Analysis of Groundwater Resources in the Fernley Dodge Flat Hydrographic Basin

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Science
Environment
Solutions

Outline

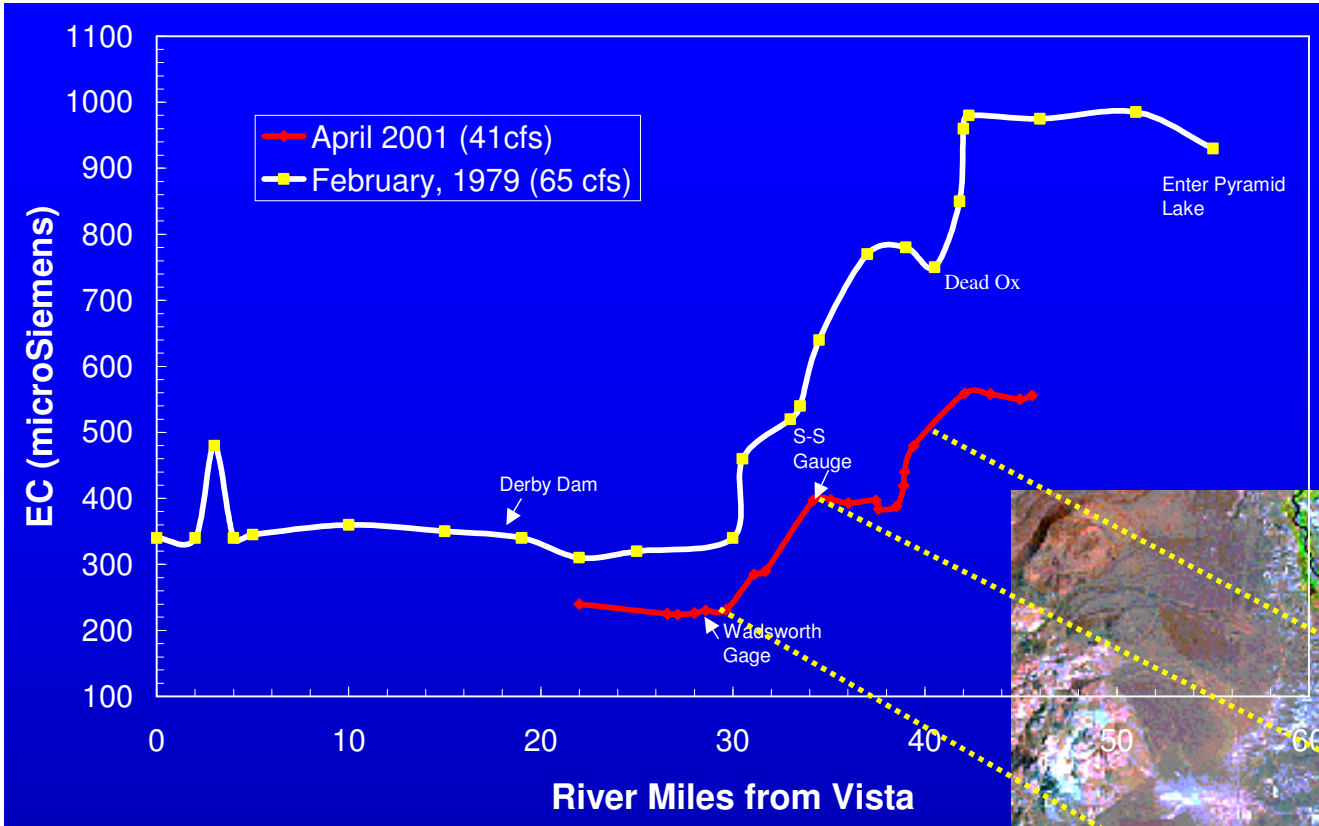
- Research History
- Previous Resource Assessment
  - Data Collection
  - Water quality
  - How Much Water is There?
  - Groundwater model
  - Where does Fernley water come from?
  - Where does Fernley water go?
  - Can Fernley pump more groundwater?
- Conclusions
- Future Research

Research History

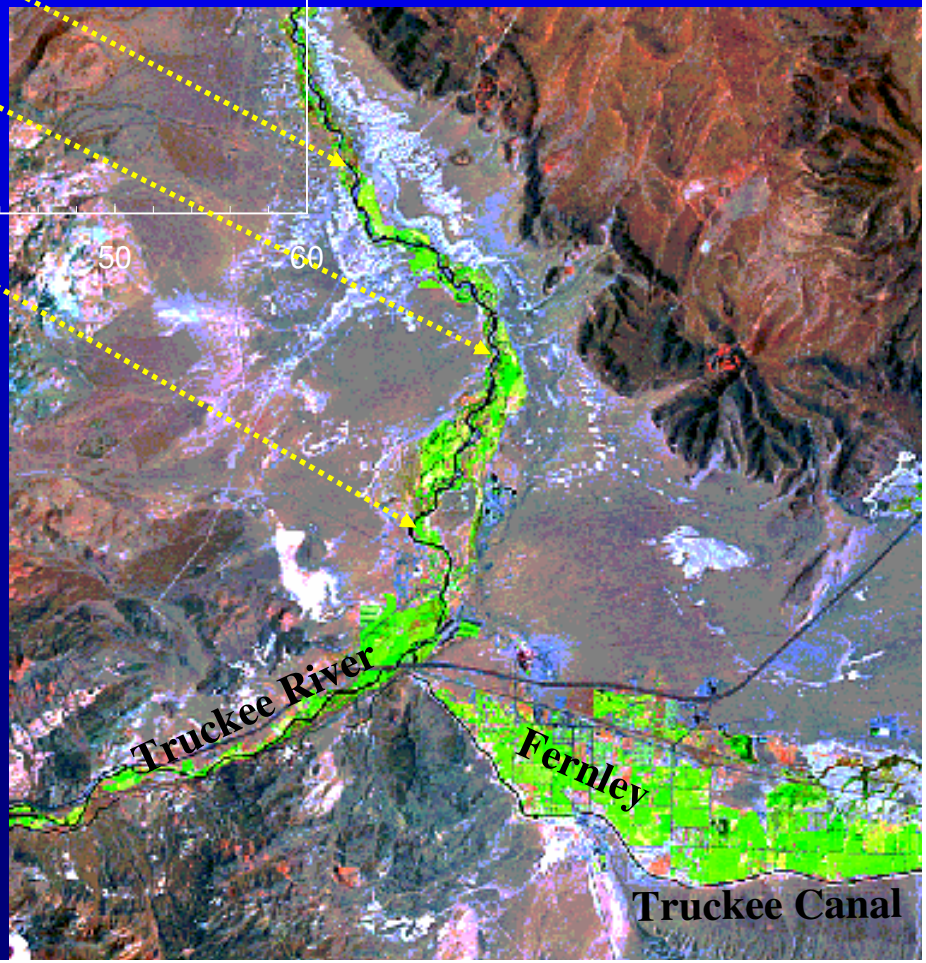
- 1998 - Dodge Flat Model: Assessment of the Truckee River flood plain aquifer and artificial recharge into Dodge Flat
- 2001 – Fernley/Dodge Flat Model: Quantified TDS loading in Truckee River under various land management scenarios
- 2002 – Canal Seepage Analysis:_Developed seepage estimates along Truckee Canal

