

**EDWARD'S AQUIFER
GROUND-WATER
FLOW MODEL**

SAF MEETING

March 02, 2004

PRESENTATION

- HYDRAULIC PROPERTIES
 - Hydraulic Conductivity
 - Storativity
- TRANSIENT SIMULATION RESULTS
- SENSITIVITY ANALYSIS

HYDRAULIC PROPERTIES

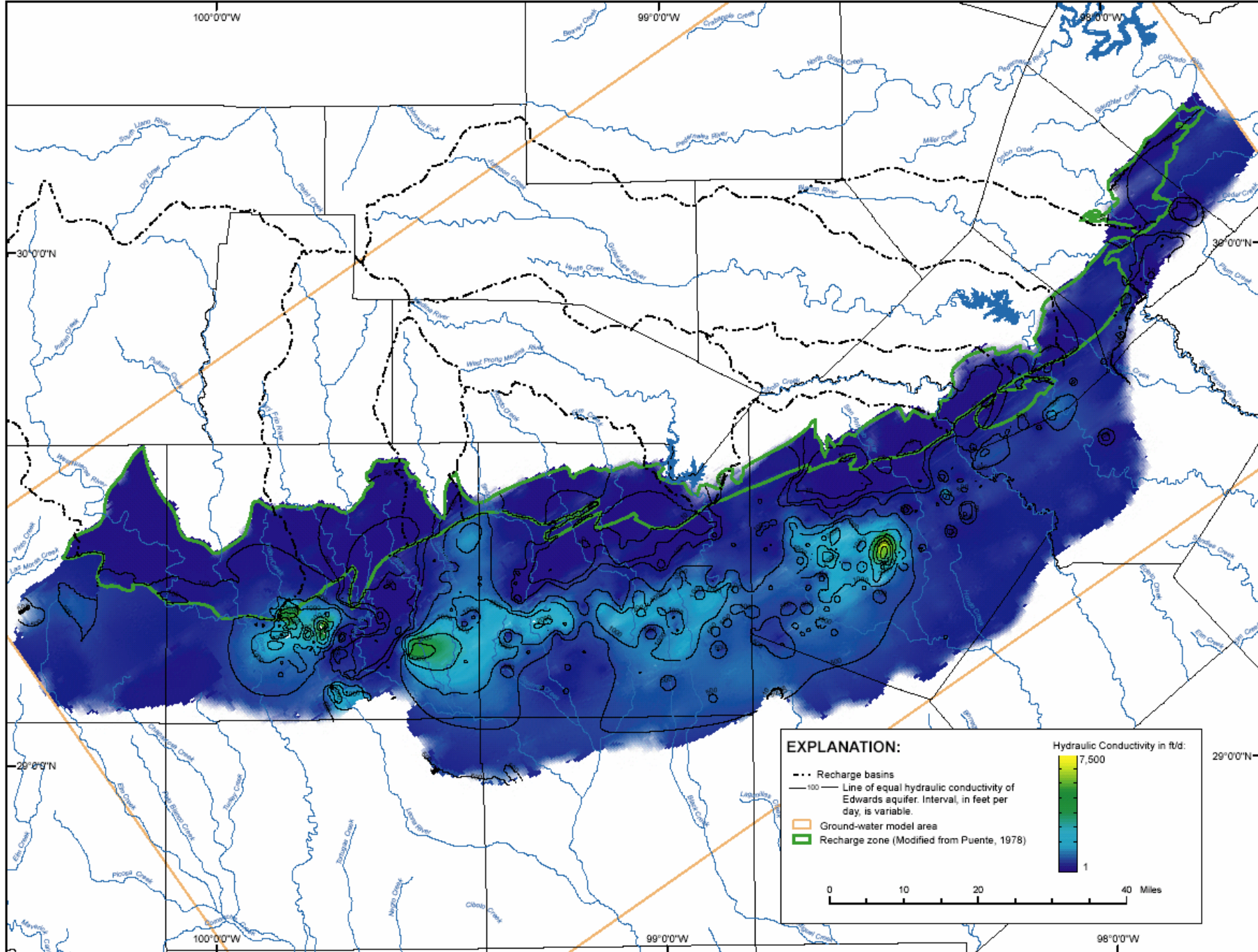


Figure 8. Horizontal hydraulic conductivity distribution for Edwards aquifer (from Painter and others, 2002; Revision 3 distribution).

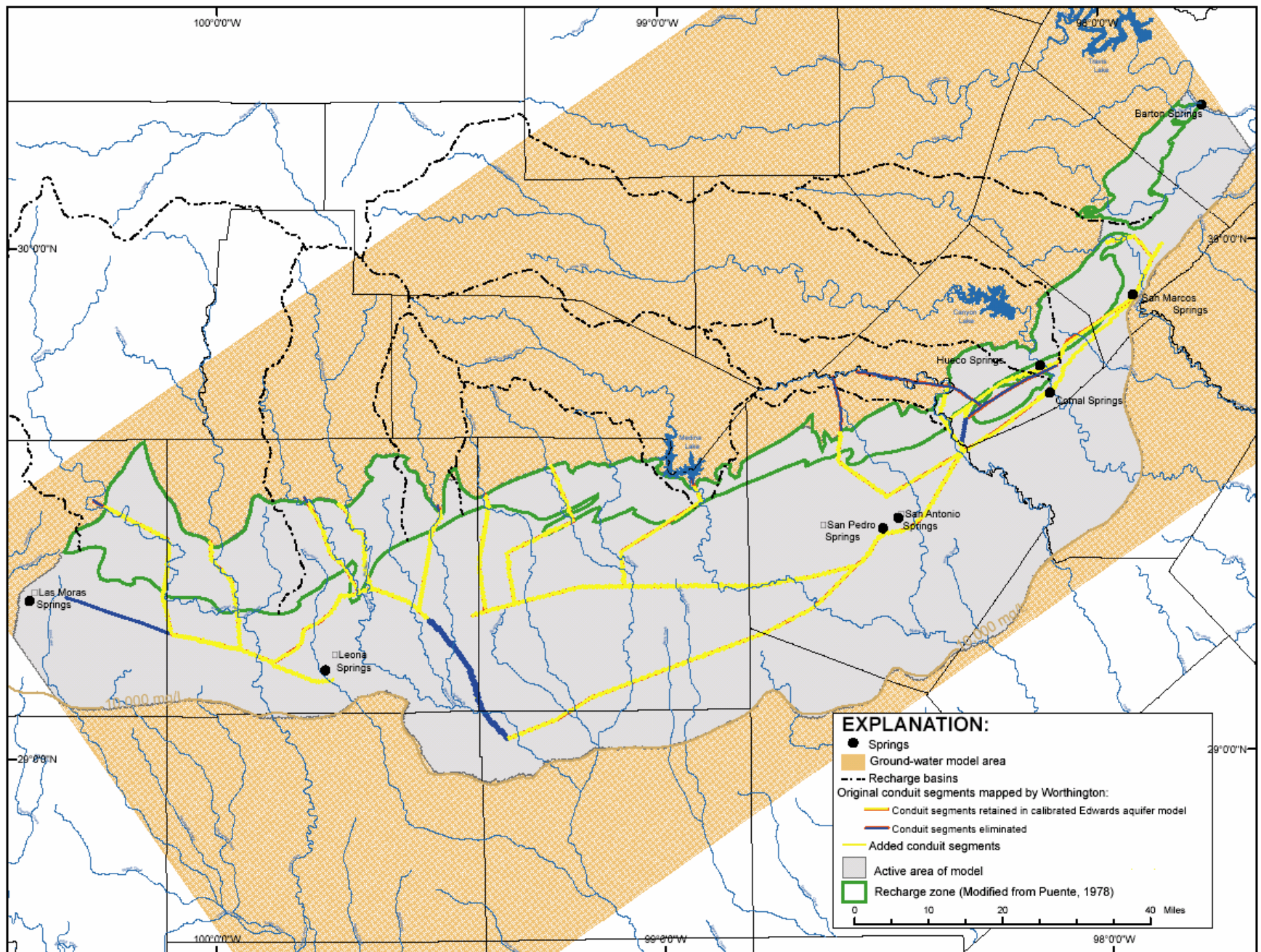


Figure 7. Locations of conduits and conduit revisions.

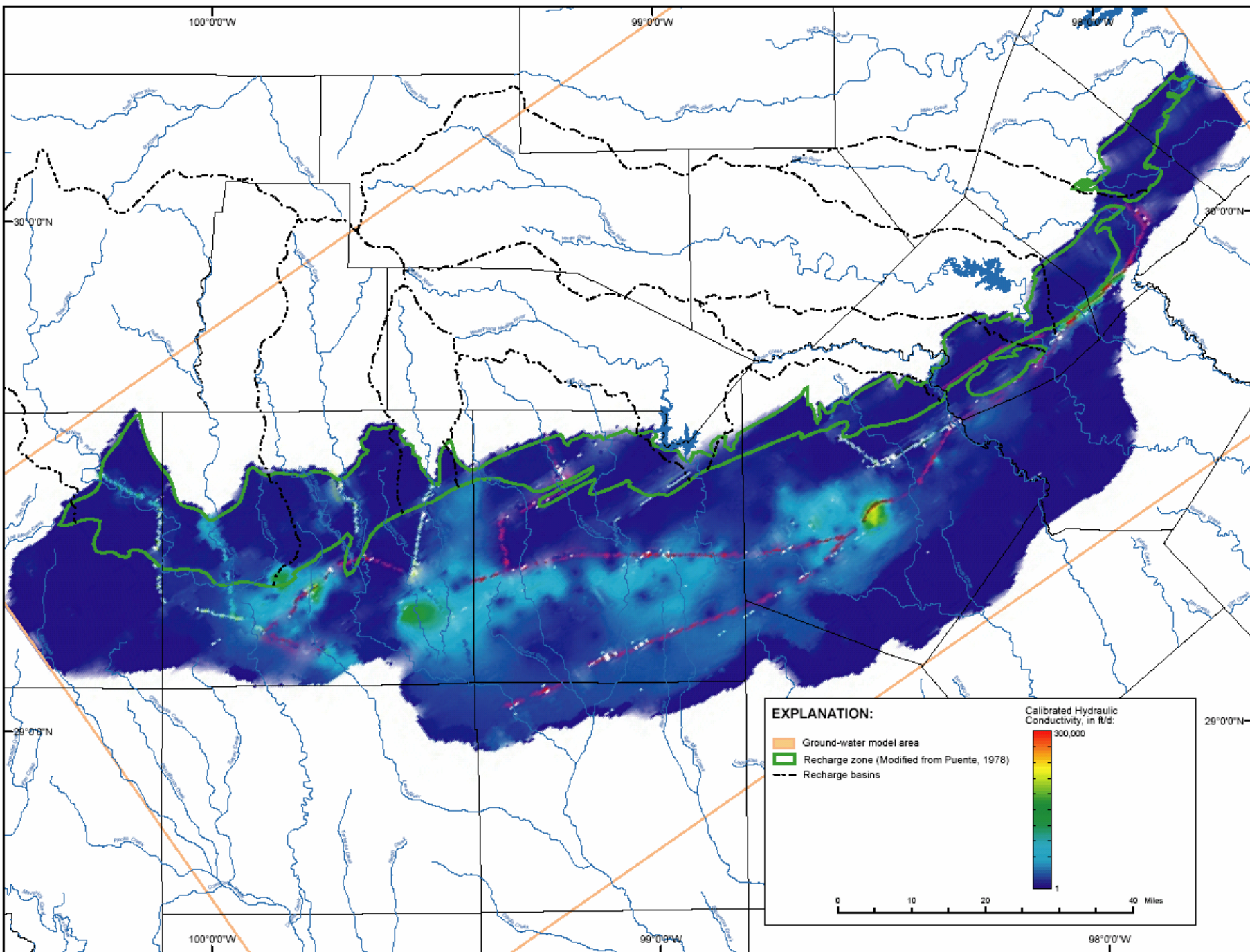


Figure 24. Simulated horizontal hydraulic conductivity distribution for calibrated ground-water-flow model.

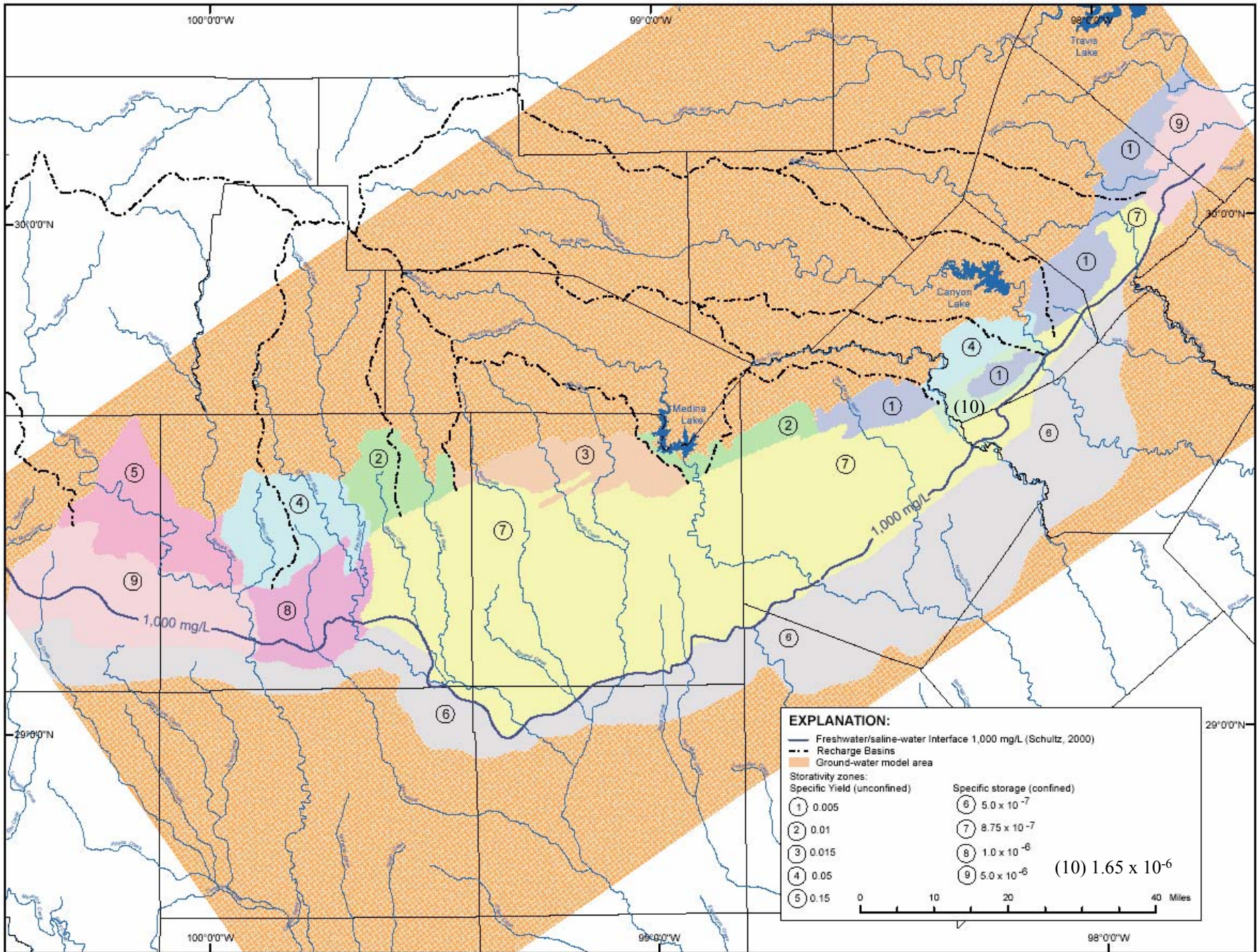


Figure 23. Simulated storativity zones for calibrated ground-water-flow model.

TRANSIENT SIMULATION

- Calibration Period: 1947-1990
- Verification Period: 1991-2000
 - required some modifications because simulated hydraulic heads in recharge zone were above land surface near some streams for some months with very high recharge
 - highest recharge during calibration period: 2,003,630 acre-ft in 1987
 - highest recharge during verification period: 2,485,693 acre-ft in 1992

TRANSIENT SIMULATION RESULTS

Water-Level Hydrographs

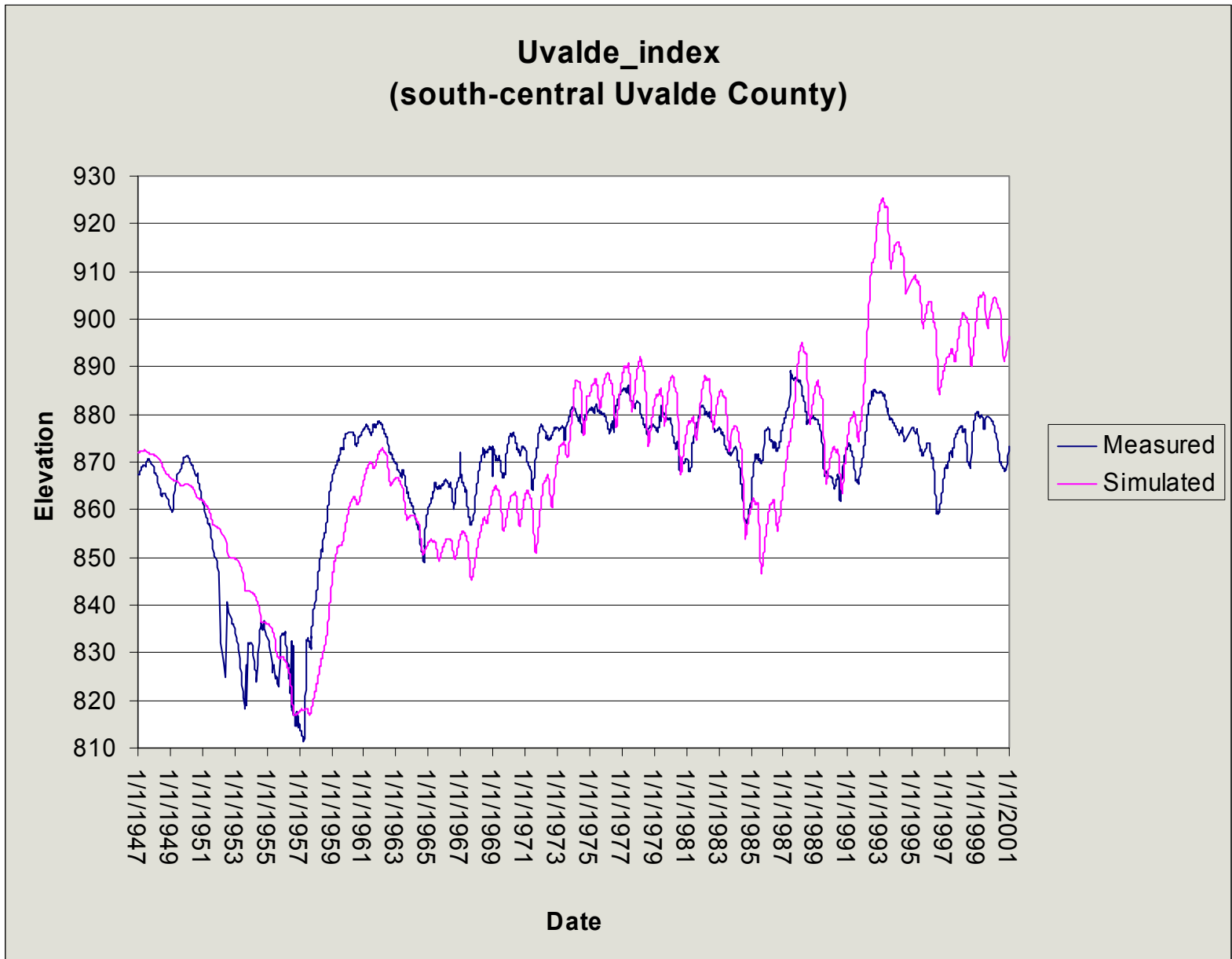


Figure 15a. Measured and simulated hydraulic heads for wells in Uvalde and Medina Counties

Uvalde_6945401
(east-central Uvalde County)

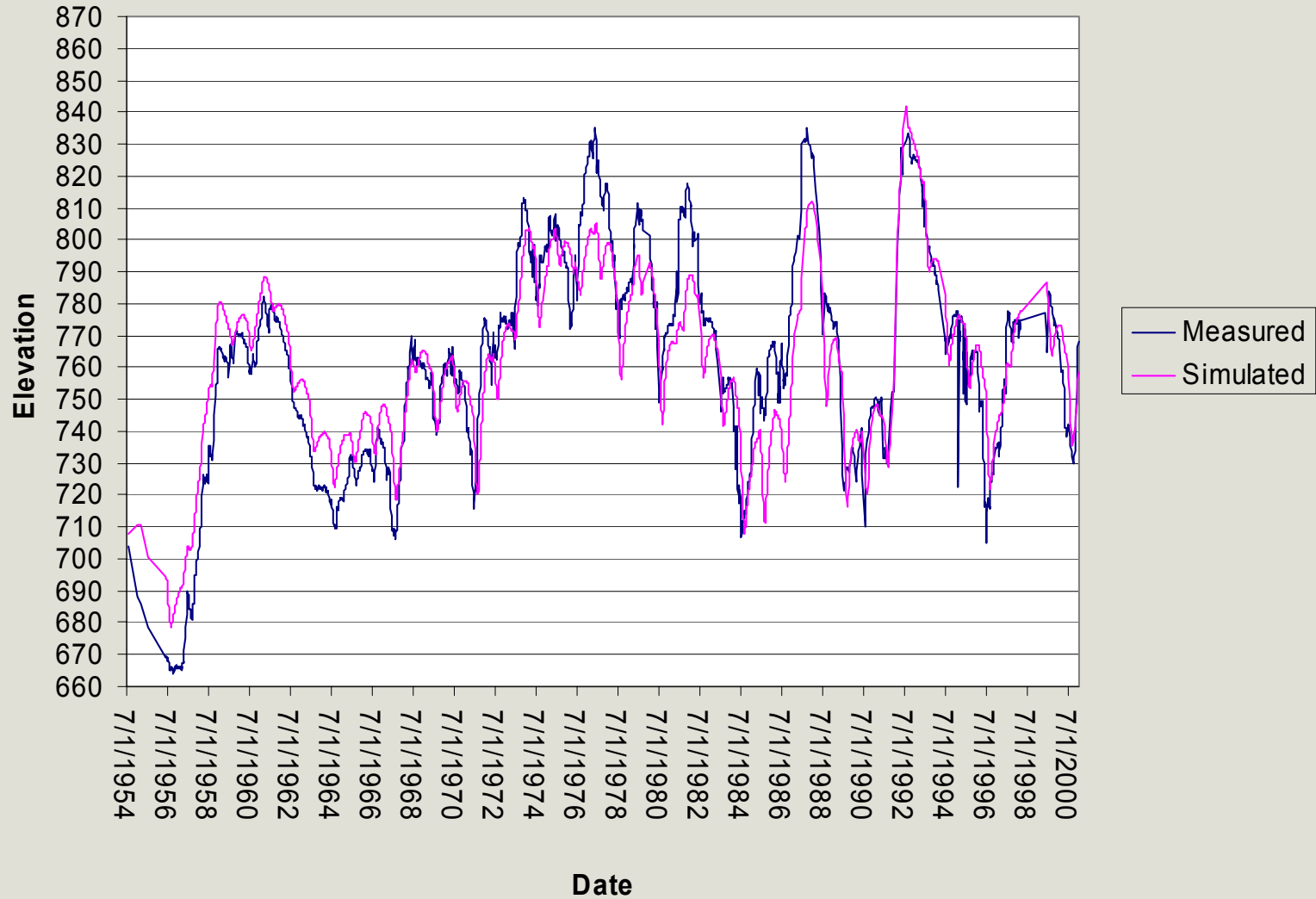


Figure 15b. Measured and simulated hydraulic heads for wells in Uvalde and Medina Counties

Medina_6946701 (southwest Medina County)

