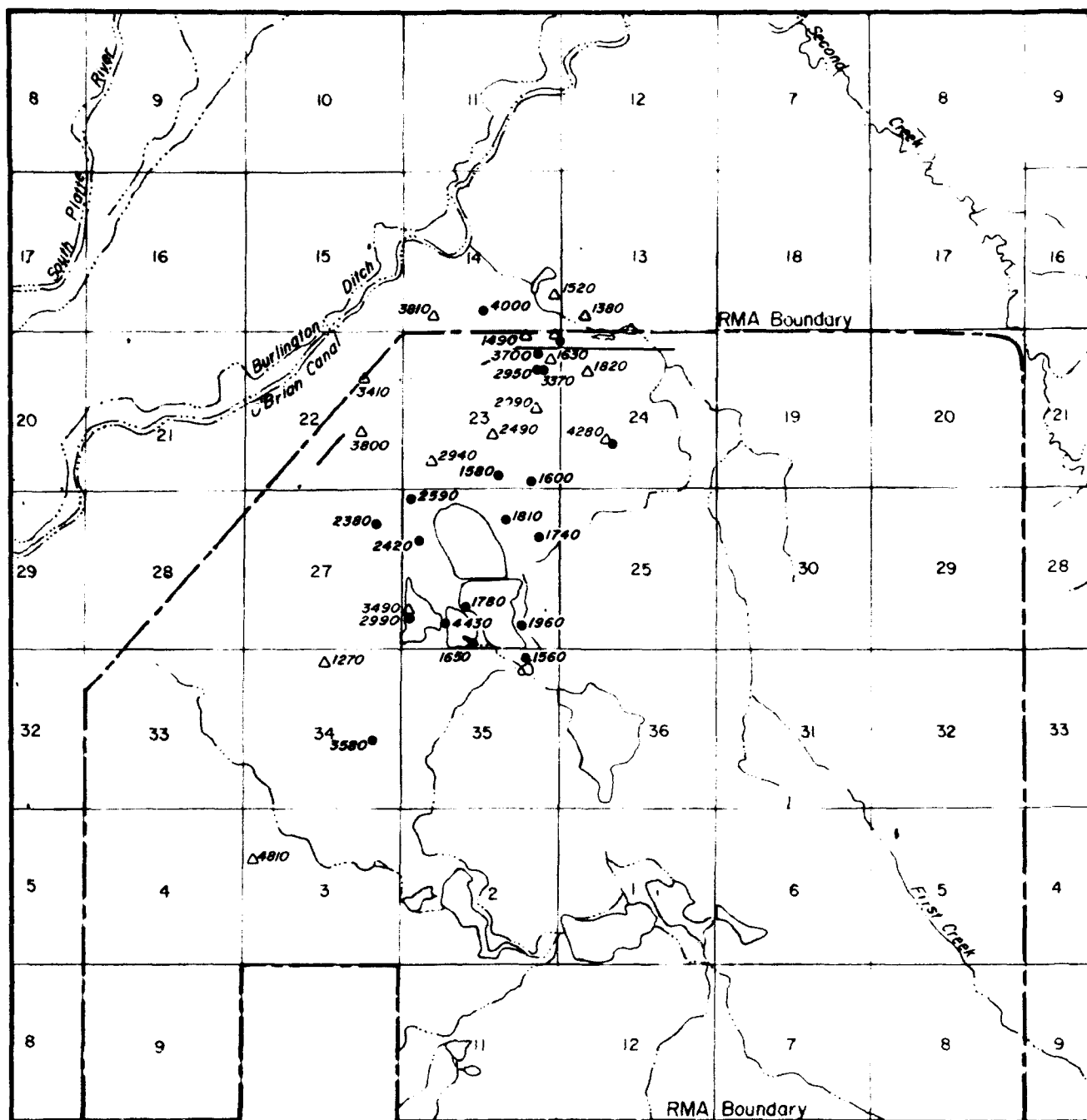


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-105
Fluoride Detections
Denver Zone 1
Spring 1988

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 2 Well Location
 - △ Denver Zone 3 Well Location
- Analyte Concentration in µg/l

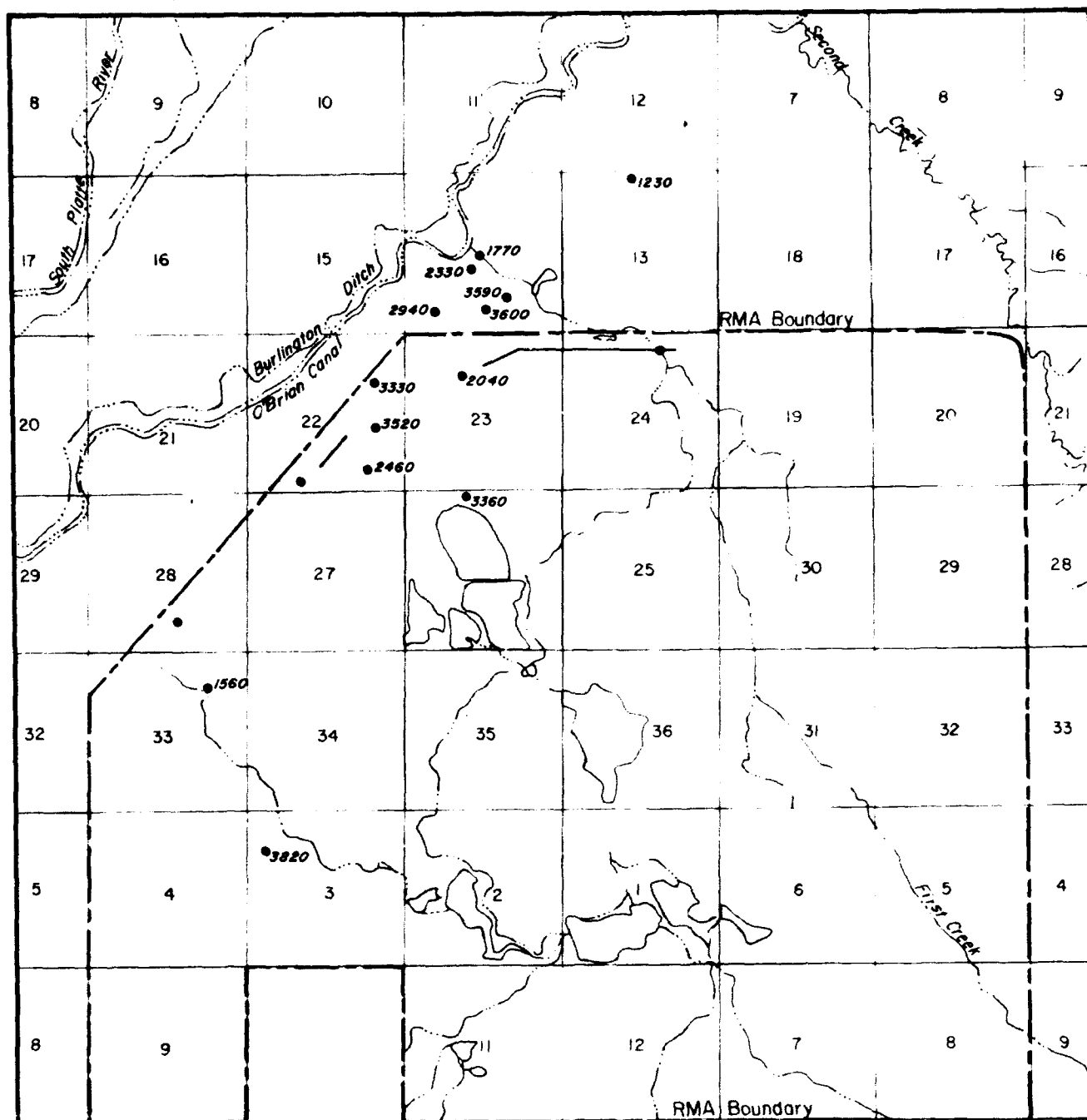


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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FIGURE A-106
Fluoride Detections
Denver Zones 2 & 3
Spring 1988

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

• Denver Zone 4 Well Location

Analyte Concentration in $\mu\text{g/l}$

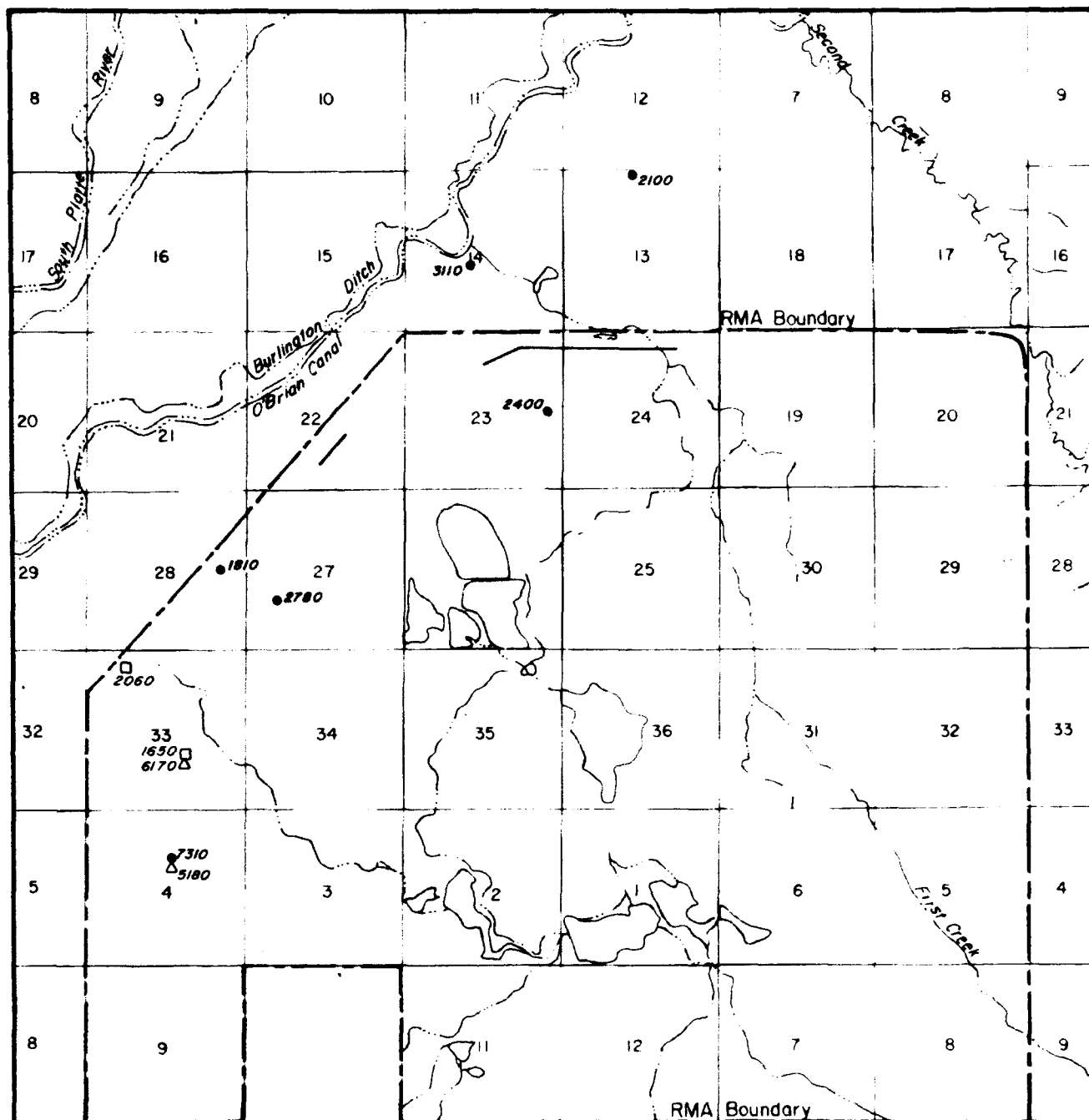


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-107
Fluoride Detections
Denver Zone 4
Spring 1988

