

# Use of ArcView GIS to Manage Declining Ground Water Levels Denver Basin Aquifers

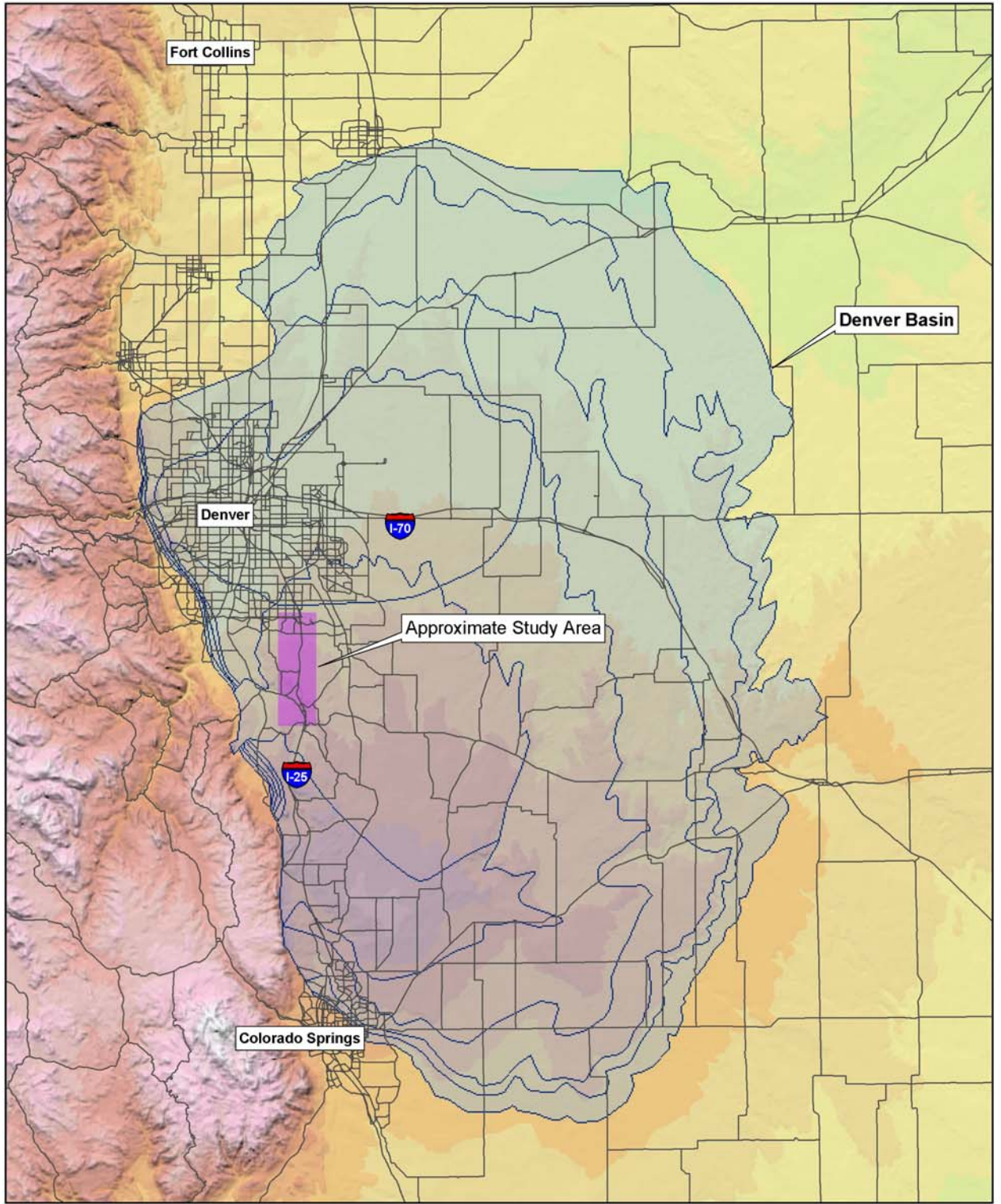
Theresa Jehn-Dellaport

Kim Edwards

Jehn Water Consultants, Inc.

# Use of GIS as a Management Tool




- Manage a Large Database which is Georeferenced
- Tie that database to a map, aerial photography, geologic information, etc.
- Continually Update the information
- Manipulate data with ease

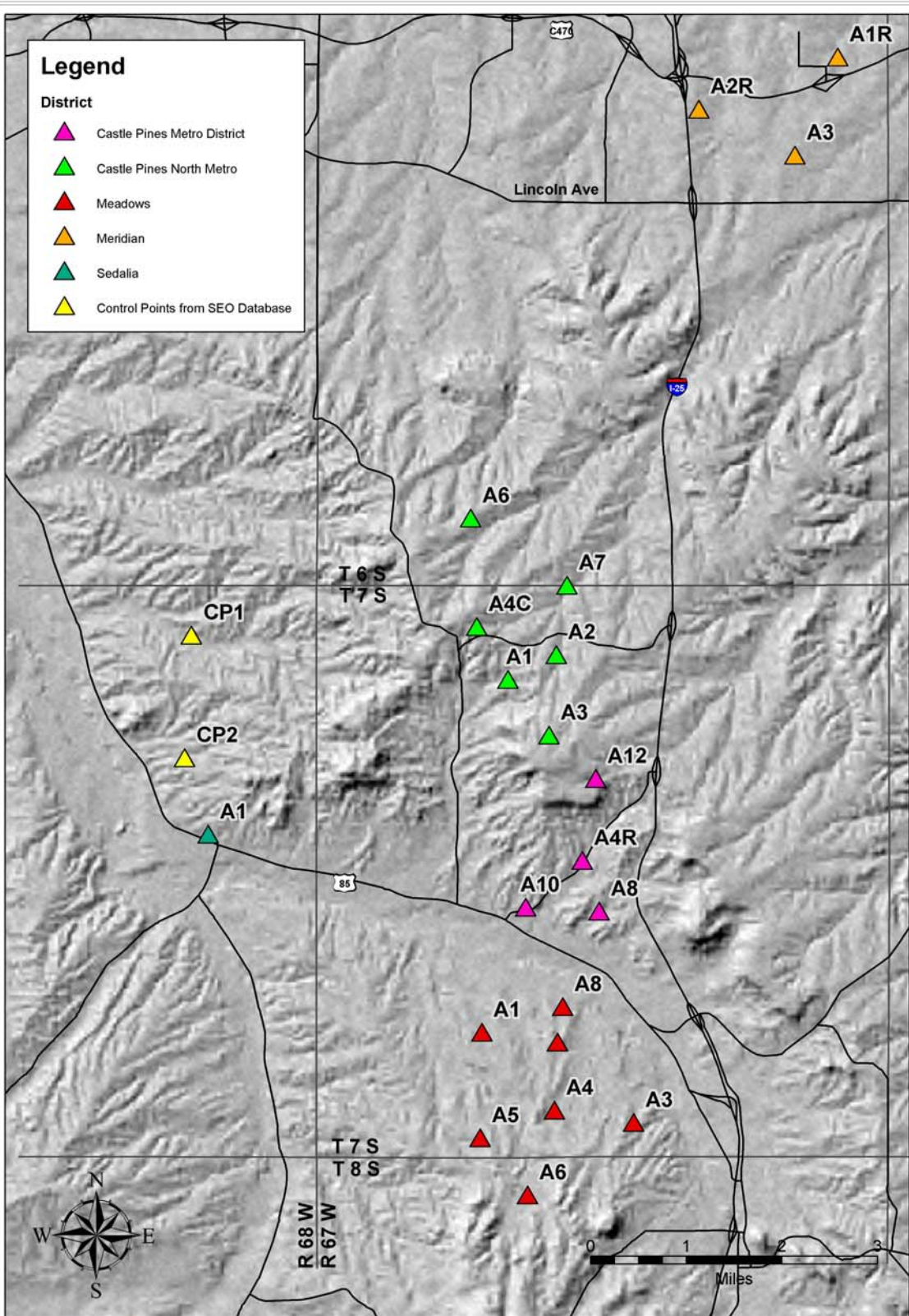


# Denver Basin

**Legend**

**District**

-  Castle Pines Metro District
-  Castle Pines North Metro
-  Meadows
-  Meridian
-  Sedalia
-  Control Points from SEO Database