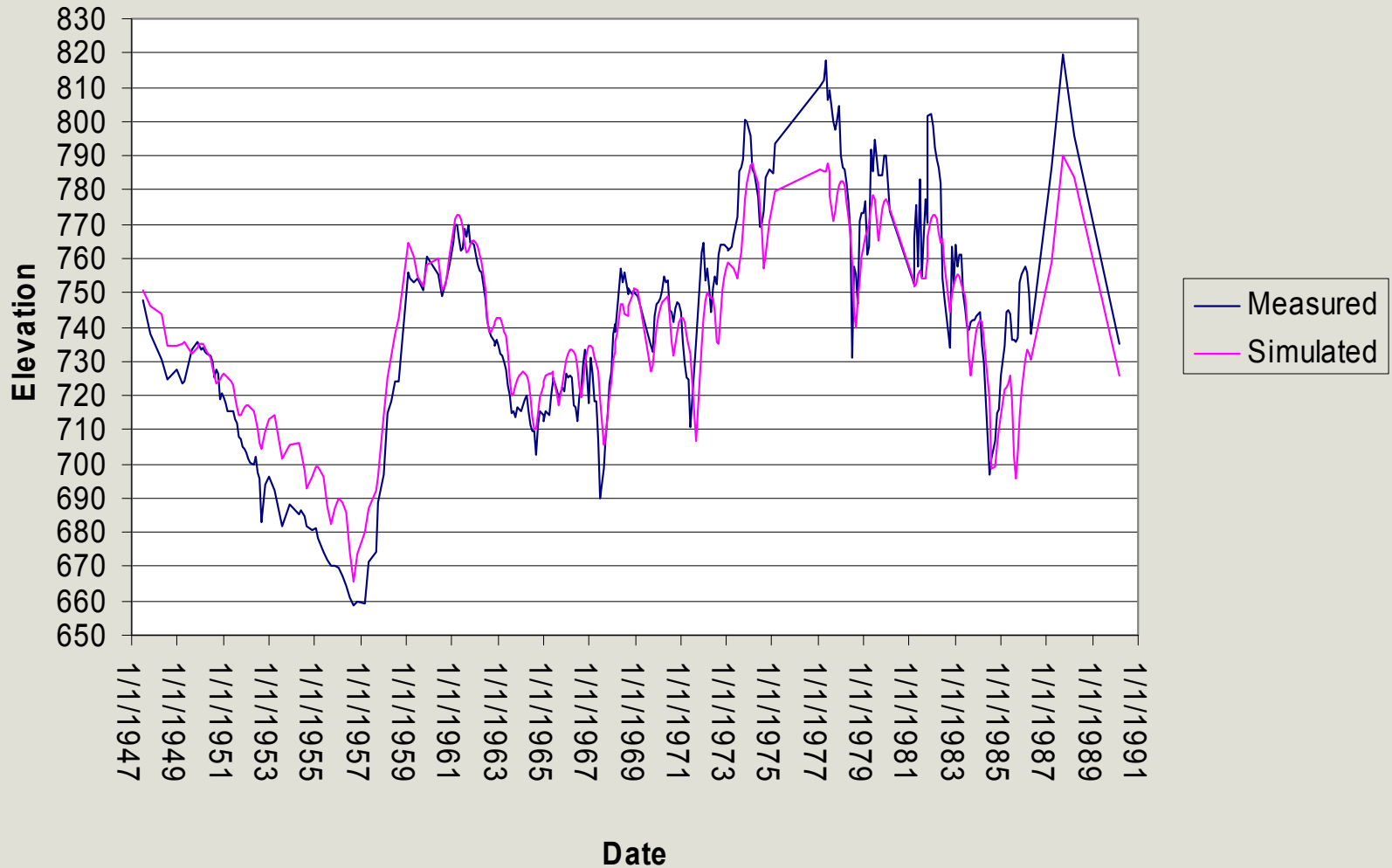


Figure 15c. Measured and simulated hydraulic heads for wells in Uvalde and Medina Counties

Medina_6841301
(east-central Medina County)

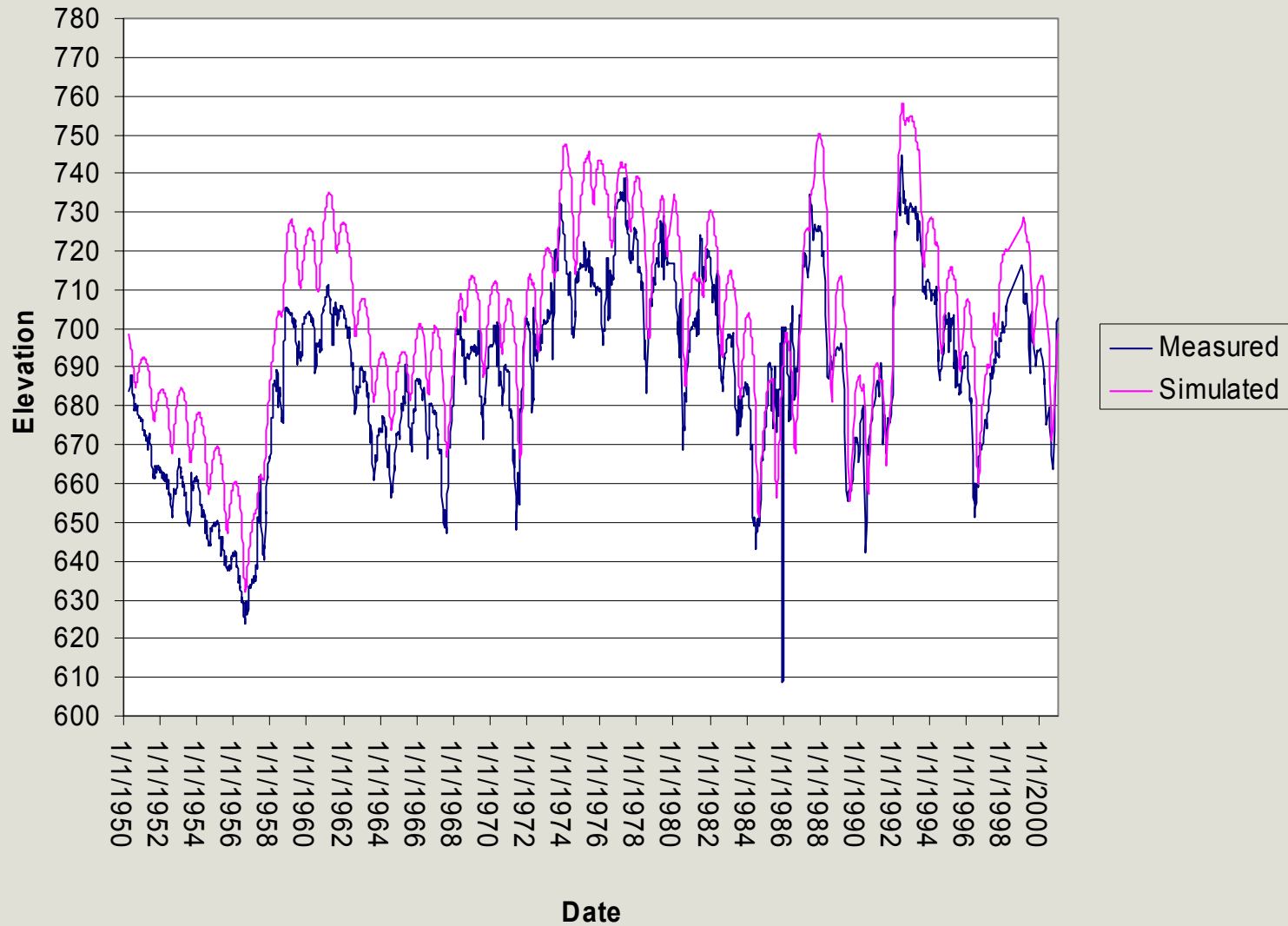


Figure 15d. Measured and simulated hydraulic heads for wells in Uvalde and Medina Counties

Bexar_index (central Bexar County)

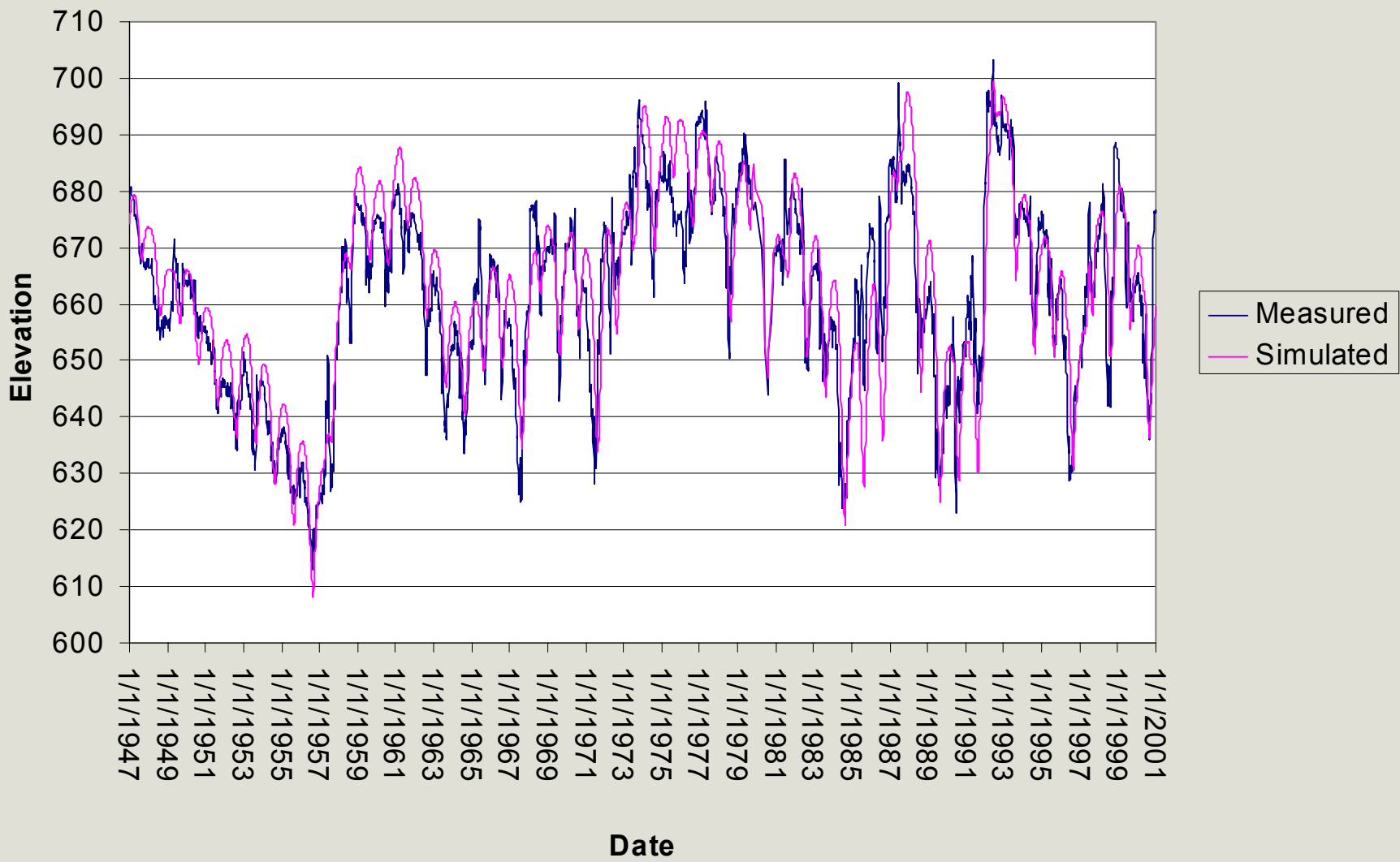


Figure 16a. Measured and simulated hydraulic heads for wells in Bexar County

Bexar_6845102 (south-central Bexar County)

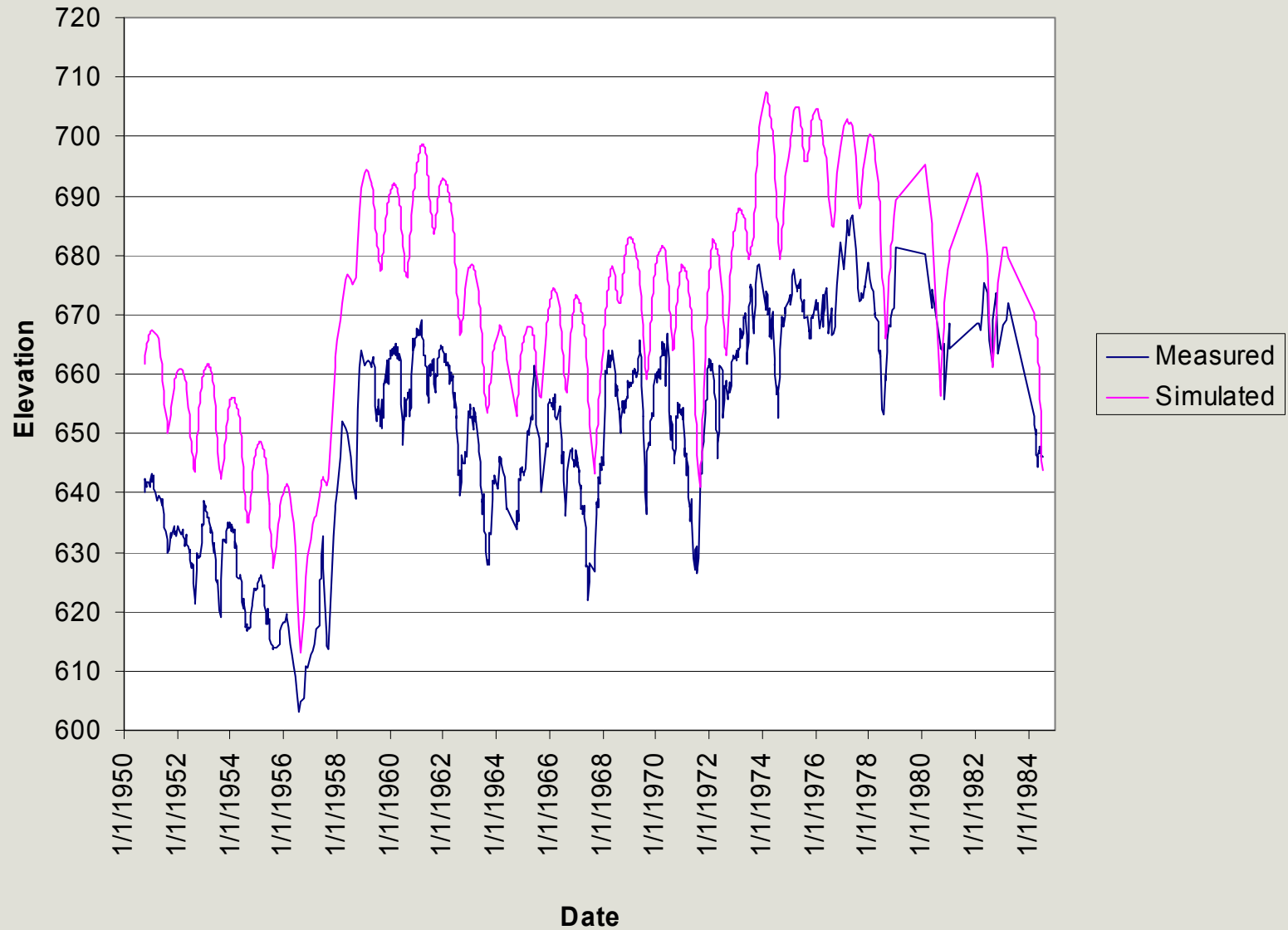


Figure 16b. Measured and simulated hydraulic heads for wells in Bexar County

Bexar_6830211 (northeast Bexar County)

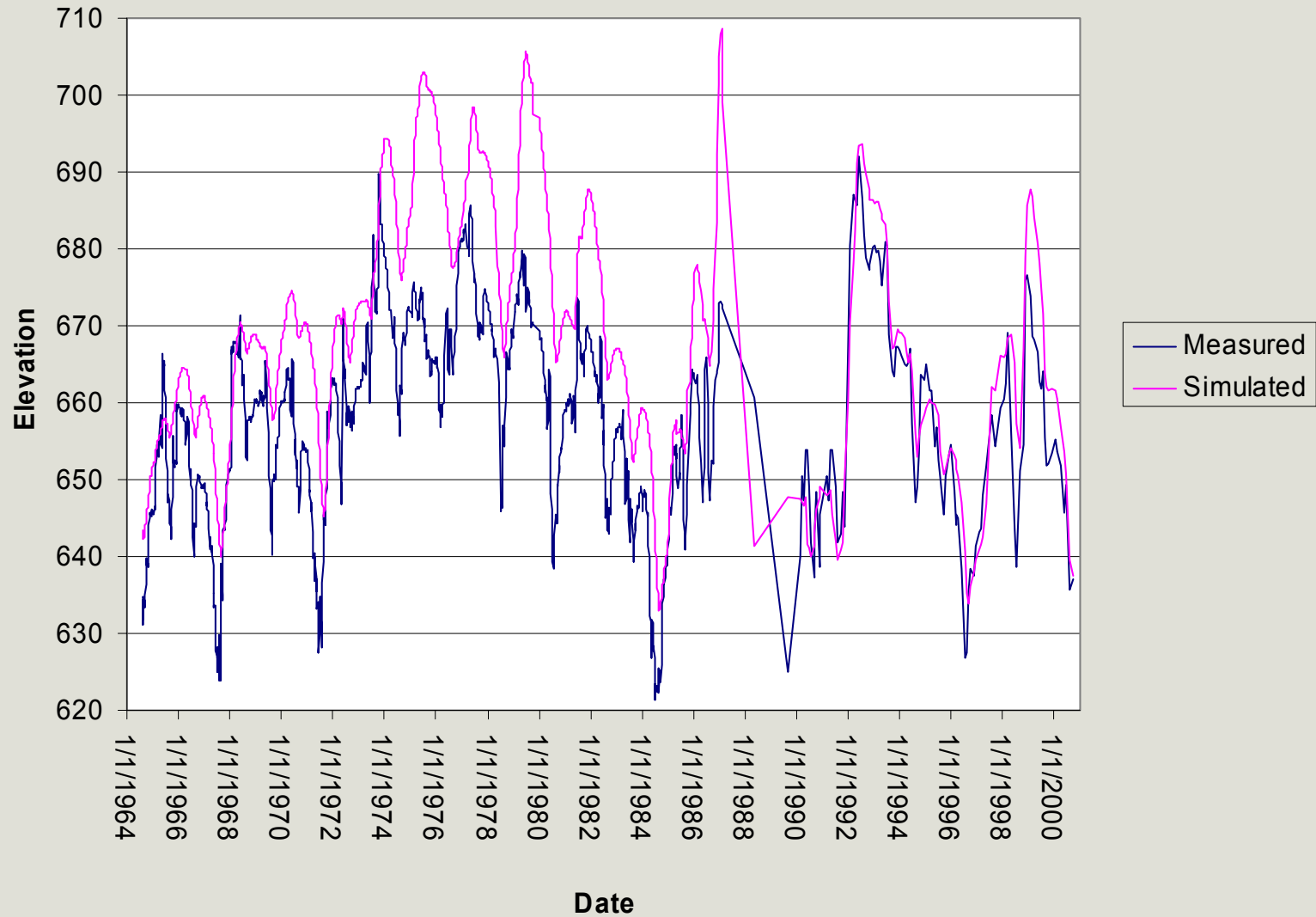


Figure 16c. Measured and simulated hydraulic heads for wells in Bexar County

Comal_6823701
(central Comal County)

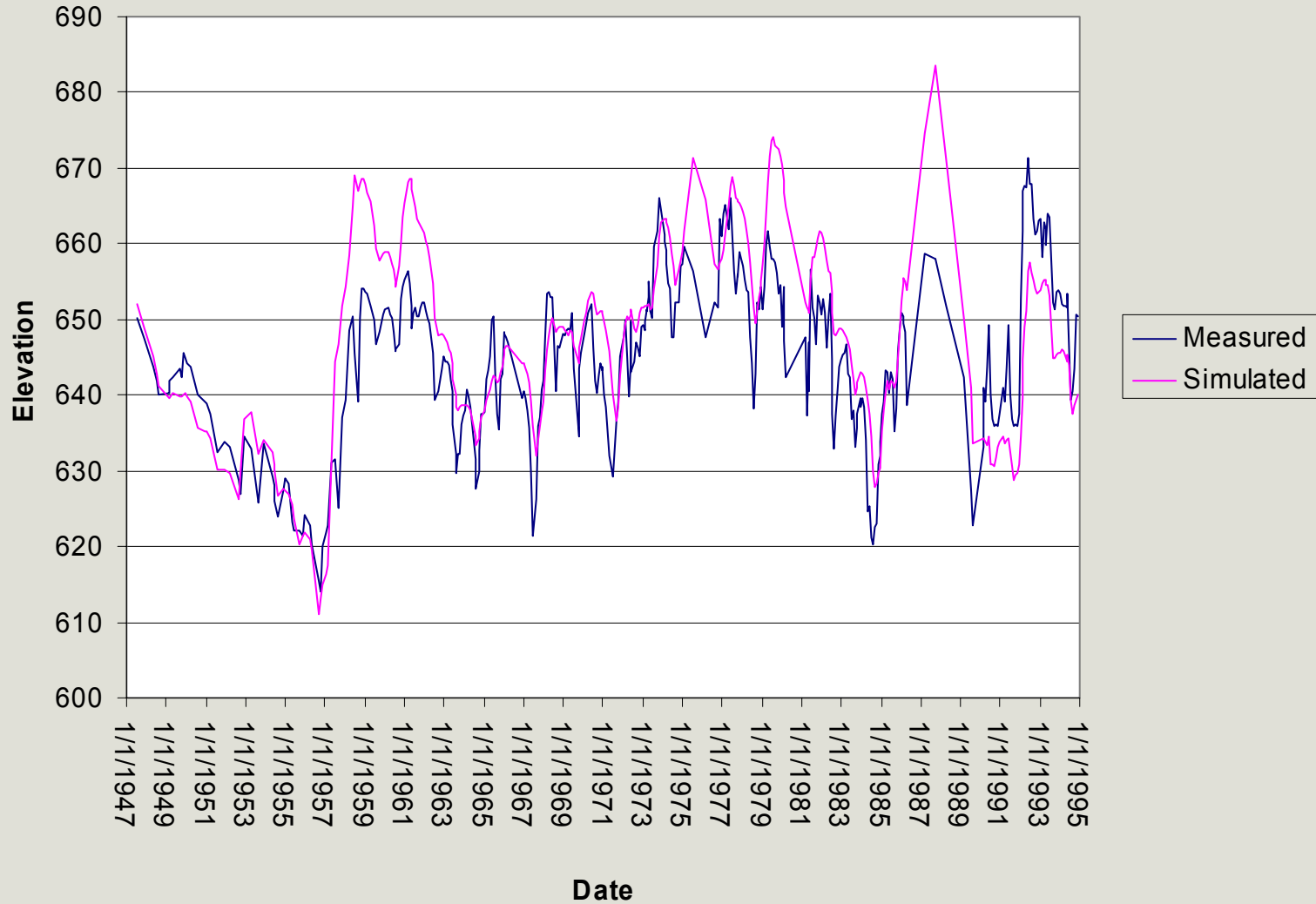


Figure 17a. Measured and simulated hydraulic heads for wells in Comal and Hays Counties

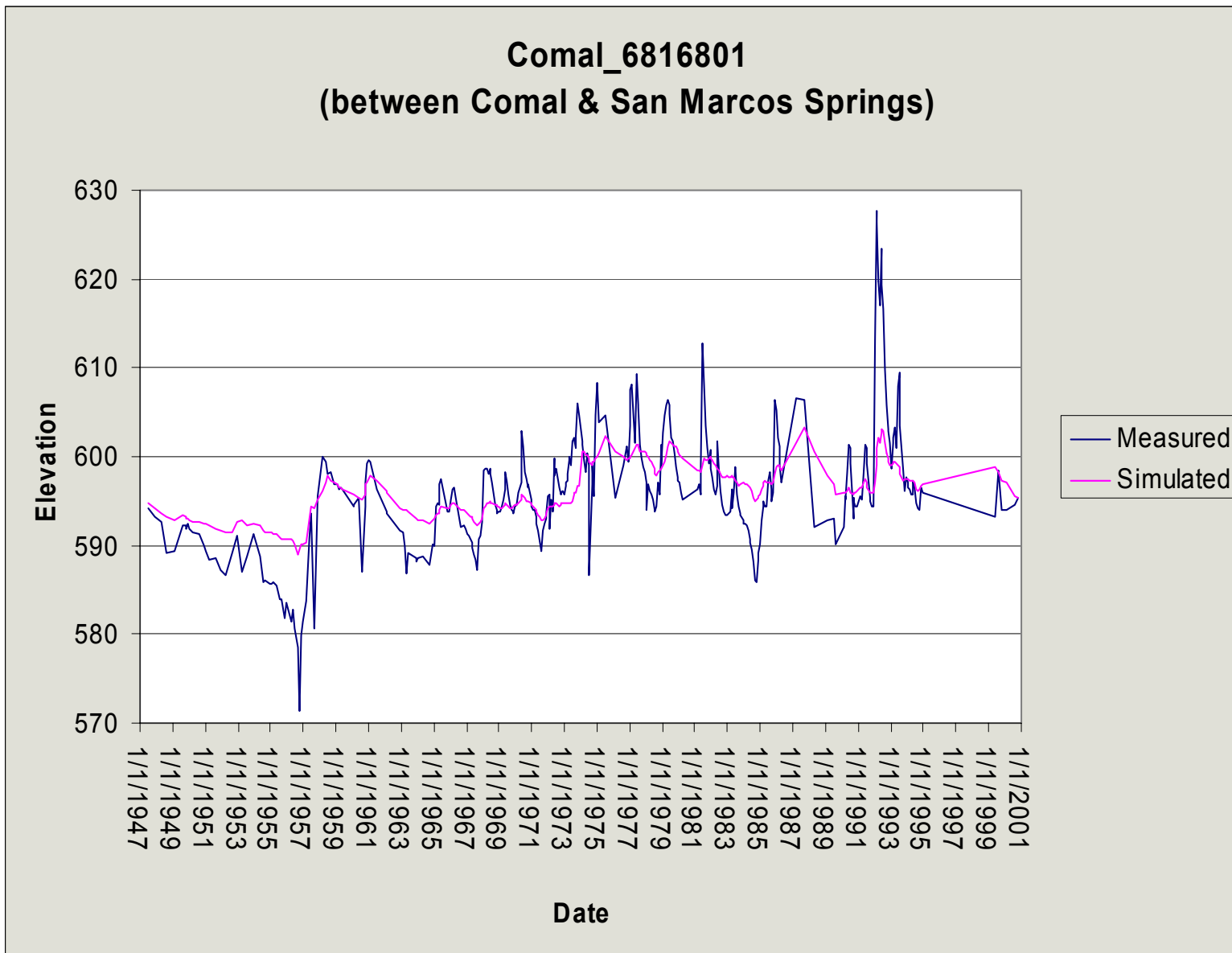


Figure 17b. Measured and simulated hydraulic heads for wells in Comal and Hays Counties

