PROGRAM MANAGER
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 1989
JUNE 1990

FINAL REPORT

Version 2.0

Volume II Rocky Mount

R.L. STOLLAR & ASSOCIATES, INC.
Harding Lawson Associates
Ebasco Services Incorporated
DataChem, Inc.
Enseco-Cal Lab
Midwest Research Institute

ROCKY MOUNTAIN ARSENAL • COMMERCE CITY, COLORADO • 80022-2180

(2)

COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

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Volume II

Prepared by:

R. L. STOLLAR & ASSOCIATES INC.
HARDING LAWSON ASSOCIATES
EBASCO SERVICES INC.
DATACHEM, INC.
ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
MIDWEST RESEARCH INSTITUTE

Prepared for:

PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

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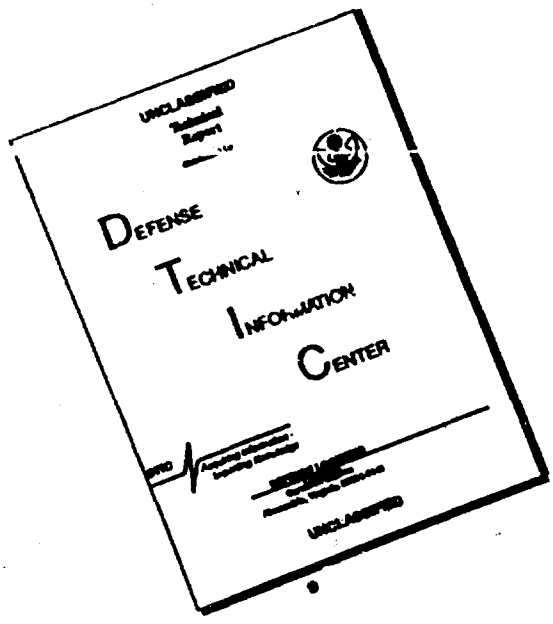

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THE FY89 WELL NETWORK CONSISTED OF BOTH ON-POST AND OFF-POST WELLS FOR MONITORING GROUND WATER LEVEL FLUCTUATIONS AND WATER QUALITY CONDITIONS. THE WATER LEVEL NETWORK INCLUDED APPROXIMATELY 1000 WELLS MONITORED ON A QUARTERLY BASIS. THE WATER QUALITY NETWORK INCLUDED 488 WELLS MONITORED ANNUALLY, 388 SEMIANNUALLY, AND 62 QUARTERLY. THE SAMPLES WERE ROUTINELY ANALYZED FOR 73 ANALYTES.

THIS REPORT INCLUDES THE FOLLOWING SECTIONS:

1. INTRODUCTION - SITE BACKGROUND, OVERVIEW OF MONITORING PROGRAM
2. HYDROGEOLOGIC SETTING
3. PROGRAM METHODS AND STRATEGY
4. RESULTS OF FY89 PROGRAM
5. DATA ASSESSMENT - INTERPRETATION OF THE DATA.

WATER LEVEL AND QUALITY DATA ARE PROVIDED ON COMPUTER DISK.

APPENDICES INCLUDE:

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APPENDIX A - LIST OF FIGURES (Continued)

LIST OF ACRONYMS

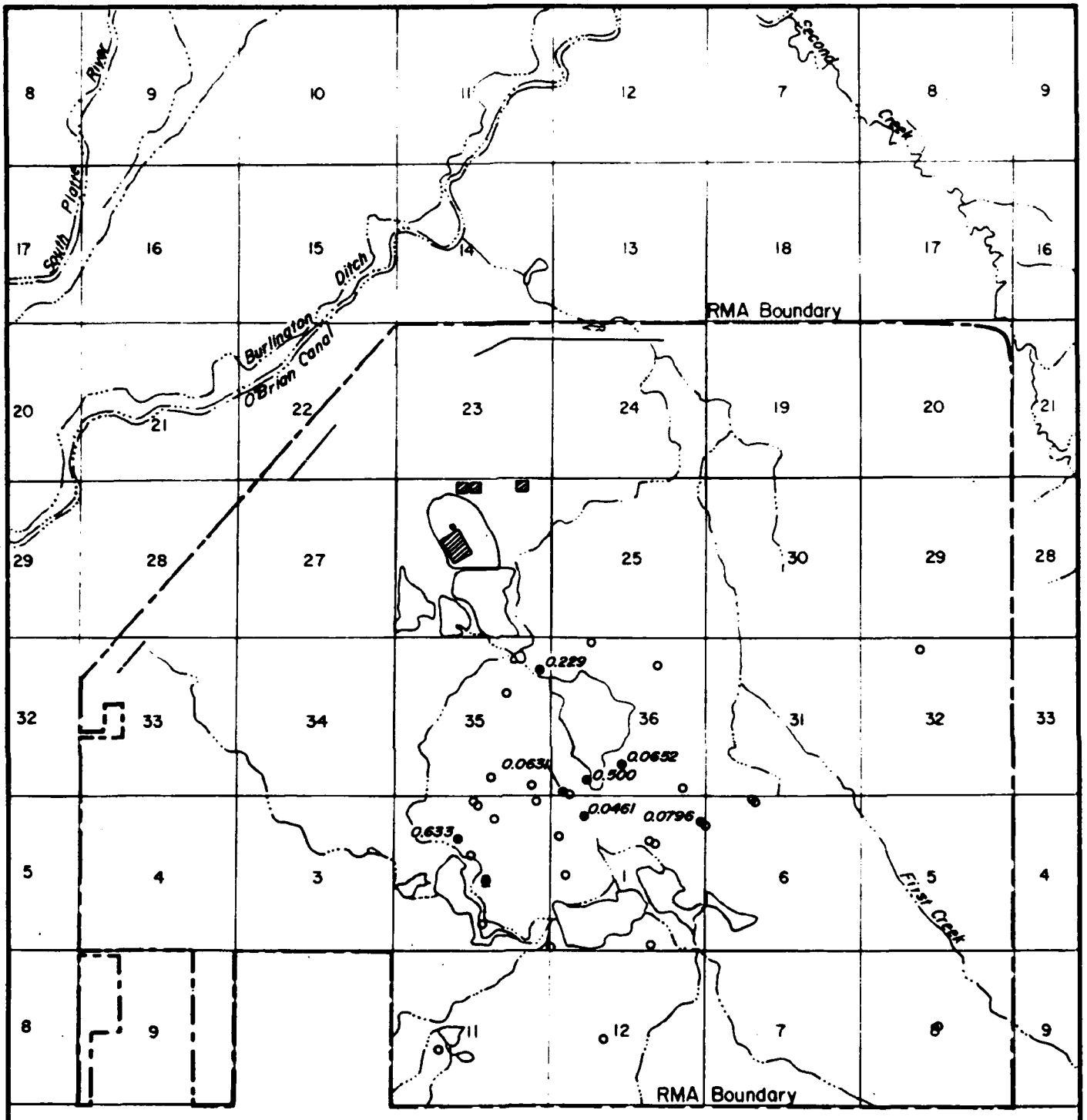
ACRONYMS AND ABBREVIATIONS

Chlordane	1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene
ClC_6H_5	Chlorobenzene
CMP FY88	Comprehensive Monitoring Program Fiscal Year 1988
CO	Carbon Monoxide
DBCP	Dibromochloropropane
DCLE11	1,1-Dichloroethane
DCLE12	1,2-Dichloroethane
DCPD	Dicyclopentadiene
DDD	Dichlorodiphenyldichloroethane
DMB12	Dimethylbenzene
DMDS	Dimethyl Disulfide
EPA	Environmental Protection Agency
ETC_6H_5	Ethylbenzene
GC/MS	Gas Chromatography/Mass Spectrometry
GC/ECD	Gas Chromatography/Electron Capture Detection
ICAP	Inductively Coupled Argon Plasma
Malathion	0,0-dimethyl-s-(1,2-dicarboxyethyl) phosphorodithioate
MIBK	Methyl Isobutyl Ketone
Parathion	Parathion ($C_{10}H_{14}NO_5PS$)
PMRMA	Program Manager Rocky Mountain Arsenal
PPDDE	Dichlorodiphenylethane
PPDDT	Dichlorodiphenyltrichloroethane
SO_2	Sulfur Dioxide
Supona	2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate
T12DCE	Trans-1,2-Dichloroethene
TCLEE	Tetrachloroethene
TRCLE	Trichloroethene
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
XYLENE	Xylene

APPENDIX A

MAPS SHOWING DISTRIBUTIONS OF CONTAMINANTS

IN THE CONFINED FLOW SYSTEM



Explanation

0.229 Denver Zone A Well Location

Containment System
Physical Barrier
Hydraulic Barrier

Basin F IRA Structure

N

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

0 5000 10,000 Feet
0 1000 2000 3000 Meters

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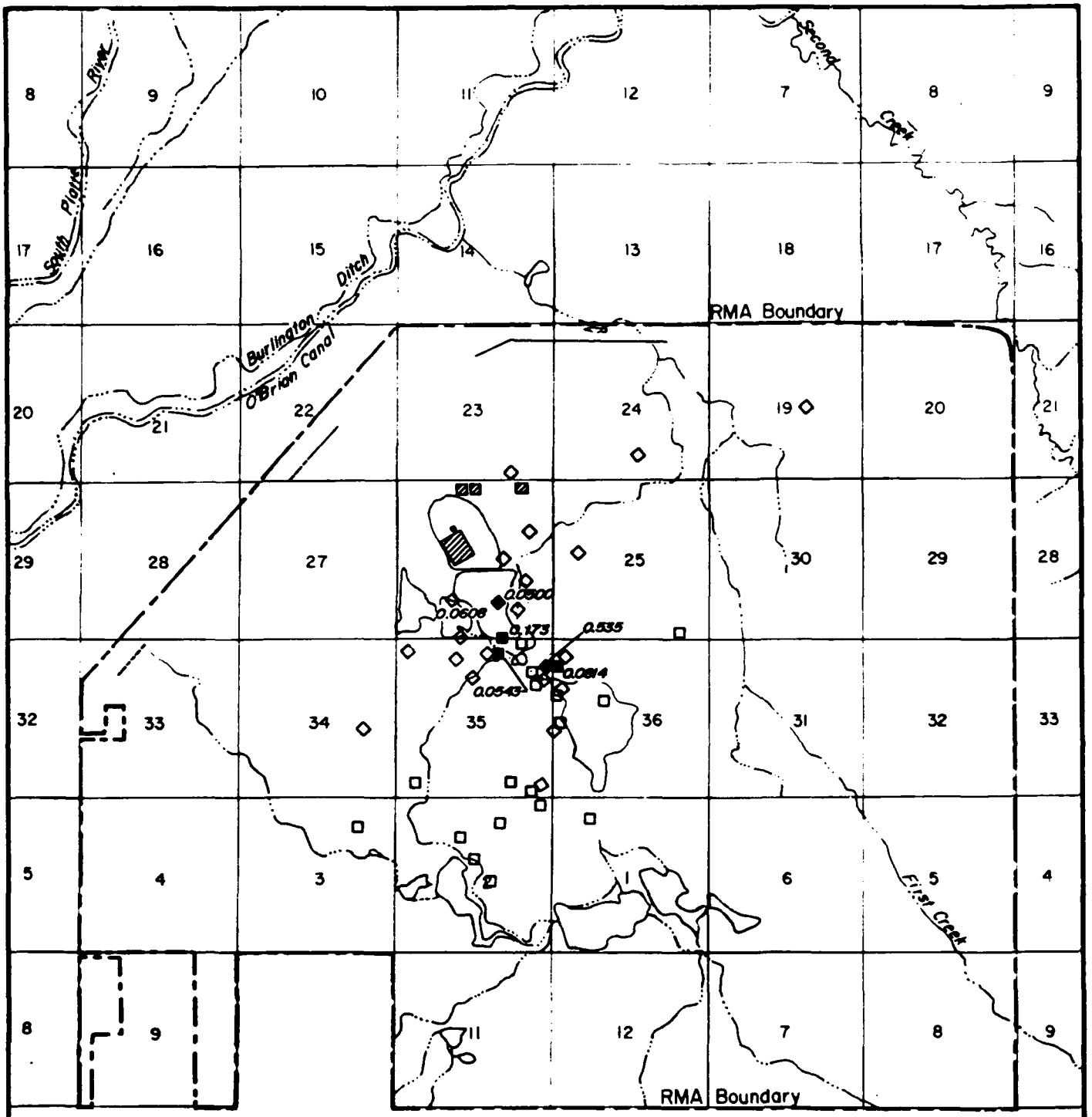
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-1

Dieldrin Detections
Denver Zone A
Fall 1988
CMP GWAR FY89



Explanation

- 0.173 — Denver Zone 1U Well Location
- 0.0614 — Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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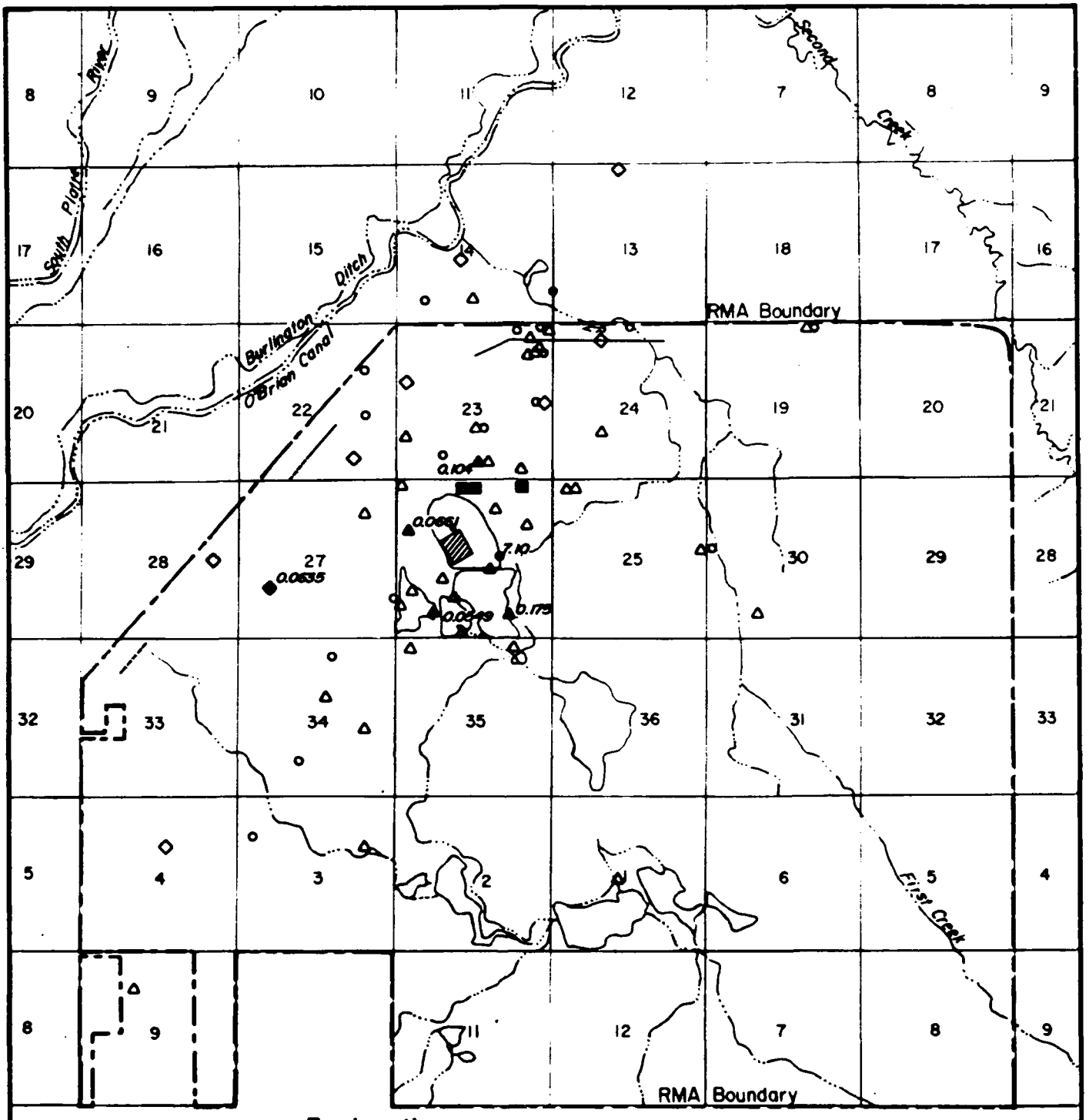
Figure A-2

Dieldrin Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- $^{0.175}$▲ Denver Zone 2 Well Location
- $^{7.10}$● Denver Zone 3 Well Location
- $^{0.0635}$◆ Denver Zone 5 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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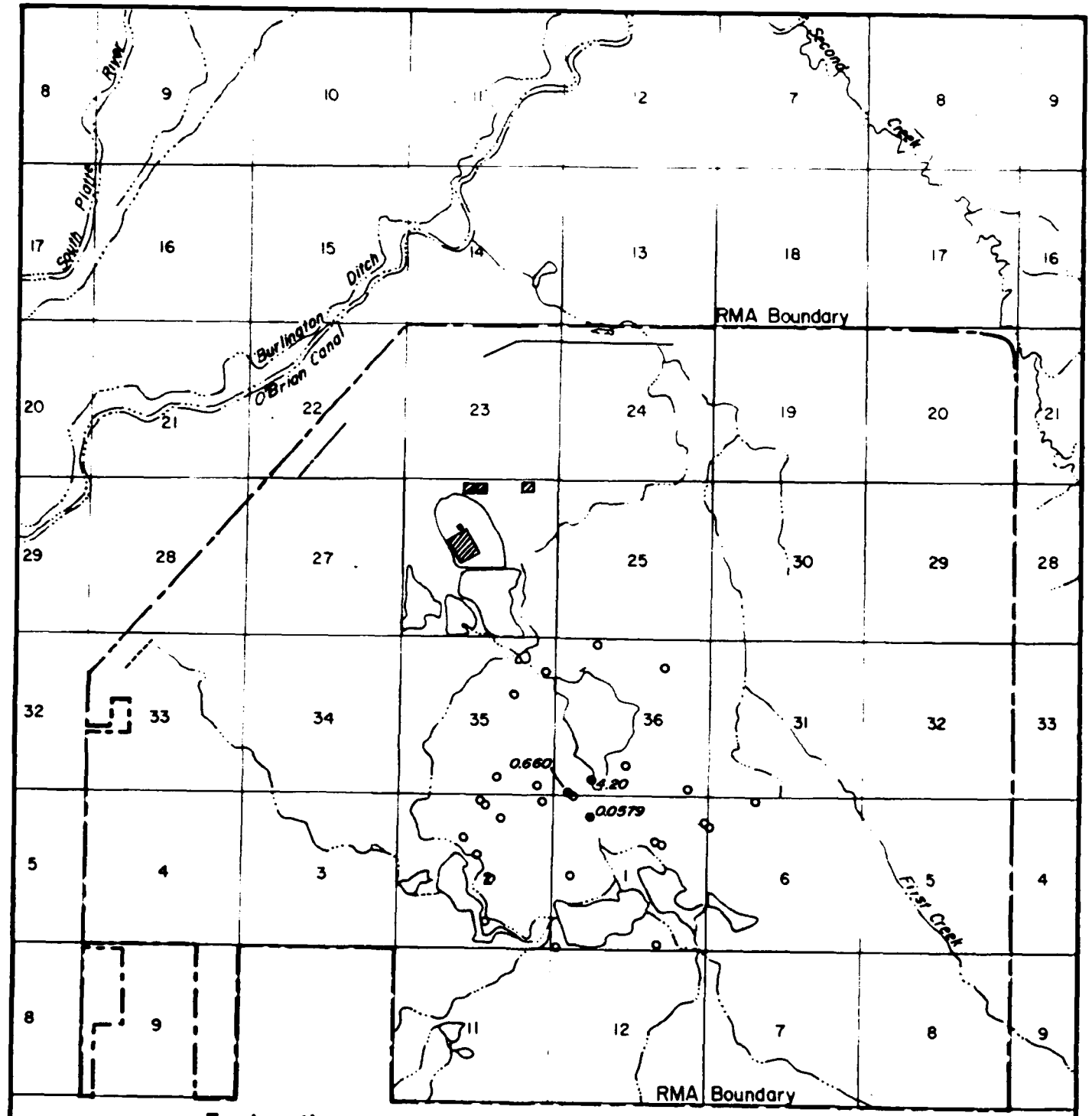
Figure A-3

Dieldrin Detections
Denver Zones 2, 3 & 5
Fall 1988
CMP GWAR FY89



Explanation

- 4.20 — Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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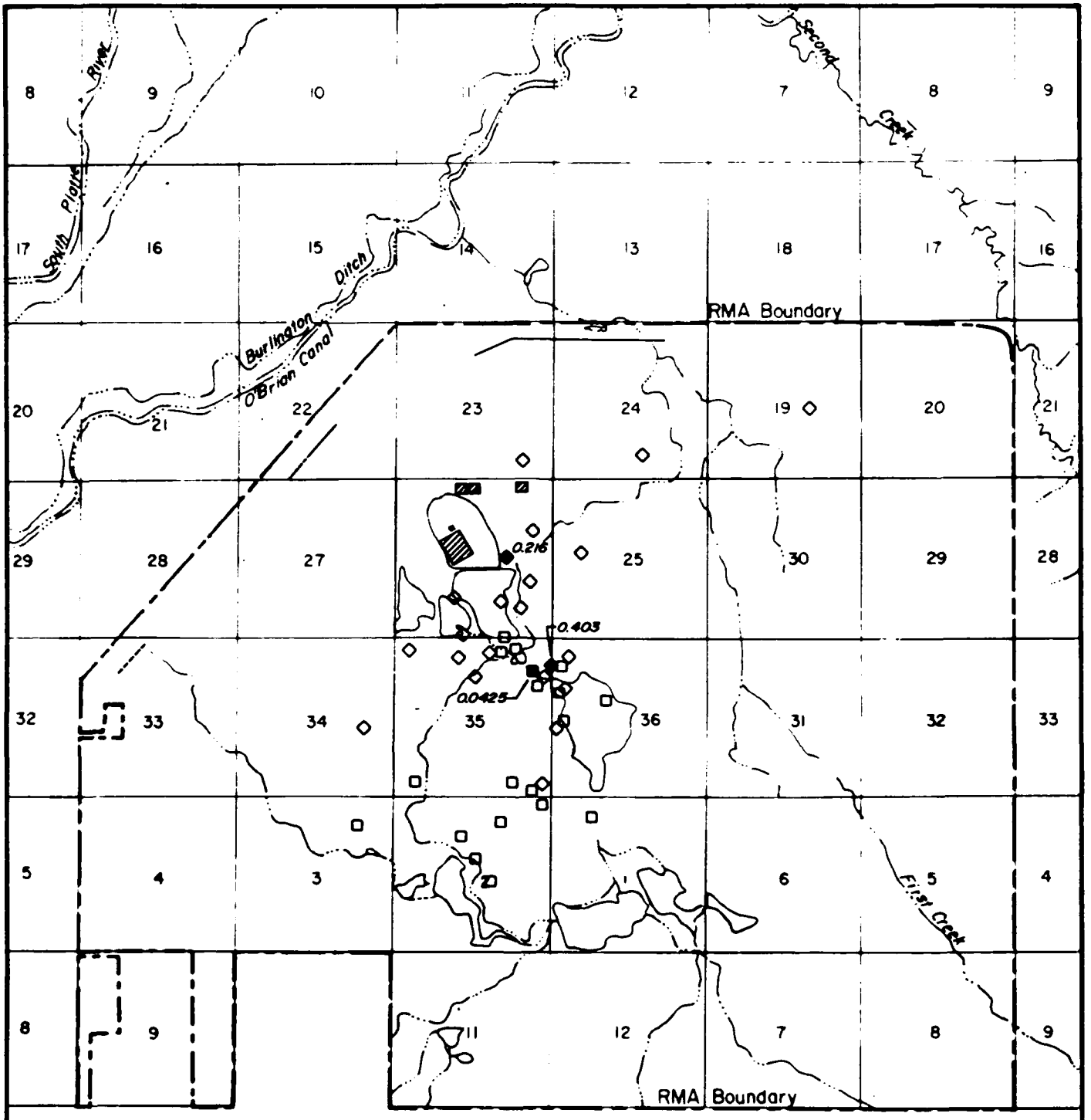
Figure A-4

Endrin Detections
Denver Zone A
Fall 1988
CMP GWAR FY89



Explanation

- 0.0425 — Denver Zone 1U Well Location
- 0.216 — Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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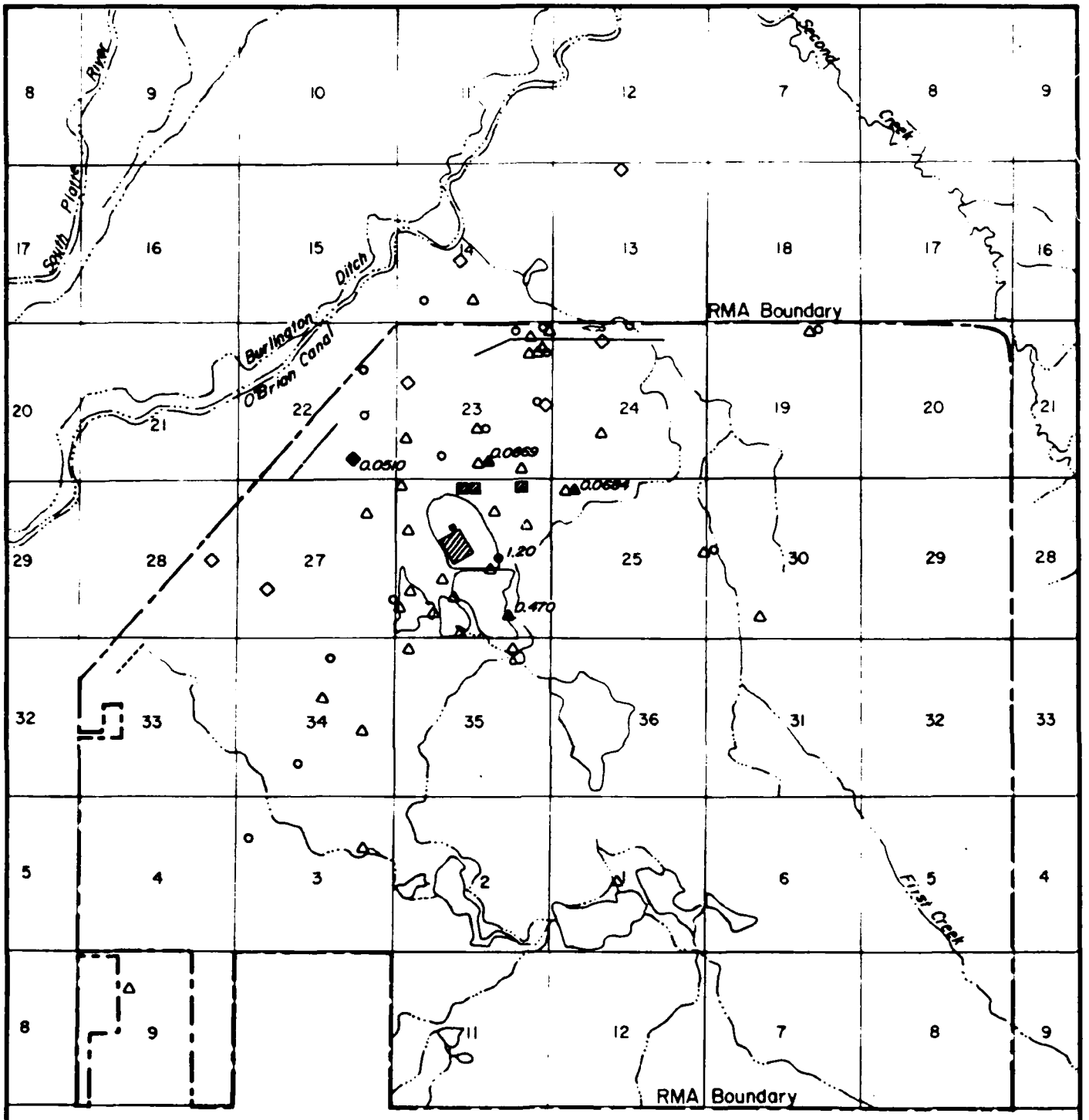
Figure A-5

Endrin Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- 0.0684 Denver Zone 2 Well Location
- 1.20 Denver Zone 3 Well Location
- 0.0510 Denver Zone 5 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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Figure A-6

Endrin Detections
Denver Zones 2, 3, & 5
Fall 1988
CMP GWAR FY89

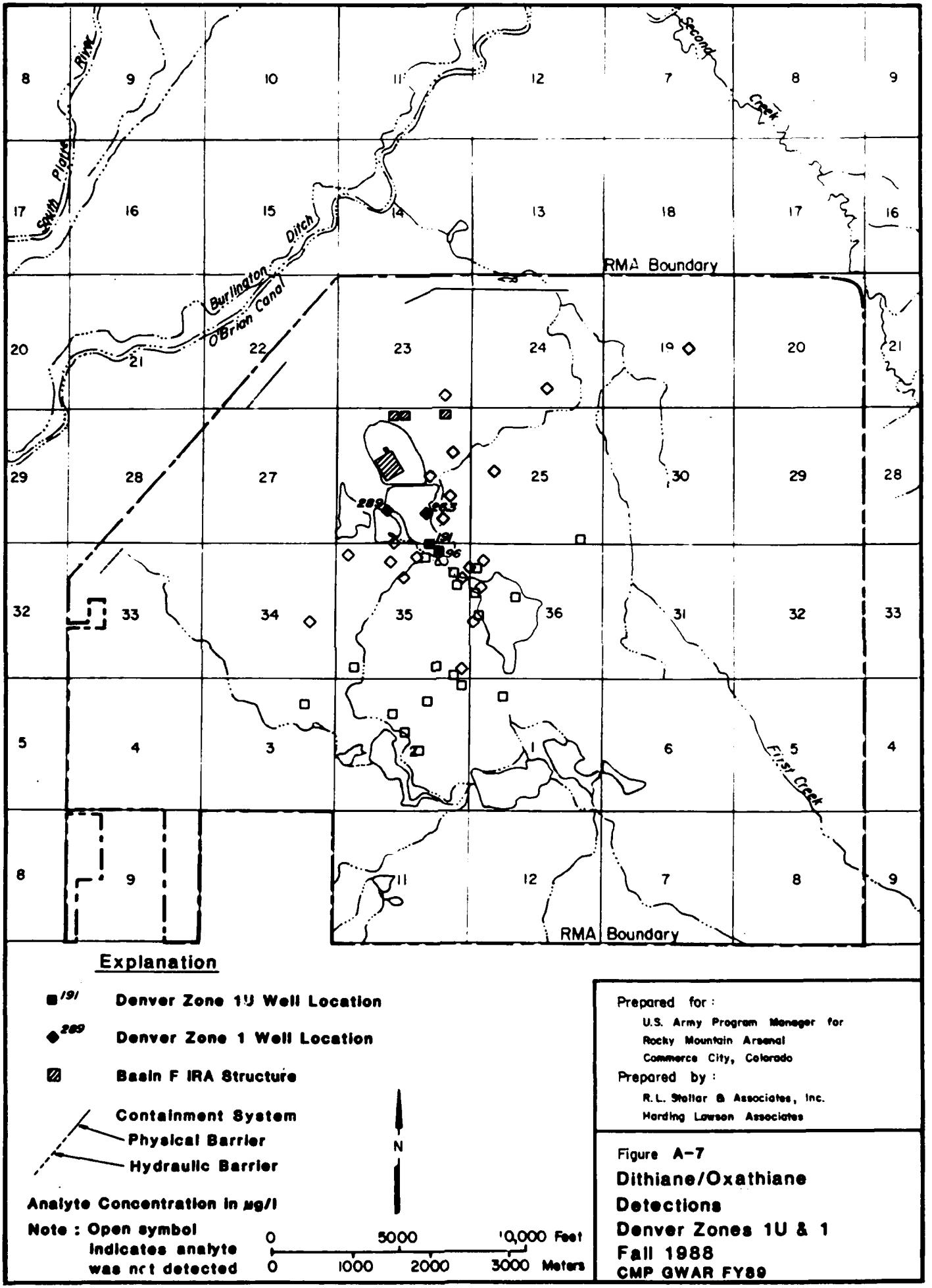
South Platte River
Second Creek
Burlington Ditch
O'Brien Canal
RMA Boundary
First Creek
RMA Boundary
Explanation
191 Denver Zone 1U Well Location
269 Denver Zone 1 Well Location
Basin F IRA Structure
Containment System
Physical Barrier
Hydraulic Barrier
Analyte Concentration in µg/l
Note : Open symbol indicates analyte was not detected
N
0 5000 10,000 Feet
0 1000 2000 3000 Meters
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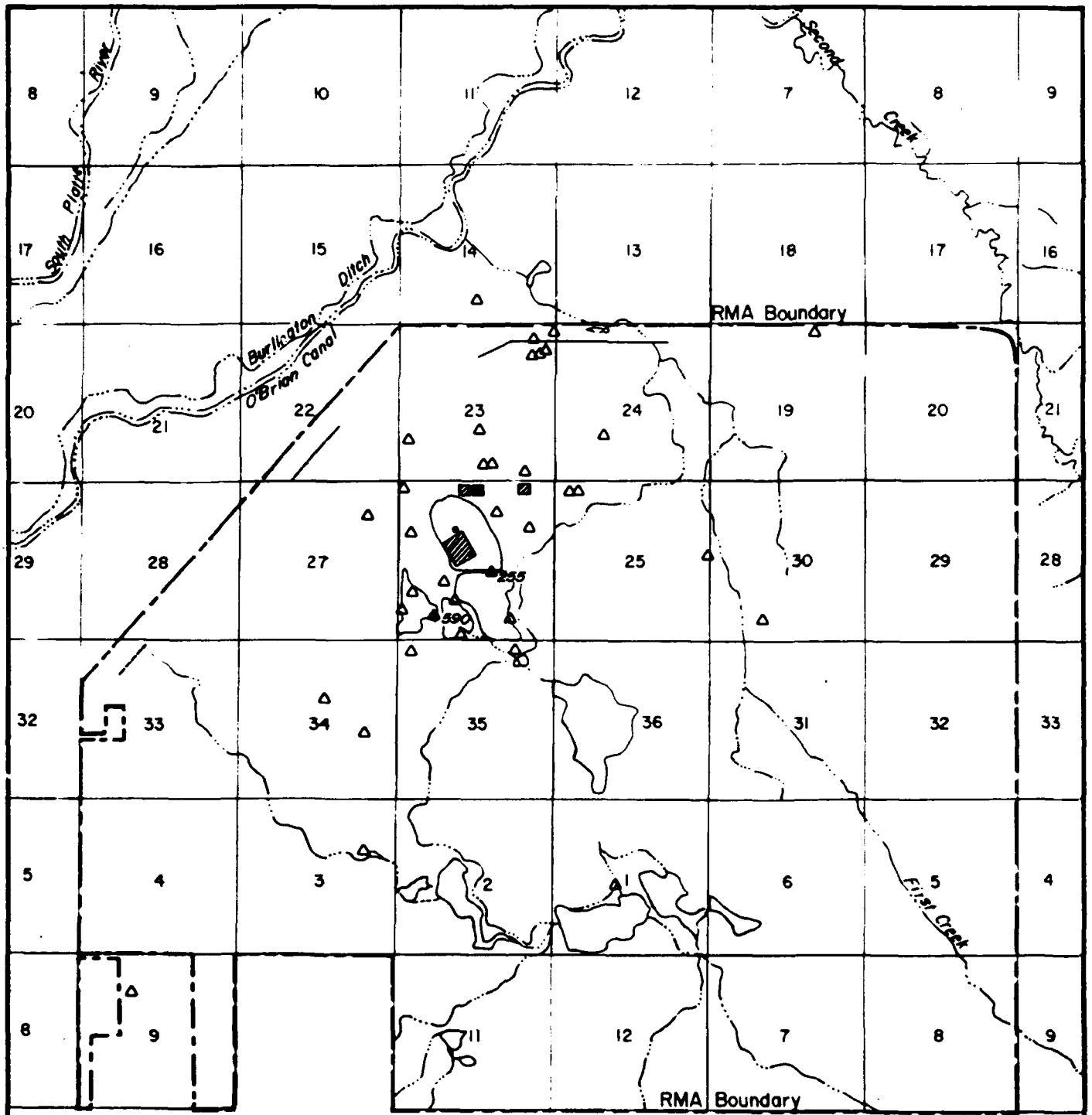
Figure A-7
Dithiane/Oxathiane Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

△255 Denver Zone 2 Well Location

Containment System

Physical Barrier

Hydraulic Barrier

Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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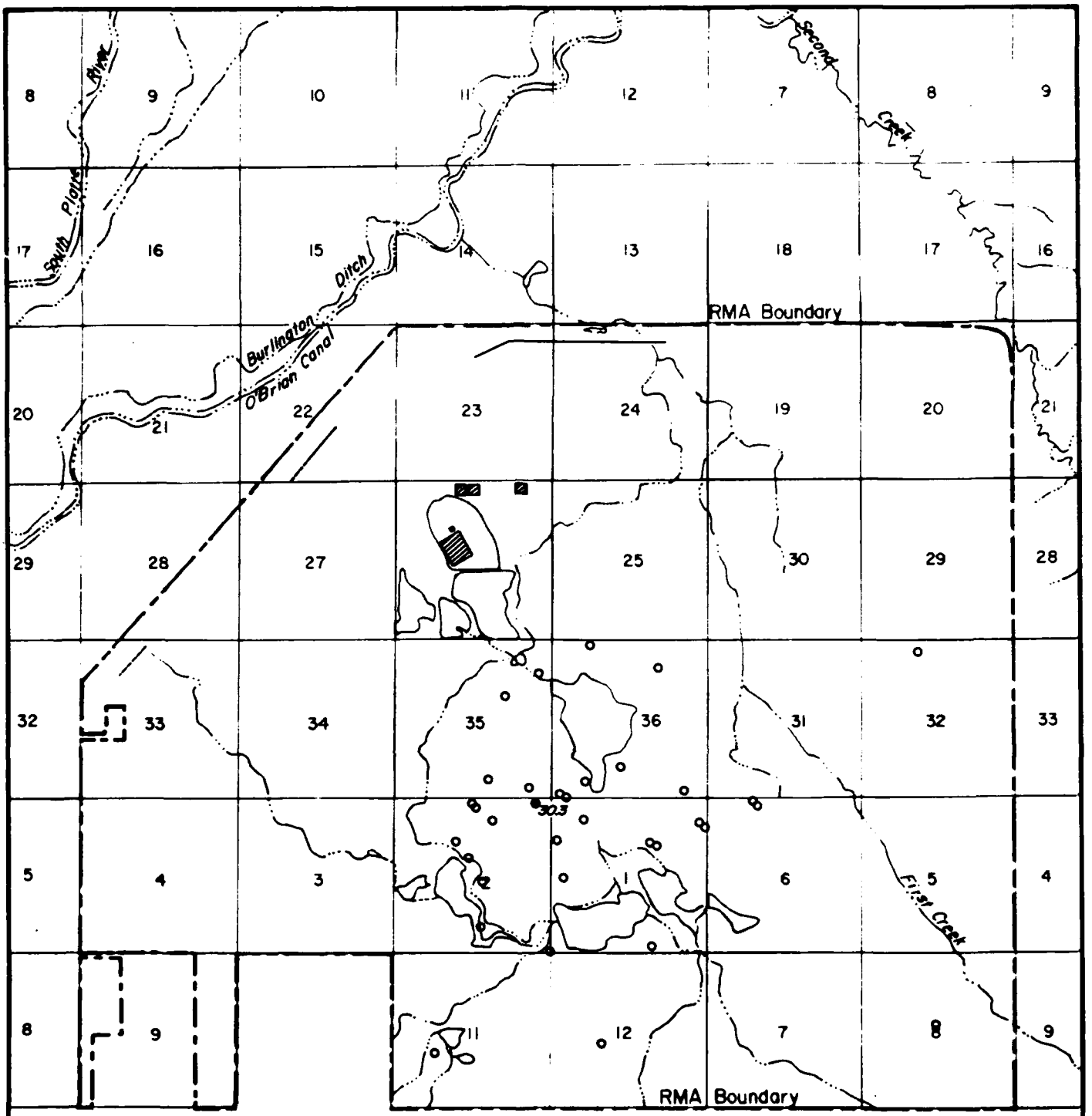
Figure A-8

Dithiane/Oxathiane Detections

Denver Zone 2

Fall 1988

CMP GWAR FY89



Explanation

- ●30.3 Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

N

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

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0 1000 2000 3000 Meters

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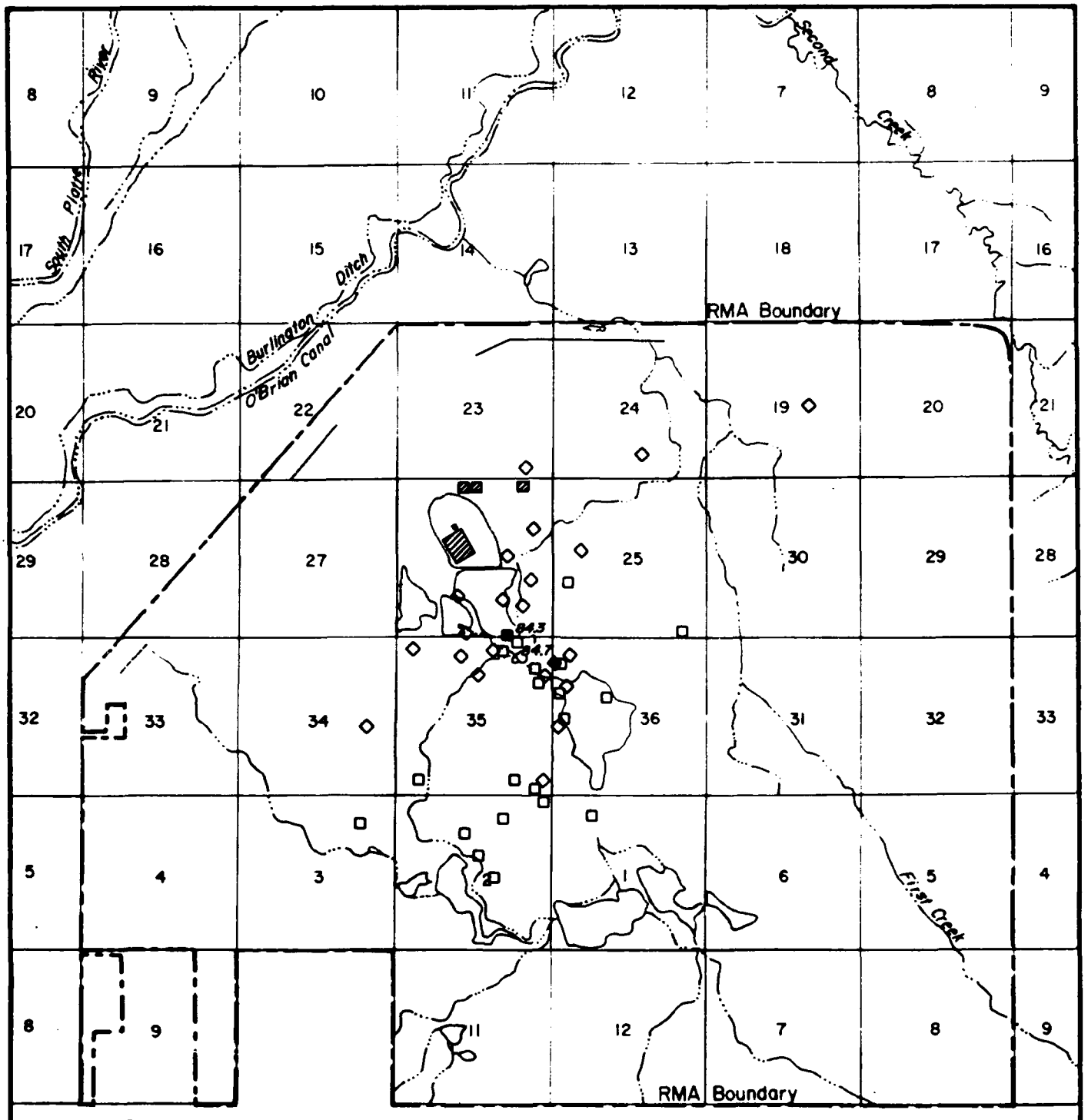
Figure A-9

Summed Organosulfur Compound Detections Denver Zone A Fall 1988

CMP GWAR FY89



Explanation

- 84.3 Denver Zone 1U Well Location
- 84.7 Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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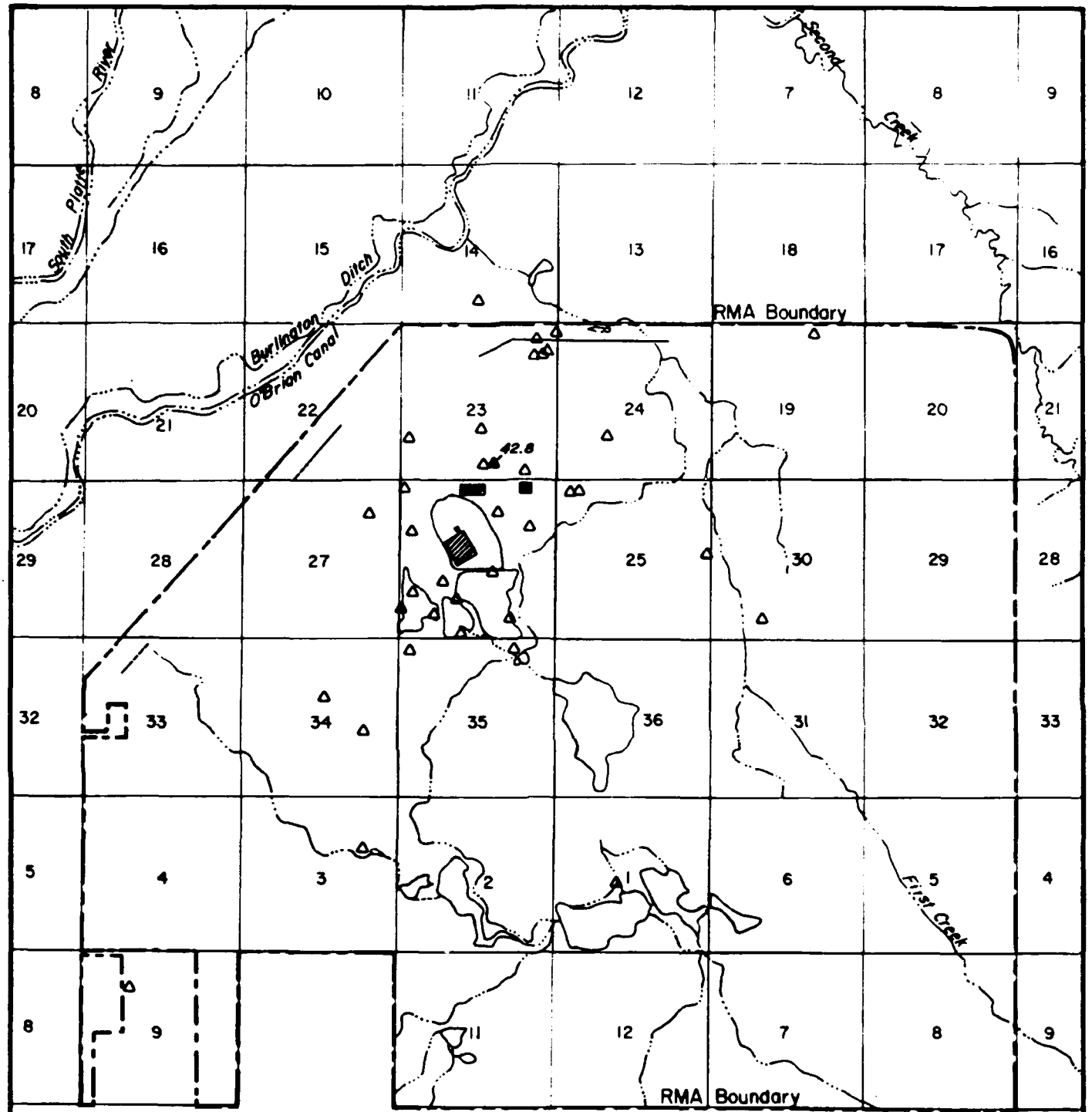
Figure A-10

