HIDDEN VALLEY LAKE COMMUNITY SERVICES DISTRICT

Mel Aust, General Manager

Coyote Valley Groundwater Basin Management

November 2007

Hidden Valley Lake Community Services District

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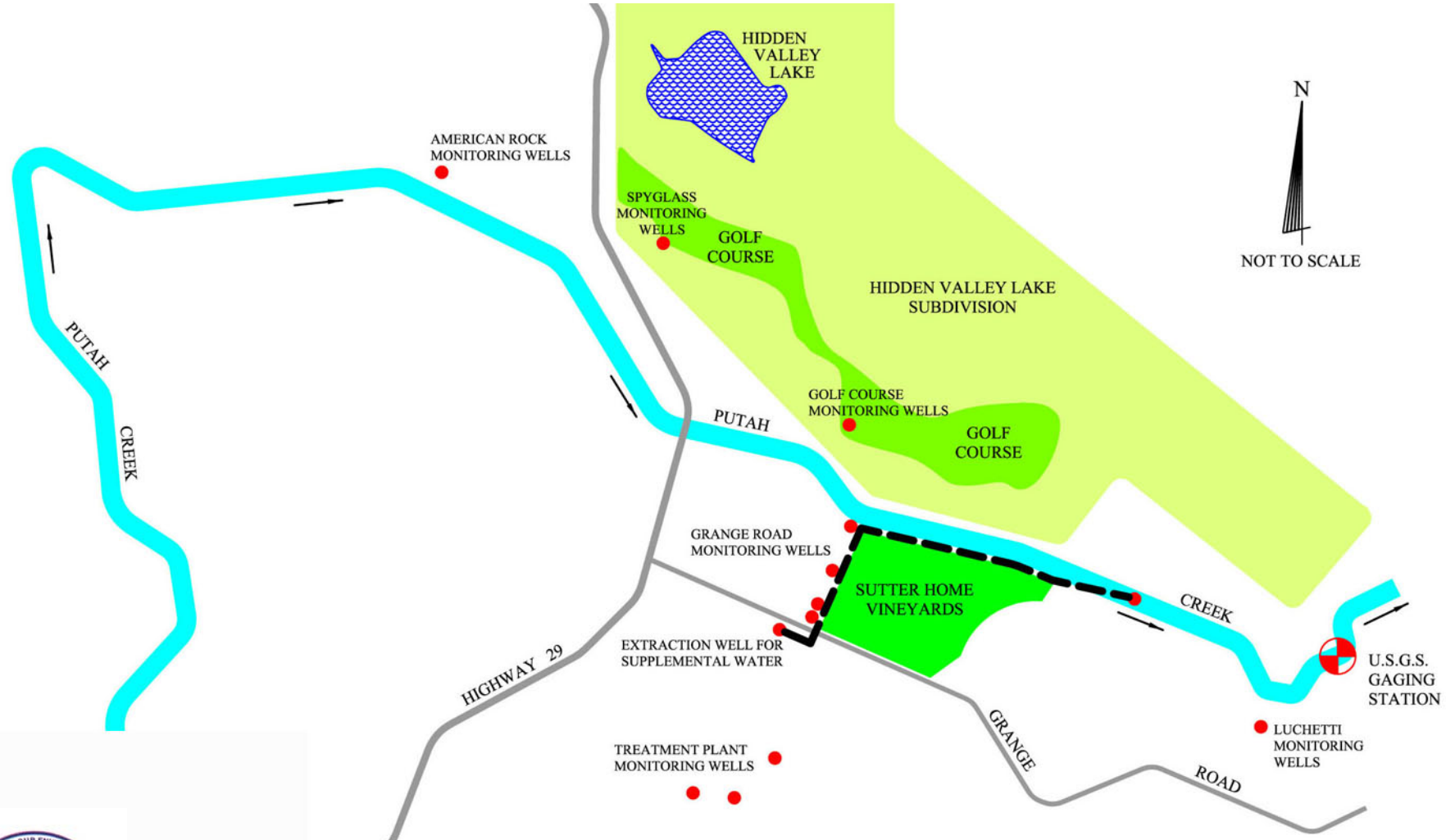
Coyote Valley Groundwater Basin Management
Overview of Coyote Valley



Schematic of Putah Creek Water Supply and Monitoring Well Locations

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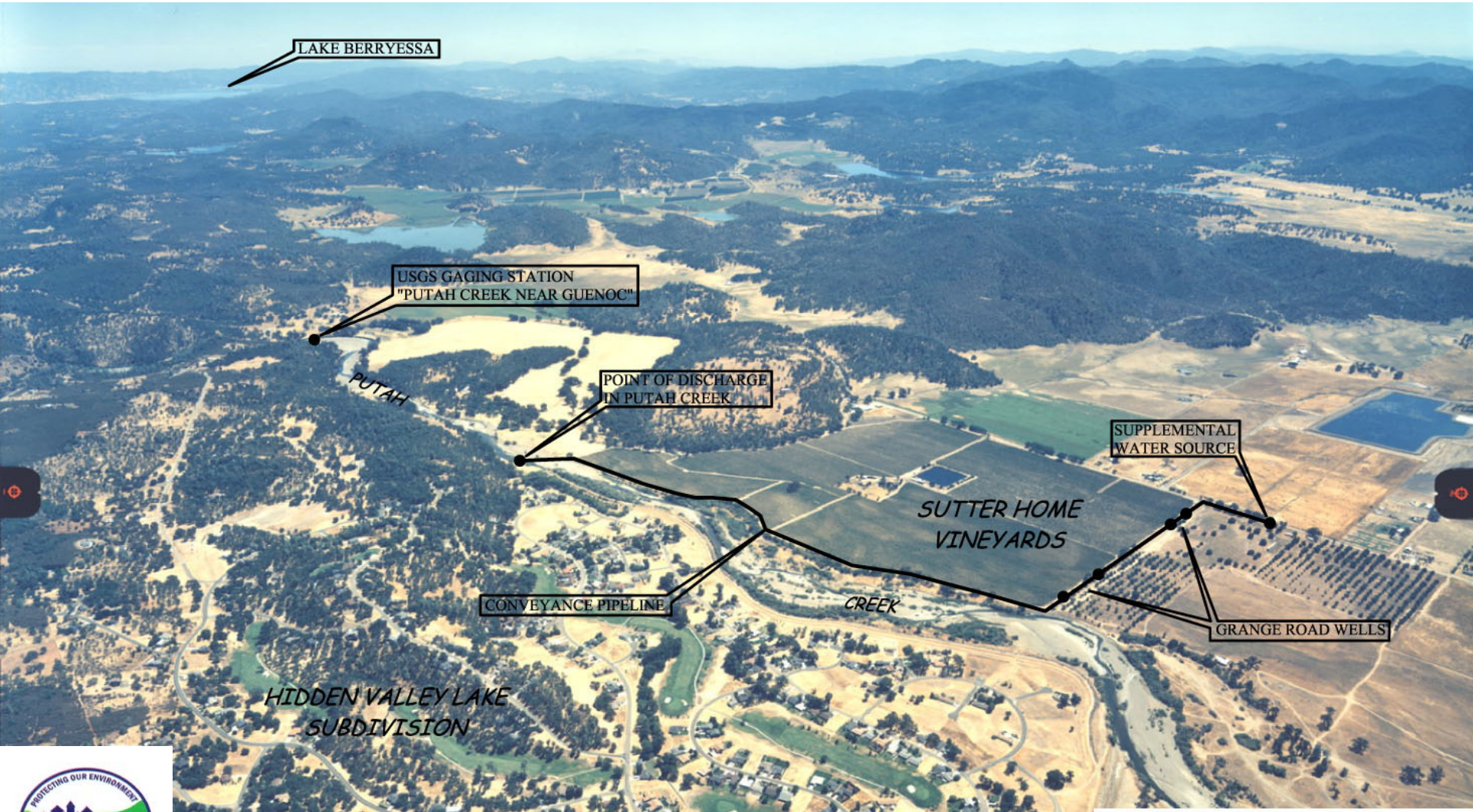
Coyote Valley Groundwater Basin Management
Oblique Aerial View of Coyote Valley



PANORAMA OF
HIDDEN VALLEY LAKE SUBDIVISION
AND PUTAH CREEK

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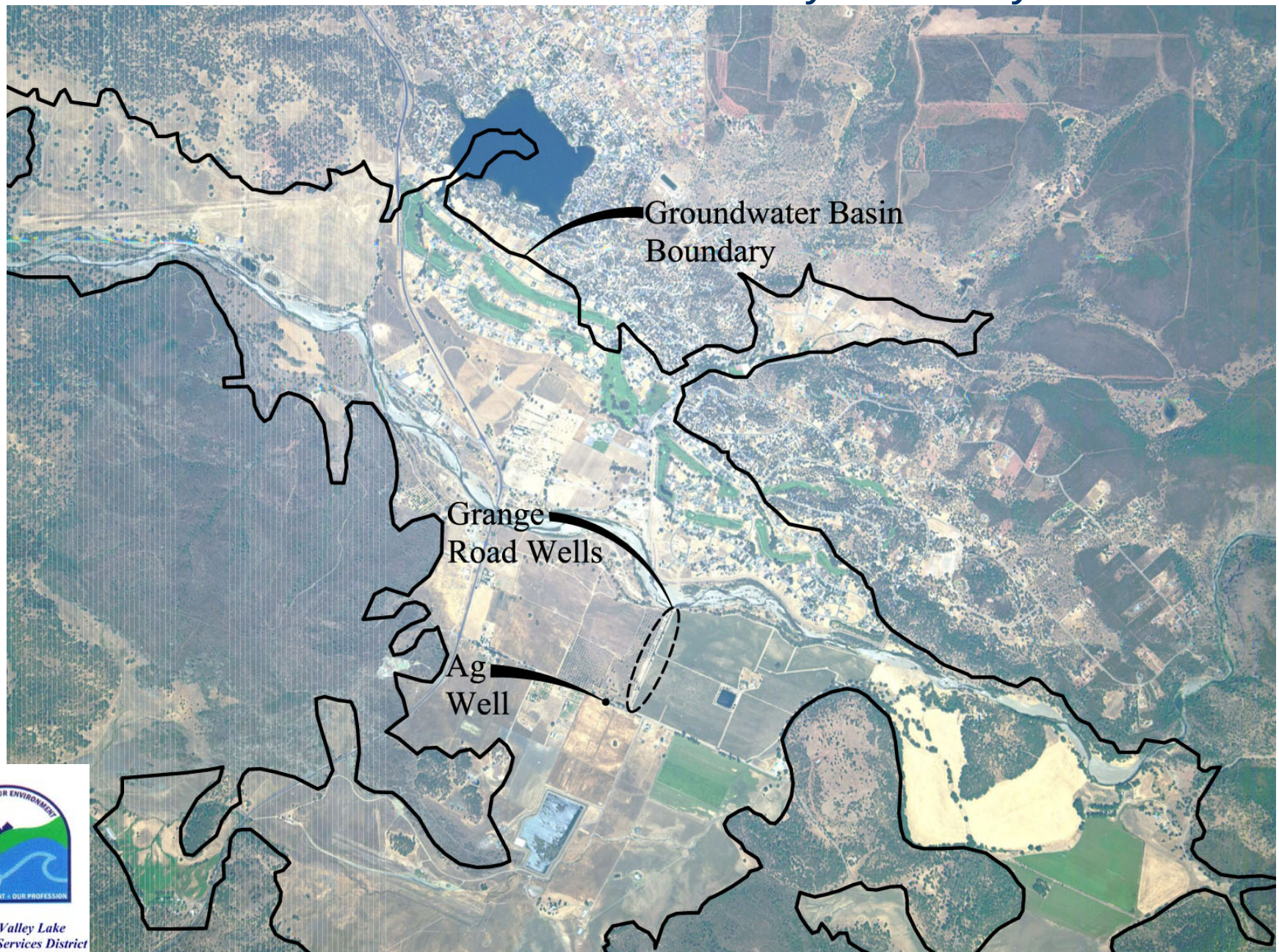
Community Services District