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 5 Well Location
 - △ Denver Zone 6 Well Location
 - Denver Zone 7 Well Location
- Analyte Concentration in µg/l

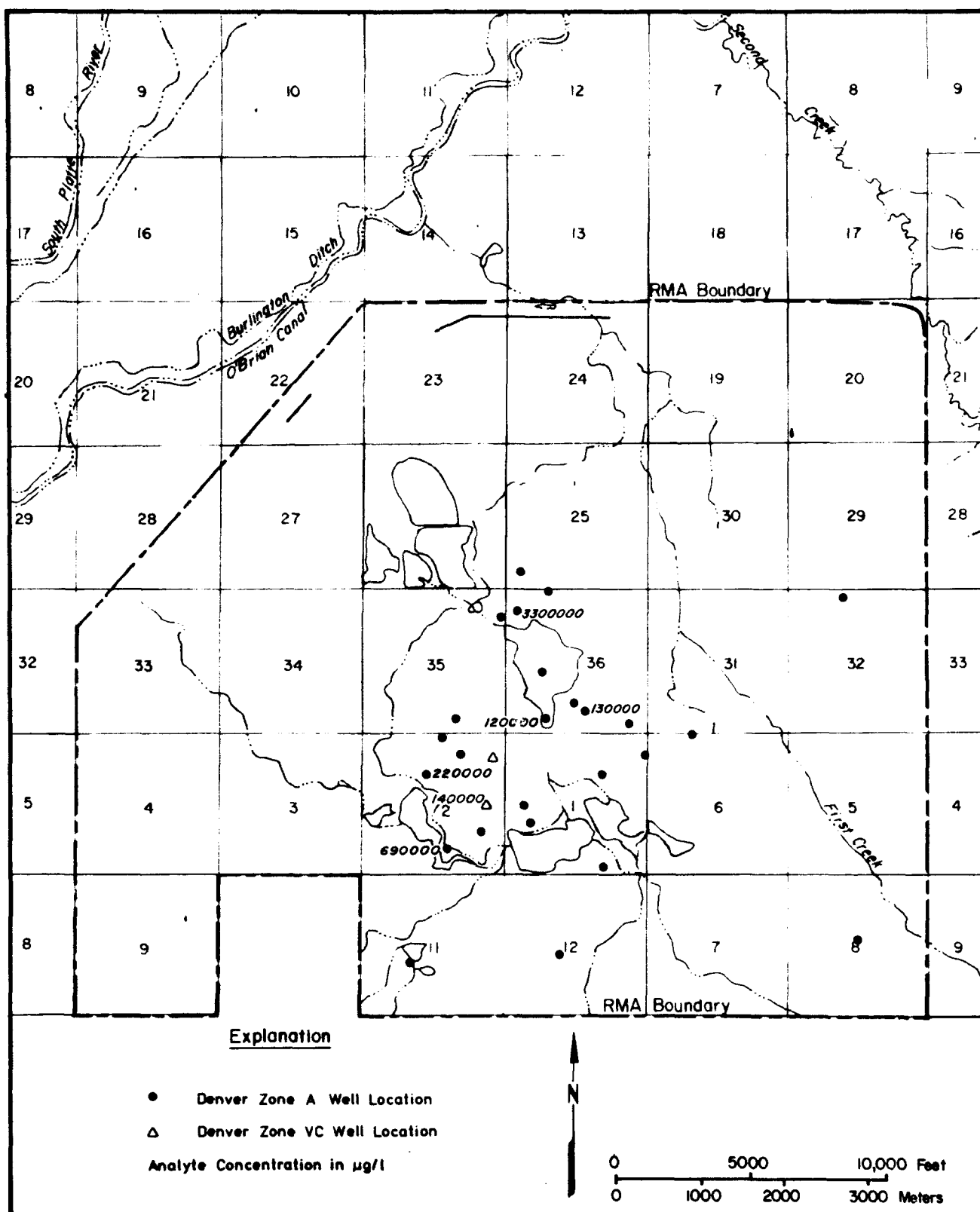


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-108
Fluoride Detections
Denver Zones 5, 6, & 7
Spring 1988

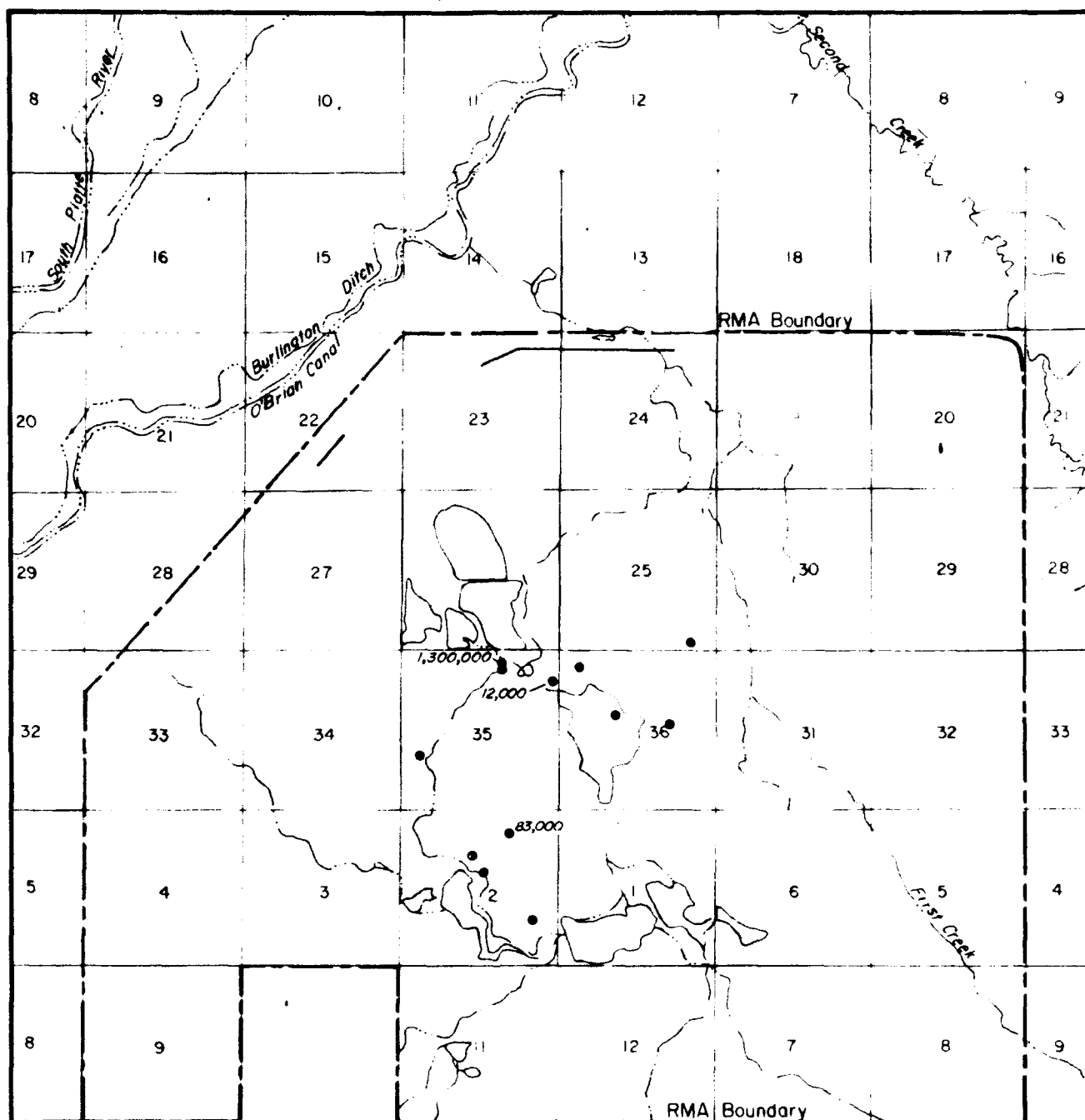
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-109
Chloride Detections
Denver Zones A & VC
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

• Denver Zone 1U Well Location

Analyte Concentration in µg/l

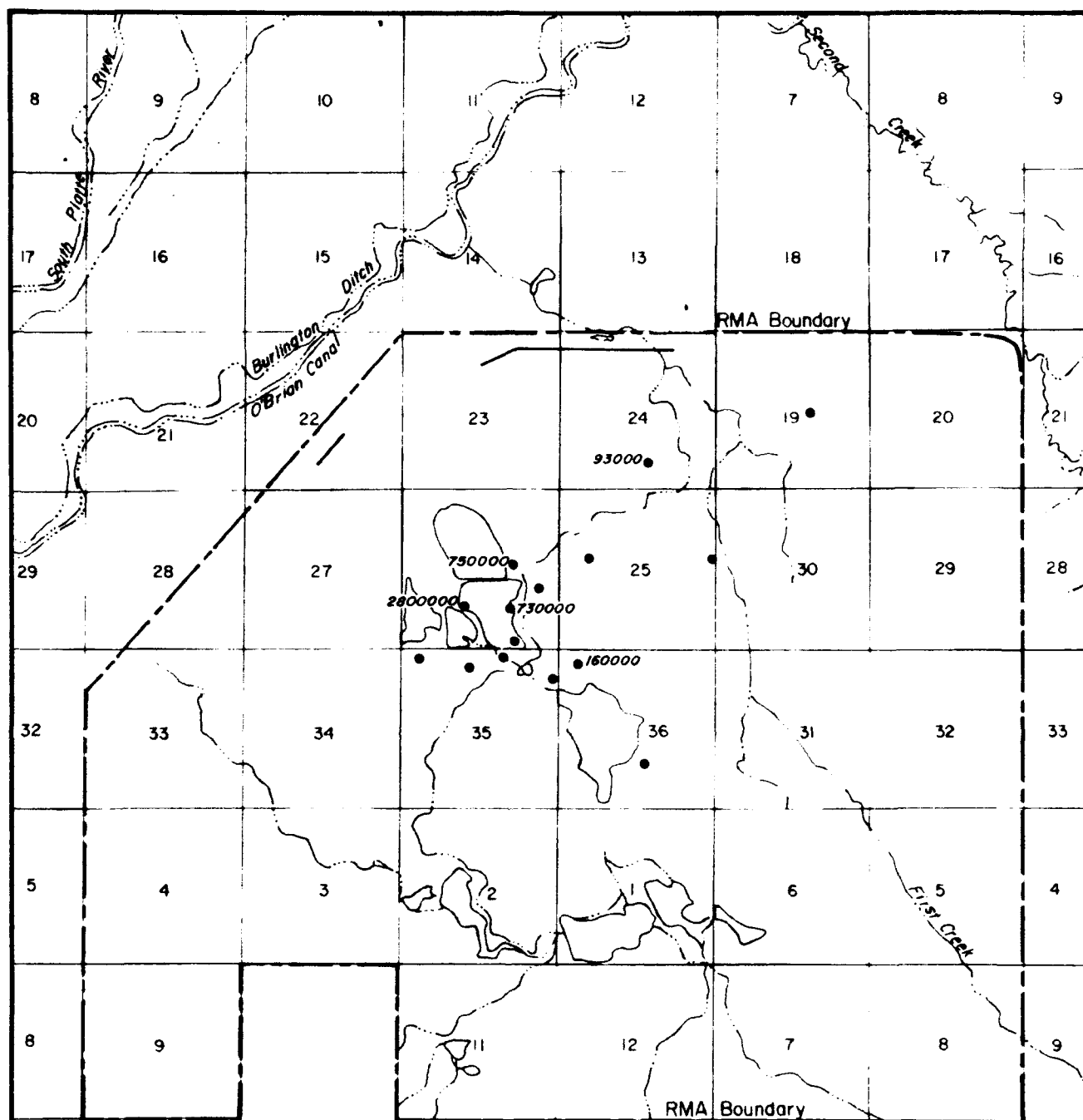


0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
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Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-110
Chloride Detections
Denver Zone 1U
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Denver Zone 1 Well Location
- Analyte Concentration in $\mu\text{g/l}$