Summed Organosulfur Compound Detections Denver Zones 1U & 1 Fall 1988

CMP GWAR FY89



Explanation

- Denver Zone 2 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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Figure A-11

Summed Organosulfur Compound Detections
Denver Zone 2
Fall 1988
CMP GWAR FY89

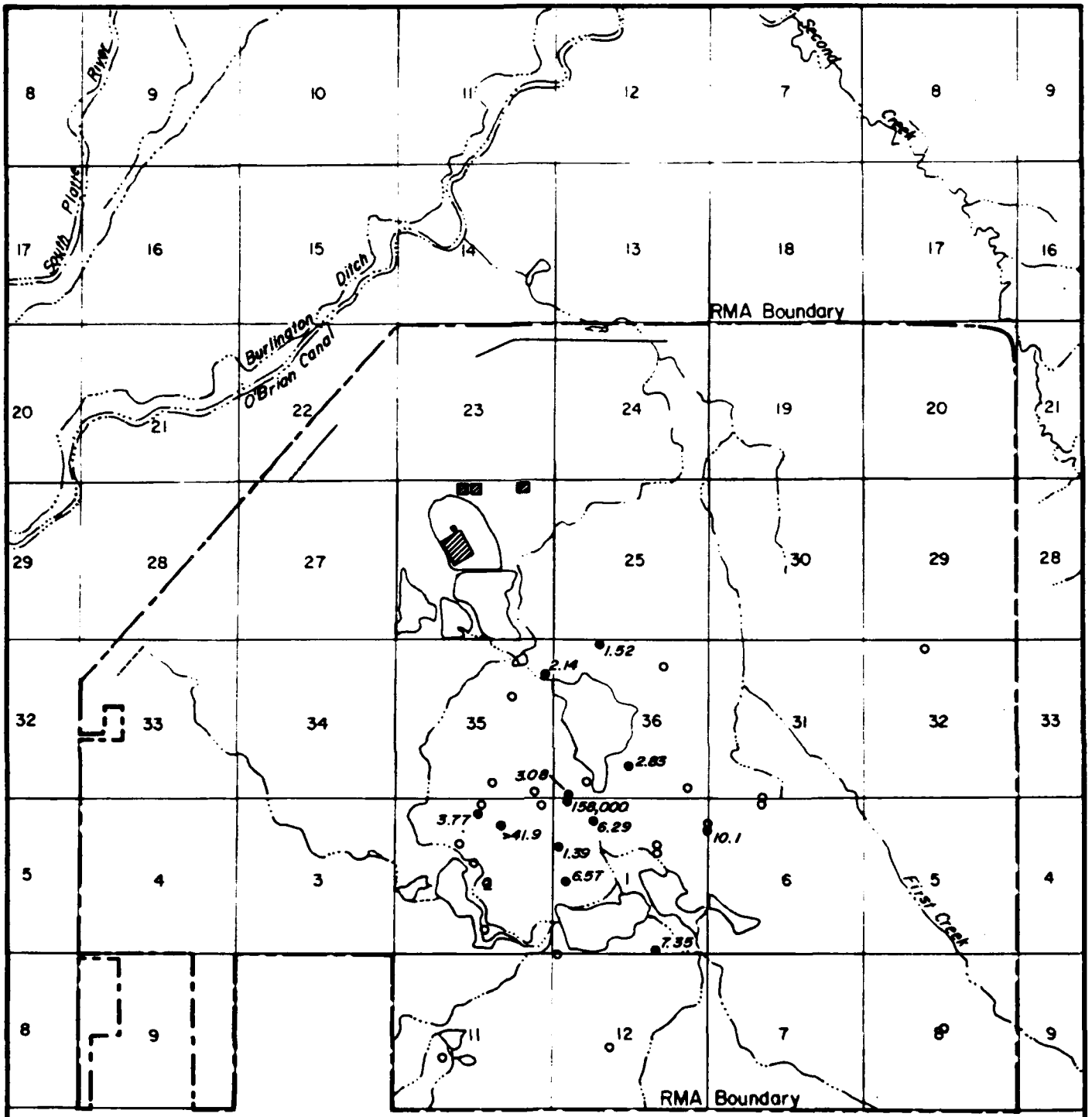
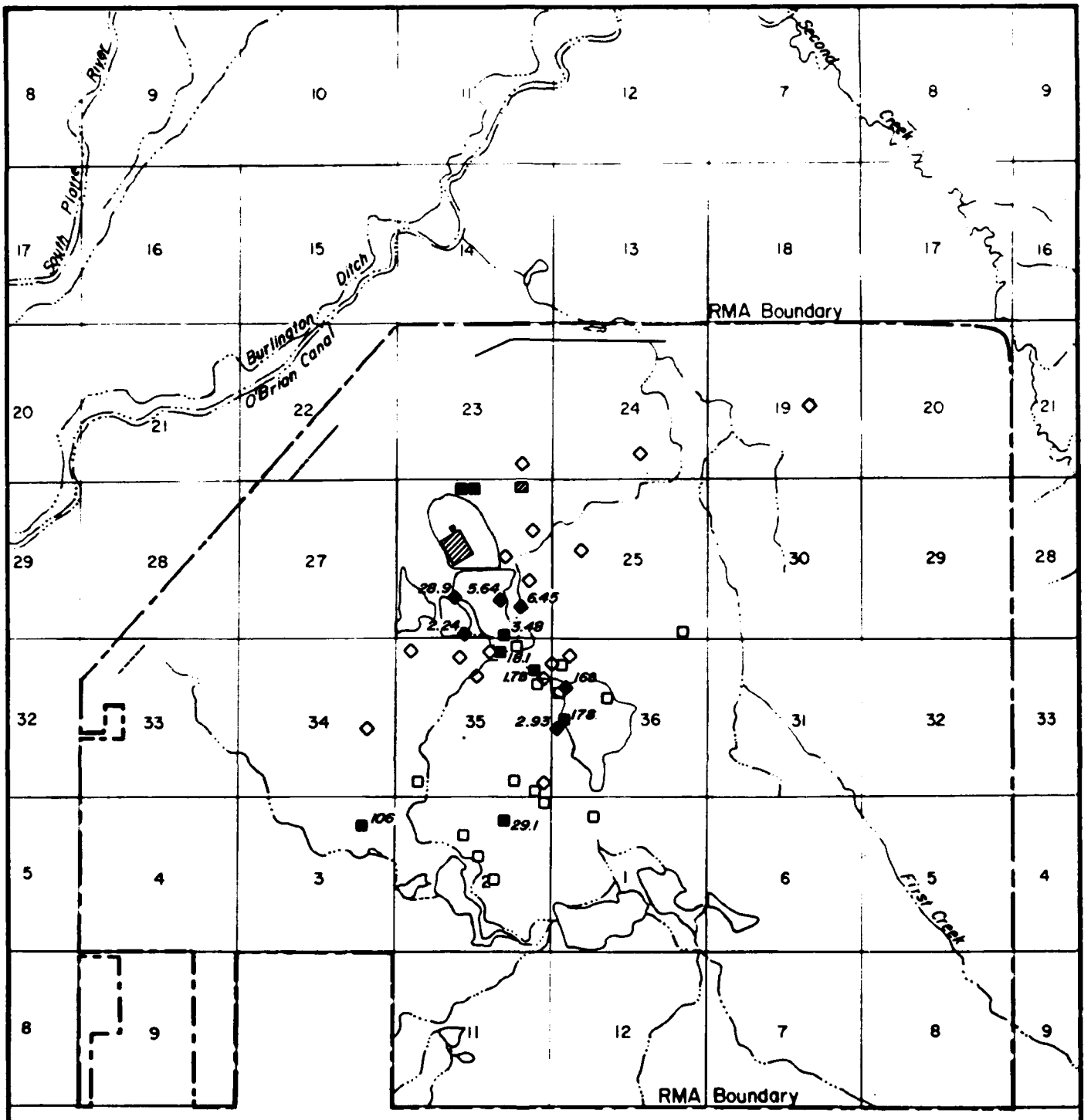


Figure A-12
Summed Volatile Aromatic Compound Detections Denver Zone A Fall 1988
CMP GWAR FY89



Explanation

- 3.48 Denver Zone 1U Well Location
- 2.95 Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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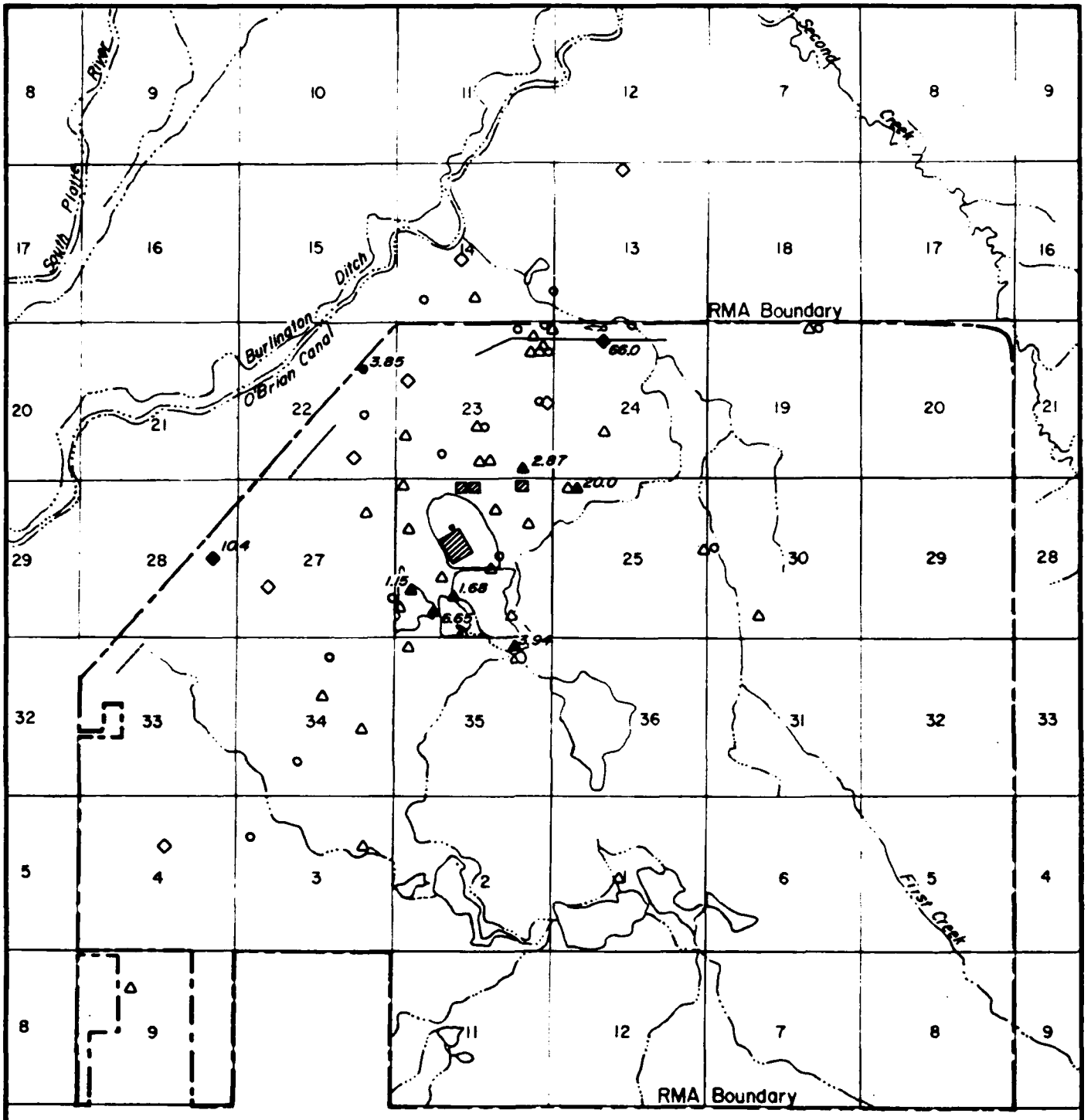
Figure A-13

Summed Volatile Aromatic Compound Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- Denver Zone 2 Well Location (20.0)
- Denver Zone 3 Well Location (3.85)
- Denver Zone 5 Well Location (66.0)
- Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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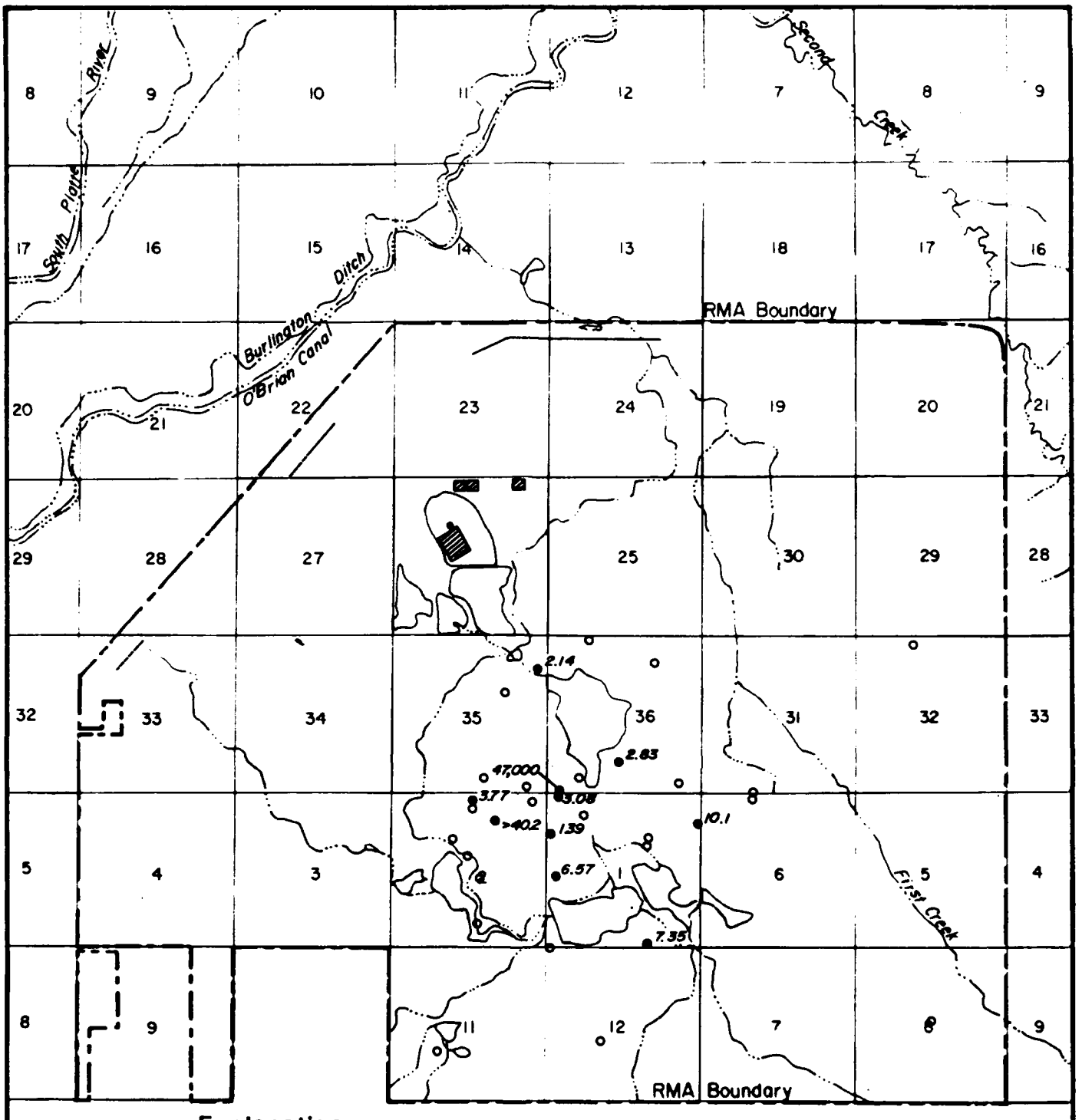
Figure A-14

Summed Volatile Aromatic Compound Detections Denver Zones 2, 3, & 5 Fall 1988

CMP GWAR FY89



Explanation

- 2.83 — Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic System
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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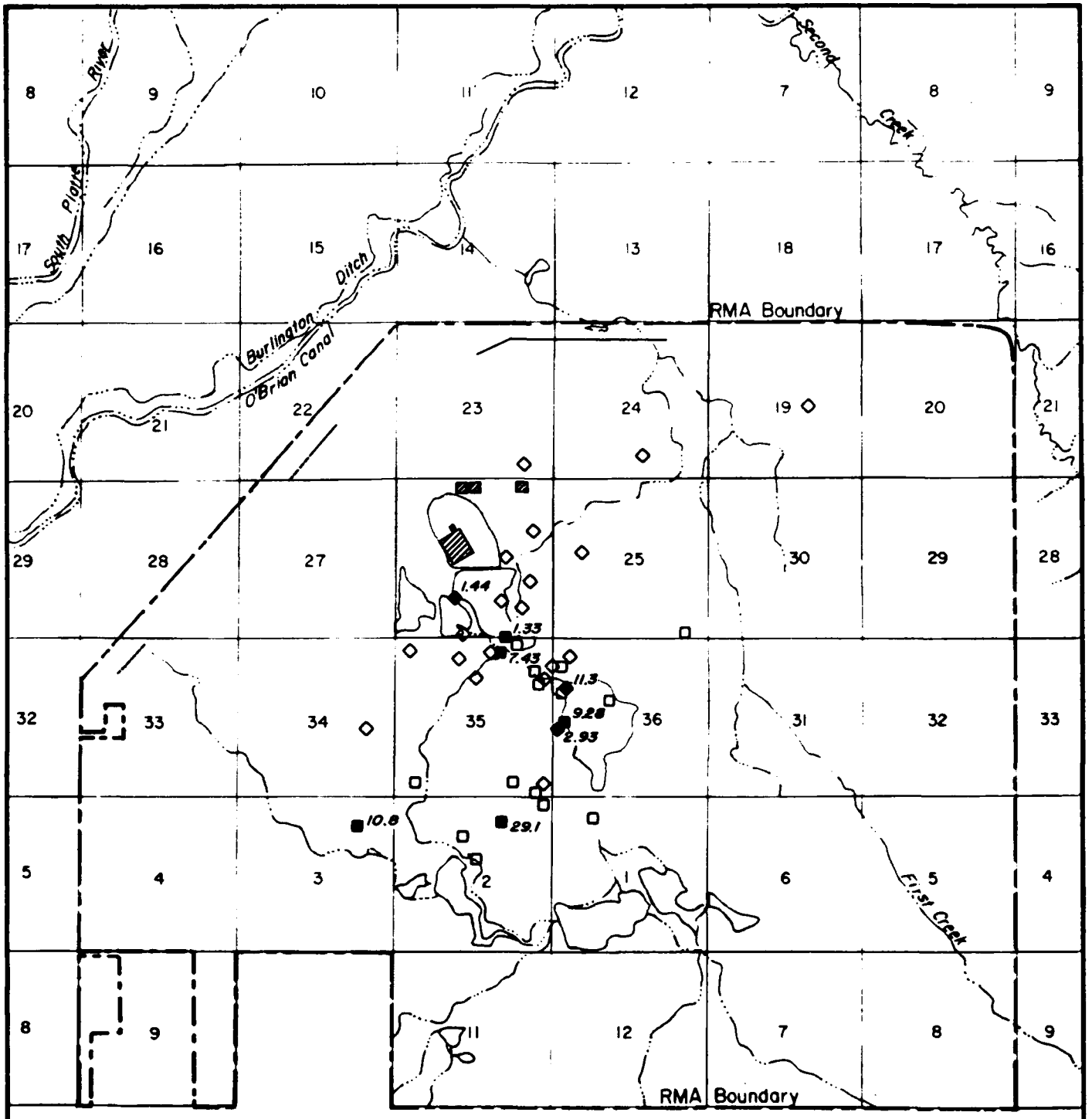
Figure A-15

Benzene Detections
Denver Zone A
Fall 1988
CMP GWAR FY89



Explanation

- 1.33 Denver Zone 1U Well Location
- 11.3 Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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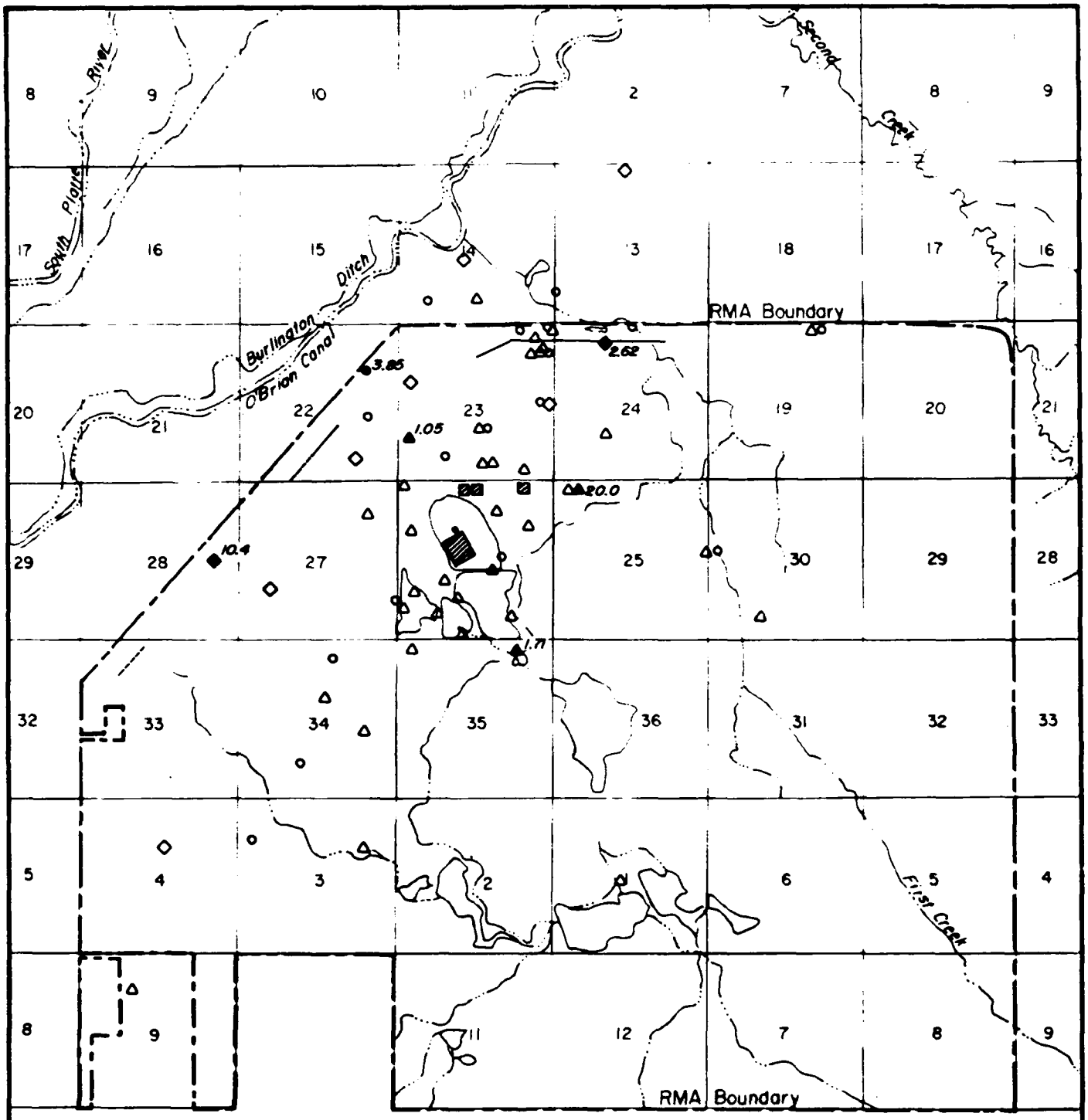
Figure A-16

Benzene Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- ▲ 20.0 Denver Zone 2 Well Location
- ● 3.85 Denver Zone 3 Well Location
- ◆ 10.4 Denver Zone 5 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

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0 1000 2000 3000 Meters

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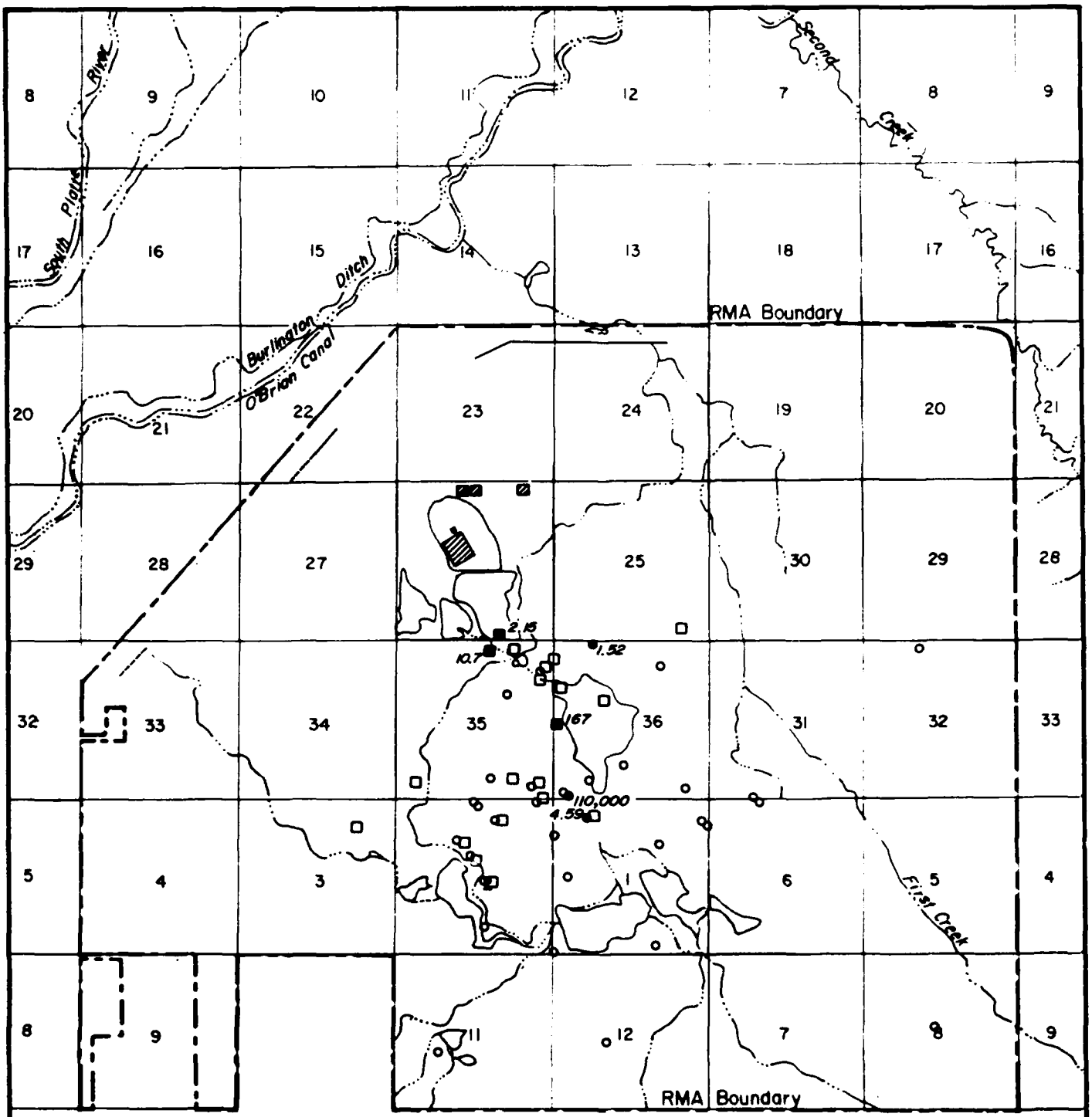
Figure A-17

Benzene Detections
Denver Zones 2, 3, & 5
Fall 1988
CMP GWAR FY89



Explanation

- 1.52 Denver Zone A Well Location
- 167 Denver Zone 1U Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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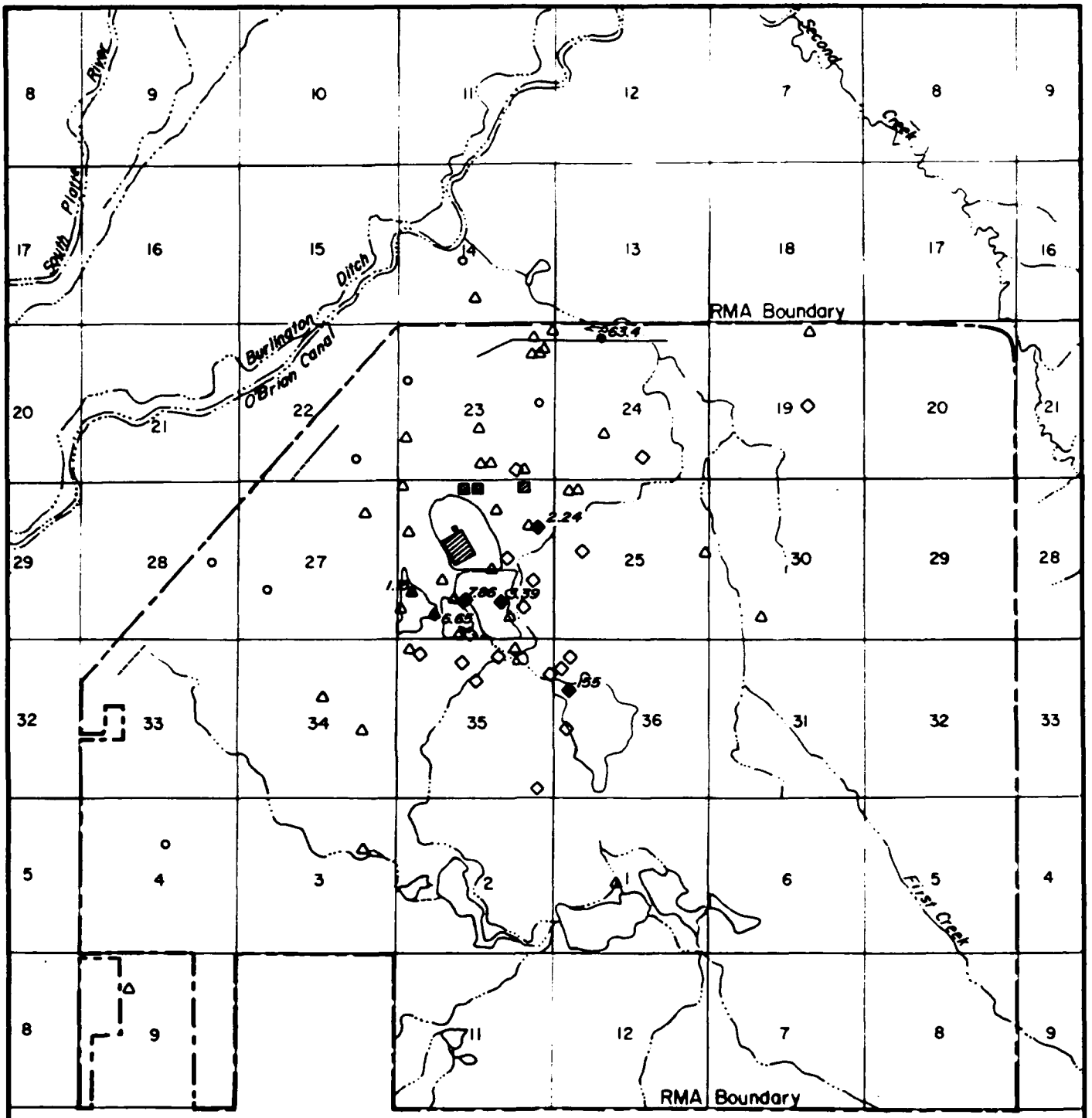
Figure A-18

Chlorobenzene Detections
Denver Zones A & 1U
Fall 1988
CMP GWAR FY89



Explanation

- ◆ 2.24 — Denver Zone 1 Well Location
- ▲ 1.15 — Denver Zone 2 Well Location
- ● 63.4 — Denver Zone 5 Well Location
- ▨ Basin F IRA Structure

Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

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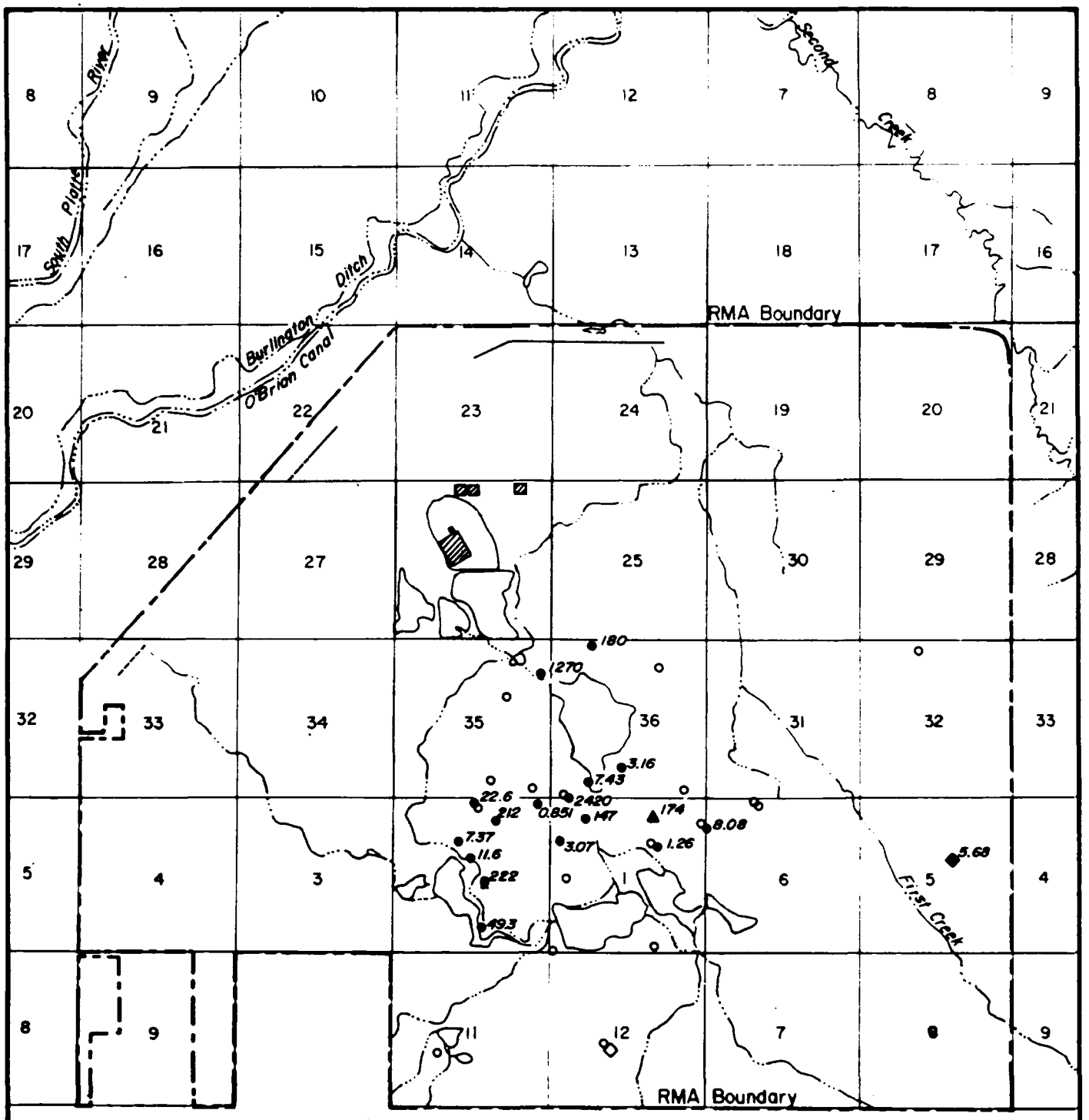
Figure A-19

Chlorobenzene Detections
Denver Zones 1, 2, & 5
Fall 1988
CMP GWAR FY89



Explanation

- ◆ 5.68 — Denver Zone B Well Location
- ● 180 — Denver Zone A Well Location
- ▲ 174 — Denver Zone VC Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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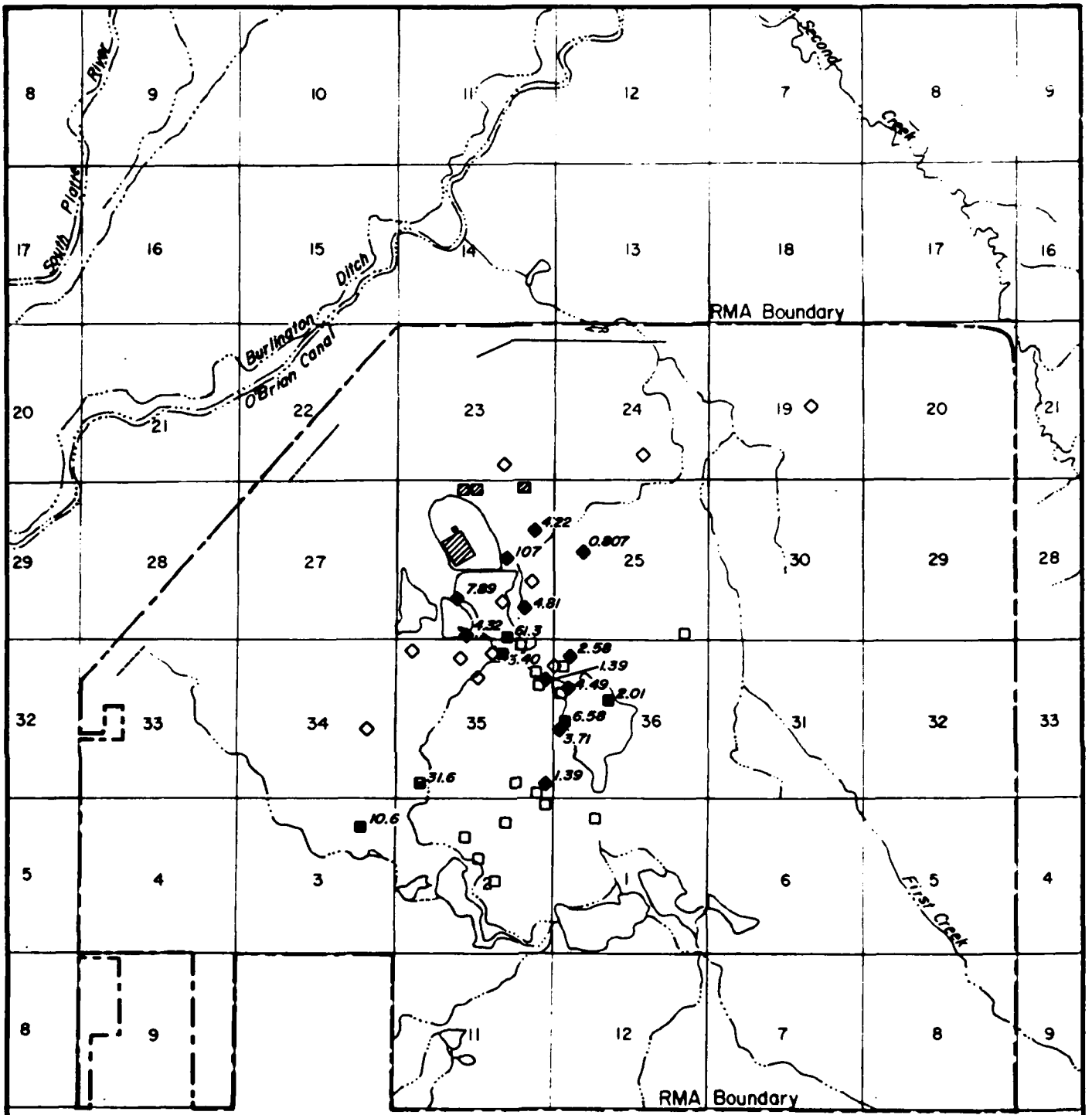
Figure A-20
Summed Organohalogen Compound Detections Denver Zones B,VC,& A Fall 1988
CMP GWAR FY89



Explanation

- ■ 61.3 — Denver Zone 1U Well Location
- ◆ 2.58 — Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

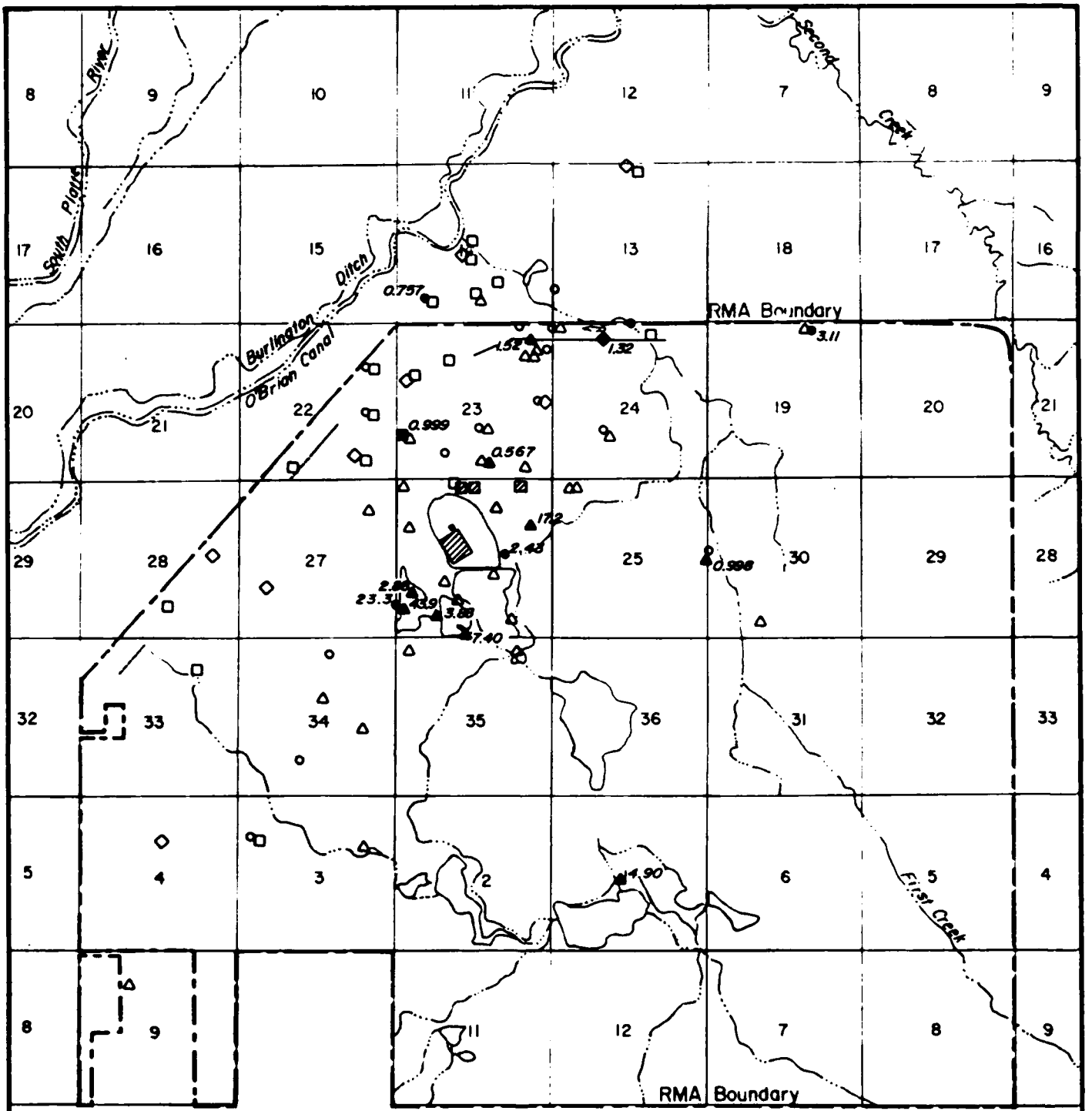
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-21

Summed Organohalogen Compound Detections Denver Zones 1U & 1 Fall 1988

CMP GWAR FY89



Explanation

- $^{0.567}\blacktriangle$ Denver Zone 2 Well Location
- $^{2.43}\blacktriangle$ Denver Zone 3 Well Location
- $^{0.999}\blacksquare$ Denver Zone 4 Well Location
- $^{1.32}\blacklozenge$ Denver Zone 5 Well Location
- ▨ Basin F RMA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

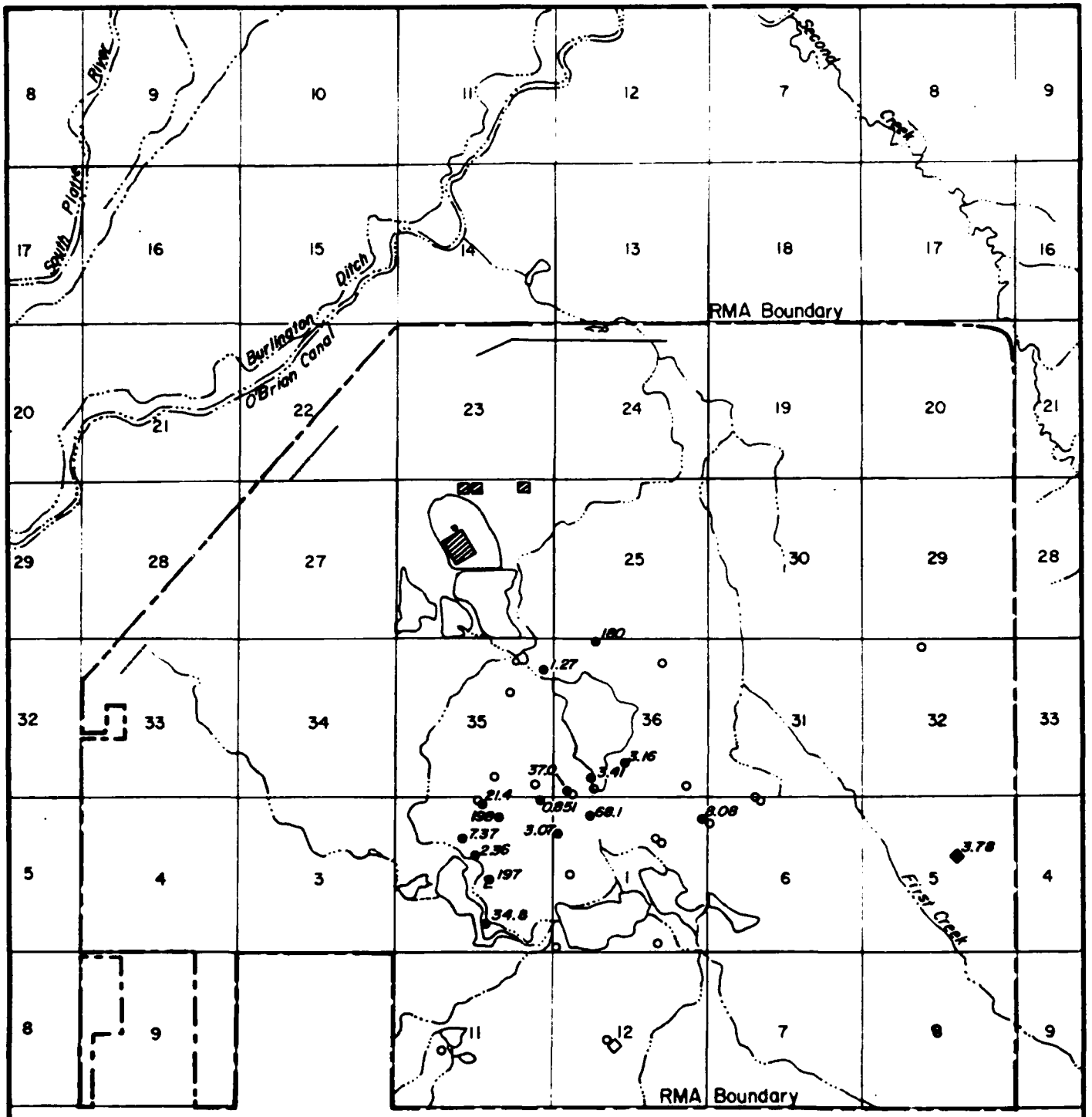
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-22