Coyote Valley Groundwater Basin Management

Overhead Aerial View of Coyote Valley



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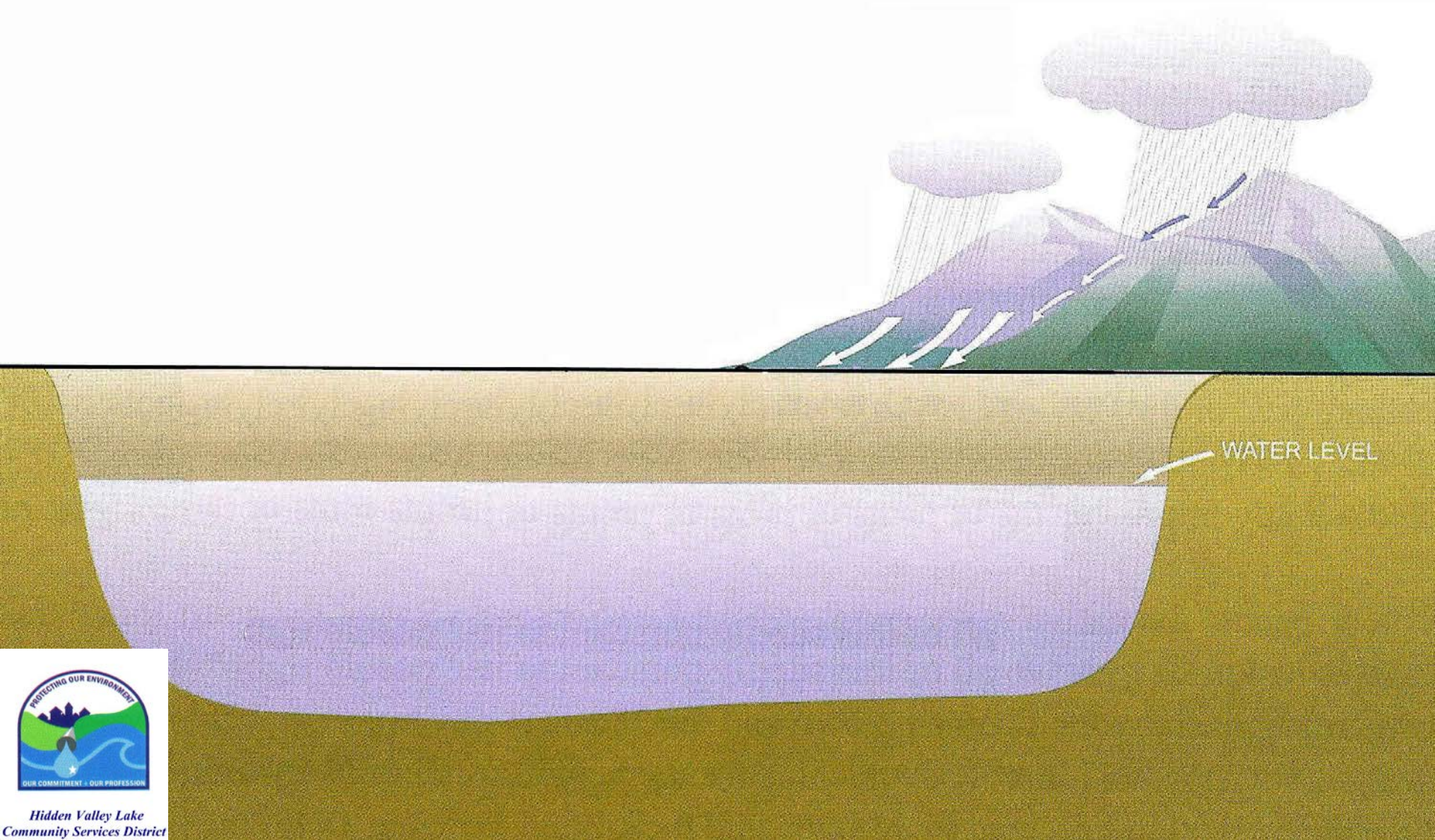
Coyote Valley Groundwater Basin Management
Groundwater Basin Management Objective

- BALANCE SUPPLY AND DEMAND AND MAXIMIZE RESOURCES FOR THE BENEFIT OF THE COMMUNITY AT LARGE

Coyote Valley Groundwater Basin Management
How Do We Accomplish These objectives?

- IDENTIFY CURRENT AND FUTURE DEMANDS
- IDENTIFY AVAILABLE WATER SUPPLY
- IDENTIFY POTENTIAL IMPACTS ASSOCIATED WITH MEETING THE DEMANDS
- DEVELOP TOOLS NEEDED TO EVALUATE AND MEET OBJECTIVES

Coyote Valley Groundwater Basin Management
Where Does the Water Come From?



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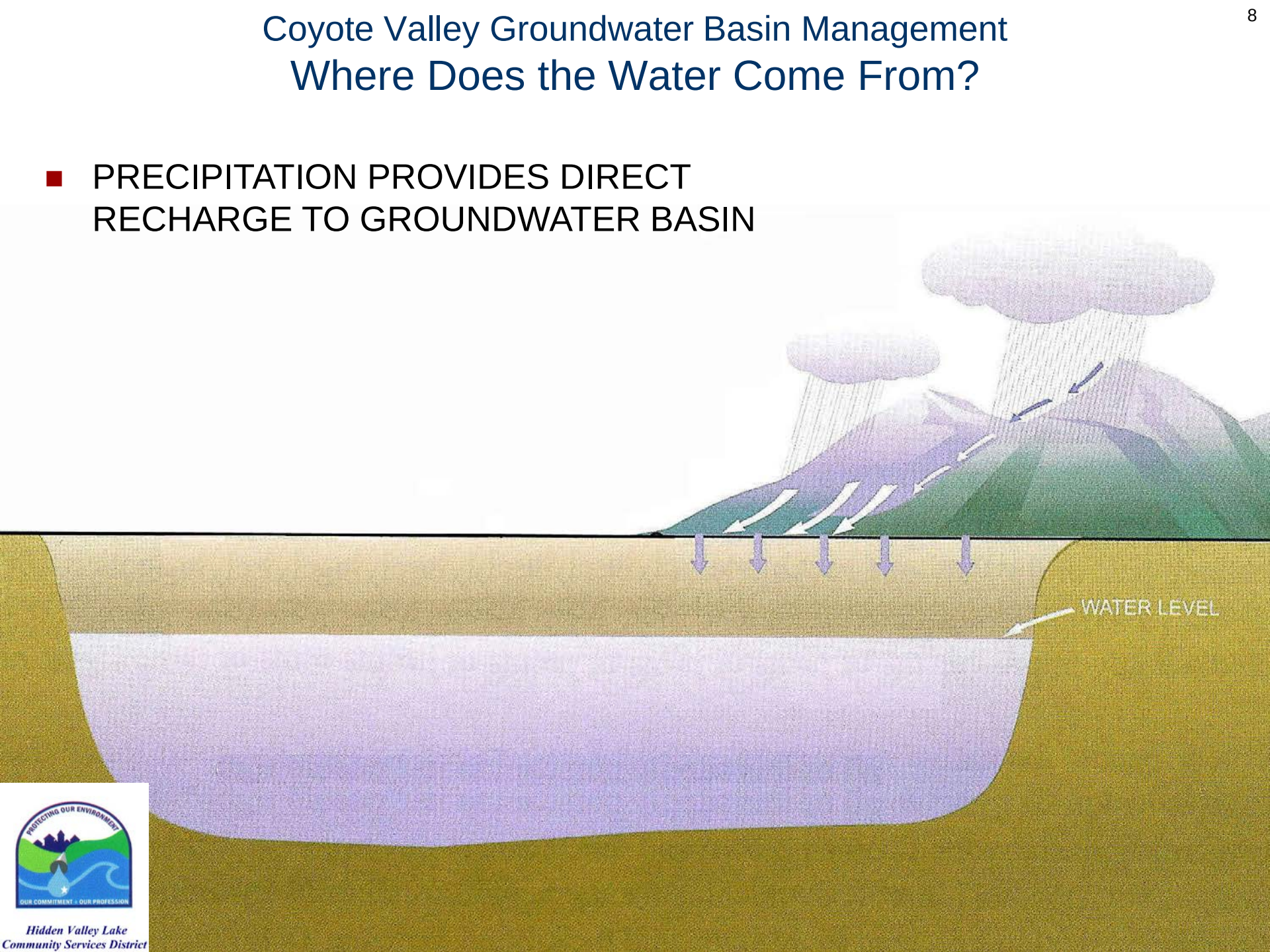
Coyote Valley Groundwater Basin Management
Where Does the Water Come From?

- PRECIPITATION PROVIDES DIRECT RECHARGE TO GROUNDWATER BASIN



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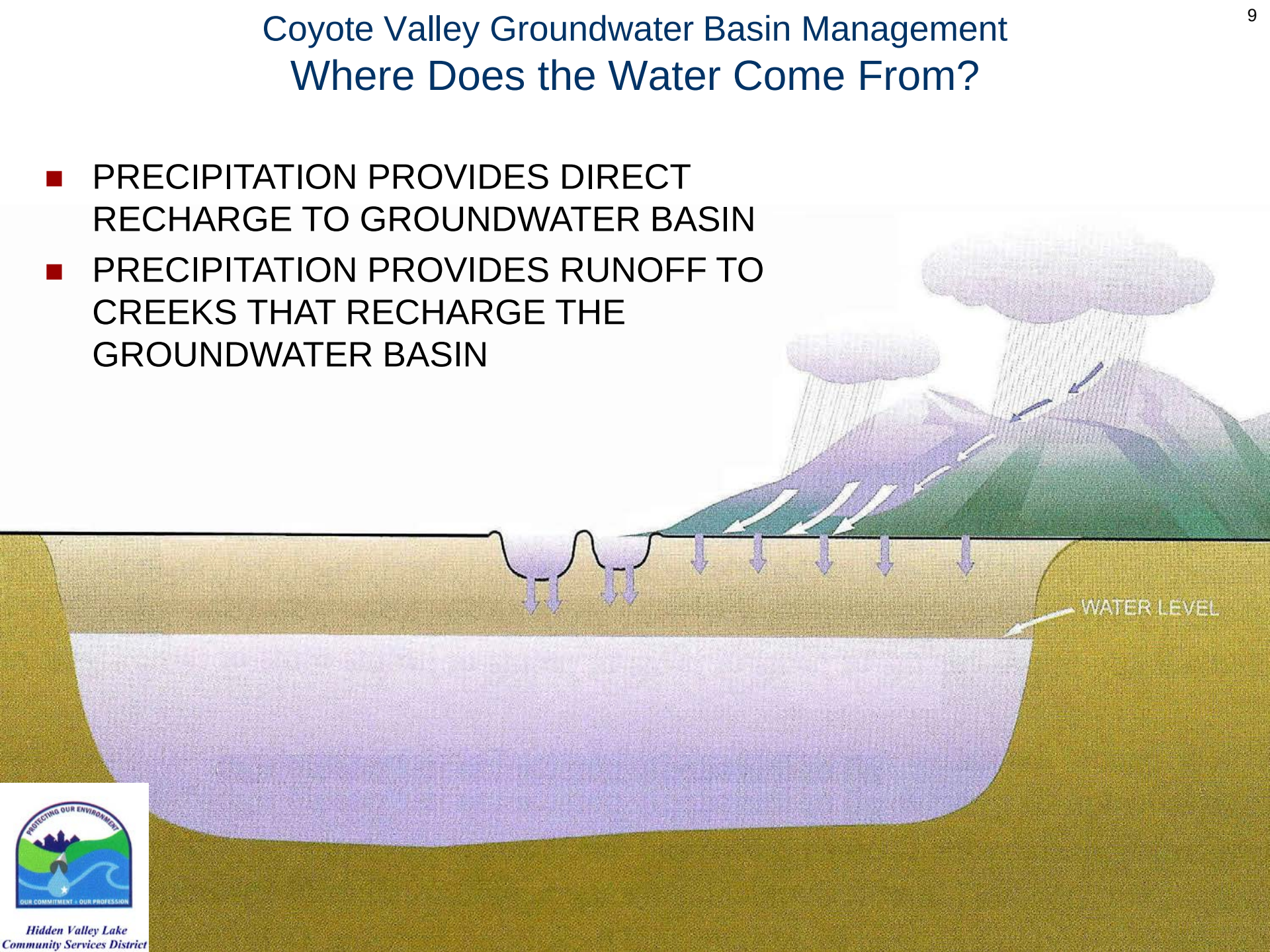
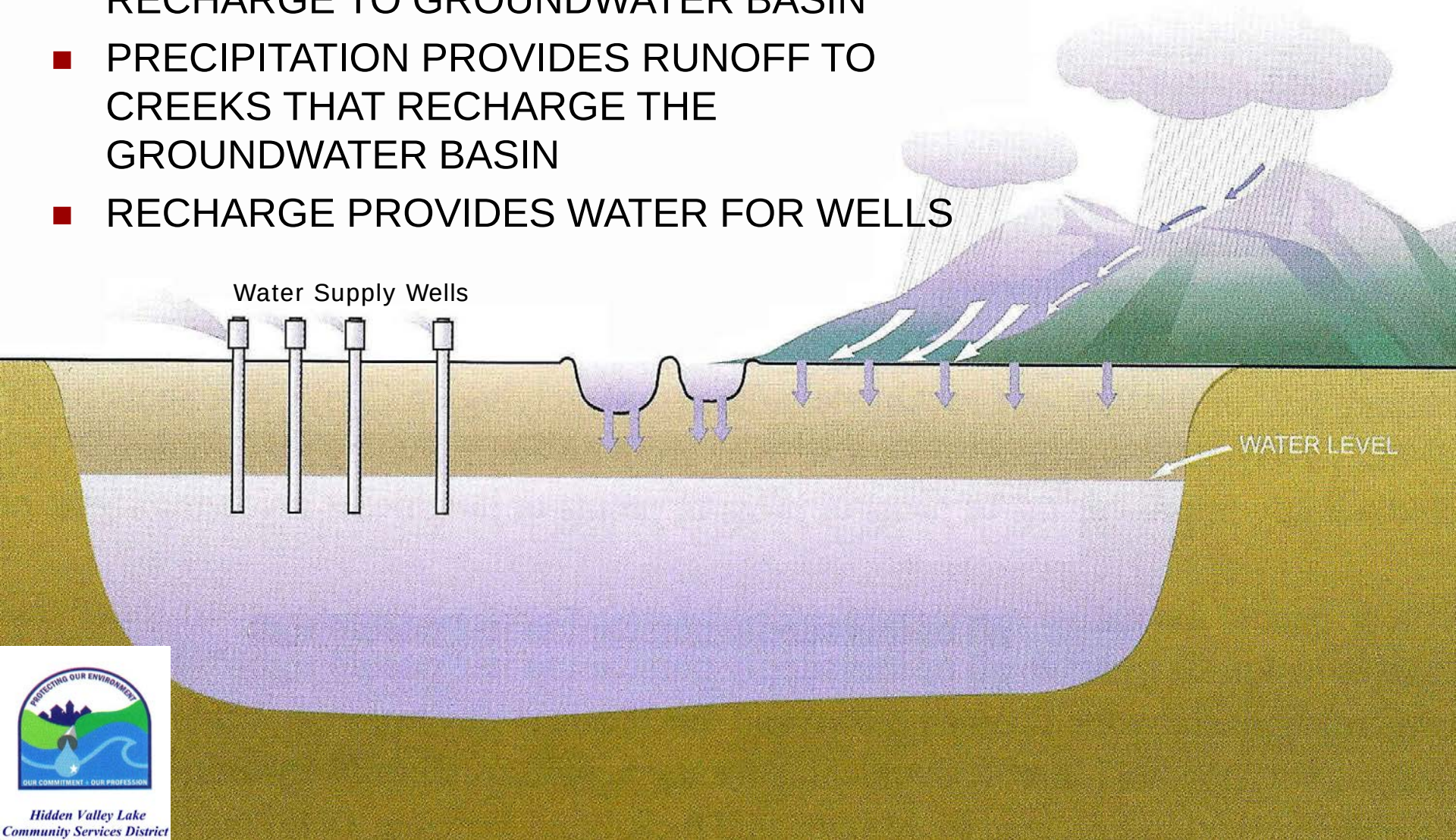
Coyote Valley Groundwater Basin Management
Where Does the Water Come From?