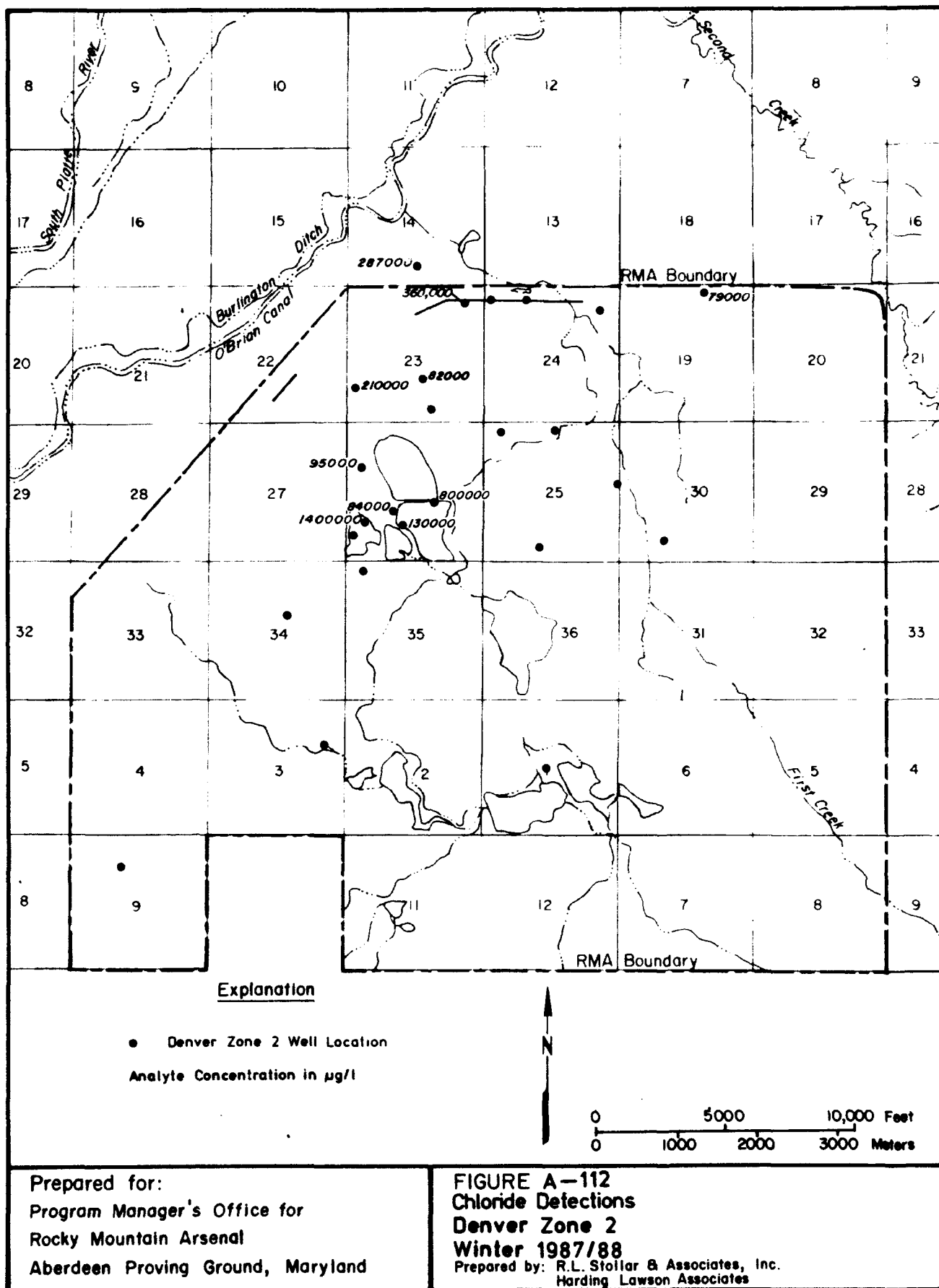


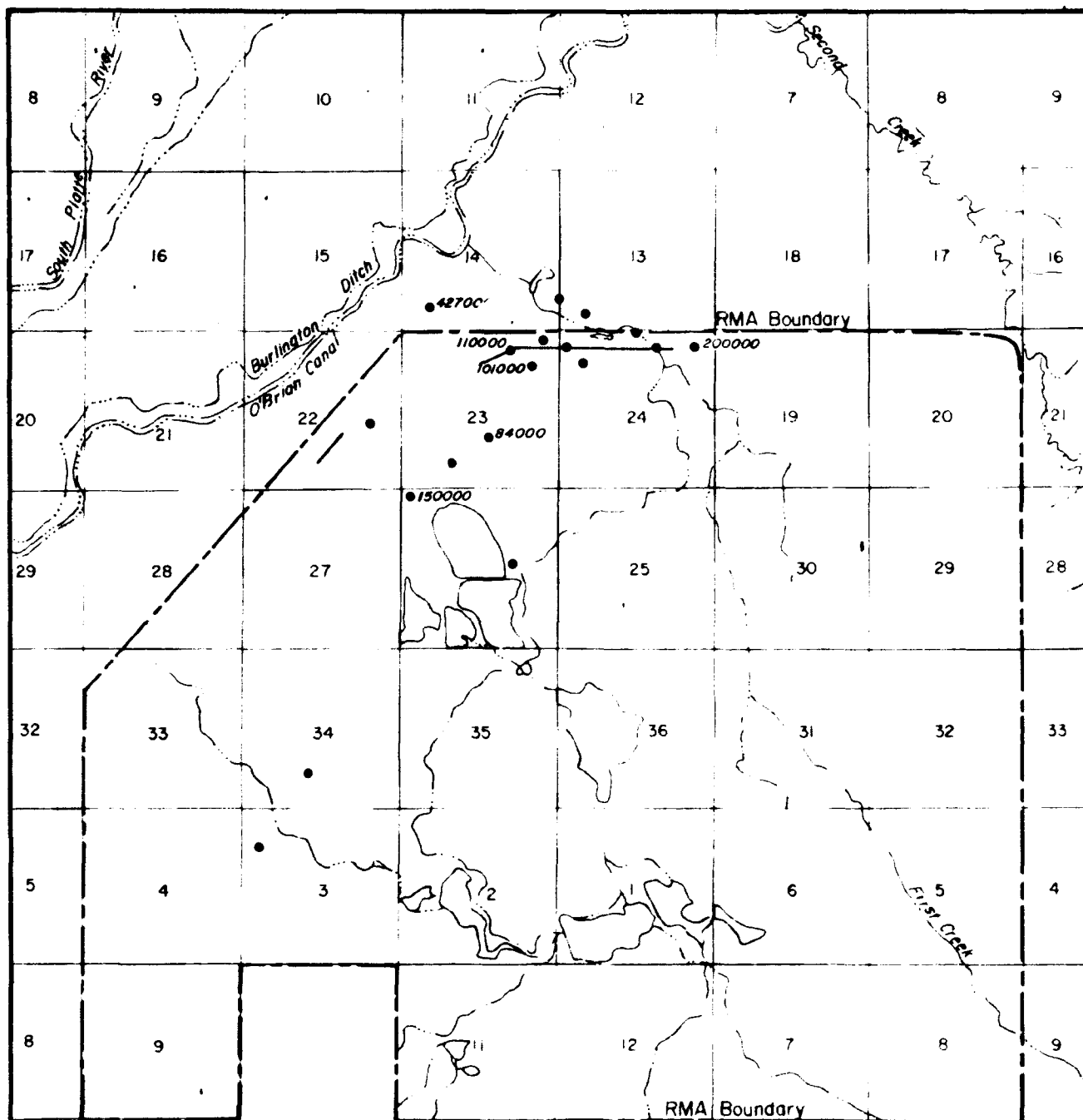
0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-111
Chloride Detections
Denver Zone 1
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates





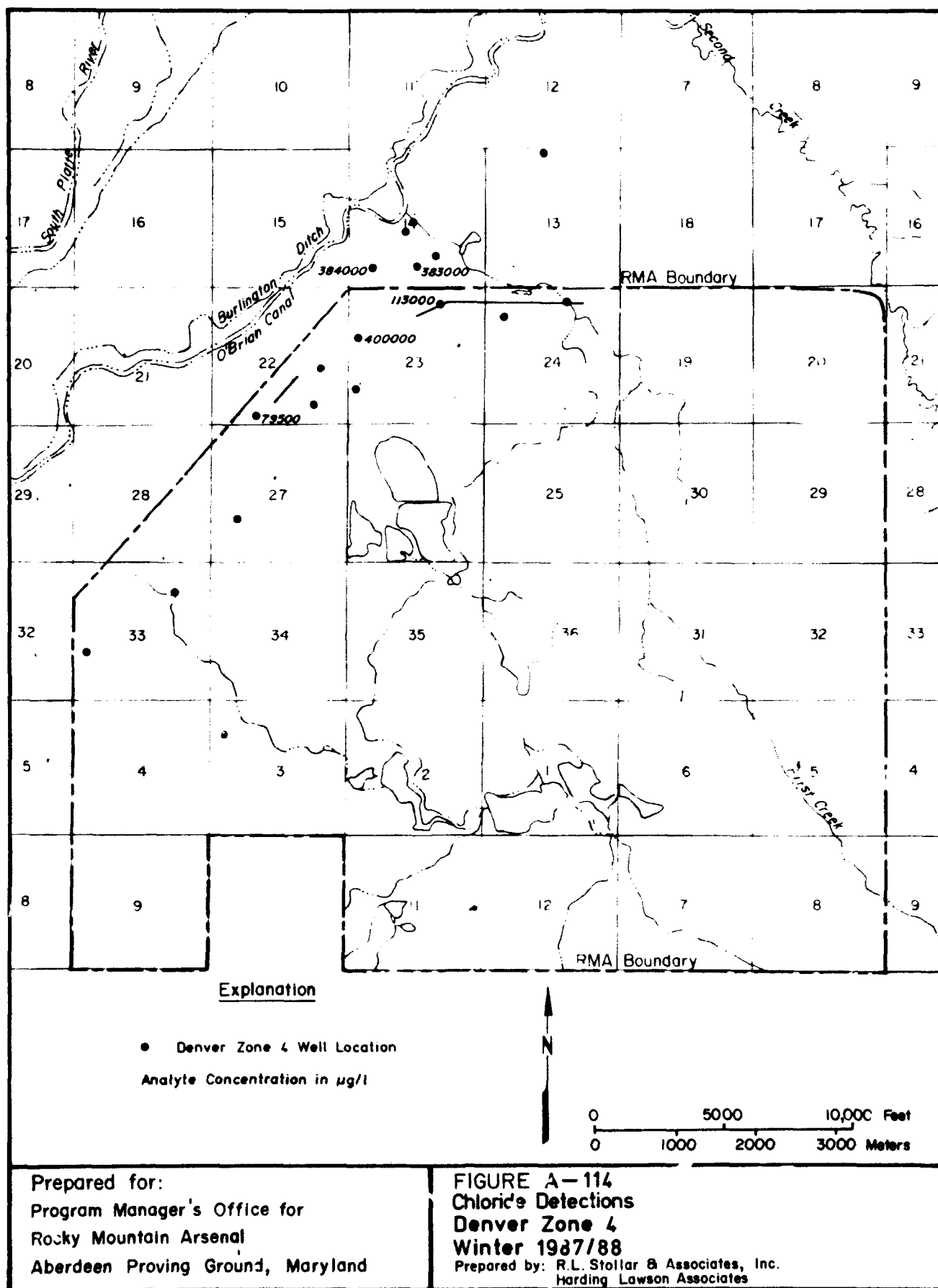
Explanation

- Denver Zone 3 Well Location
- Analyte Concentration in $\mu\text{g/l}$

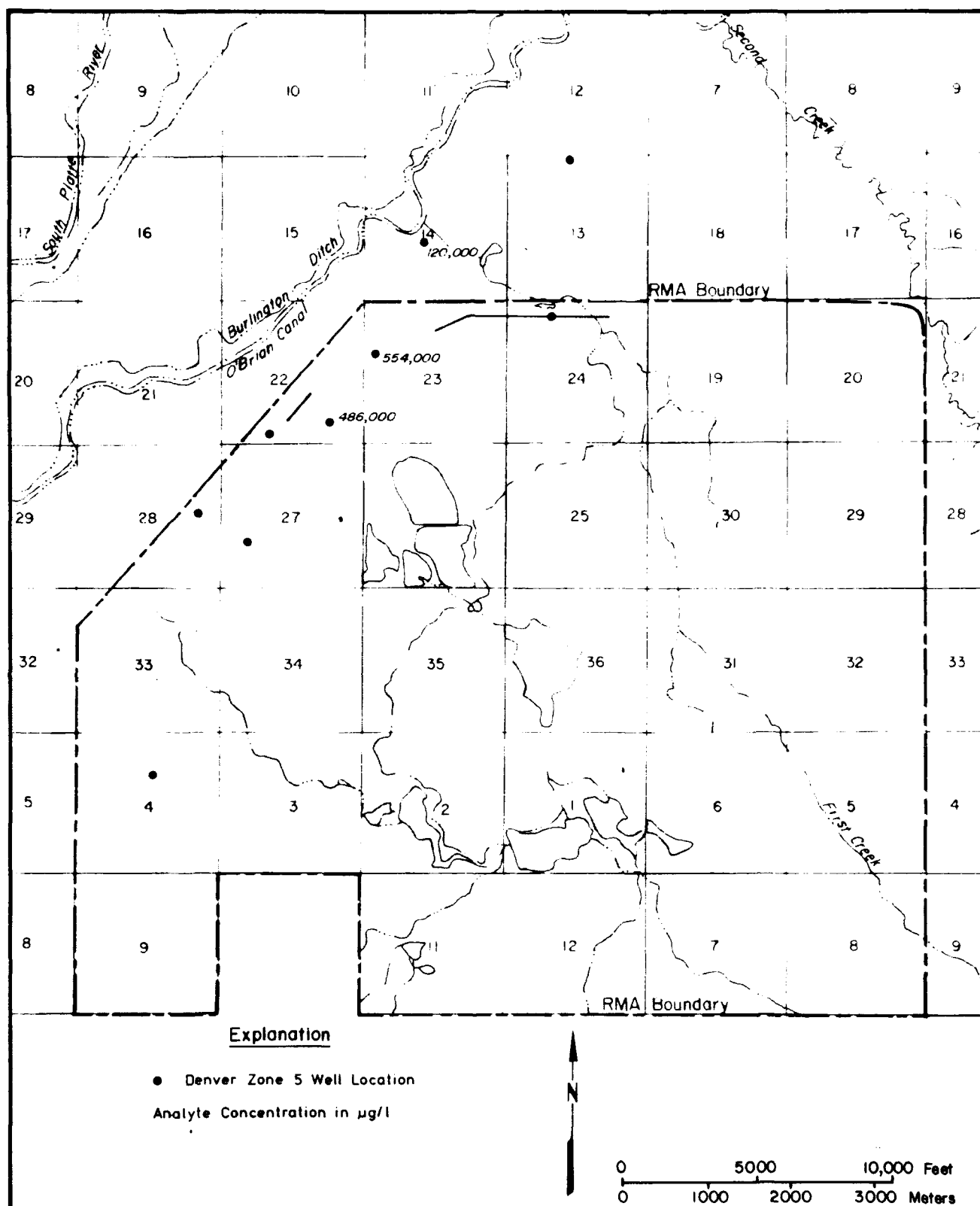
Prepared for:
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 Rocky Mountain Arsenal
 Aberdeen Proving Ground, Maryland

FIGURE A-113
Chloride Detections
Denver Zone 3
Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates

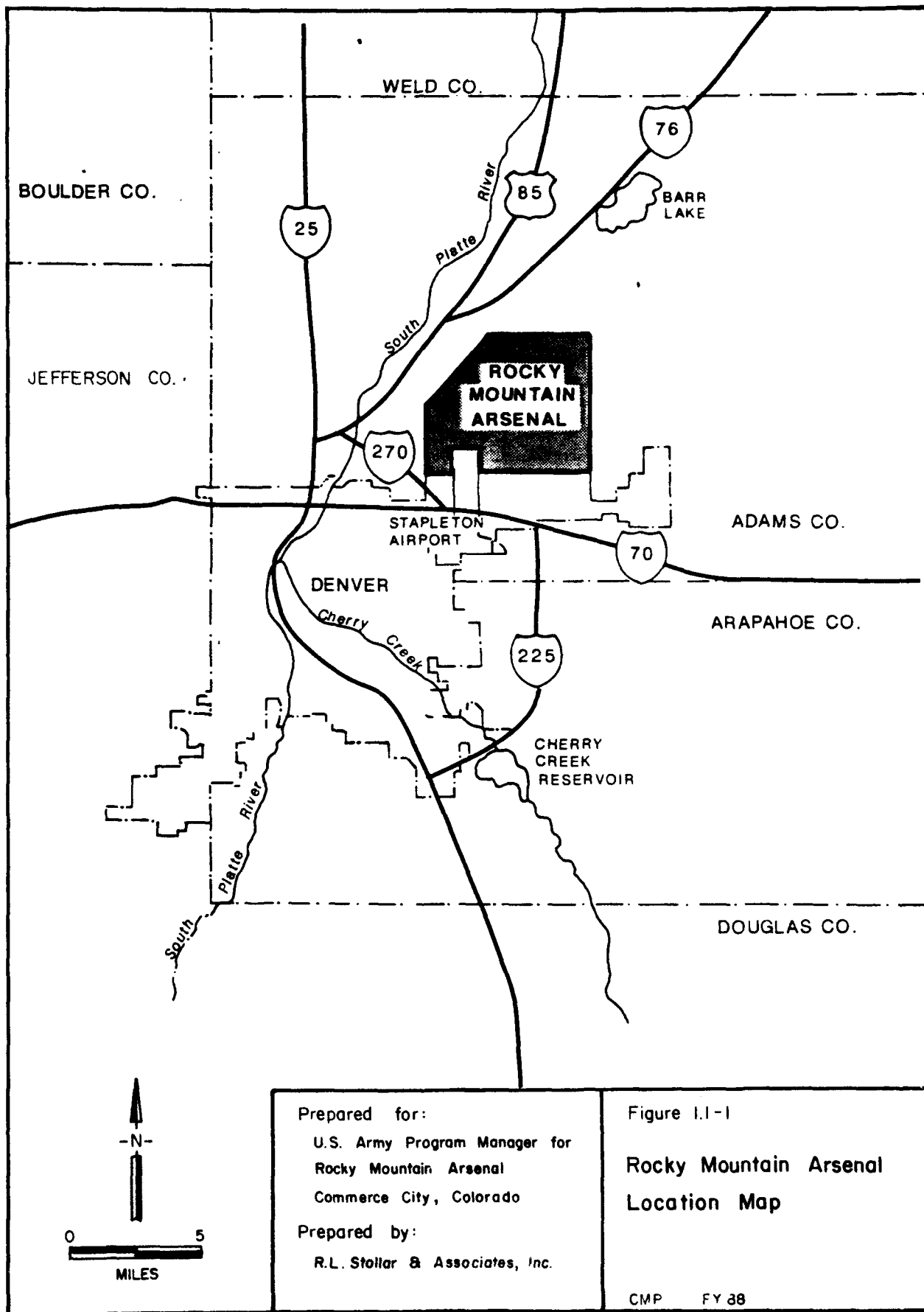


Prepared for:
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 Aberdeen Proving Ground, Maryland



Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE A-115
Chloride Detections
Denver Zone 5
Winter 1987/88
Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