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 (303) 321-8346 fax

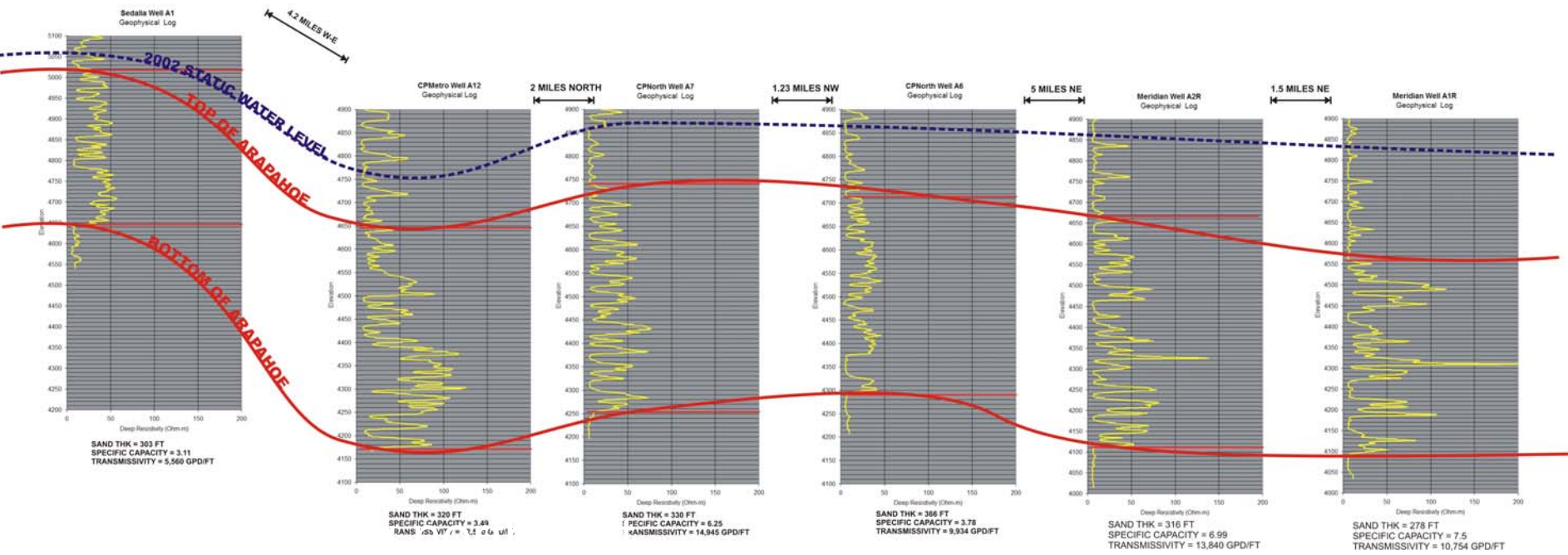









## Study Area and Well Location Map

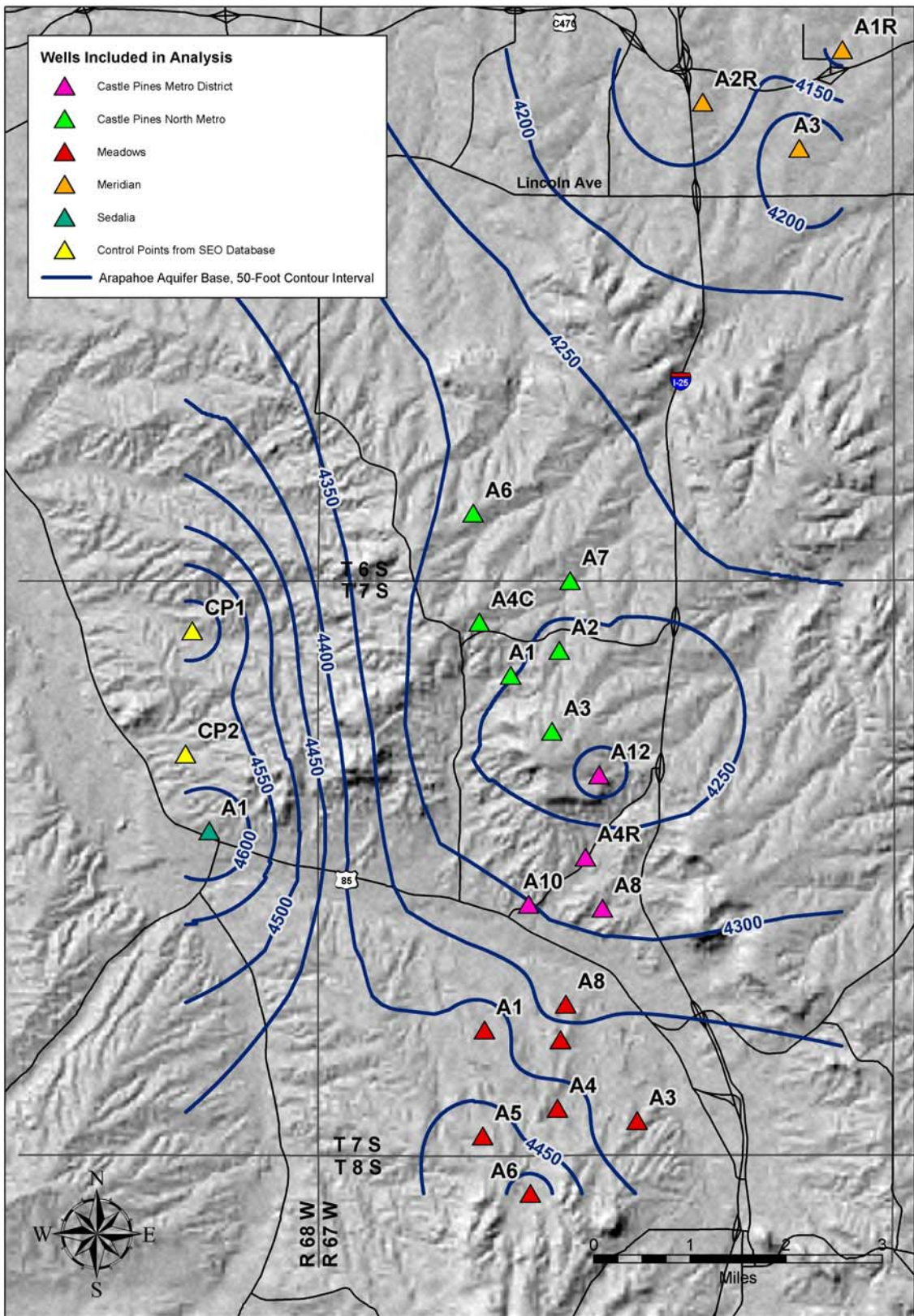
# ARAPAHOE GEOPHYSICAL LOGS

SW

NE



- Wells Included in Analysis**
-  Castle Pines Metro District
  -  Castle Pines North Metro
  -  Meadows
  -  Meridian
  -  Sedalia
  -  Control Points from SEO Database
  -  Arapahoe Aquifer Base, 50-Foot Contour Interval