Summed Organohalogen Compound Detections Denver Zones 2, 3, 4, & 5

Fall 1988

CMP GWAR FY89



Explanation

◆3.78 Denver Zone B Well Location

●180 Denver Zone A Well Location

Containment System
Physical Barrier
Hydraulic Barrier

Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

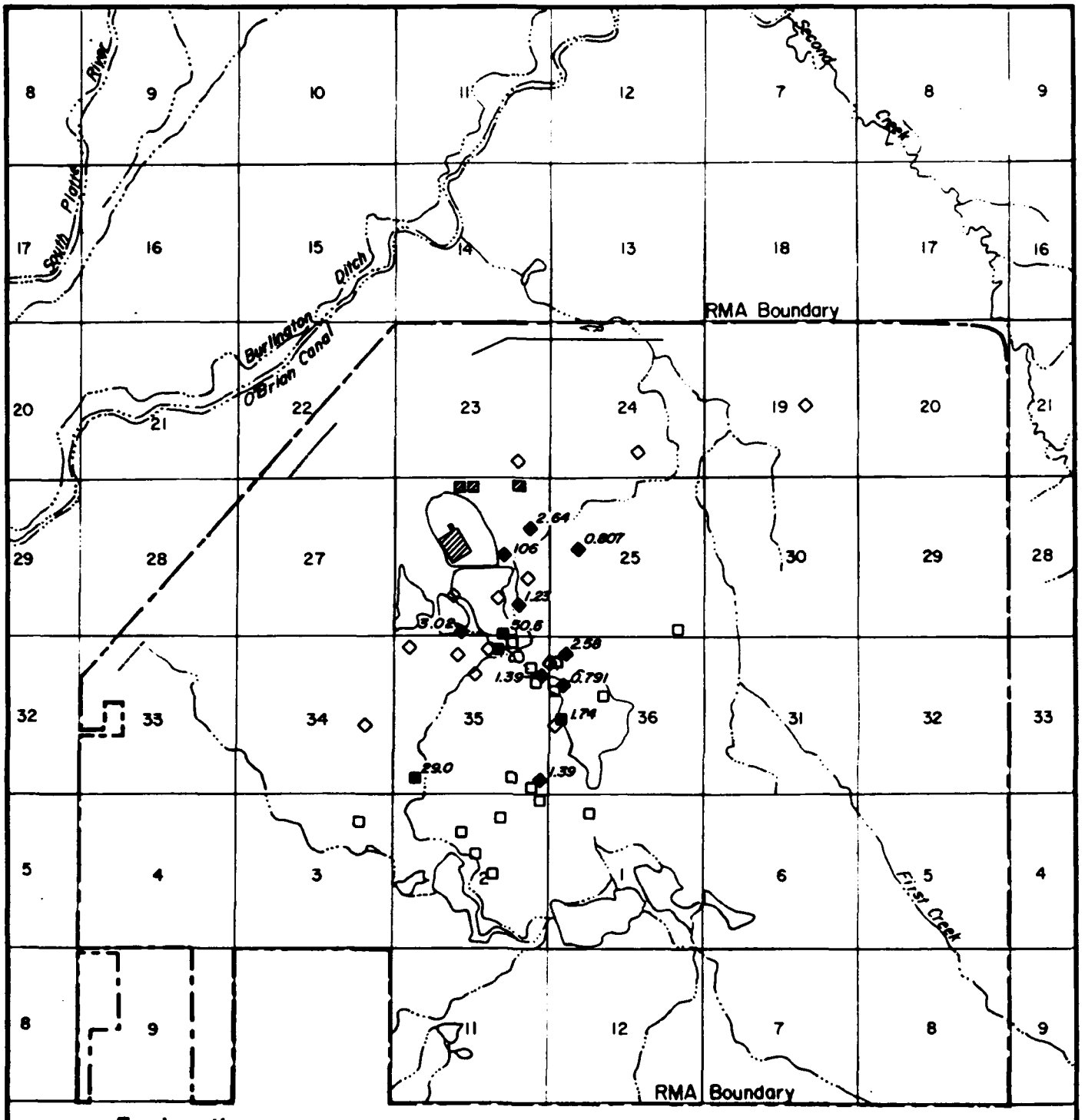
N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-23

Chloroform Detections
Denver Zones B & A
Fall 1988
CMP GWAR FY89



Explanation

- 50.0 — Denver Zone 1U Well Location
- 2.58 — Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

N

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

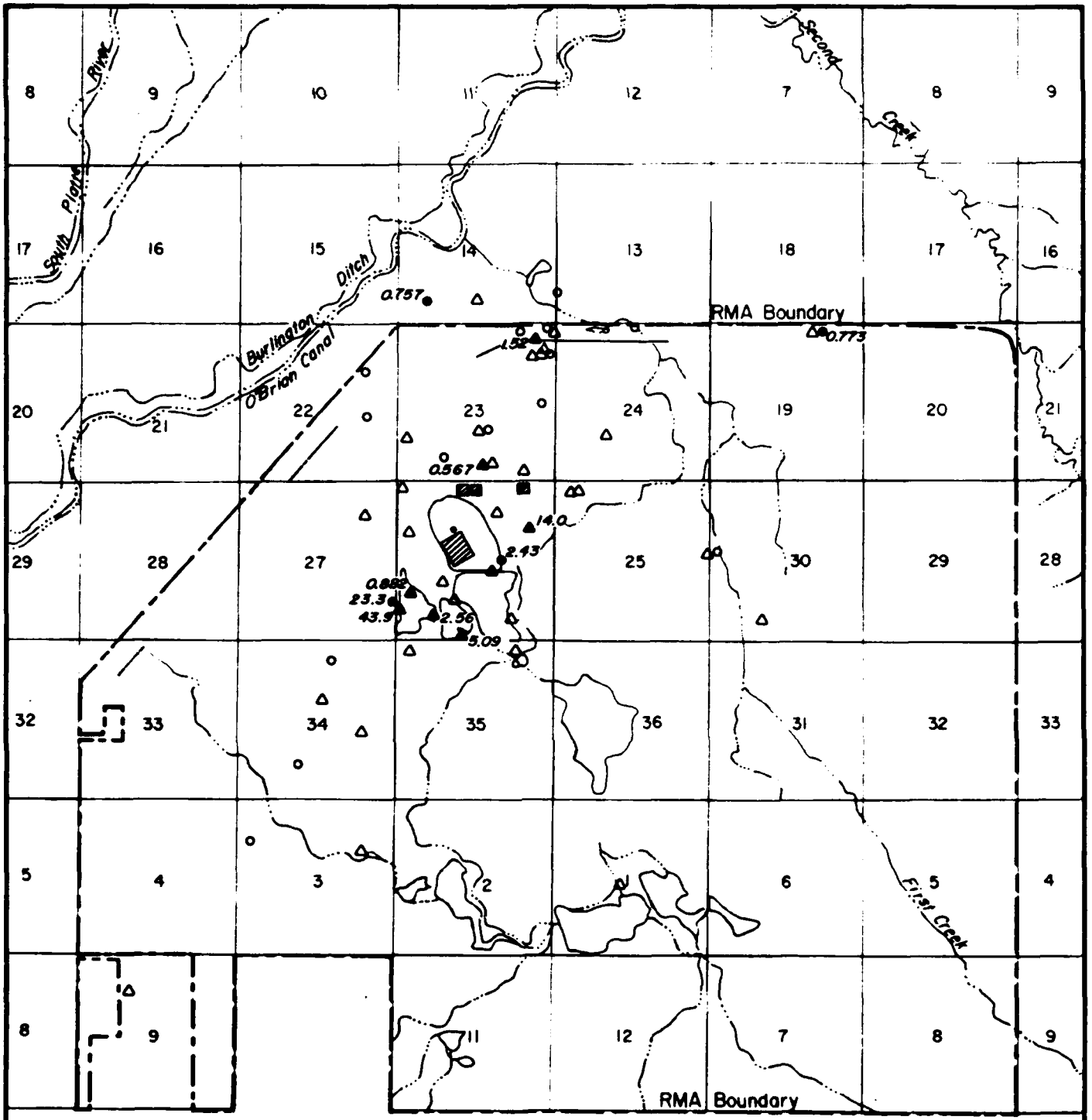
0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-24

Chloroform Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- ▲ 1.52 — Denver Zone 2 Well Location
- ● 23.3 — Denver Zone 3 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

Prepared for :
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Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by :
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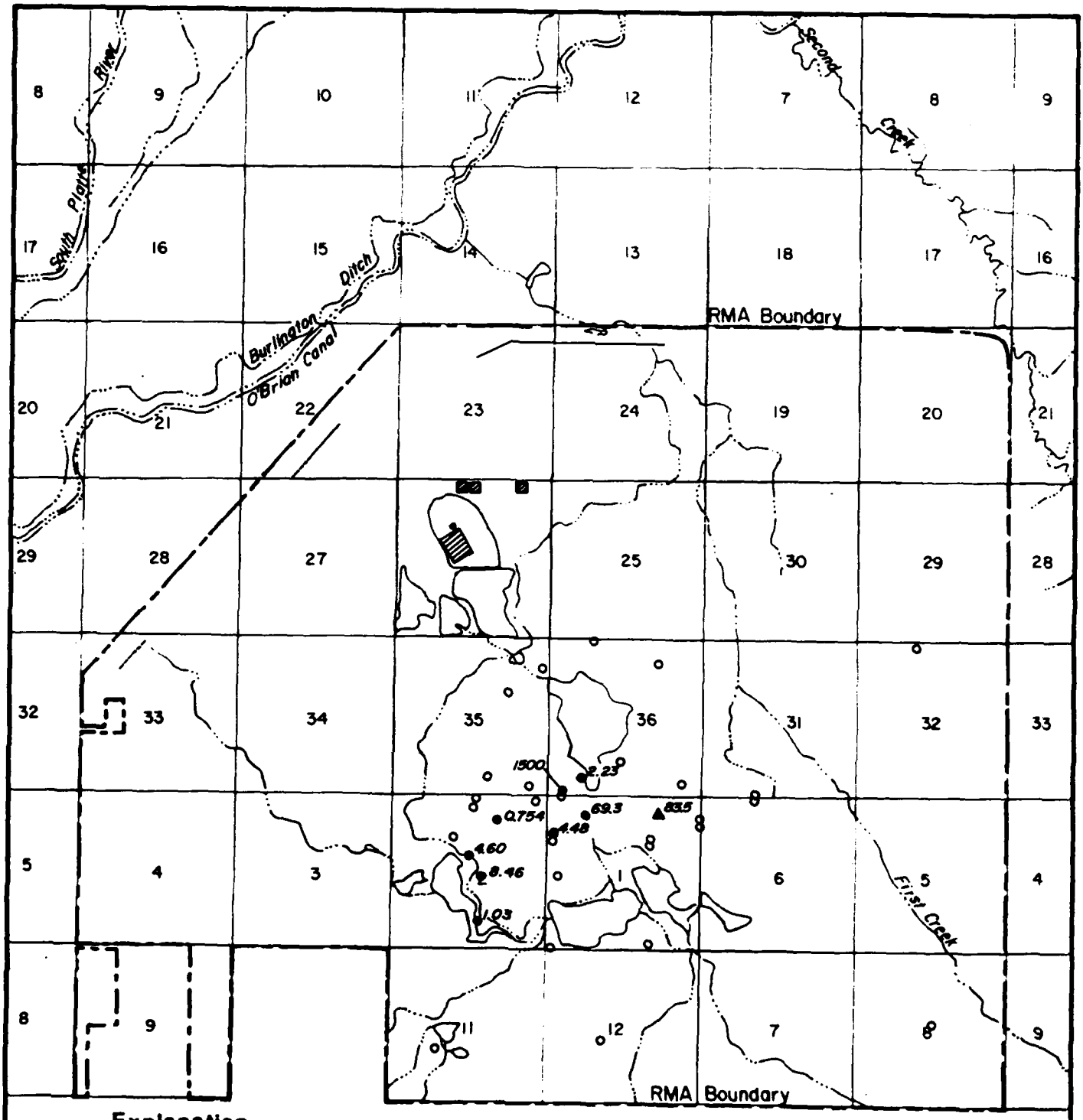
Harding Lawson Associates

Figure A-25

Chloroform Detections
Denver Zones 2 & 3
Fall 1988
CMP GWAR FY89



Explanation

- 2.23 Denver Zone A Well Location
- 83.5 Denver Zone VC Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in ug/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by :
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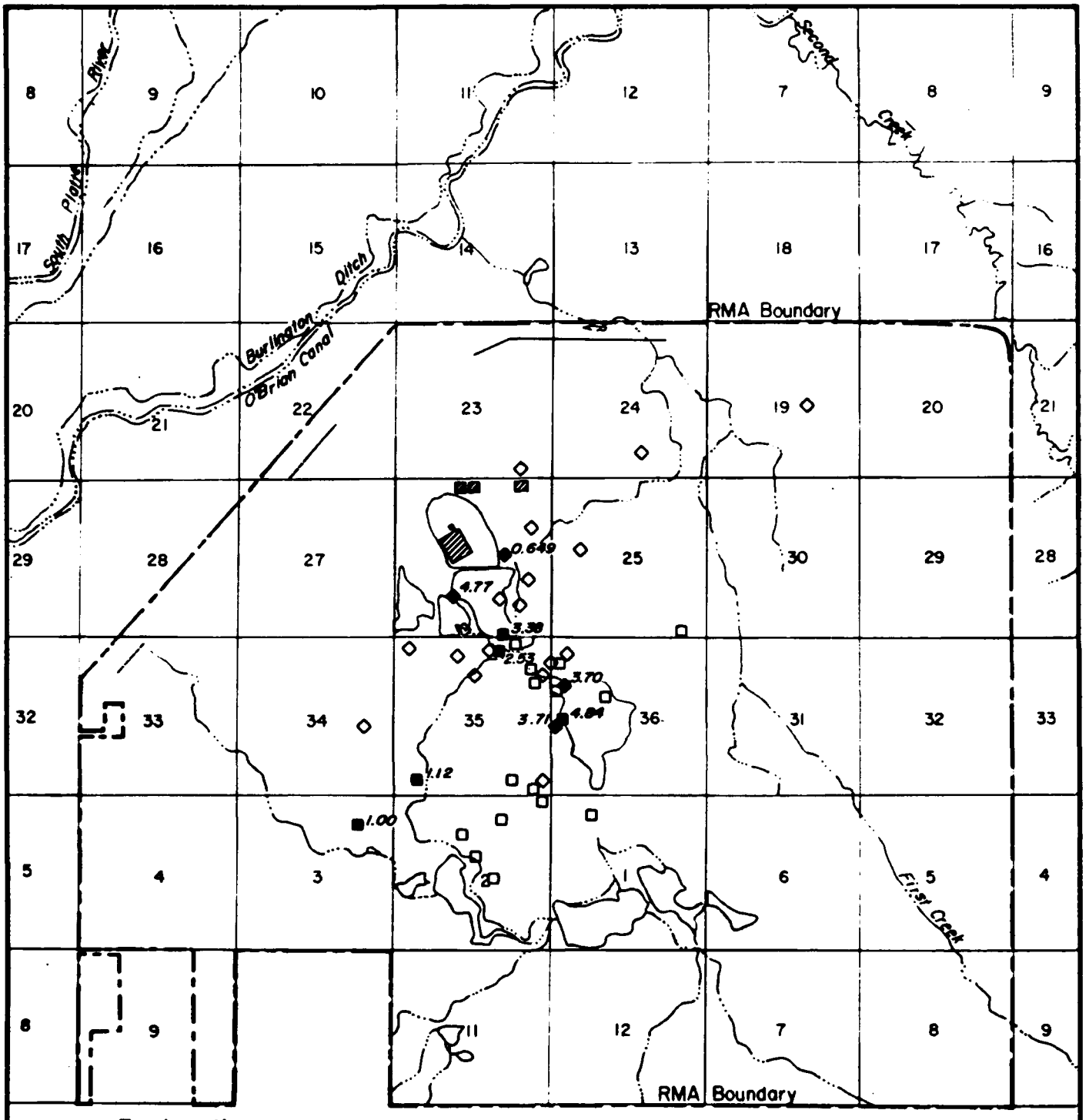
Harding Lawson Associates

Figure A-26
Trichloroethene (TRCLEE) Detections
Denver Zones VC & A
Fall 1988
CMP GWAR FY89



Explanation

- 3.38 Denver Zone 1U Well Location
- 3.70 Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

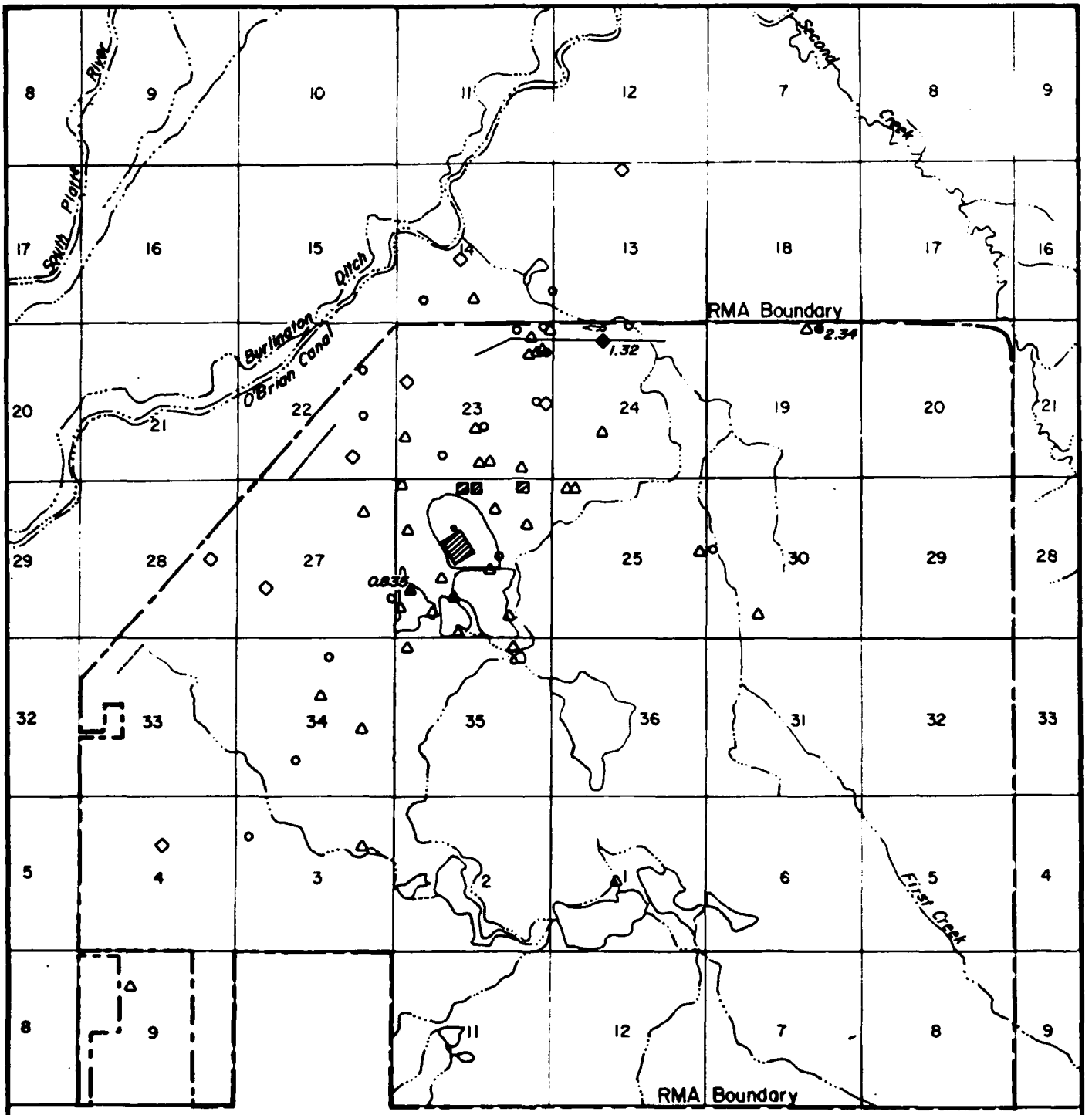
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-27

Trichloroethene (TRCLEE) Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- ▲ 0.835 — Denver Zone 2 Well Location
- ● 2.34 — Denver Zone 3 Well Location
- ◆ 1.32 — Denver Zone 5 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

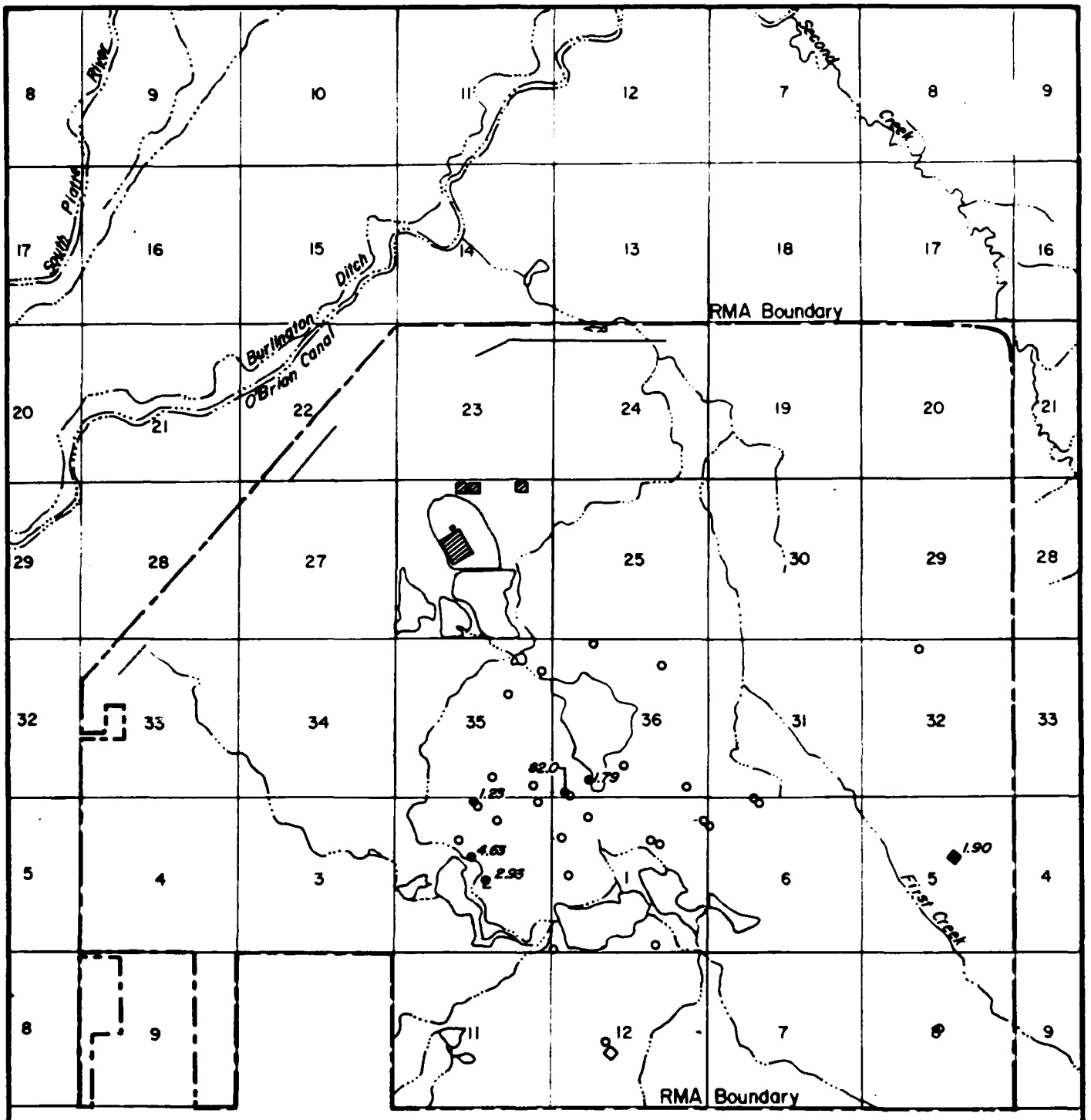
0 1000 2000 3000 Meters

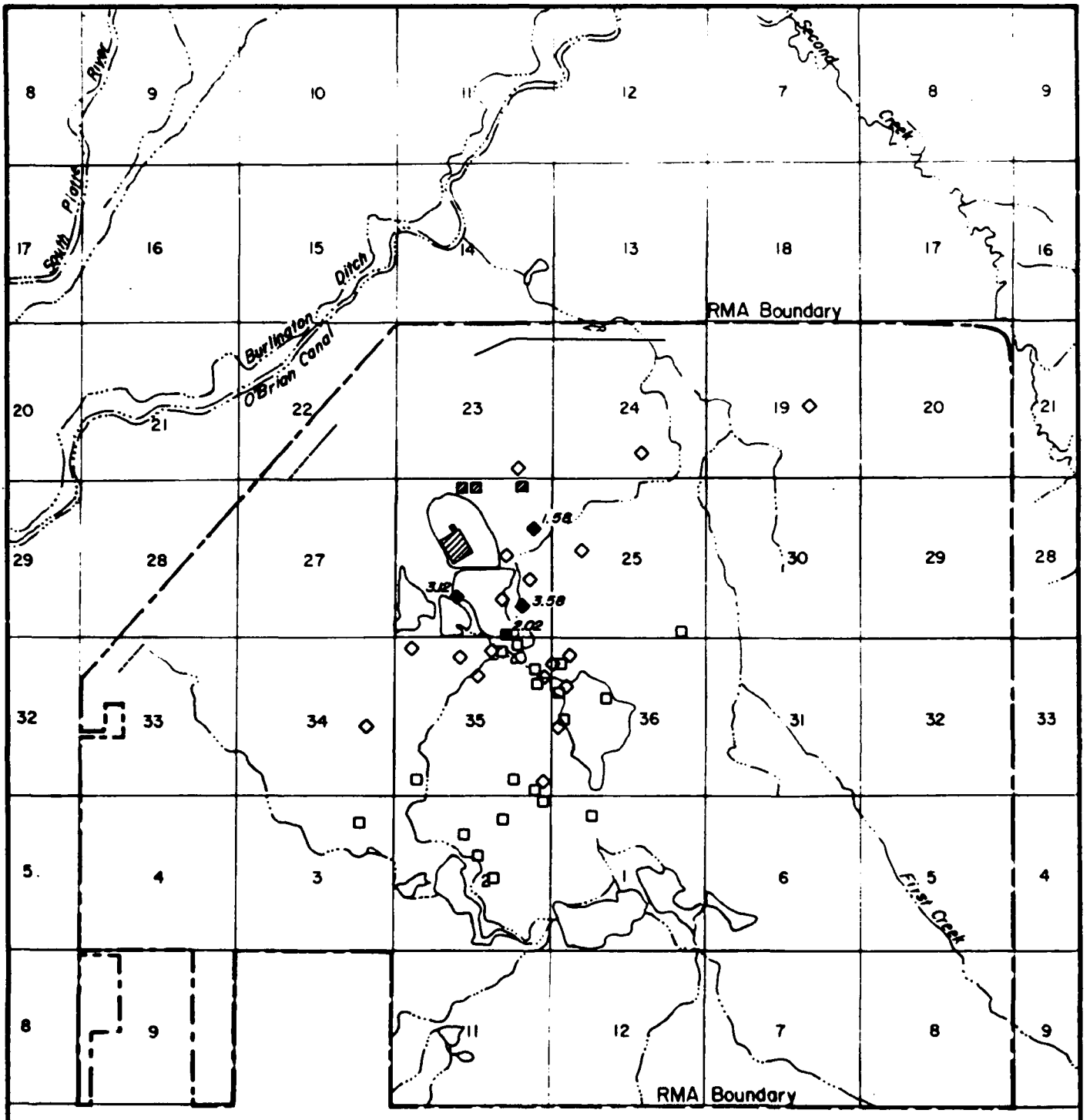
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-28

Trichloroethene (TRCLEE) Detections
Denver Zones 2, 3, & 5
Fall 1988
CMP GWAR FY89


South Platte River
Burlington Ditch
O'Brian Canal
Second Creek
First Creek
RMA Boundary
RMA Boundary
82.0
1.79
1.23
4.65
2.93
1.90
Explanation
1.79 Denver Zone A Well Location
1.90 Denver Zone B Well Location
Containment System
Physical Barrier
Hydraulic Barrier
Basin F IRA Structure
Analyte Concentration in µg/l
Note : Open symbol indicates analyte was not detected
N
0 5000 10,000 Feet
0 1000 2000 3000 Meters
Prepared for :
U.S. Army Program Manager for Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates
Figure A-29
Tetrachloroethene (TCLE) Detections
Denver Zones A & B
Fall 1988
CMP GWAR FY89



Explanation

- 2.02 — Denver Zone 1U Well Location
- 3.58 — Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Analyte Concentration in µg/l

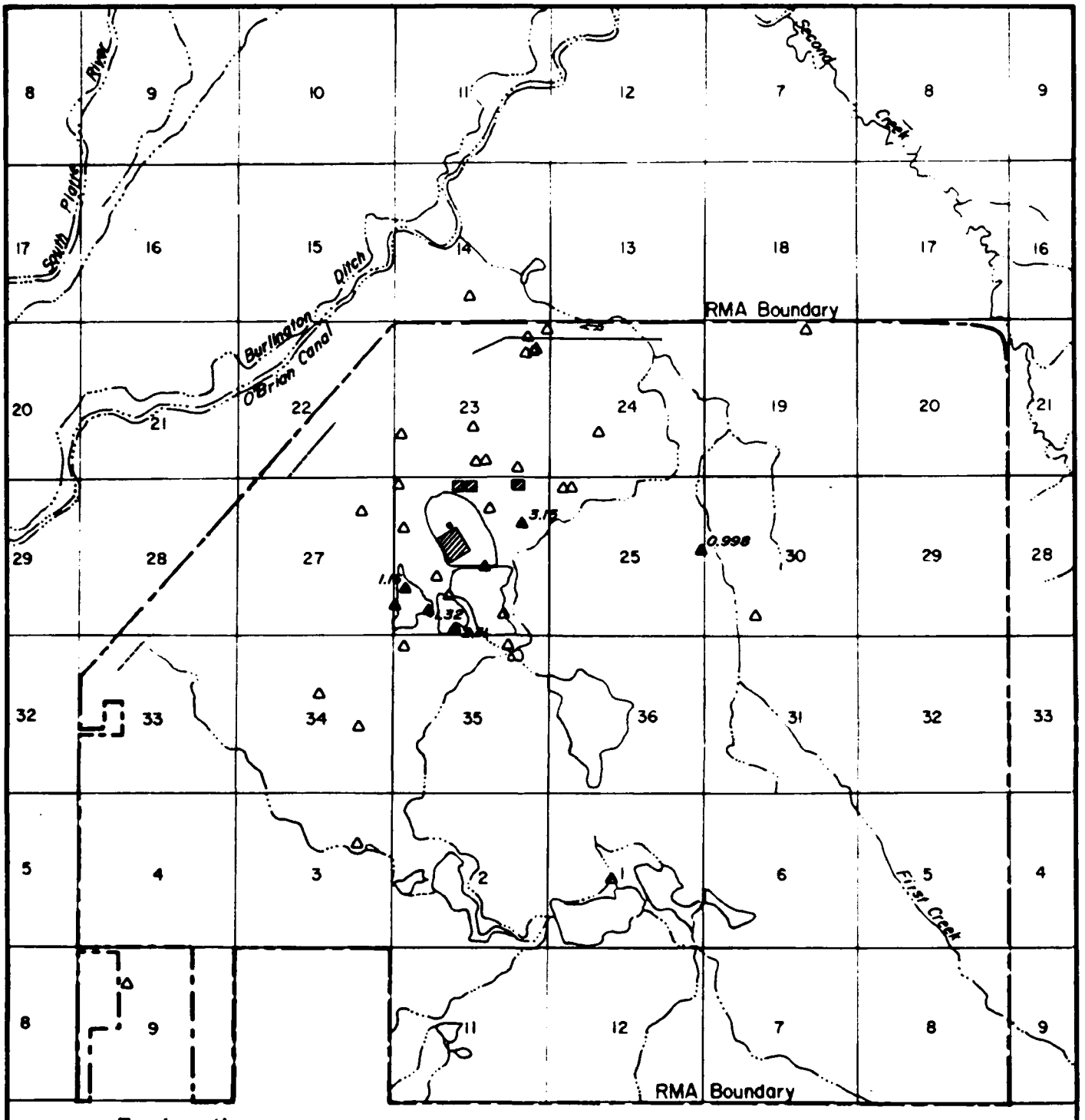
Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-30
Tetrachloroethene (TCLE) Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

▲3.15 Denver Zone 2 Well Location

Containment System

Physical Barrier

Hydraulic Barrier

▨ Basin F RFA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by :
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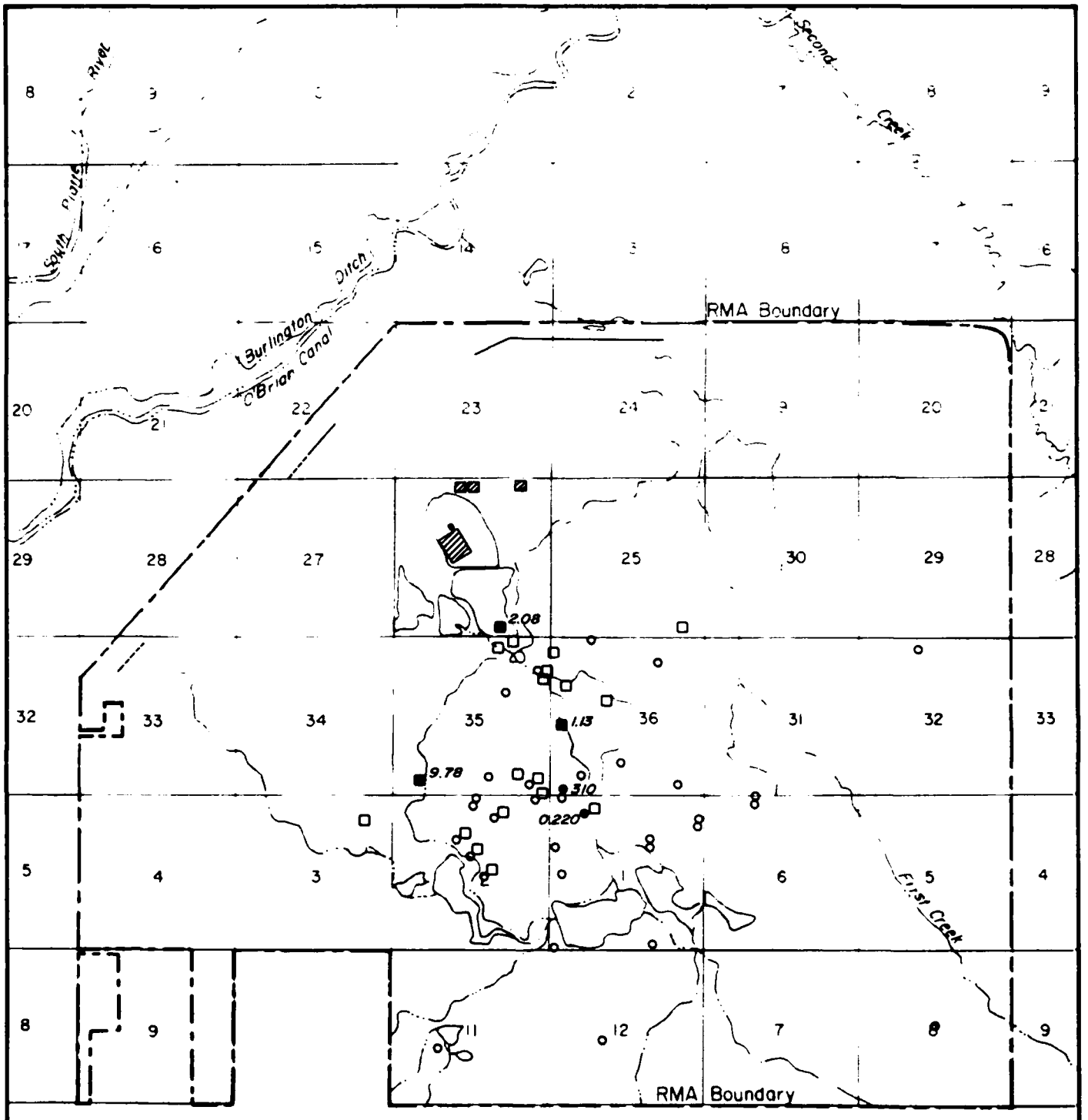
Harding Lawson Associates

Figure A-31

Tetrachloroethene (TCLE) Detections
Denver Zone 2
Fall 1988
CMP GWAR FY89



Explanation

- 310 — Denver Zone A Well Location
- 2.08 — Denver Zone 1U Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

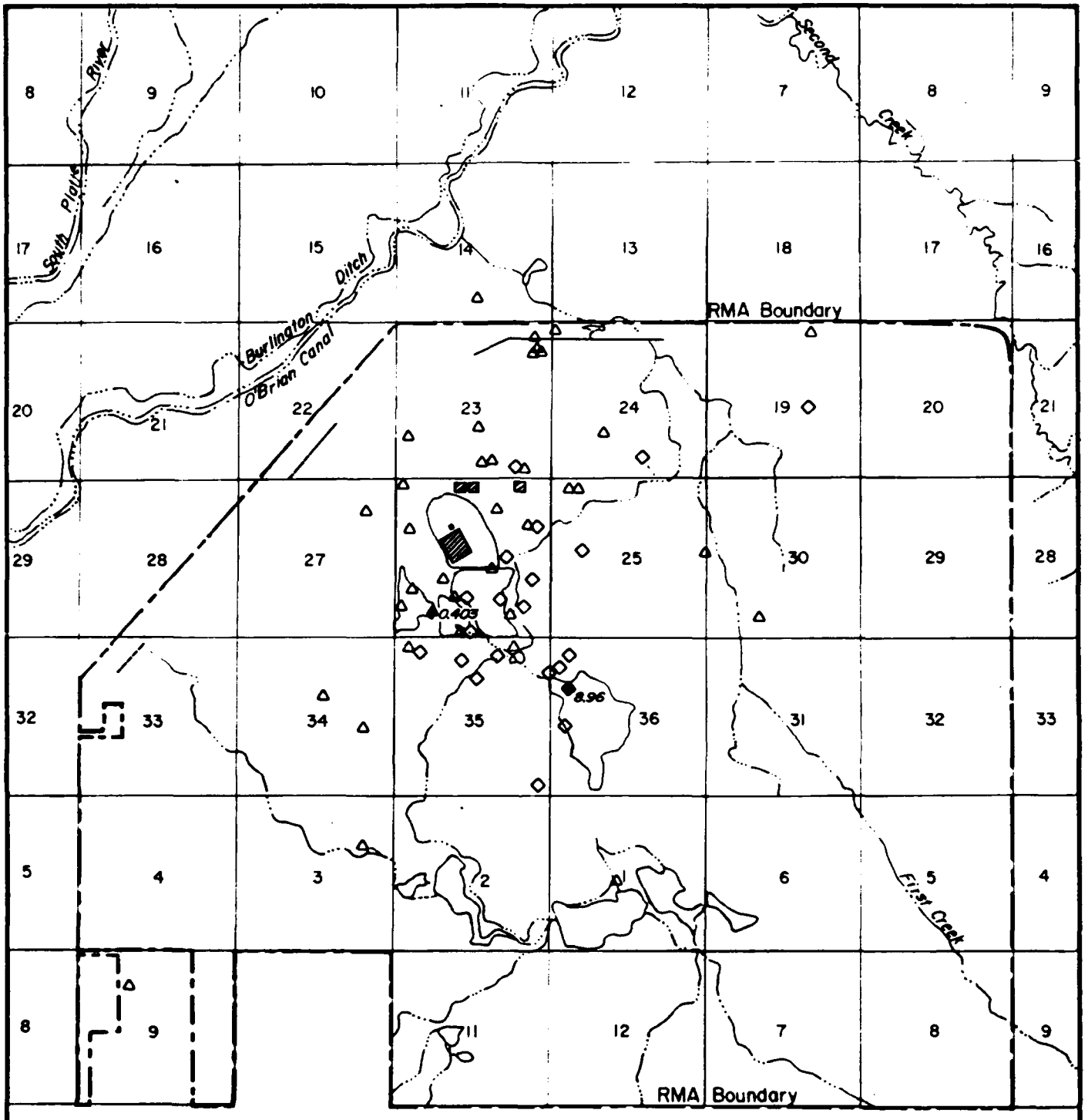
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-32

Dibromochloropropane(DBCP) Detections
Denver Zones A & 1U
Fall 1988

CMP GWAR FY89



Explanation

- 8.96 Denver Zone 1 Well Location
- 0.403 Denver Zone 2 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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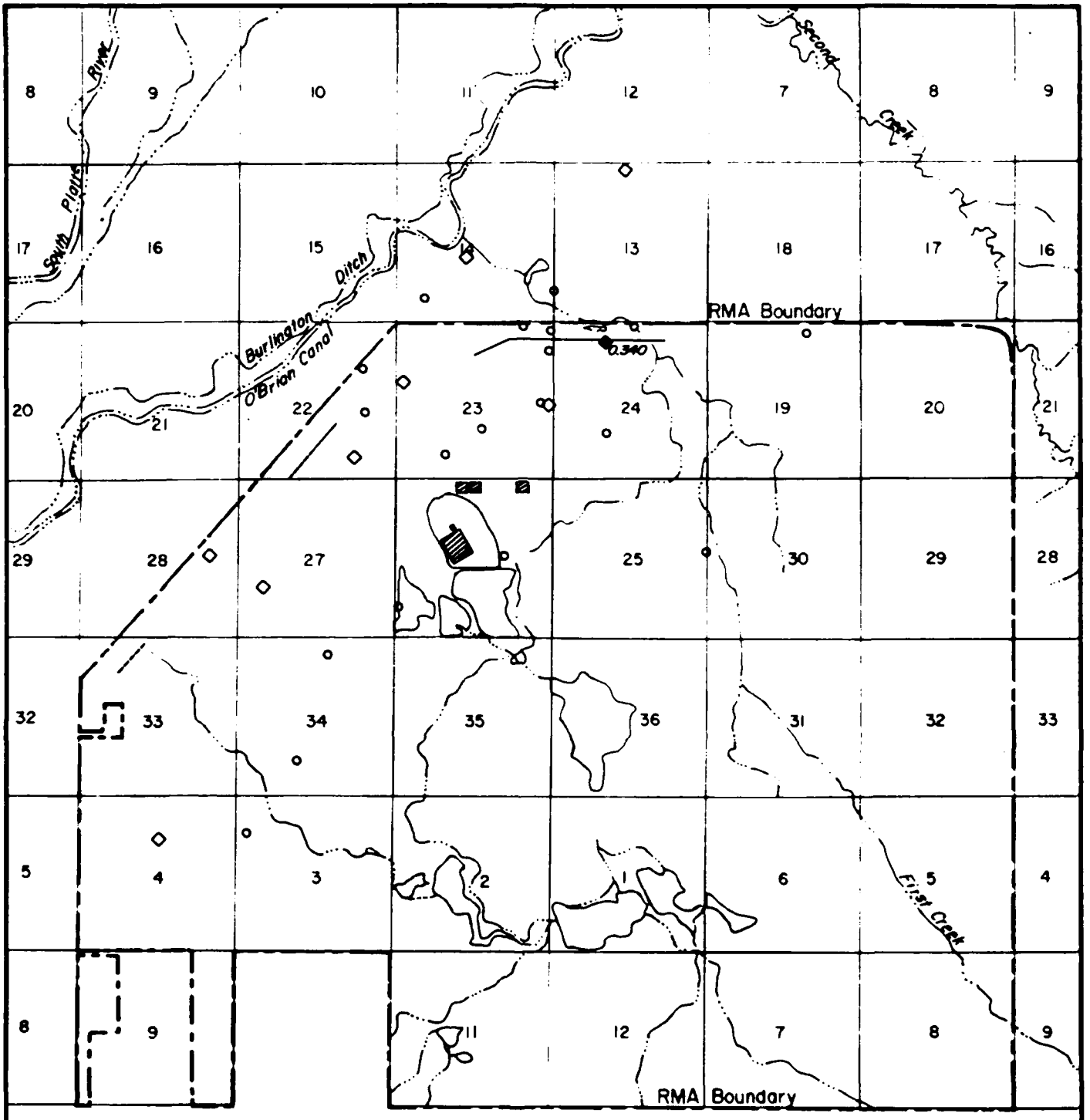
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-33

Dibromochloropropane (DBCP) Detections
Denver Zones 1 & 2
Fall 1988
CMP GWAR FY89



Explanation

- Denver Zone 3 Well Location
- 0.340 Denver Zone 5 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