- PRECIPITATION PROVIDES DIRECT RECHARGE TO GROUNDWATER BASIN
- PRECIPITATION PROVIDES RUNOFF TO CREEKS THAT RECHARGE THE GROUNDWATER BASIN



Coyote Valley Groundwater Basin Management
Where Does the Water Come From?

- PRECIPITATION PROVIDES DIRECT RECHARGE TO GROUNDWATER BASIN
- PRECIPITATION PROVIDES RUNOFF TO CREEKS THAT RECHARGE THE GROUNDWATER BASIN
- RECHARGE PROVIDES WATER FOR WELLS



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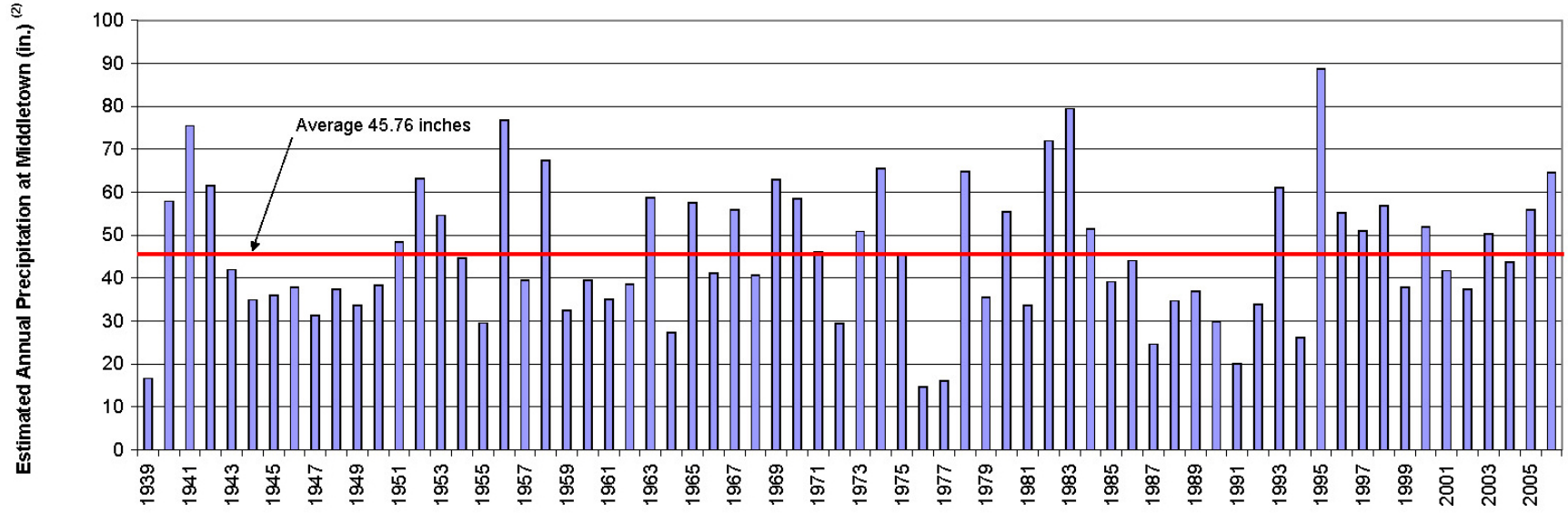
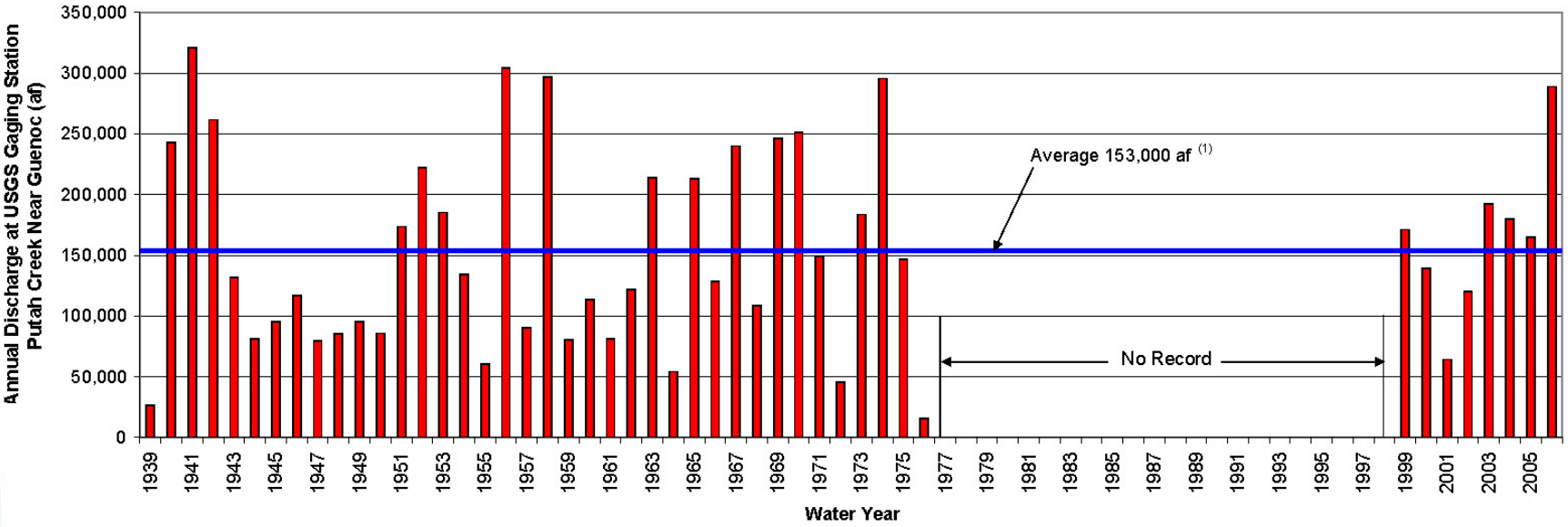
Coyote Valley Groundwater Basin Management

How Much Water Do We Get?





(1) Average annual Putah Creek gage flow based on period of record 1905-06, 1931-76, and 1999-2006.

(2) Middletown precipitation station data used when available. Some years were correlated using data from Clear Lake or Calistoga precipitation stations.

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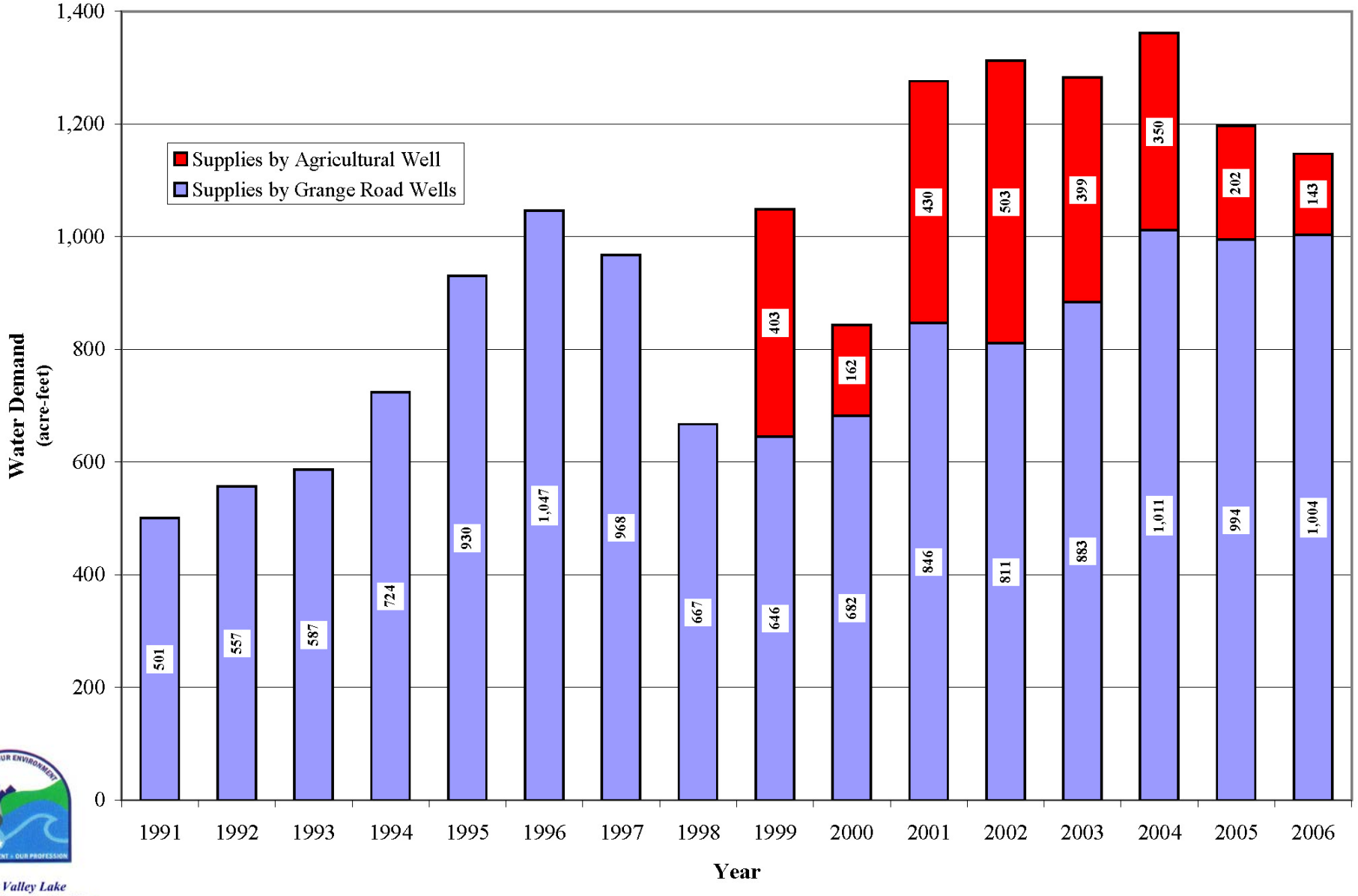
Coyote Valley Groundwater Basin Management
Present and Historic Water Use by HVLCSD



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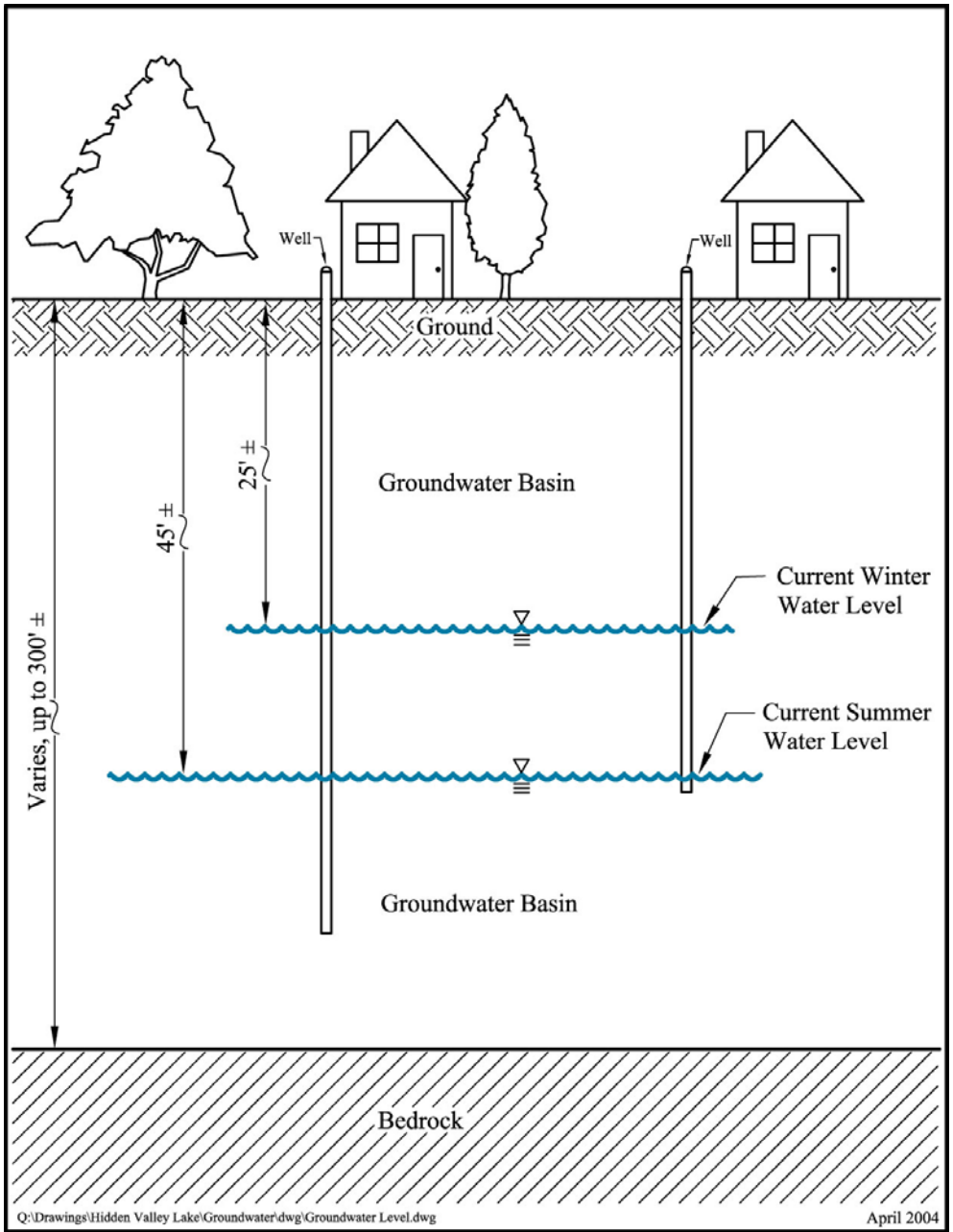
Coyote Valley Groundwater Basin Management
Non-District Water Demands in Coyote Valley