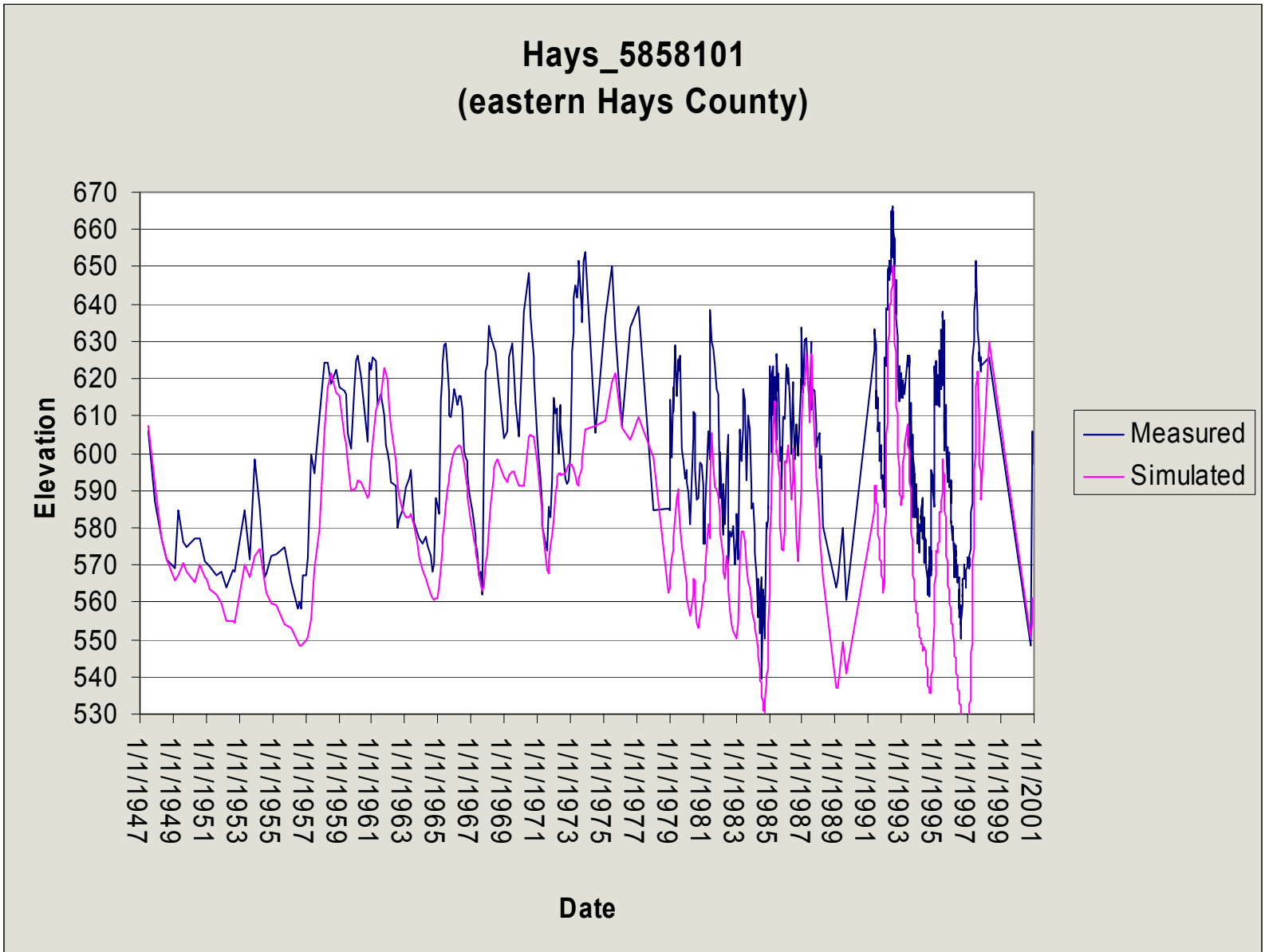


Figure 17c. Measured and simulated hydraulic heads for wells in Comal and Hays Counties

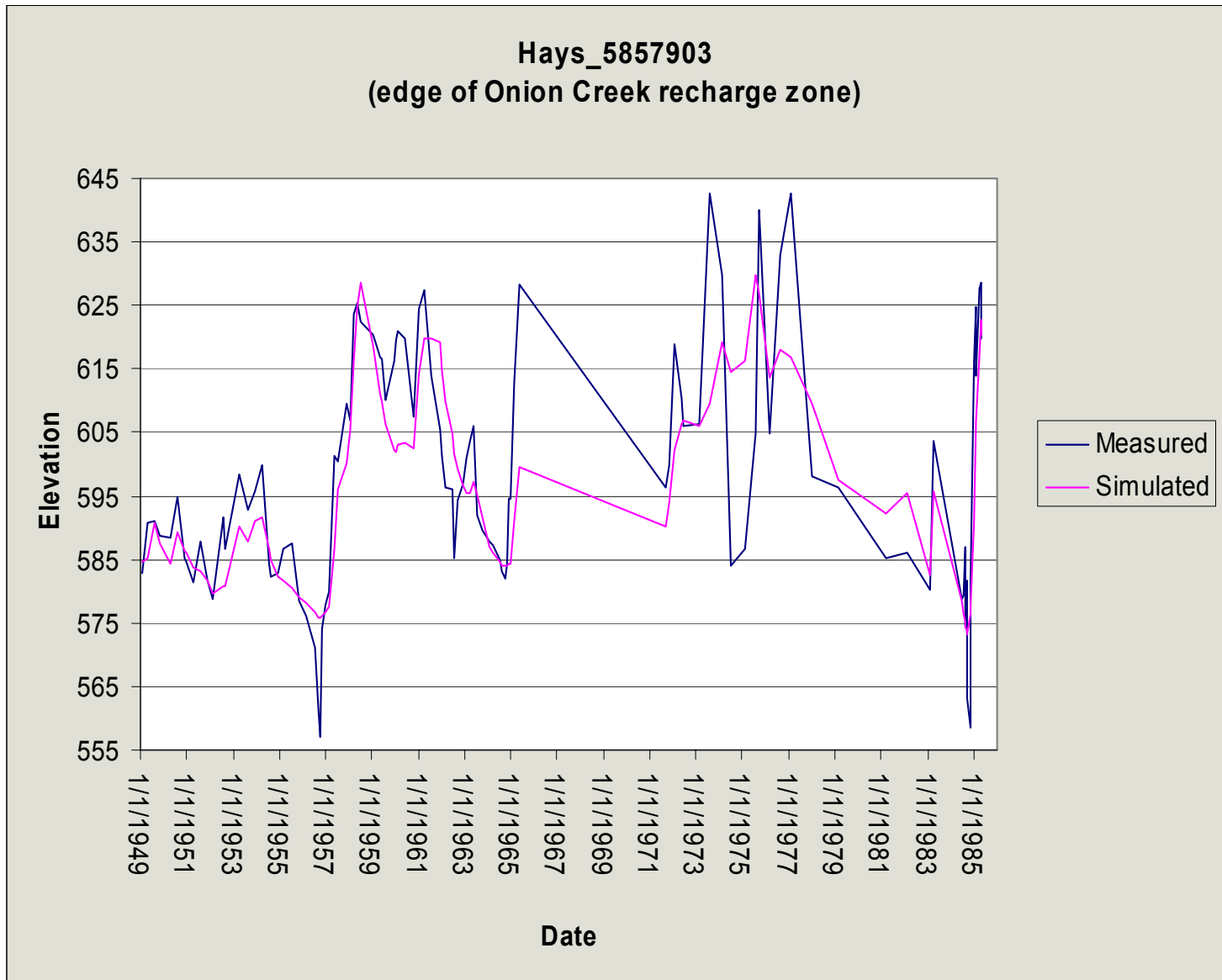


Figure 17d. Measured and simulated hydraulic heads for wells in Comal and Hays Counties

TRANSIENT SIMULATION RESULTS

Springflow Hydrographs

Comal Springs

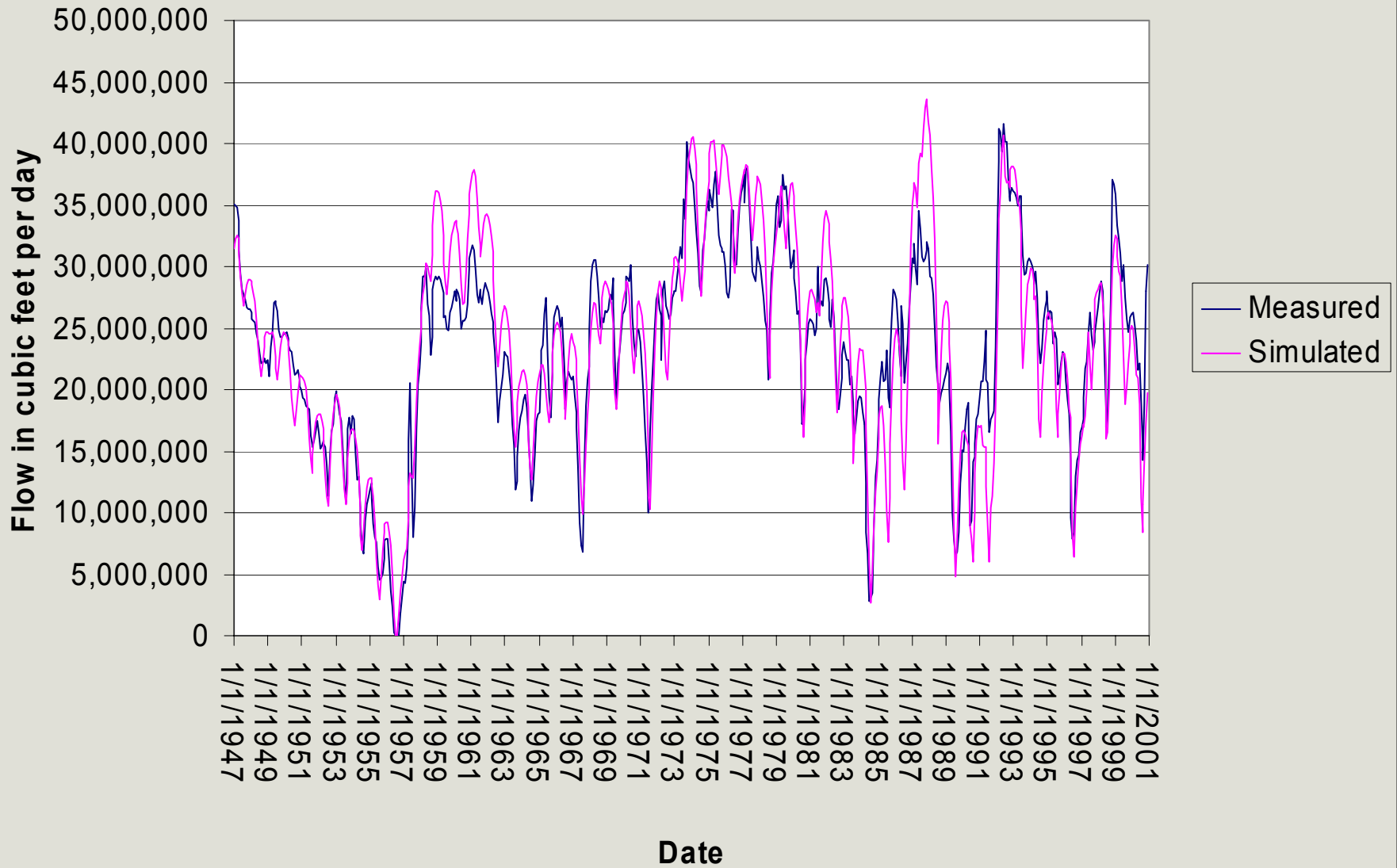


Figure 28a. Measured and simulated spring discharges for Comal and San Marcos Springs, 1947-2000

San Marcos Springs

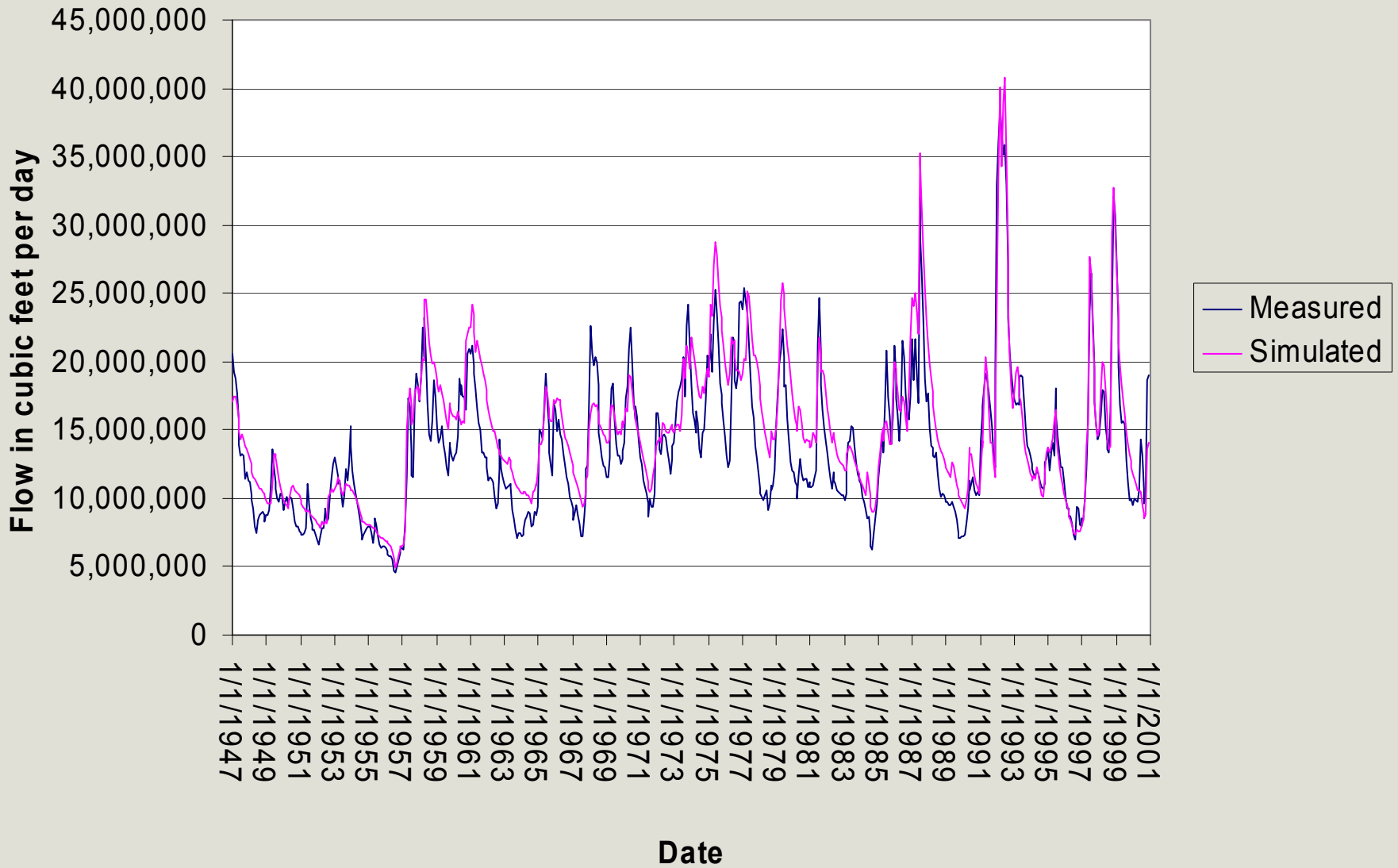


Figure 28b. Measured and simulated spring discharges for Comal and San Marcos Springs, 1947-2000

Leona Springs

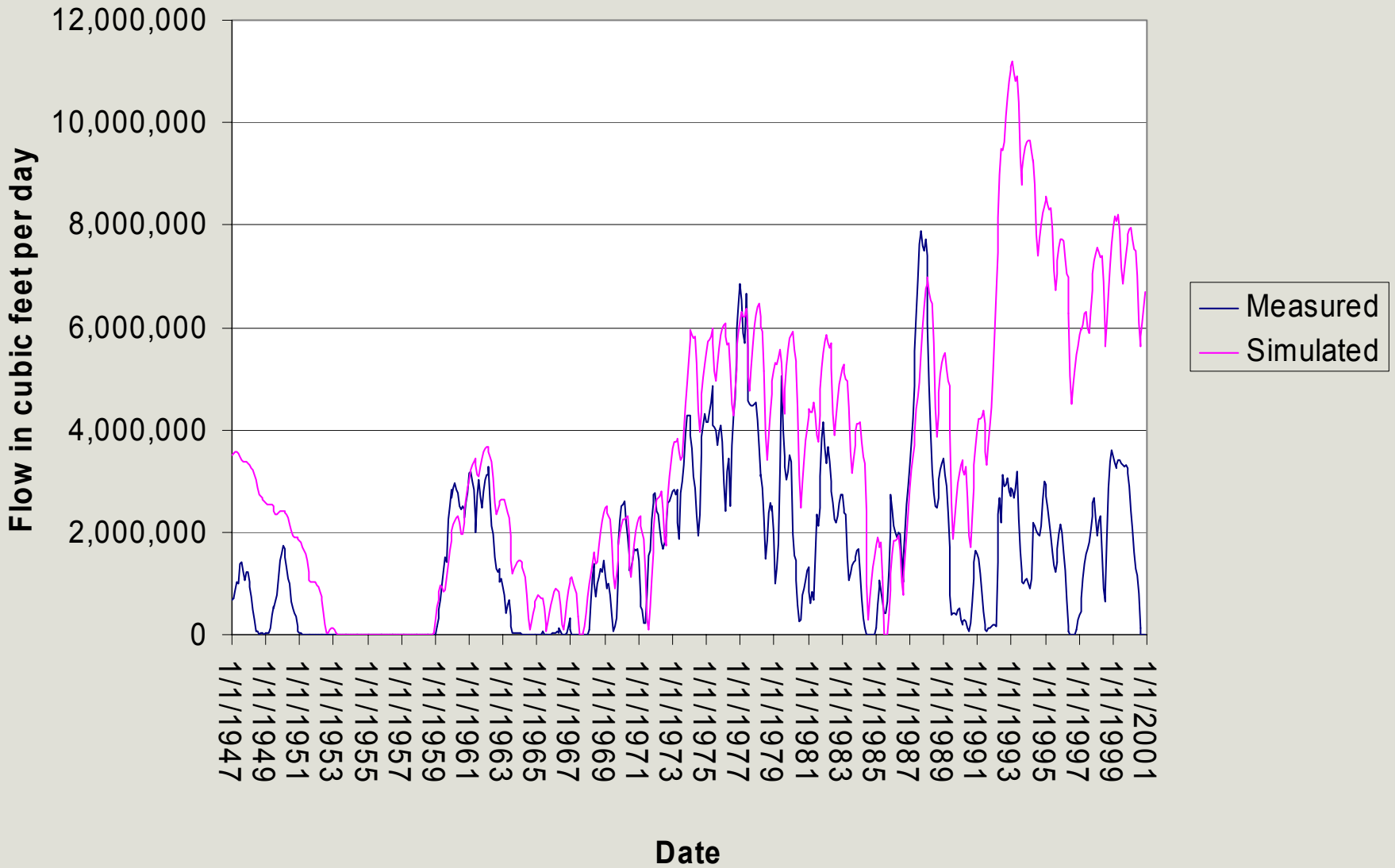


Figure 29a. Measured and simulated spring discharges for Leona, San Antonio, and San Pedro Springs, 1947-2000

San Antonio Springs

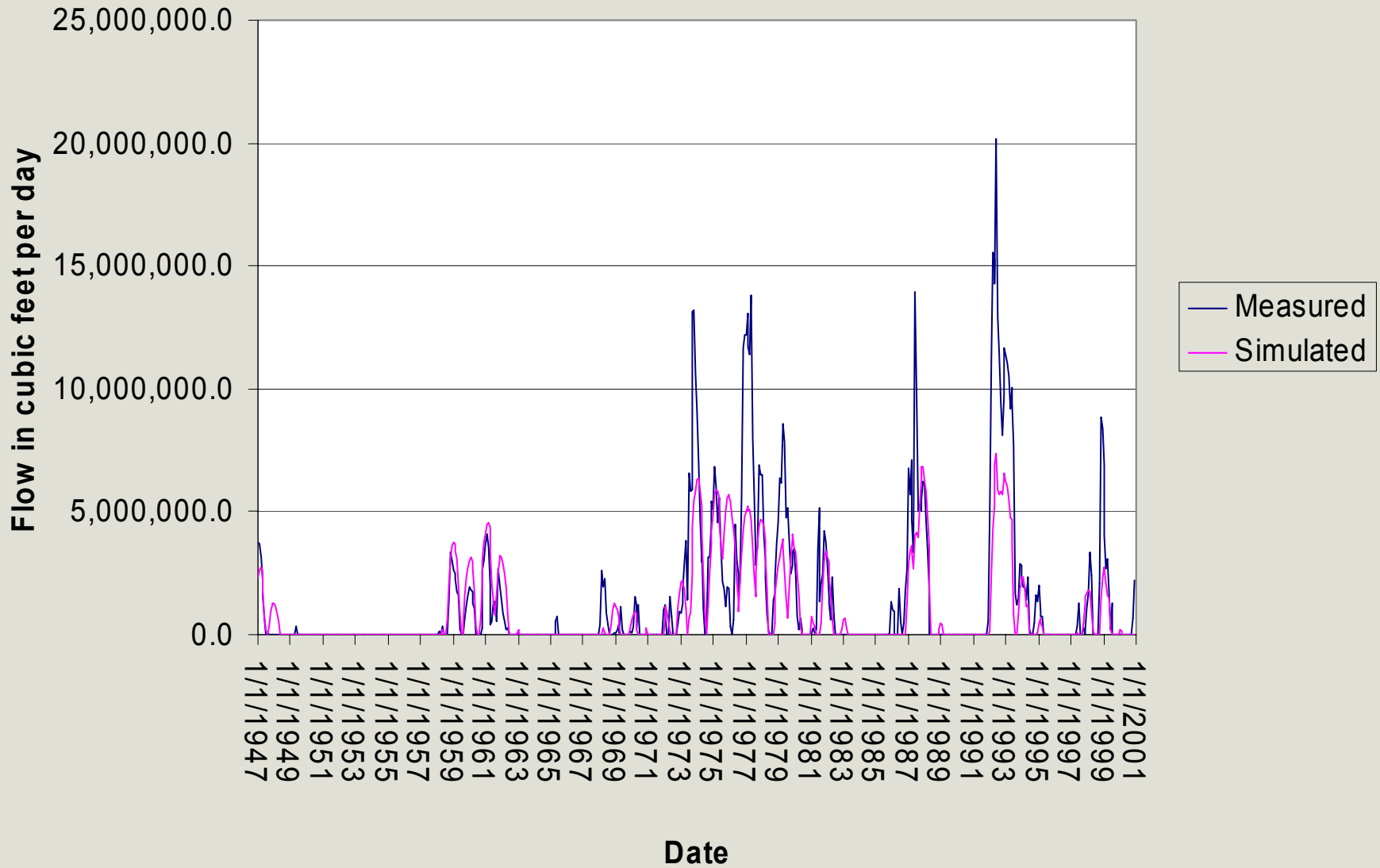


Figure 29b. Measured and simulated spring discharges for Leona, San Antonio, and San Pedro Springs, 1947-2000