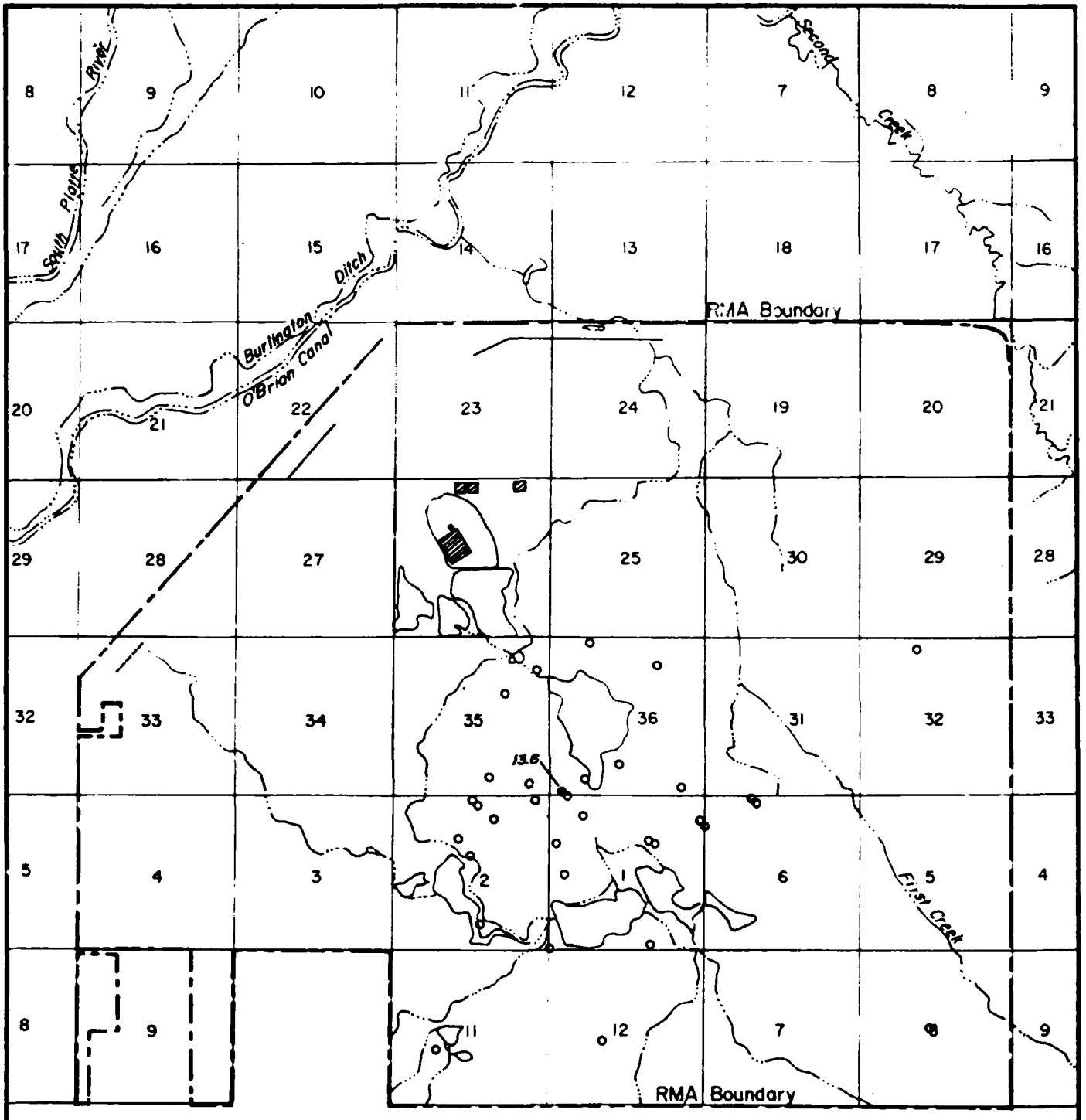
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-34

Dibromochloropropane (DBCP) Detections
Denver Zones 3 & 5
Fall 1988
CMP GWAR FY89



Explanation

- ●13.6 Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

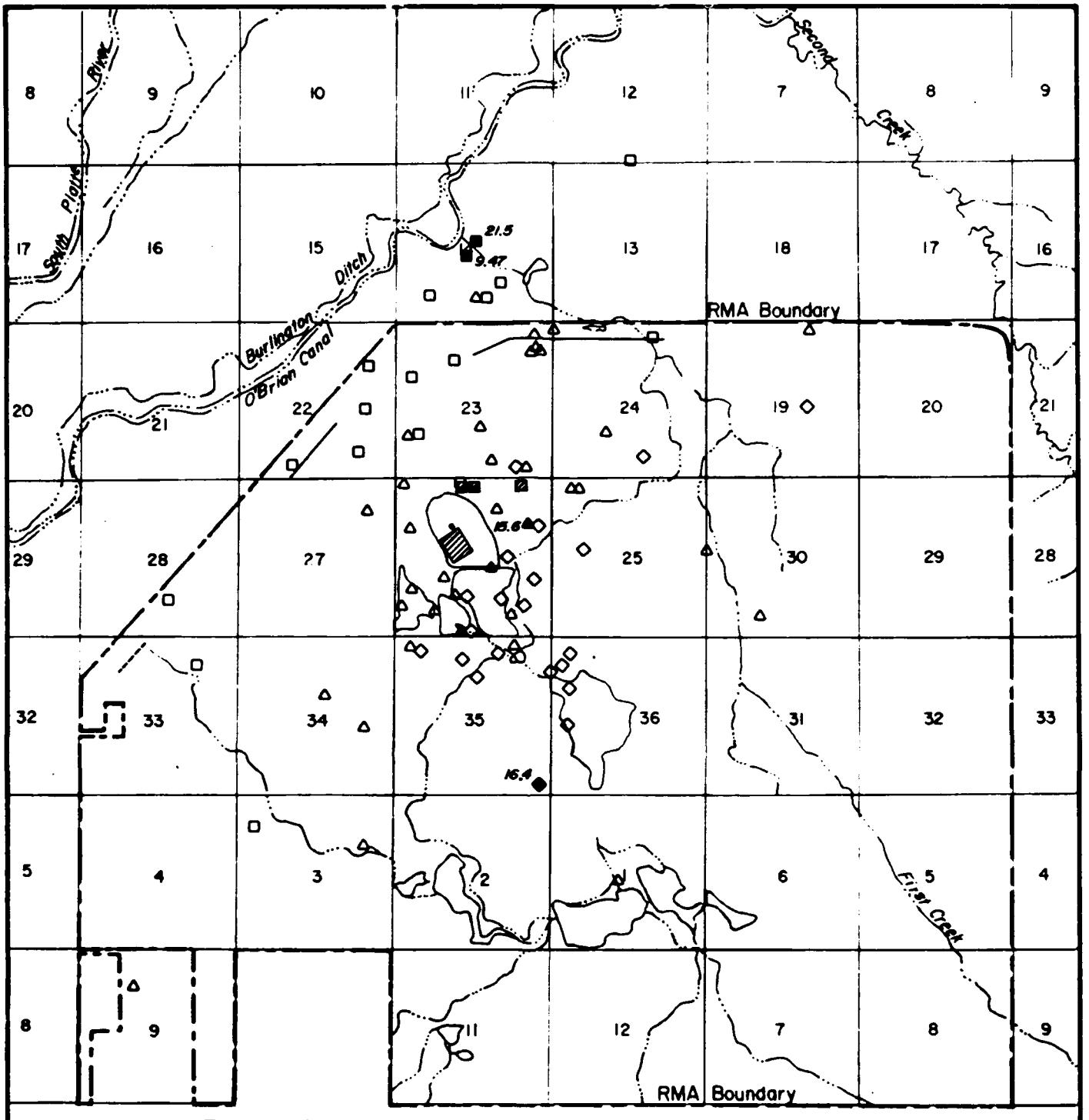
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-35

Dicyclopentadiene (DCPD) Detections
Denver Zone A
Fall 1988
CMP GWAR FY89



Explanation

- $\blacklozenge^{6.4}$ Denver Zone 1 Well Location
- $\blacktriangle^{15.6}$ Denver Zone 2 Well Location
- $\blacksquare^{21.5}$ Denver Zone 4 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

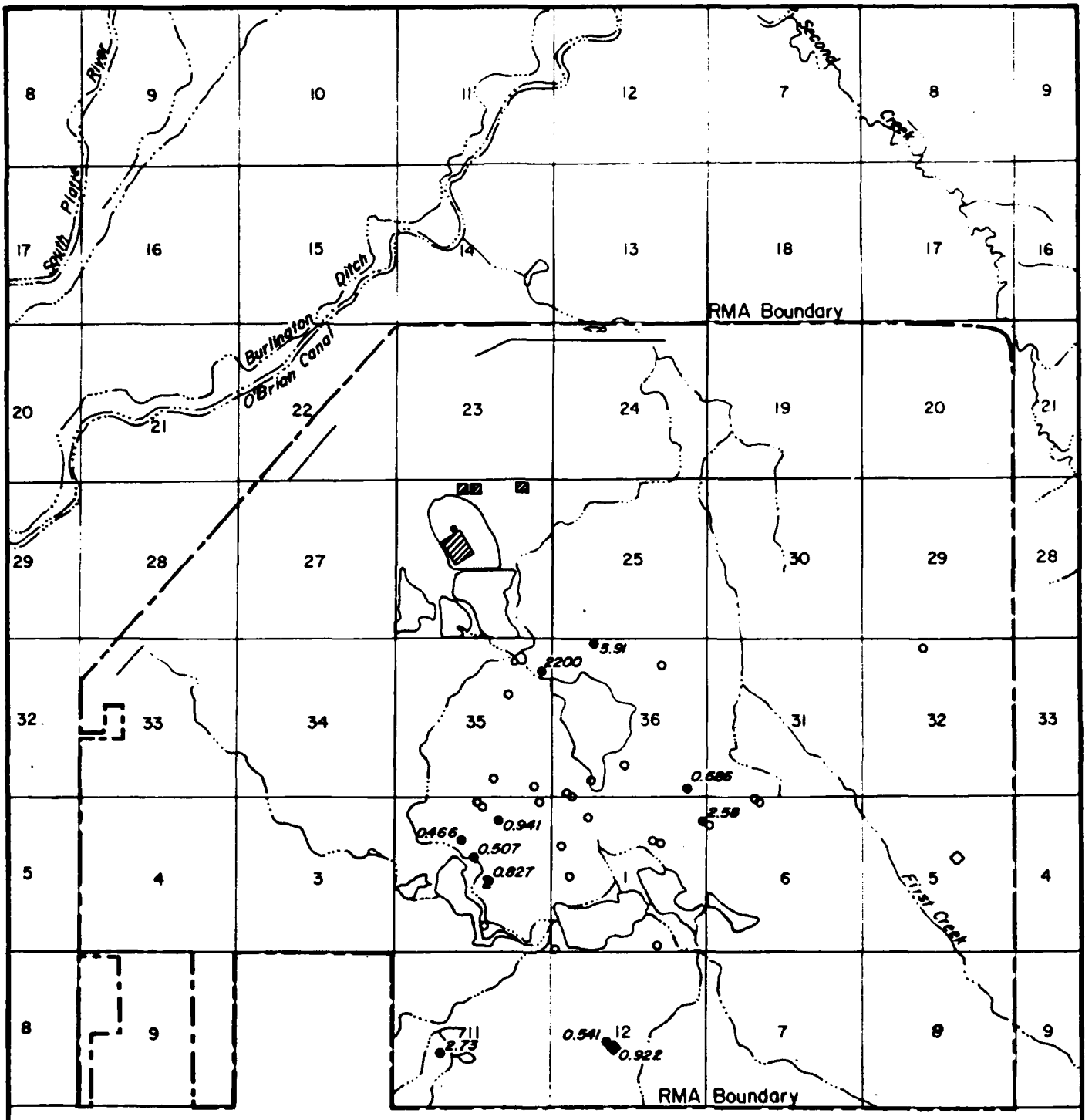
Note :
Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R. L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-36
Dicyclopentadiene (DCPD) Detections
Denver Zones 1, 2, & 4
Fall 1988
CMP GWAR FY89



Explanation

- 0.992 Denver Zone B Well Location
- 5.91 Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

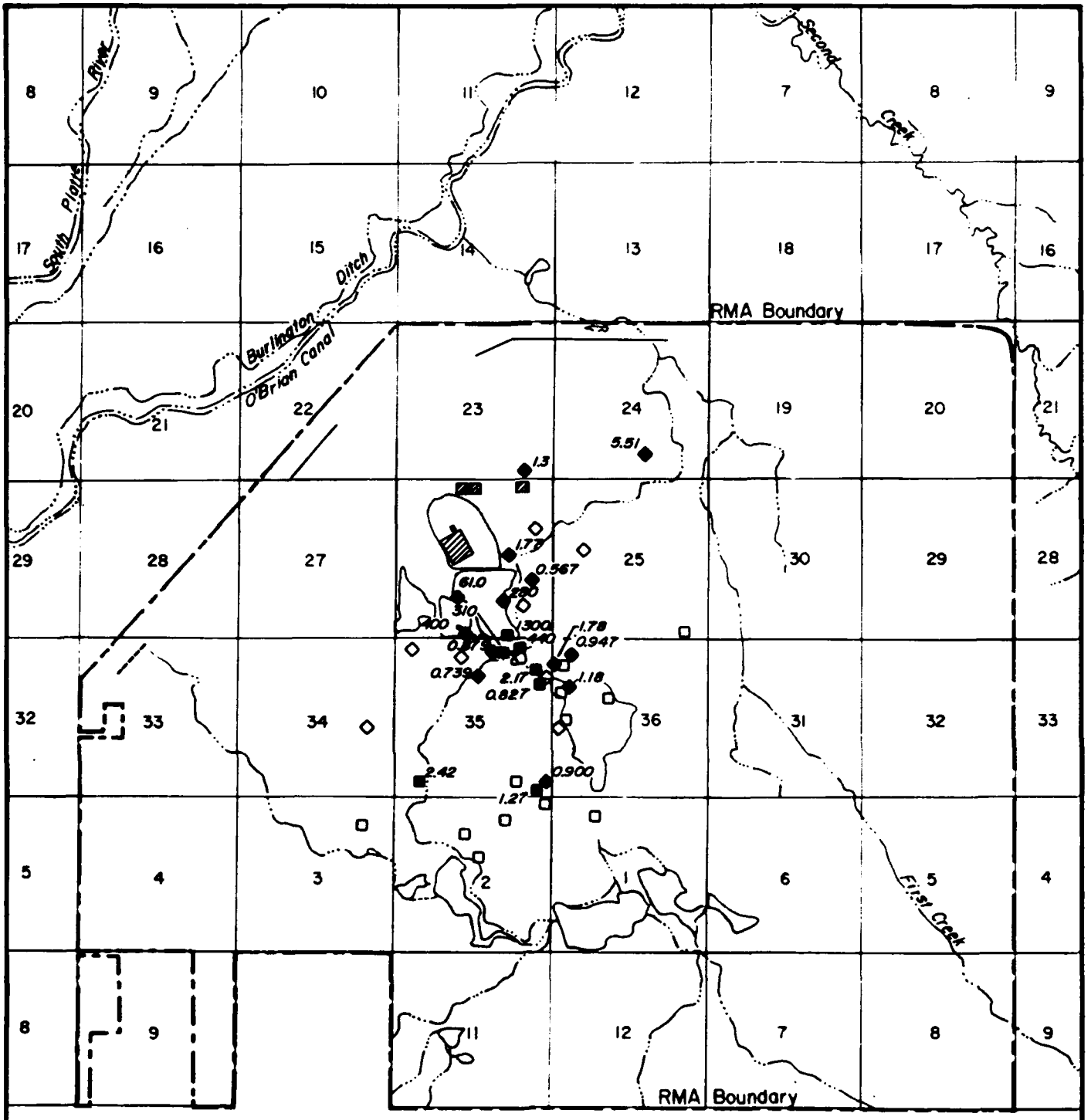
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-37

Diisopropylmethylphosphonate (DIMP) Detections Denver Zones B & A Fall 1988

CMP GWAR FY89



Explanation

- 2.17 Denver Zone 1U Well Location
- 1.77 Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Analyte Concentration in µg/l

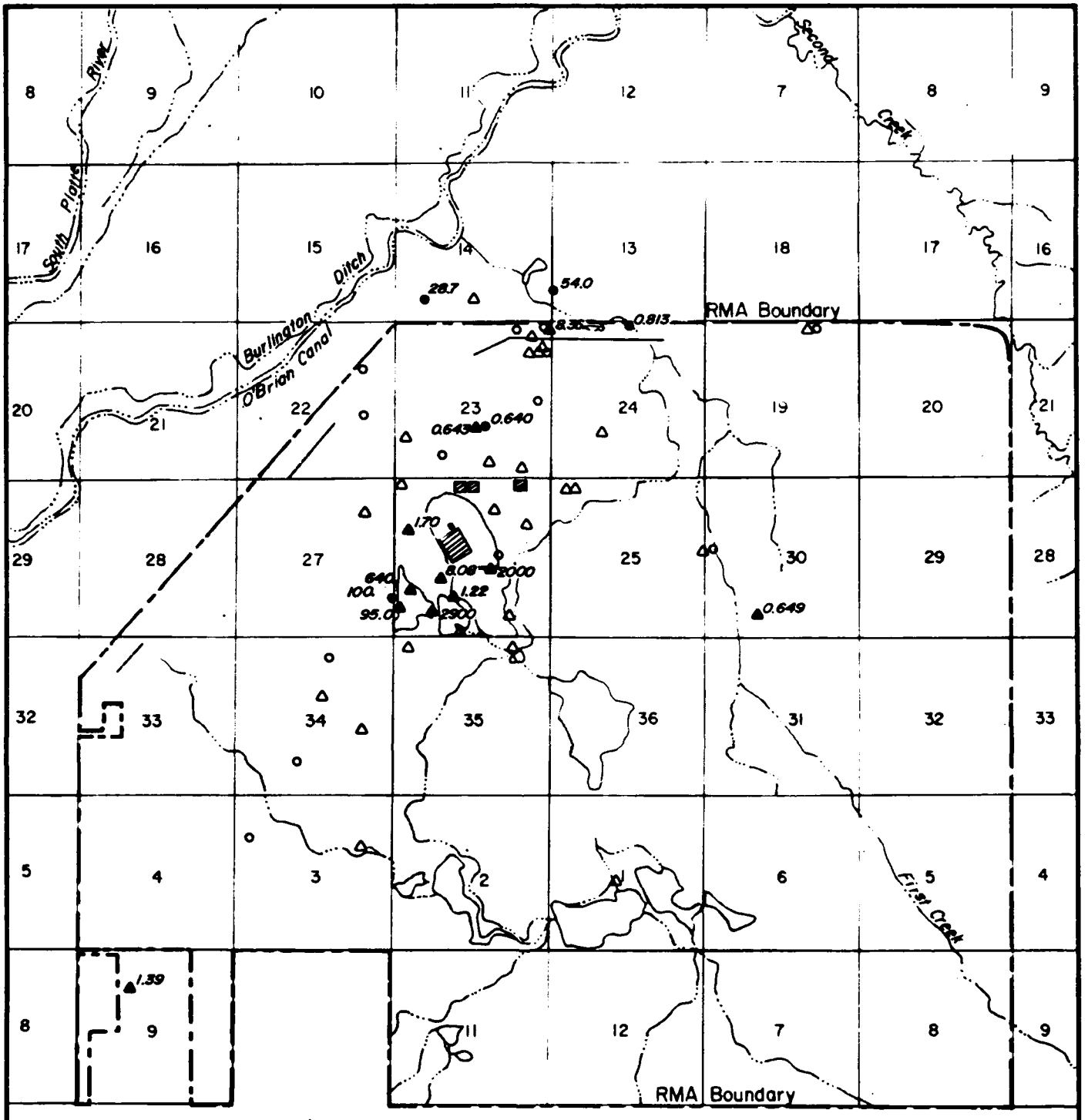
Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-38
Diisopropylmethylphosphonate (DIMP) Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

▲ 1.70 Denver Zone 2 Well Location

● 100. Denver Zone 3 Well Location

Containment System

Physical Barrier

Hydraulic Barrier

▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

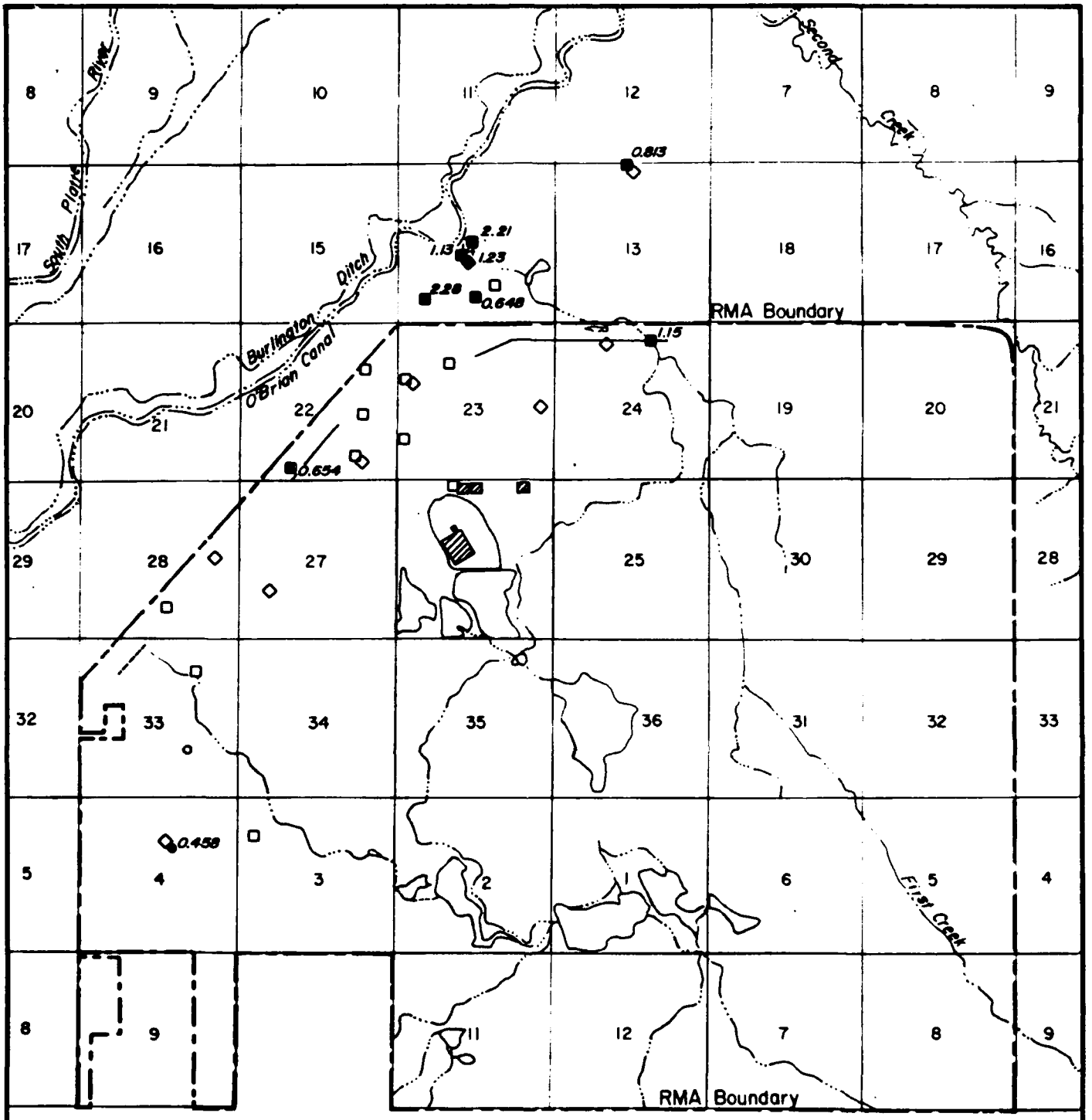
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-39

Diisopropylmethylphosphonate (DIMP) Detections
Denver Zones 2 & 3
Fall 1988
CMP GWAR FY89



Explanation

- ■ 2.21 Denver Zone 4 Well Location
- ◆ 1.23 Denver Zone 5 Well Location
- ● 0.458 Denver Zone 6 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Note :
Open symbol indicates analyte was not detected

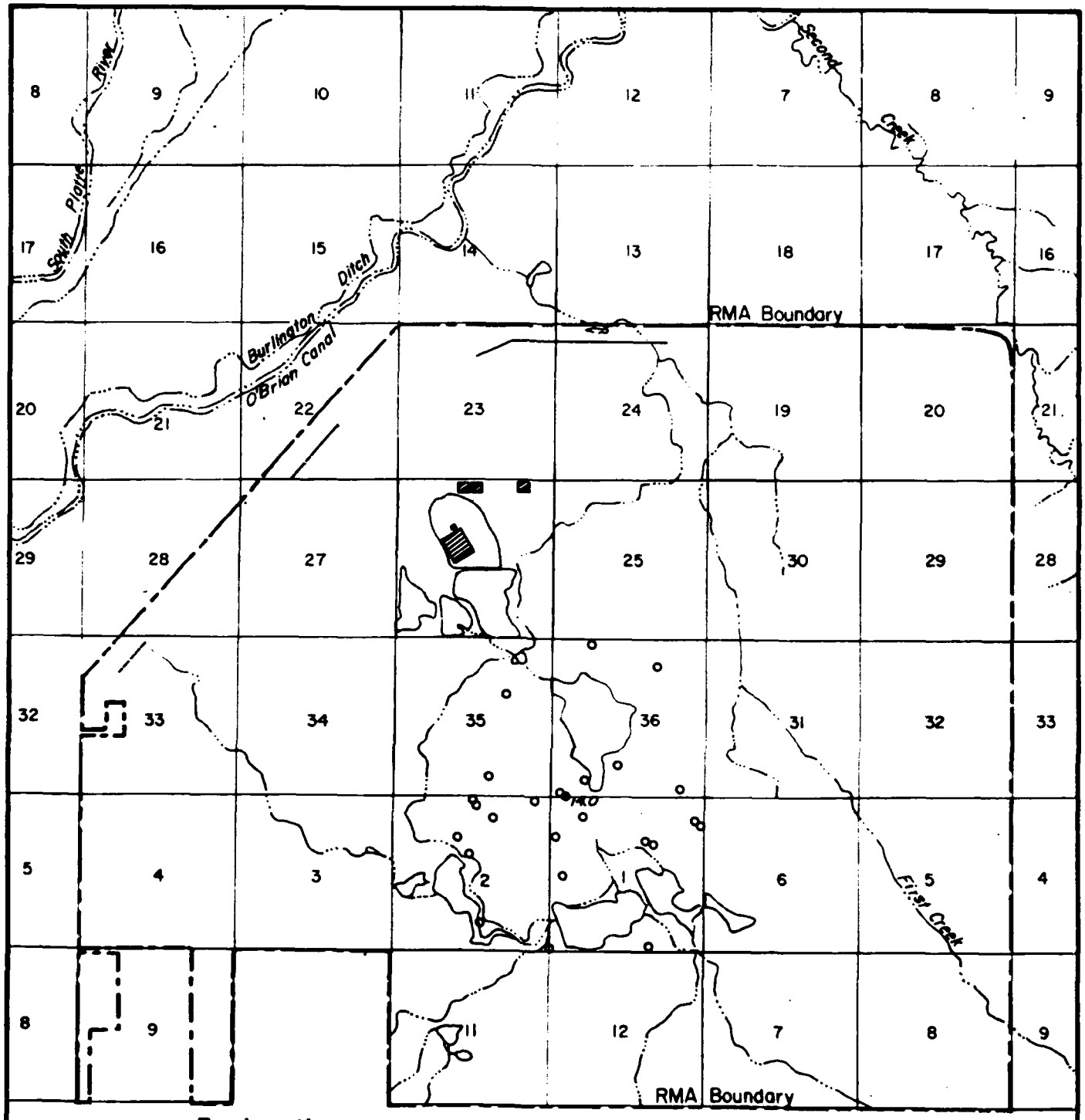
N

Analyte Concentration in µg/l

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-40
Diisopropylmethylphosphonate (DIMP) Detections
Denver Zones 4, 5, & 6
Fall 1988
CMP GWAR FY89



Explanation

- ●14.0 Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

N

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

0 5000 10,000 Feet

0 1000 2000 3000 Meters

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U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by :
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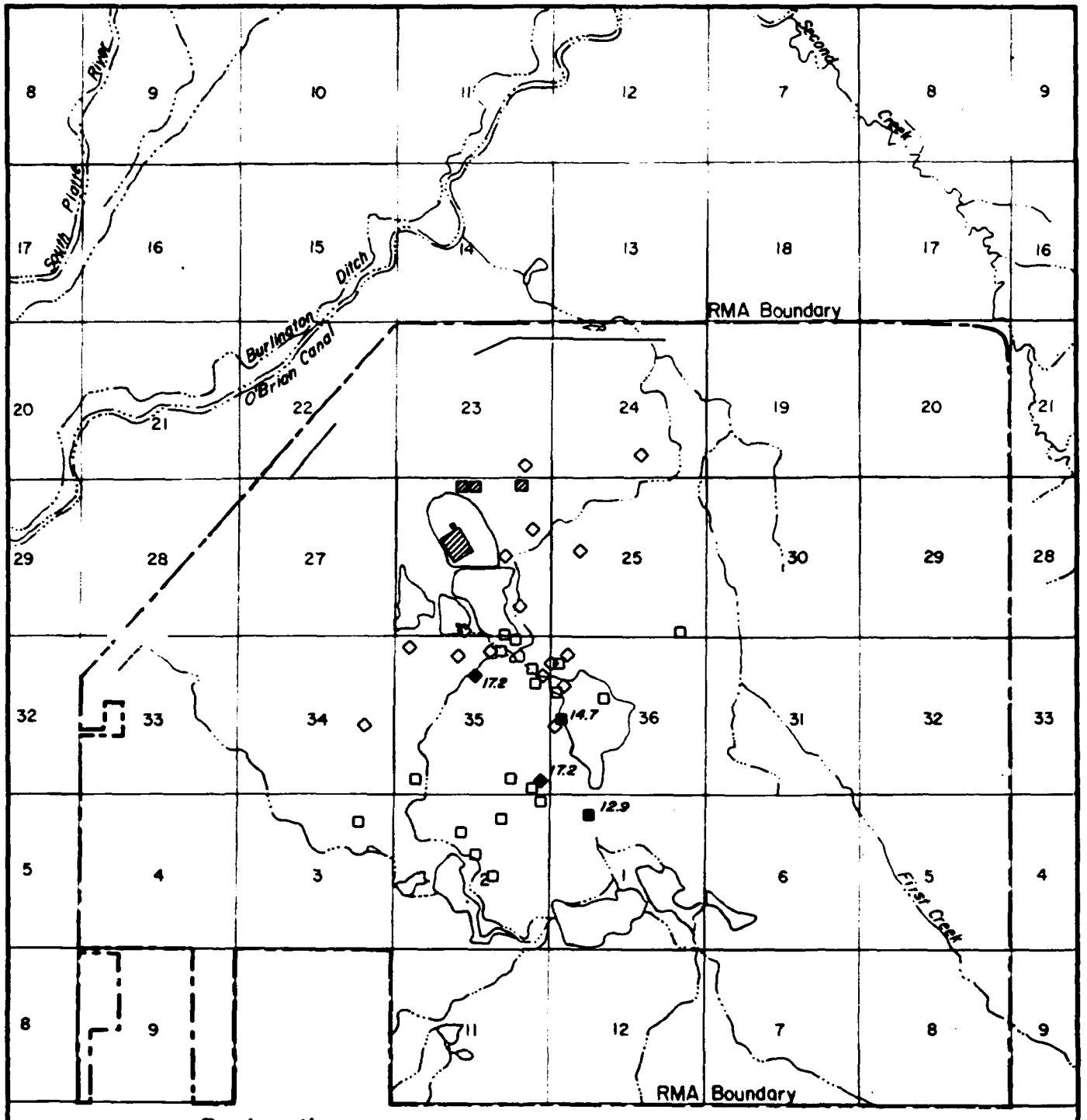
Harding Lawson Associates

Figure A-41

Phenol Detections
Denver Zone A
Fall 1988
CMP GWAR FY89



Explanation

- ■ 14.7 Denver Zone 1U Well Location
- ◆ 17.2 Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

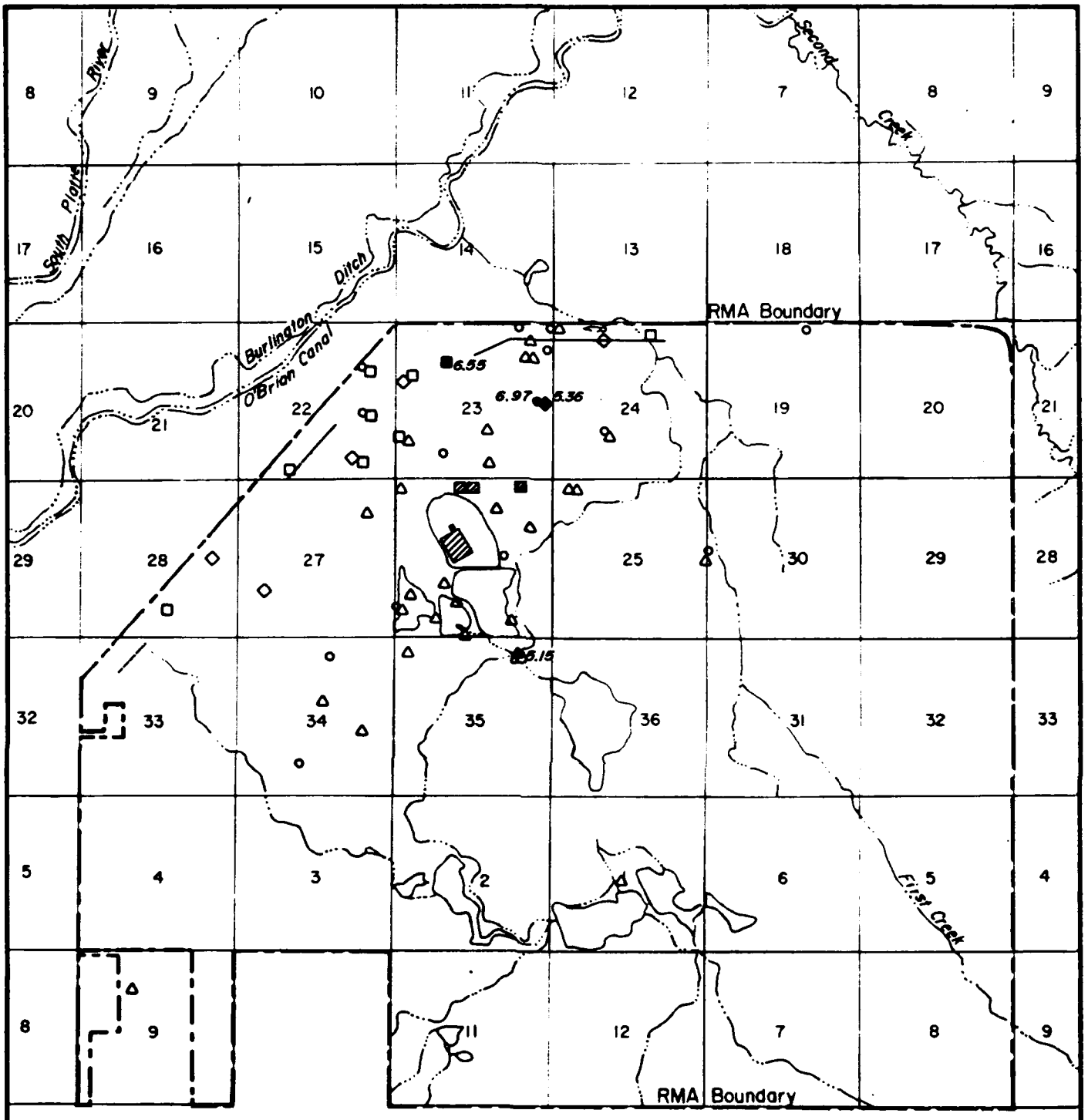
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-42

Phenol Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY88



Explanation

- ▲ 5.15 Denver Zone 2 Well Location
- ● 6.97 Denver Zone 3 Well Location
- ■ 6.55 Denver Zone 4 Well Location
- ◆ 5.36 Denver Zone 5 Well Location
- ▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

Containment System

- Physical Barrier
- Hydraulic Barrier

Prepared for :
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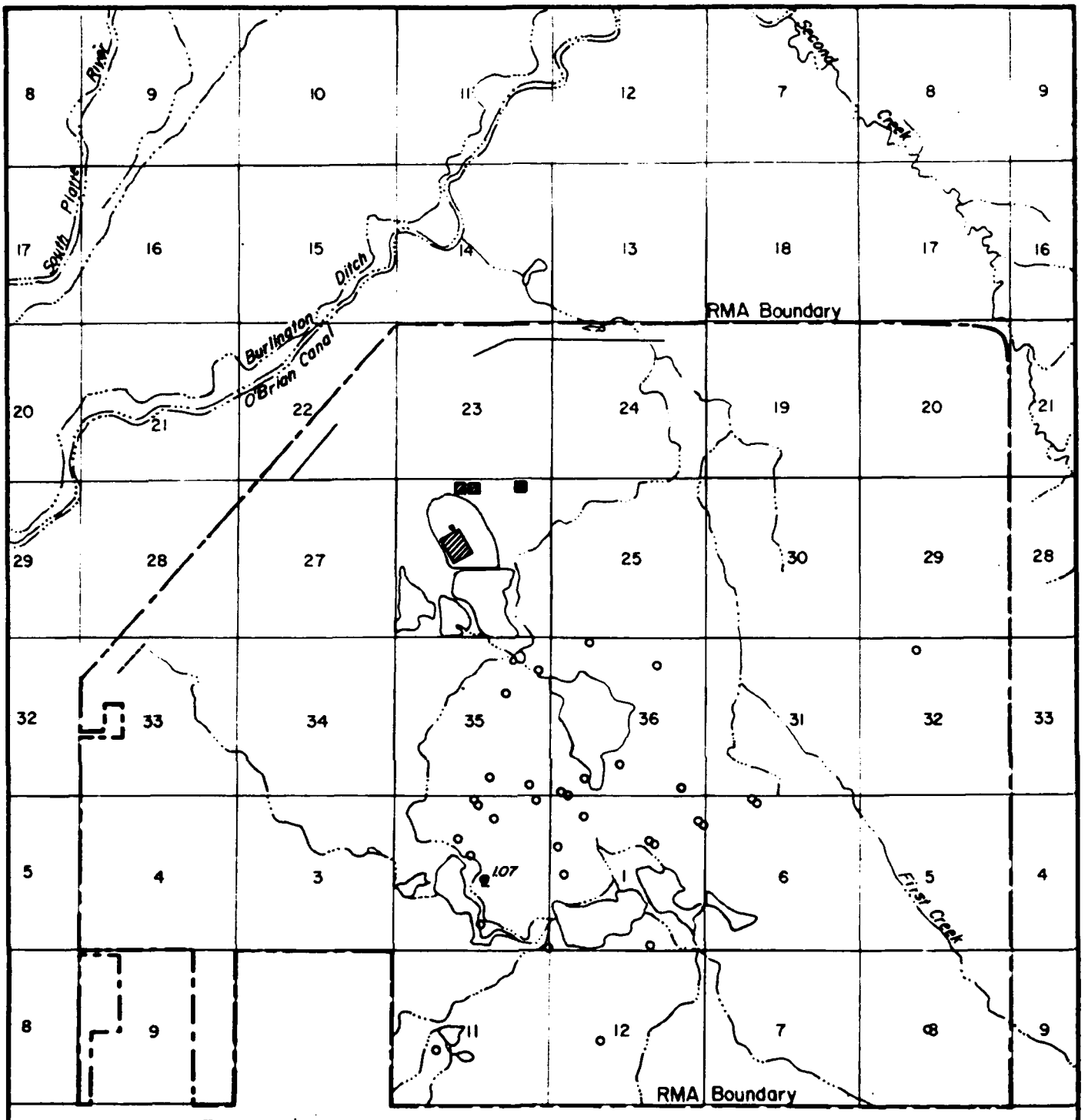
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-43

Phenol Detections
Denver Zones 2, 3, 4, & 5
Fall 1988
CMP GWAR FY89



Explanation

- 1.07 Denver Zone A Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

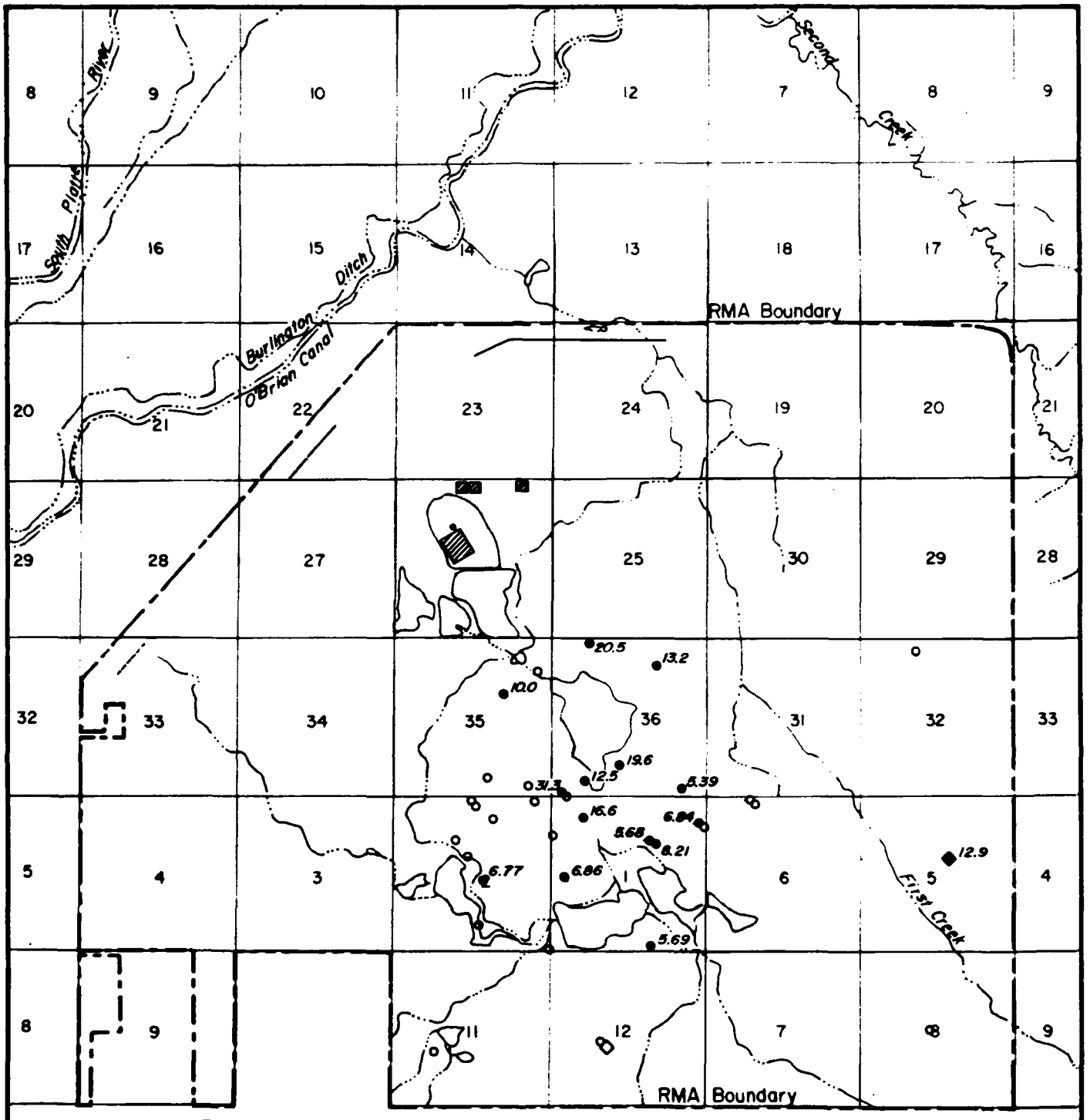
0 1000 2000 3000 Meters

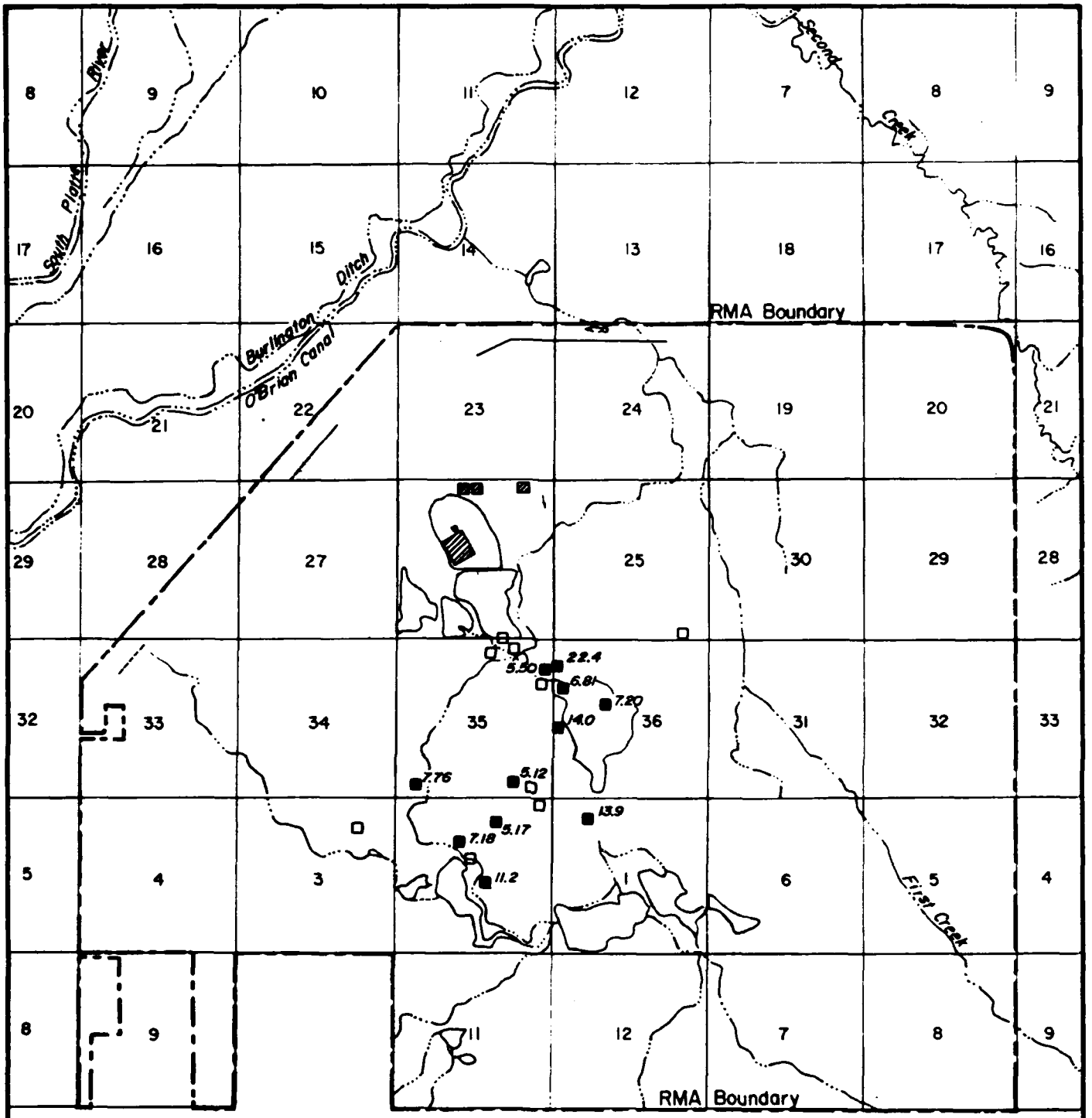
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-44

Parathion Detections
Denver Zone A
Fall 1988
CMP GWAR FY89


South Platte River
Burlington Ditch
O'Brian Canal
Second Creek
First Creek
RMA Boundary
RMA Boundary
20.5
13.2
10.0
12.6
12.5
5.39
31.3
16.6
6.84
5.68
8.21
6.77
6.86
5.69
12.9
Explanation
12.9 Denver Zone B Well Location
100 Denver Zone A Well Location
Containment System
Physical Barrier
Hydraulic Barrier
Basin F IRA Structure
Analyte Concentration in µg/l
Note : Open symbol indicates analyte was not detected
N
0 5000 10,000 Feet
0 1000 2000 3000 Meters
Prepared for :
U.S. Army Program Manager for Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates
Figure A-45
Cyanide Detections
Denver Zones B & A
Fall 1988
CMP GWAR FY89



Explanation

- 5.12 Denver Zone 1U Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l
Note : Open symbol indicates analyte was not detected