- AGRICULTURAL DEMANDS
  - Sutter Home
  - Luchetti
  - Belcher
  - Public School
- DOMESTIC DEMANDS BY RURAL RESIDENTS

Coyote Valley Groundwater Basin Management
Sources of HVLCSD Water Supply

- GROUNDWATER SUPPLIES ALL DEMANDS
  - Grange Road Wells for Potable Supply
  - Agricultural Well Supplies Supplemental Golf Course Irrigation
  - Summer Environmental Enhancement Flows in Putah Creek (if required)

Coyote Valley Groundwater Basin Management
Seasonal Water Level Changes Under Current Demands



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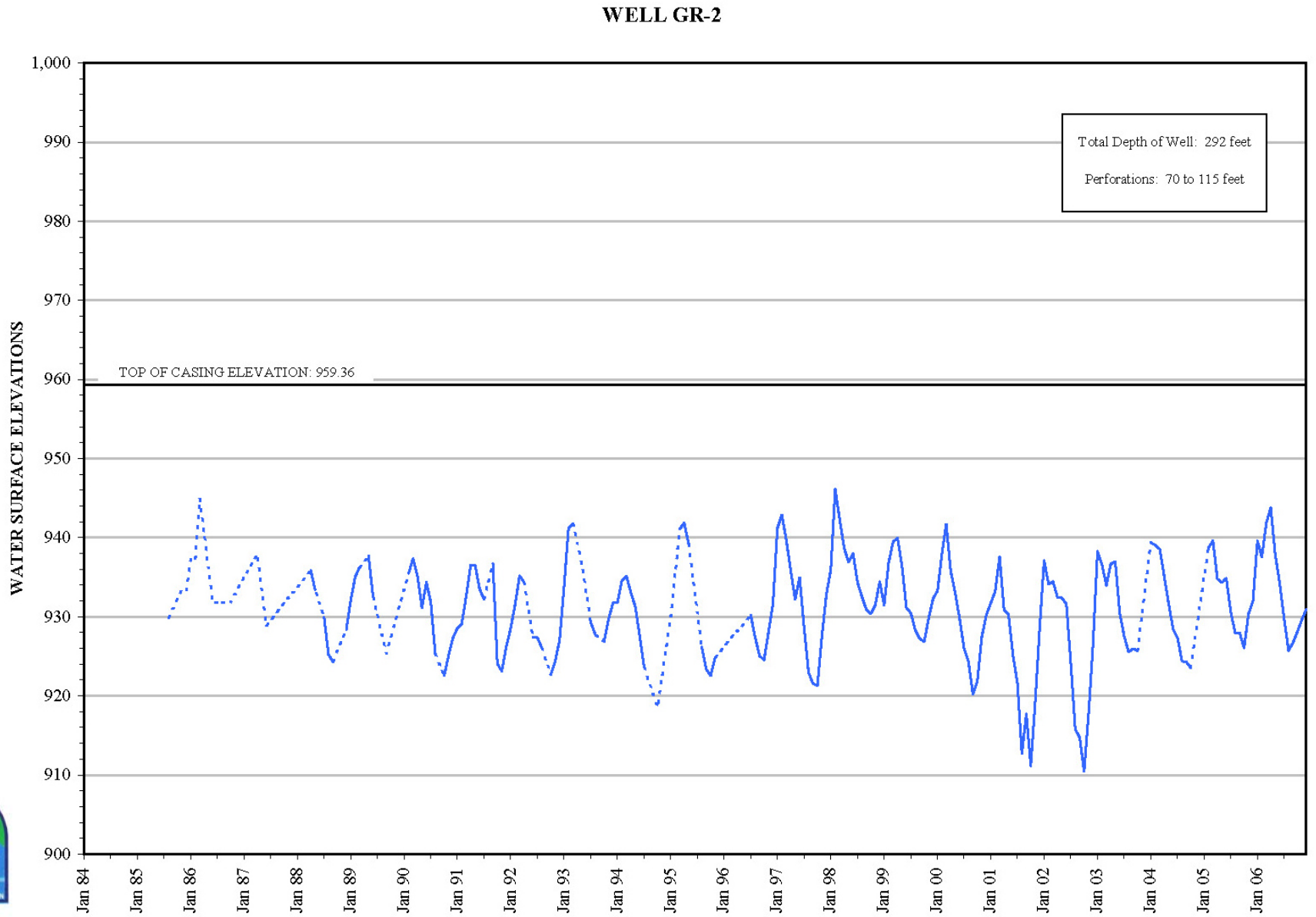
Coyote Valley Groundwater Basin Management
Water Levels Have Been Stable for 20 Years



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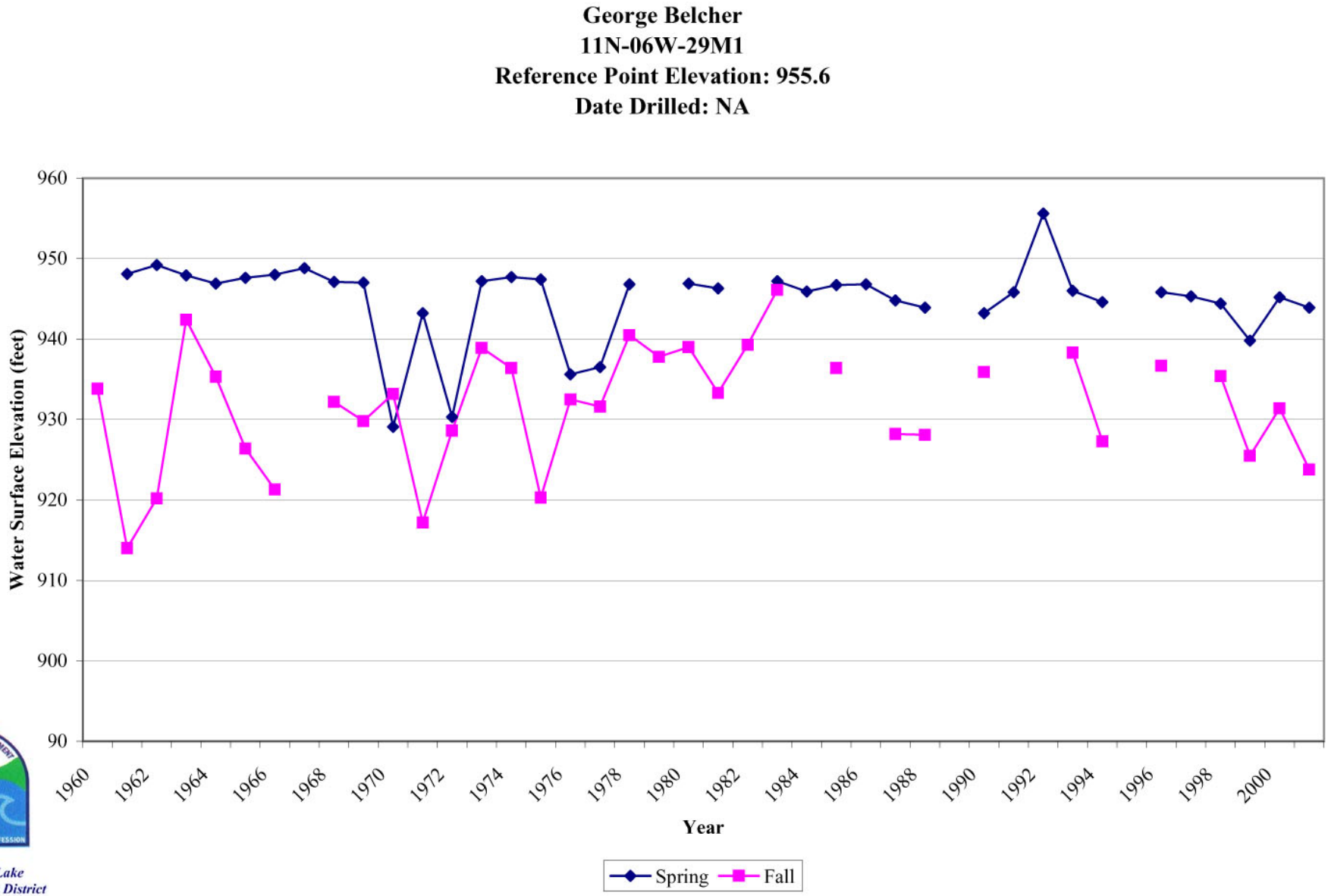
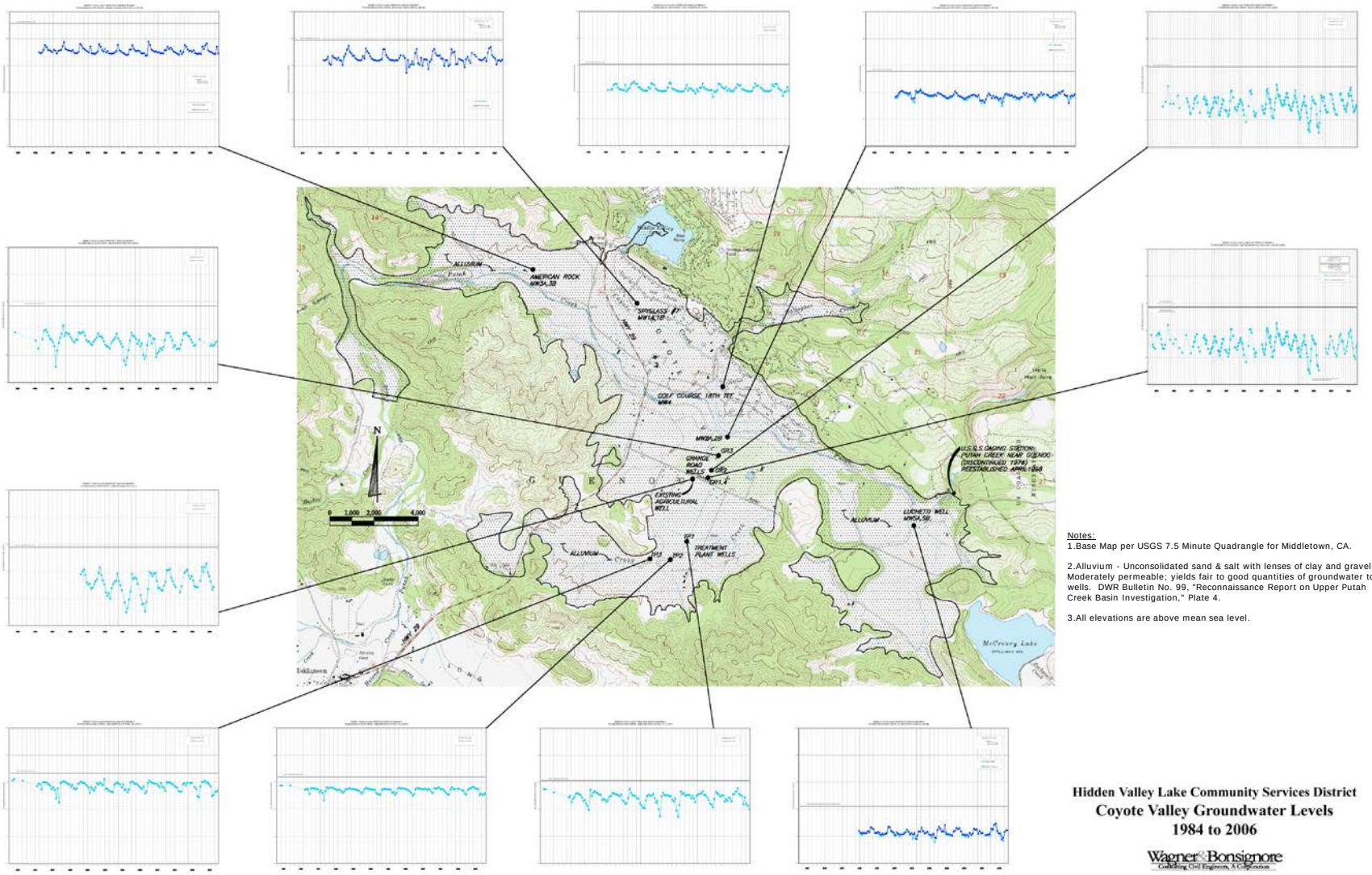
Coyote Valley Groundwater Basin Management
Water Levels Have Been Stable for Over 40 Years



Coyote Valley Groundwater Basin Management
Groundwater Levels



Notes:
1.Base Map per USGS 7.5 Minute Quadrangle for Middletown, CA.

2.Alluvium - Unconsolidated sand & salt with lenses of clay and gravel. Moderately permeable; yields fair to good quantities of groundwater to wells. DWR Bulletin No. 99, "Reconnaissance Report on Upper Putah Creek Basin Investigation," Plate 4.

3.All elevations are above mean sea level.