Hydrogeologic Evaluation of the Wadsworth-Dodge Flat Area

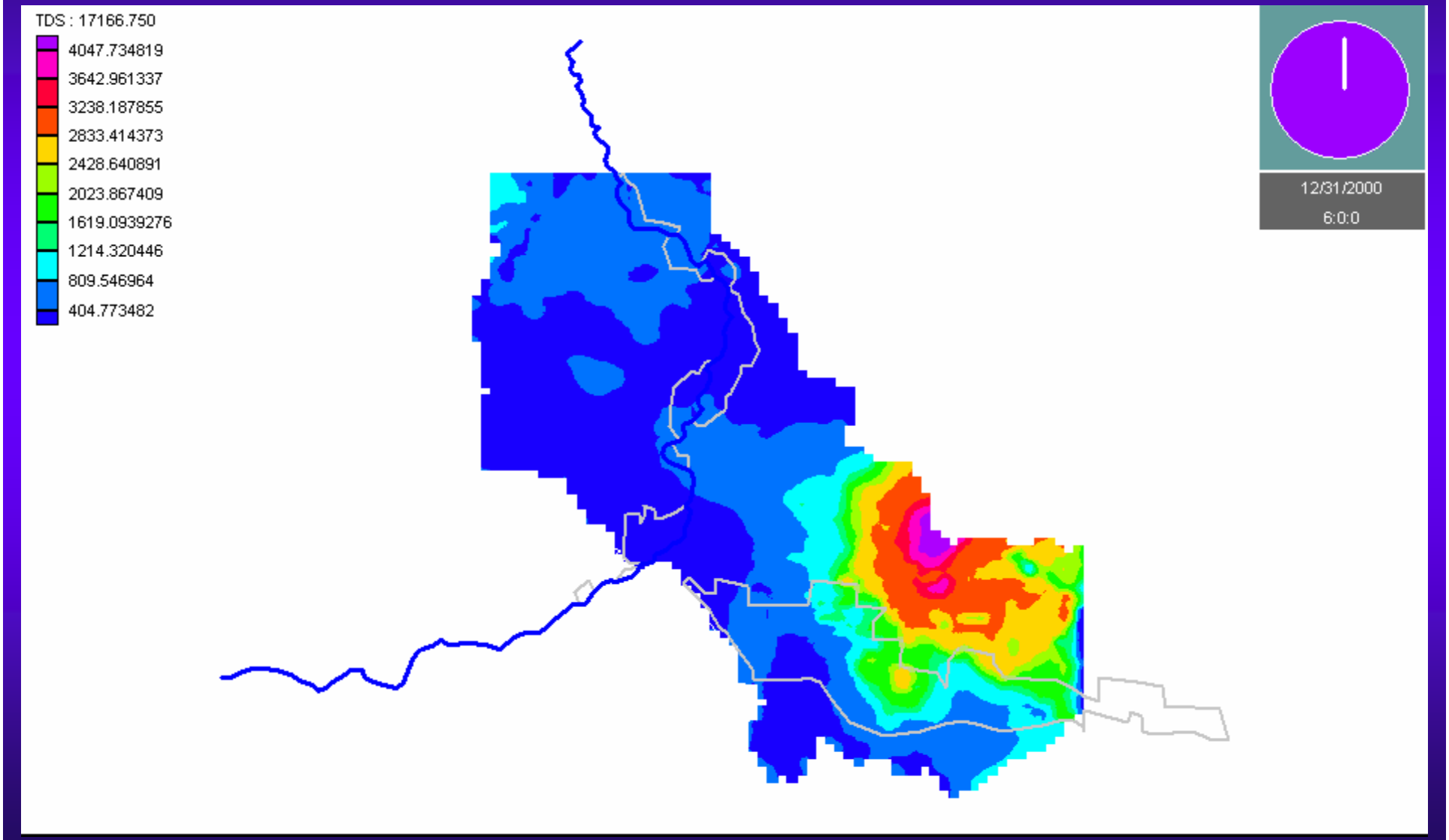
- The Truckee River flood plain aquifer has the capacity to provide 7,500 acre-ft/yr
- Drawdowns ranging 20 – 60 ft can be expected
- Water quality from groundwater in the Fernley area may require treatment