San Pedro Springs

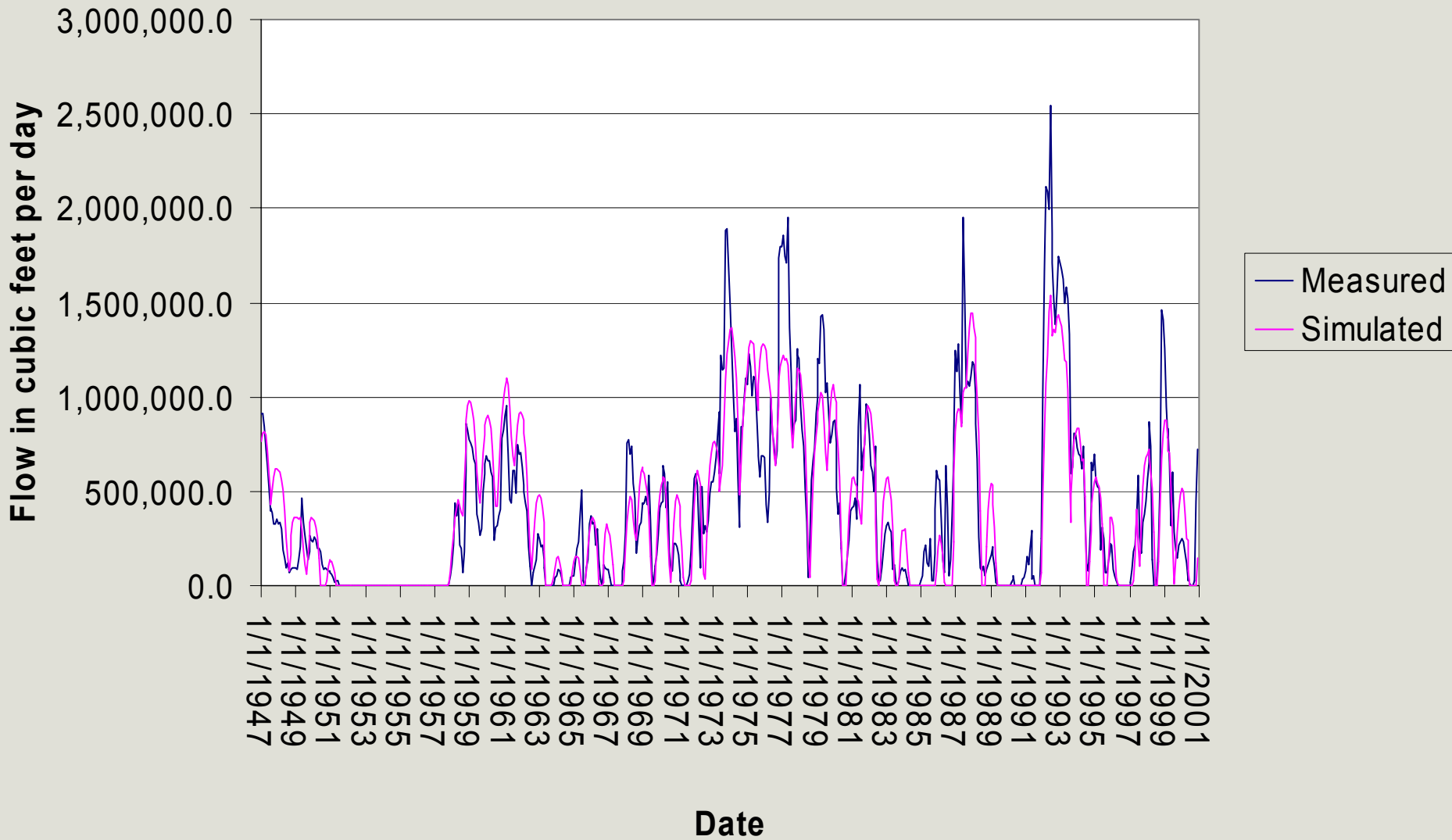
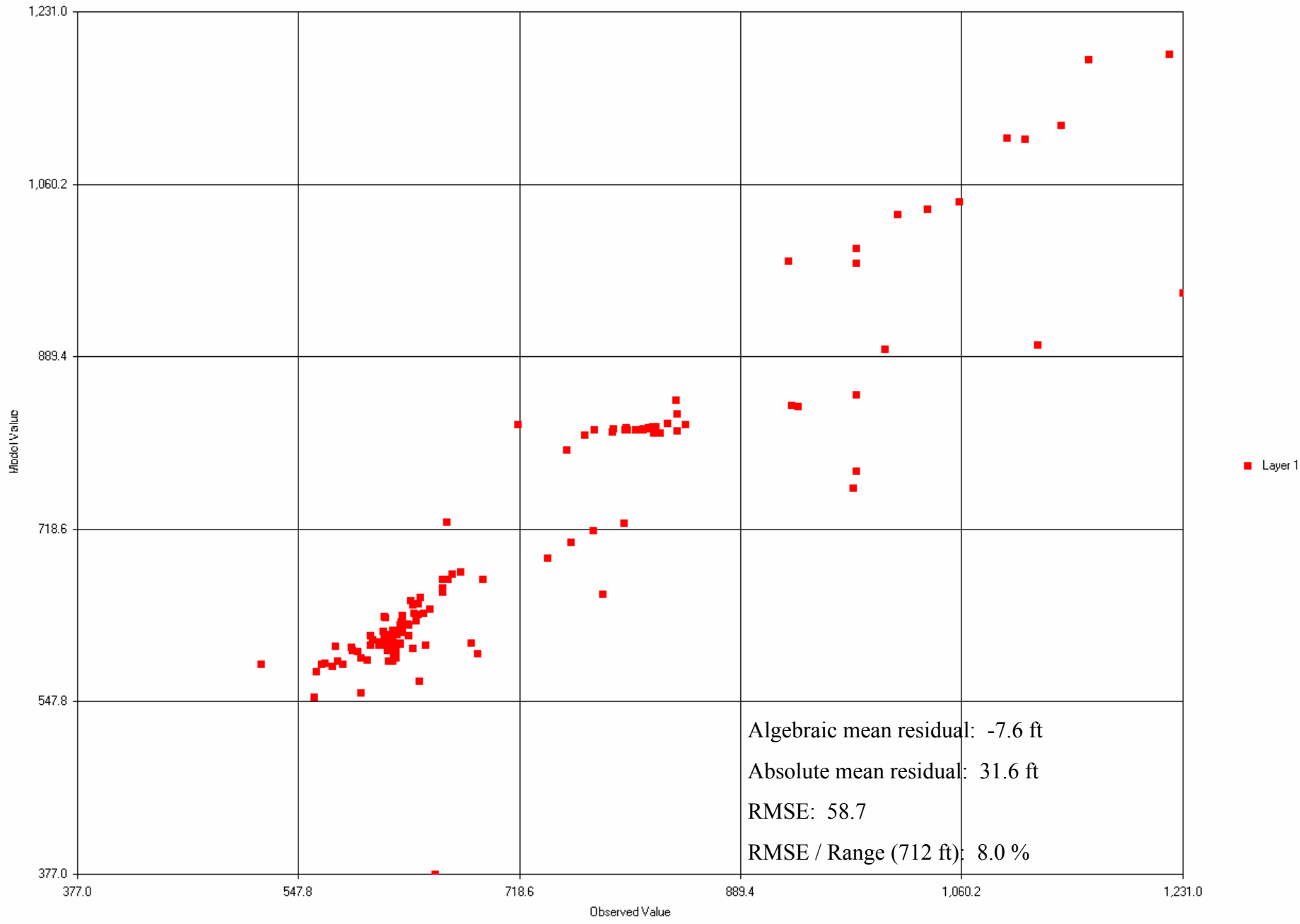


Figure 29c. Measured and simulated spring discharges for Leona, San Antonio, and San Pedro Springs, 1947-2000

TRANSIENT SIMULATION RESULTS

Water-Levels

Drought Conditions – 1956



1,231.0

1,060.2

889.4

718.6

547.8

377.0

377.0

547.8

718.6

889.4

1,060.2

1,231.0

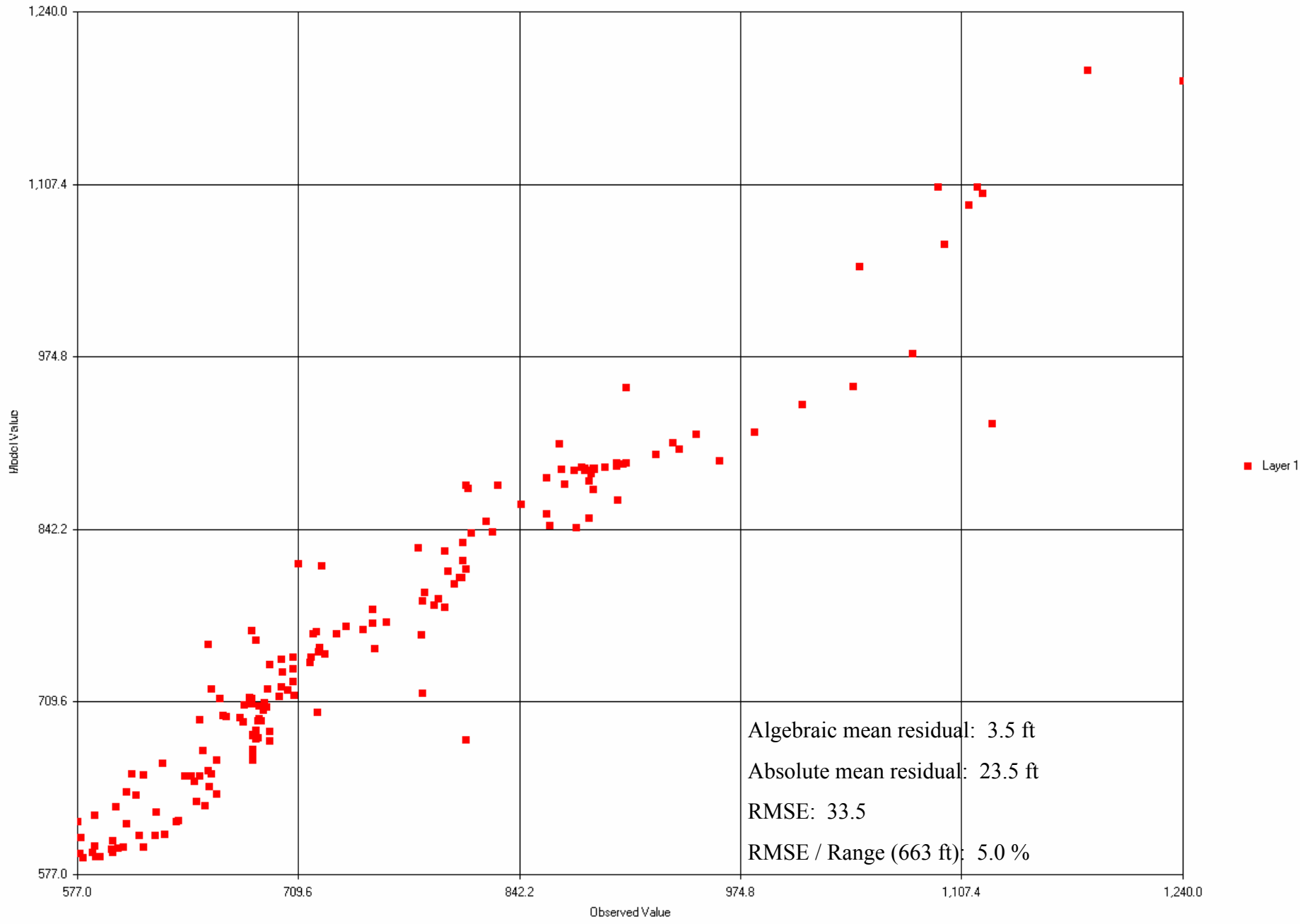
Observed Value

Layer 1

TRANSIENT SIMULATION RESULTS

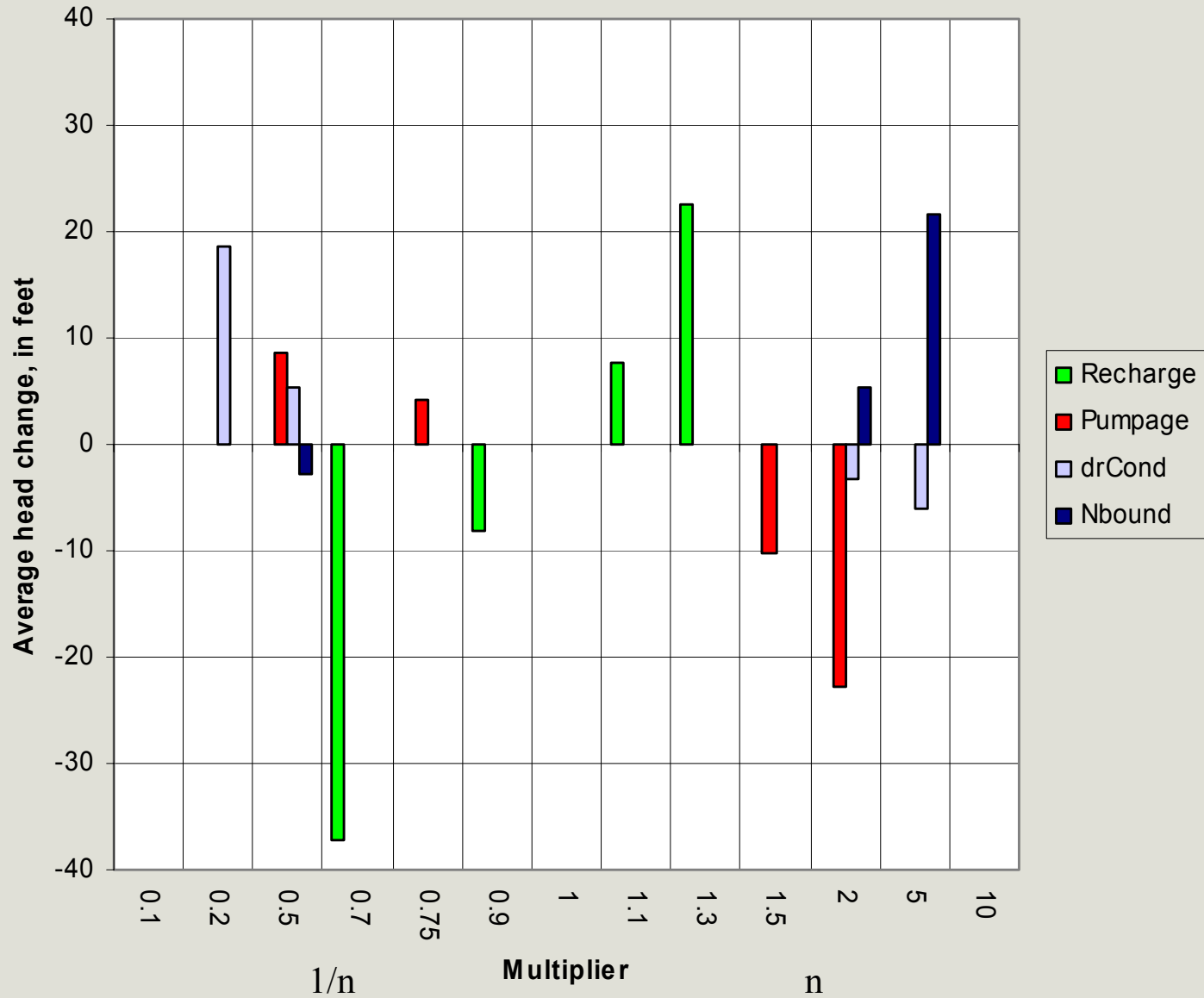
Water-Levels

Above-Normal Precipitation --
1975



SENSITIVITY ANALYSIS

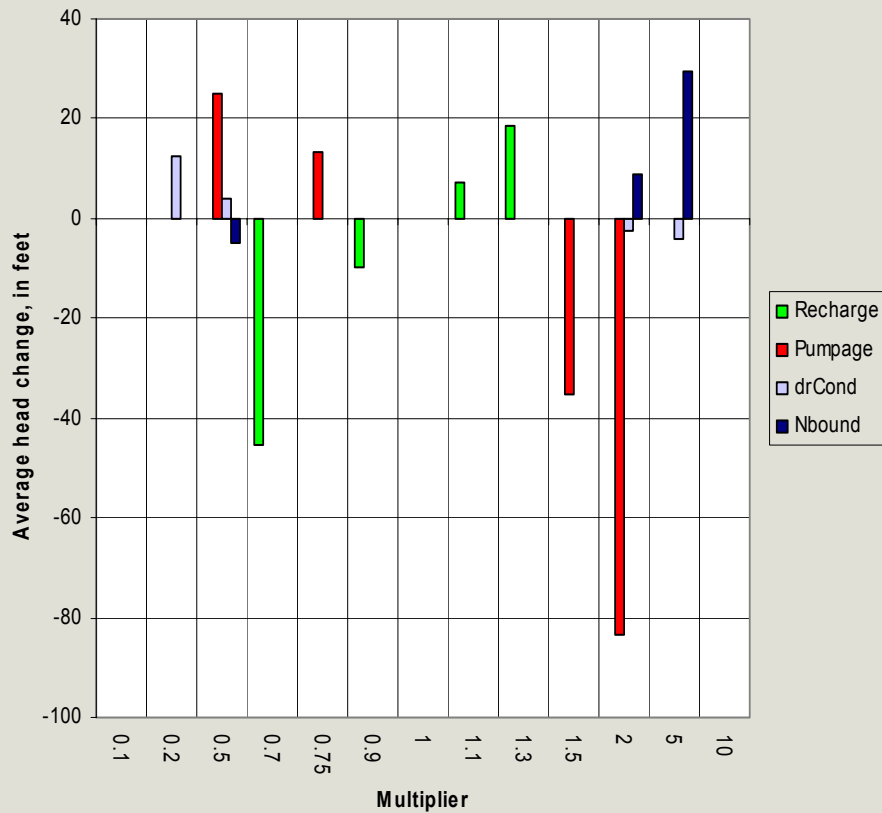
Sensitivity -- steady-state Stresses etc. Hydraulic Heads



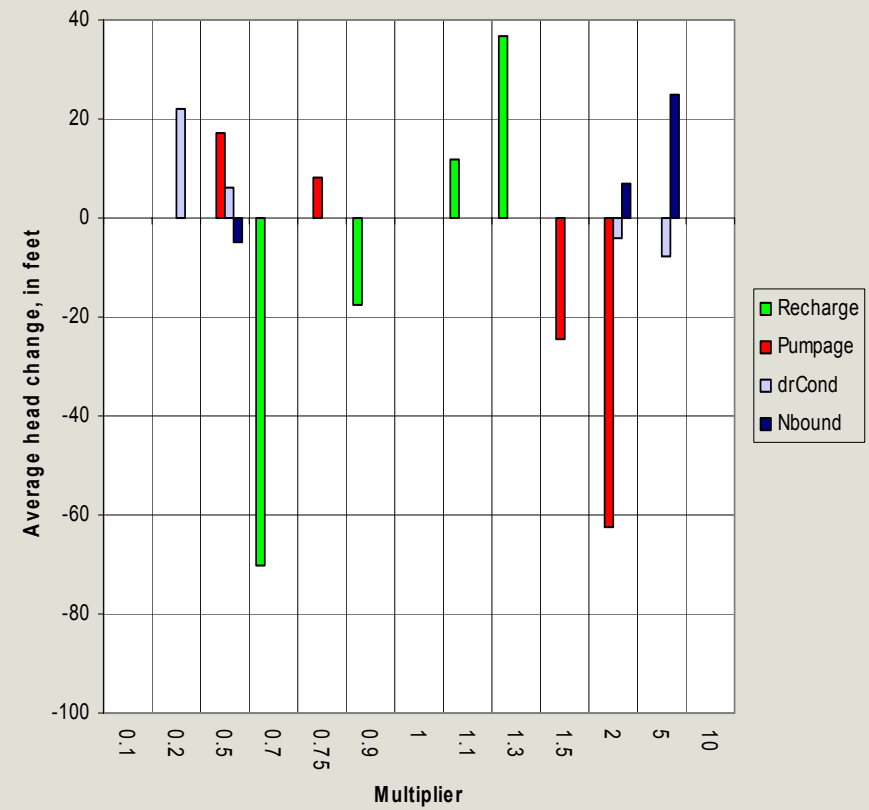
SENSITIVITY ANALYSIS

Hydraulic Heads

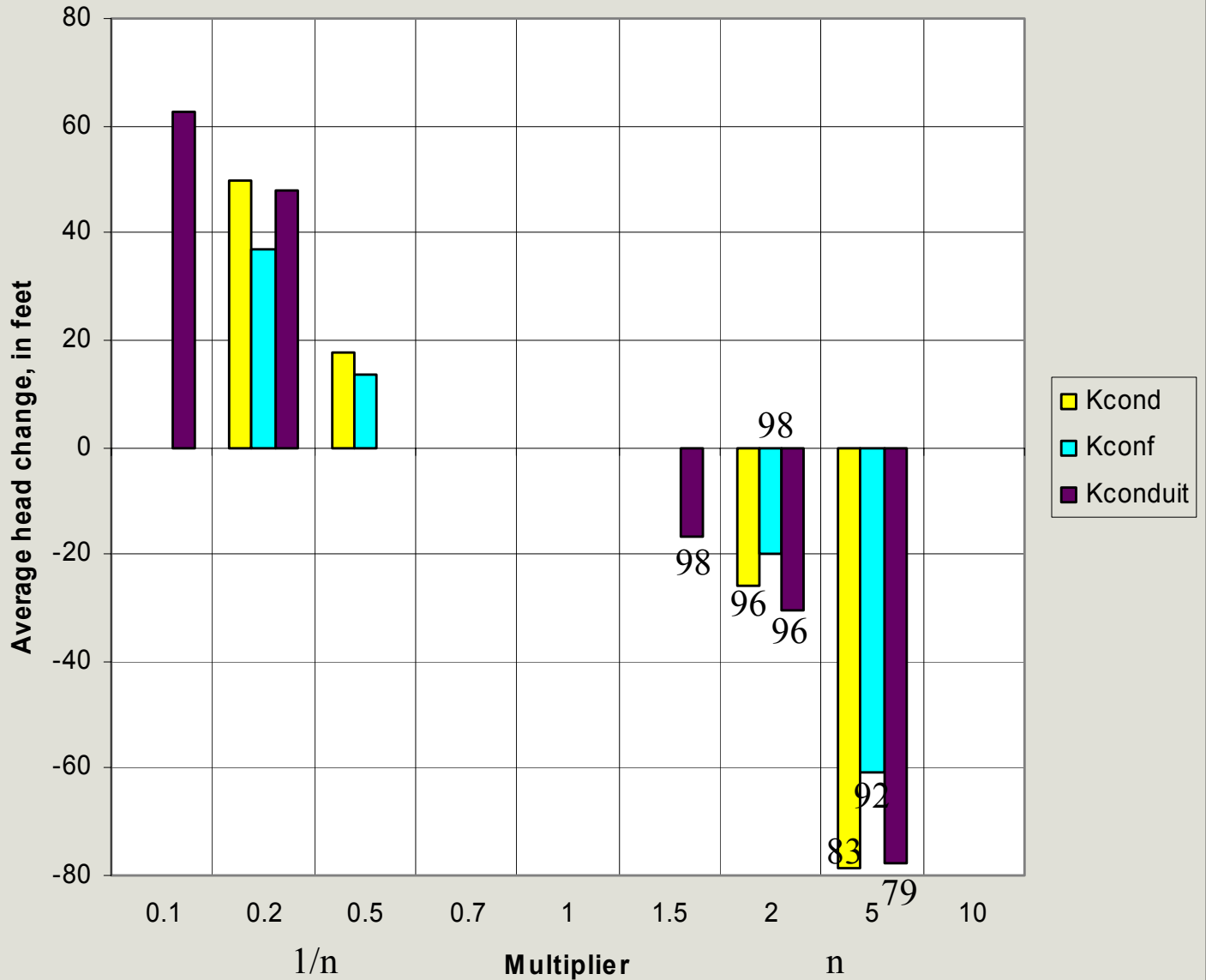
Sensitivity -- Drought Stresses etc.



Sensitivity -- above normal recharge Stresses etc.