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Coyote Valley Groundwater Levels
1984 to 2006

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PROTECTING OUR ENVIRONMENT
OUR COMMITMENT + OUR PROFESSION

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Coyote Valley Groundwater Basin Management
Coyote Valley Background Information

- AVERAGE ANNUAL PRECIPITATION AT MIDDLETOWN = 45 +/- INCHES
- LONG-TERM AVERAGE ANNUAL RUNOFF AT PUTAH CREEK GAGE = 153,000 +/- ACRE-FEET
- 1999-2002 AVERAGE ANNUAL RUNOFF AT PUTAH CREEK GAGE = 123,000 +/- ACRE-FEET
- 2006 TOTAL GROUNDWATER PRODUCTION BY DISTRICT WELLS = 1,147 ACRE-FEET
- ESTIMATED ANNUAL NON-DISTRICT GROUNDWATER PRODUCTION = 800+/- ACRE-FEET

Coyote Valley Groundwater Basin Management
HVLCSD Has the Right to Pump Water From Coyote Valley Basin

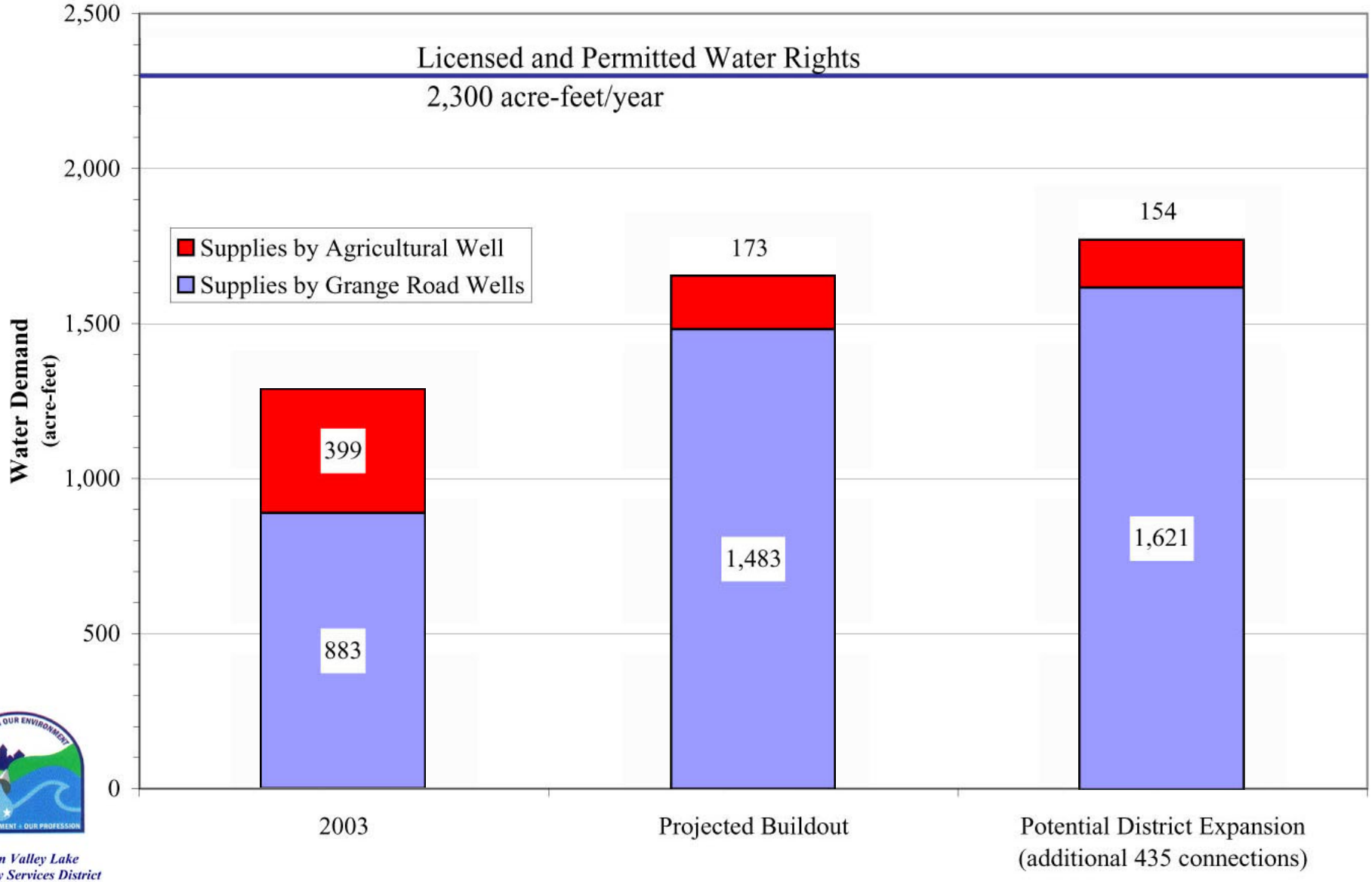
- APPROPRIATIVE WATER RIGHT LICENSES AND PERMITS ISSUED BY STATE WATER RESOURCES CONTROL BOARD
  - License 13527 (Application 30049A)
  - Permit 20770B (Application 30049B)
- RIPARIAN RIGHTS TO PUTAH CREEK
- OVERLYING RIGHTS TO GROUNDWATER

Coyote Valley Groundwater Basin Management

HVLCSD Must Meet Certain Compliance Conditions Imposed by the State Water Resources Control Board

- GROUNDWATER ELEVATION MONITORING PROGRAM FOR COYOTE VALLEY BASIN
  - Monthly Water Level Measurements of Twelve Monitoring Wells
  - Measurement of Surface Flow in Putah Creek
- MAINTENANCE OF MINIMUM FLOWS IN PUTAH CREEK DURING SUMMER MONTHS
  - Release of Supplemental Water Into Putah Creek
  - Measurement of Surface Flow in Putah Creek
  - Installation and Maintenance of Putah Creek Gaging Station
- ANNUAL MONITORING REPORT
  - Tabulation of Supplemental Water
  - Summary of Average Daily Flow in Putah Creek
  - Summary of Monitoring Well Water Level Measurements

Coyote Valley Groundwater Basin Management
HVLCSD Must Plan for the Future



Hidden Valley Lake
Community Services District

Coyote Valley Groundwater Basin Management
Current and Future Demands Present Certain Management Concerns

- CONCENTRATED PUMPING IN ONE GEOGRAPHICAL AREA (GRANGE ROAD)
- HEAVY SUMMER PUMPING TO MEET ENVIRONMENTAL ENHANCEMENT REQUIREMENTS MAY IMPACT WATER SUPPLY FOR THE COMMUNITY
- IS WATER SUPPLY ADEQUATE TO MEET FUTURE DEMANDS WITHOUT RESULTING IN BASIN OVERDRAFT?

Coyote Valley Groundwater Basin Management
How Do We Address These Concerns?

- DEVELOP A NUMERICAL GROUNDWATER MODEL
  - A Sophisticated Computerized Computational Tool
  - Used to Predict Basin Response to Extractions and Recharge

Coyote Valley Groundwater Basin Management
Komex – Technical Memorandum

DRAFT

KOMEX

KOMEX • H2O SCIENCE • INC
1624 SANTA CLARA DRIVE, SUITE 120
ROSEVILLE, CA 95661, USA
TEL 916.797.7283 FAX 916.797.1101
EMAIL: info@sacramento.komex.com
WEB SITE: www.komex.com

ENVIRONMENT AND WATER RESOURCES

TECHNICAL MEMORANDUM

SUMMARIZING MODEL PREDICTIONS OF GROUNDWATER LEVELS IN COYOTE VALLEY

PREPARED FOR:

Wagner & Bonsignore

PREPARED BY:

KOMEX

1624 Santa Clara Drive, Suite 120

Roseville, CA 95661

USA

2 April 2004

Coyote Valley Groundwater Basin Management
The Groundwater Model

- HVLCSD HIRED KOMEX-H_2O SCIENCE TO DEVELOP THE GROUNDWATER MODEL
- THE GROUNDWATER MODEL PROVIDES:
  - A Computerized Simulation of Groundwater Level Fluctuation in Response to the Available Recharge and the Pumping Demands of the Community
  - A Management Tool That Can Be Used to Predict How Groundwater Levels Will Respond to Existing and Future Demand

Coyote Valley Groundwater Basin Management
Groundwater Model Input

- SOURCES OF INFORMATION
  - Winzler & Kelly
    - Aquifer Test – Well No. 4 (January 2004).
  - Trans Tech Consultants
    - Summary of Field Activities – Monitoring Well Installations (October 15, 1996).
  - USGS
    - Ground Water of the Lower Lake-Middletown Area – Water Supply Paper 1297 (1955).
  - Komex
    - Geophysical Surveys at Hidden Valley Lake Community Services HVLCSD Well Field (December 20, 2002).
  - DWR
    - Putah Creek Cone Investigation – Prepared Pursuant to Chapter 1478, Statutes of 1951 (December 1955).
    - Reconnaissance Report on Upper Putah Creek Basin Investigation – Bulletin No. 99 (March 1962).

Coyote Valley Groundwater Basin Management
Groundwater Model Input

- WELL DRILLERS LOGS FOR 36 WELLS
  - Help Determine Aquifer Characteristics
- HISTORICAL GROUNDWATER LEVEL DATA
  - Water Level Data for 18 Wells
- HISTORICAL SURFACE WATER FLOW DATA
  - Daily Discharge Data for USGS Gage at Putah Creek Near Guenoc, 1905 to 1906, 1939 to 1976 and 1998 to Present

Coyote Valley Groundwater Basin Management
Groundwater Model Input

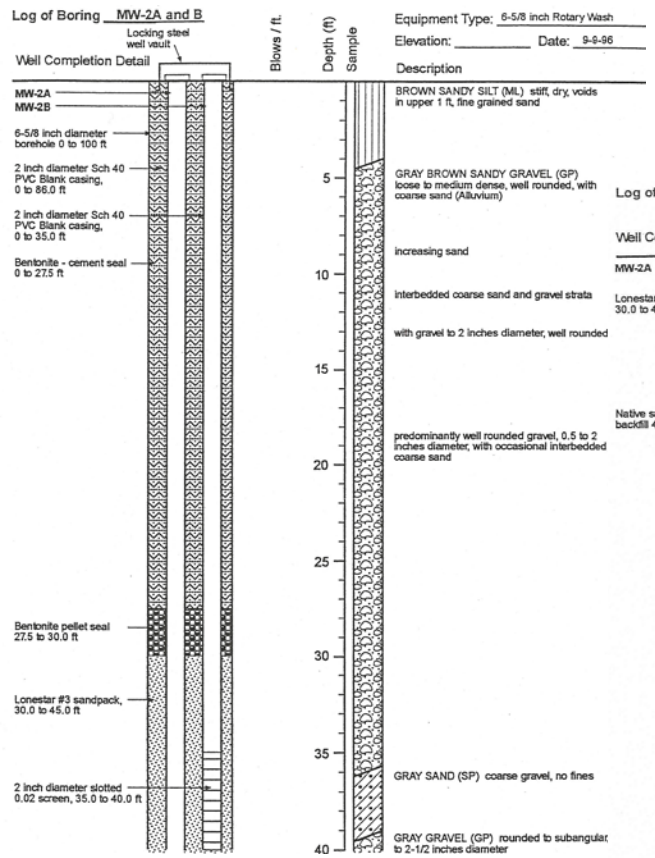
- LAND USE INFORMATION
- WATER PRODUCTION
- WATER USE AND RETURN FLOW
- POPULATION

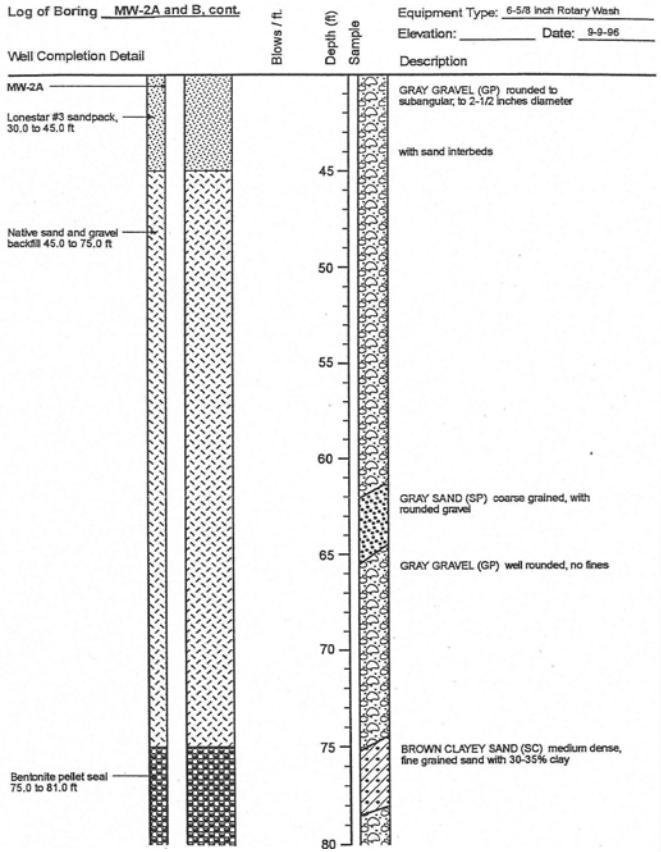
Coyote Valley Groundwater Basin Management
Groundwater Model Input – Aquifer Investigations

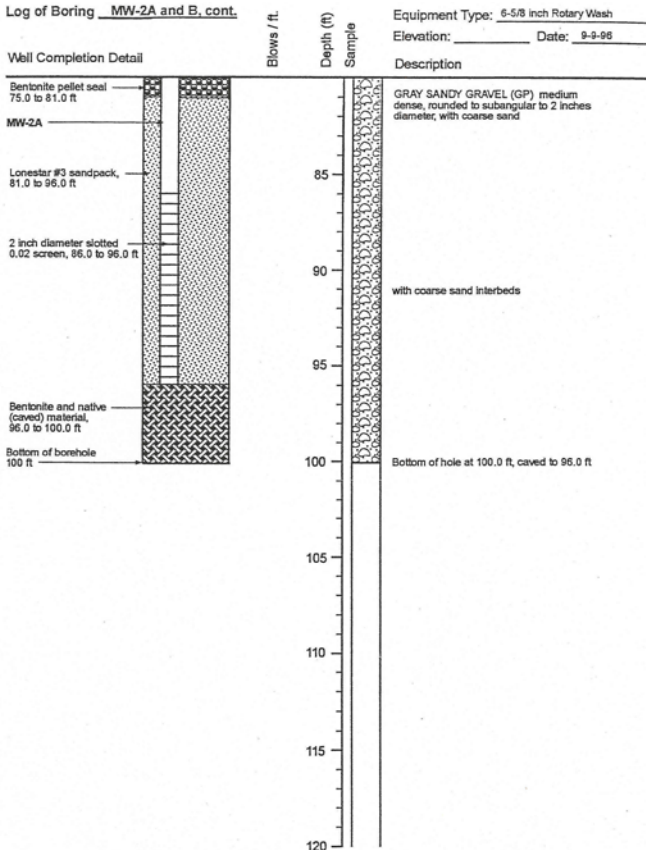
- GEOPHYSICAL INVESTIGATION
- PUMP TESTING