Truckee River Low Flow TDS Surveys

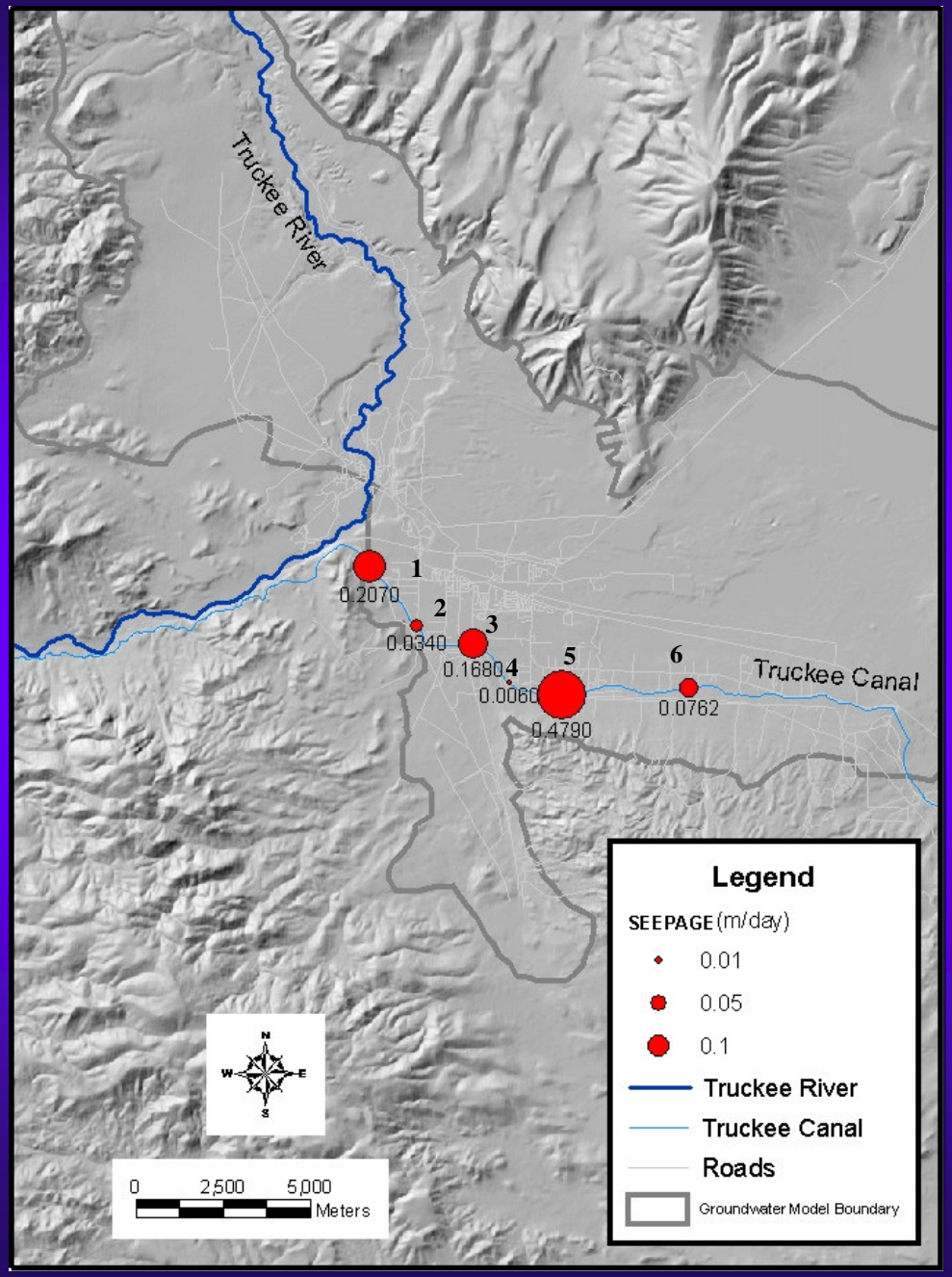


TDS Migration

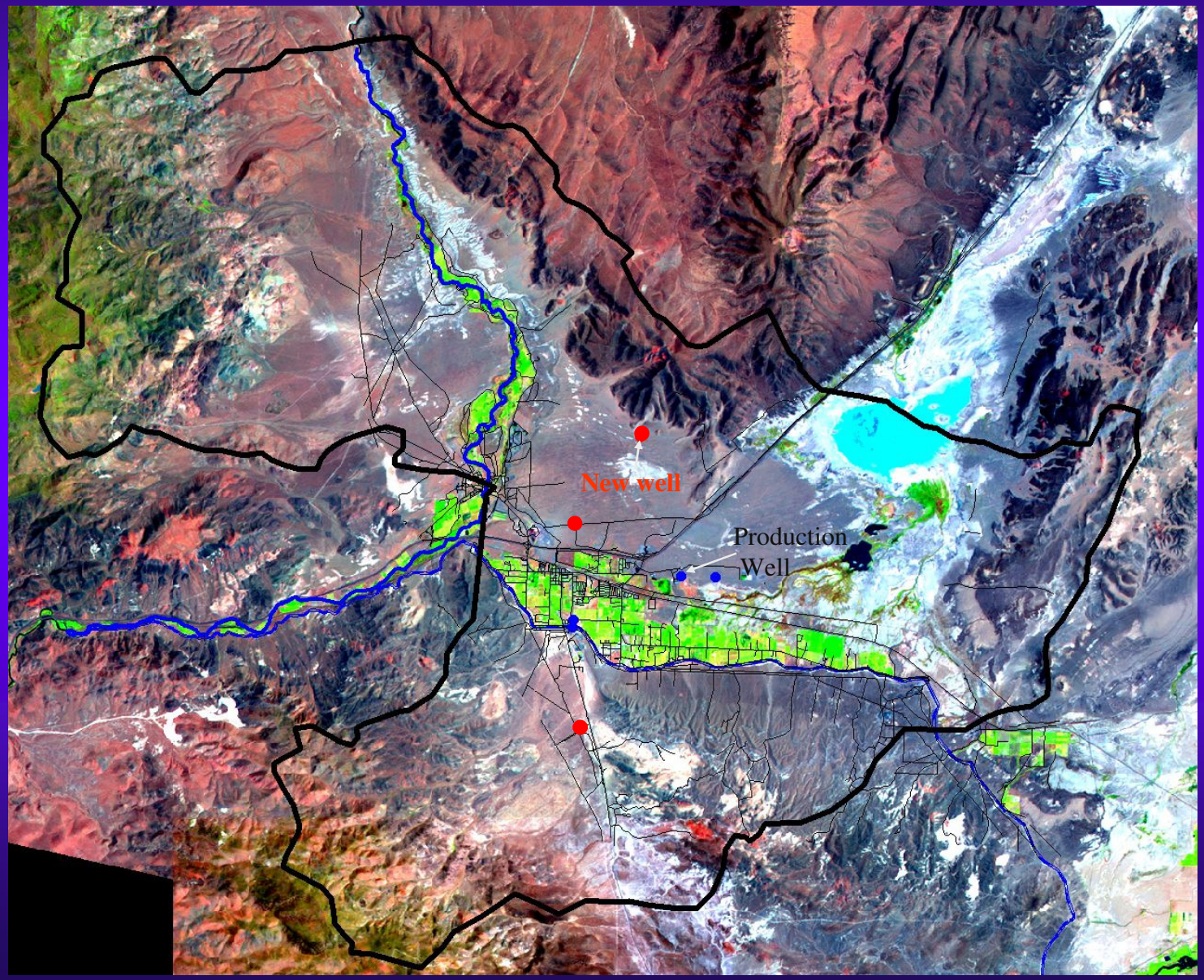


Canal Seepage Analysis

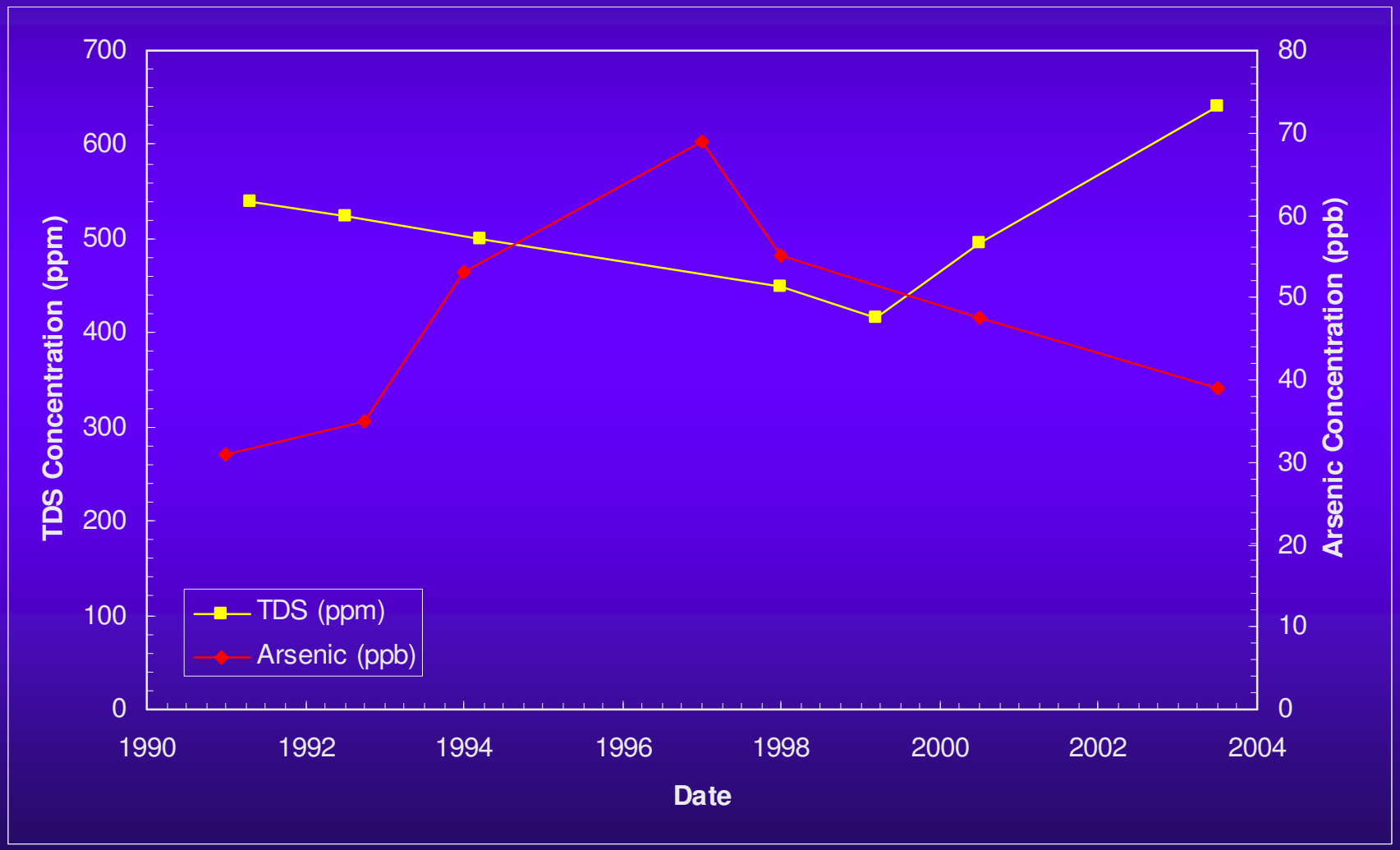
Section #	Seepage Rate (acre-ft/yr)
1	1270
2	440
3	1810
4	50
5	6900
6	710
Total:	**11,180**