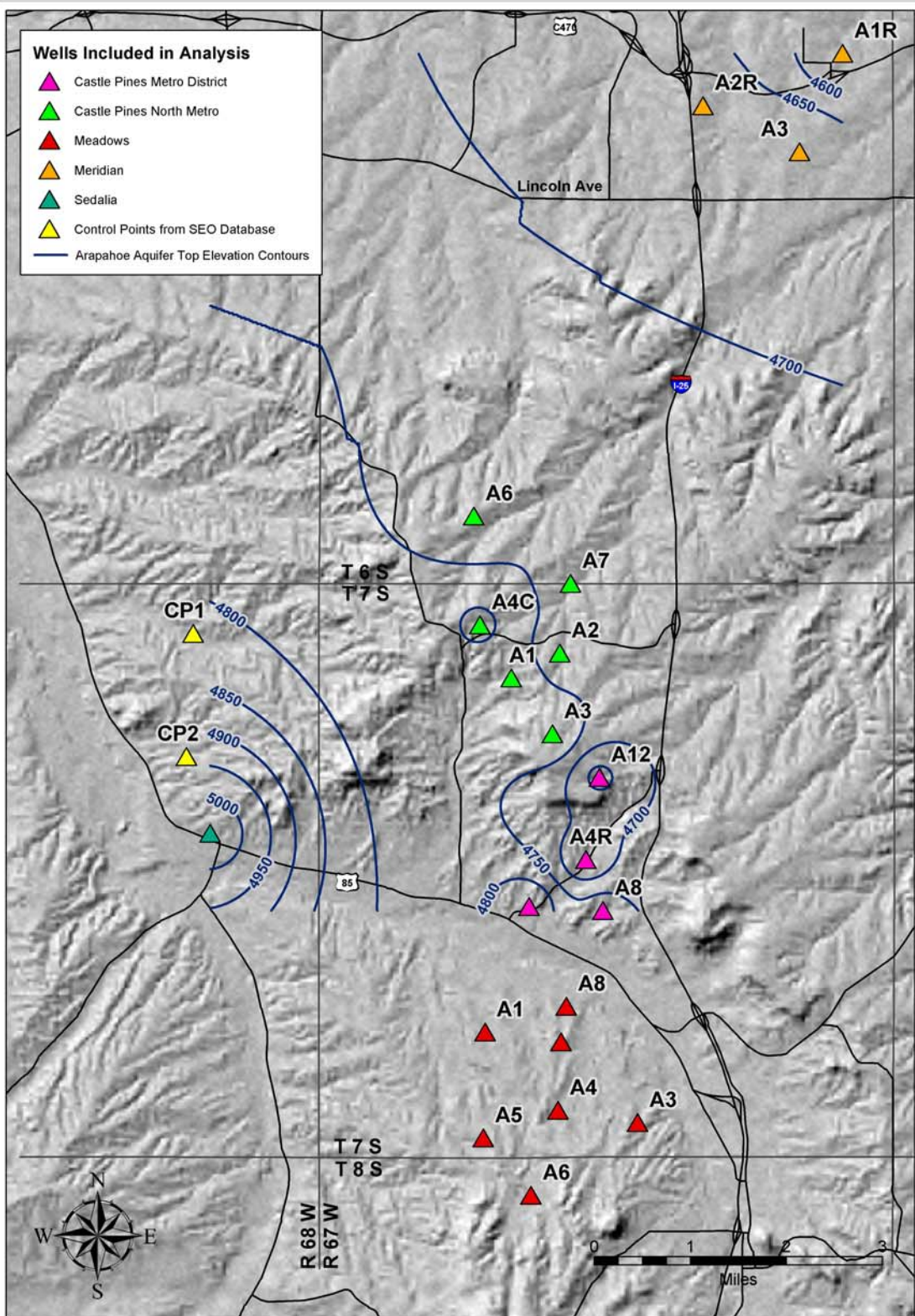
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## Arapahoe Aquifer Base Elevation Contour

**Wells Included in Analysis**

- ▲ Castle Pines Metro District
- ▲ Castle Pines North Metro
- ▲ Meadows
- ▲ Meridian
- ▲ Sedalia
- ▲ Control Points from SEO Database
- Arapahoe Aquifer Top Elevation Contours



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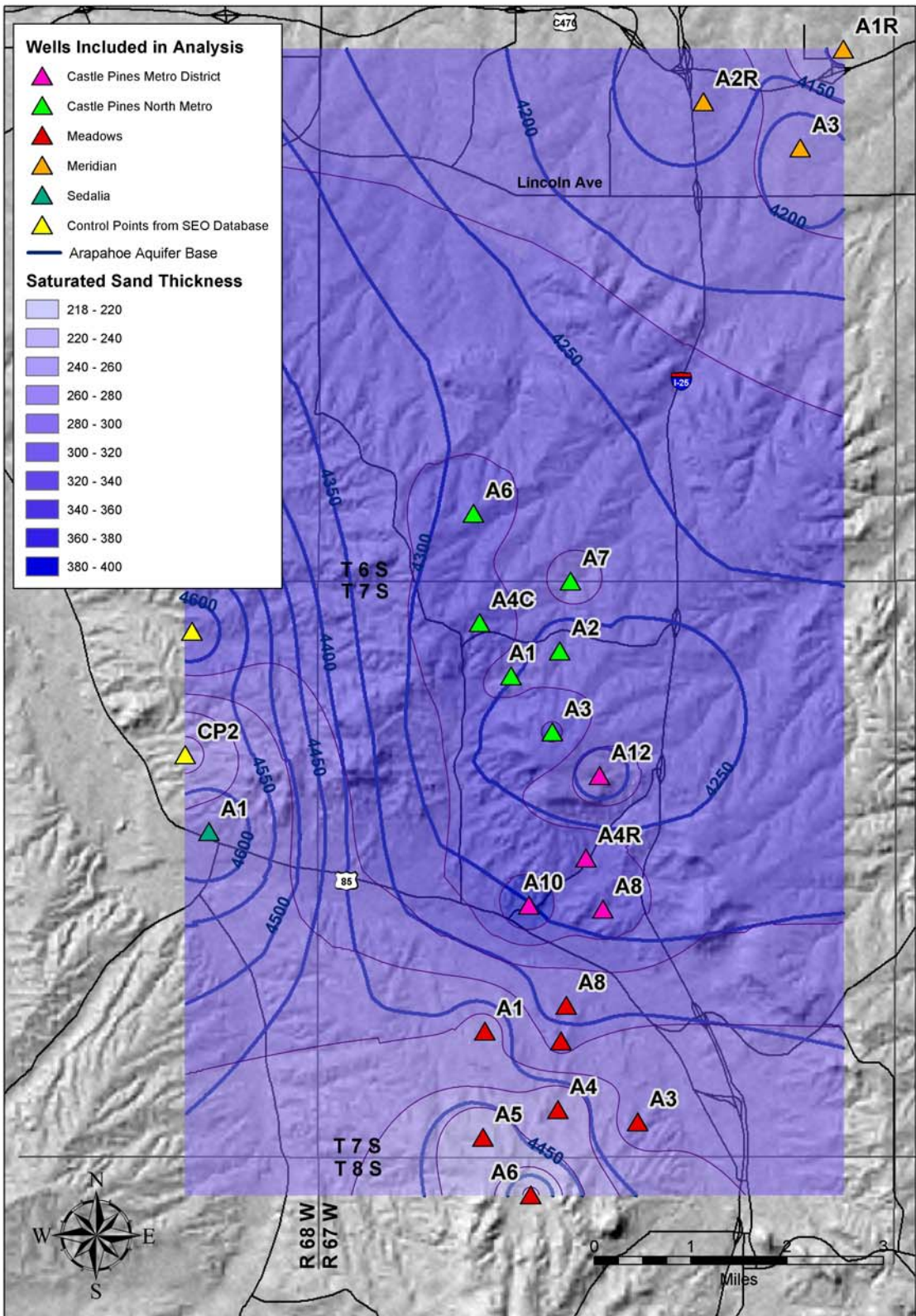
## Arapahoe Aquifer Top Elevation Contour