Coyote Valley Groundwater Basin Management
Groundwater Model Input

- INVESTIGATE GEOLOGY OF BASIN
  - Evaluate Well Logs







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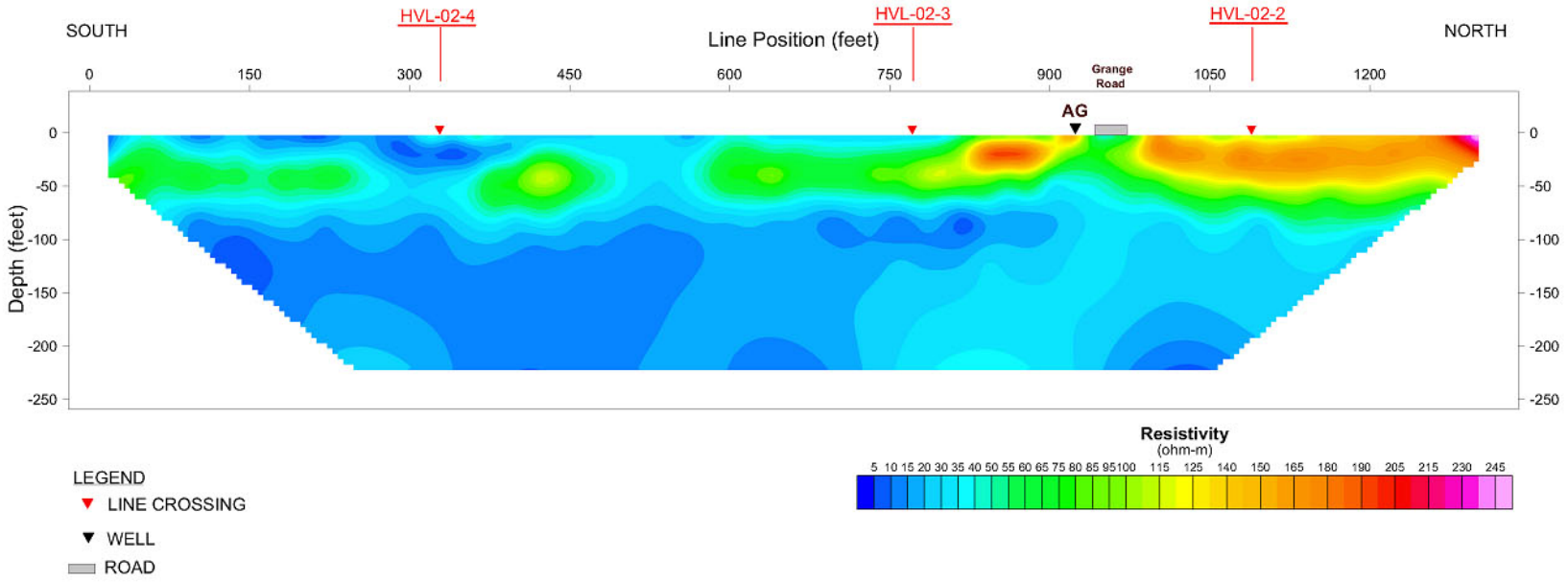
Coyote Valley Groundwater Basin Management
Groundwater Model Input - Geophysical Investigation



NOTE: The cross-section shows interpreted trends.
Deviations in the physical properties are expected

Scale 1:1200
50 0 50 100 150 200 250
(feet)

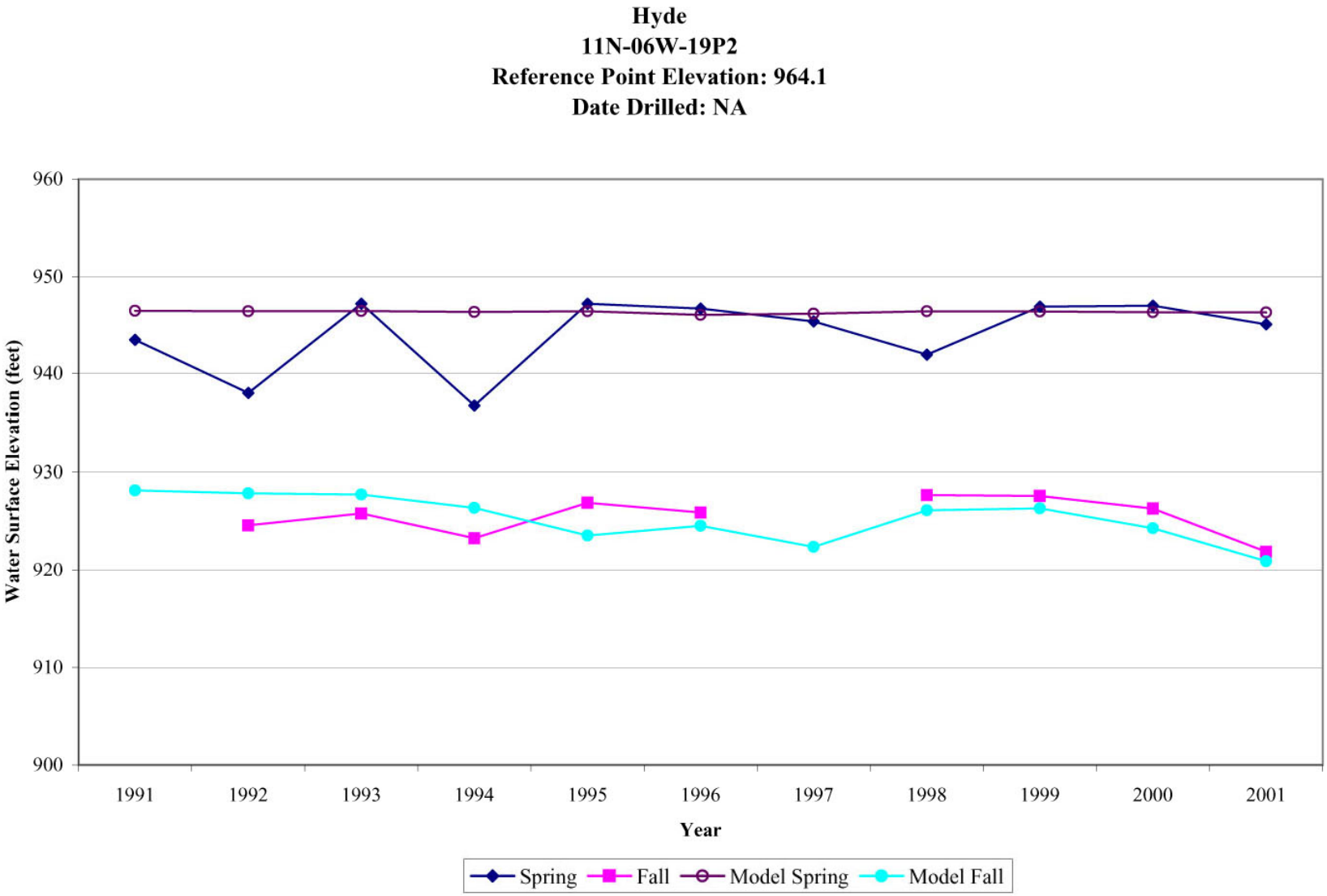
Hidden Valley Lake Community Services District

WAGNER & BONSIGNORE HIDDEN VALLEY LAKE COMMUNITY SERVICES DISTRICT	KOMEX
ELECTRICAL RESISTIVITY TOMOGRAPHY CROSS-SECTION : LINE HVL-02-5 FIGURE 7	Data collected: December 2002 Minimum Electrode Spacing: 5.0 m Electrode Configuration: Wenner
	Approved: / Date: Dec 2002
FILE: J:/35654700/geophysics/ERT/HVLD0205.map	

Coyote Valley Groundwater Basin Management
Groundwater Model Output

- MODEL GENERATES WATER LEVELS THAT ARE CALIBRATED WITH MEASURED WATER LEVELS IN WELLS

Coyote Valley Groundwater Basin Management
Groundwater Model Calibration

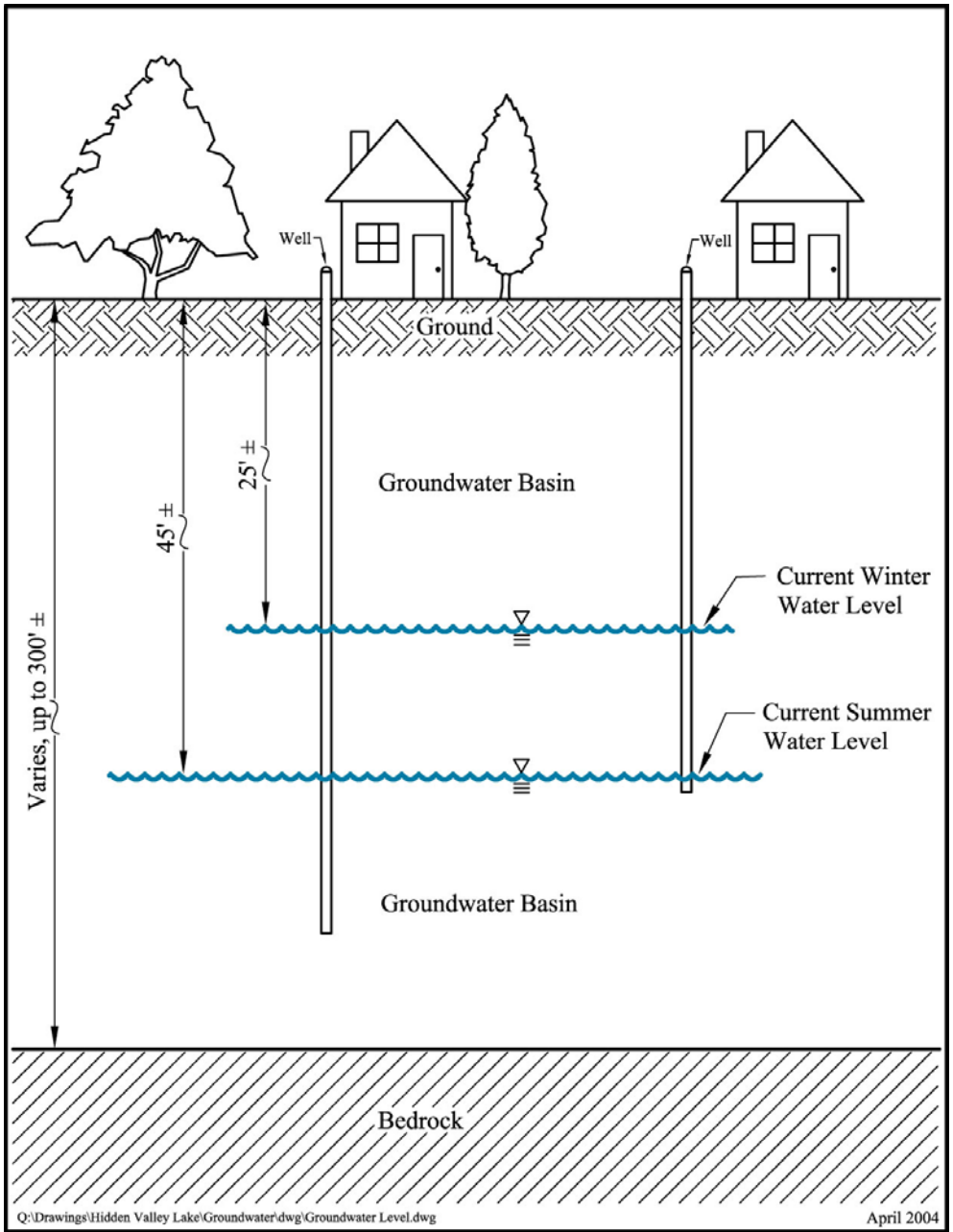


Coyote Valley Groundwater Basin Management
Results of Historical Analysis

- GROUNDWATER LEVELS FLUCTUATE ABOUT 25 FEET SEASONALLY NEAR GRANGE ROAD WELLS
- GROUNDWATER LEVELS START DROPPING IN JULY
- GROUNDWATER LEVELS START RISING IN NOVEMBER
- BASIN REPLENISHES EACH YEAR – BIGGEST CONTRIBUTORS ARE PERCOLATION OF PUTAH CREEK FLOWS AND DEEP PERCOLATION OF PRECIPITATION