Data Collection



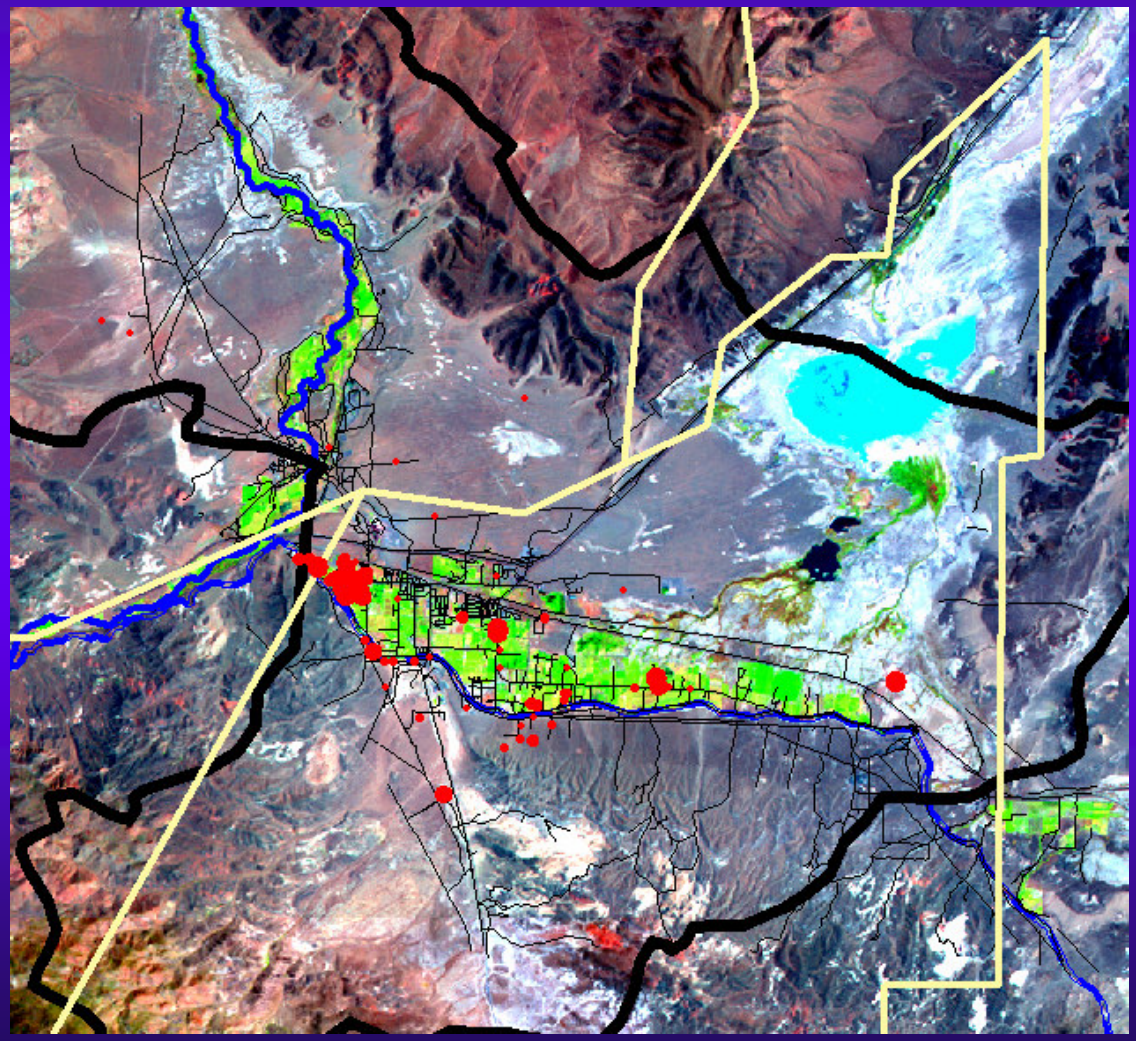
Water Quality



Arsenic Distributions

Arsenic Concentration

- 0 - 62
- 62 - 135.99
- 135.99 - 278.07
- 278.07 - 457.58
- 457.58 - 985.07



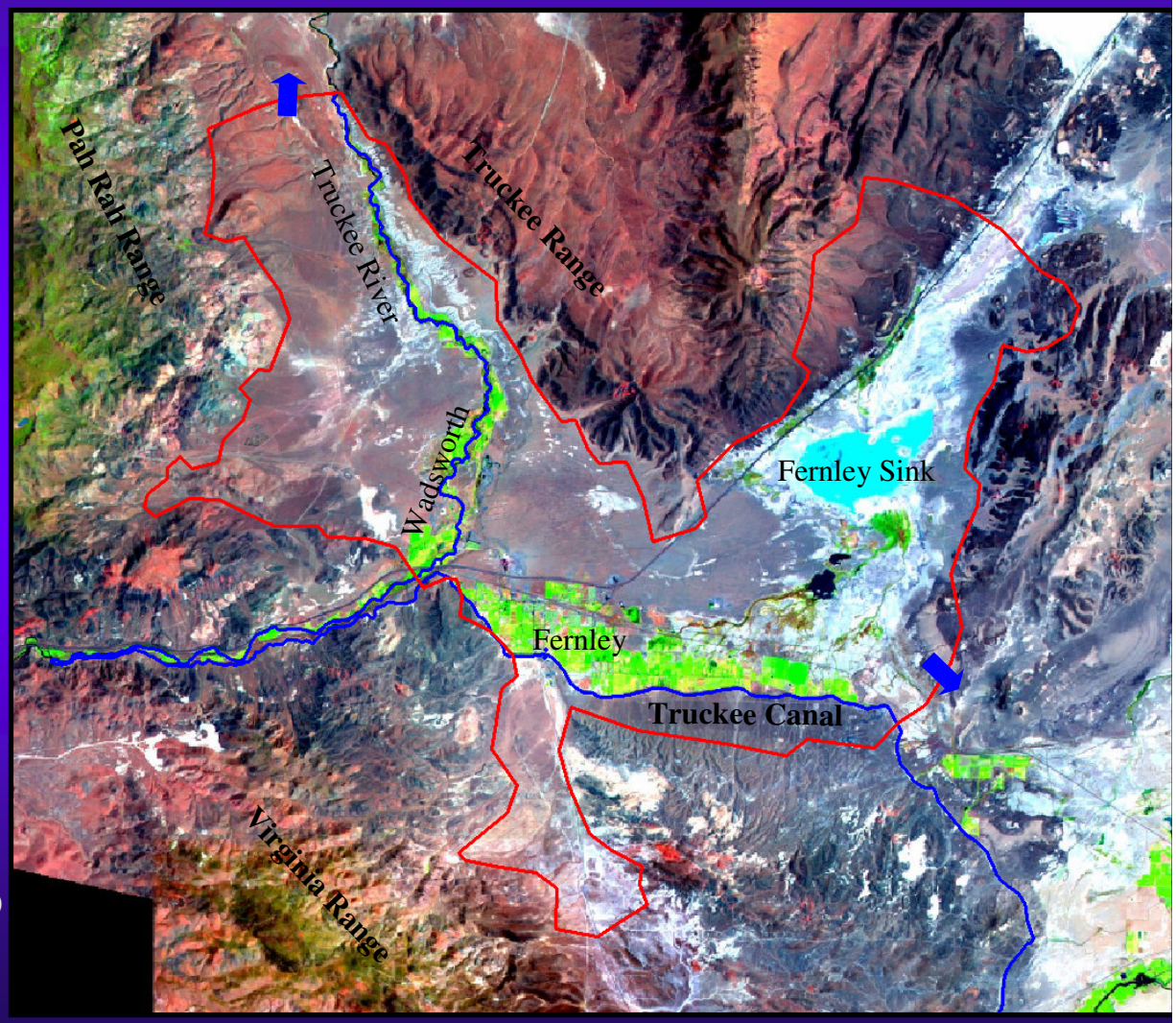
How Much Water is There?

INPUTS (acre-ft/year)	
Fernley Irrigation Losses	6,900
Wadsworth Irrigation Losses	1,900
Leakage from Truckee Canal	14,000
Natural Recharge from Pah Rah Range	3,600
Natural Recharge from Virginia Range	2,000
Natural Recharge from Truckee Range	1,700
Total:	30,100

OUTPUTS (acre-ft/yr)	
Fernley Groundwater Pumping	6,800
Fernley Sink Evapotranspiratioin	6,600
Truckee River	12,000
Interbasin Groundwater Flow	4,700
Total:	30,100

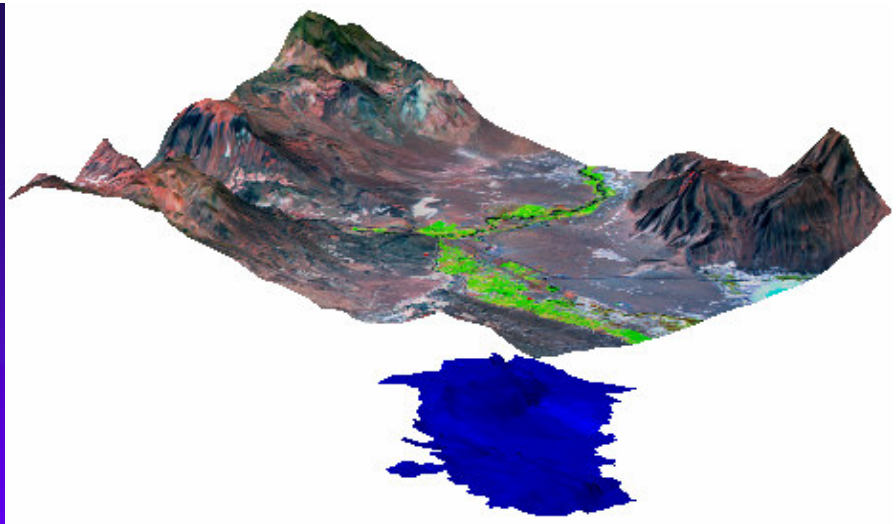
Natural Recharge = 7,300 acre-ft/year (25%)

Anthropogenic Recharge = 22,800 acre-ft/year (75%)