**Wells Included in Analysis**

- ▲ Castle Pines Metro District
- ▲ Castle Pines North Metro
- ▲ Meadows
- ▲ Meridian
- ▲ Sedalia
- ▲ Control Points from SEO Database
- Arapahoe Aquifer Base

**Saturated Sand Thickness**

- 218 - 220
- 220 - 240
- 240 - 260
- 260 - 280
- 280 - 300
- 300 - 320
- 320 - 340
- 340 - 360
- 360 - 380
- 380 - 400



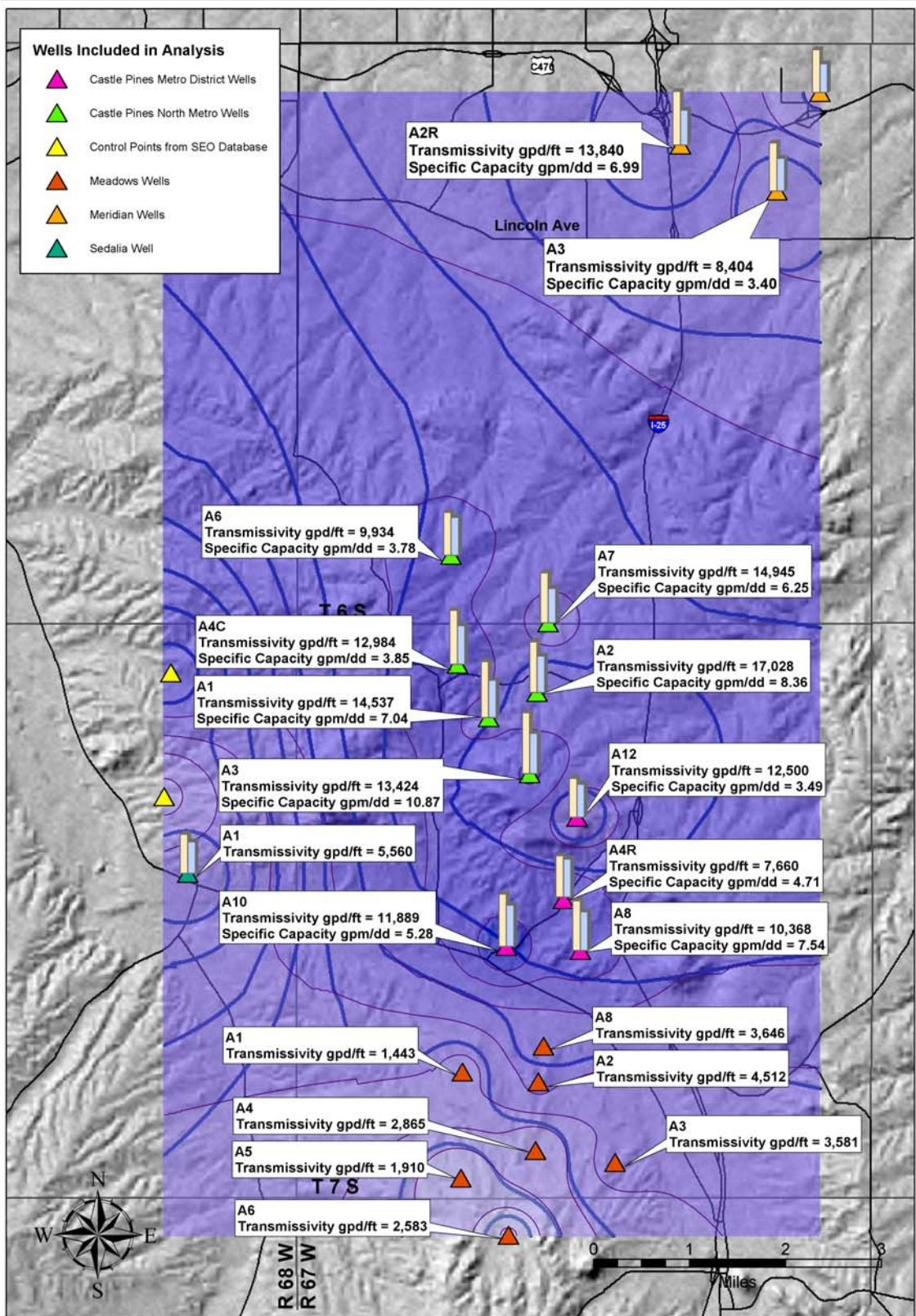
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## Arapahoe Aquifer Saturated Sand Thickness with Base Elevation Contour

**Wells Included in Analysis**

- ▲ Castle Pines Metro District Wells
- ▲ Castle Pines North Metro Wells
- ▲ Control Points from SEO Database
- ▲ Meadows Wells
- ▲ Meridian Wells
- ▲ Sedalia Well