Coyote Valley Groundwater Basin Management

Seasonal Water Level Changes Under Current Demands



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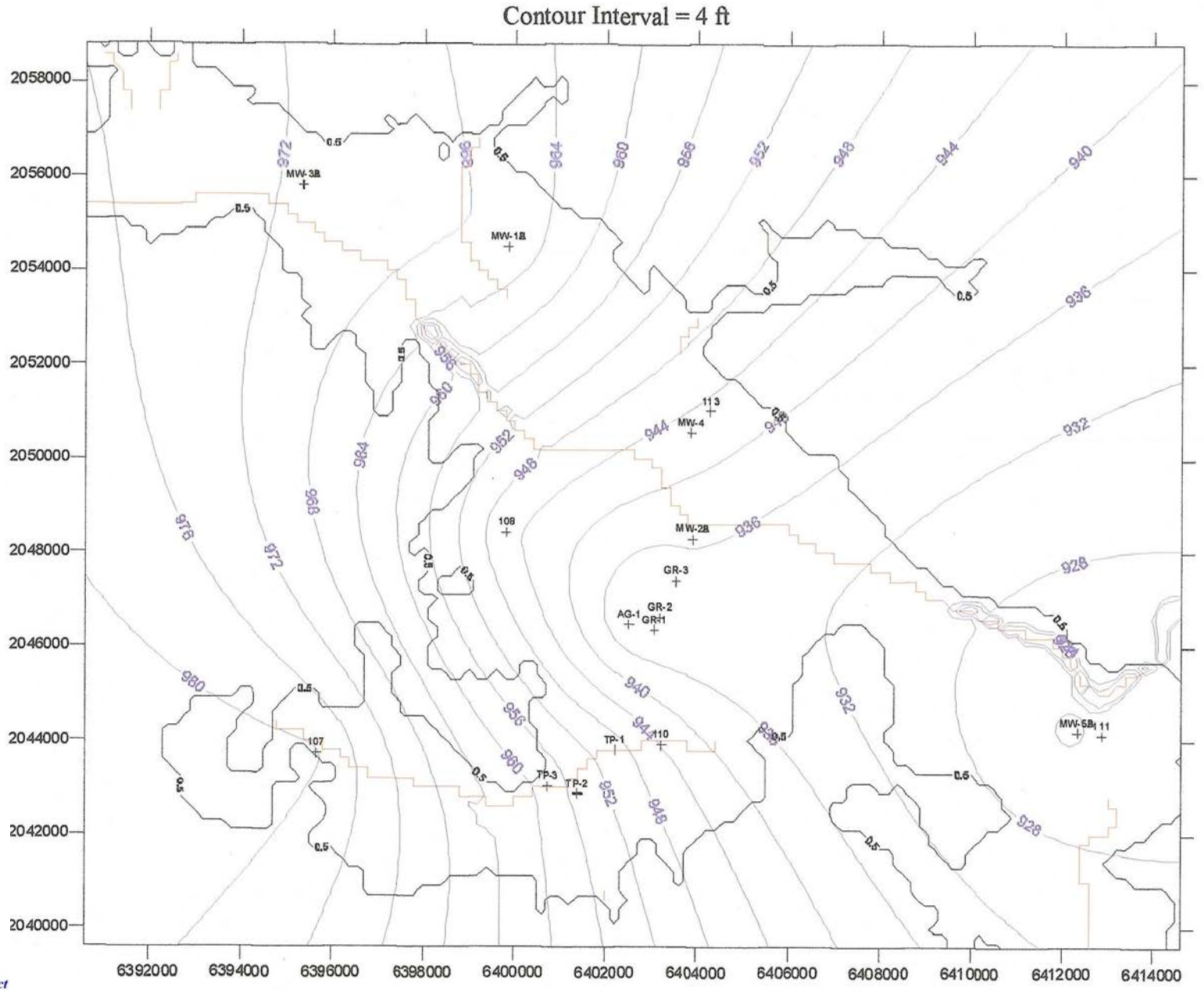
Coyote Valley Groundwater Basin Management
Observed Groundwater Levels, April 2001



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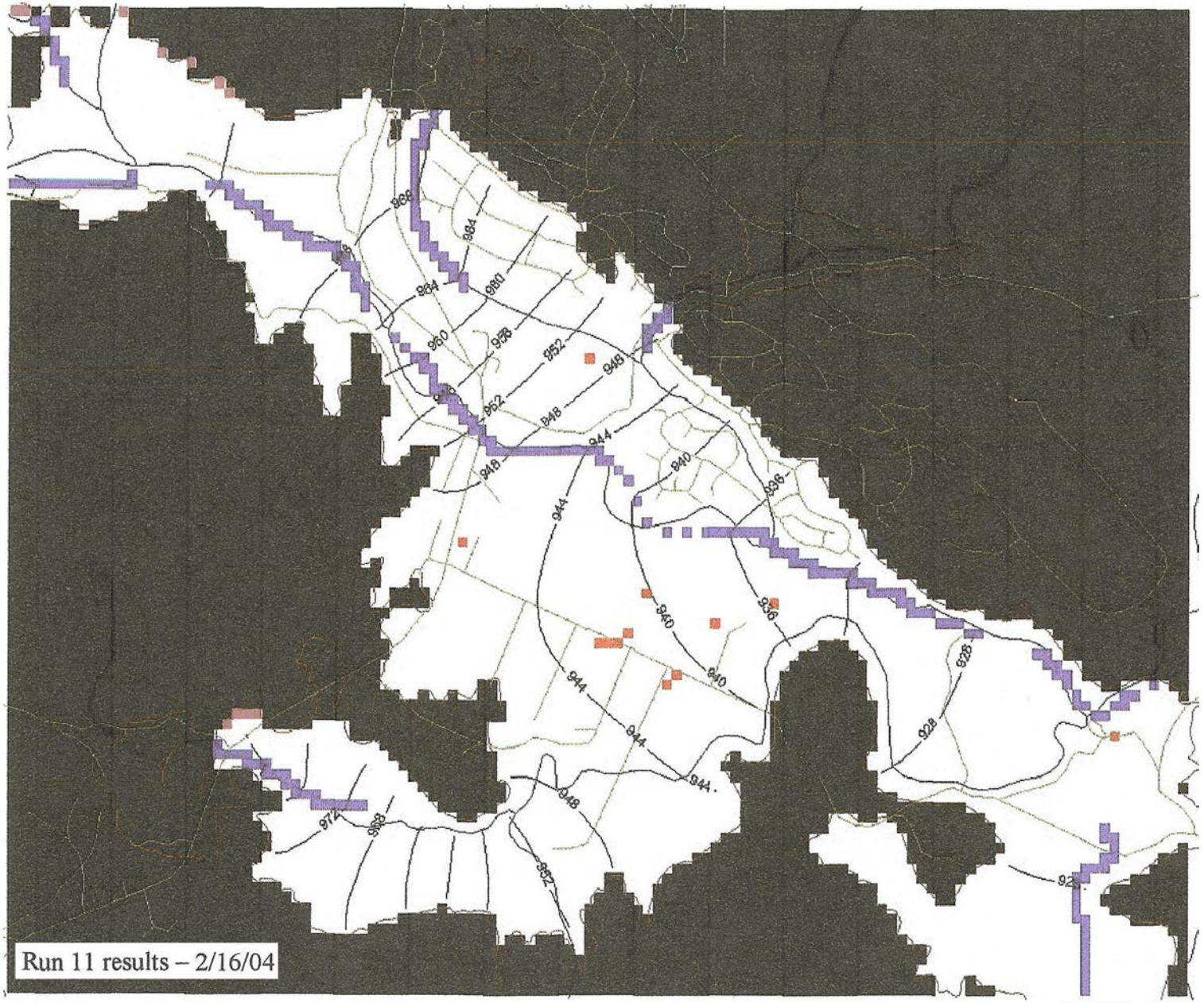
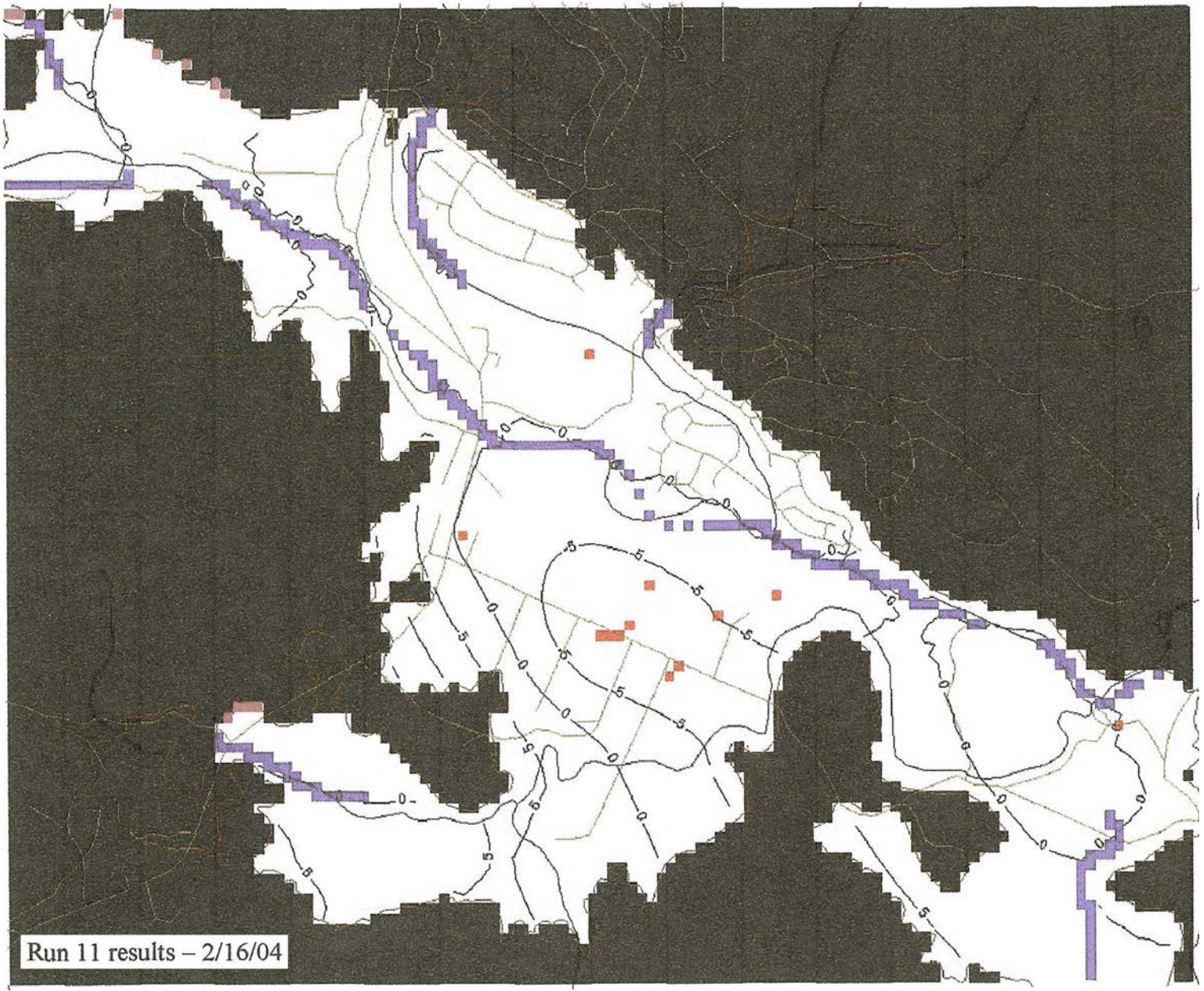
Coyote Valley Groundwater Basin Management
Steady-State Heads for April 2001, ft amsl



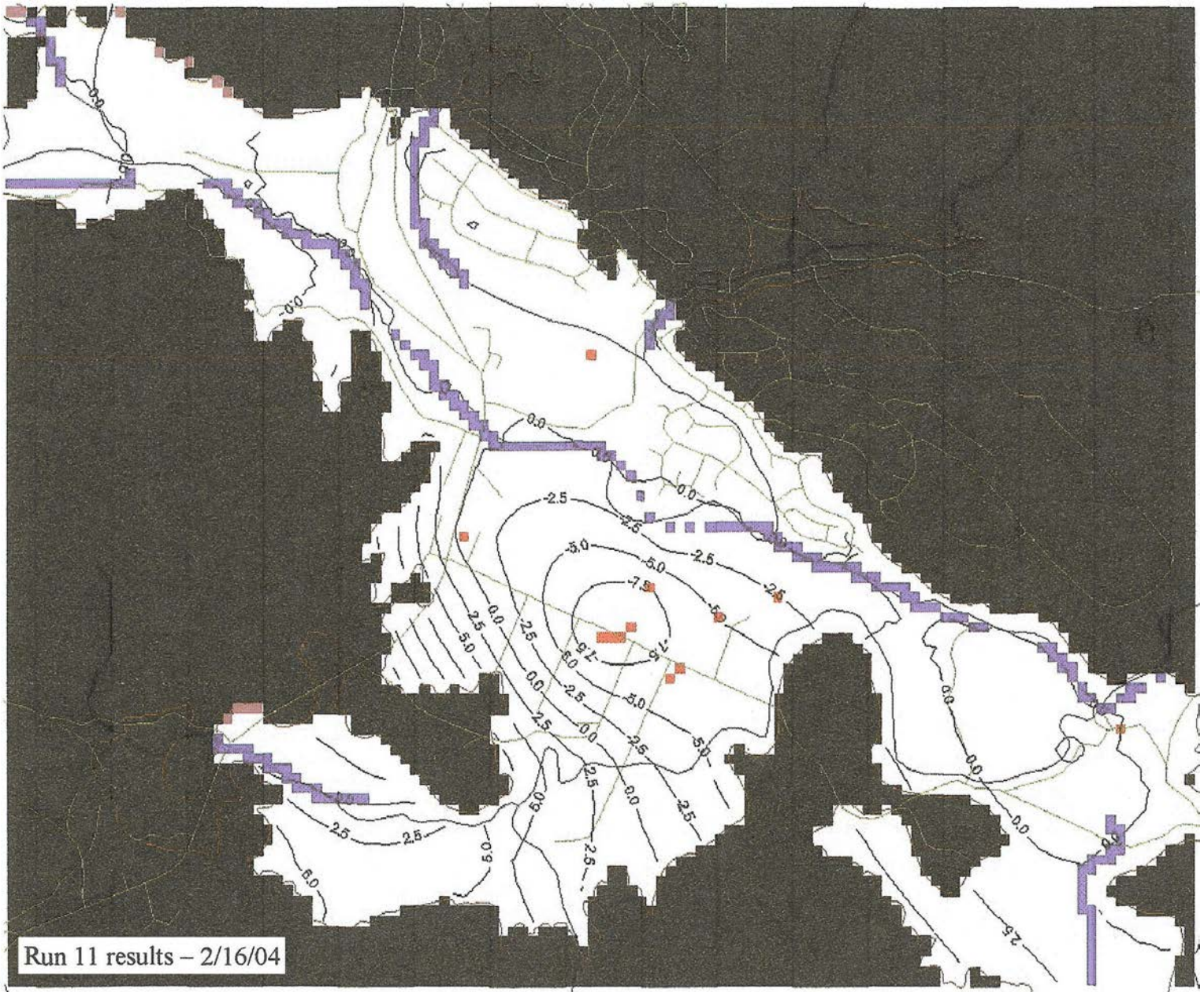
Coyote Valley Groundwater Basin Management