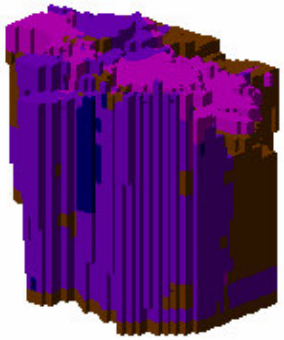
Groundwater Model Elements

Surface Topography

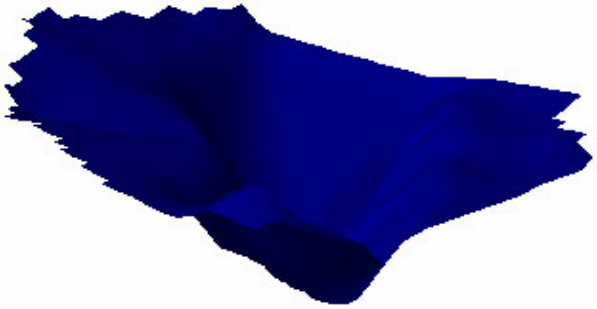


Water Levels

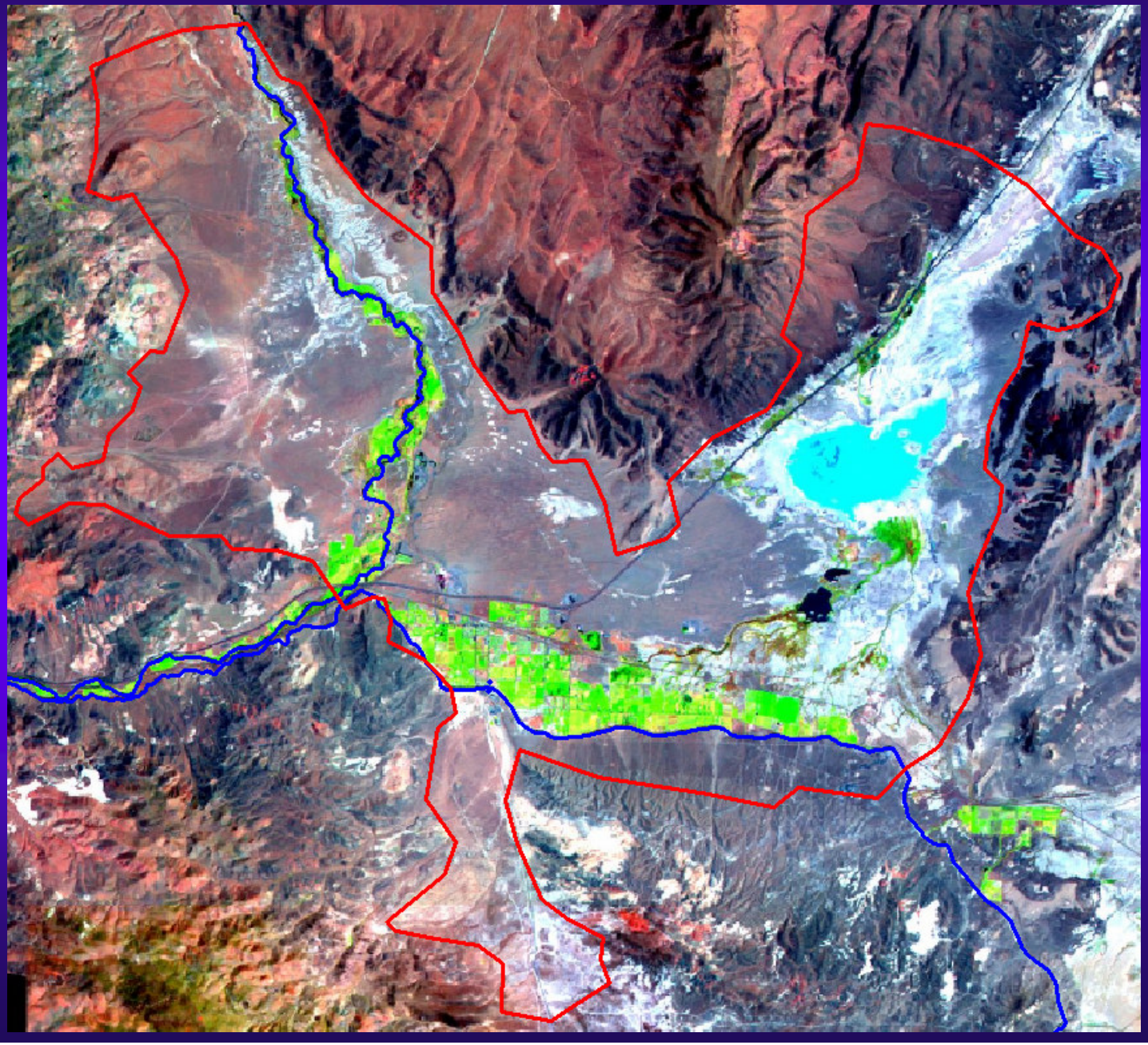
Geologic Model



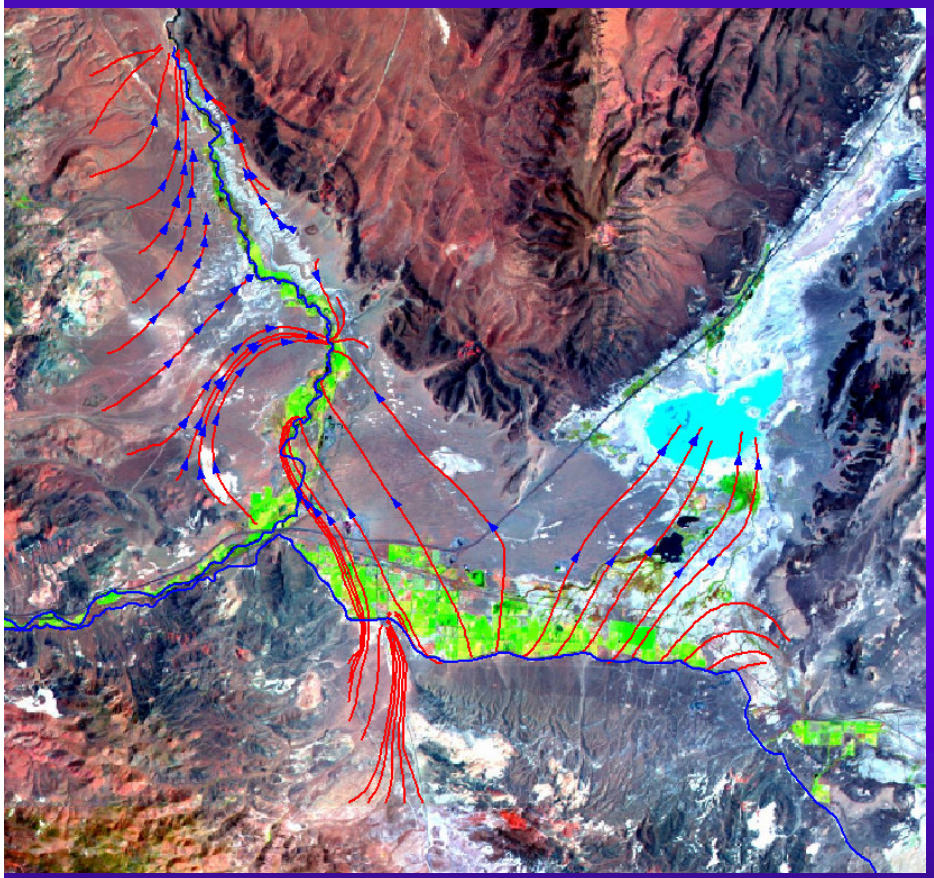
Bedrock Surface



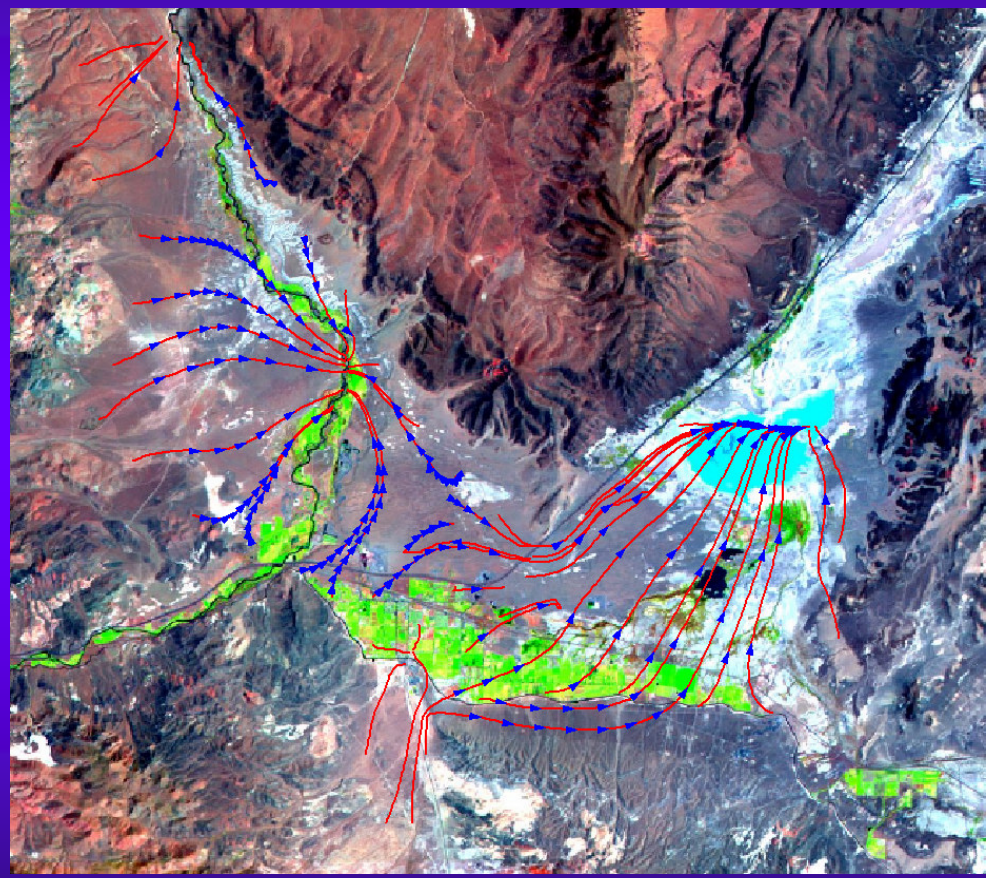
Groundwater Model Area



Where Does the Water Go?