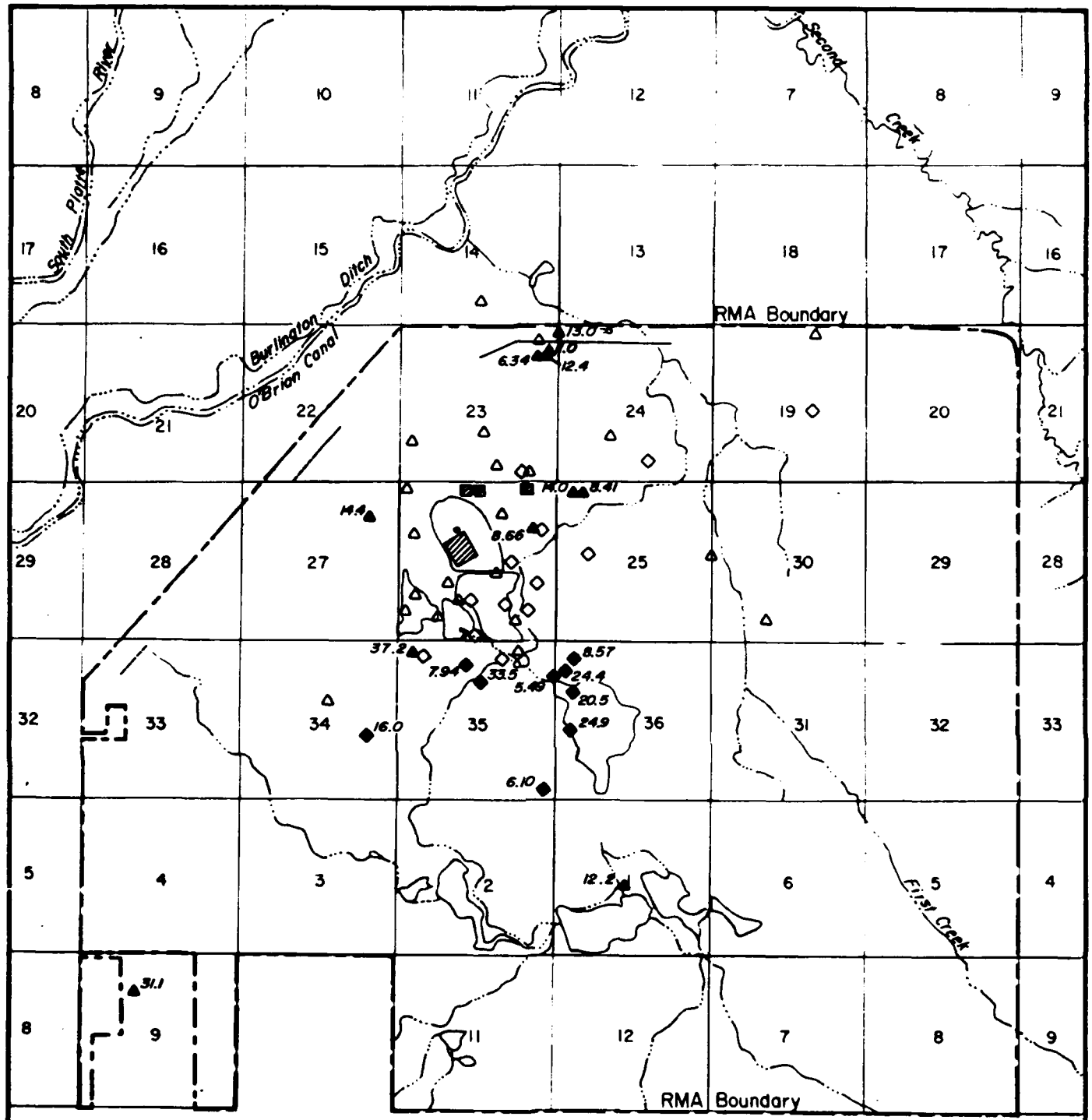
N

0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates

Figure A-46

Cyanide Detections
Denver Zone 1U
Fall 1988
CMP GWAR FY89



Explanation

- 8.57 Denver Zone 1 Well Location
- 8.41 Denver Zone 2 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

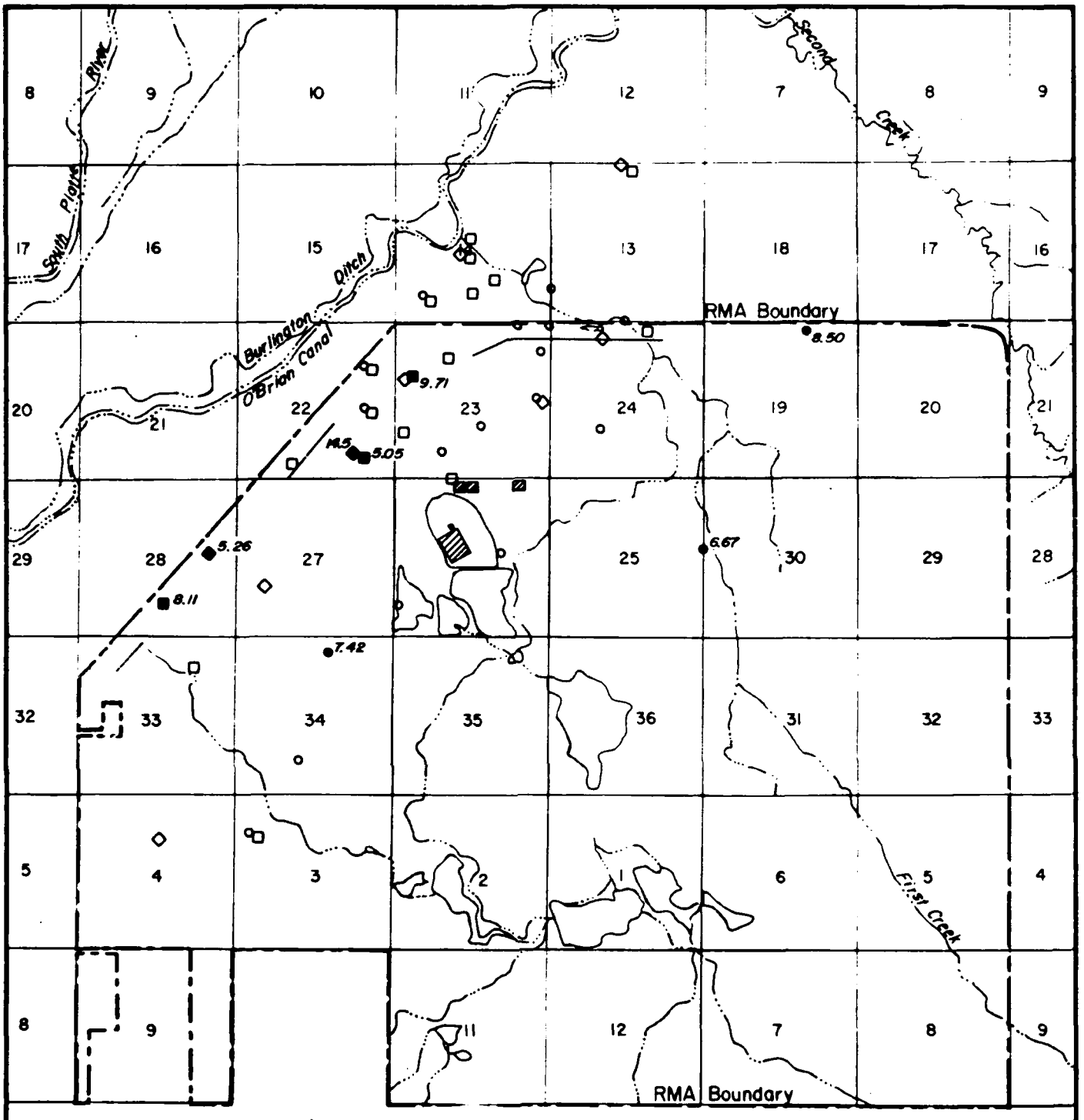
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-47

Cyanide Detections
Denver Zones 1 & 2
Fall 1988
CMP GWAR FY89



Explanation

- 8.50 Denver Zone 3 Well Location
- 9.71 Denver Zone 4 Well Location
- 14.5 Denver Zone 5 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note :
Open symbol indicates analyte was not detected

N

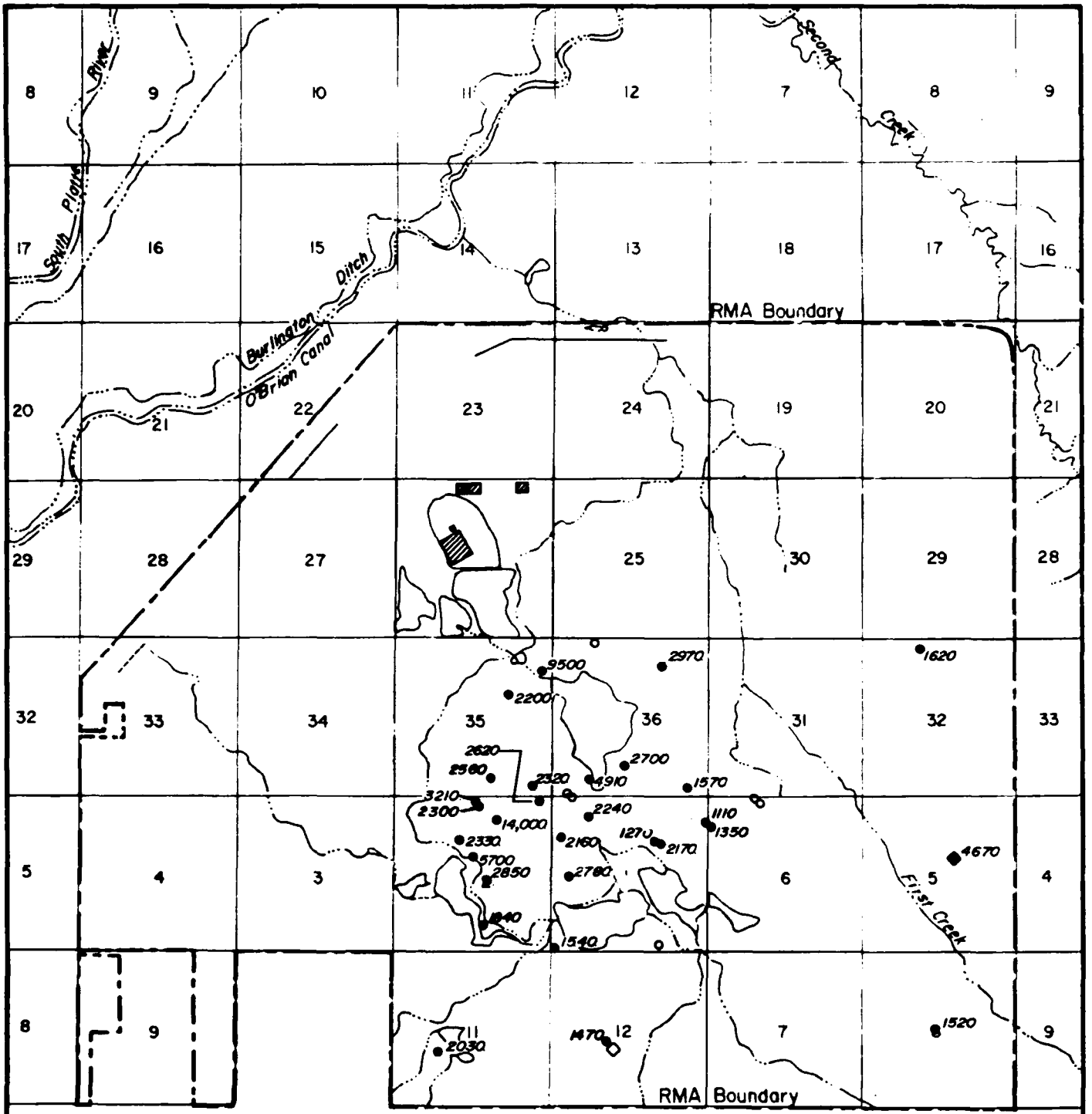
0 5000 10,000 Feet
0 1000 2000 3000 Meters

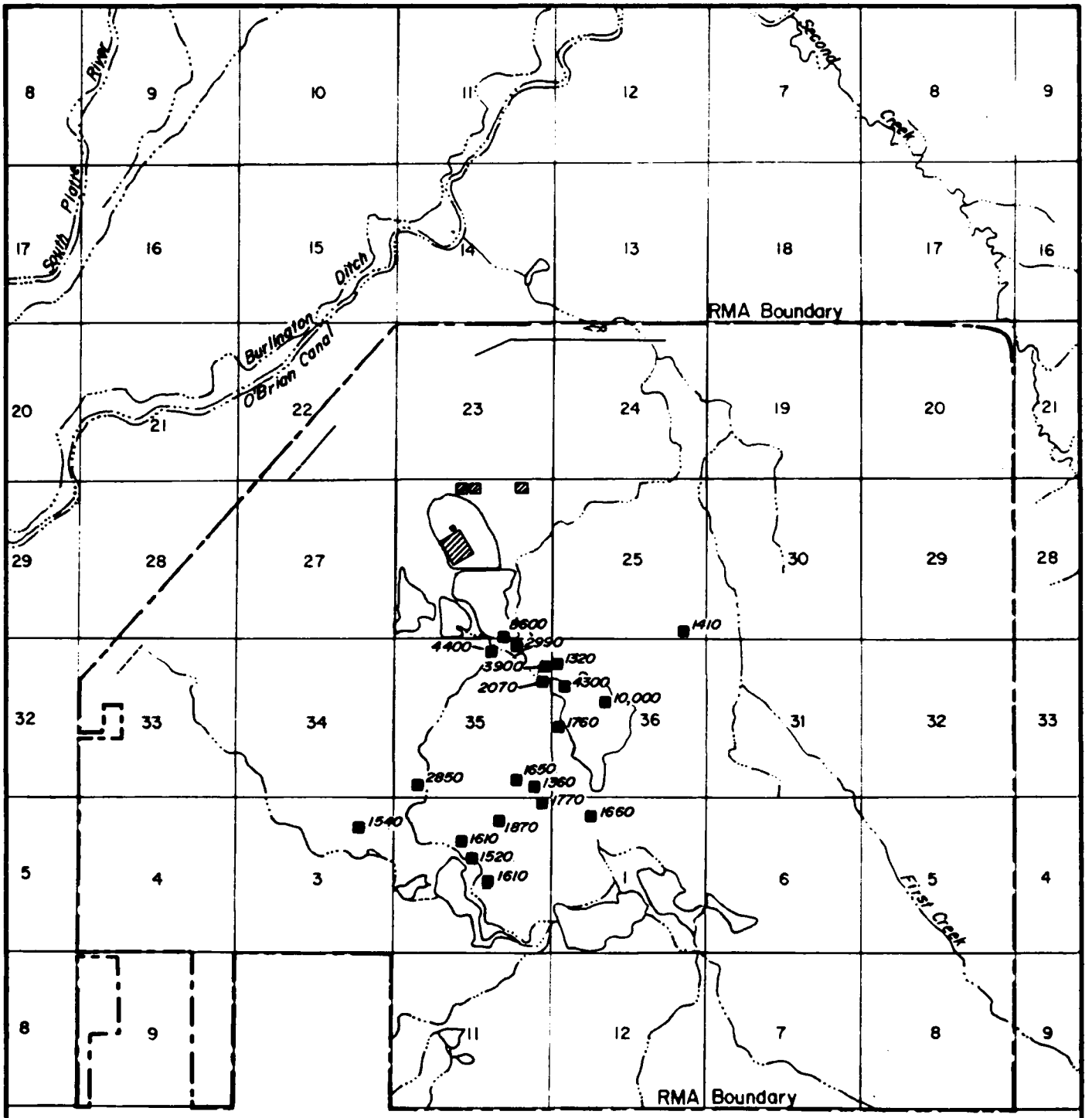
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-48

Cyanide Detections
Denver Zones 3, 4, & 5
Fall 1988
CMP GWAR FY89


South Platte River
Second Creek
Burlington Ditch
O'Brien Canal
First Creek
RMA Boundary
RMA Boundary
9500
2970
1620
2200
2620
2560
2700
2320
4910
1570
3210
2300
2240
1110
14,000
1350
2330
2160
1270
2170
4670
5700
2850
2780
1840
1540
2030
1470
1520
Explanation
4670.0 Denver Zone B Well Location
1520.0 Denver Zone A Well Location
Containment System
Physical Barrier
Hydraulic Barrier
Basin F IRA Structure
Analyte Concentration in µg/l
Note : Open symbol indicates analyte was not detected
N
0 5000 10,000 Feet
0 1000 2000 3000 Meters
Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by :
R.L. Stollar & Associates, Inc.
Harding Lawson Associates
Figure A-49
Fluoride Detections
Denver Zones B & A
Fall 1988
CMP GWAR FY89



Explanation

- 1610.0 Denver Zone 1U Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

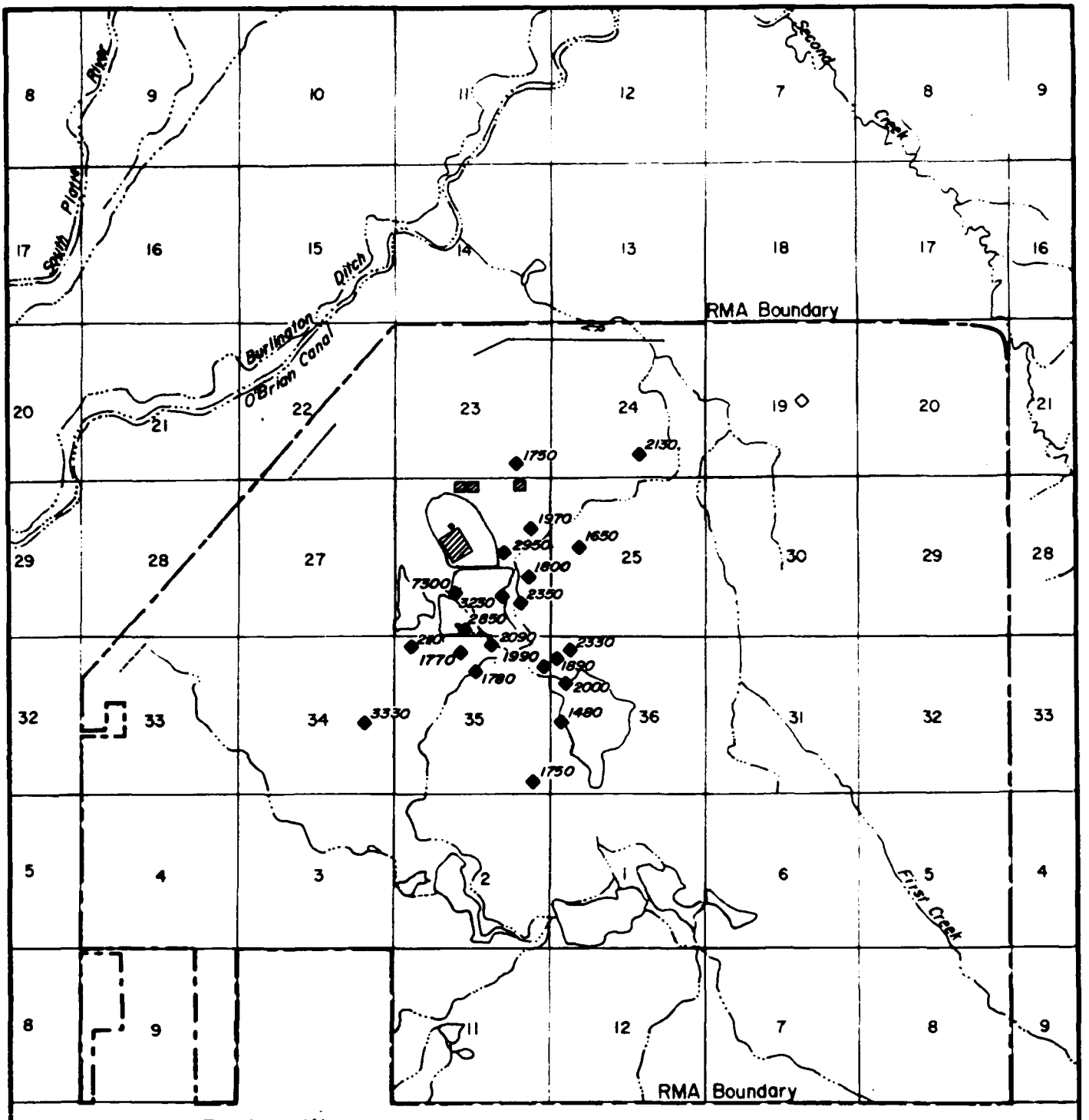
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-50

Fluoride Detections
Denver Zone 1U
Fall 1988
CMP GWAR FY89



Explanation

- 1750 — Denver Zone 1 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

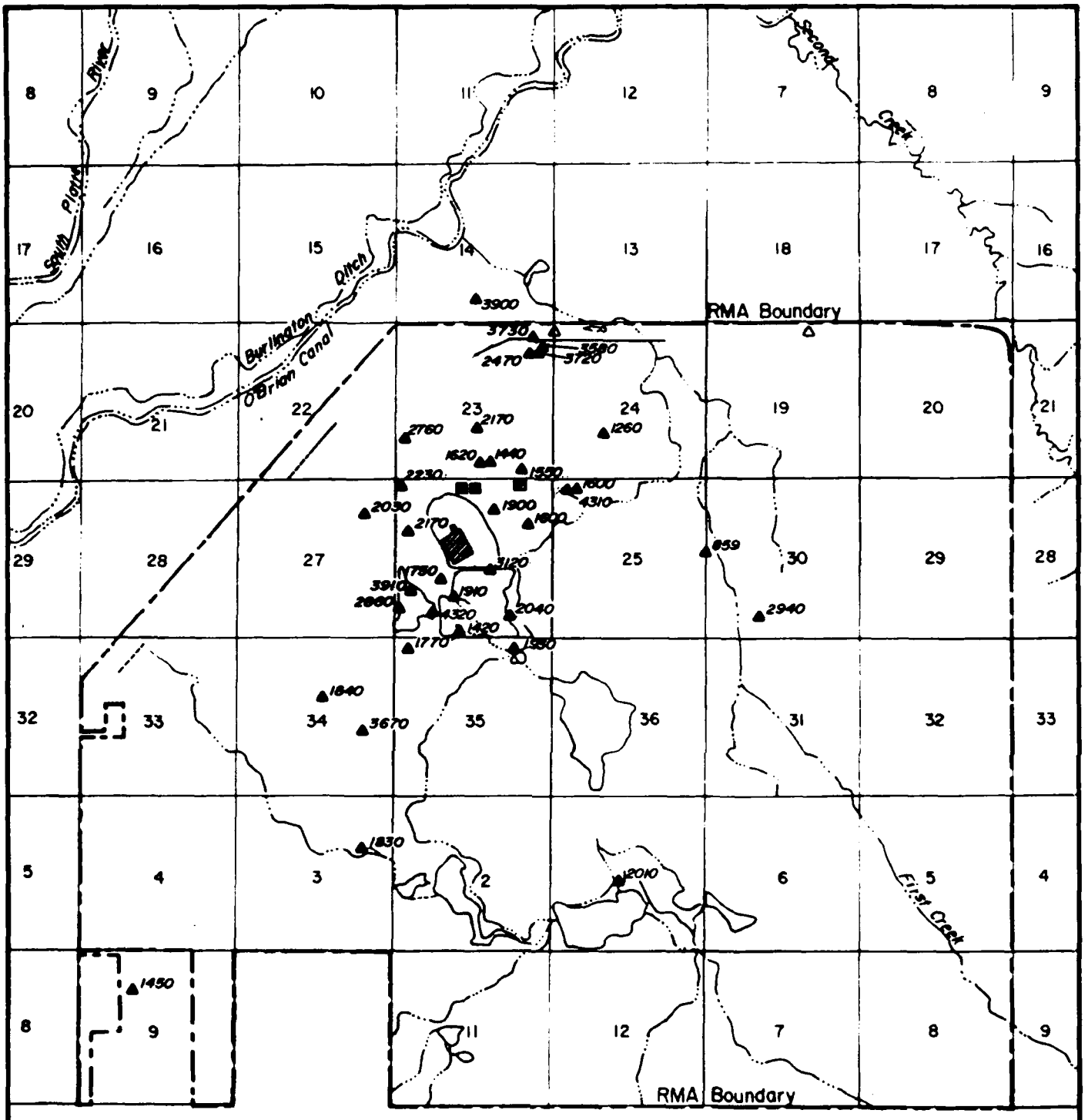
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-51

Fluoride Detections
Denver Zone 1
Fall 1988
CMP GWAR FY89



Explanation

- ▲ 6590 Denver Zone 2 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

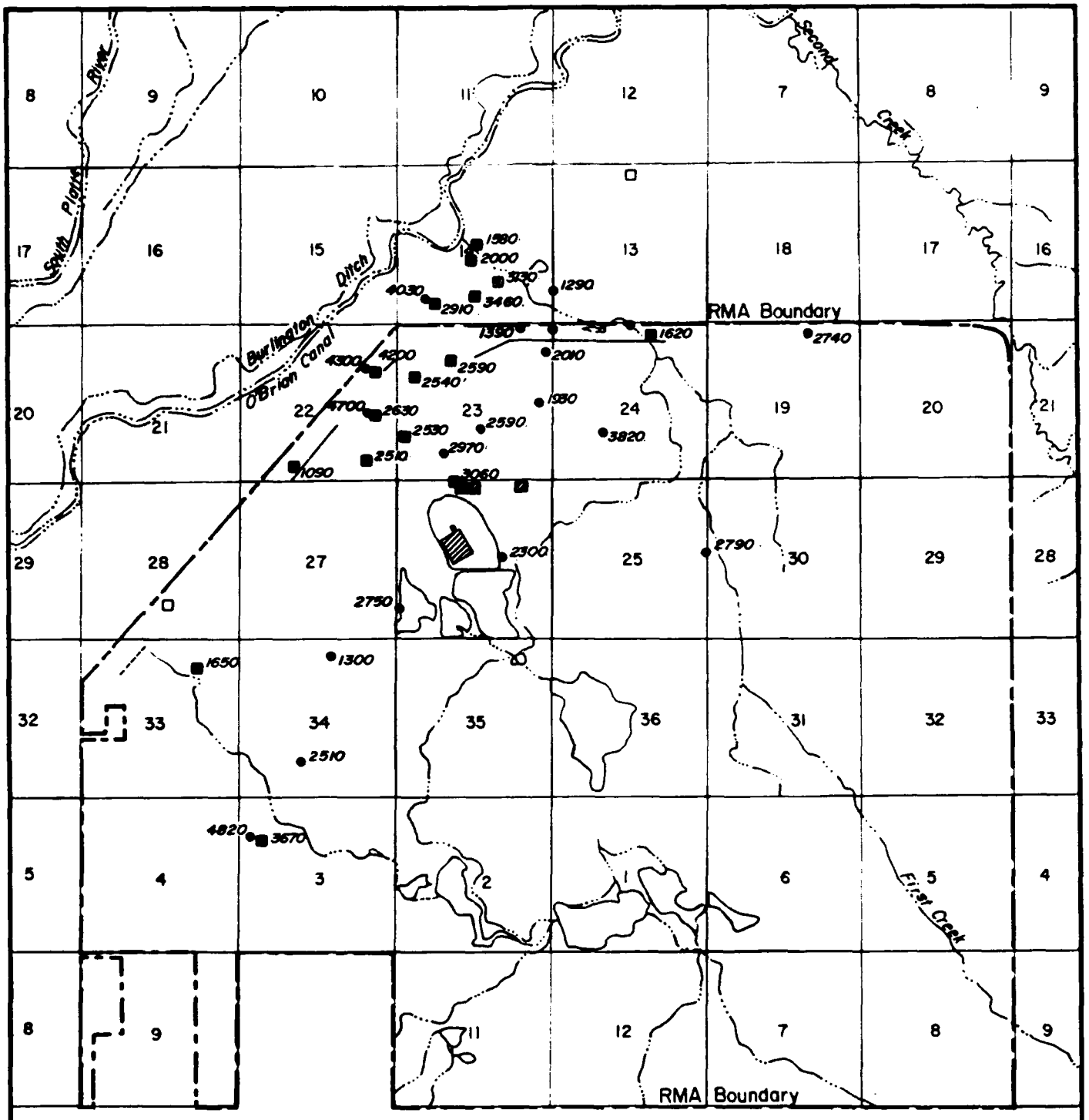
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-62

Fluoride Detections
Denver Zone 2
Fall 1988
CMP GWAR FY89



Explanation

- 1290.0 Denver Zone 3 Well Location
- 3060.0 Denver Zone 4 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Analyte Concentration in µg/l

N

Note : Open symbol indicates analyte was not detected

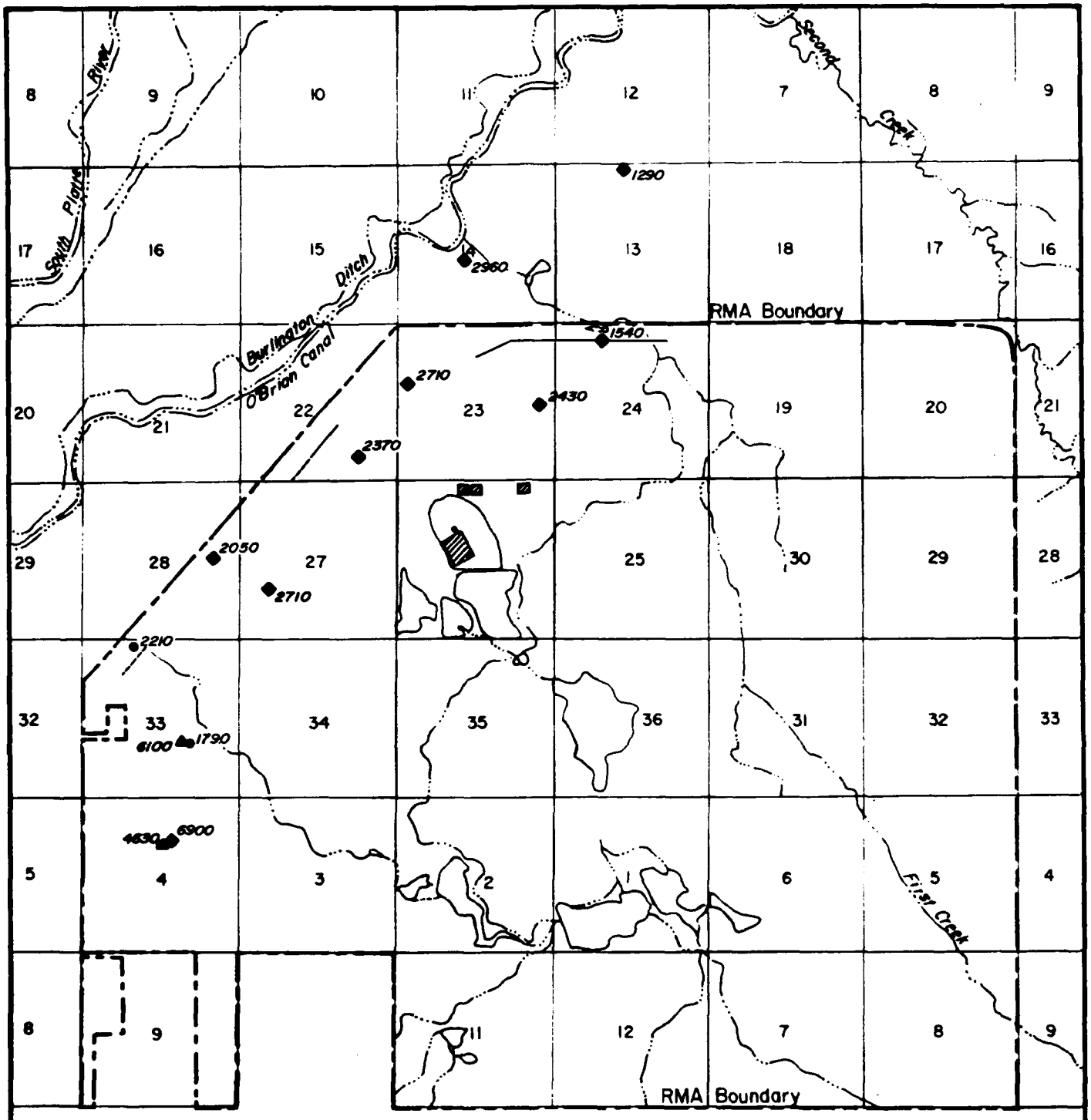
0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-53

Fluoride Detections
Denver Zones 3, & 4
Fall 1988
CMP GWAR FY89



Explanation

- 1290 Denver Zone 5 Well Location
- 6100 Denver Zone 6 Well Location
- 2210 Denver Zone 7 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Basin F IRA Structure

Note : Open symbol indicates analyte was not detected

N

Analyte concentration in ug/l

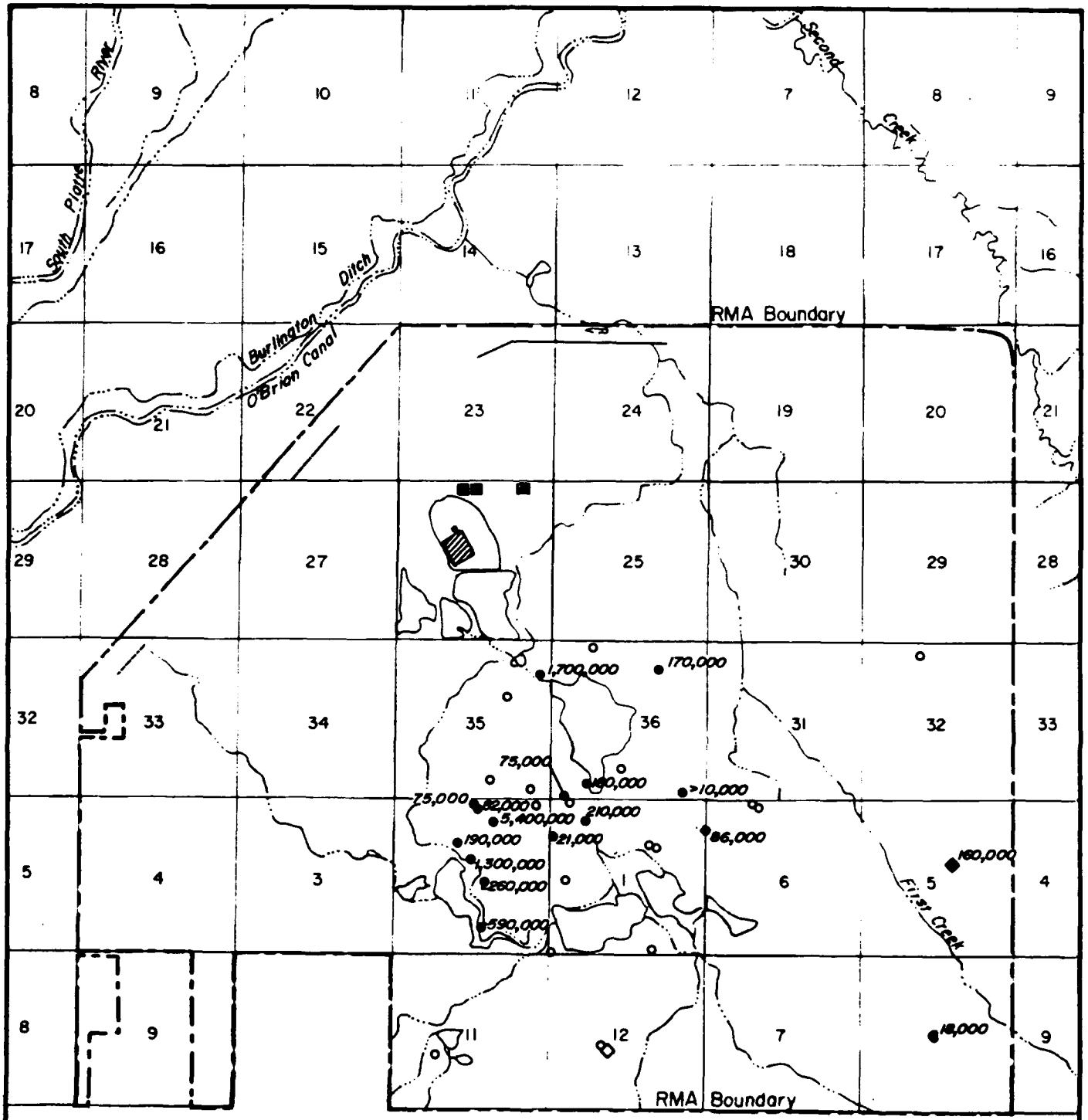
0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-54

Fluoride Detections
Denver Zones 5, 6, & 7
Fall 1988
CMP GWAR FY89



Explanation

160,000 Denver Zone B Well Location

86,000 Denver Zone A Well Location

Containment System

Physical Barrier

Hydraulic Barrier

Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

Prepared for :

U.S. Army Program Manager for Rocky Mountain Arsenal Commerce City, Colorado

Prepared by :

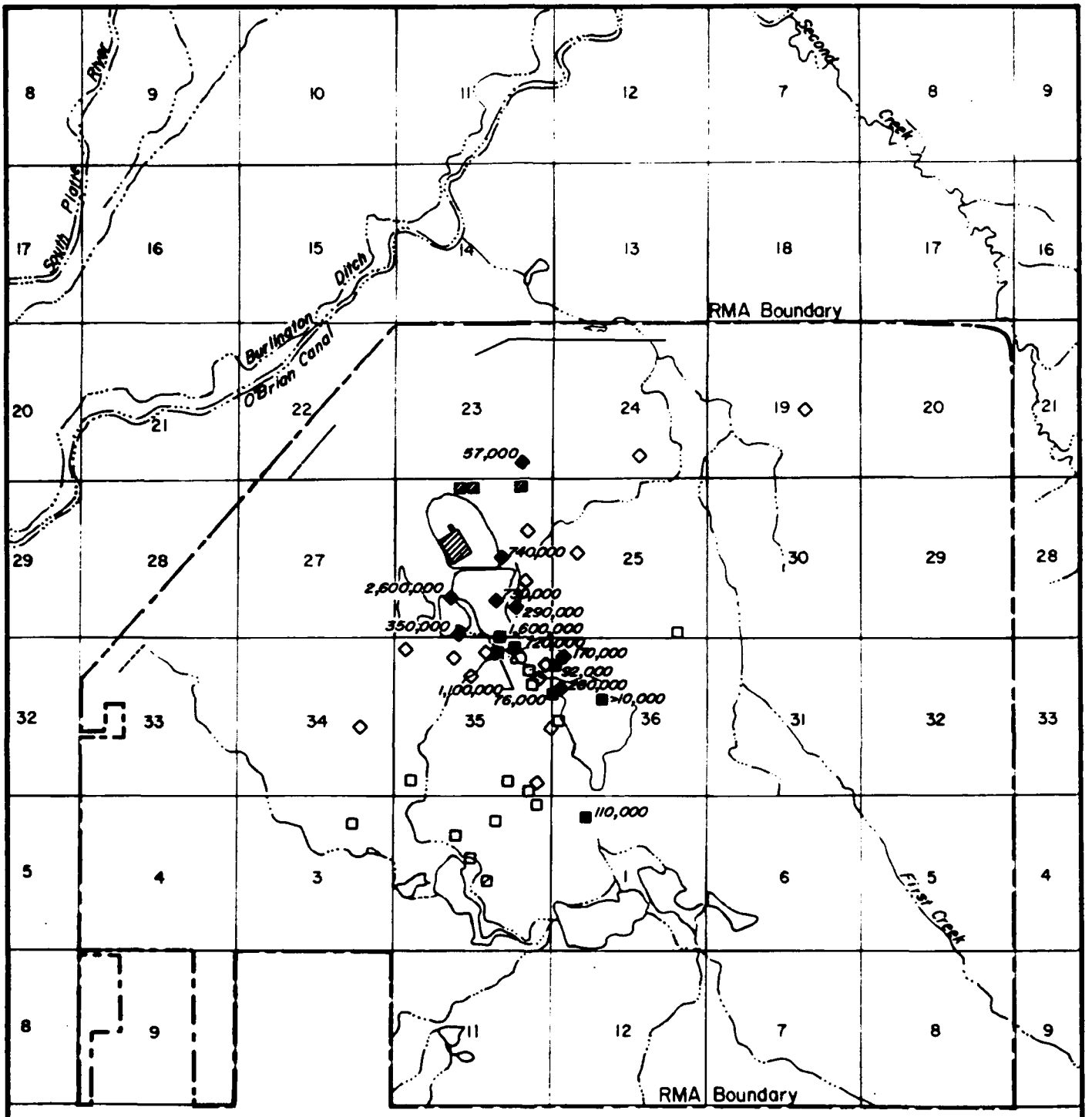
R.L. Stollar & Associates, Inc.