Observed Minus Predicted Steady-State Heads, April 2001, ft



Coyote Valley Groundwater Basin Management

Observed Minus Predicted Steady-State Heads, April 2001, ft



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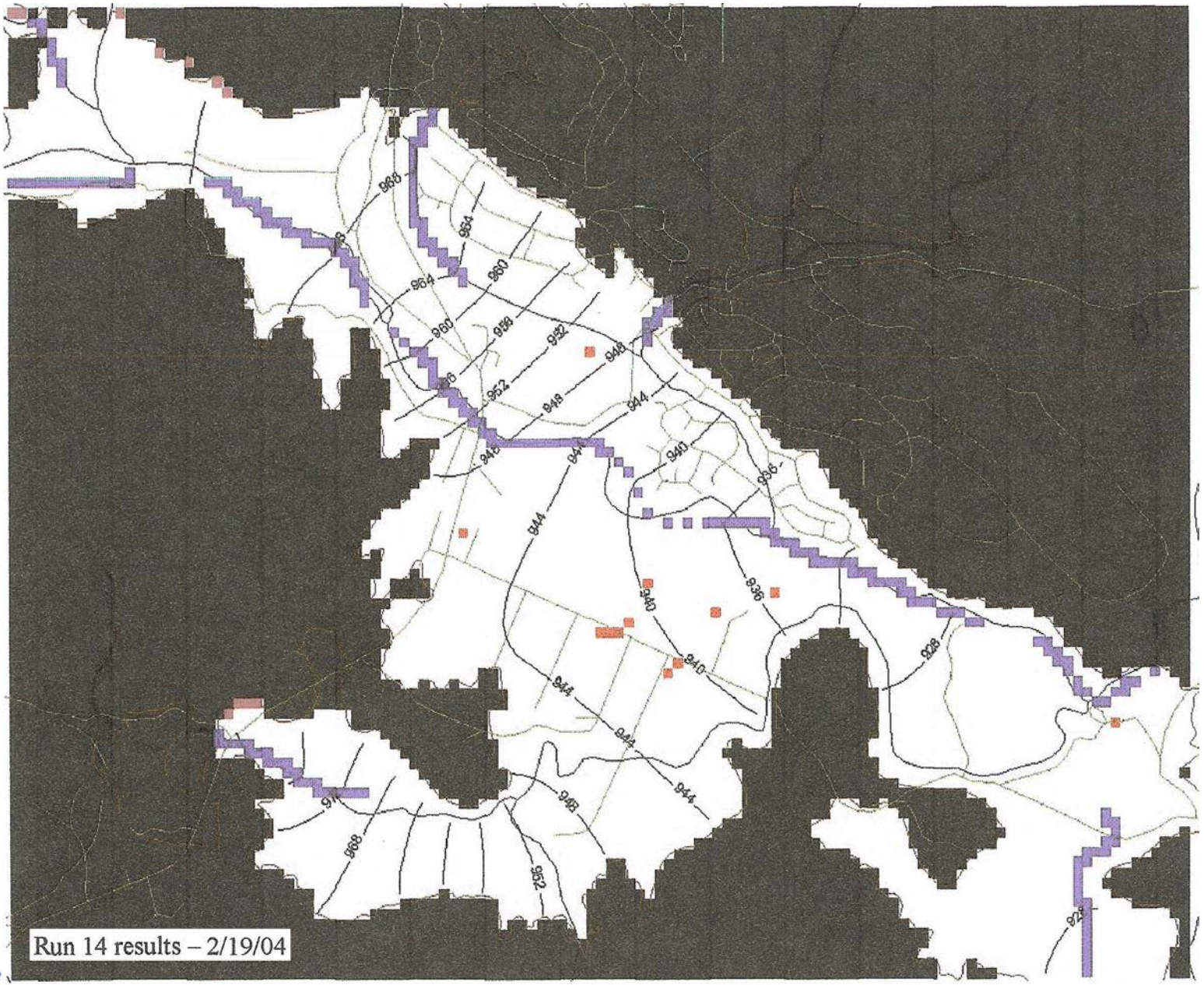
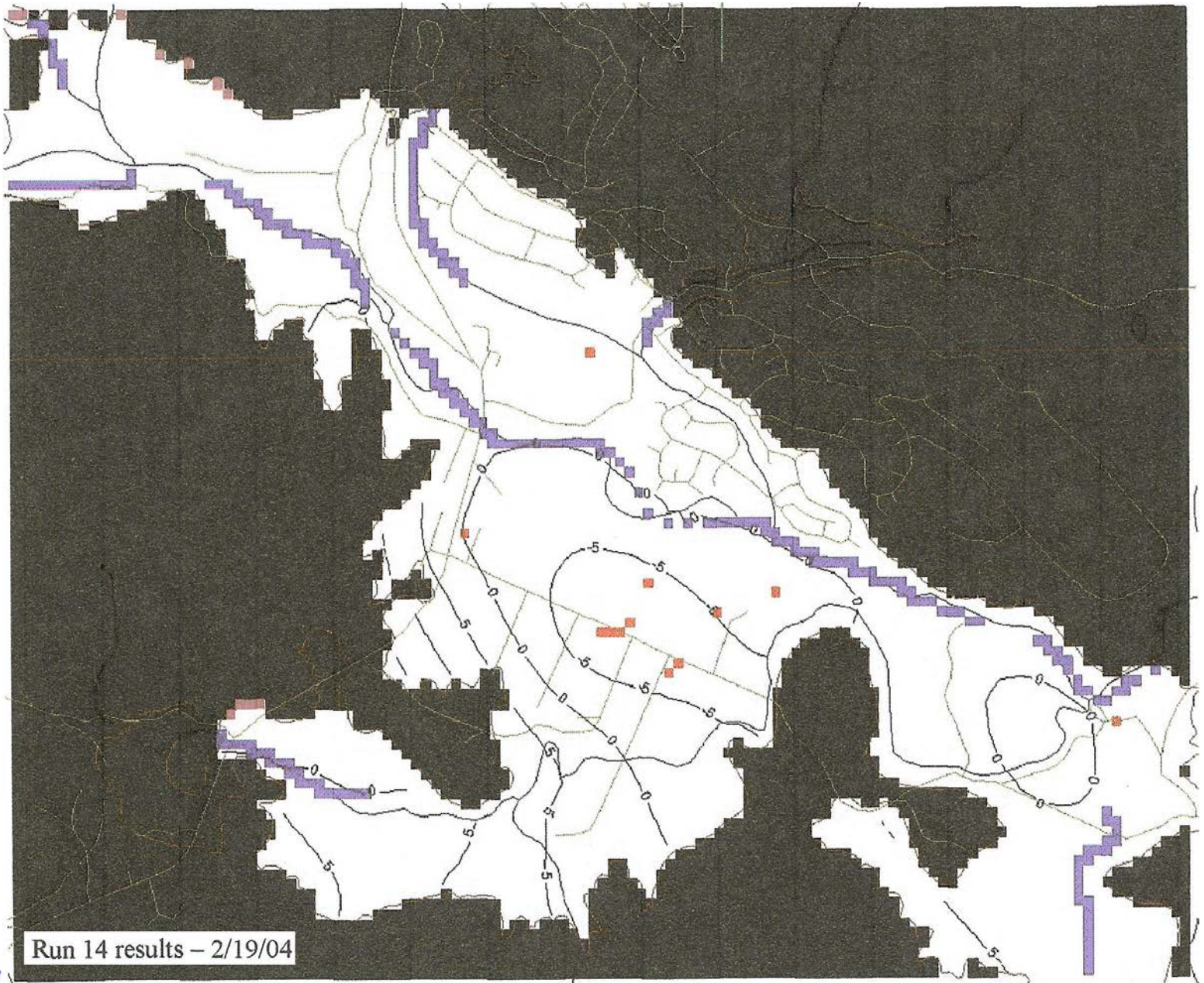
Coyote Valley Groundwater Basin Management
Steady-State Heads for June 2001, ft amsl



Coyote Valley Groundwater Basin Management

Observed Minus Predicted Steady-State Heads, June 2001, ft



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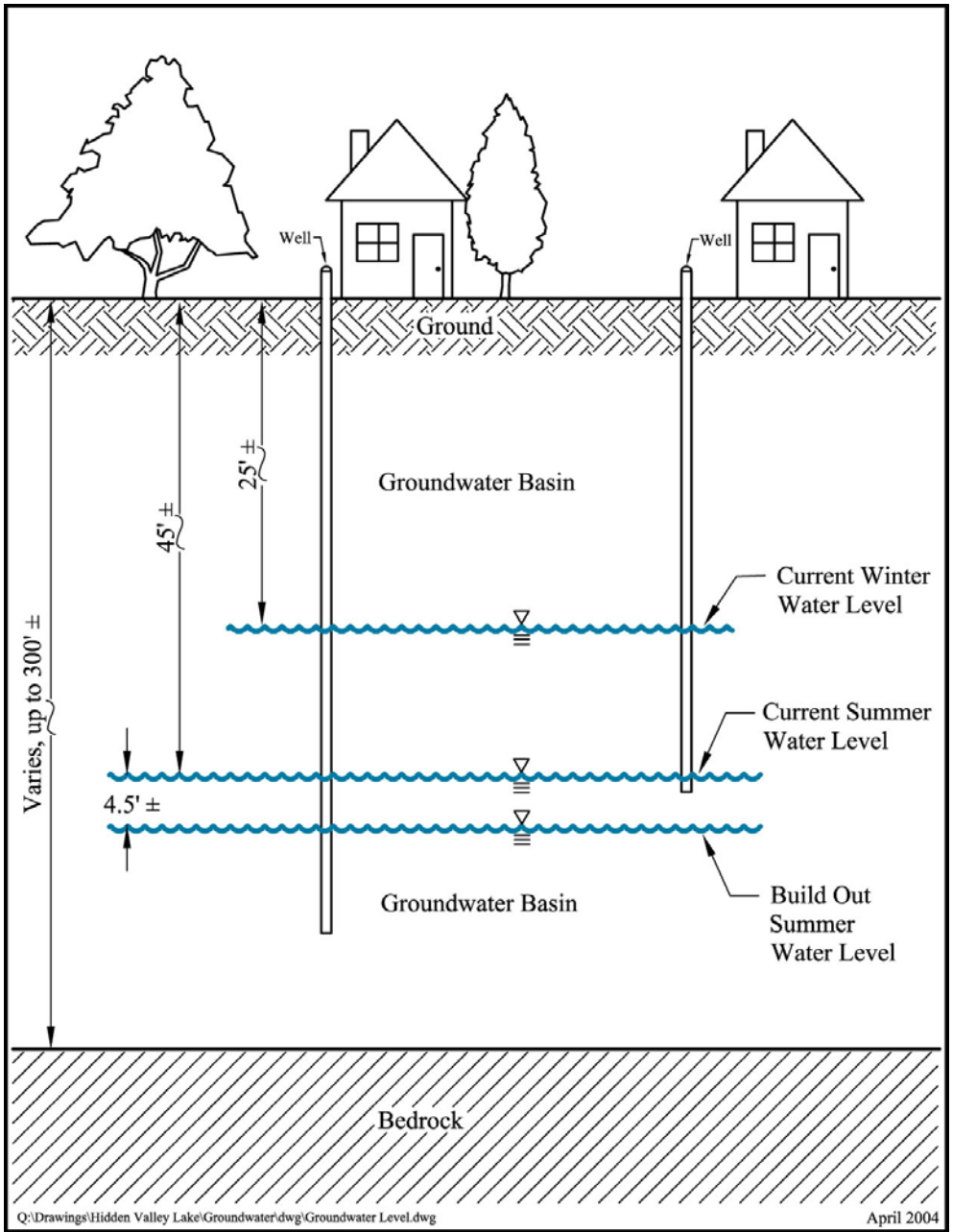
Coyote Valley Groundwater Basin Management
Prediction of Future Conditions at Buildout

- MINIMUM GROUNDWATER LEVELS IN LATE FALL WILL DROP AN AVERAGE OF 4.5 FEET BASIN-WIDE VERSUS PRESENT CONDITIONS
- BASIN WILL CONTINUE TO BE REPLENISHED COMPLETELY IN THE WINTER
- BASIN WILL NOT BE OVERDRAFTED
- CALIBRATED MODEL CAN BE USED TO PREDICT WATER LEVEL CHANGES FROM VARIOUS ALTERNATIVE PUMPING SCENARIOS

Coyote Valley Groundwater Basin Management

Estimated Average Drawdown of Groundwater Level at Buildout



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Economic Characteristics of Small Systems
Scott J. Rubin

Criteria to Assess the Affordability of Water Service
Scott J. Rubin

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- Map 2 (.pdf)
- Map 3 (.pdf)
- Map 4 (.pdf)
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Update of Affordability Database for National Rural Water Association
Scott J. Rubin

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Robert S. Raucher & Nimmi Damodaran

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Confronting Trade-offs in Protecting Human Health and the Environment
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Jeffrey K. Griffiths

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Joseph A. Cotruvo

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- Consolidation Potential for Small Water Systems — Differences Between Urban and Rural Systems
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  John Cromwell and Robert S. Raucher

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Laurence Bowman

National Cost Estimate for Cross Connection Control in Small Water Systems (.pdf)
Fredrick W. Pontius and William B. Evans

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WASTEWATER

The Impact of Clean Water Act Regulations on Small and Rural Wastewater Systems
EA Engineering, Science and Technology, Inc.

National Rural Water Association
2915 South 13th Street, Duncan, OK 73533
580-252-0629, FAX 580-255-4476
Printed in the United States of America.