**A2R**  
 Transmissivity gpd/ft = 13,840  
 Specific Capacity gpm/dd = 6.99

**A3**  
 Transmissivity gpd/ft = 8,404  
 Specific Capacity gpm/dd = 3.40

**A6**  
 Transmissivity gpd/ft = 9,934  
 Specific Capacity gpm/dd = 3.78

**A7**  
 Transmissivity gpd/ft = 14,945  
 Specific Capacity gpm/dd = 6.25

**A4C**  
 Transmissivity gpd/ft = 12,984  
 Specific Capacity gpm/dd = 3.85

**A2**  
 Transmissivity gpd/ft = 17,028  
 Specific Capacity gpm/dd = 8.36

**A1**  
 Transmissivity gpd/ft = 14,537  
 Specific Capacity gpm/dd = 7.04

**A12**  
 Transmissivity gpd/ft = 12,500  
 Specific Capacity gpm/dd = 3.49

**A3**  
 Transmissivity gpd/ft = 13,424  
 Specific Capacity gpm/dd = 10.87

**A4R**  
 Transmissivity gpd/ft = 7,660  
 Specific Capacity gpm/dd = 4.71

**A1**  
 Transmissivity gpd/ft = 5,560

**A8**  
 Transmissivity gpd/ft = 10,368  
 Specific Capacity gpm/dd = 7.54

**A10**  
 Transmissivity gpd/ft = 11,889  
 Specific Capacity gpm/dd = 5.28

**A8**  
 Transmissivity gpd/ft = 3,646

**A1**  
 Transmissivity gpd/ft = 1,443

**A2**  
 Transmissivity gpd/ft = 4,512

**A4**  
 Transmissivity gpd/ft = 2,865

**A3**  
 Transmissivity gpd/ft = 3,581

**A5**  
 Transmissivity gpd/ft = 1,910

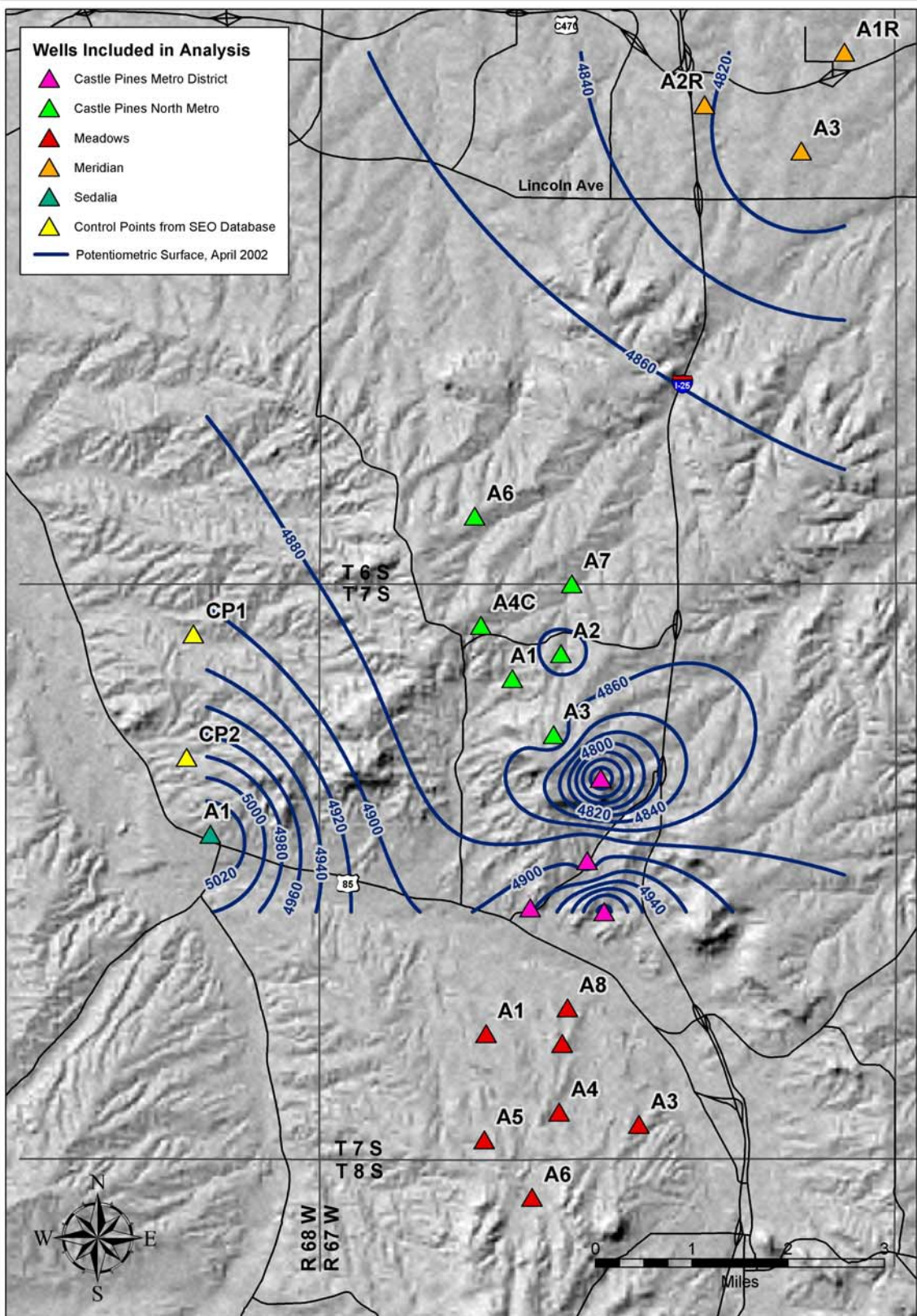
**A6**  
 Transmissivity gpd/ft = 2,583

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**Total Aquifer Thickness  
 Compared with  
 Saturated Sand Thickness**

- Wells Included in Analysis**
- ▲ Castle Pines Metro District
  - ▲ Castle Pines North Metro
  - ▲ Meadows
  - ▲ Meridian
  - ▲ Sedalia
  - ▲ Control Points from SEO Database
  - Potentiometric Surface, April 2002










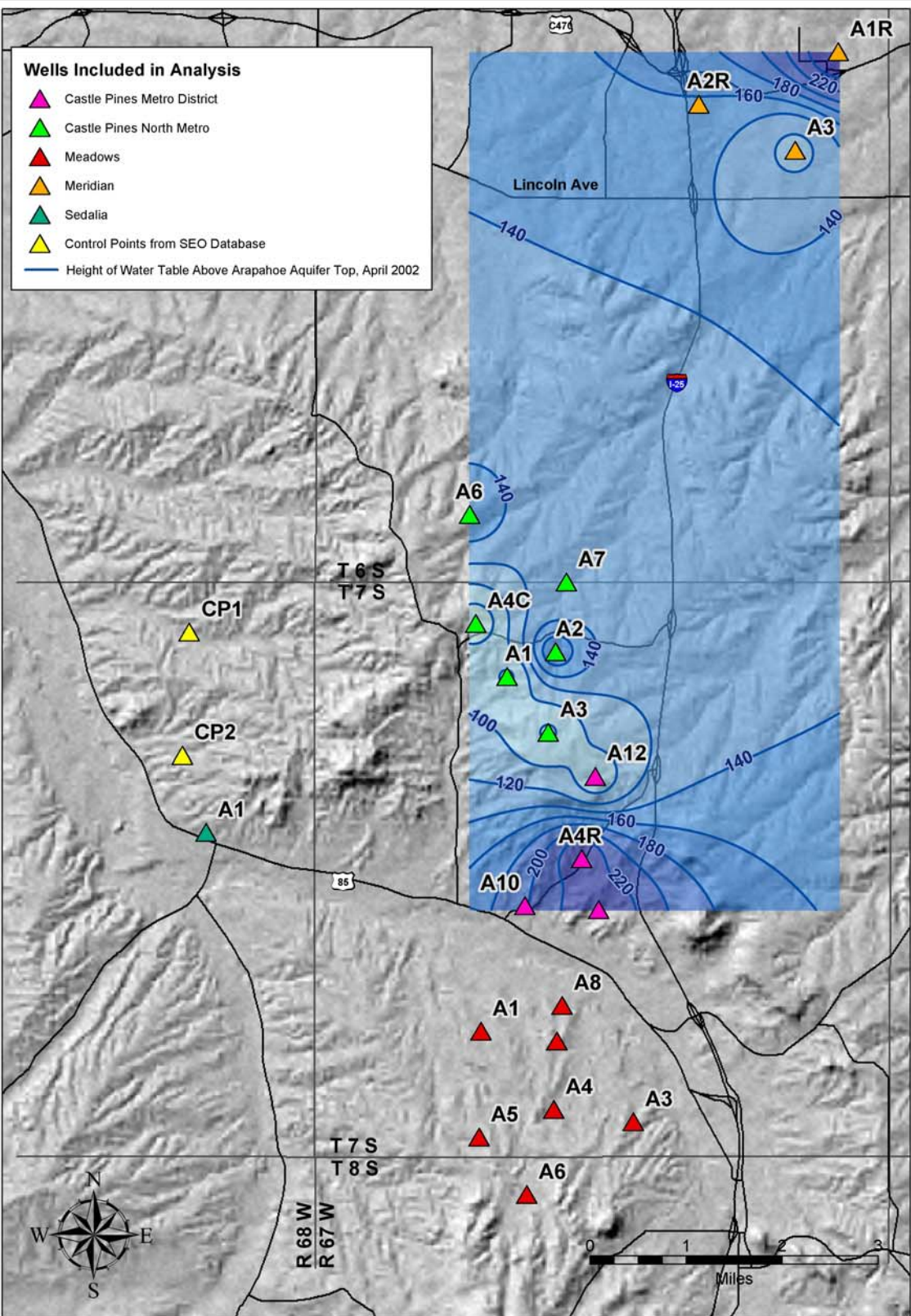
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## Arapahoe Aquifer Potentiometric Surface, April 2002