Harding Lawson Associates

Figure A-55

Chloride Detections Denver Zones B & A Fall 1988

CMP GWAR FY89



Explanation

- 76,000 — Denver Zone 1U Well Location
- 740,000 — Denver Zone 1 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

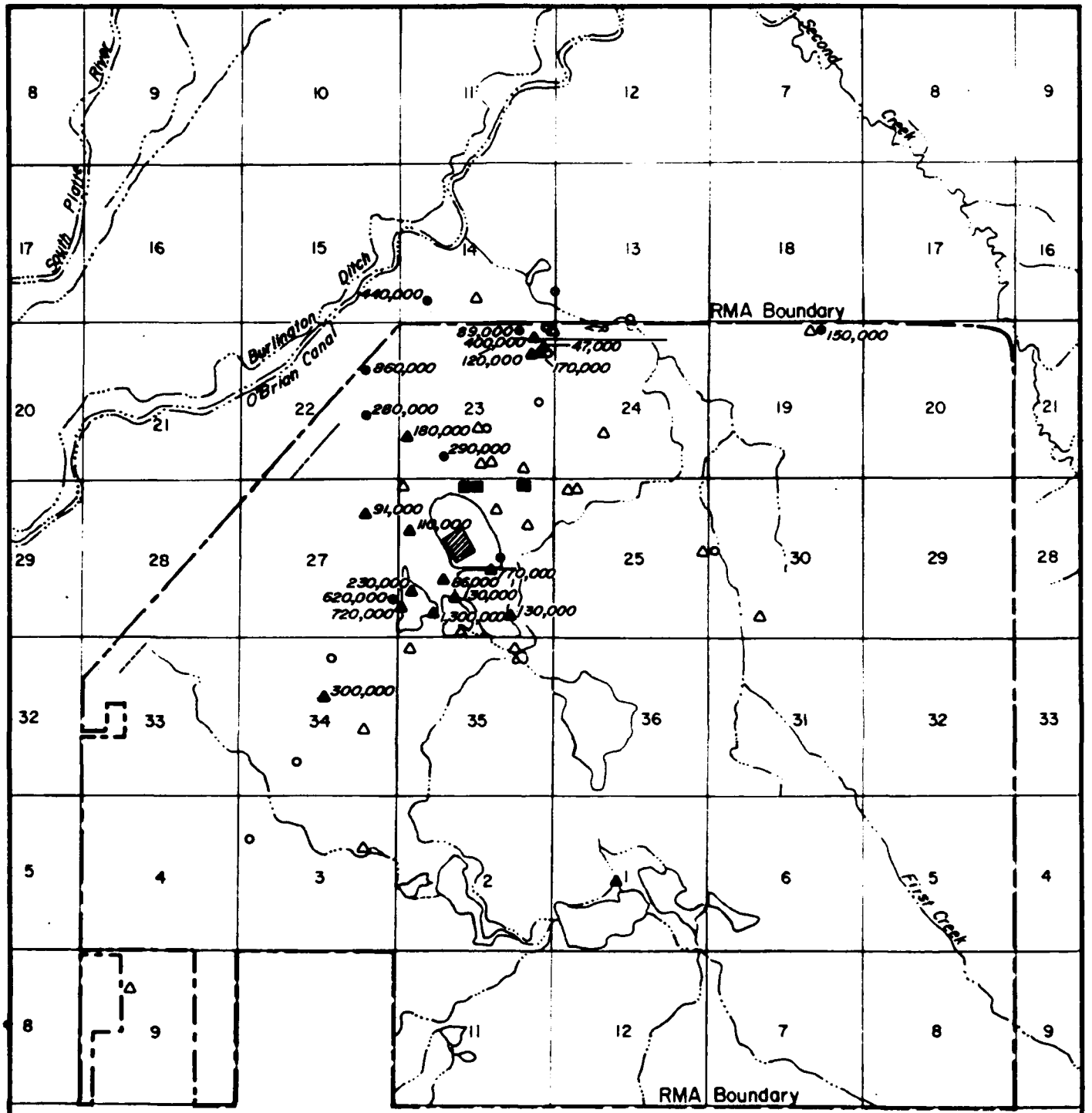
0 5000 10,000 Feet
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-56

Chloride Detections
Denver Zones 1U & 1
Fall 1988
CMP GWAR FY89



Explanation

- ▲91,000 Denver Zone 2 Well Location
- ●89,000 Denver Zone 3 Well Location
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- ▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

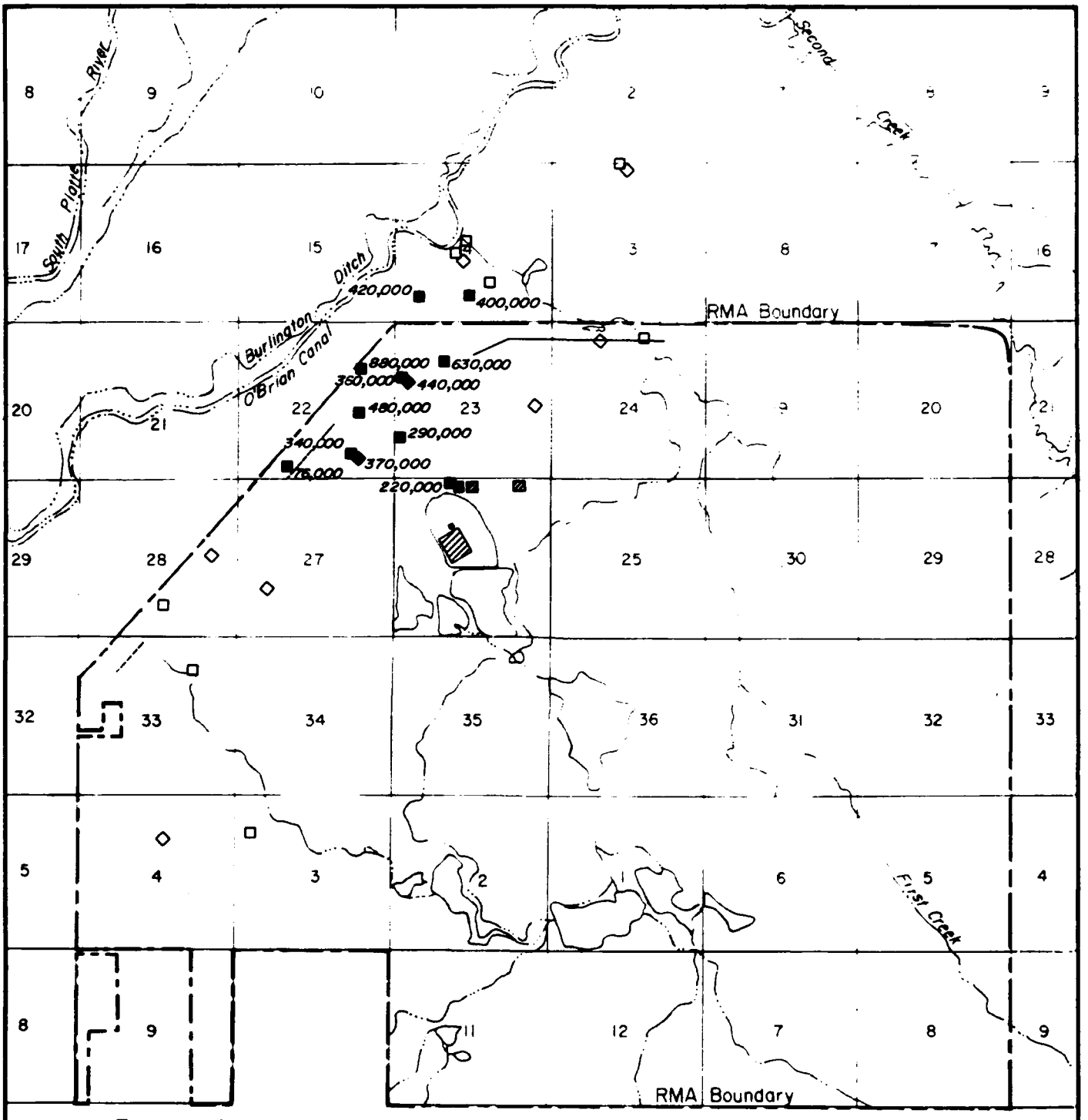
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-57

Chloride Detections
Denver Zones 2 & 3
Fall 1988
CMP GWAR FY89



Explanation

- 400,000 Denver Zone 4 Well Location
- 370,000 Denver Zone 5 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

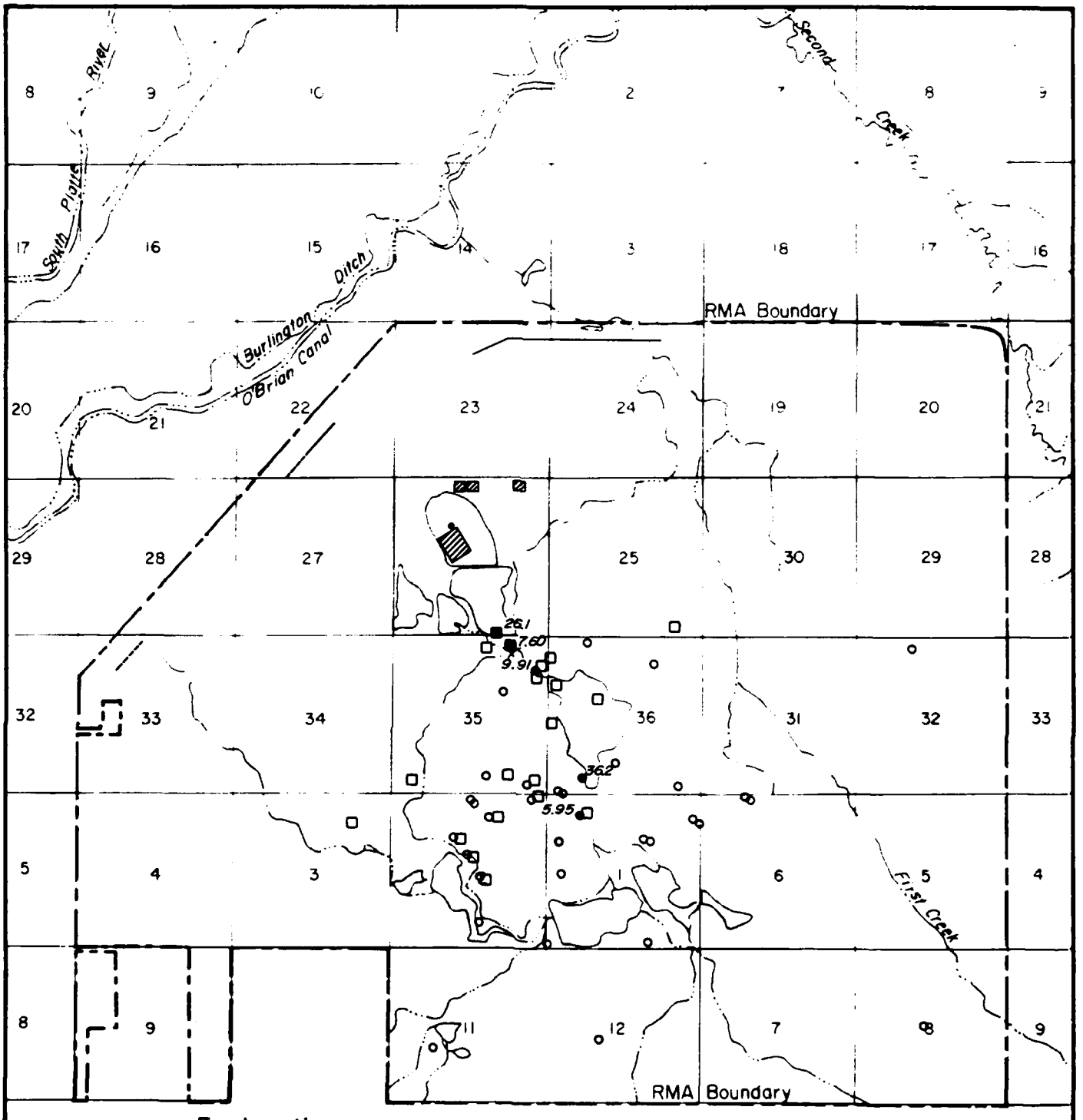
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-58

Chloride Detections
Denver Zones 4 & 5
Fall 1988
CMP GWAR FY89



Explanation

- ● 9.91 Denver Zone A Well Location
- ■ 26.1 Denver Zone 1U Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

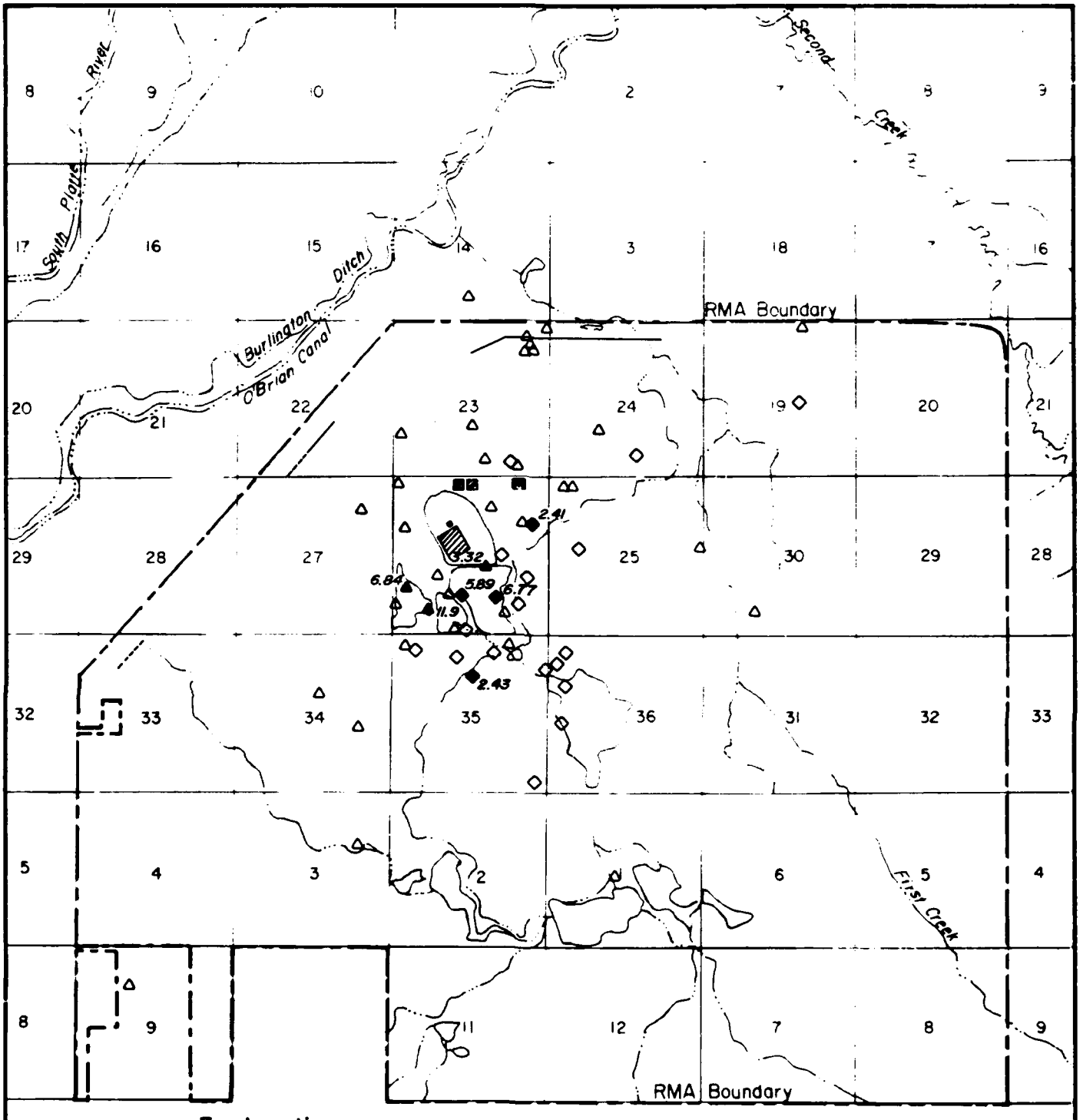
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-59

Arsenic Detections
Denver Zones A & 1U
Fall 1988
CMP GWAR FY89



Explanation

◆2.41 Denver Zone 1 Well Location

▲3.31 Denver Zone 2 Well Location

Containment System

Physical Barrier

Hydraulic Barrier

▨ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

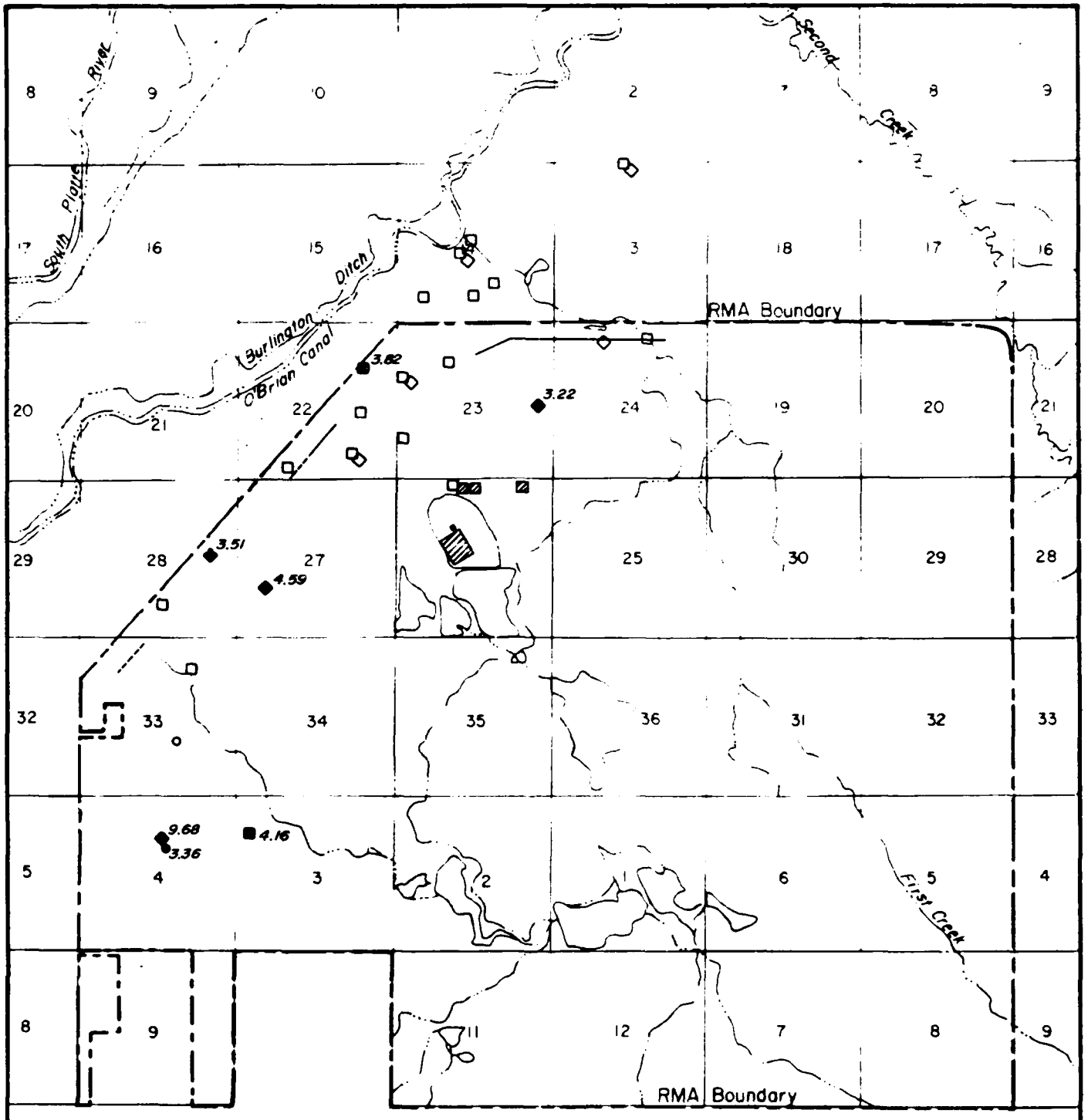
0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-60

Arsenic Detections
Denver Zones 1 & 2
Fall 1988
CMP GWAR FY89



Explanation

- 3.82 Denver Zone 4 Well Location
- 3.22 Denver Zone 5 Well Location
- 3.36 Denver Zone 6 Well Location
- Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol indicates analyte was not detected

N

0 5000 10,000 Feet

0 1000 2000 3000 Meters

Prepared for :
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

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

Figure A-61

Arsenic Detections
Denver Zones 4, 5, & 6
Fall 1988
CMP GWAR FY89

APPENDICES B AND C

APPENDIX B: HYDROLOGIC DATA COLLECTED DURING FY89
(on diskette - enclosed)

APPENDIX C: ANALYTICAL DATA COLLECTED DURING FY89
(on diskette - enclosed)

APPENDIX D

GEOLOGIC/WELL CONSTRUCTION LOGS FOR WELLS INSTALLED

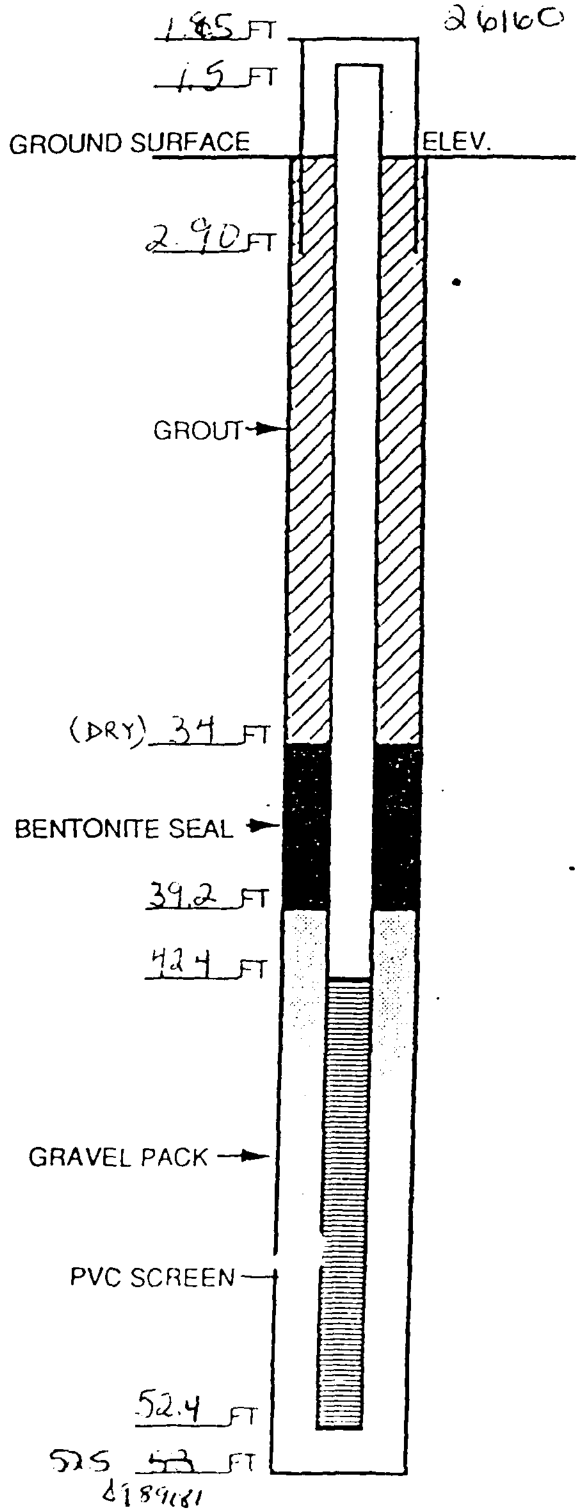
DURING FY89

WELL CONSTRUCTION LOG

46.4
1.5
47.?

SECTION 26

WELL NO. CMP-1
26160



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 55 52.5'

Hole Diameter: 9 3/4"

Drilling Company: LAYNE WESTERN

Driller: RON MUCKEY

Rig Type: CME 55

Bits: CME CARBIDE

Geologist: SUSAN GOLDBERG

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89179	0835	89181	0640
Screen Placement:	89181	0710	89181	0820
Filter Placement:	89181	0825	89181	1030
Seal Placement:	89181	1042	89181	1105
Grouting:	89181	1310	89181	1500

DEPTH TO WATER

Depth: 44.6' Date: 89181 Time: 1235

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity	14.5	1/4" TABLETS	6.25 BAGS
Type	1:2 PORTLAND	3 BUCKETS (15 GAL TOTAL)	COLORADO SILICA 10/20

Screen

Size: .010 SLOT

Config: HORIZONTAL SLOT

Comp: PVC

Inside Diam: 4"

Outside Diam.: 4"

COMMENTS

LEFT .5' AT BOTTOM OF HOLE

EBASCO SERVICES INCORPORATED

H NEATER, MORE COMPLETE DESCRIPTION
IS ATTACHED
SEE

R. L. STOLLAR & ASSOCIATES, INC.

FIELD LOG

LOCATION SKETCH OR DESCRIPTION

PAGE 1 OF 2

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP	WELL	CMP-1	11

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE WESTERN	ZON MUCKEY	6/28/89 / 0835	6/29/89 / 1520

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 - HOLLOW STEM AUGER	52.5 ft / 1575 cm	44.5 ft / 1335 cm	ft / cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 ¼" ED, 6¼" ID REAM	SPLIT SPOON CONTINUOUS	Susan Goldley 6/28/89	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				53"/60"	V. FINE SANDY CLAY SANDY CLAY 2.5-2.0 ϕ W/ CALCAREOUS NODULES SUBANGULAR - SUBROUNDED ROOTS TO 4FT MOD SORTED	0	0	0	20	80 CL	MOIST		7.5YR 4/1	1
				135/152	↓ INCREASES TO MED SAND W/ CALCAREOUS NODULES DECREASING MOISTURE HIGHER CLAY	0	0	90	0	10 SC				7.5YR 3/2 DK BROWN	
5				152/135/152/155	INCREASINGLY COARSER SAND W/ CLAY SUBROUNDED - SUBANGULAR 2.0-1.5 DRY	0	0	90	0	10 SC	DRY	LOOSE		7.5YR 4/1	2
					LIGHT INCREASING CLAY, LOW MOISTURE CALCS NODULES ARE LARGER SUBROUNDED, WELL SORTED	0	0	50	0	50 SC	LOW MOIST			7.5YR 4/2	
10				55/152/155	SANDY CLAY 10-15' MOD - POORLY SORTED	5	0	45	0	55 CL	MOIST			7.5YR 4/4	
					LTC CLAYEY SILT W/ CALCAREOUS NODULES, BITS OF MUSCOVITE	0	0	0	0	100/100				10YR 6/3	3
15				152/152	15'-18' V FINE SAND WITH SILT 10% MOIST, W/ TINY BITS OF MICA				90	10/10	MOIST			10YR 6/3	
					16.5-17.5' POORLY SORTED MED SAND W/ CLAY W/ CALCAREOUS NODULES	10	0	70	0	20				PALE BROWN → 10YR 6/3	4
					17.5-20' NODULES, LESS CLAY										
20				17/152	20-22' SAME AS 18.5-20'	30	70	0	0	100				10YR [illegible]	
					22-25 LARGE GRAVEL (up to 2") MIXED W/ GRAVEL, GRANITIC COARSE → POORLY SORTED MOSTLY .5-.00ϕ									[illegible]	5
25															

VERSION IS ATTACHED
SC

FIELD LOG

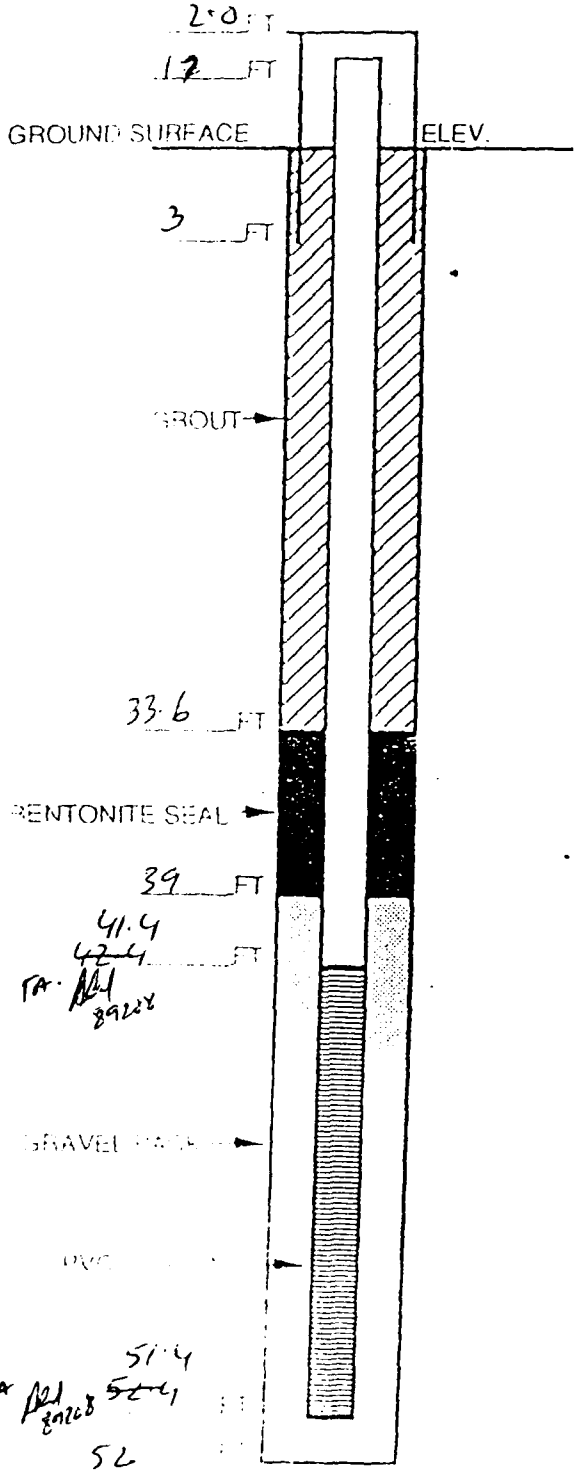
PAGE 1 OF 2

SITE ID: 26160

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25				100/152	GRAVEL W/ COARSE SAND 1" = MAXIMUM GRAVEL SIZE SLIGHTLY BETTER SORTING LM - DRY AT BOTTOM. GRANITIC FRAGMENTS (FRAGMENTS ARE SUBROUNDED)										6
30				132/152	~~GRAVEL AS ABOVE~~ T 30-33' SILTY SANDY CLAY W/ IRON STAINING	0	0	0	10	30/60	MH/CL			2.5Y 6/2 LIGHT BROWNISH GREY	7
					33-35 COARSE - MED SAND MOD - POORLY SORTED, SOME MIXED W/ GRAVEL (GRANITIC) LOOSE	20	10	20	0	0	SW	DRY			
35				87/152 GRA	35 - 39.5 - S - SAME AS 33-35										
					39.5 - 40 COARSE SAND (LESS COARSE THAN 33-39.5) 1.0 - .5Φ, LOOSE COARSE GRAINS ARE GRANITIC OF VARYING COLORS	0	70	30	0	0	SW	DRY		2.5 Y 6/2 LIGHT BRAWNISH GREY	8
40				75/152	MED COARSE SAND GRADES DOWN TO COARSE SAND Med MOIST - MOIST, LOOSE ~ 0.0Φ AT TOP OF CORE BOTTOM CORE HAS PEBBLES (POOR MATERIAL) UP TO 1" > -.5 - -1.0Φ	6	10	90	0	0	SP	MOIST	VSO	2.5Y 5/6 LIGHT OLIVE BROWN	9
						30	50	20	0	0	SW/SP	LM	VSO	++	
45				110/152	45-46 VERY COARSE SAND LOOSE, POORLY SORTED WET SAME AS 40-45	50	40	10	0	0	SW	WET	VSO	SOFT VARIABLE	
46					SOFT SHARP SEPARATION BETWEEN LAYERS FINE GRAINED, V WELL SORTED SAND WET	0	0	0	100	0	SP	WET	VSO	10YR 5/1	10
					50-53' SAME AS 46'-50' SATURATED										

WELL CONSTRUCTION LOG

WELL NO. 26161



DRILLING SUMMARY

Total Depth of Hole: 52'

Hole Diameter: 10' Reamed

Drilling Company: Layne Western

Driller: Larry King

Rig Type: CME-75

Bits: 3 3/4" Pilot 10" Ream

Geologist: Tariq Ahmad

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Ream	89186	1259	89187	0710
Drilling:	89186	0826	89186	1020
Screen Placement:	89186	0715	89186	0735
Filter Placement:	89186	0735	89186	0815
Seal Placement:	89186	0821	89186	0901
Grouting:	89186	1216	89186	1240

DEPTH TO WATER

Depth: 46 BGL Date: 89186 Time: 0952

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	7 bags #94	100 lbs	564 lbs
Type:	Low Alkali Cem/Bent Portland	1/4 Bentonite	Colorado Silica Sand 10/20

Screen

Size: 4" I.D. Config: 10 slot flush Threaded

Material: Comp: Schedule 40 PVC

Inside Diam: 4" I.D. Outside Diam.: 4.5"

COMMENTS

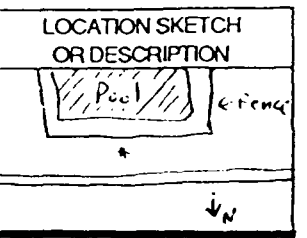
EBASCO SERVICES INCORPORATED

R. L. STOLLAR & ASSOCIATES, INC.

FIELD LOG

PAGE 1 OF 2

LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
KAIA Camp Bowser Drilling	well	26161 (KMP-2)	11

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Larry Ring	89186 / 0826	89186 / 1020

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-75 – Hollow stem	52 ft cm	44 ft cm	? ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
5 3/4 Pilot ; 10" Ream	split spoon	TARIQ Ahmed .	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				122/152	0–1': clayey Silt. Coarsening towards the bottom end. Organic material	—	—	—	30	40/60	ml	mm	M H R	10YR 5/2	1
					1'–4': Silt with very fine Sand. some clay. lighter colour and coarser.	—	—	—	25	70/5	ml	D	M H R	10YR 5/3	
5				152/152	4–7.8': Silty Sand						sm	D	M H R	10YR 5/4	2
					7.8–9.0': Silty clay	—	—	—	15	70/15	CL	mo	M H R	10YR 7/3	
10					9–12.5': ~~Silty Sand~~ sandy silt						cl	M m	M H R	10YR 7/3	
				152/152	12.5–14': Clay silts intermixed with calcareous ? clays										3
					clays	0	–	–	2	8/90				10YR 8/1	
					clayey silts	5	–	–	15	75/15				10YR 5/4	
15					14–16': Silty Sand. Some gravel						sm				
				152/152	16–18.5': Silty clay						cl				4
					18.5–19': Silty Sand	15	50	20	10	5/0	sm			10YR 5/6	
20					19–22.5': Missing										
				46/152	22.5–24': Gravelly Sand. Poorly sorted. well graded. 1 3/4" gravels are Pink granitic and Feldspathic rock fragments. angular to subangular Sand.	15	50	20	10	5/0	SW			10YR 5/6	5
25															

FIELD LOG

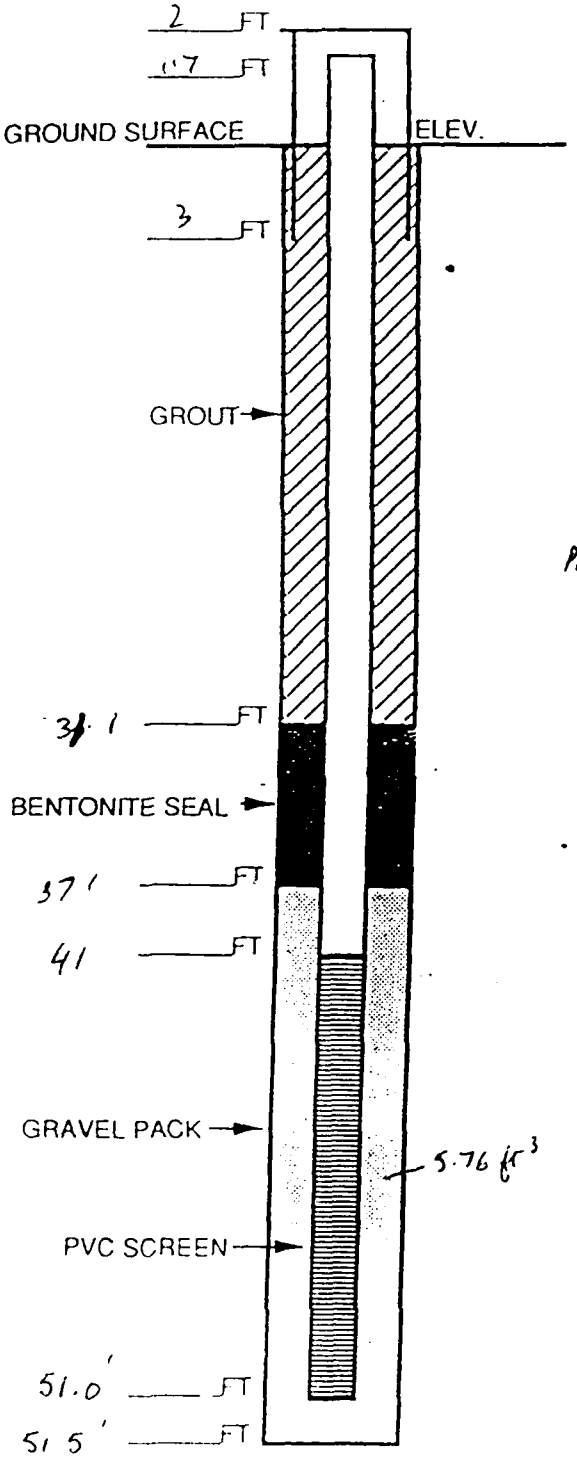
PAGE 2 OF 2

SITE ID: 2616.1

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
31	LC / SAND			76/152	24 – 26.5′ Missing 26.5 – 29′: well sorted to medium sorted sand. Mostly poorly graded. Sand 1.5 – 2ϕ. Angular to Subangular R. Fragments and sand	2	–	90	8	–	SP	m/m		10YR 6/4	6
36	LC / SAND	BENTONITE		76/152	29′ – 31.5′: Missing 31.5 – 33.5′: Well graded Sand angular to Subangular. Some gravel 33.5 – 34′: Clay with some Gravel	15 5	50 –	20 –	10 5/6 5	5/10 80/10	SW CH	m m		10YR 5/6 10YR 5/6	7
41	SAND	S.T.		76/152	34 – 36.5′: Missing 36.5 – 39′ – Well graded Sand angular to Subangular. Some gravel	15	50	20	10	5/0	SW	m		10YR 5/6	8
46	SAND	10/20 SAND		61/152	39 – 42′: Missing 42 – 44′: Well graded sand with some gravel. angular to Subangular. Coarsening towards bottom	15	50	20	10	5/0	SW	M/W		10YR 5/6	9
51		SB		—/152	~~44′ – 50.3′: Missing~~ Void ~~50.3 – 52′: Sedstone – Denver Formation – fine gr~~ VOID SPACE SAMPLE 10 should be here										~~10~~
56				106/152	44 – 45.5′ Coarse gravel. rounded to subangular. well graded some fine and medium Sand. Mafic and Feldspathic rocks. 45.5′ – 49′: Siltstone. fine grained Bedrock. Fractures. rusty discoloration	80	10	5	5	–	–	GP	DM/W	10YR 5/4 10YR 5/1	10
				52/152	49′ – 50.3′ Missing 50.3 – 52′ – Siltstone fine grained fine fractures – Rusty discoloration along fractures								W	10YR 5/1	11

WELL CONSTRUCTION LOG

WELL NO. 26162



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 51.5' BGL

Hole Diameter: 10" (Reamed)

Drilling Company: Layne Western

Driller: Larry King / Helper Alton Shoemaker

Rig Type: CME-75

Bits: 3 3/4 for Pilot - 10' for Ream

Hydro Geologist: Tariq Ahmad

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Reaming	89191	1153	89192	0751
Pilot Drilling:	89191	0643	89191	0840
Screen Placement:	89192	0839	89192	~~0857~~ TR 0850
Filter Placement:	89192	0850	89192	0907
Seal Placement:	89192	0910	89192	0925
Grouting:	89192	1338	89192	1420

DEPTH TO WATER

Depth: Dry hole. (As to date) Date: _____ Time: _____

WELL CONSTRUCTION MATERIALS

	Grout	Gel	Seals	Filter
Quantity:	(752 lbs cem/37.60 lbs Ben.)			
Type:	182 low alkali Portland Cement Screen		1/4" Tablet Volclay bentonite	10/20 sand Dry Colorado Silica
Size:	4" OD		Config:	Flush Threaded
Area/Ft.:			Comp:	Schedule 40 PVC / 10 slot
Inside Diam.:	?		Outside Diam.:	?

COMMENTS

Because of potential of leachate migration basically to top of Denver, a deeper hole to the confined aquifer was not drilled in future. This will satisfy the proper authorities that no leaching from the point to the water table.

* cem/Bentonite Ratio for Grout = 20 : 1

EBASCO SERVICES INCORPORATED

Boring (1)

R. L. STOLLAR & ASSOCIATES, INC

FIELD LOG

PAGE 1 OF 2

LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
RMA Comp. Drilling	well	2662	5

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Larry King	8/19/91 / 0643	8/19/91 / 0850

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
	ft cm	ft cm	ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3¼ in Pilot	Core Barrel	Tony [illegible]	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				121.92/121.92	0-4' ~~[illegible]~~ clayey silt	0	0	0	10	85/5	ML	M	[illegible]	10YR 6/8	
5				152/152	4-8.2 - lt. gray silt	0	0	0	10	85/5	ML	M	[illegible]	10YR 6/8	
					8.2-8.6 silty clay [illegible] eolian calcareous / caliche claypan	0	0	0	10	5/85	CL	M	[illegible]		
					8.6-9' clayey silt	0	[illegible]			[illegible]	ML	[illegible]	[illegible]	10YR 6/8	
10				152/152	9-14 clayey silt	[illegible]				[illegible]	ML	[illegible]	[illegible]	10YR 6/8	
15				152/152	14-14.3 - lost core										
					14.3-15 - clayey silt	0	0		10	[illegible]	ML	[illegible]	[illegible]	10YR 6/8	
					15-16.2 - clayey silt interlayered with coarse grained well sorted sand [illegible]	sand [illegible]									
					16.2-19.2 - [illegible] sorted sand *1										
20				152/152	19.2-21.7 - lost core										
					21.7-24.2 - gravelly sand [illegible]	40	40	10	10	[illegible]				"	
25															

*1 [illegible] gravel - [illegible] coarse grained [illegible] grained sand (s.R.) [illegible]

Preliminary 1

FIELD LOG

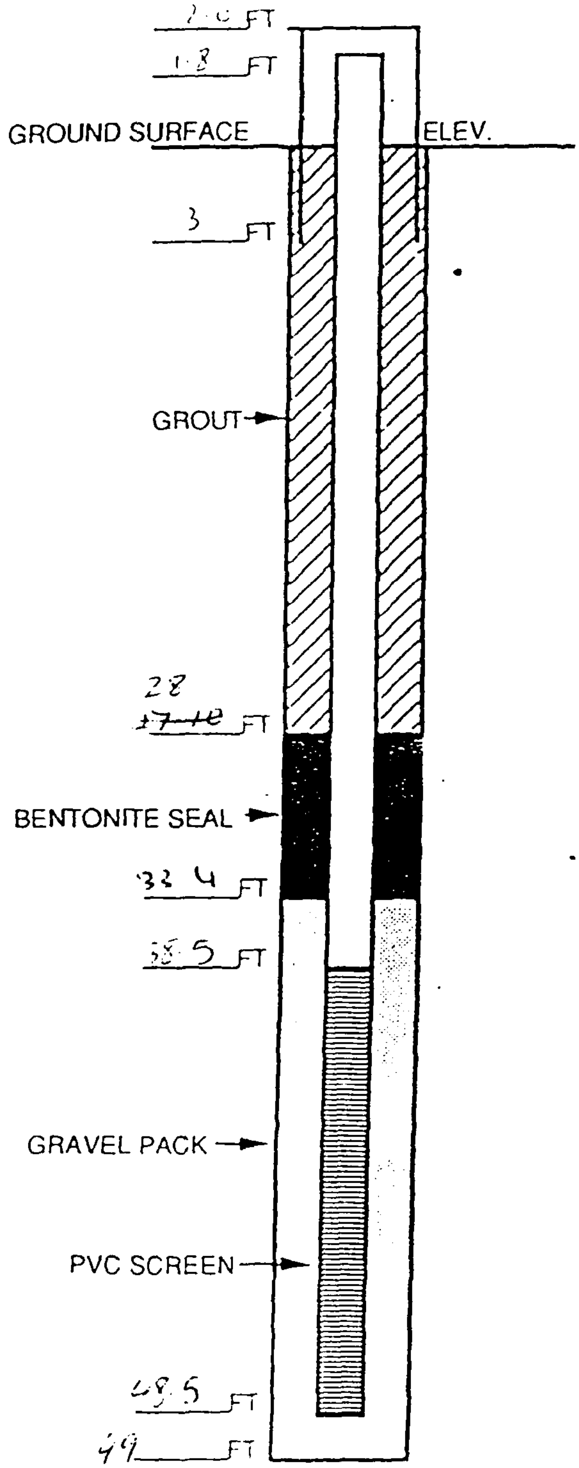
PAGE 2 OF 2

SITE ID: 761L

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25	LC				24.2 – 26.2 Lost core										
				152/152	26.2 – 27.7 gravelly sand, same as @ 21.7'.	30	30	20	10	5/5	SW 20	M M	SOR	11	
					27.7 – 29. clayey silt.	—	—	—	5	90/95	ML	M M	SOR		
30	LC				29 – 31 Lost core										
				152/152	31 – 31.5 clayey silt.				5	90/95	ML	M M	SOR	10YR 6/4	
					31.5 – 34: Medium/fg sorted sand with some gravel. Gravel rounded to sub-round. Coarsening head downwards	15	50	40	5	0	SP	M M	SOR	10YR 6/8	
35	LC				34 – 36 Lost core										
				152/152	36 – 39: – medium/fg sorted sand with some gravel. Gravel rounded to sub-rounded, elongation equally to subangular. Coarsening head downwards.	20	60	15	5		SP	M M	SOR	10YR 7/4	
40	LC				39 – 41.5 lost core										
				152/152	41.5 – 43.5: Gravel with well graded sand. Gravel rounded to sub-rounded coarse grain predominant	60	20	15	5		GW	M M	SOR	1	
					43.5 – 44. siltstone fissile/laminated	~~25~~ 65	~~30~~	~~5~~	~~5~~						
45				152/152	44 – 49. siltstone clasts.										
50					49 – 54										
				152/152	lignite/organic clay/silt									10YR 3/1	

WELL CONSTRUCTION LOG

WELL NO. 26163



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 49.1

Hole Diameter: 10' outer /4" Casing

Drilling Company: Layne Western

Driller: Larry King / Helper Altonsto ...

Rig Type: CME-75

Bits: 3" Pilot 6¼ 10 Ream

Hydr Geologist: Tariq Ahmad. (HLA)

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Reaming	89143	0941	89193	0938
Drilling:	89143	0657	89193	0745
Screen Placement:	89193	1030	89193	1043
Filter Placement:	89193	1044	89193	1114
Seal Placement:	89193	1116	89193	1123
Grouting:	89193	1220	89193	1345

DEPTH TO WATER

Depth: 41.4 Date: 89143 Time: 0725

Denver was dry. Sand layer on top had water.

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity: (Cement 14 bag, Ben. 25 lbs)		3 Buckets = 150 lbs	611 lbs
Type:	Bentonite / Portland Cement	¼ tablet	10-20 Sand

Screen

Size: 10   Config: 10 slot

Area/Ft.:   Comp: Schedule 40 PVC

Inside Diam.: 4   Outside Diam.: 4.5

COMMENTS

EBASCO SERVICES INCORPORATED

R. L. STOLLAR & ASSOCIATES, INC

FIELD LOG

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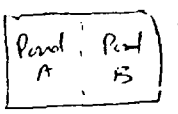
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
LMP Basin F Monitor wells	well (M)	26163	10

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Larry Ring	0637 / 89193	0745 / 89193

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-75 / Hollowstem	49 ft cm	41.9 ft cm	ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 3/4 Plug.	split spoon (5')	Tariq Ahmad	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0		A		12/12	0-4': clayey Silt.	0	0	0	15	80/5	ML	Dry/Moist	S0/R	10YR 6/4	at 1.5'
5				12/12	4-8.5': - clayey silt · < 3.5-3.0 Q some sand (Fine) seems more clay content. Transition to more silt content at lower end.				10	60/30	ML	M/M	S0/R	10YR 4/3	(Moist)
					8.5-9': - clayey silt				15	80/5	ML	D/M	S0/R	10YR 7/6	8.9'
10				12/12	9-14': - clayey silt as at 4-8.5' more moisture				15	80/5	ML	M/M	S0/R	10YR 7/6	
15				12/12	14-17.8': - clayey silt as at 9'-14' same moisture				15	80/5	ML	M/M	S0/R	10YR 7/6	
		Grout			17.8-19': - Medium graded gravelly sand · rounded to sub rounded gravel. Multipole rock types. Sand fraction angular to subangular.	15	30	40	15	0	SW	M/M	S0/R	10YR 6/6	
20				10.66/12	19-22.5': - same as at 17.8	15	30	40	15	0	SW	M/M	S0/R	10YR 6/6	
					22.5-24' lost core										
25															

FIELD LOG

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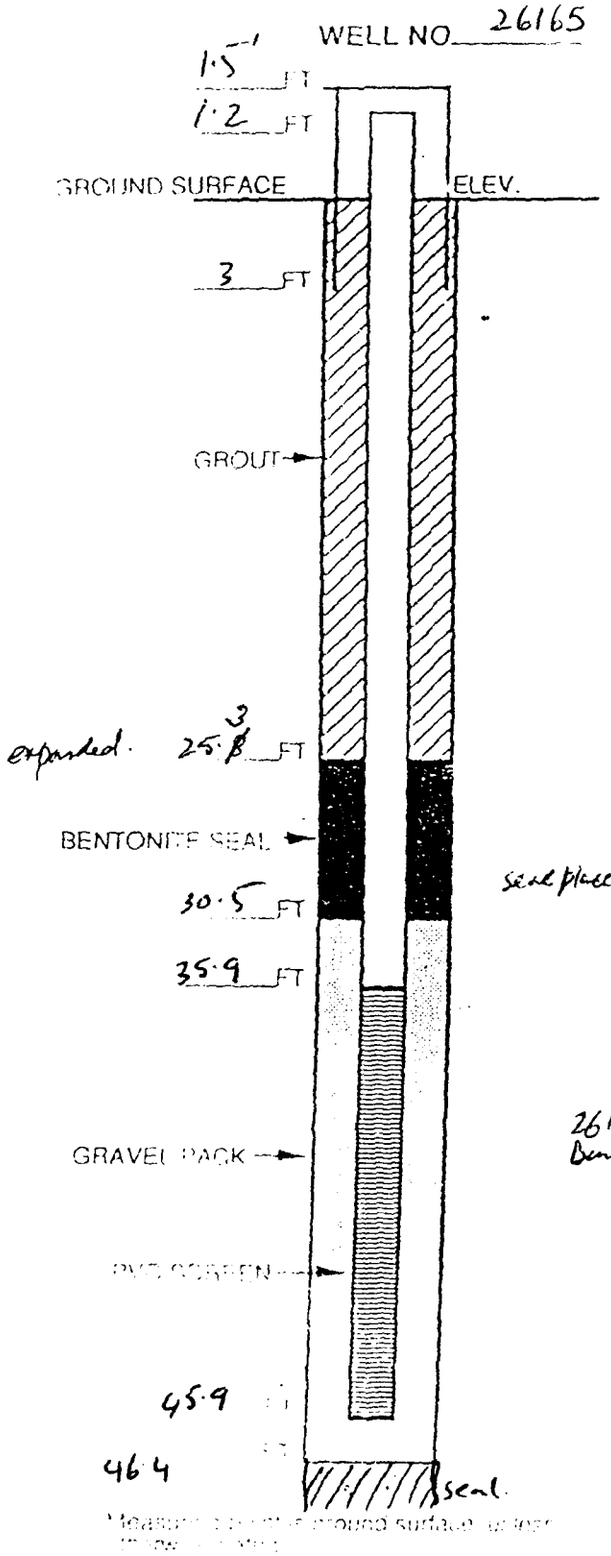
SITE ID: 26163

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25				85% / 152	24-26.8 - moderately graded sand with some gravel - rounded to sub rounded gravel - sand fraction angular to subangular (gravelly)	15	30	40	15	0	SW	m	S/R	10YR 6/6	
					26.8-29 lost core										
30				137% / 152	29-33.5 - clayey silt with red/rusty lamination - silt grezish	0	0	0	10	80/10	ML	m	S/R	10YR 7/1	
					33.5-34 - lost core										
35				98% / 152	34-34.2 - clayey silt as at 29' - with good well marked contact with sand below										
					34.2-35.6 - well sorted fine to med grained sand layer	0	0	50	50	0	SP	m	S/R		
					35.6-37 - Moderately graded sand with some gravel - rounded to subrounded gravel - angular to subangular sand fraction gravelly	15	30	40	15	0	SW	m	S/R	10YR 6/6	
					37-39 - lost core										
40				50% / 152	39-41.4 - same sand as at 35.6 gravel fraction removed same to naked eye	15	30	40	15	0	SW	m	S/R	10YR 6/6	
					41.4-41.8 - same sand as above but with high organic content - moderately graded - gravelly sand	15	30	40	15	0	SW	m	S/R	10YR 6/6	
					41.8-44 - lost core										
				152 / 152	44-44.9 - gravelly sand as at 41.4' high organic content	15	30	40	15	0	SW	m	S/R	10YR 6/2	
					44.9-44 Denver formation -										a145

WELL CONSTRUCTION LOG



seal placement 54'—

DRILLING SUMMARY

Total Depth of Hole: 54 original/Sealed to

Hole Diameter: 8"

Drilling Company: Layne Western

Driller: ~~Larry King~~ Alton Shoemaker

Rig Type: CME-75

Bits: 10" outer

Geologist: Tariq Ahmad.