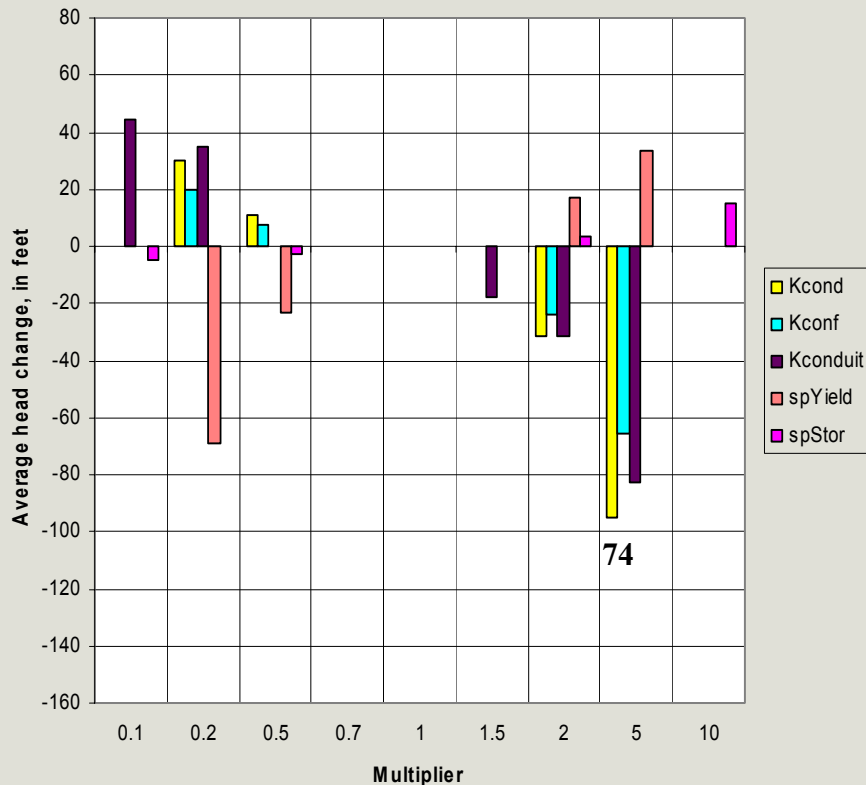
Sensitivity -- Steady-State Hydraulic Properties Hydraulic Heads



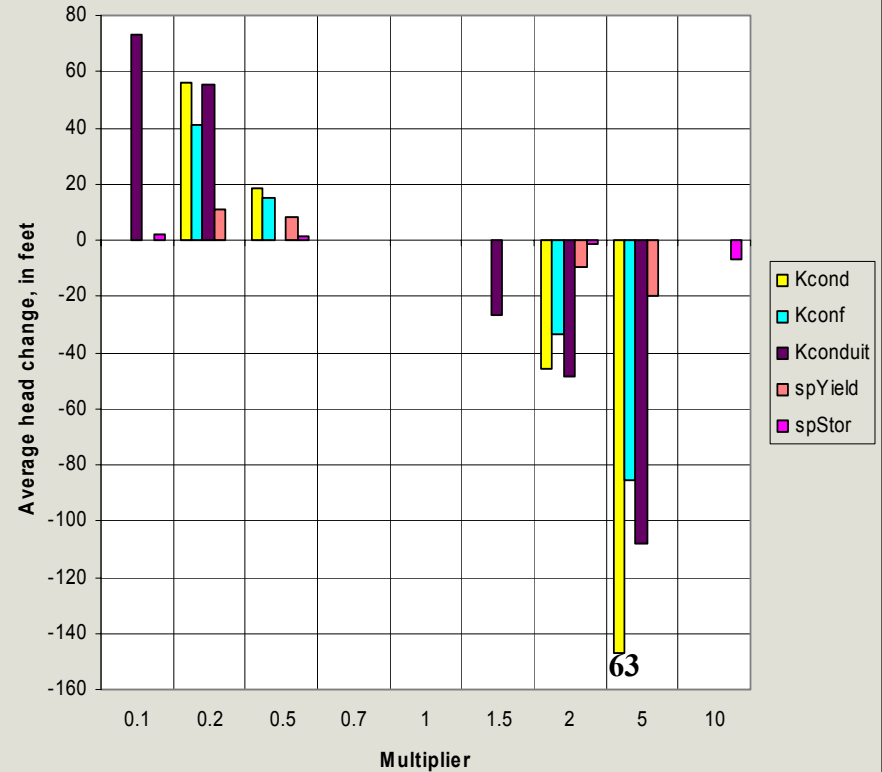
SENSITIVITY ANALYSIS

Hydraulic Heads

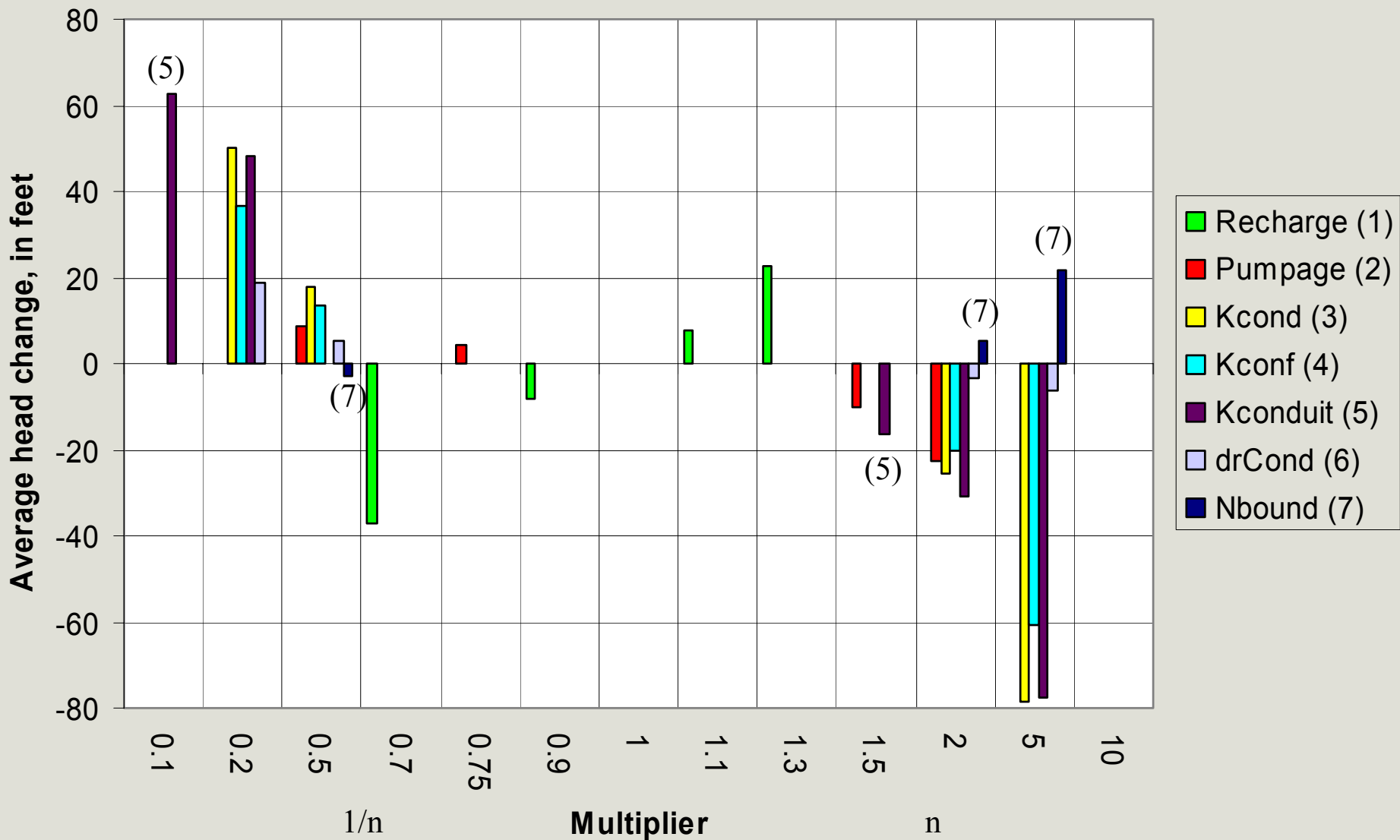
Sensitivity -- Drought
Hydraulic Properties



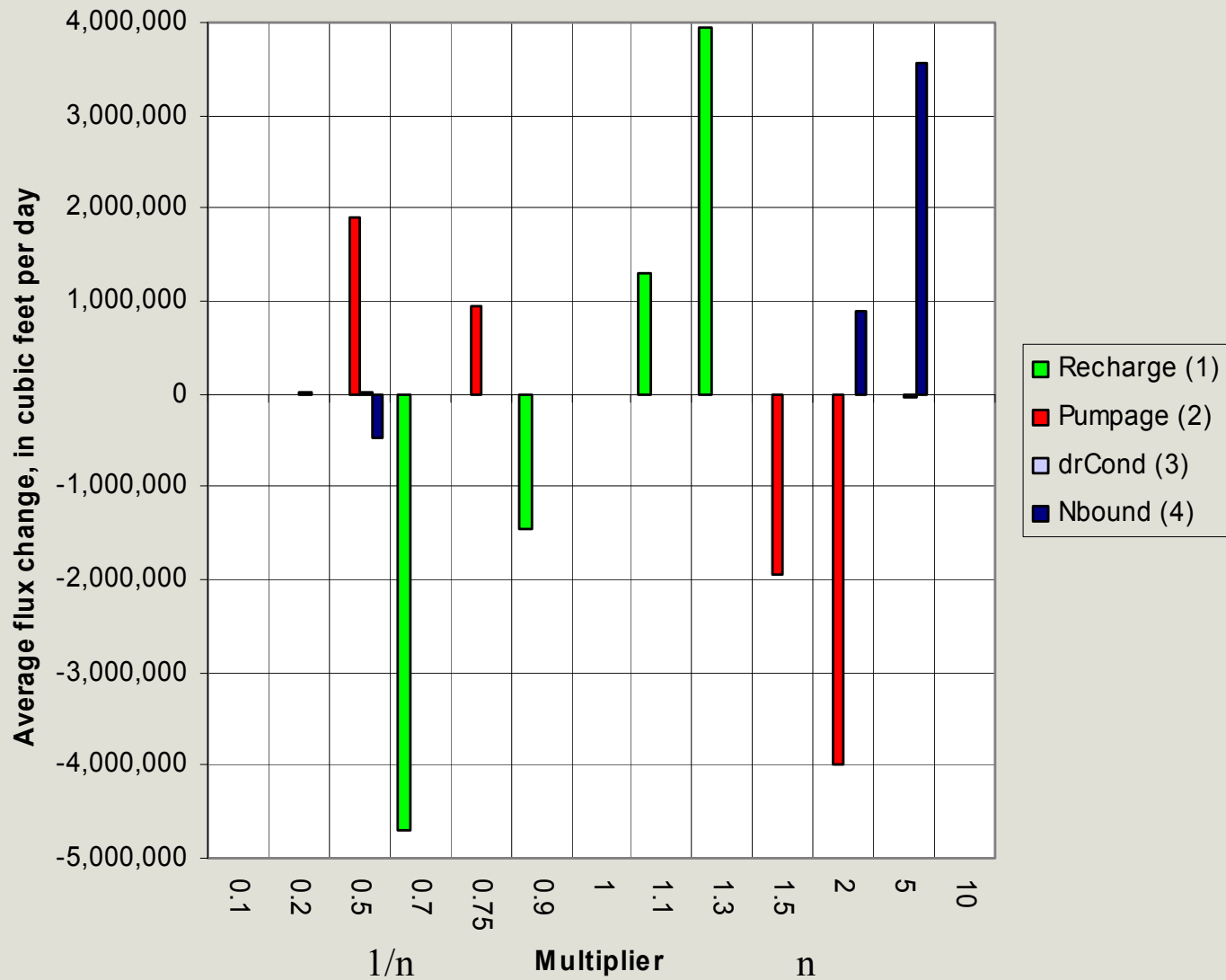
Sensitivity -- above normal recharge
Hydraulic Properties



Sensitivity -- steady-state Hydraulic Heads



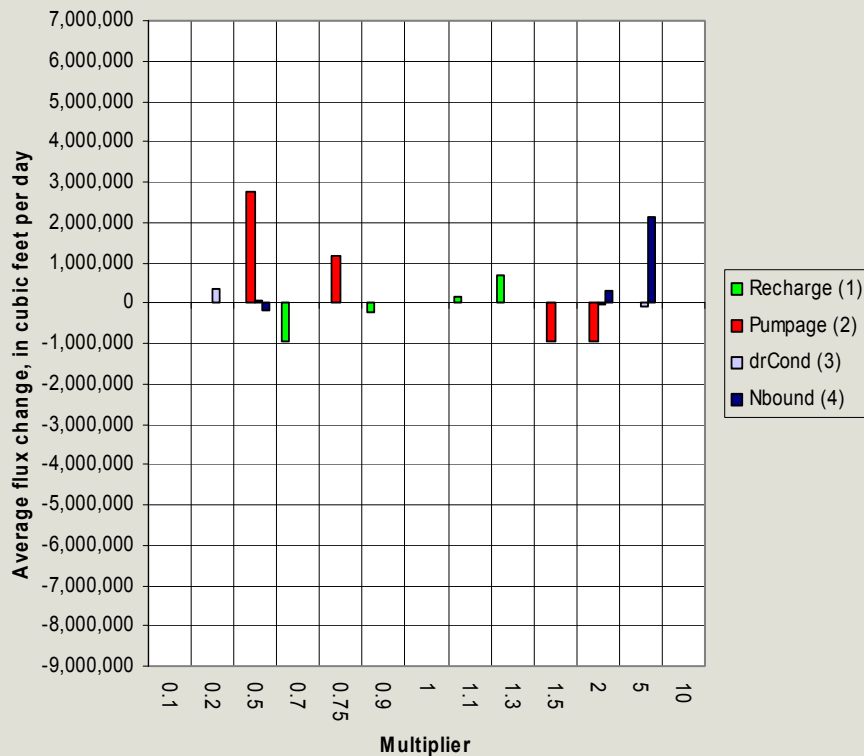
Sensitivity -- steady-state
Springflow
Stresses etc.



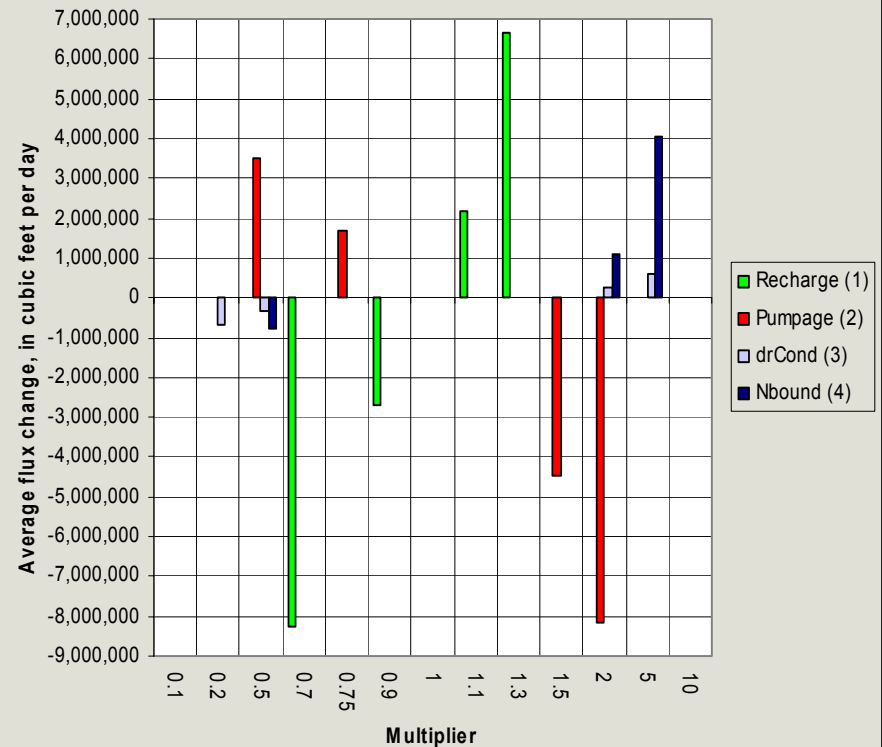
SENSITIVITY ANALYSIS

Springflow

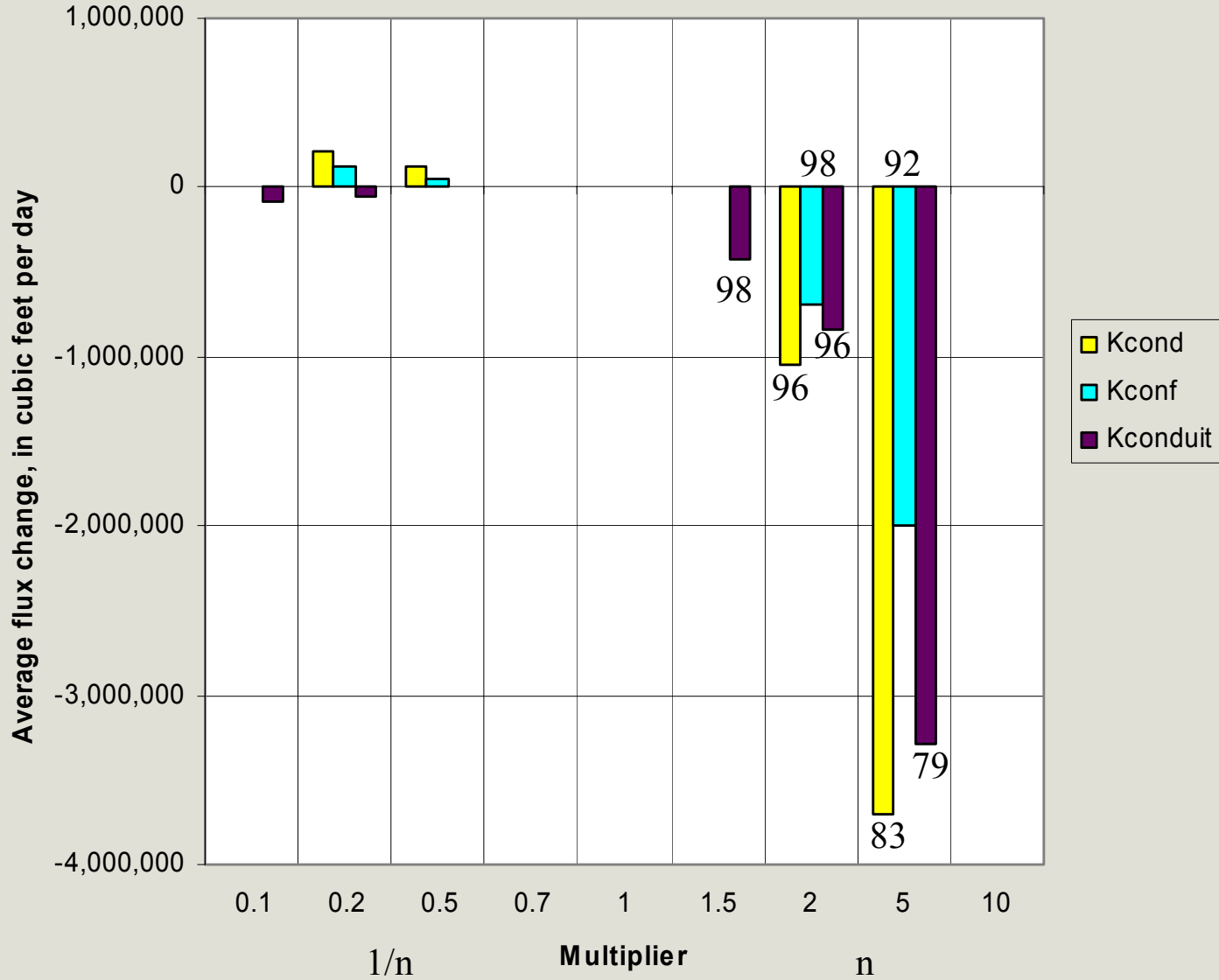
Sensitivity -- Drought
San Marcos Springflow
Stresses etc.



Sensitivity -- above normal recharge
Springflow
Stresses etc.

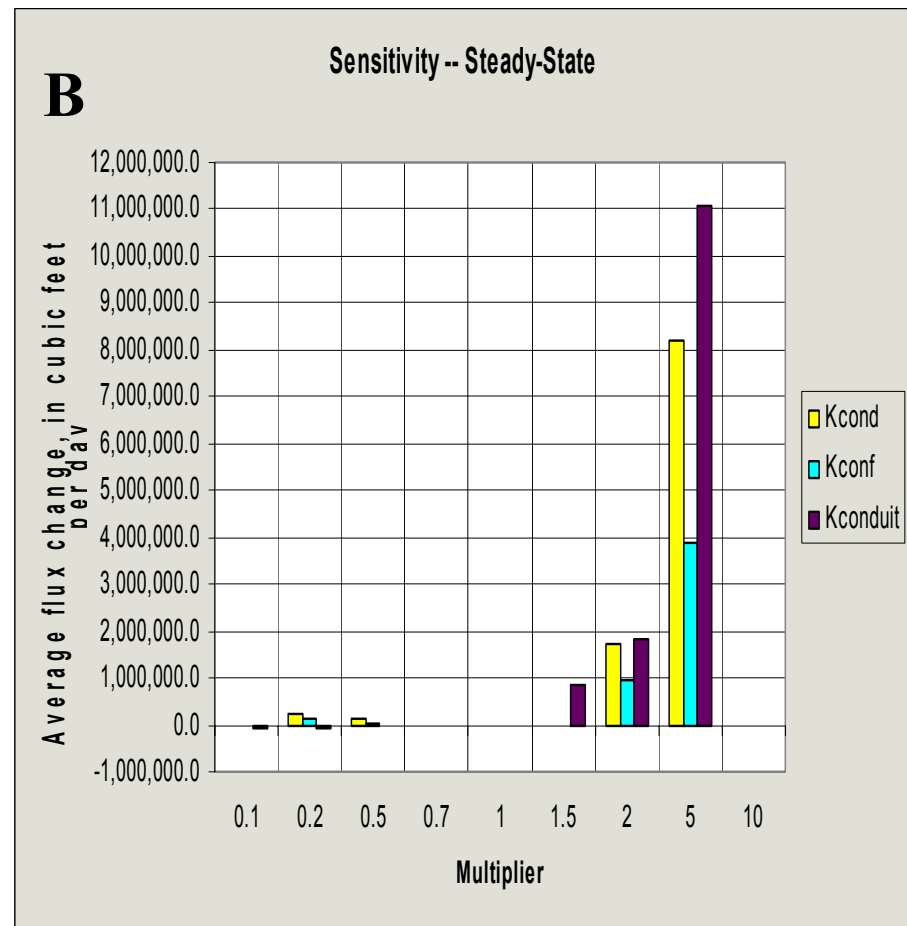
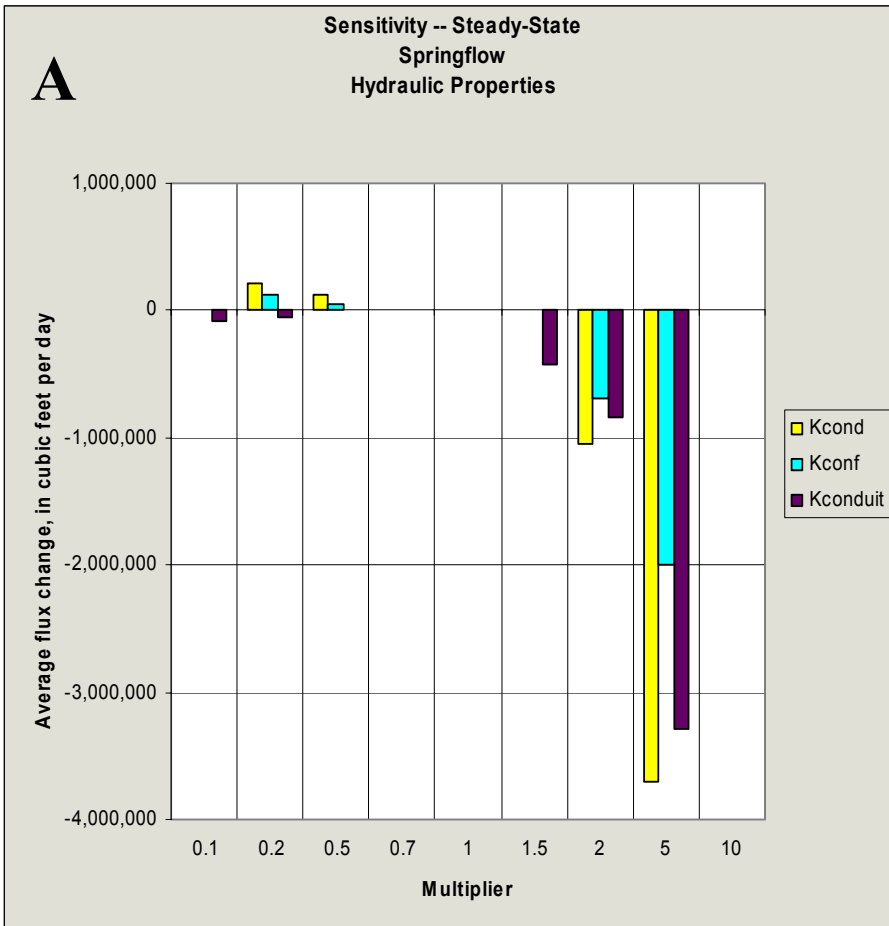