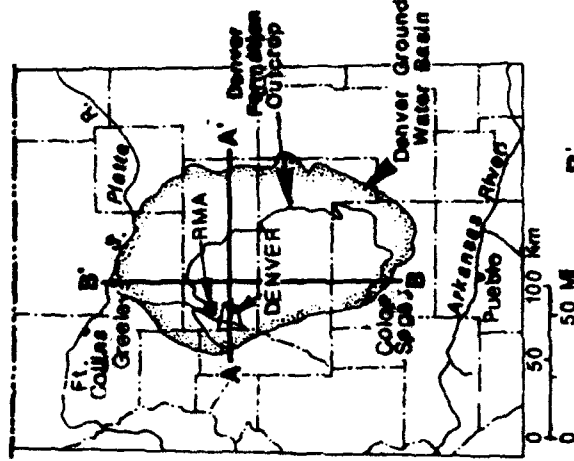
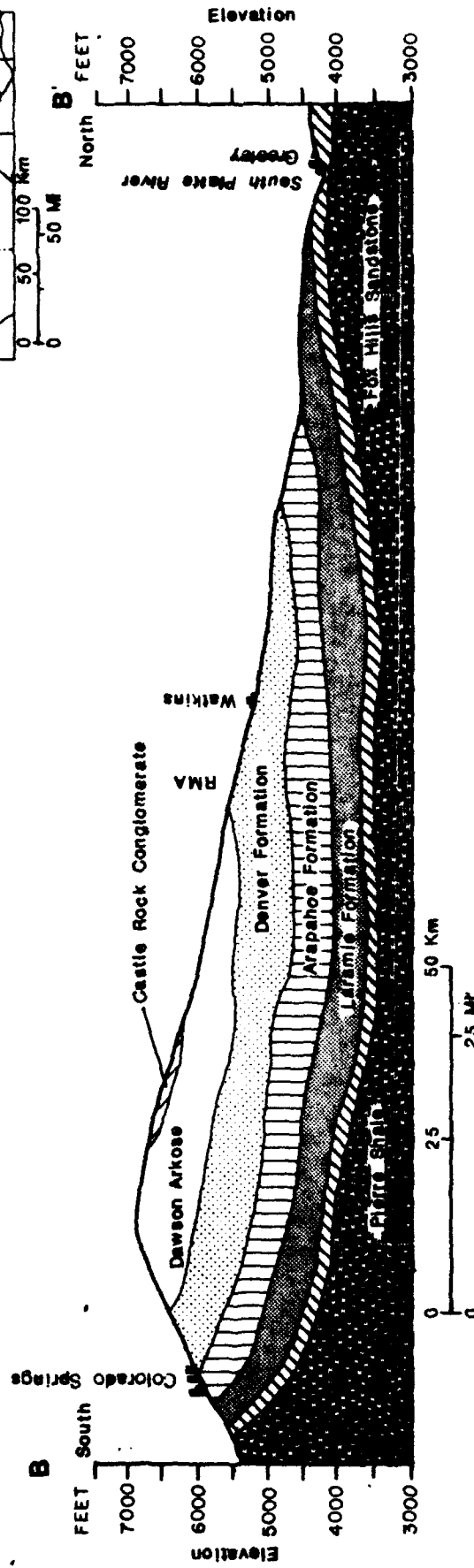
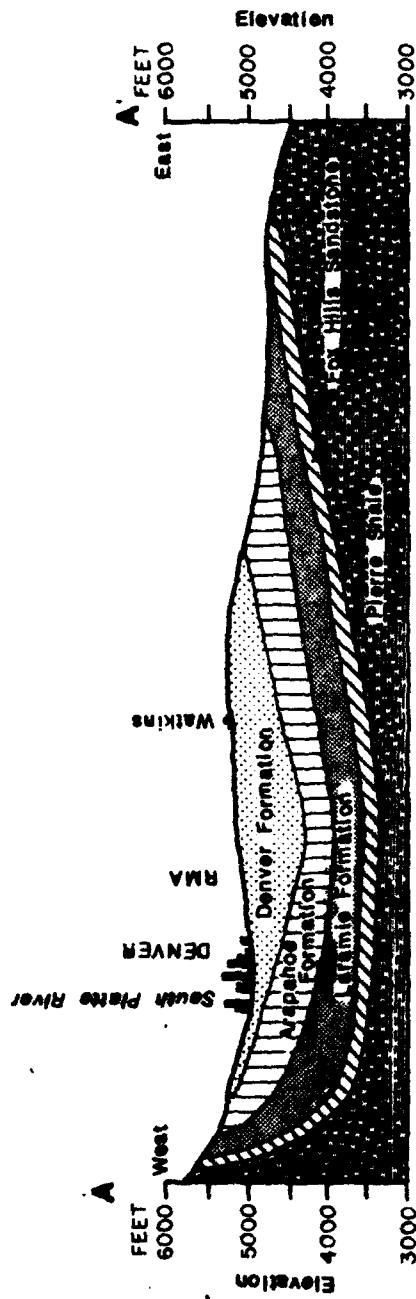


FIGURE 2.1-1
Upper Stratigraphic Sections of the Denver Basin

Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

Source: Robson, 1981

ERA	PERIOD	EPOCH	AGE	FORMATION
Cenozoic	Quaternary	Holocene		Post Piney Creek
				Piney Creek
				Eolian
		Pleistocene	Wisconsin	Loess
				Broadway
				Louviers
			Illinoian	Slocum
			Kansan	Verdos

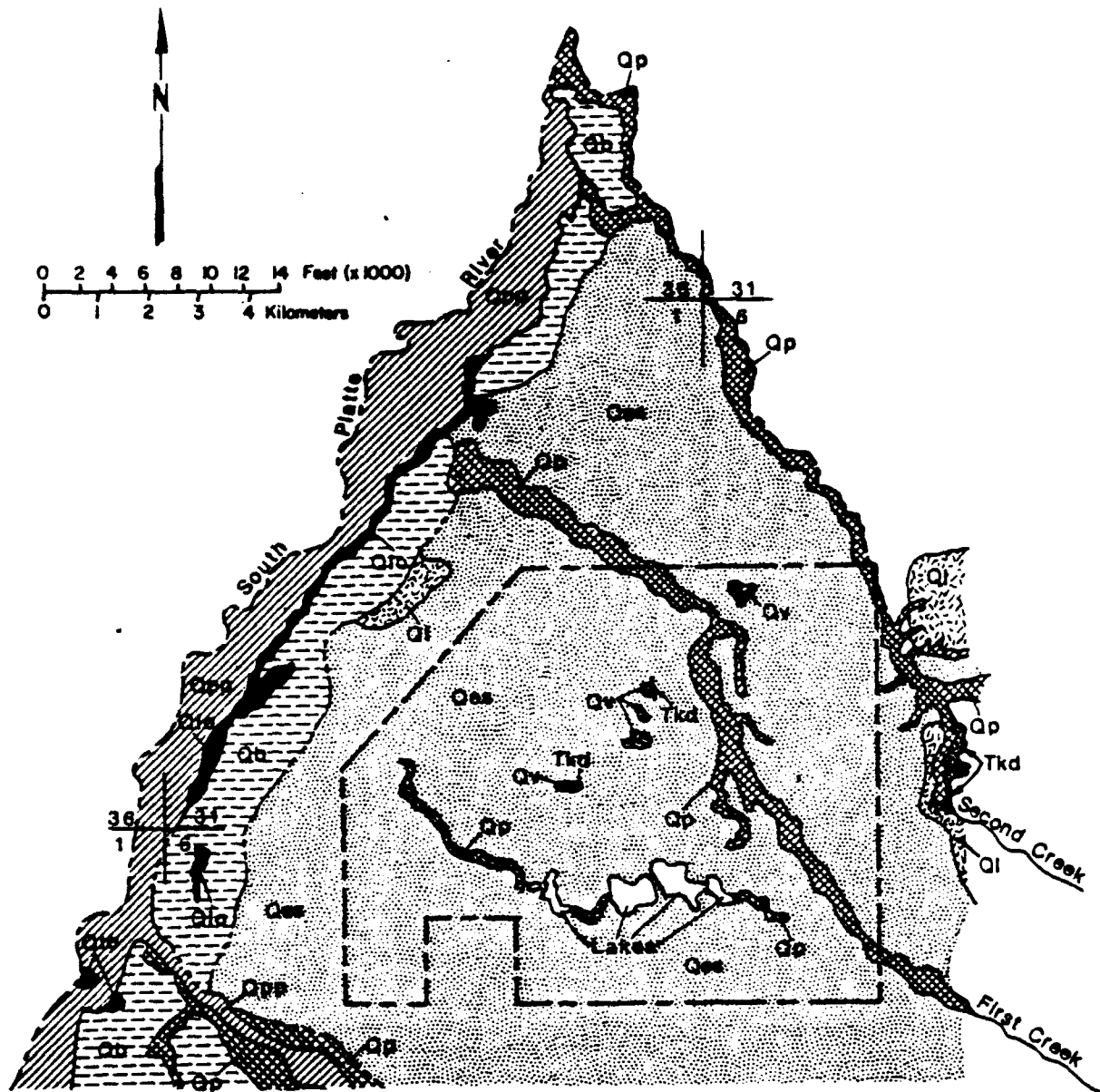
Not to Scale

Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

Aberdeen Proving Ground, Maryland

FIGURE 2.1-2
Quaternary Columnar Section

Source: Modified from MKE (1988)



Explanation

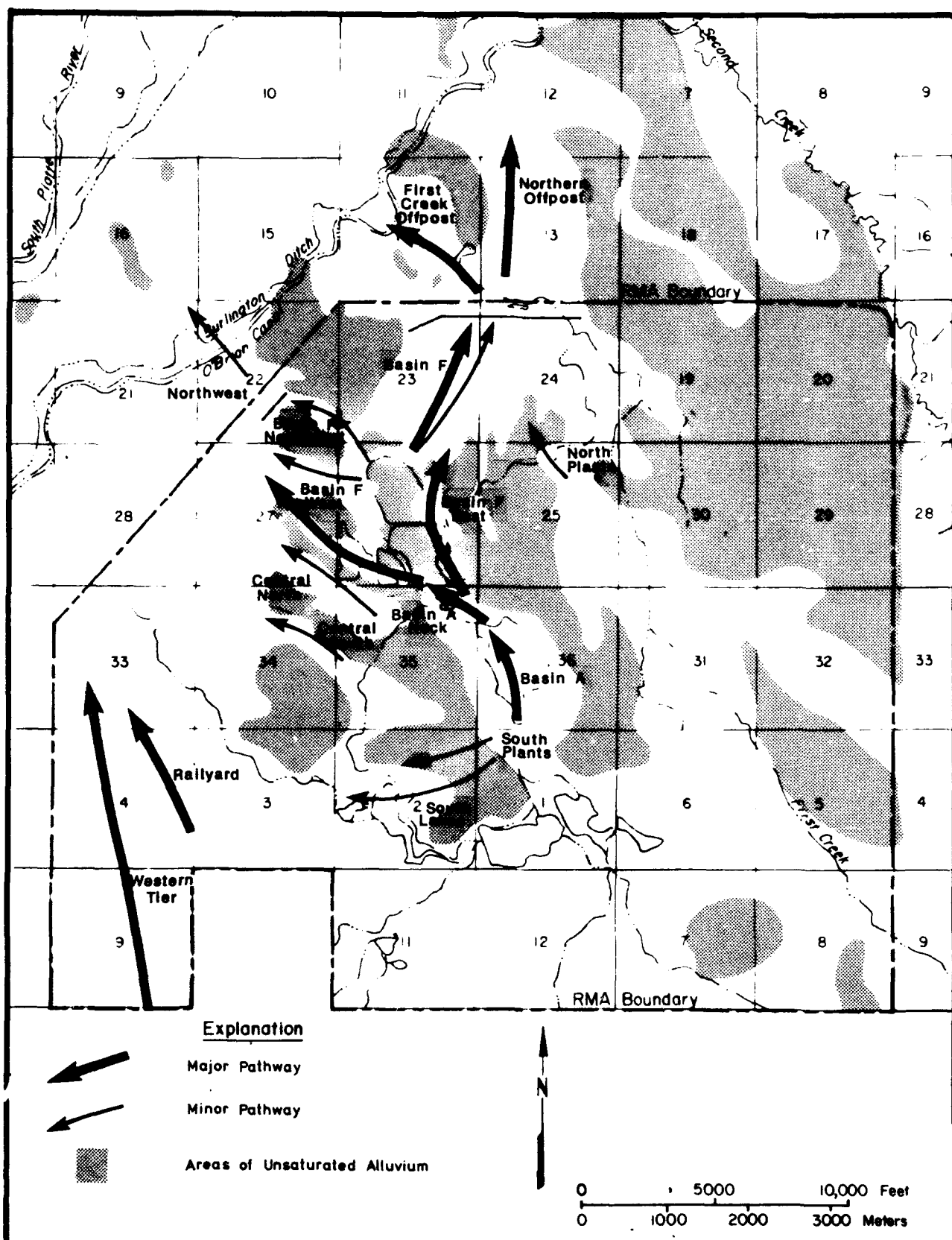
	Qpp	Post Piney Creek Alluvium (Quaternary)
	Qp	Piney Creek Alluvium (Quaternary)
	Qes	Eolian Sand (Quaternary)
	Ql	Loess (Quaternary)
	Qb	Broadway Alluvium (Quaternary)
	Qlo	Louviers Alluvium (Quaternary)
	Qv	Verdes Alluvium (Quaternary)
	Tkd	Denver Formation (Upper Cretaceous & Tertiary)

Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

Aberdeen Proving Ground, Maryland

FIGURE 2.1-3
Geologic Map of Rocky
Mountain Arsenal Area

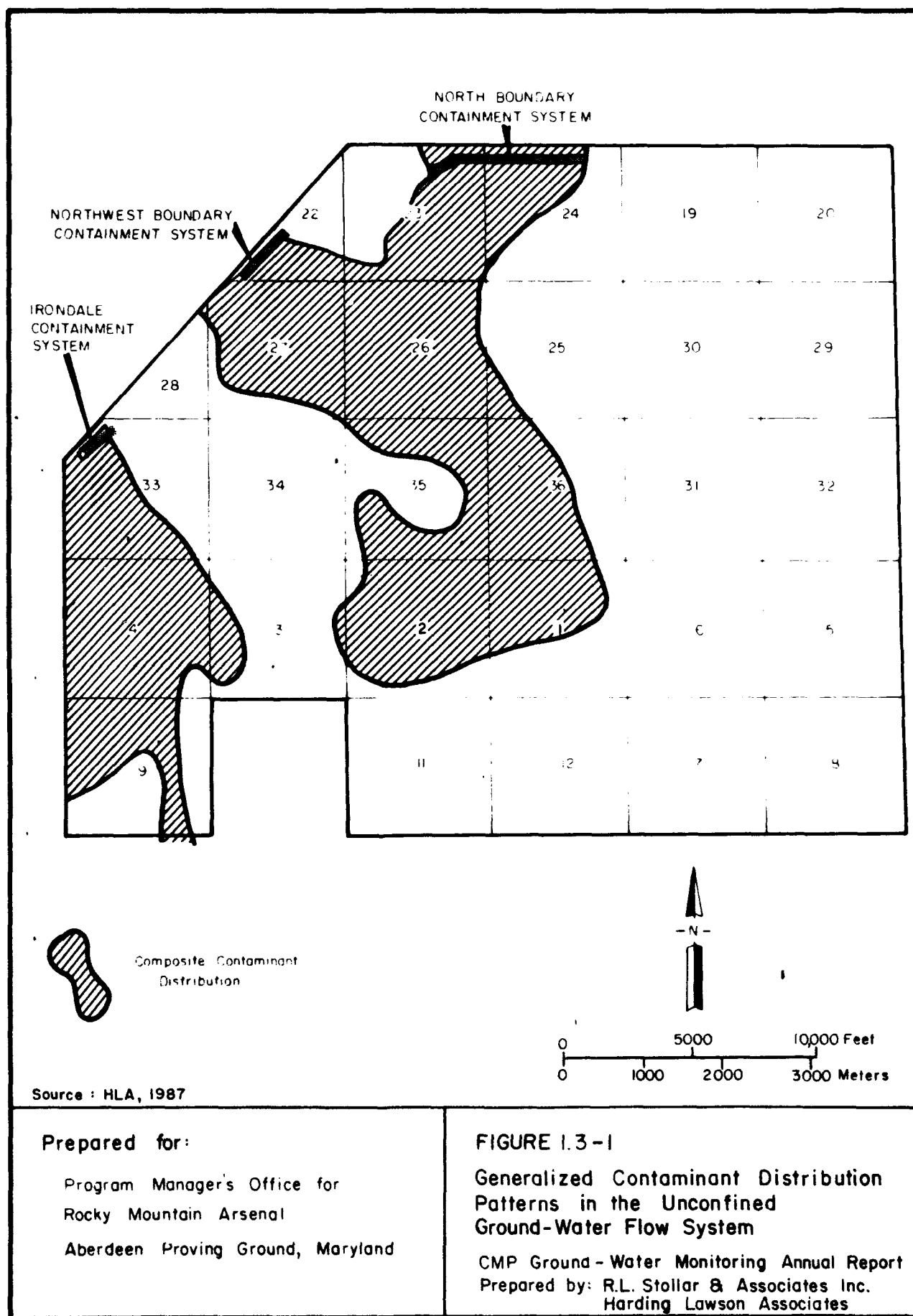
Source: Lindvall (1980)



Prepared for:
 U.S. Army Program Manager
 for Rocky Mountain Arsenal
 Aberdeen Proving Ground, Maryland

FIGURE 2.2-1
RMA Contaminant Migration Pathways

Prepared by: R.L. Stollar & Associates, Inc.



Prepared for:

Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE 1.3-1

Generalized Contaminant Distribution
Patterns in the Unconfined
Ground-Water Flow System

CMP Ground-Water Monitoring Annual Report
Prepared by: R.L. Stollar & Associates Inc.
Harding Lawson Associates

Sampling Events
Included Within
Winter 1987/88
Sampling Program

South Plants Wells

MKE

Date Not Complete
At Time Of Annual
Report Preparation

Wells Near RMA
Boundary Systems

Task 20

Offpost Wells

Task 41

Task 44

Presented in WRIR

Modified Task 44
Onpost Regional Network
Wells

Task 44

Semi-Annual
Specific Area Wells

CMP

Quarterly
Specific Area Wells

Basin
F

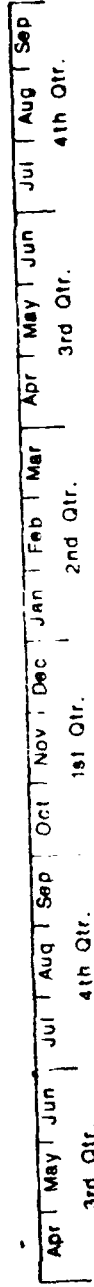
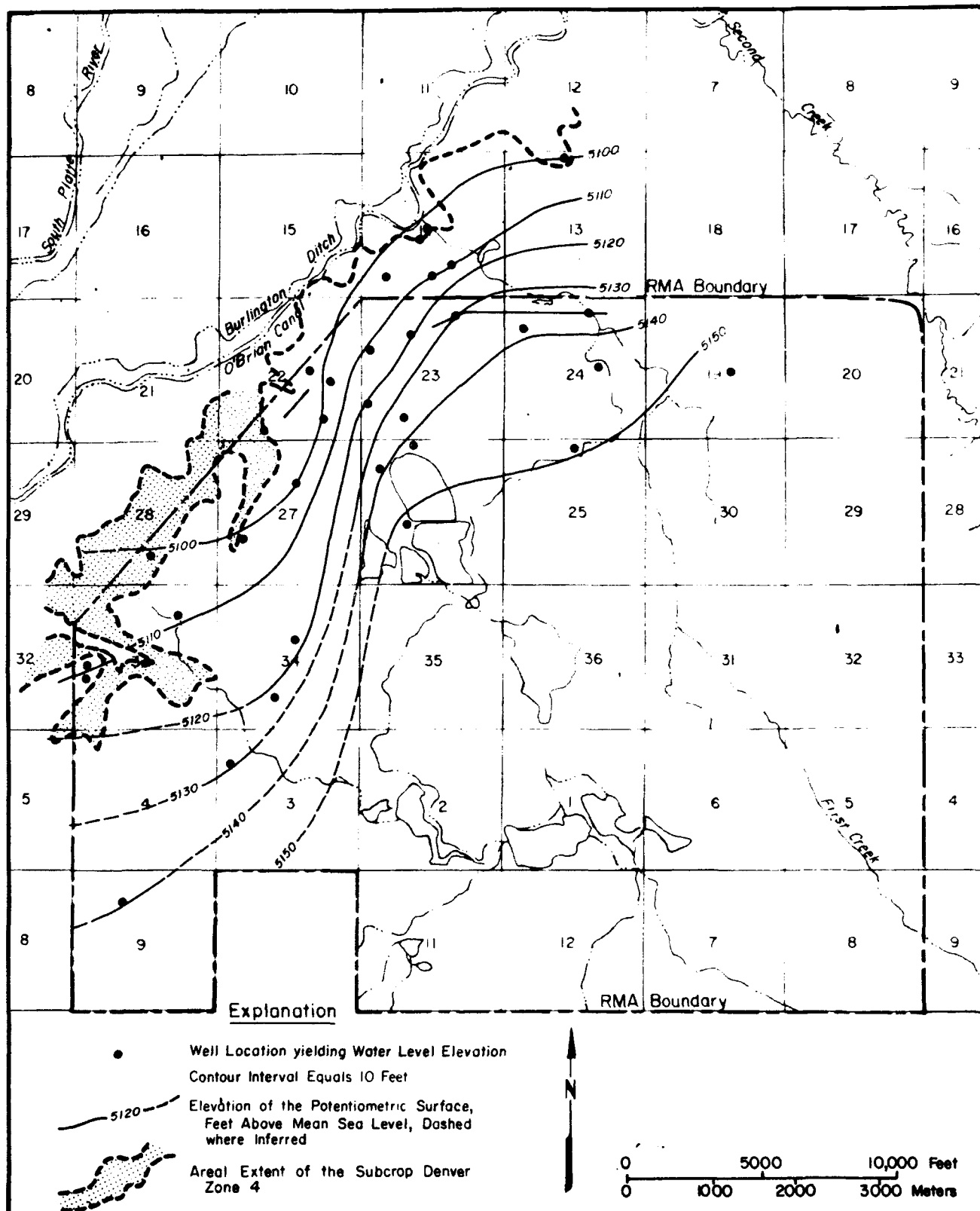


Figure 3.2-2
TEMPORAL RELATIONSHIPS BETWEEN VARIOUS
SAMPLING EVENTS AT RMA

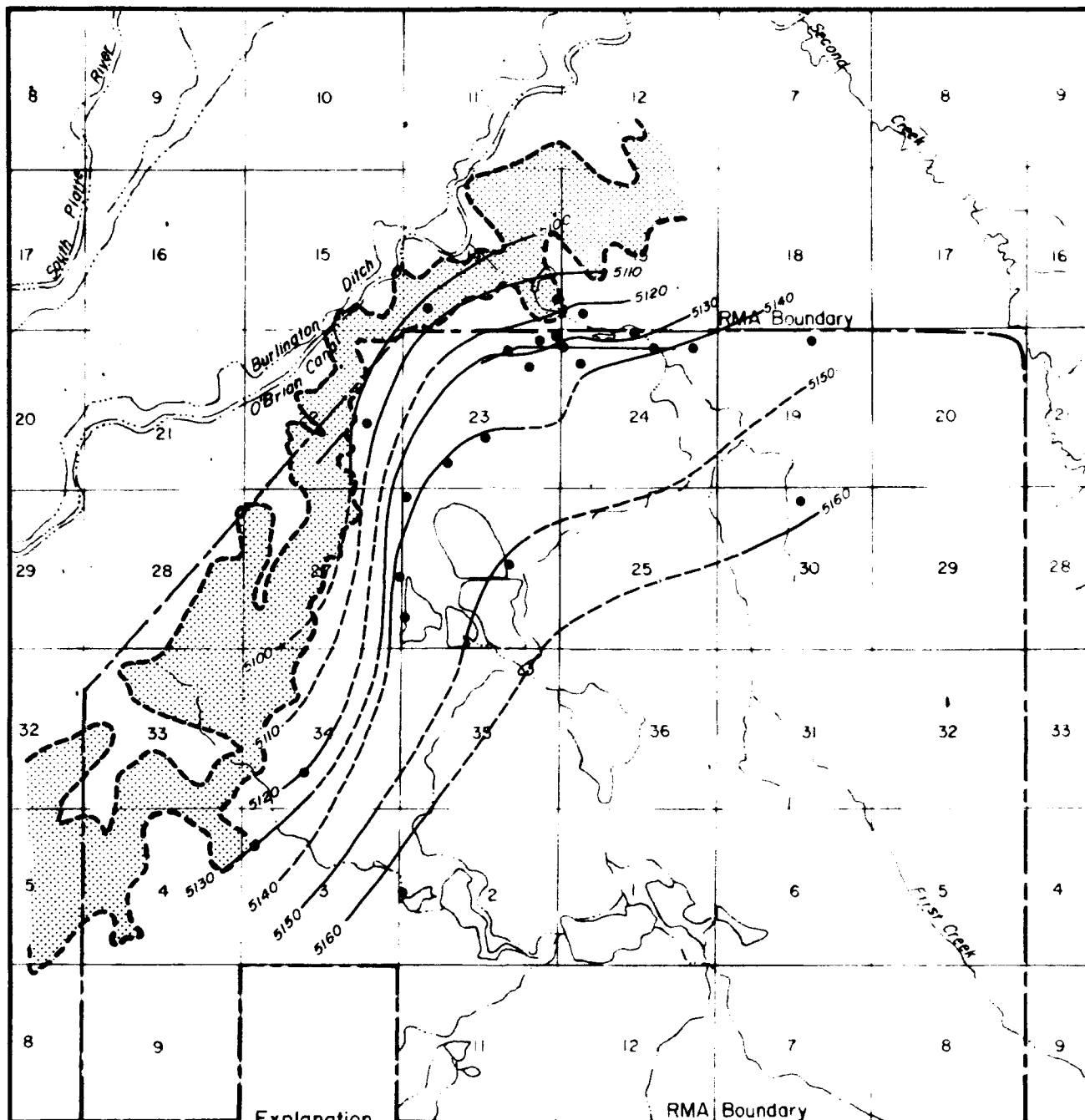
Prepared for:
U.S. Army Program Manager
For Rocky Mountain Arsenal



Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

FIGURE 4.2-1
Potentiometric Surface of Denver Fm
Zone 4, Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Explanation

- Well Location yielding Water Level Elevation
Contour Interval Equals 10 Feet
- 5120 — Elevation of the Potentiometric Surface,
Feet Above Mean Sea Level, Dashed
where Inferred
- ▨ Areal Extent of the Subcrop Denver
Zone 3, including Lignitic Zone D

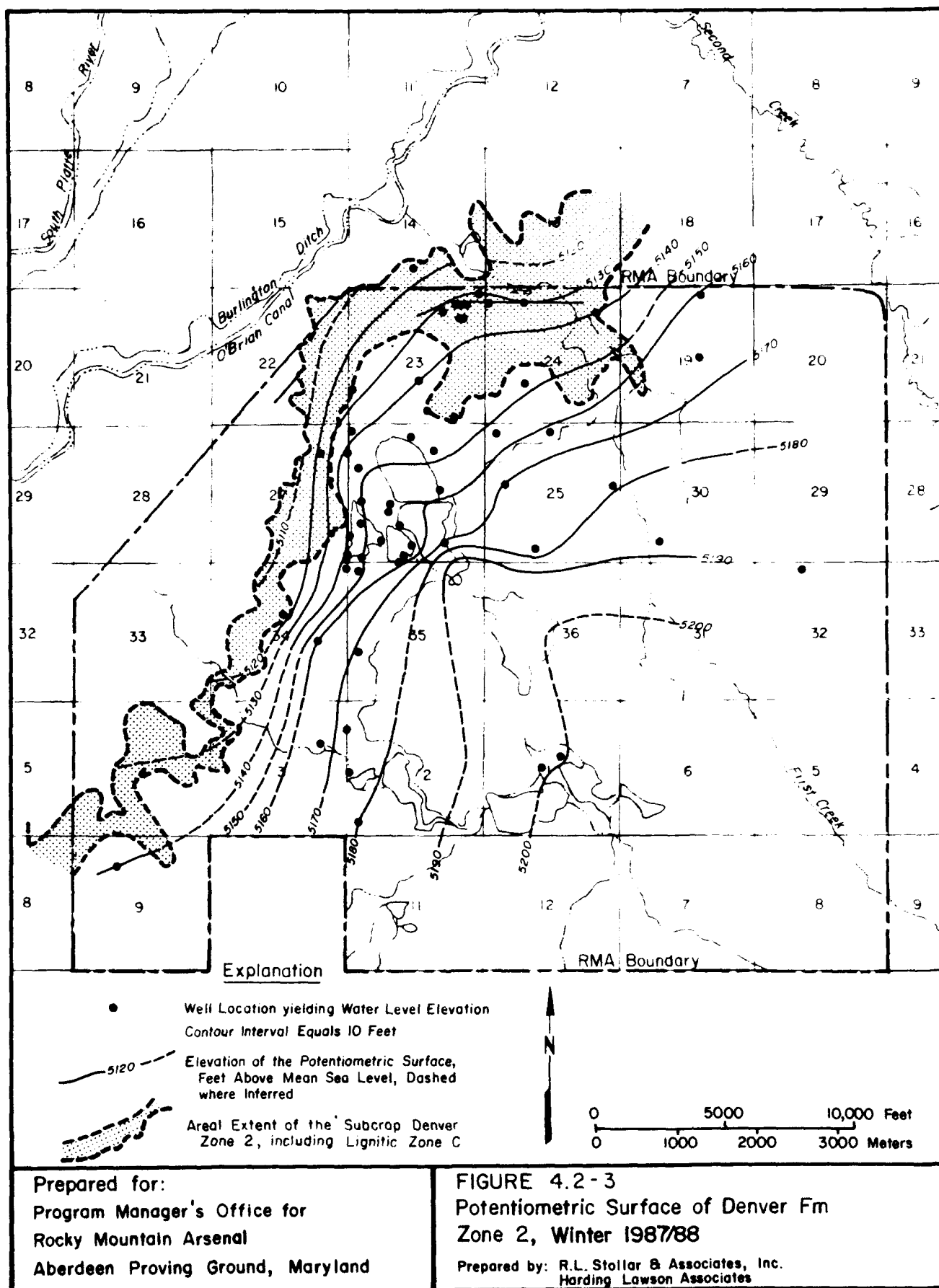


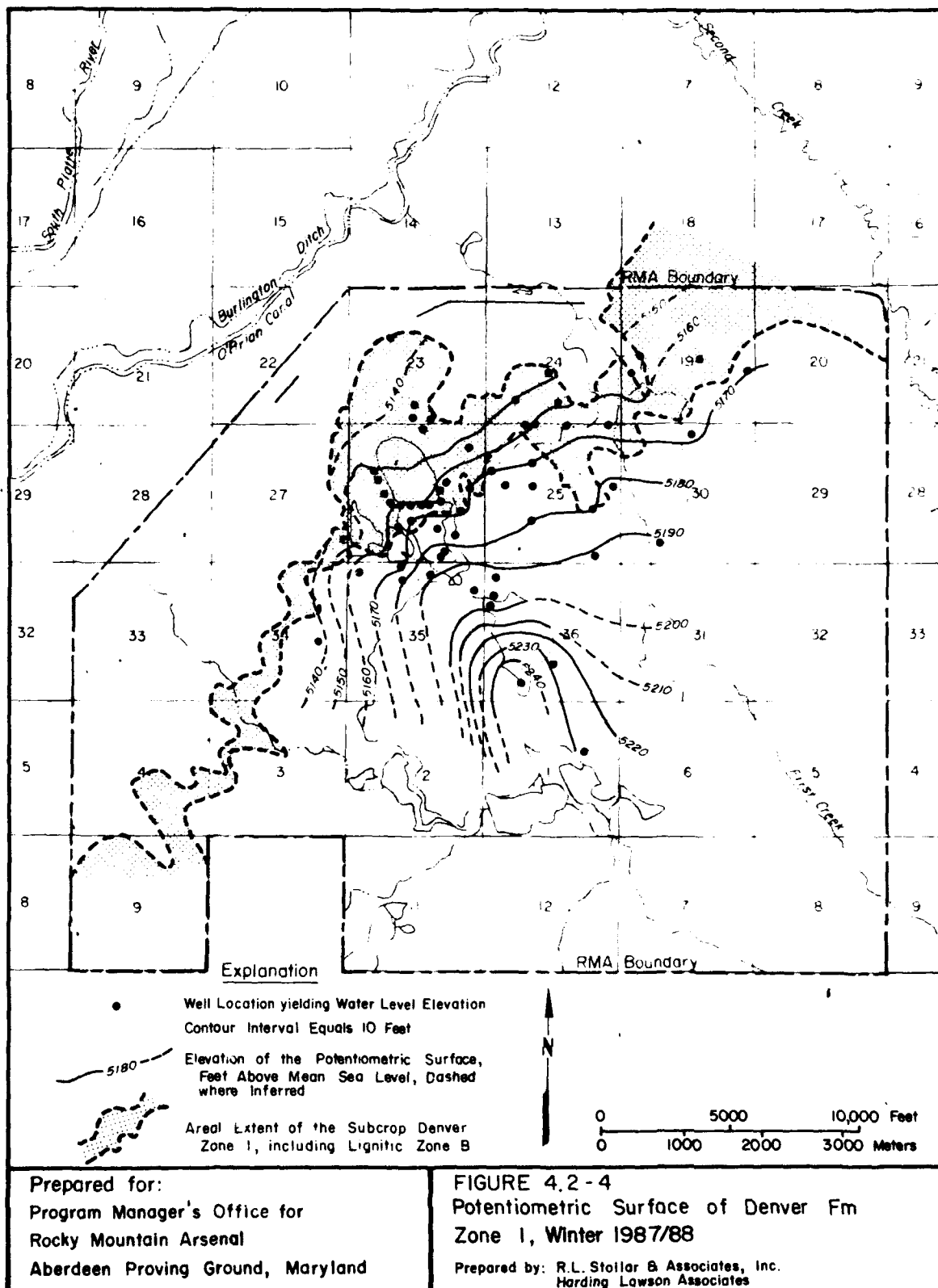
0 5000 10,000 Feet
0 1000 2000 3000 Meters