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89194	0645	89194	0753
Screen Placement:	89194	0923	89194	0930
Filter Placement:	89194	0925	89194	0958
Seal Placement:	89194	1000	89194	1004
Grouting:	89194	10:30	89194	10:45
	89194	0800	89194	0812

DEPTH TO WATER

Depth: 46.4 Date: 89191 Time: 0930

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	7 bags	3 buckets	7 bags
Type:	low alkali Portland	1/4 Pellets Volclay	Silica 10/20

26 lbs Bentonite

Screen

Size: 4" I.D / 4.50D Config: 10 slot (factory)

Comp: Schedule 40 PVC

Outside Diam.: 4.5"

COMMENTS

Dry well.

EBASCO SERVICES INCORPORATED

R. L. STOLLAR & ASSOCIATES, INC

FIELD LOG

DLA 900531

26165

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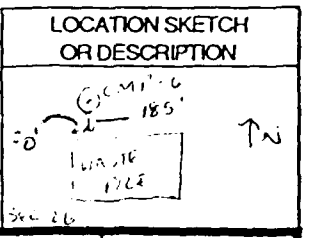
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP BASIN MONITORING WELL INSTALLATION	WELL	CMP-6	9

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE	RON MUCKEY	PILOT 89191/0700 1 REAMED 0900 1	PILOT 89191/1050 1

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 HOLLOW STEM AUGER	ft / cm	N/A ft / cm	ft / cm

SIZE AND TYPE OF BIT (ID)	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 3/4" PILOT ; 6 1/4" REAM	CONTINUOUS SPLITSPOON	KIM HEDLEY 89191	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0			5'	106/122	0-1.3' SILTY SAND				10	35/60	ML	M	SOR	10YR 4/4	1
					1.3-4.0' SANDY SILT ROUNDED SUBANGULAR WELL GRADED KH			10	80	10/0	SM	LM	NR	10YR 4/6	
5			5'	138/152	4-9.0' FINE SAND SUB ROUNDED MOD SORTED (INCR COARSE) KH		5	10	80	5/0	SM	LM	NR	2.5Y 5/6	2
10			5'	78/152	9-10.6' SILTY CLAY KH		2	5	66	25/5	SM	LM	NR	10YR 4/6	
					10.6-11.6' SUBROUNDED SAND MOD SORTED CLAY w/ CALICHE KH				5	60/35	CL	M	SOR	10YR 6/3	3
					LOST BOTTOM 2.4'									10YR 5/6	
15			5'	78/152	14-14.6' WELL CEMENTED SILTY CLAY			2	10	35/50	ML	M	NR	10YR 5/3	4
					14.6-16.6' HARD CLAY w/CALICHE CONTAINS SOME MOLLUSITE				20	35/50	MC	M-VM	SOR	5YR 6/4	
					LOST BOTTOM 2.4'										
20			5'	36/152	19-20.2' POORLY SORTED SAND & GRAVEL SUBANGULAR QTZ, PLAG, MUSC, AMPH. SOME IRON STAINING LOST BOTTOM 30 (SLID CUT)	20	13	50/30 KH	2	0	GP	M	NR	5YR 6/6	5
25															

DLA 92031
26.16.5

FIELD LOG

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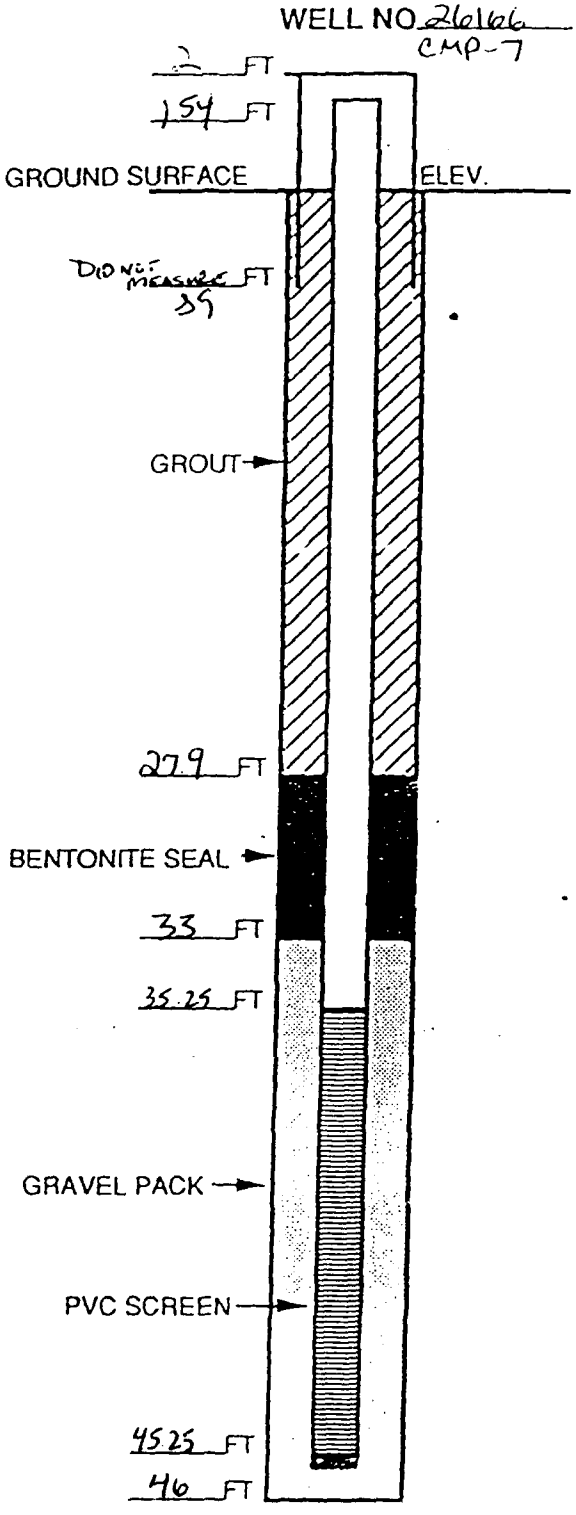
SITE ID: CMF 6

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
24			5'	48/152	24-25.3' COARSER GRAVELS AND SAND MOD. SORTED SUBANGULAR QTZ, PLAG, AMPH. MOD CONTAINS LARGE COBBLES 3-7 mm diameter LOST BOTTOM 3.7'	60	20	30	0	0	GP	VM	NCR	7.5YR 6/4	same as #5 except coarser
29			5'	44/152	29-30.4 COARSE GRAVELS AND SAND SAME AS 24-25.3' EXCEPT SUB B RH ROUNDED BOTTOM 3.6' SLID OUT	50	30	20			GP	VM	NCR	7.5 YR 5/6	SAME AS #5
34			5'	72/152	34-36.4 ALTERNATING LAYERS SUB ROUNDED OF SAND AND GRAVEL WELL SORTED MORE CLAY NEAR BOTTOM SUBANGULAR POORLY SORTED	70 40 5	25 35 25	5 25 50	 10	 10/10	GP GW SC	VM M M	NCR NCR NCR	7.5YR 4/4 10 YR 7/6 7.5YR 5/4	6
39			5'	152/152	39-43.0' CLAY-SOME IRON STAINING 43.0-44.0' SAND AND GRAVELS (SAME AS ABOVE) SUB ROUNDED	50	30	15	5	9/10	CH GW	VM VM	SOR NCR	10YR 5/3 7.5YR 5/6	7
44			5'	127/152	44-45.5' POORLY SORTED SAND & GRAVEL 45.5-48.0' DENVER CLAYSTONE FRIABLE FRACTURED W/ IRON STAINING LOST BOTTOM 1.0'	30	50	10	10	69/100	GW-GM ML	VM LM	NCR HR	7.5YR 5/4 5Y5/1	8
49			5'	152/152	49-52.3' SAME FRACTURED DENVER CLAYSTONE AS ABOVE MORE IRON STAINED LAYERS 1-5cm THICK 52.3-54' BLACK CLAYSTONE FRACTURED FRIABLE					29/100	ML	LM	HR	10R 2.5/1	9
54															

WELL CONSTRUCTION LOG



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 46'

Hole Diameter: 9.75"

Drilling Company: LAYNE WESTERN

Driller: ROD MUCKEY

Rig Type: CME 55

Bits: 6¼ 10" 9¾" CD Auger BIT: 10" REAMEABLE CARBIDE TEETH

Geologist: SUSAN GOLDBERG
Susan Goldberg

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89194	1200	89195	0938
Screen Placement:	89195	0951	89195	1000
Filter Placement:	89195	1005	89195	1116
Seal Placement:	89195	1121	89195	1209
Grouting:	89195	1238	89195	1332

DEPTH TO WATER

Depth: 39.0 Date: 89195 Time: 0559

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	12 BAGS	3 BUCKETS	5 (100 lb) BAGS
Type:	TYPE II LOW ALKALI PORTLAND	¼" TABLETS VOLCLAY HOLEPLUG	CSS 5.4C9 0/20

Screen

Size: 01 Config: FLUSH JOINTED

Area/Ft.: Comp: PVC

Inside Diam.: 4" Outside Diam.: 4"

COMMENTS

WELL IS SCREENED IN A FINE/MEDIUM/GRAVELLY SAND). BEDROCK WAS NOT ENCOUNTERED

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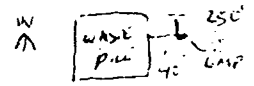
R. L. STOLLAR & ASSOCIATES, INC

FIELD LOG

PAGE 1 OF 2

LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP [illegible]	WELL	[illegible] CMP-7	10

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE	RON MUCKEY	8/1/94 / 1200	8/1/95 / 1332

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH		INIT. WATER LEVEL		24 HR WATER LEVEL	
CME 55 [illegible]	46.7 ft	1402 cm	14.95 ft	118 cm	ft	cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
10" [illegible] CARBIDE	SPLIT SPOON	Susan [illegible] 8/1/95	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (ft/ft)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				3.5/5	0-5' VERY FINE SILTY SAND [illegible] ↓ DRY AT TOP [illegible] 5'	0	0	0	60	30/10	SM	LM	SCR	10YR 5/3 BROWN	1
5				4.5/5	5-10' SAME AS 0-5 WITH A SMALL AMOUNT OF GRAVEL FLAKEY [illegible] LESS [illegible] SOME [illegible] FLAKES	10	0	0	50	30/10	↓	↓	✓	✓	2
10				4/5	10-15' [illegible] SAME AS 5 [illegible] SOME [illegible] VERY POORLY SORTED [illegible] SAND [illegible] FRAGMENTS > 1"	10 / 20 / 30 / 40	30 / 50	10	10	[illegible]	SW	[illegible]	[illegible]	7.5YR [illegible] BROWN [illegible] 7.5YR [illegible]	3
15				[illegible]	15-20' SAME AS [illegible] VERY COARSE DRY SAND [illegible] GRAVEL [illegible]	30	50	10	10	0	↓	↓	↓		4
20				3/5	20-25' SAME AS [illegible] 20', [illegible] 5 [illegible]	10	40	40	[illegible]	[illegible]	[illegible]	[illegible]		✓	
25															

ORIGINAL

FIELD LOG

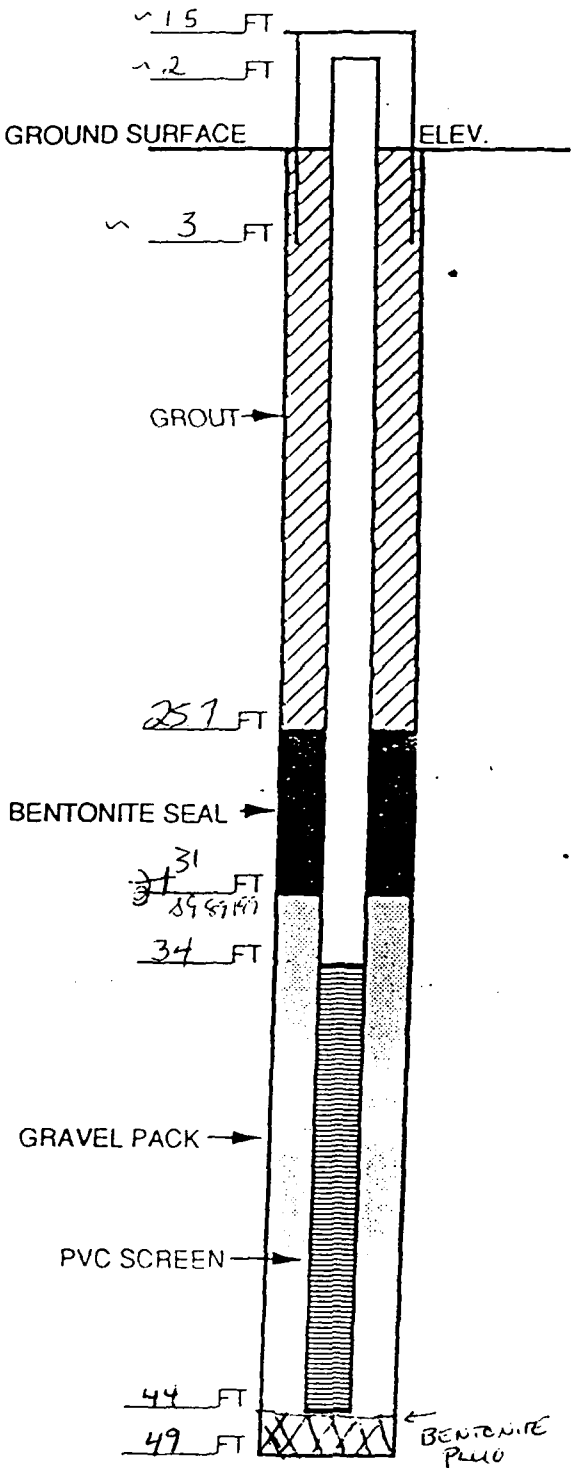
CMP-7

SITE ID: 26166

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
				2.5/5'	25-30' - SAME WITH ~~COARSE~~ SOME MOISTURE SLIGHTLY MORE GRAVEL CLAYEY SAND	20	40	30	10	0	SW	SLIGHTLY MOIST	SOFT VERY	VARIABLE	6
				3.4/5'	30-31.5 ~~SAND~~ ~~CLAY~~ W/ IRON OXIDE STAINING, MUSCOVITE FLAKES STIFF MED-MOIST - MOIST PLASTIC	0	0	0	50	10/40	SC	SLIGHTLY MOIST	SOFT	10YR 5/1 GRAY	7
					31.5-35 VCL SAND 0.0-0.5Ø LOOSE NON CEMENTED SUBROUNDED-SUBANGULAR	10	70 80	20	0	0	SW	MOIST	SOFT	VARIABLE	
				3/5'	~~SM~~ 35-~~37~~ 37.7 VCL SAND 0.0--0.5Ø LOOSE NON CEMENTED, SAME AS ~~31.5-35~~ W/ SOME STREAKS OF GREENISH CLAY 31 ~~31.5~~ - VERY WET COARSE SAND ~~ETC~~ - ? COATED W CLAY ~~SUB~~ ROUNDED → SUBANGULAR MOD-POORLY SORTED LOST BOTTOM OF CORE	10	80	20	0	0	SW	WET		VARIABLE	8
						20 40	30 40	10	0	0/10	SW SC	WET			
				1/1'	40-41 VCL SAND COATED WITH CLAY LOST 41-42' FROM USING CENTER BIT	V	V	V	V	0/10	~~SC~~ SW SM	WET		VARIABLE	9
				2.1/3.5'	~~42-45.5~~ 42-43' VERY FINE SILTY CLAYEY SAND 3.5-3 CR, SUBROUNDED, WELL SORTED	0	0	0	80 70	10/20	SC	WET		2.5Y 5/2 GRAYISH BROWN	
					43-45.5' COARSE SAND WHICH BECOMES COARSER W DEPTH - MOD. WELL SORTED SUBANGULAR	20	60	20	0	0		WET		VARIABLE	10

WELL CONSTRUCTION LOG

WELL NO. 26167



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 49', BENTONITE PLUG → 44'

Hole Diameter: 9.75"

Drilling Company: LAYNE WESTERN

Driller: RON MUCKEY

Rig Type: CME 55

Bits: CMC CARBIDE

Geologist: SUSAN GOLDBERG

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89198	0825	89199	0856
Screen Placement:	89199	1045	89199	1108
Filter Placement:	89199	1112	89199	1226
Seal Placement:	89199	1226	89199	1247
Grouting:	89199	1309	89199	1352

DEPTH TO WATER

Depth: DRY Date: 89199 Time: 1351

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	12	35 BUCKETS	6.5 BAGS 100 LB
Type:	PORTLAND	AMERICAN COLLOID VOLCLAY TABLETS + 4 BUCKETS FOR BOTTOM SEAL	CSSF SILICA 10/20

Screen (89199)

Size: 4" OD Config: HORIZ SLOT

Area/Ft.: Comp: PVC

Inside Diam.: 4" Outside Diam.: 4"

COMMENTS

HOLE WAS REAMED TO 49' AND PLUGGED W/ BENTONITE FROM 44-49'. CASING WAS SET ON TOP OF PLUG.

R.L. STOLLAR & SERVICES INCORPORATED

SCE-

ORIGINAL FIELD COPY

R. I. STOLLAR & ASSOCIATES, INC.

FIELD LOG

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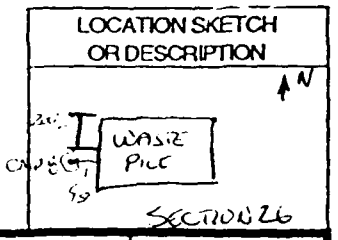
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP BASIN F	WELL	LMP-8 26167	9

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE WESTERN	RON MUCKEY	5/9/98 1025	/

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 : HOLLOW STEM AUGER	ft cm	ft cm	ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
	SPLIT SPOON	Susan Godfrey 5/9/98	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY ~~SPT~~ CORE (inches)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				4.3/5'	C-4 MU SAND. VERY WELL SORTED. 350-500 M, DRY → L MOISTURE SUBANGULAR - SUBROUNDED	0	5	95	0	0	SP	LM	PRE	10YR 5/4 YELLOWISH BROWN	1
5				1.4/5'	4 5' B 10' 6.5 MU SAND SAME AS C-5' WITH SOME CALCS NODULES. CORE PLUGGED AT BOTTOM, RECOVERY 5.4/5'										2
10				5'/5'	9 10' A-5' SAME MU SAND										
					10-14' A-15' CLAYEY SILT W/ 10% GRAVEL SOFT, BUT, STIFFER PUSHED, CONTACT SOME CALCS	10	0	0	0	20/20	CL	LM		10YR 7/3 VERY PALE BROWN	3
15				4.15/5'	15-~~15.5~~ CLAYEY SILT, SAME 14 17.5' 19										4
					17.5 19' ~~15.5~~ 20' COARSE SAND W/ GRANITIC FRAGMENTS ANGULAR - SUBROUNDED MED. POORLY SORTED, VERY LOOSE NON CEMENTED	20	50	30	0	0	NR	WET			
20				2/5'	20-~~21.5~~ SAME AS 18 5 20 19 - 20.5										5
					~~21.5~~ - ~~25'~~ LLL COARSE SAND 20.5 - 24' W/ PEBBLES (GRANITIC) GRAVEL ~~20~~ SMALLER SAND GRAINS STICK CORE BARREL LOOSE	30	40	20	10	0	GW	L M	NO RECOVERY 5.5	VARIABLE SAND	
25															

FIELD LOG

PAGE 2 OF 2

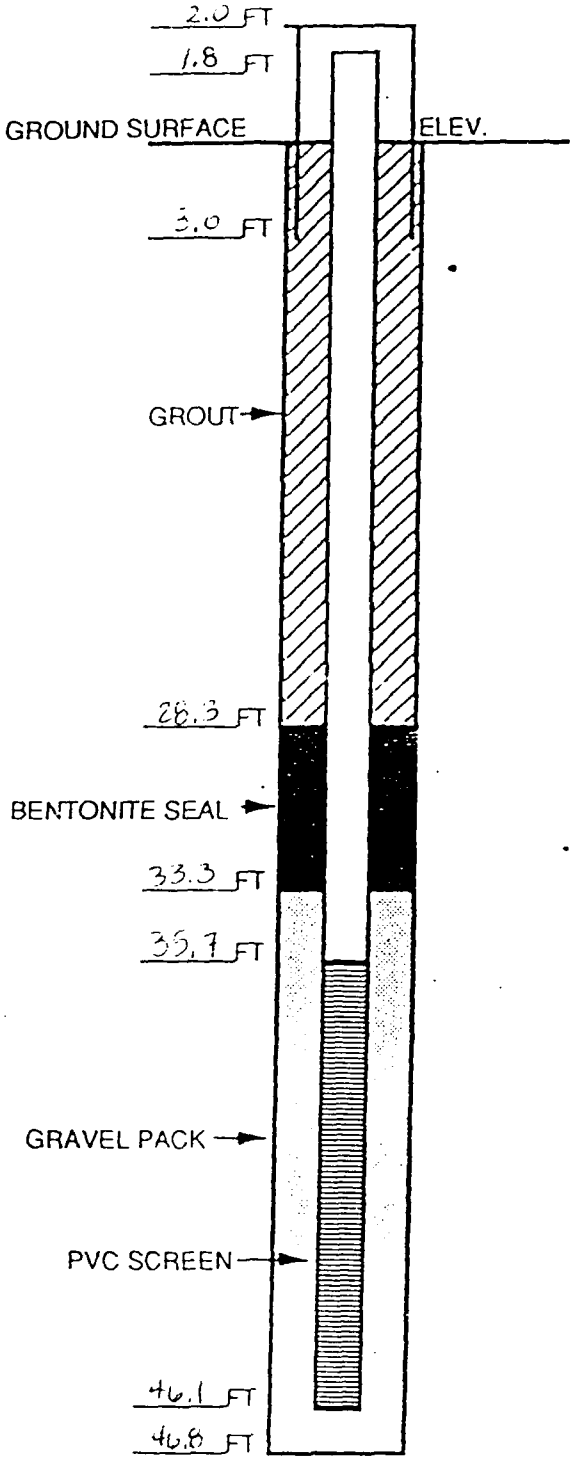
SITE ID: 26167

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25 – 30	o o o o		NO CORE	0/5	24 - 29' 25-30' NO CORE HAD TO GO IN W/ CENTER BIT DUE TO GRAVEL W/ LG. STONES DRILLER SAYS THE THE LARGE GRAVEL WAS CONTINUOUS THROUGH SECTION.										
30				2.5/5	29-31.5 ~~25-27.5~~ ~~30-32.5~~ - SAME ~~?~~ 30-31.5 - 35 34.5' MOIST COARSE SAND W/ SOME AREAS SUBROUNDED, GRANITIC PEBBLES POORLY SORTED, VERY LOOSE	30	50	20	0	0	SP	SW	NCA	VARIABLE	6
				2.5/5	CORE AUGERED 34-36.5 COARSE SAND WELL SORTED SILTY AT BOTTOM OF CORE 36-39' LOST CORE	10	60	30	0	0	LM	SP	NCA	VARIABLE	7
				2.3/5	43' 44 39-~~44~~ - SAME AS 34-36.5 SOME MOIST AREAS 43-44' DRILLED THROUGH W/ CENTER BIT	↓	↓	↓	↓	↓	↓	↓	↓	↓	8
				5/5	44-49' CLAYSTONE BEDROCK HIGHLY WEATHERED, FRACTURED CRUMBLY, IRON OXIDE STAINING ?, LITTLE MOISTURE	0	0	0	0/40	90	CL/ST	LM	MK	10YR 5/3 BROWN	9

WELL CONSTRUCTION LOG

JG168 DLA 90031

WELL NO. CMP-9



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: ~~47'~~ KH 46.8'

Hole Diameter: 9 3/4"

Drilling Company: LAYNE

Driller: RON MUCKEY

Rig Type: CME -55

Bits: HOLLOW AUGER CME 6 1/4" (SIX) W/REPLACEABLE CARBIDES

Geologist: KIM HEDBERG

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89187	0617	~~89187~~ 89188 KH	0640
Screen Placement:	89188	0703	89188	0716
Filter Placement:	89188	0722	89188	0905
Seal Placement:	89188	0908	89189	0923
Grouting:	89188	0925	89188	1024

DEPTH TO WATER

Depth: 38.75' Date: 89188 Time: 1040

WELL CONSTRUCTION MATERIALS

	Grout (94 lbs)	Seals	Filter (100 lbs)
Quantity:	10 BAGS	~~5~~ KH 3 2 1/4 BUCKETS	4 1/3 BAGS
Type:	1-2 PORTLAND CEMENT	AMER COLLOID CO 1/4" TABLETS	CSSI SILICA SAND #10

Screen

Size: .10 Config: HORIZONTAL SLOT

Area/Ft.: Comp: PVC

Inside Diam.: 4" Outside Diam.: 4" (SCHEDULE 40)

COMMENTS

WELL WAS SANDED-IN AT 36'.

5 GALLONS DISTILLED WATER ADDED TO DISLODGE AUGER

EBASCO SERVICES INCORPORATED

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FIELD LOG

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LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
MT BASIN 1 MONITORING WELL INSTALLATION	WELL	CMP-9	11

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE	RON MUCKEY	9/11/87 1 0600	9/18/87 1 1100

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 HOLLOW STEM AUGER	47 ft 1433 cm	38.75 ft 1181 cm	ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 3/4 HOLLOW STEM	CONTINUOUS SPLIT SPOON	K HOLLEY 8/88	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				124/124	0-0.5' FINE CLAY					90/100	CH	VM	SOFT (SOR)	7.5YR 3/2	1
					0.5-3.5' ~~SANDY~~ SILTY CLAY KH					50/50	ML	M	F (SOR)	7.5YR 3/4	2
					3.5-4.0' DRYER SILTY ~~CLAY~~ SAND VF				80	10/10	SM	M	L (SOR)	7.5YR 5/4	
5				143/152	4.0-9.0 DRY SILTY SAND SOME CALICHE				70	20/100	SM	M	SOR	7.5YR 5/4	3
				61/152	LOST BOTTOM 3'										
10					9-11.0' SILTY CLAY CONTAINS WHITE CALICHE				20	80/100	ML	M	MHR	10YR 5/4	4
				40/152	LOST BOTTOM 3.5'										5
15					14-15' CLAY					20/100	MH	M	MHR	10YR 5/6	
					15-15.5' SANDY GRAVEL ~~WELL~~ KH SORTED POORLY	10	10	30	50	0	SP	M	M NCR	2.5Y 5/4	6
					LOST BOTTOM 2.5'										
20				14/152	19-21.5 SANDY GRAVEL SUBANGULAR MODERATELY SORTED	10	20	50	20	0	SP	M	NCR		SAME AS 6
25															

FIELD LOG

PAGE 2 OF 2

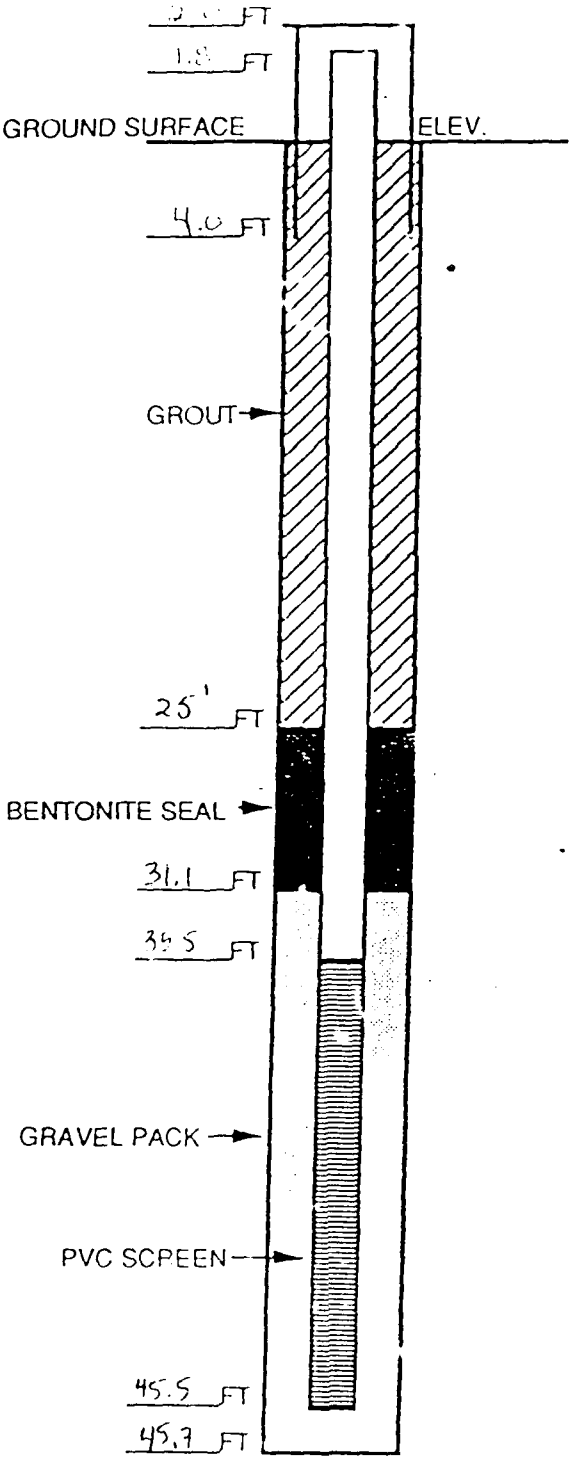
SITE ID: [illegible]

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND: CSE	SAND: MED	SAND: FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
~~24~~ 24				47/152	LOST BOTTOM 3.5' 24-~~29~~ 25.5 SUBANGULAR • SANDS & GRAVEL (DARK w/QTZ) CONTAINS 0.1' LAYER BIOTITIC ROCK	10	20	45	5	0	~~SM~~ SP SM	M	NCR	7.5YR 4/6	7
29				40/152	LOST BOTTOM 3.4' (SLID OUT 29-30.1 SUBANGULAR SANDS & GRAVELS MOD SORTED	5	20	65	10	0	SP SM	M	NCR	7.5YR 4/4	SAME AS 7
34				66/152	LOST BOTTOM 2.8' WATER ~~AT~~ BOTTOM FOOT 34-35 CLAY LENSES SURROUND SANDS & GRAVELS 35-~~36.2~~ SUBANGULAR POORLY SORTED		40	10		5%	ML	M	~~FIRM~~ STIFF	10YR 5/4	8
						10	35	50	5		CL	M	NCR	7.5YR 4/4	SAME AS 7
39				104/152	~~LOST~~ LOST TOP 2' ~~41~~ 41-41.5' BLACK GRAVEL POORLY GRADED	50	20	20 KH	10		GP	W	NCR	7.5YR 2/0	9
					41.5-~~44~~ 43.5 DENVER SANDS LAYER 43.5-44' SUBROUNDED WELL GRADED			100			SP	W	NCR	2.5YR 4/4	10
44				71/91	LOST BOTTOM 0.8' 44-45.5' DENVER SANDS			80	20		SP	W	NCR	~~2.5YR~~ 3.5YR ~~4/4~~ KH 4/4	SAME AS 10
47					45.5-46.2' V. HARD CLAYSTONE SILTY WEATHERED DENVER			~~80~~ 10	~~10~~ 40	~~10~~ 50	~~SP~~ KH	W	~~D~~ HR	KH 5YR 4/1	11
					IRON STAINED LAYERS ~~FRIABLE~~ KH FRACTURED										

WELL CONSTRUCTION LOG

JL169 DOA 90031

WELL NO. CMP-10



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 45.7'

Hole Diameter: 9 3/4"

Drilling Company: LAYNE

Driller: R MUCKEY, A SCHOONMAKER, L RING

Rig Type: CME 55 PILOT, REAMED TO 24'; CME-75 POWER HOLE

Bits: HOLLOW AUGER 6 1/4" W/6 REPLACEABLE CARBIDES

Geologist: KIM HEDBERG

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	8?200	0832	89202	0803
Screen Placement:	89202	0824	89202	0827
Filter Placement:	89202	0827	89202	0850
Seal Placement:	89202	0858	89202	1013
Grouting:	89202	1051	89202	1101

DEPTH TO WATER

Depth: 38.45' Date: 89200 Time: 0952

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	4 BAGS (94#)	3 1/2 BUCKETS	5 BAGS (100#)
Type:	PORTLAND CEMENT TYPE I & II	ENVIROPLUG PELLETS (3/8")	CSSI SILICA SAND

Screen

Size: 0.10 Config: HORIZONTAL SLOT

Area/Ft: Comp: PVC

Inside Diam.: 4" Outside Diam.: 4" SCHEDULE 40

COMMENTS

CME 55 BROKE DOWN 89200 HOLE

FINISHED W/ CME-75 89202

DRILLERS R MUCKEY PILOT, REAMED TO 24';

A SCHOONMAKER REAMED TO 25.5'; L RING

FINISHED REAMING AND CONSTRUCTED WELL

EBASCO SERVICES INCORPORATED

BENTONITE PLUGGED AUGER @ 28', SO ALL

AUGER WAS REMOVED. HOLE DEPTH WAS 30'

SO WELL CAVED ABOUT 0.5' 5' BENTONITE ADDED IN TOT

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FIELD LOG

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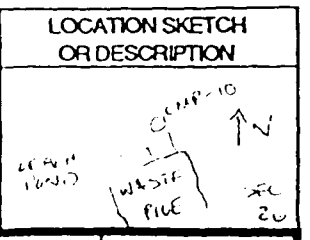
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP BASIN F MONITORING WELL INSTALLATION	WELL	CMP-10	9

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE	CME-75 & CME-55 RON MUCKEY & SCHOOLMAKER	PILOT REAMED 89200/0532 / 89200/1242	PILOT (44') REAMED 89200/1636 /

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-75 REAMED 24" CME-55 HOLLOW STEM AUGER	ft / cm	38.45 ft / cm	ft / cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3¾" PILOT 6¼" REAM (10")	CONTINUOUS SPLIT SPOON	KIM Hallum 89200	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0			2'	12/12	~~FINE SANDY~~ KH CLAY 0.4' SILTY				5	70/75	ML	LM	VCR	10YR 4/6	1
4			5'	13/151	4'-5' SILTY CLAY CONTAINS CALICHE 8.5-9.0' LOST LAST 0.5					60/40	ML	LM	VCR	10 YR 7/4 -10 YR 6/6	2
9			5'	13/151	9-9.7' LOST TOP 0.7' 9.7-12' SILTY CLAY W/CALICHE					5%/30	ML	M	VCR	10YR 5/4	3
14			5'	15/151	12-12.5 GRAVELLY CLAY (QTZ, PL, BIO, MMX) 12.5-13.5 KH ~~13.5-14.0~~ GRAVELLY SAND (QTZ, PL, BIO, MMX) 12.5-14.0' POORLY SORTED, SUBROUNDED	30	10	10	10	20/20	UML	M	VCR	10YR 4/6	
						30	20	35	15	0	GM	LM	VCR	10YR KH 7/6 8/6	
19			5'	15/151	14-16.5' POORLY SORTED GRAVELLY SAND (AS ABOVE) MUCK ROCK FLOUR AT BOTTOM 16.5-19' LOST BOTTOM 2.5'	30	30	35	15	0	GM	LM	VCR	10YR 6/8	4
					18.1-18.3' SAND LAYER	5	5	5	80	5/0	SM	LM	VCR	10YR 3/6	
24			5'	85/151	19-21.8' POORLY SORTED GRAVELLY SAND SUBANGULAR BECOMES FINER NEAR 21'	20	30	30	20	0	GW	M	VLR	10YR 5/4	5
					21.8-24' SILTY SAND CONTAINS MICA (MMX), QTZ 21.8-24 LOST ~~TAKEN~~ BOTTOM 2.2'				40	44/20	SM	LM	VCR	5 YR 7/6	
25															

DRILLERS: 2 MUCKEY PILOT, REAMED TO 24' (CME-55)

A SCHOOLMAKER REAMED TO 29.5' (CME-75)

1 RING FINISHED REAMING AND CONSTRUCTED WELL (CME-75)

26169 DLA 90031
2ED

FIELD LOG

PAGE 2 OF 2

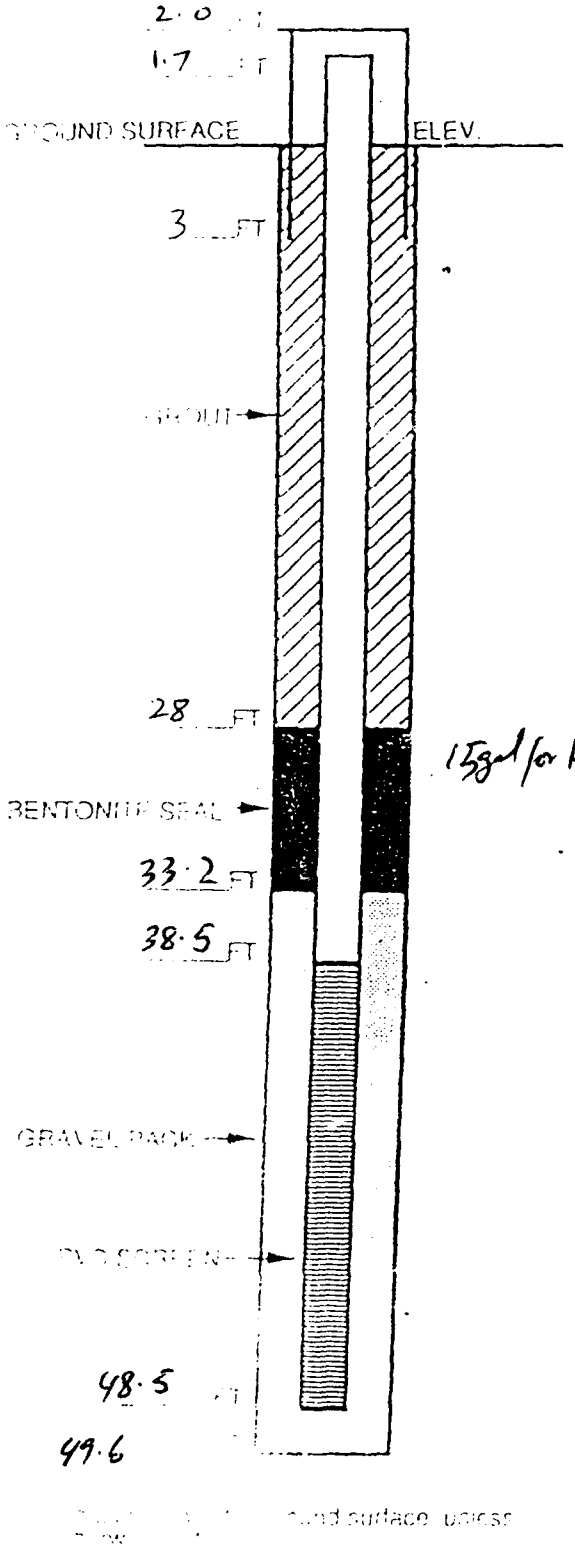
SITE ID: CMP-10

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
24			5'	75/151	24-25.7' MOD SORTED SILTY SANDS AND GRAVELS SUBROUNDED	10	20	40	20	10/0	SM	LM	NCR	7.5YR 4/4	6
					25.7-26.5' POORLY SORTED SUBROUNDED SILTY SAND, ROCK FLOUR QTZ, MUSC, PLAG, AMPH	5	10	30	40	15/0	SM	D	NCR	10YR 6/3	
29			5'	91/151	26.5-29 LOST BOTTOM 2.5'										
					29-30' POORLY SORTED SANDS & GRAVELS SUBROUNDED QTZ, PLAG	20	30	40	10	0	GW	LM	NCR	10YR 5/6	7
					30-31' MOD. SORTED SANDS & GRAVELS	2	10	40	40	8/0	SM	LM	NCR	10YR 6/4	
					31-32' FINE SANDS ROCK FLOUR	2		10	80	8/0	SM	LM	NCR	10YR 7/1	
34					32-34 LOST BOTTOM										
			5'	75/151	34-35.2' POORLY SORTED SAND & GRAVEL SUBROUNDED QTZ, PLAG, MUSC, BIO AMPH	10	40	45	5	0	GW	VM	NCR	7.5YR 5/4	8
					35.2-36.5 WET POORLY SORTED S. & G.	5	20	50	15	0	SM	W	NCR	7.5YR 4/4	
					36.5-39' LOST BOTTOM 2.5'										
39			5'	91/151	39-40' SUBROUNDED MOD SORTED GRAVELLY SAND	40	30	25	5	0	GW	W	NCR	7.5YR 6/2	9
					40-42' LOST DUE TO SAMPLE REMOVAL (ROCK REMOVED BY USE OF BIT)						KH				
					42-42.3' DENVER SANDS				5	60/35	CL MH	W	KH W SCR	10YR 5/3	
					42.3-44' DENVER CLAYSTONE										
44					MORE KH RIDDED W/IRON STAINING					10/90		D	HR	5YR 4/1	
					44-44.5' CLAYSTONE LOST 1.5' NO SAMPLE									2.5YR 5/6	IRON STAIN

WELL CONSTRUCTION LOG

CMD-11

WELL NO. 26170



DRILLING SUMMARY

Total Depth of Hole: 49' BGL

Hole Diameter: 10'

Drilling Company: Layne Western

Driller: Larry Ling

Rig Type: CME-75

Bits: 3 3/4 ID Pilot 16 1/4 ID Ream

Geologist: Tariq Ahmad

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Ream	89195	0915	89195	1005 1142
Drilling	89195	0632	89195	0748
Screen Placement:	89195	1150	89195	1158
Filter Placement:	89195	1200	89195	1217
Seal Placement:	89195	1219	89195	1228
Grouting:	89195	1311	89195	1340

DEPTH TO WATER

Depth: ~41 Diary drilling / 42.5 after drilling (30 Minutes) Date: 89195 Time: 0727 / 0748

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity	732 lbs cmt / 38 lbs Bent.	150 lbs	564 lbs
Type:		1/4" Tablets	10/20 Silica

Screen

Size: 4" ID 4 1/2" OD Config: 10 Slot Factory

Area: Comp: schedule 40 PVC

Inside Diam.: 4 Outside Diam.: 4.5

COMMENTS

EBASCO SERVICES INCORPORATED

STOLLAR & ASSOCIATES, INC

FIELD LOG

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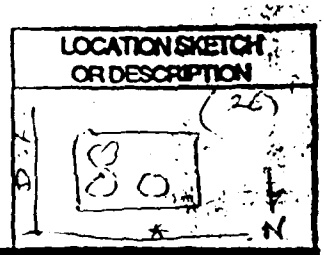
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
	Well	(CMP11) 26170	10

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Larry King	891951 0636	891951 0748

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-75 / Hollow stem	49 ft cm	41 ft cm	ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 3/4 Rock ID	Split spoon	Larry Stollar	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				19/92 / 152	0-4: clayey silt. Fine roots	0	0	0	10	70/20	ML	D	SR	10YR 4/3	3'
				151 / 152	4-7.2': clayey silt. Roots upto 1.5'.	0	0	0	10	70/20	ML	D	SR	10YR 6/3	
					7.2-9': - clayey silt with increasing Sand Content	0	0	0	15	80/5	ML	M/M	SR	10YR 5/6	8.5
				152 / 152	9-10.8': clayey silt with Sand. Sand < 3.0 - 2.50	0	0	0	15	80/5	ML	M/M	SR	10YR 5/6	
					10.8 - 14' - clayey silt as at 7.2 and 9	0	0	0	15	80/5	ML	M/M	SR	10YR 5/6	Lions
				152 / 152	14 - 18.2' - clayey silt with increasing Sand Content	0	0	25	10	60/5	ML/SL	M/M	SR	10YR 5/3	
					18.2 - 19 - Silty Sand with gravel gravel Rounded to Subrounded Sand angular to subangular	5	25	40	20	10	SM	M/M	SR	10YR 6/4	18.9
20				73.5 / 152	19 - 21.4 - Well graded gravelly Sand Rounded to Subrounded gravel. Angular to Subangular Sand.	10	50	20	20	0	SW	M/M	SR	10YR 6/6	21
	LC				21.4 - 24 Rock Core										
5															

FIELD LOG

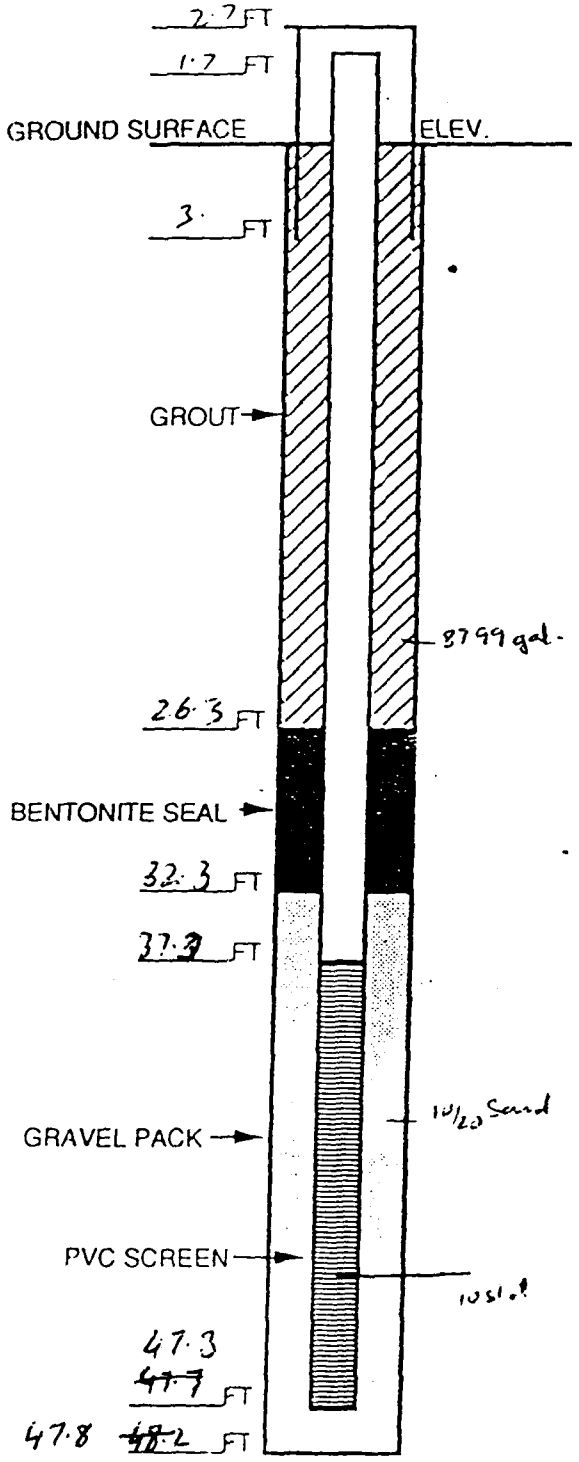
PAGE 2 OF 2

SITE ID: 2617 0·

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25		grout		97.5% 152	24-27.2: well graded gravelly Sand. increased gravel. Increased coarse sand. gravel rounds up 2" in size (2%). gravel rounded to subrounded. Sand Ang. to S.A.	15	50	30	10		SW	m m	S R	10YR 6/8	
27					27.2-29 lost Core										
L.C		bentonite			29-30.5: - well graded gravelly sand as at 24.										None
30.5				106.68 152	30.5-31.7: - well sorted coal sand 1·5-1 Φ. →	0	10	80	10	0	SP	m m	S R	10YR 6/4	31
sand					31.7-32.5: well graded sand as at 29 feet.										
35					(32.5-34) lost core										
L.C				67.05 152	34-34.5: Sandy silt. semi Plastic. Gritty.	0	0	0	30	40/30	CL	m m	S R	10YR 6/1	35.2
		sand pack			34.5-36.2: - well graded gravelly Sand as at 29. locked to subrounded Gravel. angular to S. angular sand.	15	50	30	10	0	SW	m m	S R	10YR 6/3	
					36.2-39. lost Core										
L.C				94.48 152	39-40.8 clayey silt with Sand	0	0	0	40	50/10	ML/SM	wet m a	S	10YR 5/3	40.2
		screen			40.8-42.1 ~~well graded~~ poorly graded gravelly Sand (Poorly well sorted) 1-1.5 Φ										41
					← to 2.5-2Φ.										
					42.1-44 lost core.										
				146.30 152	44-48.8 - ~~claystone~~ Siltstone with Fractures and weathering (Red) at fractures.							m m	m H R	10YR 6/2	45
50					48.8-49: - Darker claystone Fine fractures Lignite Trend.									10YR 5/1	48.8

WELL CONSTRUCTION LOG

WELL NO. 26171 (CMP-5)



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 47.8'

Hole Diameter: 10'

Drilling Company: Layne Western

Driller: Allen Shoemaker

Rig Type: CME-75

Bits: 3 7/4 ID Reamer Bit / 10" O.D Reamer

Geologist: Tariq Ahmad.