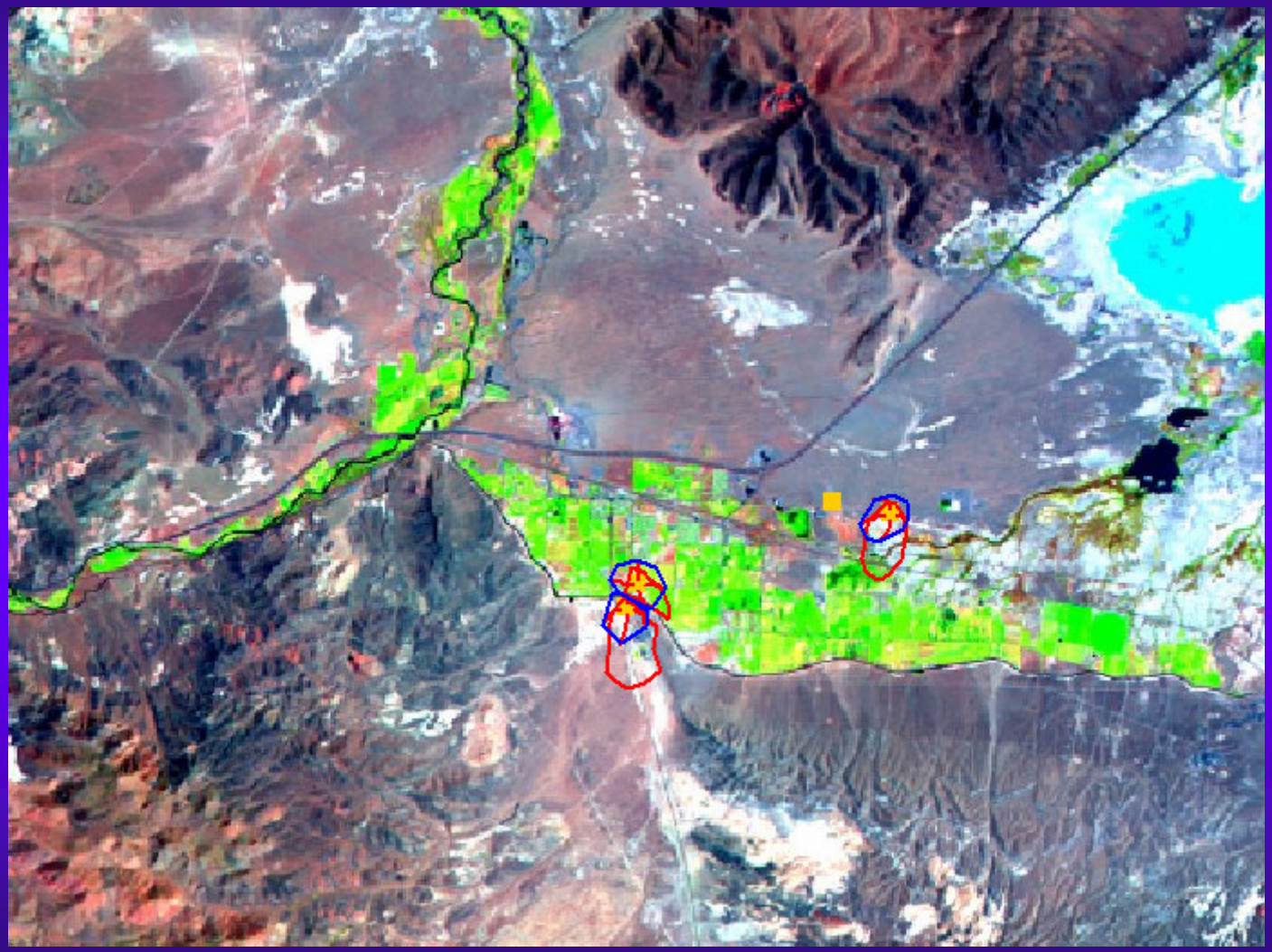


With Canal



Without Canal

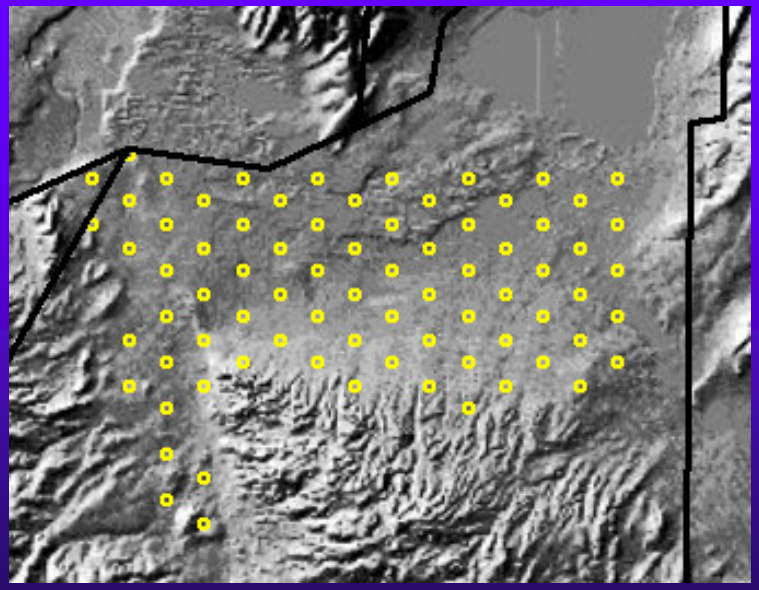
Where Does the City Water Come From?



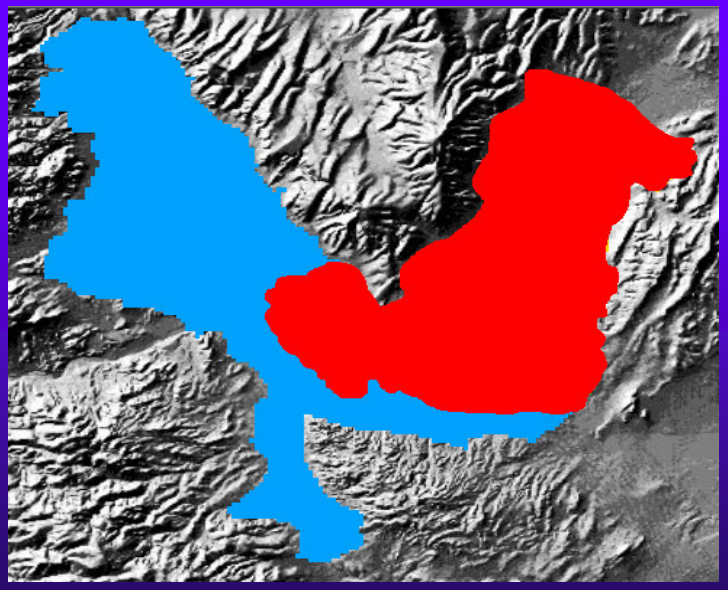
50 year capture zones for City of Fernley supply wells.
Blue line represents canal not in operation. Red line represents canal in operation.

Water Supply Analysis

- The groundwater model was used to determine the best location for a new groundwater supply well
- A statistical approach was used to determine if groundwater levels would decrease significantly and/or poor quality water would intercept the potential well