**Wells Included in Analysis**

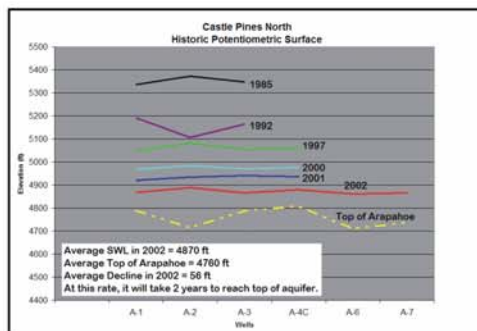
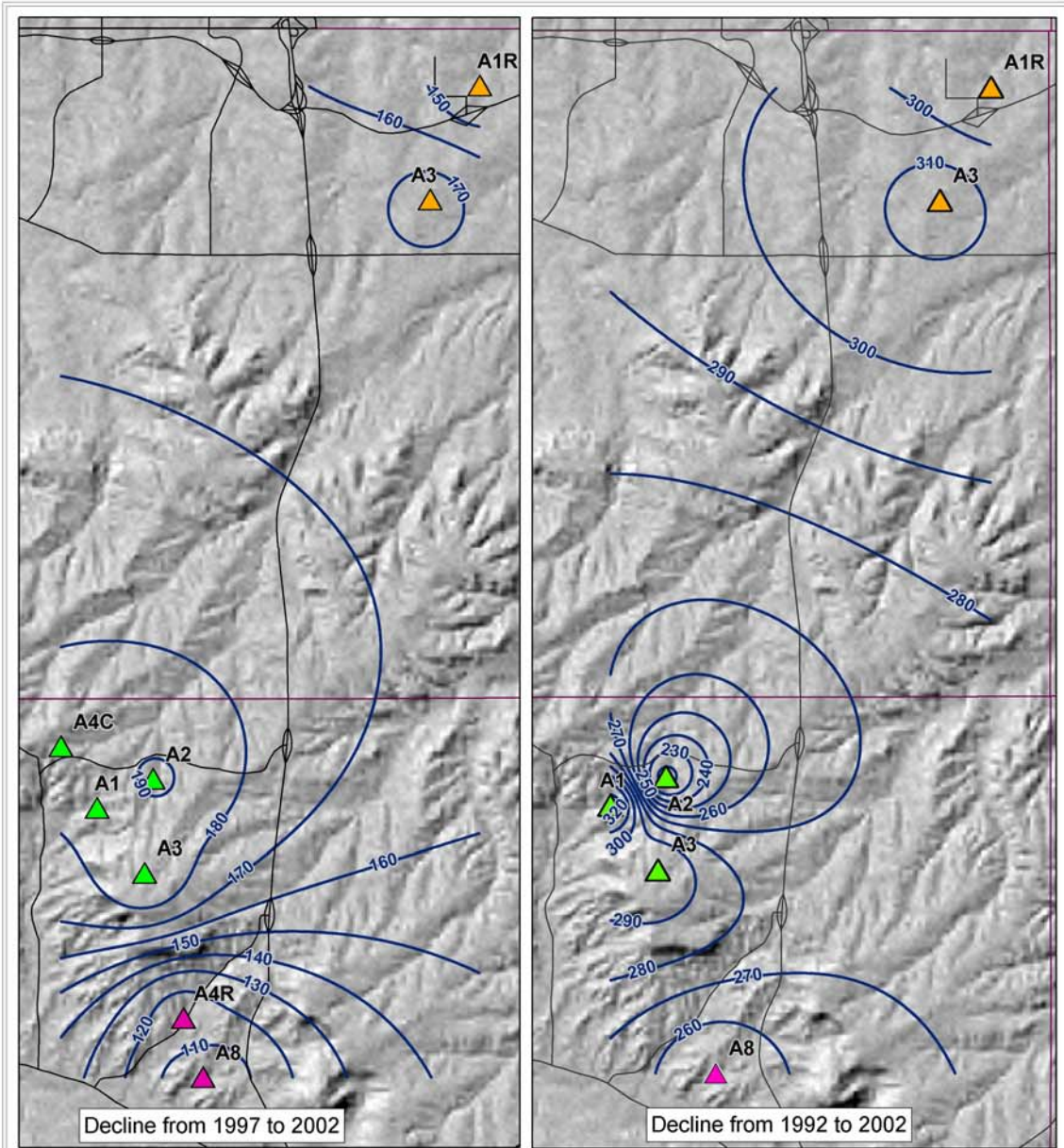
-  Castle Pines Metro District
-  Castle Pines North Metro
-  Meadows
-  Meridian
-  Sedalia
-  Control Points from SEO Database
-  Height of Water Table Above Arapahoe Aquifer Top, April 2002