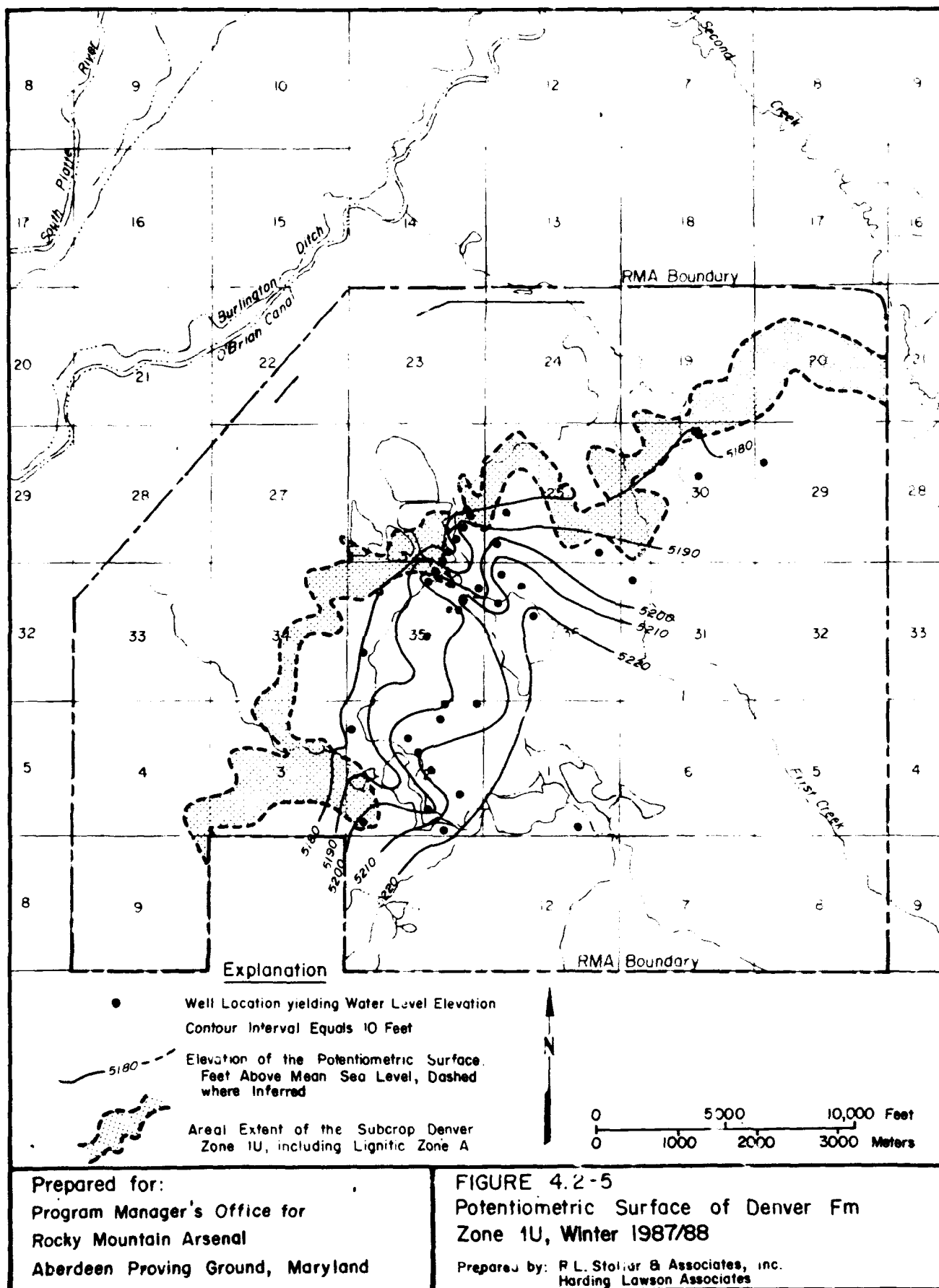
Prepared for:
Program Manager's Office for
Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

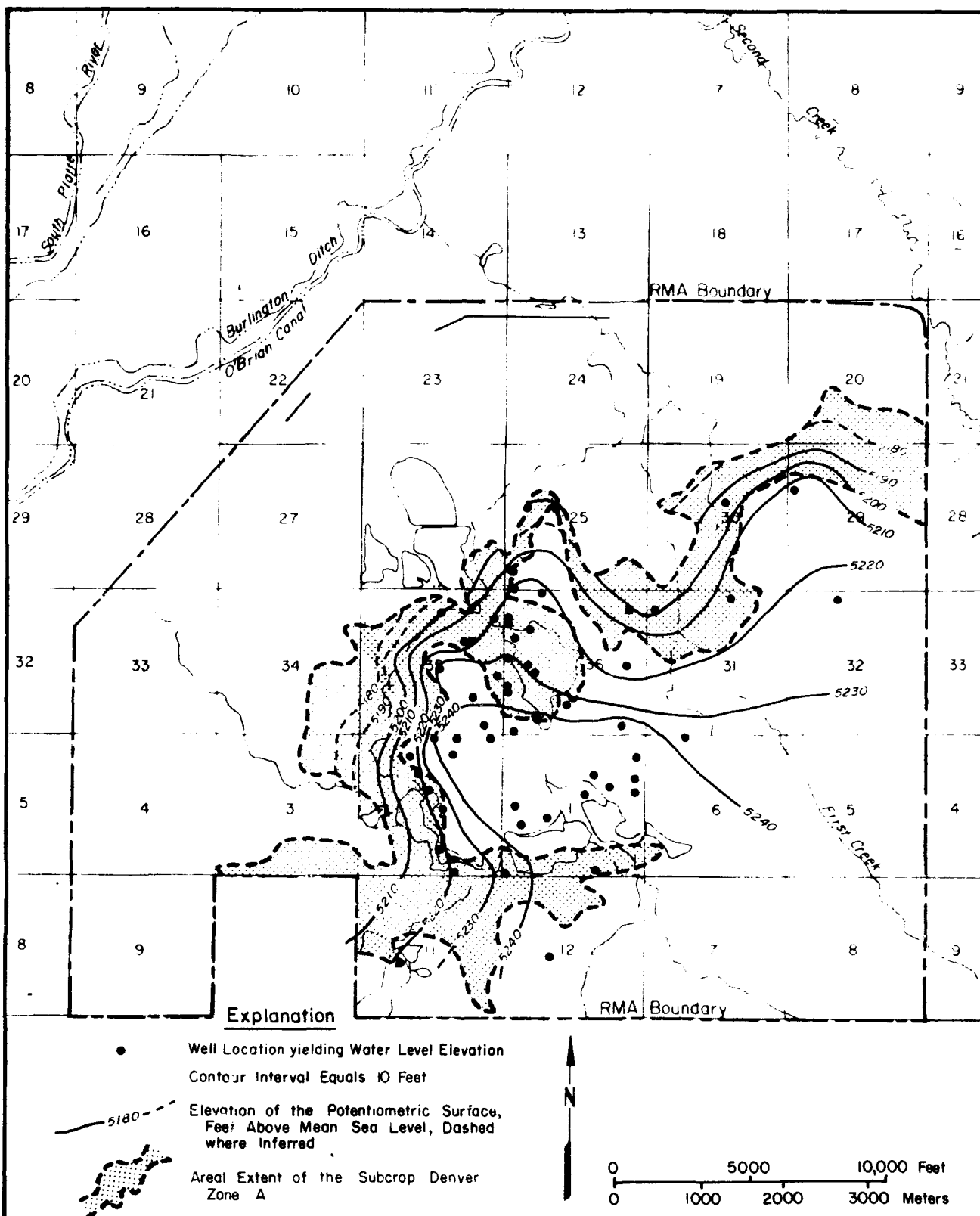
FIGURE 4.2-2
Potentiometric Surface of Denver Fm
Zone 3, Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates





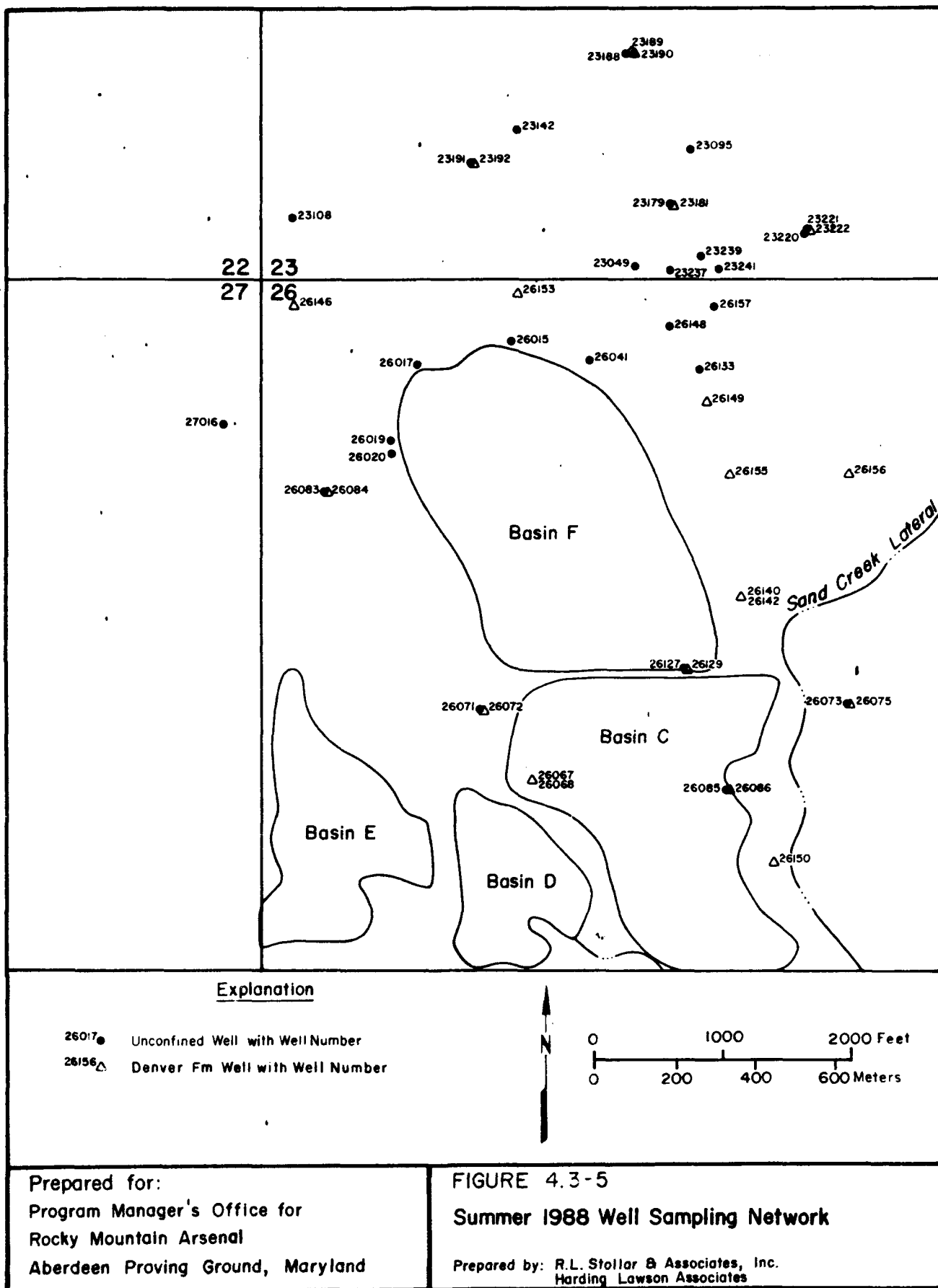




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FIGURE 4.2-6
Potentiometric Surface of Denver Fm
Zone A, Winter 1987/88

Prepared by: R.L. Stollar & Associates, Inc.
Harding Lawson Associates



Prepared for:
 Program Manager's Office for
 Rocky Mountain Arsenal
 Aberdeen Proving Ground, Maryland

FIGURE 4.3-5
 Summer 1988 Well Sampling Network

Prepared by: R.L. Stollar & Associates, Inc.
 Harding Lawson Associates

APPENDICES B AND C

APPENDIX B: HYDROLOGIC DATA COLLECTED DURING FY88

(on diskette - enclosed)

APPENDIX C: ANALYTICAL DATA COLLECTED DURING FY88

(on diskette - enclosed)

Appendixes B and C are archived in ASCII format, as ARHCIVE.ARC, on a 1.2 Mbyte diskette. The files are accessed through PKXARC by typing PKXARC and following the instructions.

Appendix B consists of the following files:

COMALLGW.DAT and COMDENGW.DAT, which contain the FY88 ground-water data for the unconfined and Denver wells respectively. The ground-water data is formatted as follows: well, east, north, well elevation, winter 1987/88 ground-water elevation, spring 1988 ground-water elevation, summer 1988 ground-water elevation, aquifer and sand unit. The elevations are in feet, and east and north are in UTM coordinates.

Appendix C consists of the following files:

W87_88.DAT, CMPSP.DAT, CMPSU.DAT, and W87ANLYT.DAT. The first three files contain the chemical data for winter 1987/88, spring 1988 and summer 1988 respectively. The fourth file contains chemical data for atrazine, parathion, malathion, and supona for winter 1987/88. The chemistry data is formatted as follows: well, analyte, boolean, concentration ($\mu\text{g/l}$), aquifer and sand unit.