Sensitivity -- Steady-State Springflow Hydraulic Properties



SENSITIVITY ANALYSIS

Springflow

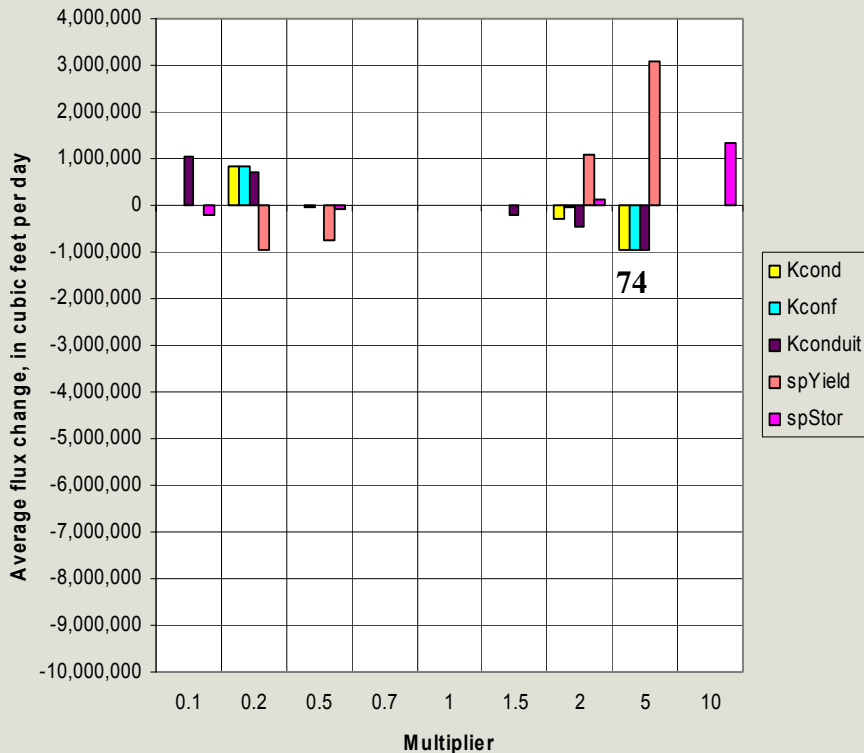


Recharge difference (lost due to dry model cells) = A + B

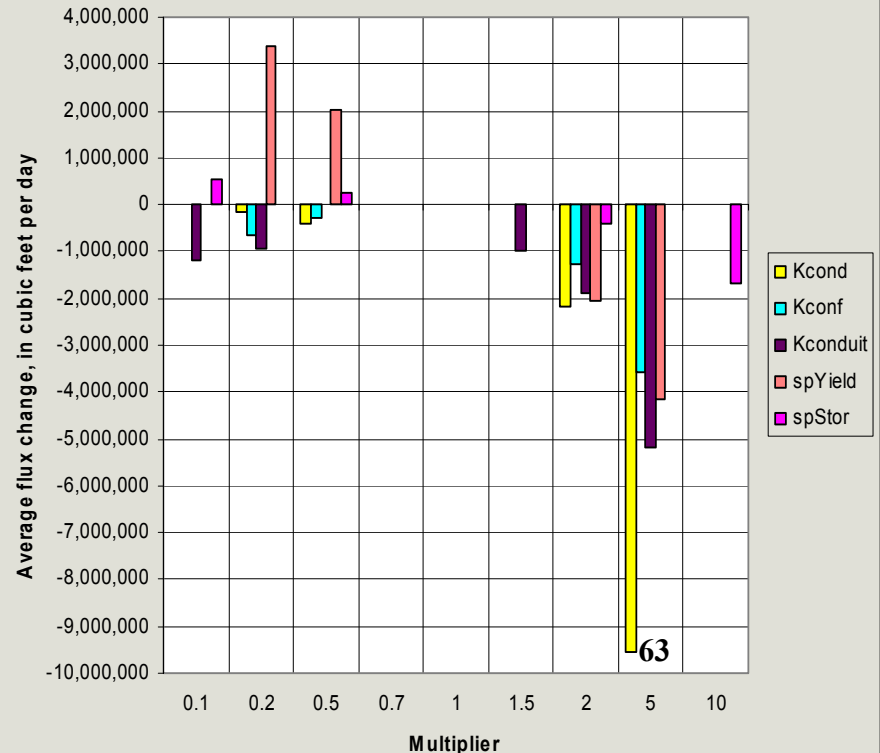
SENSITIVITY ANALYSIS

Springflow

Sensitivity -- Drought
San Marcos Springflow
Hydraulic Properties



Sensitivity -- above normal recharge
Springflow
Hydraulic Properties

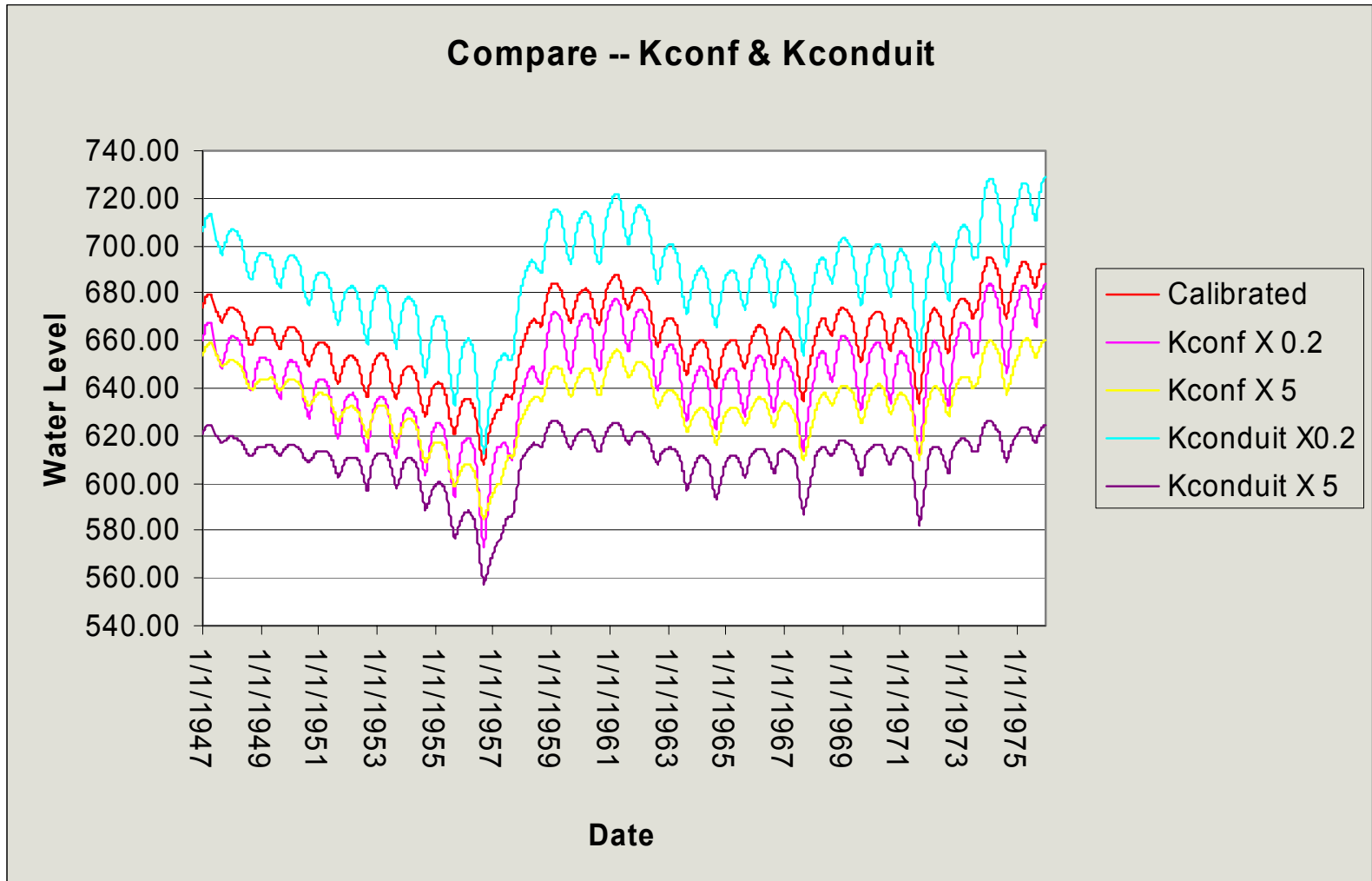


SENSITIVITY ANALYSIS

HYDROGRAPHS

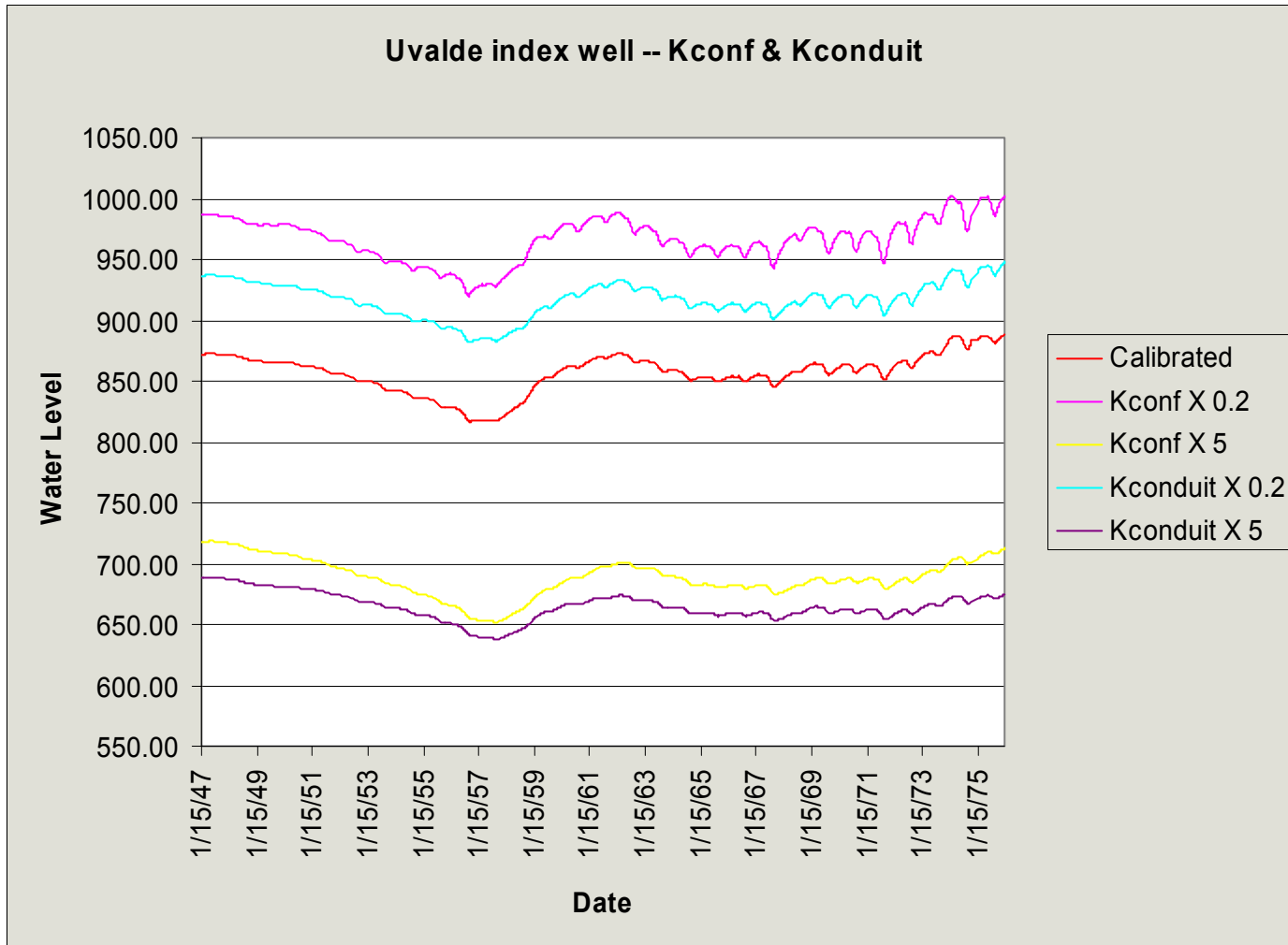
SENSITIVITY ANALYSIS

Bexar County Index Well Hydraulic Conductivity



SENSITIVITY ANALYSIS

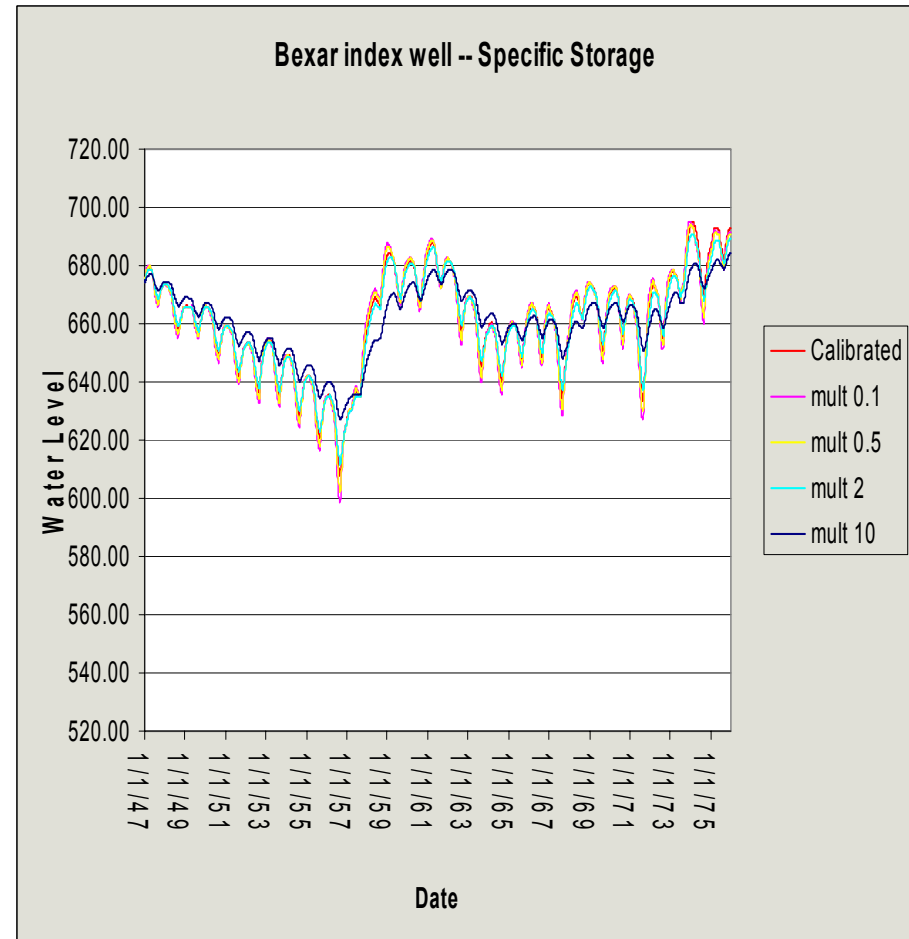
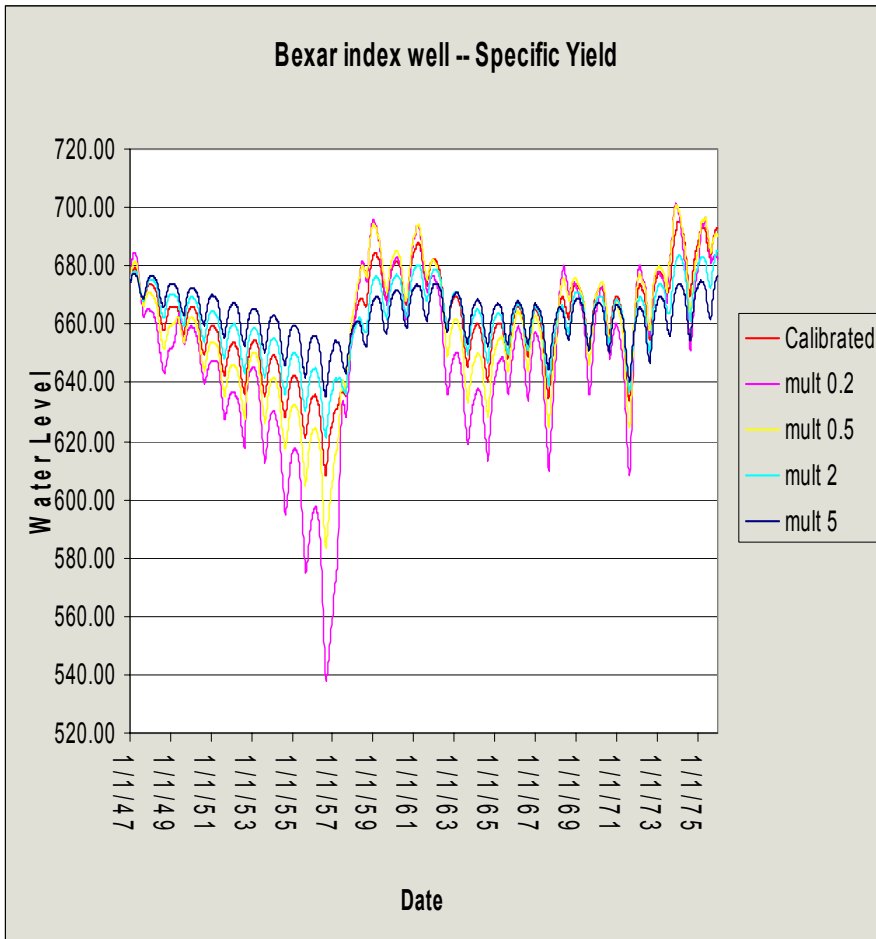
Uvalde County Index Well Hydraulic Conductivity