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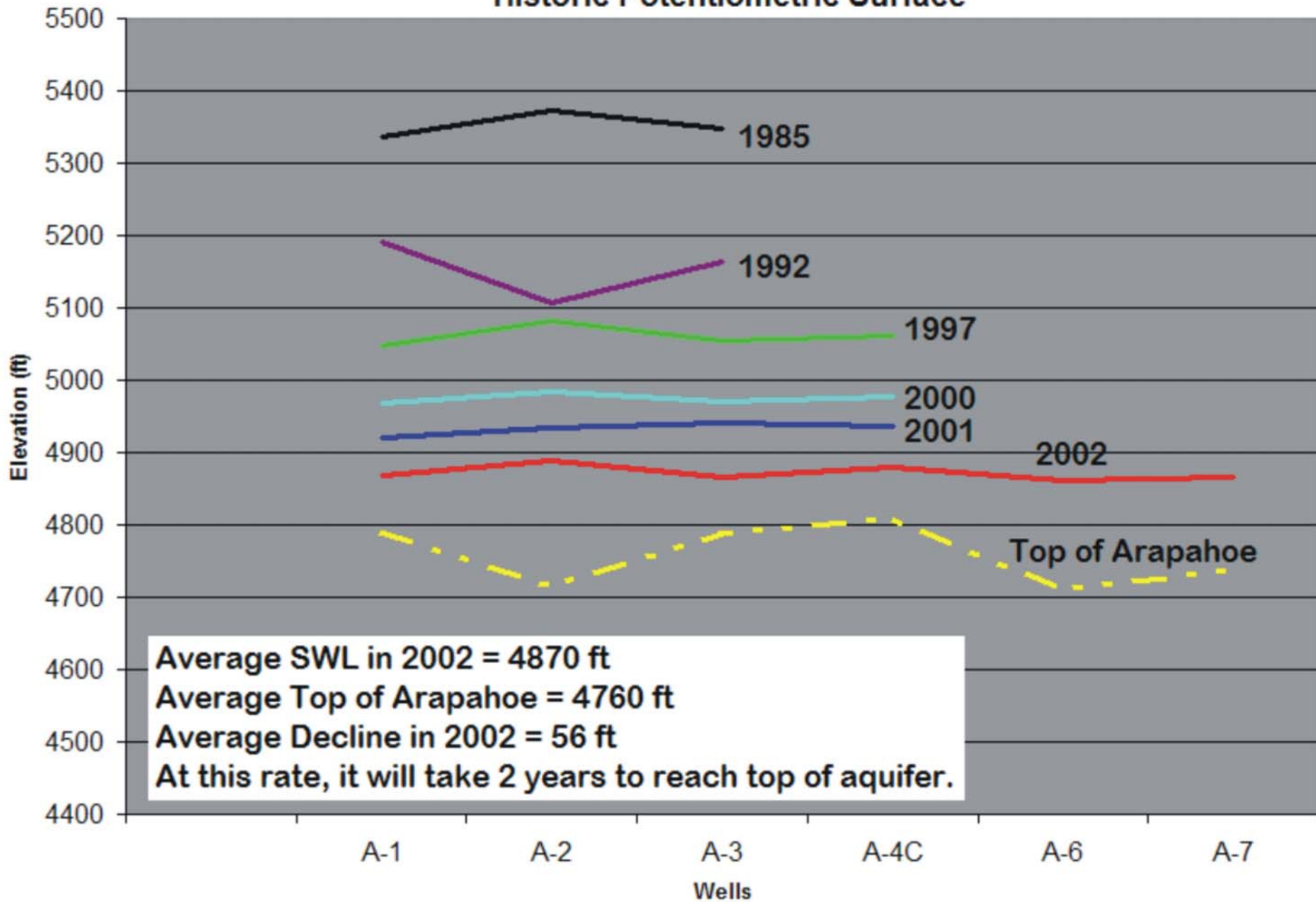
## Height of Potentiometric Surface Above Arapahoe Aquifer Top Iso-Contours



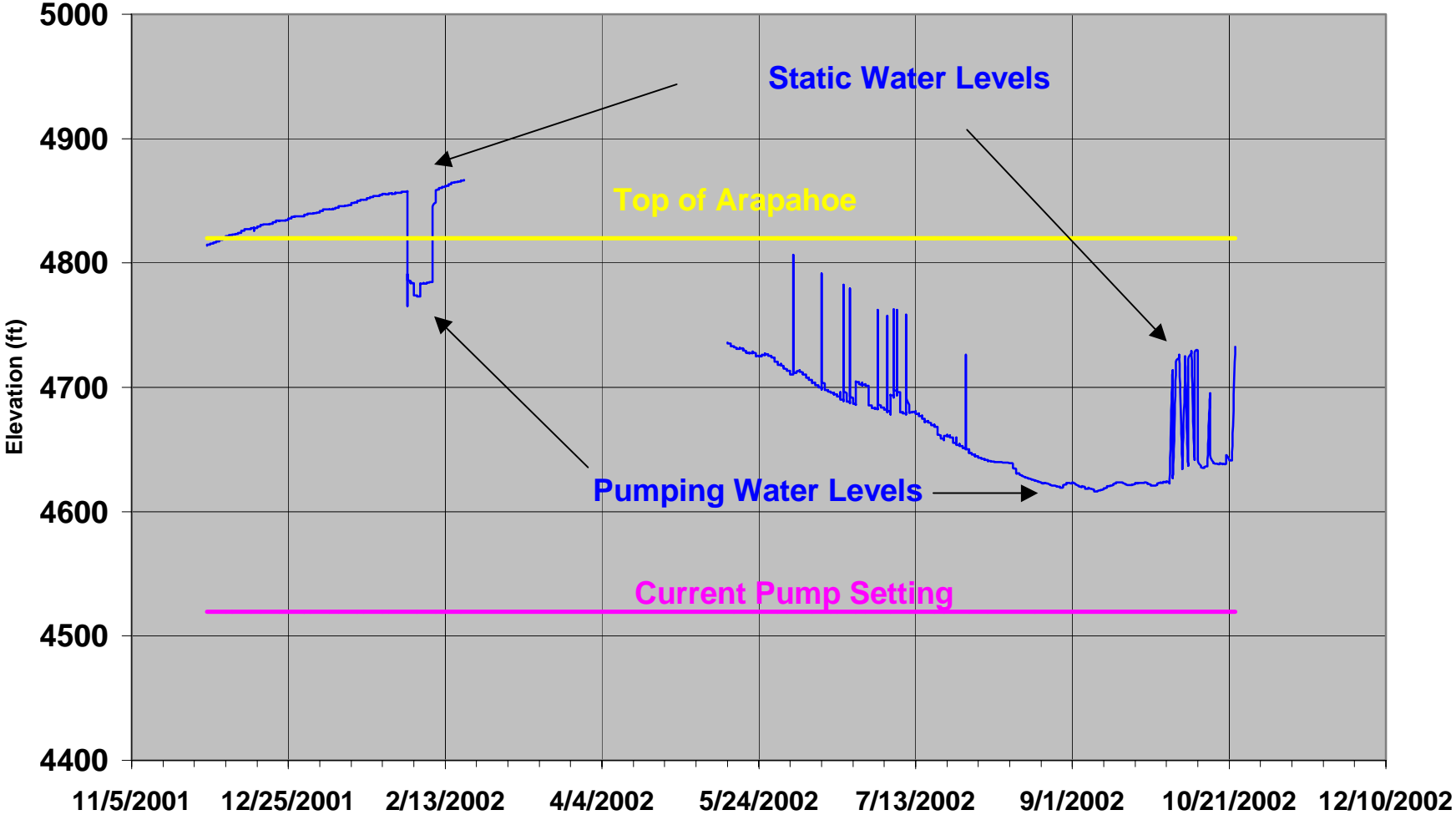
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## Decline of Potentiometric Surface Over Five Years and Ten Years