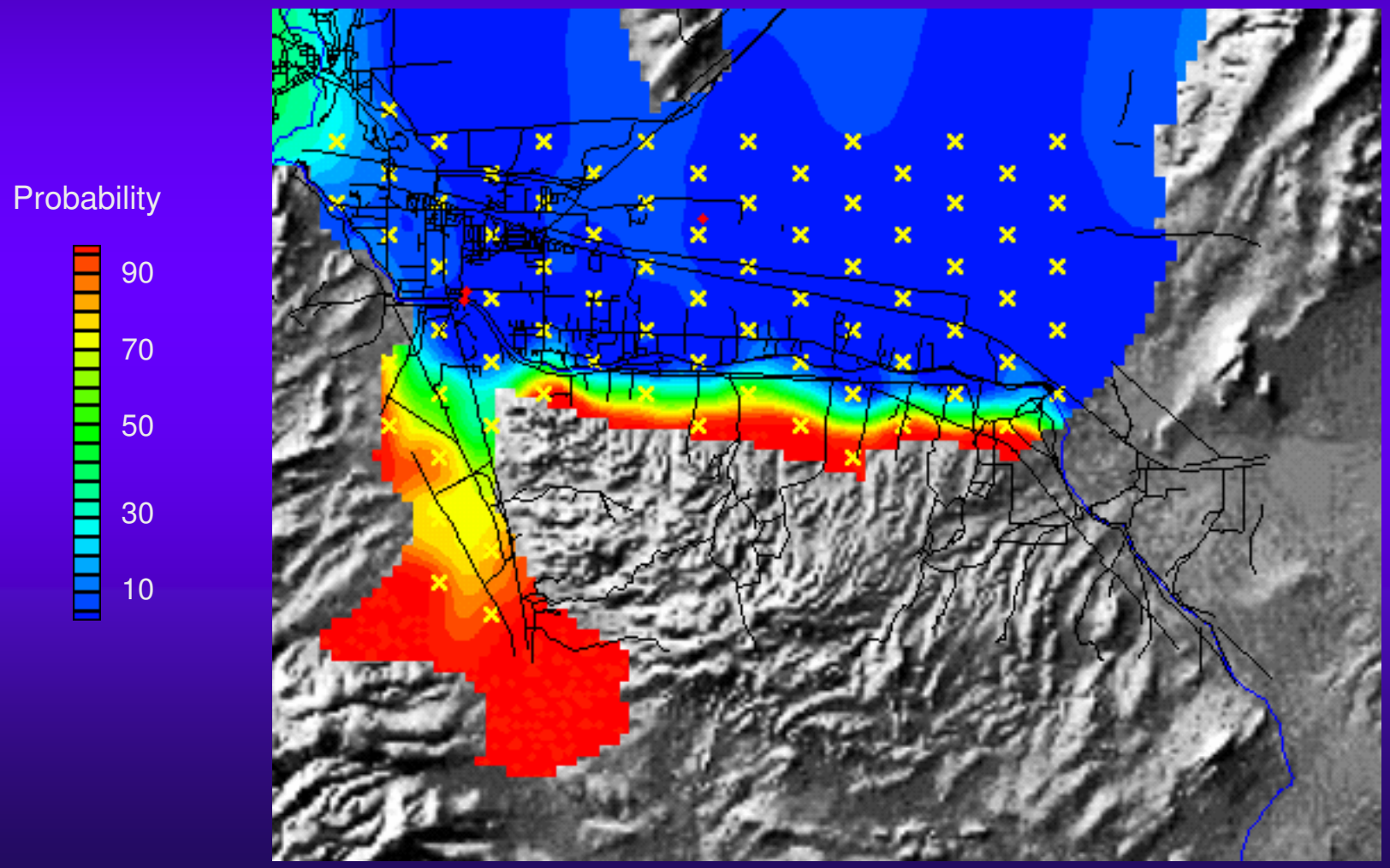


77 potential well locations

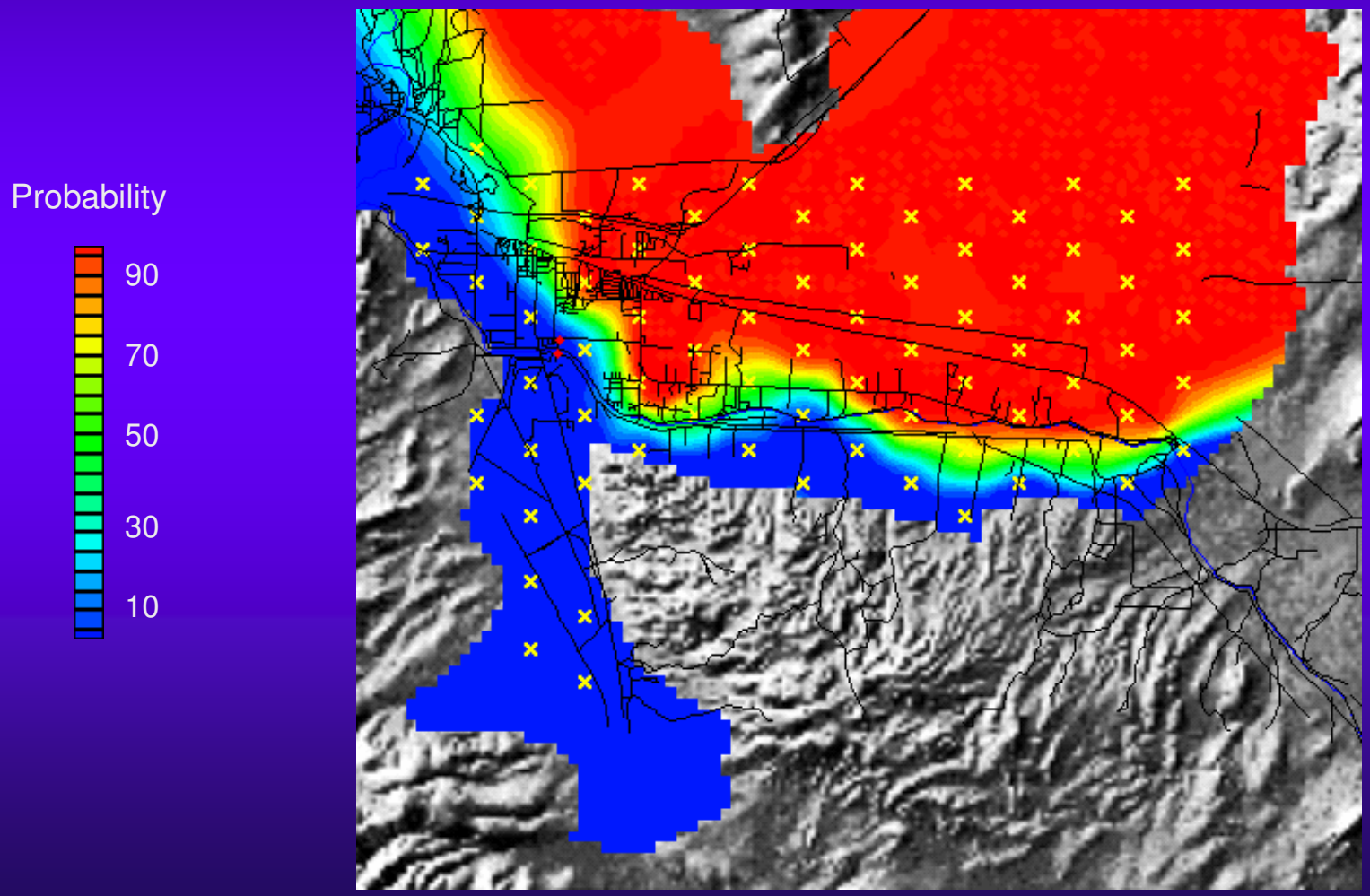


Poor quality water shown in red

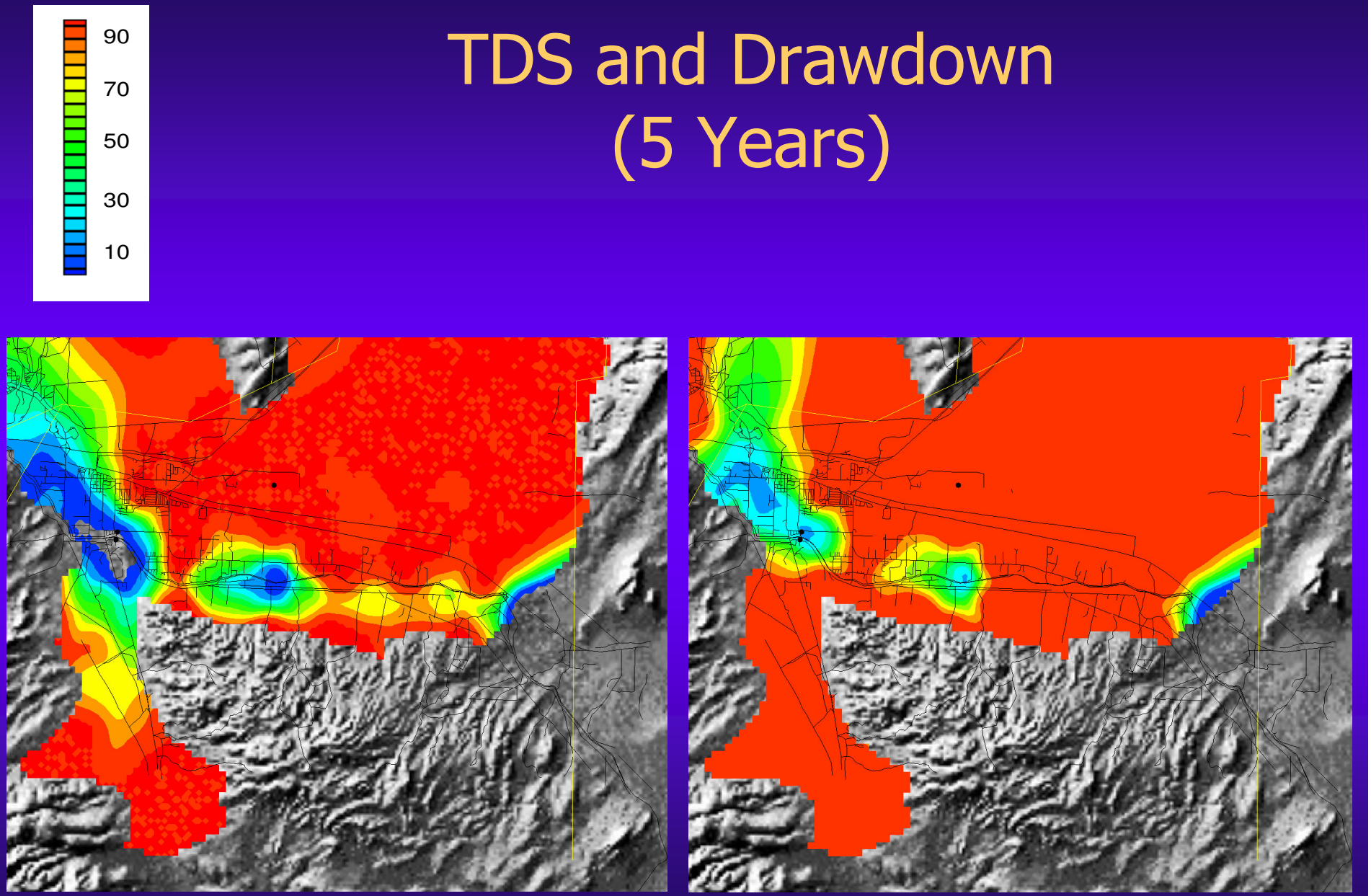
Steady State Drawdown Probabilities



Probability of TDS Plume Encroachment after 5 years