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Reaming:	89200	1450	89201	0722
Drilling:	89200	1010	89200	1152
Screen Placement:	89201	0727	892001	0736
Filter Placement:	89201	0740	892001	0802
Seal Placement:	89201	0804	89201	0825
Grouting:	89201	0930	89201	1010

DEPTH TO WATER

Depth: 40.5' Date: 89200 Time: 1132 / 1151

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	564 lbs cement ~~28 lbs Bentonite~~	5 Buckets = 250	*1 700 ~~552~~ lbs *2
Type:	Low alkali cement type I 82 Portland.	Conveying 3/8" Wyo-Ben Inc	Colorado Silica 10/20 sand

Screen

Size: 10' Config: 10 slot

~~Area~~ Ft.: Comp: Schedule 40 PVC

Inside Diam.: 4" Outside Diam.: 4.5"

COMMENTS

*1 This includes some losses due to spills which are not that much.

*2 Each Bucket is 0.52 ft³. We have 55' Annular column of Bentonite Unhydrated.

EBASCO SERVICES INCORPORATED

[illegible] ATES INC

FIELD LOG

PAGE ___ OF

PROJECT NAME	SITE TYPE	SITE ID	NO. OF SAMPLES
EMA CMP Bison F [illegible]	well	26171 (CMPS)	[illegible]

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	[illegible]	8/4/200 1010	8/4/200 1 [illegible]

DRILLING EQUIPMENT METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-75	47.8 ft ___ m	40.5 ft ___ cm	___ ft ___ cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
[illegible] 3 3/4 [illegible] 10.00	[illegible] Core Barrel	[illegible]	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				121/152	[illegible] clayey silt with some medium grained sand, sand fraction > 20 [illegible]	0	0	0	10	80/10	mL	D	S/R	10YR 5/6	5'
5				152/152	5-7 [illegible] clayey silt with some sand > 20 [illegible]	0	0	0	0	80/10	mL	D	S/R	10YR 5/6	
					[illegible] clayey silt [illegible]	[illegible]			10	[illegible]	[illegible]	D	[illegible]	10YR 5/6	
					[illegible]	0	0	0	0	90/10		m	S/R	10YR 6/3	8' [illegible] (A)
10				152/152	[illegible] clayey silt [illegible]	0	0	0	same as (A)						
		Grout			[illegible]	0	0	0	10	80/10	mL	m	S/R	10YR 4/1	
					[illegible]	0	0	0	same [illegible]						
15				103.19/152	[illegible] clayey silt with [illegible]	0	0	0	10	70/20	mL	m	S/R	10YR 6/4	15'
	LL				[illegible] silty sand						sm	m	S/R	10YR 5/4	17'
20					[illegible] - lost core										
	LL			51.8/152	[illegible]	5	5	40	12	3/6	sw	[illegible]	S/R	10YR 5/6	20'
25	LL				20.7 - 24 lost core										

FIELD LOG

PAGE 2 OF 2

SITE ID: 26171 CMR 5"

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
	LC			0/152	24-29:- Core Completely lost large cobble plugged split spoon.										
30	GS	Sand		54.8/152	29-30.8:- well graded gravelly Sand. chemistry same as at 19'.	8	50	30	12	%	SW	M	SO	10YR 6/6	30'
	LC				30.8-34:- lost Core. large cobbles get stuck in split spoon.										
35	LC			18.2/152	34-34.6:- well graded gravelly Sand as at 29'.	8	50	30	12	%	SW	M	SO	10YR 6/6	40'
					34.6-39:- lost Core. cobble stuck in split spoon										
Static 40	LC	Filter		60.96/152	39-41: well graded gravelly Sand same as at 34.	8	50	30	12	%	SW	W	SO	10YR 6/4	
Dark					41- Same dark coloured grain 39.4 & 41'.									8	
45				70.13/152	41-42: lost Core.									10YR 4/2	
					42-42.5:- Dark coloured gravelly Sand. well graded. Same as at 37.4.							W	M	10YR 4/1	
50					42.5-44.3:- Dense clayStone with siltstone interlayered. Fractures + red discoloration at fractures.								M		
				82.29/152	44.3-45.4:- Dark clayStone contaminated with some Sandy siltStone. Fractures. red discoloration at fractures.								M	10YR 4/1	
					45.4-47:- Dry Dark in clayStone Possibly higher Carbon Content.							W/M/D	M/H	M/H	

R. L. STOLLAR & ASSOCIATES, INC

FIELD LOG

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26172 DLA 90031

LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
LMI BASIN - MONITORING WELL INSTALLATIONS	M/GEL	LMP 13	7

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE	RAY MOCKEY	9/20/ 1010	9/20/ 1010

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 HOLLOW STEM AUGER	55 ft 1676 cm	NA ft NA cm	NA ft NA cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
8¾" PILOT	CONTINUOUS SPLIT SPOON	KIM MCKEE 10/1	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				24/60	0-1.7' SILTY CLAY HARD CONTAINS MICA, QTZ					70	ML	M	MHR		
					1.7-3.0' SANDY SILT CONTAINS CALICHE						CL			7.5YR 5/4	
5				10.8/60	3-4' SANDY SILT (AS ABOVE)										
				15/60	4-5.5' SILTY CLAY W/CALICHE					TR/20	ML	LM	MHR	7.5YR 5/2	2
					5.5-6.5' SILTY CLAY W/SAND (QTZ), CALICHE			2	5	60/20	CL	M	MHR	7.5YR 5/2	
				15/60	6.5 & LOST SAMPLE										
10				15/60	7-12.5' SILTY CLAY W/SAND, CALICHE (AS ABOVE)										
					12.5-13' SILTY CLAY W/GRAVEL AND CALICHE	5	5	10	10	40/30	ML	M	MHR	10 YR 6/4	3
				9/60	13-14' SILTY CLAY W/SAND CONTAINS CALICHE				5	45/35	ML	M	MCR	10YR 7/3	4
15				10.8/60	14-17.5' SILTY CLAY W/SAND (AS ABOVE) LAST 0.3' CONTAINS CALICHE				5	75/40	ML	M	MCR	10 YR 7/3	
					17.5-19' LOST SAMPLE										
20				5'/10'	19-20.5' LOST SAMPLE										
					20.5-21.0' SANDY SILT	5	0	0	10	85/20		M	MCR	10YR 7/3	
					21.0-21.5' POORLY SORTED GRAVELLY SAND SUBANGULAR	5	30	40	20	5/10		M	MCR	7.5 YR 5/4	5
				5'/10'	21.5-22.5' MOD SORTED SANDY GRAVEL FINE FLOUR SUBROUNDED	5	20	20	35	19/5		D	MCR	10YR 7/4	
					QTZ, CALC, AMPH										
25					22.5-24' NO SAMPLE										

LAST BIT USED

FIELD LOG

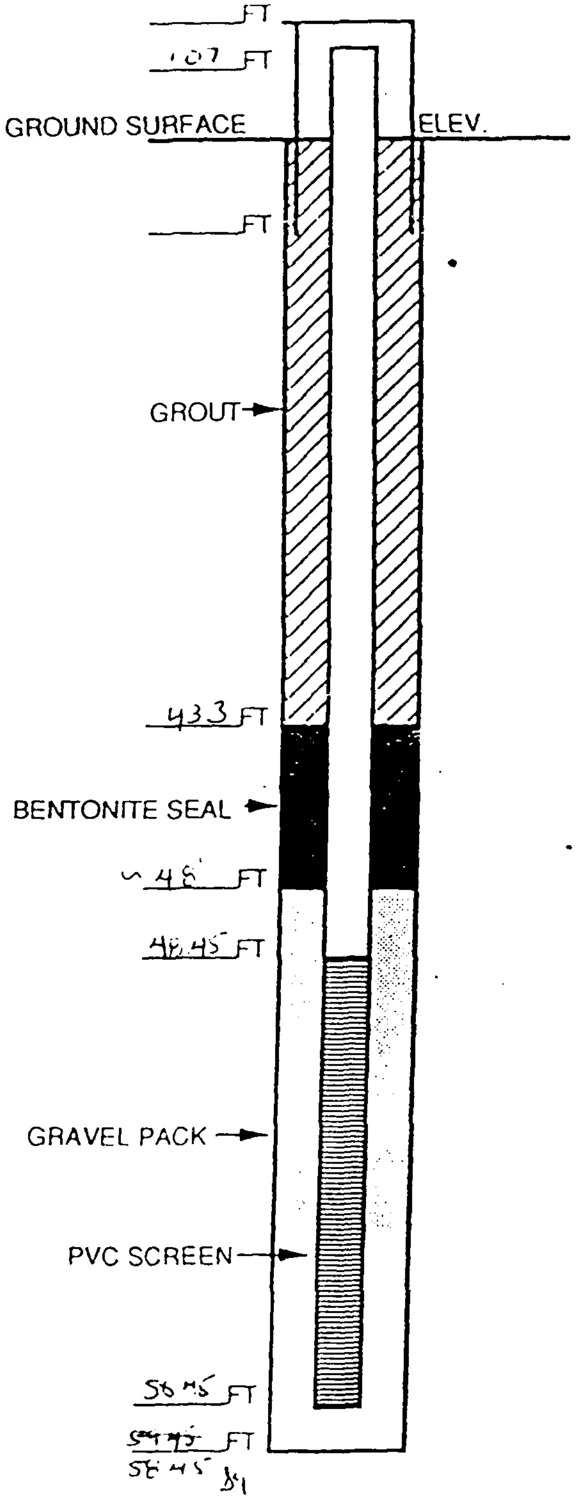
PAGE 2 OF 2

SITE ID: [illegible]-13

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND COARSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
24					24-25' MOD SORTED SANDS (GRAVEL MIX ADDED)	5	10	40	45	5/L		M	NA	7.5YR 4/4	6
					25-26' SILTY CLAY AMPH [illegible] MOD SORTED SANDS AND GRAVELS ROCK FRAGS, COBBLES 5-15mm	5	20	30	20	5/L		D	NA	7.5YR 5/4	
					24-26' 100% SAMPLE RECOVERY										
29				11" 11/12"	29-30' MOD SORTED SANDS & GRAVELS	5	30	40	20	5/L		M	NA	10YR 6/6	7
					30-32' CLAYSTONE (DONNER) W/ IRON STAINING					10/90		D	VFM	2.5Y 6/4	KH
					32-33' 100% SAMPLE RECOVERY										
					HOLE ABANDONED PER ARMY 29301 GROUT FILLED IN										

WELL CONSTRUCTION LOG

CMP-14
WELL NO. 96173



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 58.45'

Hole Diameter: 9.25"

Drilling Company: LAYNE WESTERN

Driller: DENNIS TAYLOR (HAMMER RIG) / ALAN SHOEMAKER (CME 75), REAM: D. LOICME 75

Rig Type: [illegible] CME 55 / AP 1000 (HAMMER)

Bits: 3 1/4" ID, 10" OD REAM / HAMMER 9.25" OD

Geologist: SUSAN GOLDBERG - PILOT HOLE / SETTING WELL

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89202	0757	89207	1105
Screen Placement:	89207	1520	89207	1557
Filter Placement:	89207	1557	89207	1625
Seal Placement:	89207	1625	89207	1735
Grouting:	89208	1116	89208	1135

DEPTH TO WATER

Depth: ~~53.95~~ 52.95 (BGS) Date: 89213 Time: 0810

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	15	4 BUCKETS	4 BAGS
Type:	TYPE I&II LOW ALKALINITY	1/4" PELLETS	10/20

Screen

Size: .010 Config: HORIZONTAL SLOT

Area/Ft.: ___ Comp: PVC

Inside Diam.: 4" Outside Diam.: 4"

COMMENTS

SUSAN GOLDBERG GEOLOGIST PILOT HOLE, SET WELL

JACK [illegible] GEOLOGIST - REAM

-BENTONITE IS CLOSE TO TOP OF SCREEN DUE TO

IN INACCURATE MEASUREMENTS BECAUSE DRILLER DIDN'T [illegible] REALIZE THERE WAS MORE SAND IN THE [illegible] THAN HE THOUGHT

EBASCO SERVICES INCORPORATED

THIS WELL WAS

[illegible] DATA INC

BACKFILLED [illegible]

FIELD LOG

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LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP BASIN F	WELL	26 S	

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
LAYNE WESTERN	RON MUCKEY	8/26/02 0757	/

DRILLING EQUIPMENT / METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 HOLLOW STEM AUGER	44 ft	DRY ft	— ft — cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3¼ AUGER, 6" BIT	SPLIT SPOON	Susan Goldberg 8/26/02	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				4'/4'	0-4' VERY FINE SILTY SAND, VERY WELL SORTED, SUBANGULAR CLASTS, [illegible]	0	0	0	70	30%	SM	DRY		10YR 5/3 BROWN	1
5				5'/5'	4-5' SAME BUT DRY 5-7' MEDIUM GRAINED SAND [illegible]	0	0	0	0	0	SP	DRY		10YR 6/4 [illegible] BROWN	2
10				3'/5'	9-11' SAME MEDIUM SAND 11-14' CLAYEY SILTY FINE SAND, MOIST, FROM BIT RETURN	0	0	0	2	5%	SC	MOIST			3
15				4'/5'	14'-18' SAME 18-19' SAME W/ COBBLES [illegible]	0	0	0	0	0	SC	MOIST		10YR 5/4	4
20				3'/5'	19-24' SAME AS 14-19' [illegible]	0	0	0	0	0	SC	MOIST			
25															

FIELD LOG

PAGE 2 OF 2

SITE ID: CMD-14 24173

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
25					24'-29' SILTY CLAY W/ SMALL SANDY AREAS OF CLODS, HARD, LITTLE MOISTURE SOME FINE SAND SLIGHT AMOUNTS OF FELT	0	0	0	40	20/40	CL	LM		10 YR 5/4 YELLOWISH BROWN	6
30				3/3	29-30.5' SILTY CLAY NO SAND SLIGHTLY MORE MOIST, FELT, NO GRAVEL, PLIABLE BUT CRUMBLY	0	0	0	0	20/20	CL	M		10 YR 5/3 BROWN	7
					30.5'-32 Medium (MM .25-.50CM) SAND WITH SMALL AMOUNT OF SILT VERY WELL SORTED SUBROUNDED (MM)	0	0	90	0	10/10	SP	M			
35				1 1/3	32-35' SILTY SAND & GRAVEL PIECES OF GRANITE. WELL - VERY WELL SORTED SUBROUNDED - SUBANGULAR SAND GRAINS ARE MOIST & WATER LOOKS NO CLAY	10	60	20	0	30	SM	LM		10 YR 6/2 LIGHT BROWNISH GRAY	8
40				3/5	~~35-37.5'~~ NO CORE RECOVERY 36-39 WITH CENTER BIT PEA GRAVEL									10 YR 5/3 BROWN	9
					39-44' VERY WEATHERED FRACTURED SILTY SAND FINE, V WELL SORTED LOOKS LIKE A DENVER SAND	0	0	0	60	10/30	SM	M			
45															

Drilling supervision and final boring log and well design Tariq Ahmed

R. T. STOLLAR & ASSOCIATES, INC

FIELD LOG

PAGE 1 OF 3 3 DLA 90031

LOCATION SKETCH OR DESCRIPTION

N

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
Point Comfort Drilling	well	26173 (CMW 14)	2

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Alton Shoemaker	8/22/95 1 0657	8/23/95 1 0904

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 / CME 75	ft cm	52.6 ft cm	? ft cm

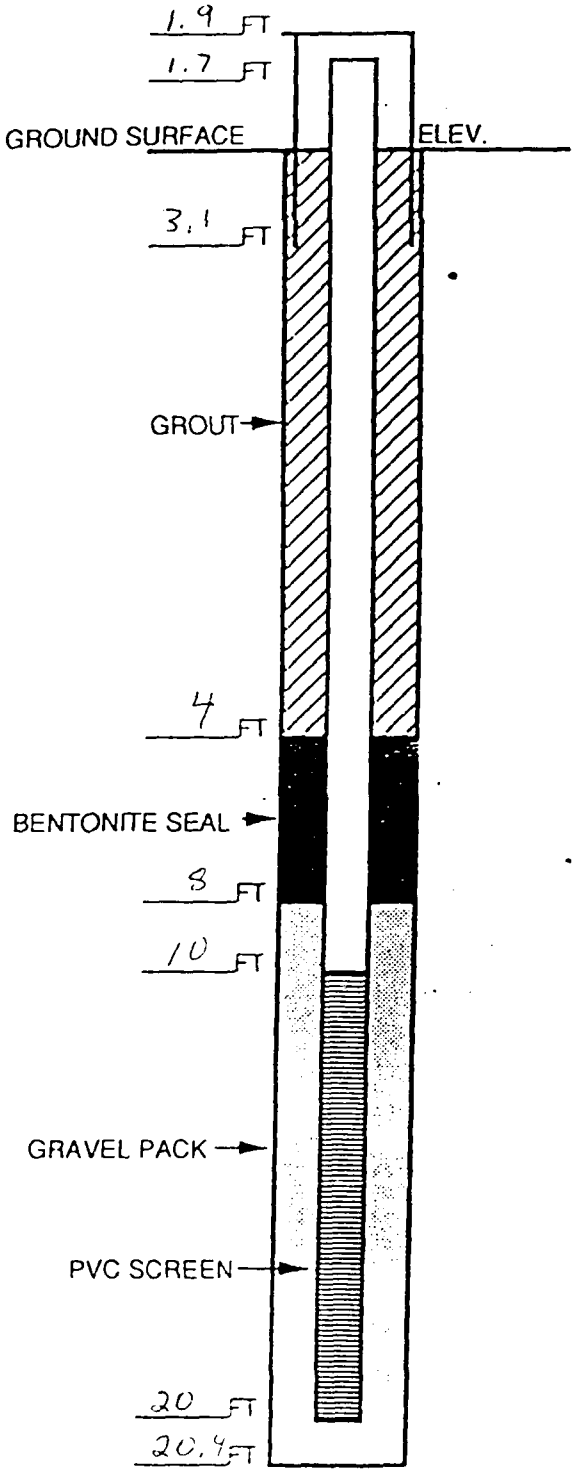
SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
5 3/4 Rock	Core barrel	Tariq Ahmed	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
40				47.5/60	54 - 45.9 - Well sorted Sand with good contrast with gravelly Sand below 45 - 46 (60%). Rest of the fraction is smaller. Red leached bands 1" to 1 1/2 cross interbed the Sands at irregular intervals - strong Residual color	0	0	5	95	5%	SP	M	M	10R 4/3	45.2
45					45.9 - 47.2 - Well graded Gravelly Sand. Gravel rounded to Sub rounded. Sand angular to irregular, Multiple rock types	10	30	40	10	10%	SW	M	M	10R 4/6	47
50					47.2 - 49 - Lost Core										
55				48/60	49 - 50.6 Dense gravelly Sand as at 45.9' coarse Grained fraction Greater Multiple rock types degree of Rounded same as at 45.9 50.6 - 54 Lost Core	10	5	25	10	0	SW	M	M		
60				48/60	54 - 55.6 - Sandy gravelly Sand (well graded) as at 47' but darker 55.6 - 57.5 Lost Core	10	30	30	10	0	SW	M	M	10R 4/2	
25															

Sample 45.2 from sample

WELL CONSTRUCTION LOG

WELL NO. 30018



Measuring point is ground surface unless otherwise noted

DRILLING SUMMARY

Total Depth of Hole: 20 Feet

Hole Diameter: 10 inches

Drilling Company: Layne-Western

Driller: Ron Muckey

Rig Type: CME 55

Bits: 3¾", 9¾" Hollow

Geologist: Brian Myller

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89214 (3m 89216)	0630	89215	1330
Screen Placement:	89215	0705	89215	0706
Filter Placement:	89215	0708	89215	0830
Seal Placement:	89215	0845	89215	0849 (8m 89216)
Grouting:	89215	0850	89215	1000

DEPTH TO WATER

Depth: 13.8' Date: 89215 Time: 1005

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	2 Bags (#94)	3 Buckets	4 bags
Type:	Portland Cement	¼" Pellets	10/20 Silica Sand

Screen

Size: 0.010" Config: horizontal slot

Area/Ft.: - Comp: PVC (Schedule 40)

Inside Diam.: 4" Outside Diam.: 4"

COMMENTS

EBASCO SERVICES INCORPORATED

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FIELD LOG

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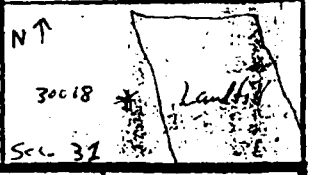
LOCATION SKETCH OR DESCRIPTION



PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
CMP/RMA Landfill Well	Well	CMP 30018	

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne - Western	Ron Mackey	89214 1 0630	89215 1 1000

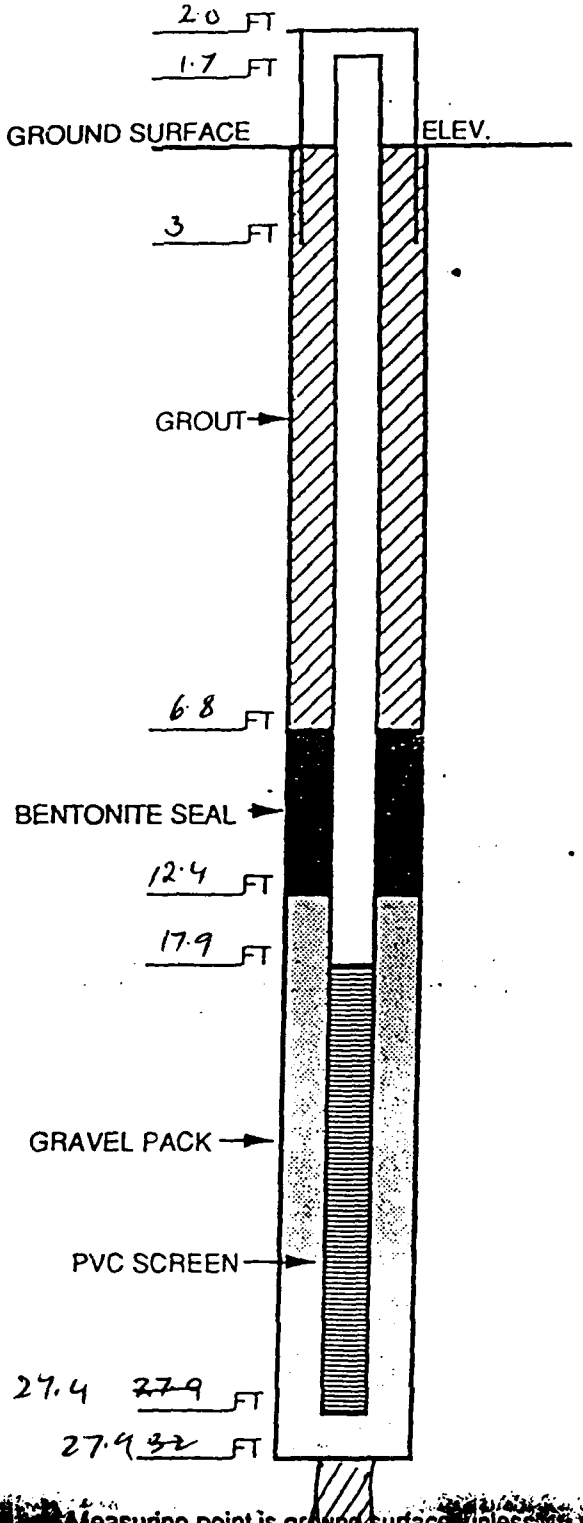
DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 Hollow Stem Auger	22 ft 671 cm	13.8 ft 421 cm	13.8 ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 1/4" Hollow stem	Split Spoon	Brian Myller 89214	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0		GROUT		3.5/5 ft	Dark Brown Sandy Silt	-	-	10	40	50	ml	LM	SOR	10YR 3/3	
					Brown Clayey Sandy Silt	-	-	20	30	50				10YR 4/3	
					Increasing clay w/ some iron staining										
5		BENTONITE													
				3.5/5 ft	Brown silty sandy clay	-	-	15	10	75	cl	mm	SOR		
					Brown silty sand	-	-	80	10	10	sm				
10					Brown clayey silty sand	-	-	60	10	30	sc	VM	SOR		
				2.8/5 ft	Brown moist medium sand with at 13.8' ▽							W		Bm 89214	
		FILTER GRAVEL PACK			Color change: Dark, possible increased organics	✓	✓	✓	✓	✓	✓			10YR 3/3	
15				3.5/5 ft	Brown silty sand, very runny. Augers sink without spinning from 20 to 22 ft.	-	-	70	20	10	sm				
20					Interval where augers advanced via gravity only.										
25															

WELL CONSTRUCTION LOG

WELL NO. 30019



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 32' Ream

Hole Diameter: 10'

Drilling Company: Layne W...

Driller: Ron Mucha...

Rig Type: Bme-55

Bits: 9 1/4 Pilot ID. 6...

Geologist: Tony Ahw...

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Ream	89207	0700		
Drilling:	89206	1025		
Screen Placement:	89207	0812		
Filter Placement:	89207	0825		
Seal Placement:	89207	0830		
Grouting:	89207	0860		

DEPTH TO WATER

Depth: 24.3 Date: 8920... Time:

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	8 bags (#47) 66	3 1/2	
Type:	Portland type / Screen	1/4" Tabl...	Volclay ...
Size:	10	Config:	
Area/Ft.:		Comp:	
Inside Diam.:		Outside Diam.:	

COMMENTS

R. L. STOLLAR & ASSOCIATES, INC.

FIELD LOG

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LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO OF SAMPLES
RMA - Comp.	well	30019	9

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne Western	Ron Mackey	89206 / 1015	89206 / 1315

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME-55 Hollow Stem	32 ft cm	none ft cm	24.3 ft cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3¼ Pilot	Core Barrel	Tonia Alward	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				122/152	0-2 · lean clay Blocky mixed with clayey silt · Root hair 2'	0	0	0	0	10/90	ML/CL	D	Soft/Mod	10YR 5/2	2'
					2-4' :- clayey Silt with some fine Sand · ~~red laminations~~	0	0	0	5	95/5	ML	D	Soft	10YR 7/4	4 ✗
5				128/152	4-8.2' :- clayey Silt · very Pale brown · Reddish laminations with some Fine Sand ·	0	0	0	5	95/5	ML	M	Soft	10YR 6/3	7'
					8.2 - a lost Core										
10				91.4/152	9-12 :- clayey Silt · same as at 4'	0	0	0	5	95/5	ML	M	Soft	10YR 6/3	
					12-14 :- Lost Core ·										
15				152/152	14-14.5 - Highly organic clay · some reddish staining (weathered bedrock?)	0	0	0	0	5/90	OL?	M	M/H	10YR 2/2	14.2
				weathered bedrock?	14.5-19.5 :- very well weathered crumbly claystone · limonite staining · Dark organic Bands ·										
20				152/152	19-21. - weathered claystone as above · interbedded with fine silty zone ·									10YR 6/1 to 10YR 4/1	17' 18.5 24
					21-24 :- Firm. Silty lenses · orange Dark grey claystone ?										
25															

FIELD LOG

PAGE 2 OF 2

SITE ID: 3807

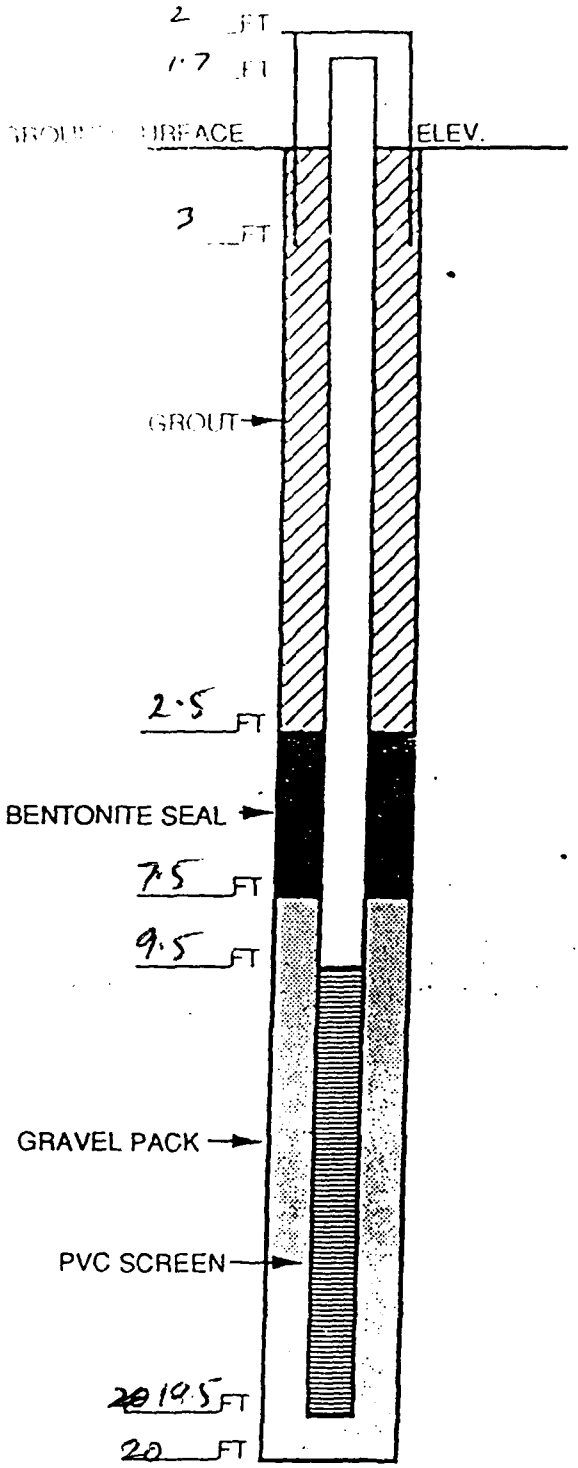
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	%MOISTURE	CONSISTENCY	MUNSELL COLOR	SAMPLE NUMBER
25				152/152	24-29' - Dark clayshale with oxidation (rusty) bands along fractures, interbedded fissile and blocky							M	M	10YR 4/1	
30				91.44/91.44	29-30.3. clayshale with lignitic bands. oxidized along fractures.							M	M	10YR 4/1	30
35					30.3-32 - clayshale. highly fissile. oxidized along fractures. platty.							M	M	10YR 5/2	31.5
40															
45															

5' cored interval

ξ = Fracture / fissility. Perpendicular to core length

WELL CONSTRUCTION LOG

WELL NO 30020



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 20'

Hole Diameter: 10" Ream

Drilling Company: Longyear Western

Driller: Ron Muckey

Rig Type: CME-55

Bits: 3 1/4 ID Pilot / 6 1/4 ID Ream

Geologist: Tariq Ahmad

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Reaming	89207	1300	89207	1330
Drilling:	89207	1156	89207	1250
Screen Placement:	89208	0642	89208	0645
Filter Placement:	89208	0648	89208	0705
Seal Placement:	89208	0706	89208	0708
Grouting:	89208	0724	89208	0751

DEPTH TO WATER

Depth: 14.8 Date: 89207 Time: 1220

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	282 lbs cement / 14 lbs Bentonite	1/4" Pellets	5 bags (#50)
Type:		Volclay grout + 5% Type I cement	

Screen			
Size:	10	Config:	10 Slot
Area/Ft.:		Comp:	Schedule 40 PVC
Inside Diam.:		Outside Diam.:	

COMMENTS

EBASCO SERVICES INCORPORATED

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FIELD LOG

PAGE 1 OF 1

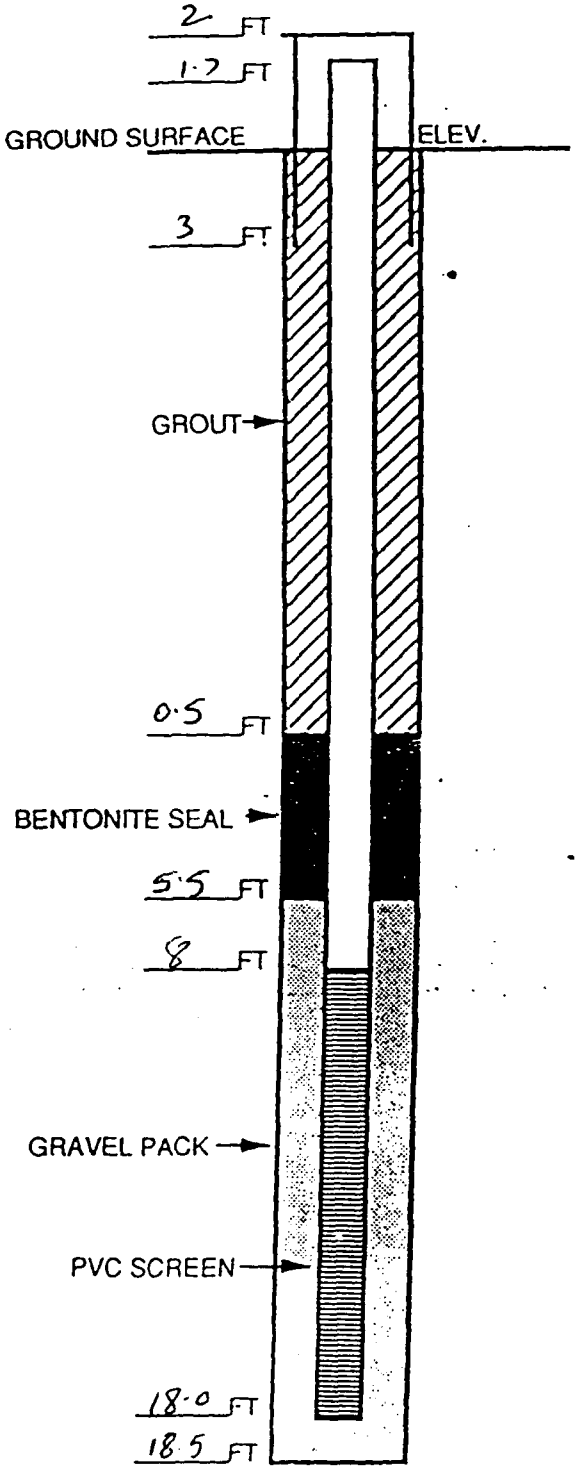
LOCATION SKETCH OR DESCRIPTION

PROJECT NAME: Power Canal Drilling	SITE TYPE: Well	SITE ID: 30020	NO. OF SAMPLES:
DRILLING COMPANY: Layne Western	DRILLER: Ron Mackey	DATE/TIME STARTED: 89207 / 1156	DATE/TIME COMPLETED: 8912
DRILLING EQUIPMENT : METHOD: Cme-55	TOTAL DEPTH: ft / cm	INIT. WATER LEVEL: 14.2 ft / cm	24 HR. WATER LEVEL: ft / cm
SIZE AND TYPE OF BIT: 3¼ Pilot	SAMPLING METHOD: Core Barrel	GEOLOGIST (signature/date): Terry Ahmad 89207	CHECKED BY/DATE:

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF: GRAVEL	SAND: CSE	SAND: MED	SAND: FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0		Grout		12½ / 152	0-4': - clayey Silt · roots all the way in.	0	0	0	5	90/5	mL	D	S/R	10YR 5/2	
5		Bentonite			4-7.2: Silty Sand · medium grained sand.			80/20	20	80/10	SP	m	S/R	10YR 5/2	
					7.2-8.2 - very well sorted Sand.	0	0	50	50	0/0	Sm	m	S/R	10YR 5/2	
10		Filter/Screen			8.2-9 - lost core.										
				128 / 152	9-10.3 : - very well sorted Sand as at 7.2'-	0	0	50	50	0/0	SP	m	S/R	10YR 5/2	
				85/114	10.3-11.8 : - a medium well sorted coarse sand. Subangular to Subrounded	0	70	20	5	2.5/2.5	Sm	V Mo			
15					Sand grains · larger silt fraction (11.8-14) last core.										
				91/144 / 152	14-15.6: - same as at 10.3 · Coarse grained portion gets larger in size · sharp contact with Clayey S.S Below		70	20	5	2.5/2.5	Sm	WS	S/R	10YR 5/2	
					15.6-17.6 : - Silty sandstone · some reddish laminations.										
20					loosely cemented · Compact with no fractures.										
25															

WELL CONSTRUCTION LOG

WELL NO. 30021



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 18.5

Hole Diameter: 10" Ream

Drilling Company: Layne Western

Driller: Ron Mackey

Rig Type: CME-55

Bits: 3 1/2 flat / 8 1/4

Geologist: Tariq Ahmad

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Ream	89208	0931		
Drilling:	89208			
Screen Placement:	89208	1118		
Filter Placement:	89208	1126	89208	1155
Seal Placement:	89208	1155	89208	1221
Grouting:	89208	1251		

DEPTH TO WATER

Depth: 11 Date: 89208 Time:

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	One bucket	3 bucket	
Type:	Portland.	1/4 pellets	Generic/Volclay

Screen			
Size:	10	Config:	
Area/Ft.:		Comp:	
Inside Diam.:		Outside Diam.:	

COMMENTS

EBASCO SERVICES INCORPORATED

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FIELD LOG

30021

PAGE 1 OF 2

LOCATION SKETCH OR DESCRIPTION

PROJECT NAME: RMA · CMP · Drilling		SITE TYPE: well	SITE ID: 30021	NO. OF SAMPLES:
DRILLING COMPANY: Layne Western	DRILLER: Ron Muckey	DATE/TIME STARTED: 8/9/2008 1 1156	DATE/TIME COMPLETED: 8/9/2008	
DRILLING EQUIPMENT : METHOD: CME-55 — Hollow Stem Auger		TOTAL DEPTH: 18.5 ft / cm	INIT. WATER LEVEL: 11 ft / cm	24 HR WATER LEVEL: ft / cm
SIZE AND TYPE OF BIT: 3¼ ID Pilot.	SAMPLING METHOD: Core Barrell	GEOLOGIST (signature/date): Tariq Ahmad	CHECKED BY/DATE:	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0				121.9/152	0-4 :- clayey Silt with some Fine Sand. Light Colour.	0	0	0	5	90/5	mL	D		10YR 7/2	
5					4-6.7 :- clayey Silt with caliche (Hardpan) increased Sand content. Sand Medium grained & fine grained. Effervence with Hcl on caliche.	0	0	5	20	70/5	mL	D		10YR 7/2	
10				152/152	6.7-9 :- Silty Sand with Laminations ? (bands) ~~sharp contact with Well sorted~~ Sandy below.										
15					9-11 :- Silty Sand as at 6.7'. Sharp contact with Well sorted Sands below.										
20	Denver			219/182	11-11.6 :- Very well sorted Medium grained Sand. Some Silt Content.			95	5	5/0	SP	D		10YR 7/2	
25															

30021

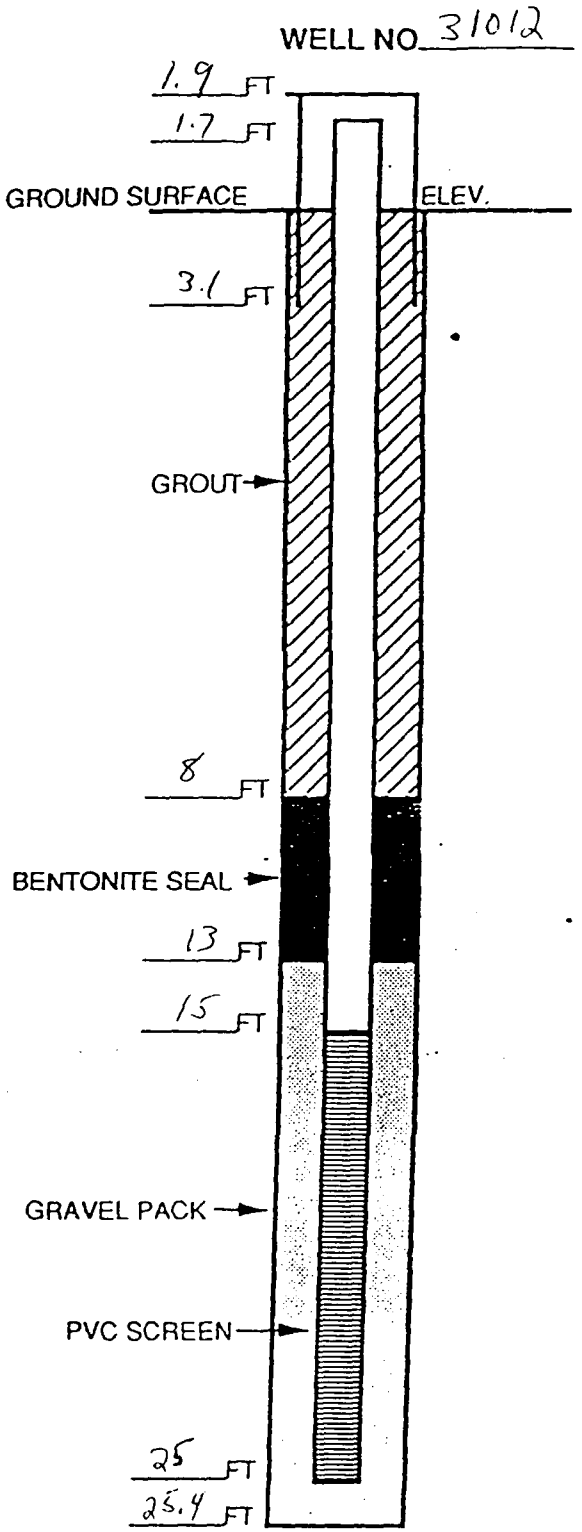
FIELD LOG

PAGE 2 OF 2

SITE ID:

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
					11.6 – 13 :- very well rounded sands · coarse grain fraction increases.	0	10	80	5	0/0	SP	W	L	10YR 6/3	13:
				10.6/10.6	13 – 16.5 :- Coarse grained fraction increases. Tending towards medium graded sands	0	20	70	5	0	SW	W	L	10YR 6/3	16
				45.7/45.7	16.5 – 17.5 :- Moderately graded sands · with continuously increasing sand coarse fraction · Sharp contact with Reinor · Subangular to subrounded · grains	15	60	20	5	0	SW	W	L		
					17.5 – 18 :- Compact blocky silty claystone · grey/yellow. very fine grained · no fractures.										

WELL CONSTRUCTION LOG



Measuring point is ground surface unless otherwise noted.

DRILLING SUMMARY

Total Depth of Hole: 30 ft

Hole Diameter: 10 inches

Drilling Company: Layne - western

Driller: Ron Muckey

Rig Type: CME 55

Bits: 10" inch hollow

Geologist: Brian Myllo

CONSTRUCTION TIME LOG

	Start Date	Start Time	Finish Date	Finish Time
Drilling:	89215	1130	89216	0740
Screen Placement:	89216	0825	89216	0830
Filter Placement:	89216	0840	89216	0855
Seal Placement:	89216	0905	89216	0910
Grouting:	89216	0915	89216	1000

DEPTH TO WATER

Depth: Bm 89216 19.5' 19.6' Date: 89216 8/4 Time: 1000

WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	4 Bags	3 Buckets	4 Bags
Type:	Portland cmt	1/4 pellets	10/20 silica sand

Screen			
Size:	0.010	Config:	Horizontal Slot
Area/Ft.:	—	Comp:	PVC Schedule 40
Inside Diam.:	4"	Outside Diam.:	4"

COMMENTS

EBASCO SERVICES INCORPORATED

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FIELD LOG

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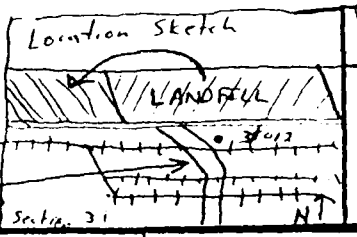
Location Sketch



LOCATION SKETCH OR DESCRIPTION

PROJECT NAME	SITE TYPE	SITE ID	NO. OF SAMPLES
RmA/LMP Sanitary Landfill Upgradient Well	Well	31012	

DRILLING COMPANY	DRILLER	DATE/TIME STARTED	DATE/TIME COMPLETED
Layne - Western	Ron Mackey	89215 / 1130	89216 / 1030

DRILLING EQUIPMENT : METHOD	TOTAL DEPTH	INIT. WATER LEVEL	24 HR WATER LEVEL
CME 55 : Hollow Stem Auger	30 ft 914 cm	19 ft 579 cm	19.6 ft 597 cm

SIZE AND TYPE OF BIT	SAMPLING METHOD	GEOLOGIST (signature/date)	CHECKED BY/DATE
3 7/4" Hollow stem	Split Spoon	Brian Myller	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF GRAVEL	SAND CSE	SAND MED	SAND FINE	SI/CL	USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
0		Grout			Brown sandy silty clay. Consolidated and fractured for top 2' ft.	–	–	10	20	70	CL	D, Y	HR	10YR3/3	
				4.0 / 5.0 ft	Grading to clayey silty sand							LM	SOR	10YR4/3	
5					Grading to clay with coarsening sand. Increasing moisture, decreasing consolidation with depth.	–	–	30	20	50	SC	mm		10YR4/6	
				4.7 / 5.0 ft	Same as above with caliche added in 1 foot layer.									10YR5/6	
10					Increasing clay immediately beneath caliche layer	–	–	30	30	40	SC	mm		10YR3/3	
				4.7 / 5.0 ft	Increasing clay again with caliche zones, approx. 3" thick, randomly distributed	–	–	20	20	60	SC	mm			
					Clay Suddenly Stops: Dark Yellowish brown Sand	–	–	70	30	–	SP	mm		10YR5/6	
15					Clay begins grading back in. Caliche zones appear again. Clayey Sand ↓ Sandy Clay	–	–	20	20	60	CL	mm			
				4.5 / 5.0 ft	STAINED INTERVAL FROM 18.6' to 18.9' Consists of Black, moist, coarse Sand. No H2S readings noted.	–	80	20	–	–	SP	VM		10YR2/1	
20					Sandy Clay, no longer plastic.	–	–	10	30	60	CL	moist		10YR3/3	
		Bentonite Seal			Clay decreasing w/ depth							wet			
				3.6 / 5.0 ft	Cuttings Are saturated at 22.5'. Clayey Sand. Auger Refusal at 23', Driller Indicates Gravels. Remove split spoon, replace with center bit. Advance with center bit 2'. No samples obtained from 23 to 25.									10YR4/4	
25					Driller indicates Gravels from 23 to 24.5										

Bm 89215

FIELD LOG

CMP

PAGE 2 OF 2

SITE ID: 31012

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF: GRAVEL	SAND: CSE	SAND: MED	SAND: FINE	SI/CL	USCS ABREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
		BENTONITE BACK FILL		5.0/5.0 ft	Denver Formation Bedrock at 25'. Weathered (friable) from 25' to 27'. Very Dark Gray Claystone with yellow iron staining.	–	–	–	–	100	CL SM	LM	MH K	10YR 3/1	