SENSITIVITY ANALYSIS

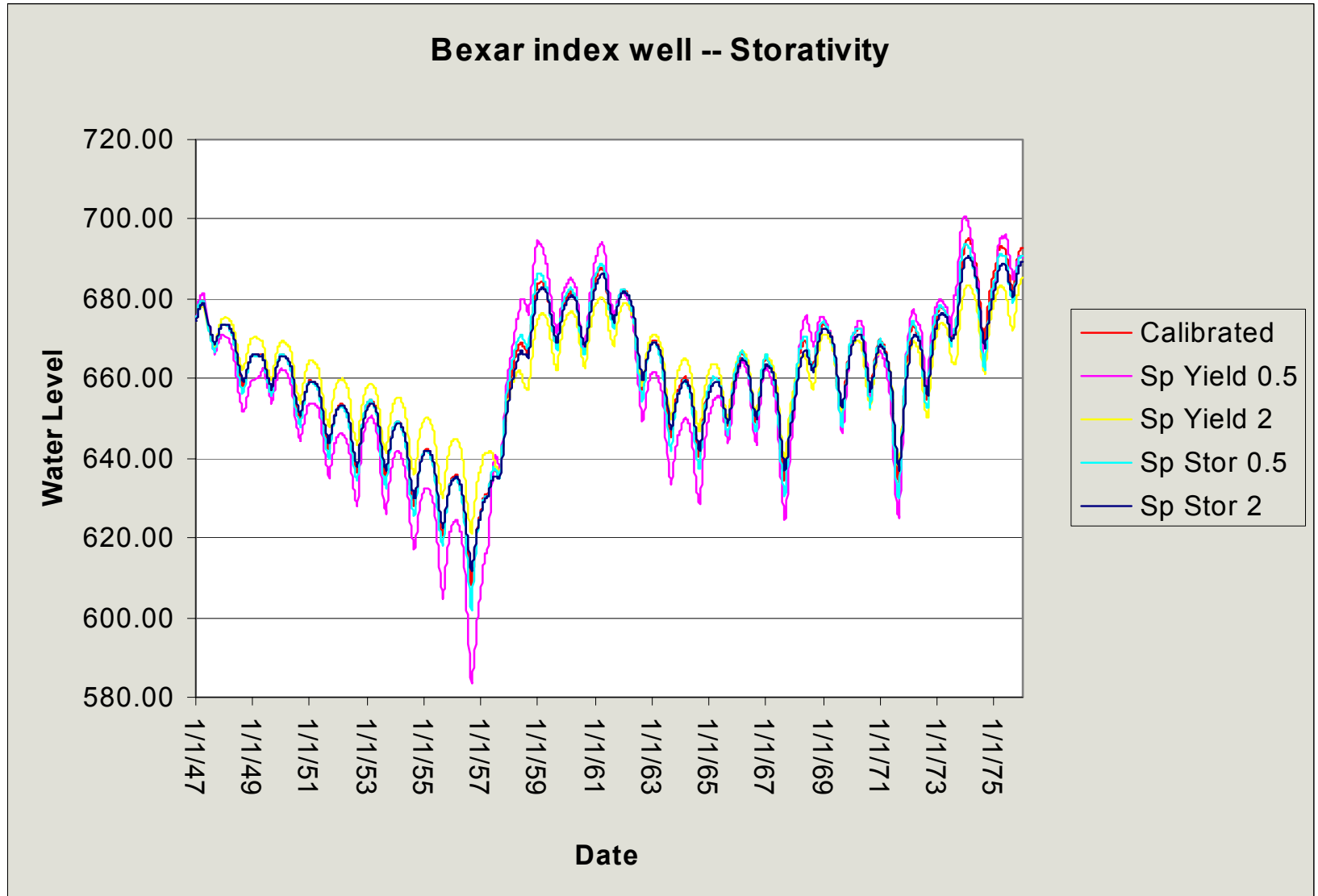
Bexar County Index Well

Storativity



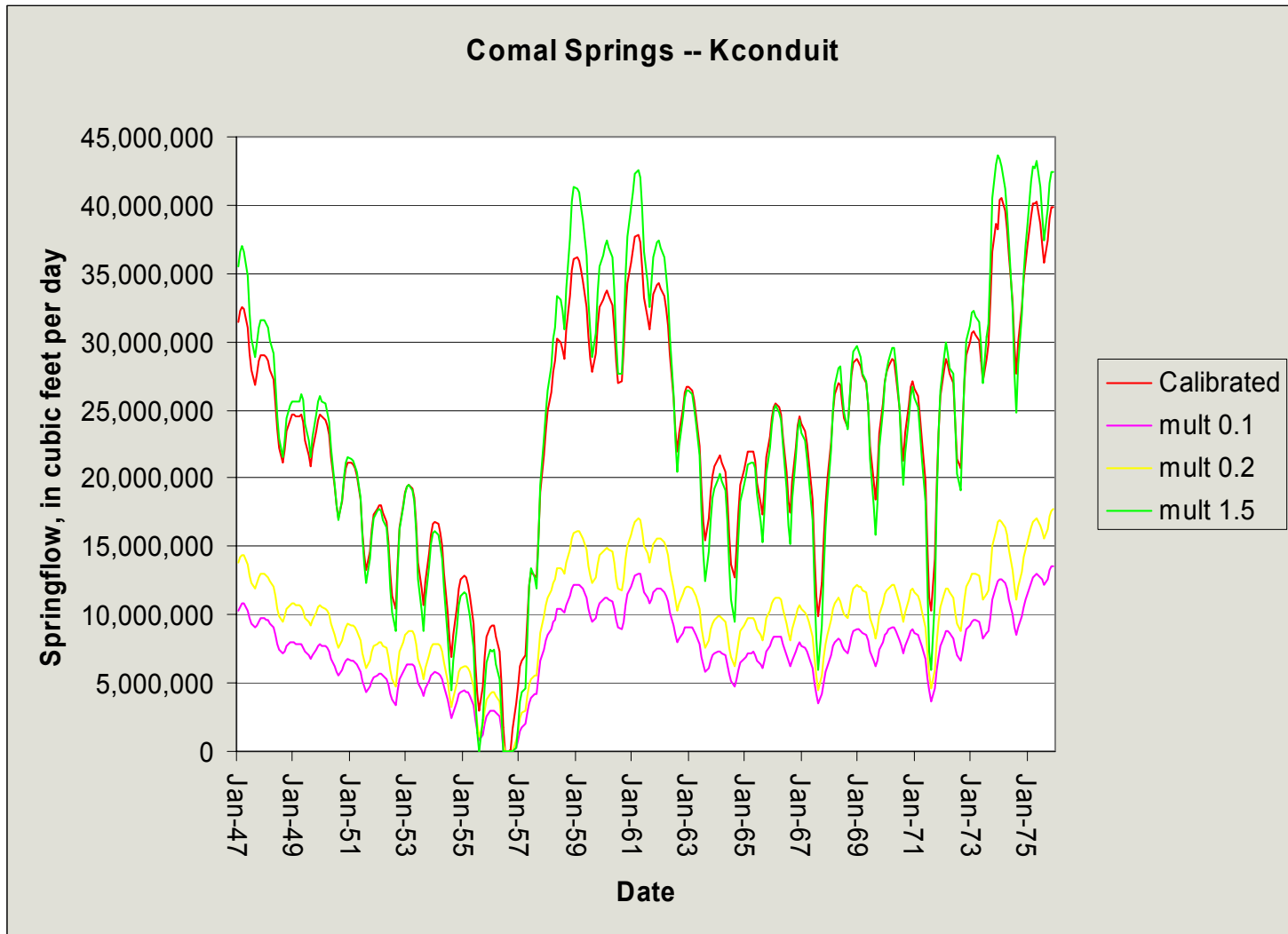
SENSITIVITY ANALYSIS

Bexar County Index Well Storativity



SENSITIVITY ANALYSIS

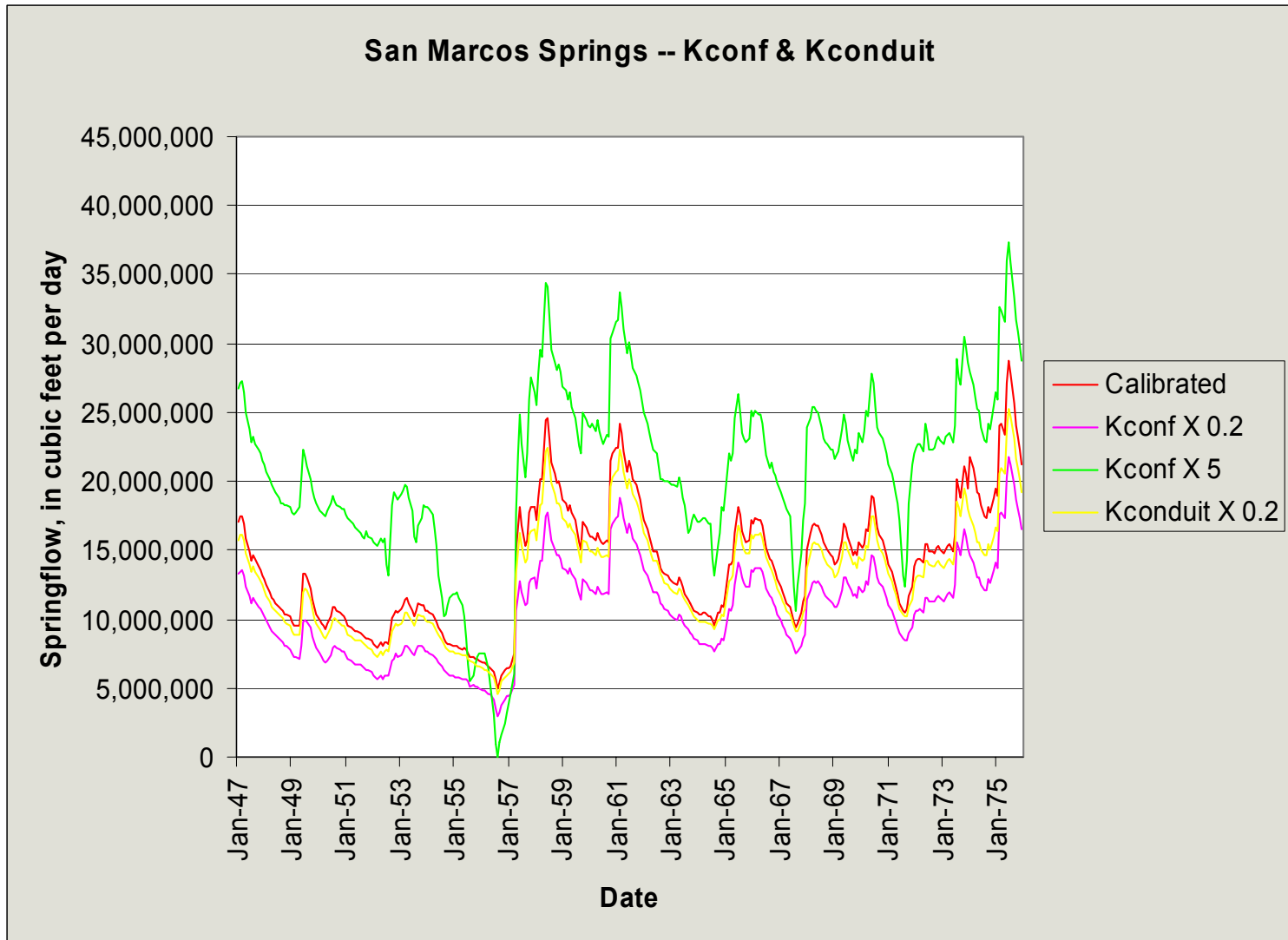
Comal Springs Hydraulic Conductivity



SENSITIVITY ANALYSIS

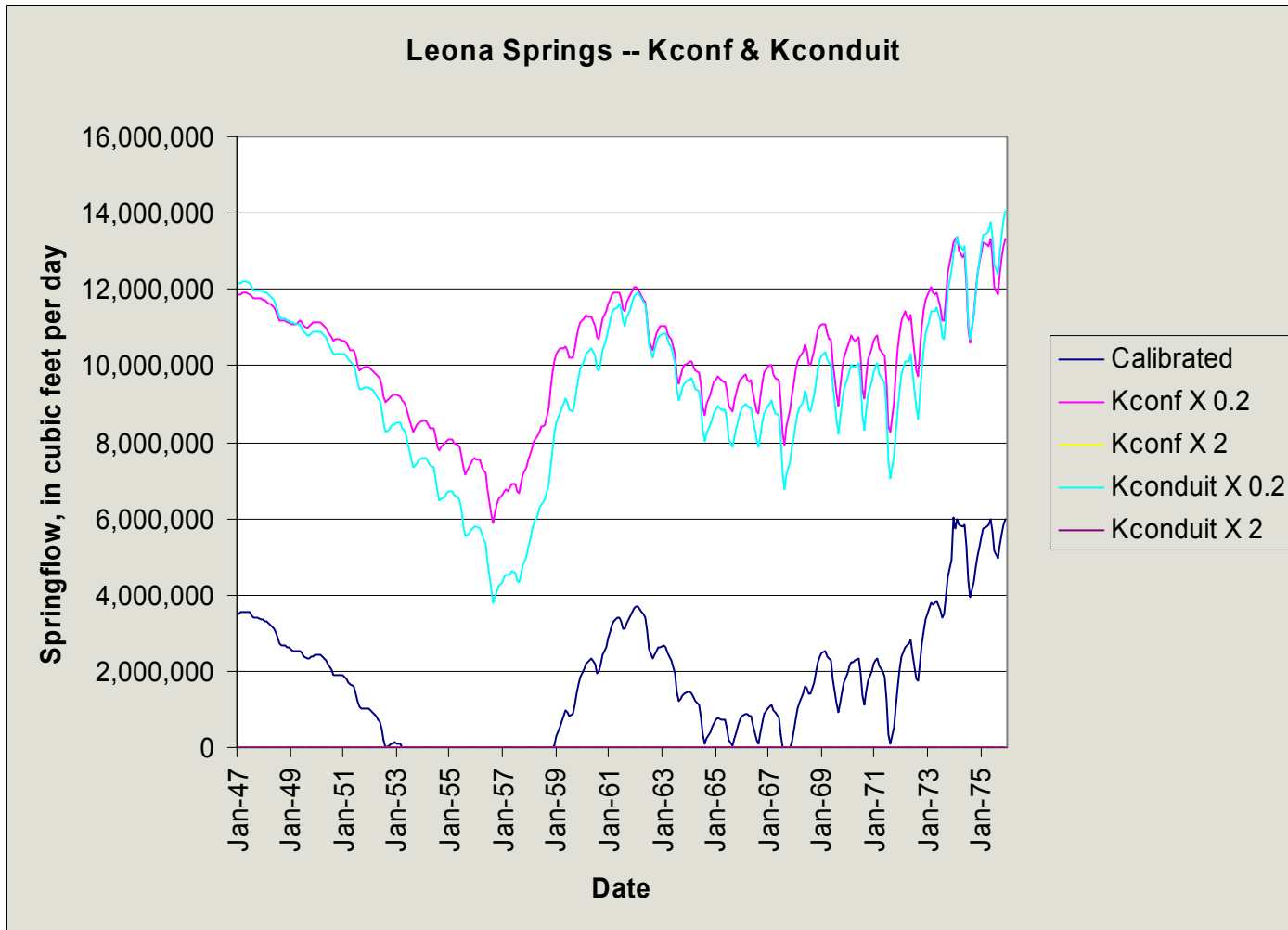
San Marcos Springs

Hydraulic Conductivity



SENSITIVITY ANALYSIS

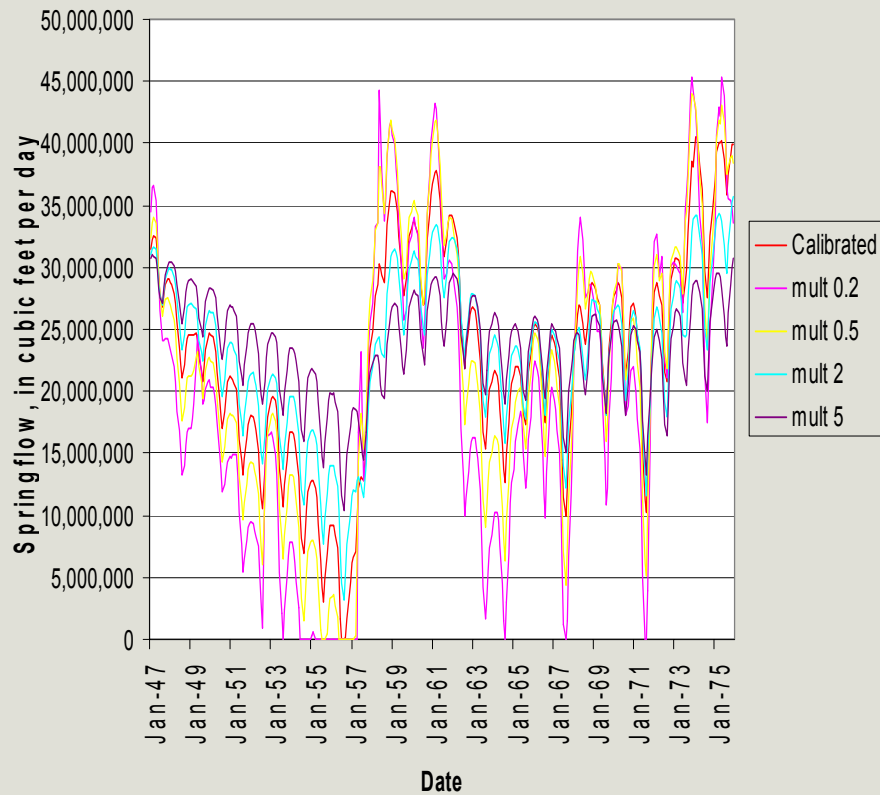
Leona Springs Hydraulic Conductivity



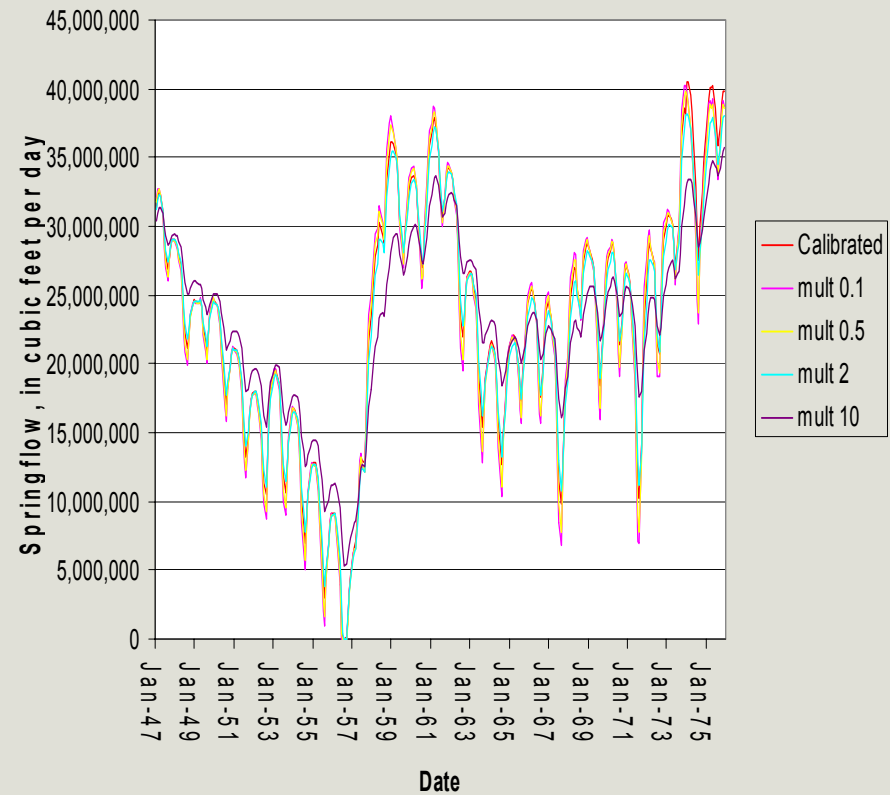
SENSITIVITY ANALYSIS

Comal Springs Storativity

Comal Springs -- Specific yield



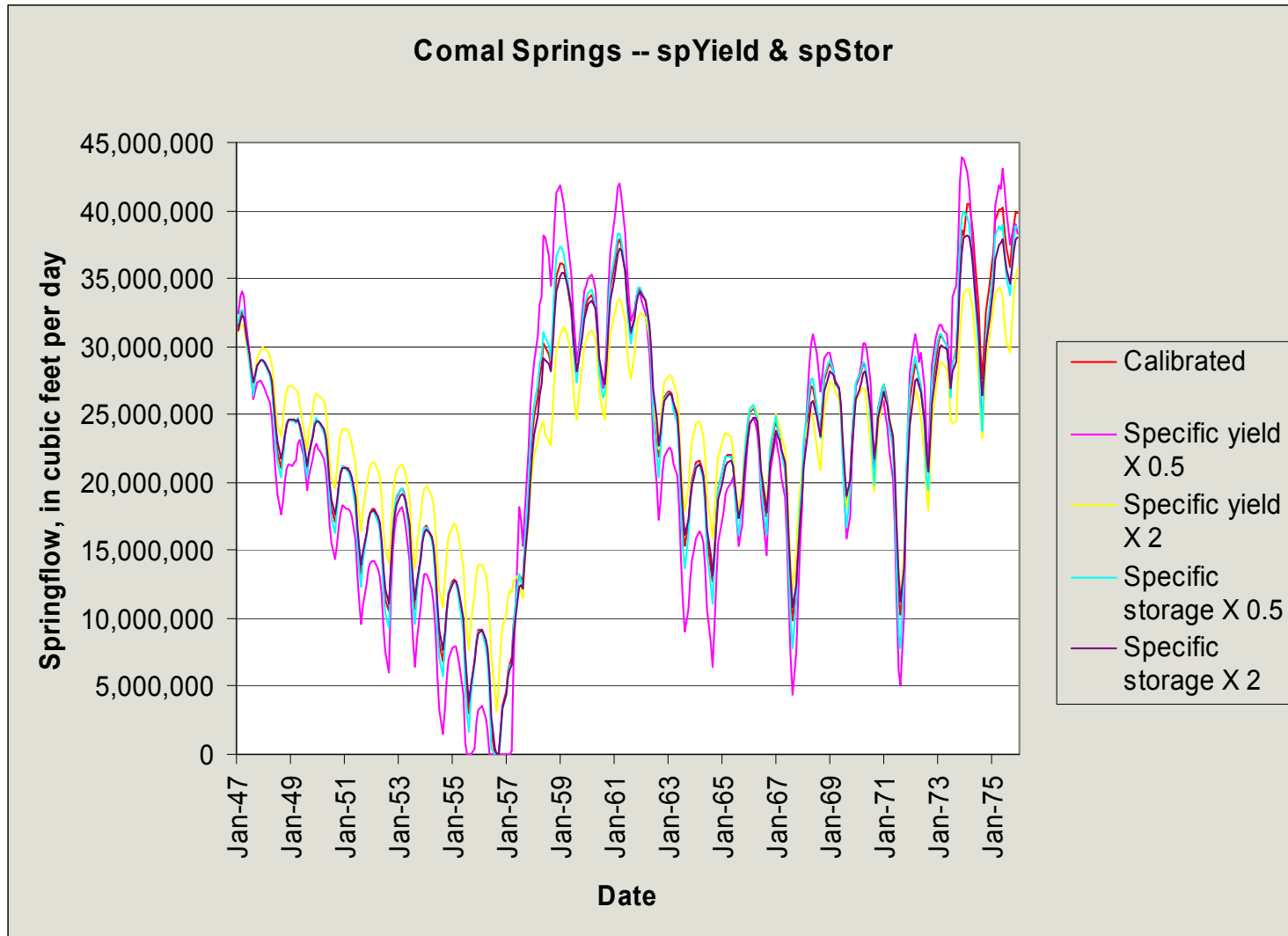
Comal Springs -- Specific storage



SENSITIVITY ANALYSIS

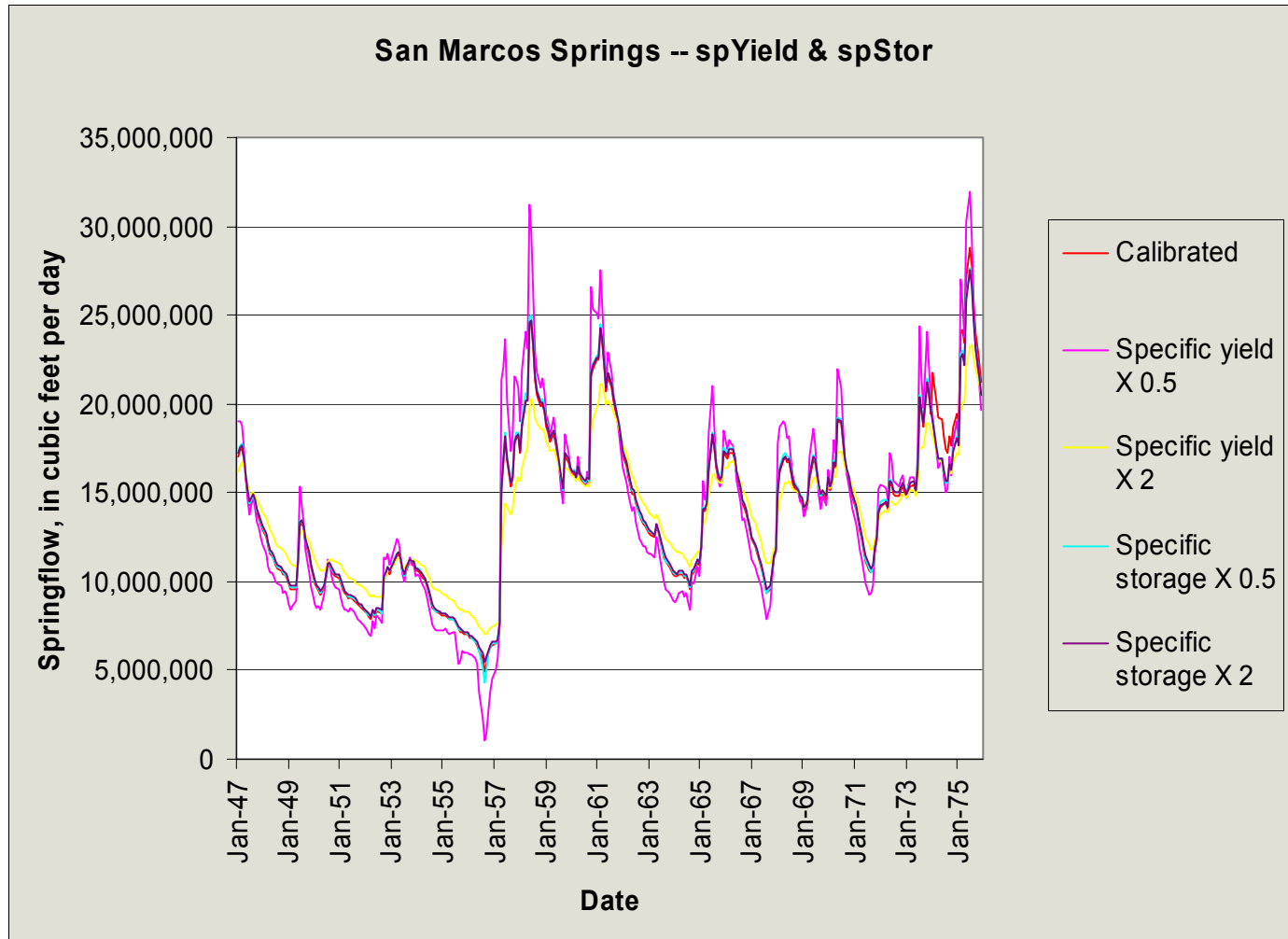
Comal Springs

Storativity



SENSITIVITY ANALYSIS

San Marcos Springs Storativity

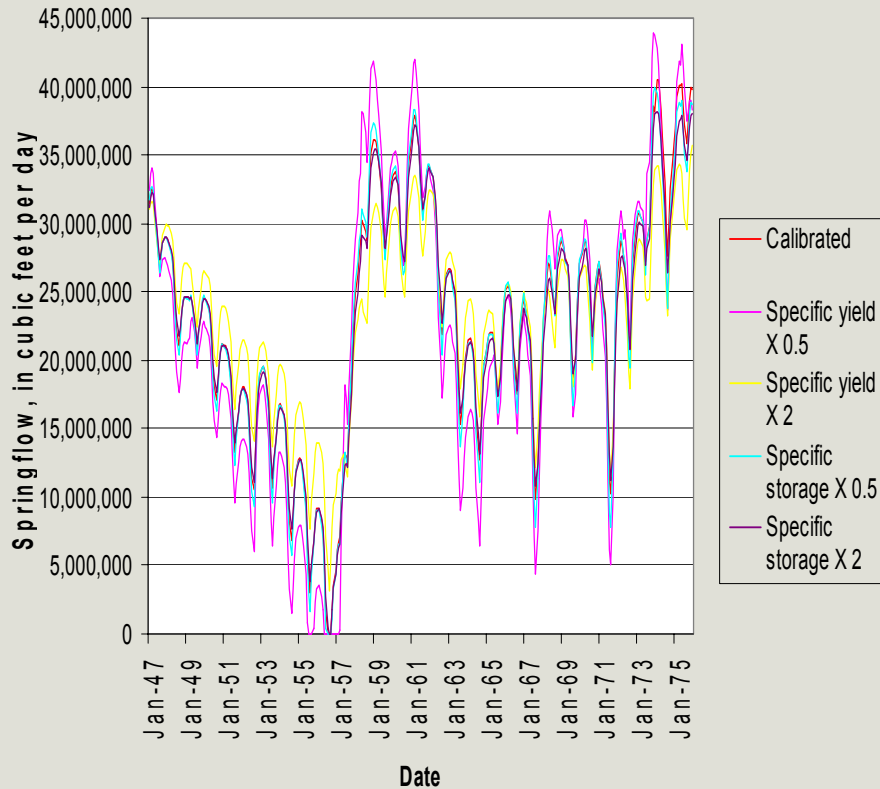


SENSITIVITY ANALYSIS

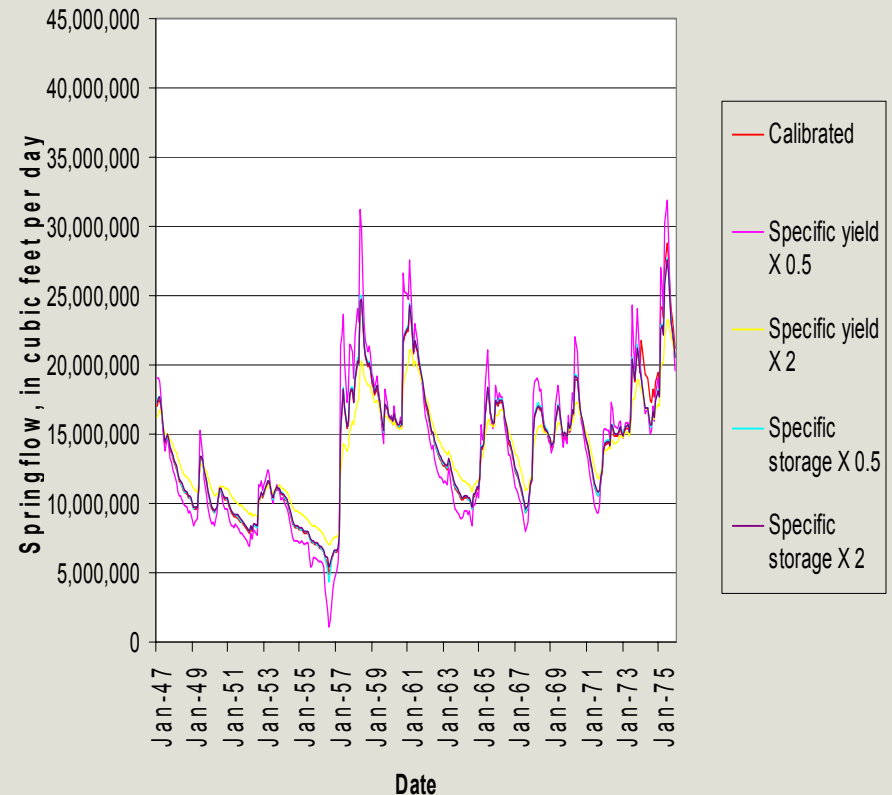
Comal & San Marcos Springs

Storativity

Comal Springs -- spYield & spStor