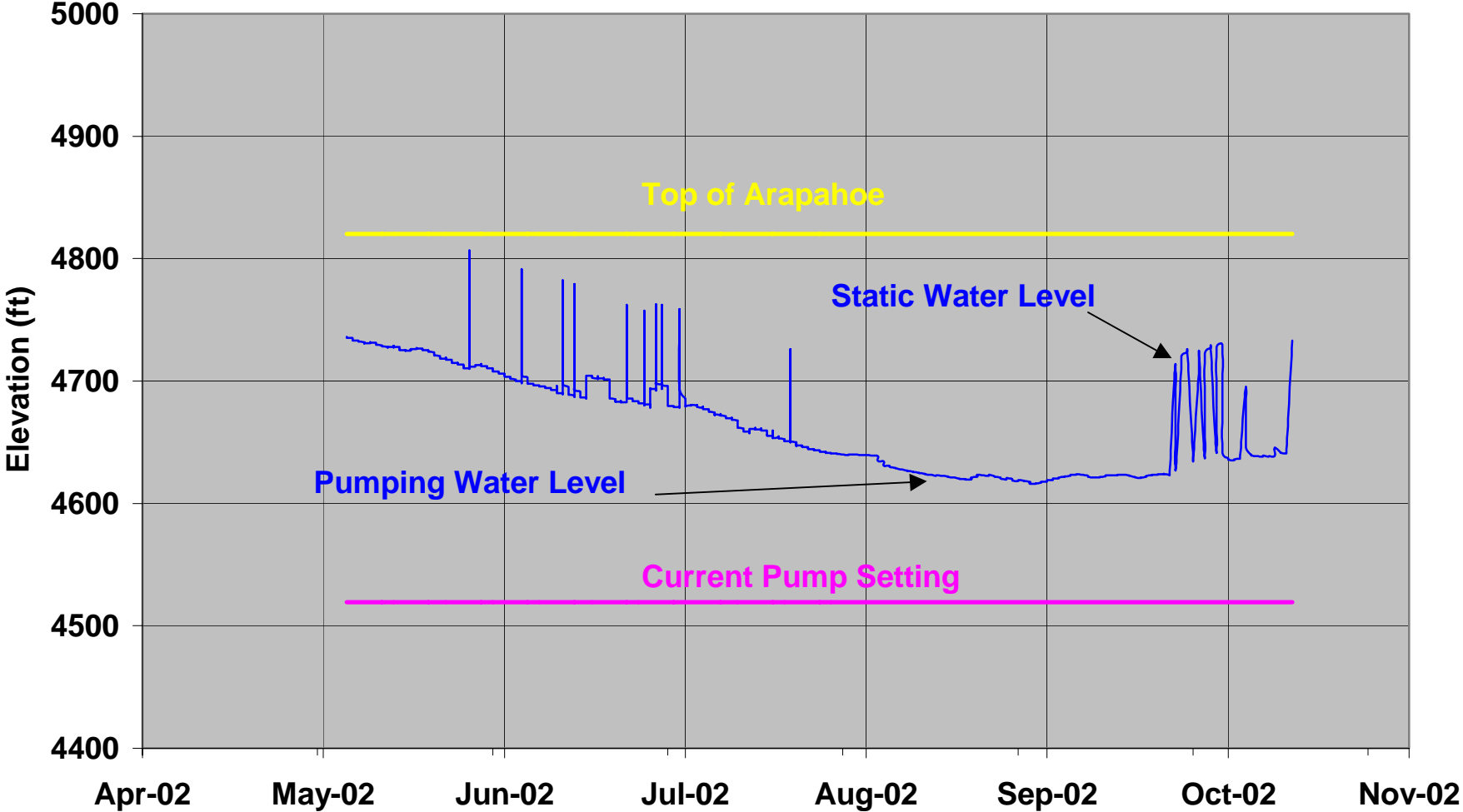
# Castle Pines North Historic Potentiometric Surface



# Castle Pines North Metro District Well A7 Water Levels



# Castle Pines North Metro District Well A7 2002 Pumping Season



# Pumping Test Comparisons

- First 24 hour pump test
- April 2001 (1100 gpm)
- Transmissivity 14,945 g/d/ft
- Specific Capacity 6.25 g/m/ftdd
- Second 24 hour test
- October 2002 (700 gpm)
- Transmissivity 6,114 g/d/ft
- Specific Capacity 7.25 g/m/ftdd

# Well A-7

- Specific Capacity indicates flow to well is still maintained
- Upper Sands are in a leaky condition
- Production rate is currently maintained
- Well is efficient

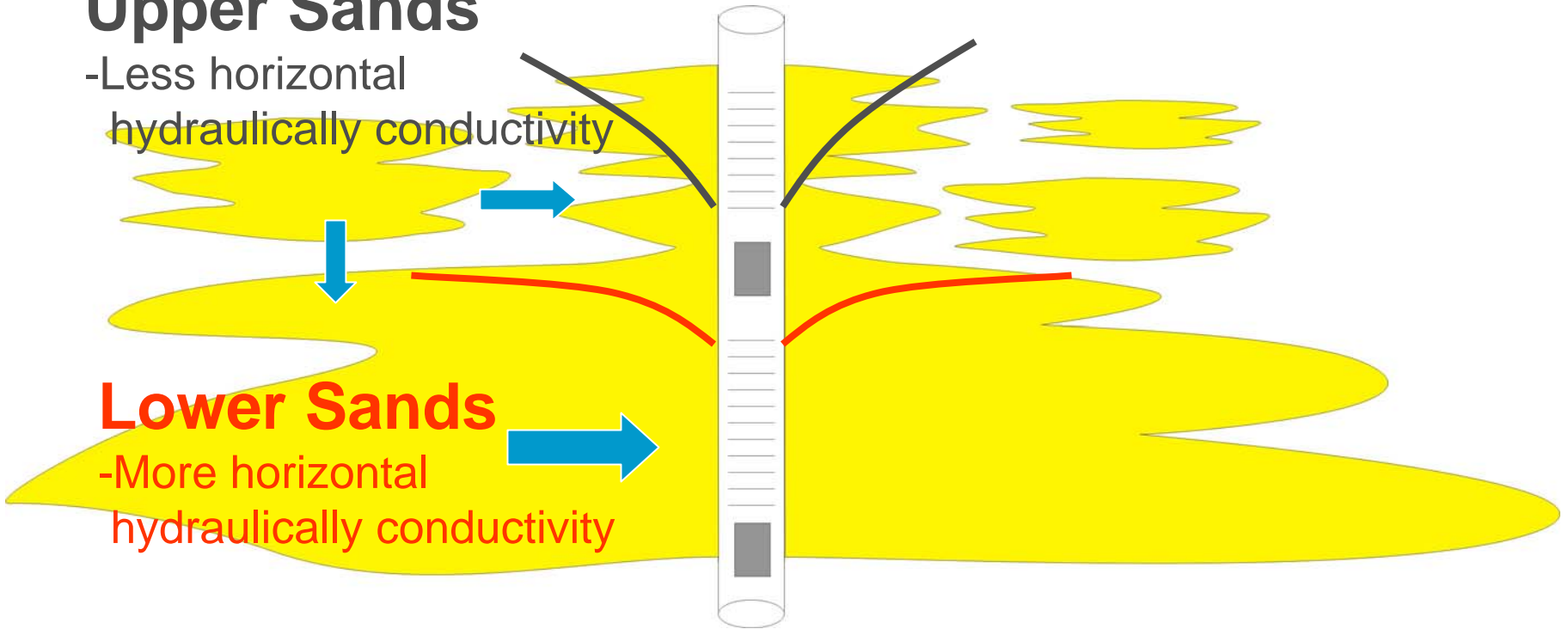
# QUESTION

- Why are some Arapahoe wells more productive than others in the same area?
  - More sand thickness?
  - Coarser sands?
  - More porosity (primary or secondary)?
  - More hydraulically connected???

The Upper Sands have a  
-Lower T and Spec. Capacity  
-Thus, a steeper cone of depression

## Upper Sands

-Less horizontal  
hydraulically conductivity



## Lower Sands

-More horizontal  
hydraulically conductivity

The Lower Sands have a  
-Higher T and Spec. Capacity  
-Thus, a gentle cone of depression