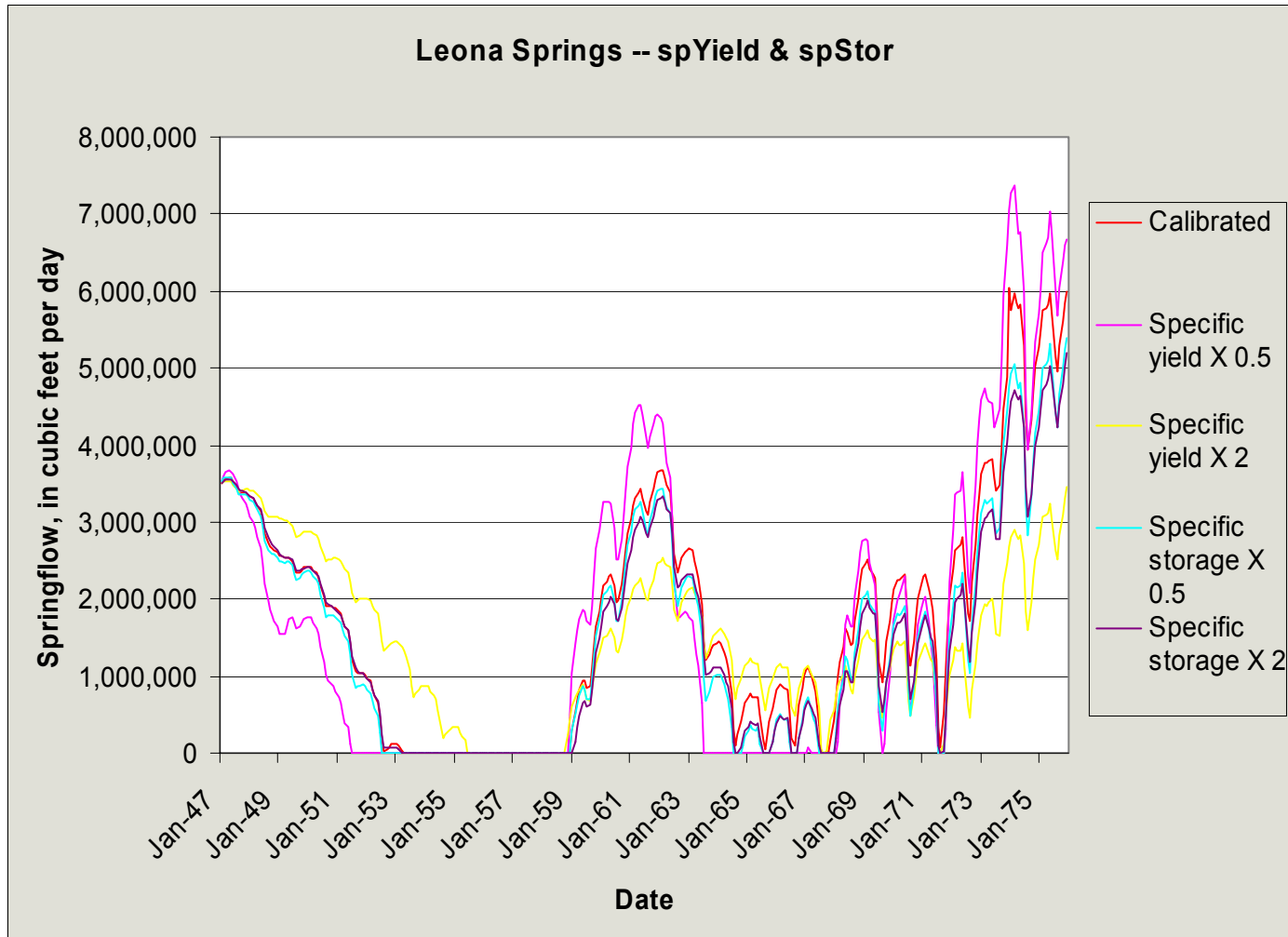


San Marcos Springs -- spYield & spStor



SENSITIVITY ANALYSIS

Leona Springs Storativity



Bexar_index well -- sensitivity

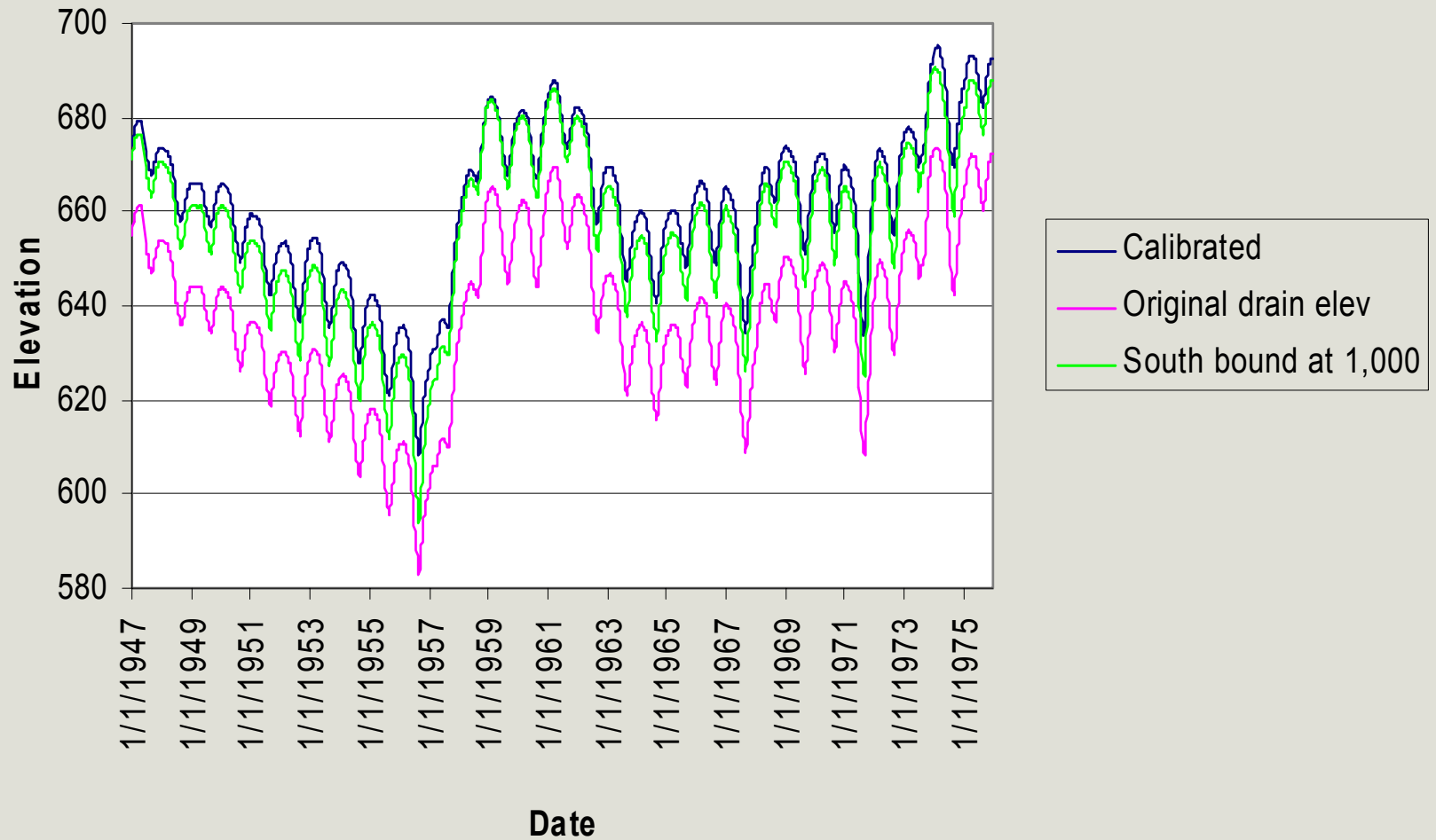


Figure 36a. Sensitivity of simulated hydraulic heads to changes in the location of southern model boundary and spring-orifice elevation

Uvalde_index well -- sensitivity

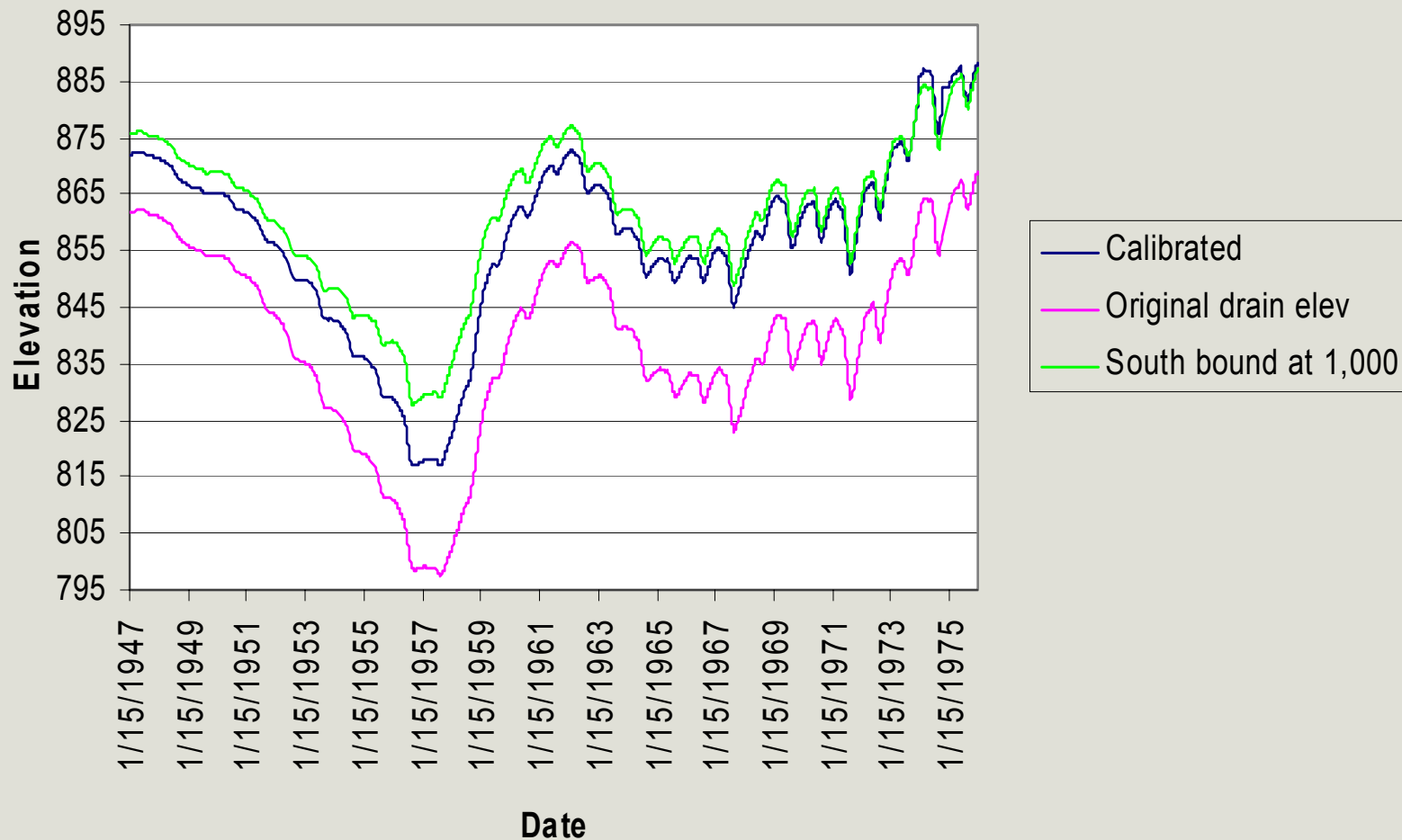


Figure 36b. Sensitivity of simulated hydraulic heads to changes in the location of southern model boundary and spring-orifice elevation

Comal Springs -- sensitivity

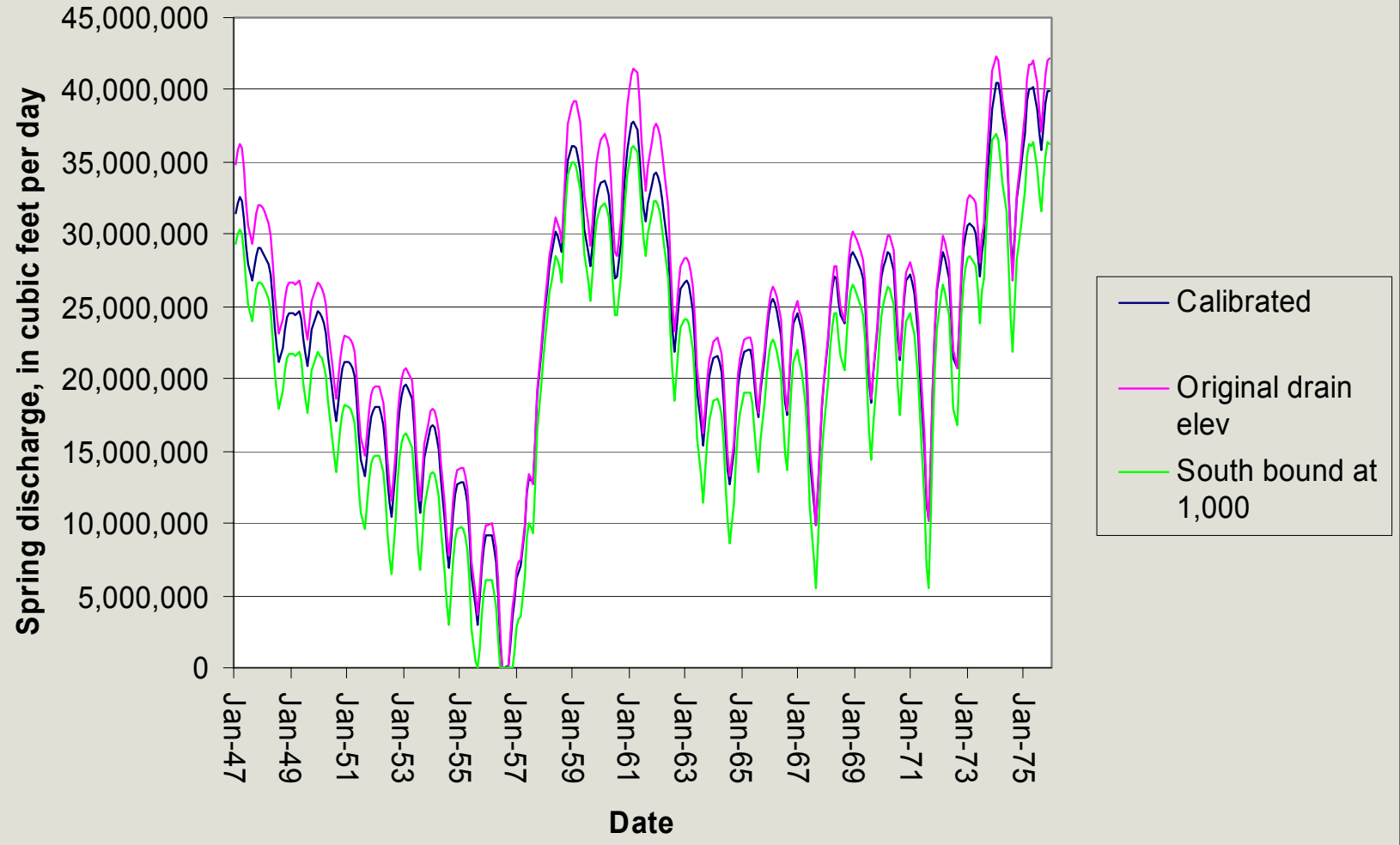
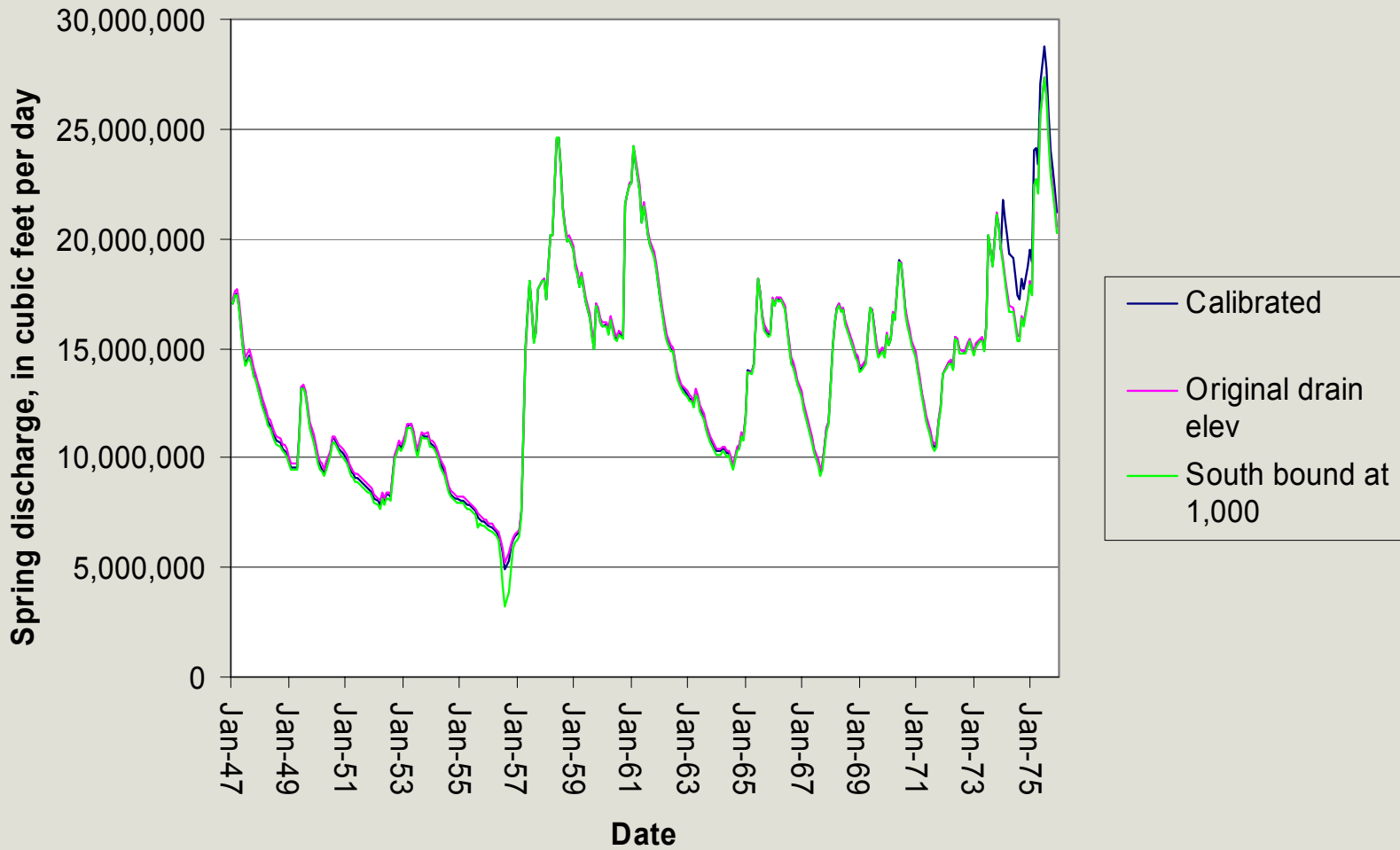


Figure 38a. Sensitivity of simulated spring discharge to changes in the location of southern model boundary and spring-orifice elevation

San Marcos Springs -- sensitivity



Leona Springs -- sensitivity

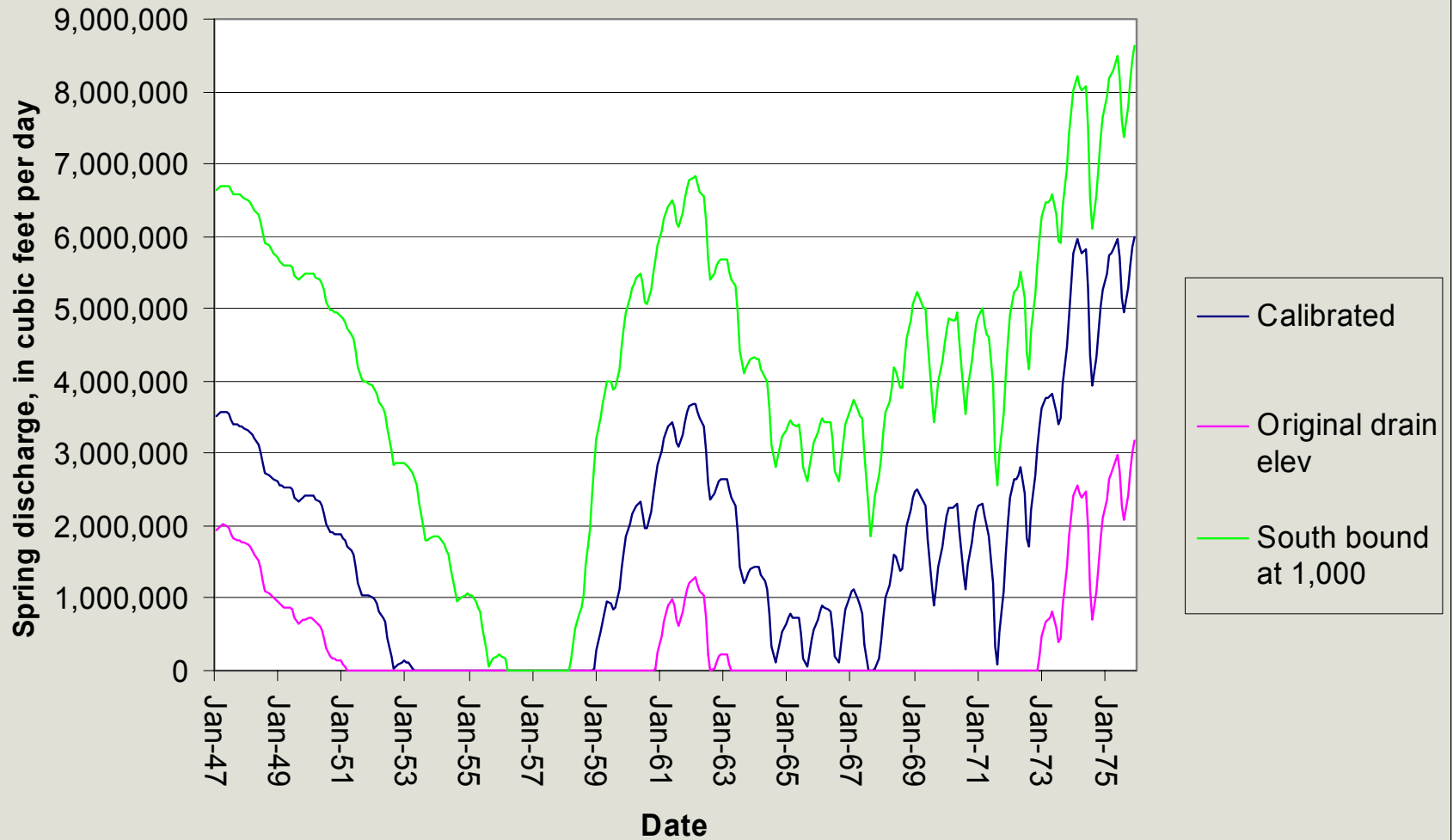


Figure 38b. Sensitivity of simulated spring discharge to changes in the location of southern model boundary and spring-orifice elevation