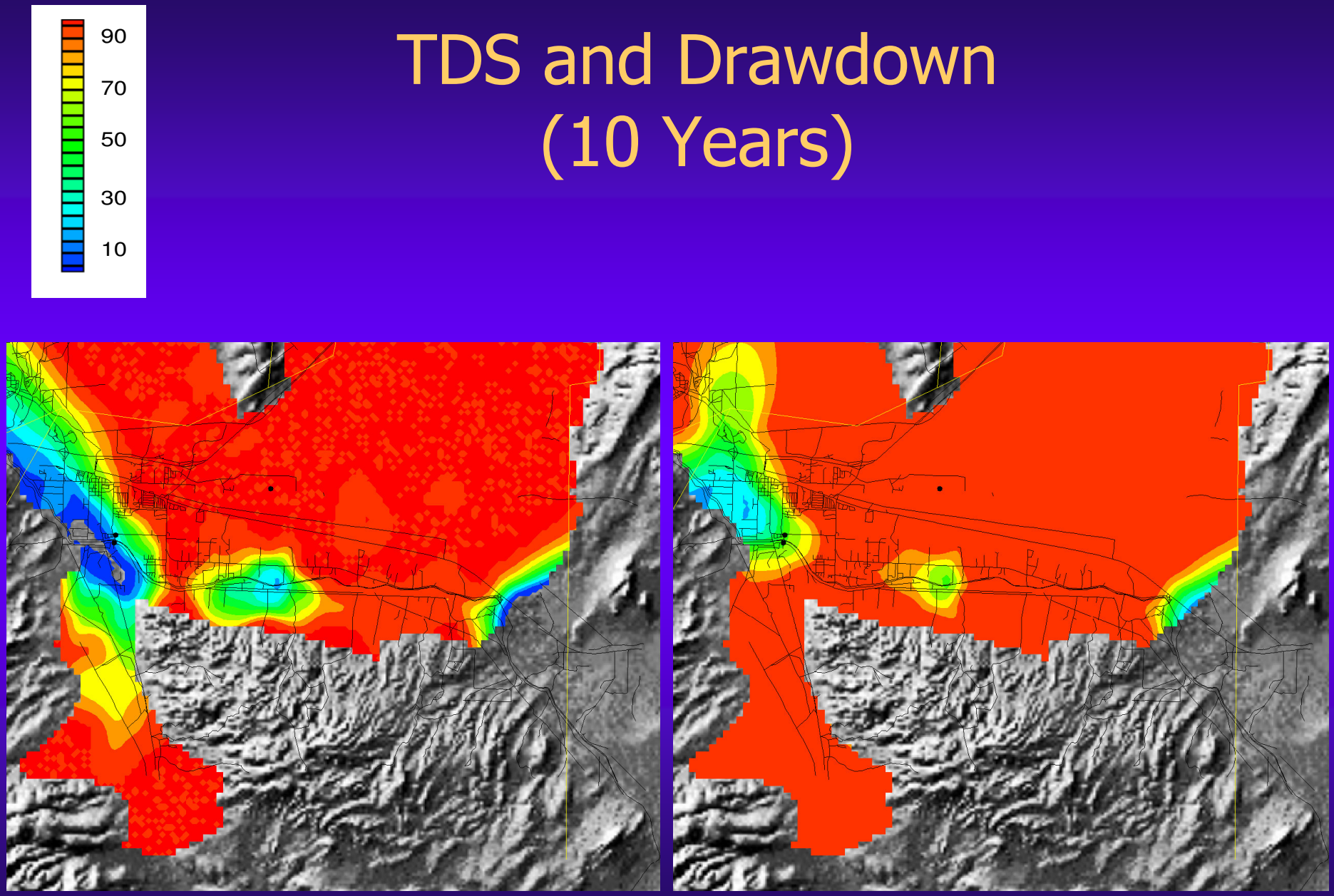
TDS and Drawdown (5 Years)



Canal

No Canal

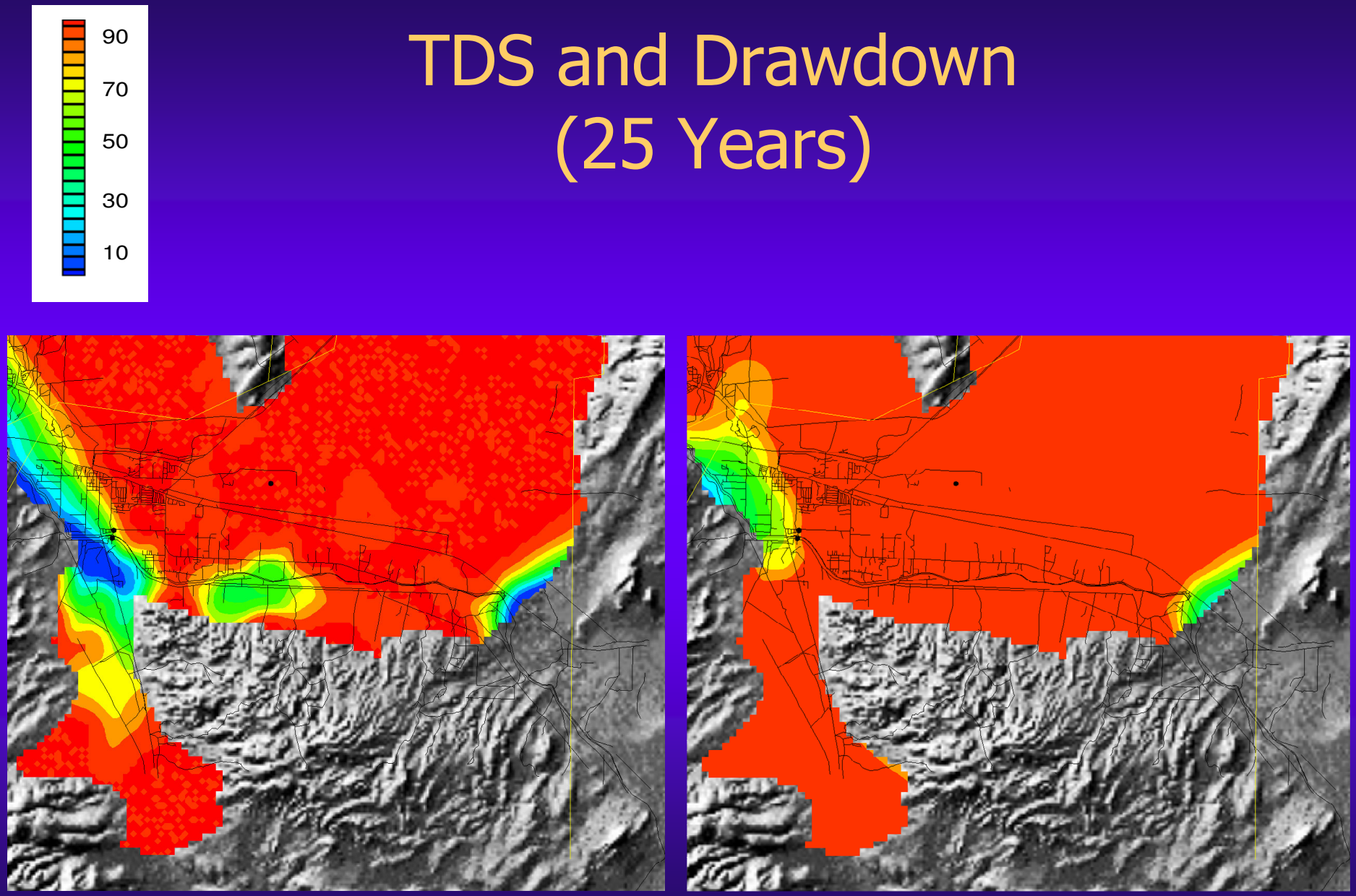
TDS and Drawdown (10 Years)



Canal

No Canal

TDS and Drawdown (25 Years)



Canal

No Canal

Conclusions

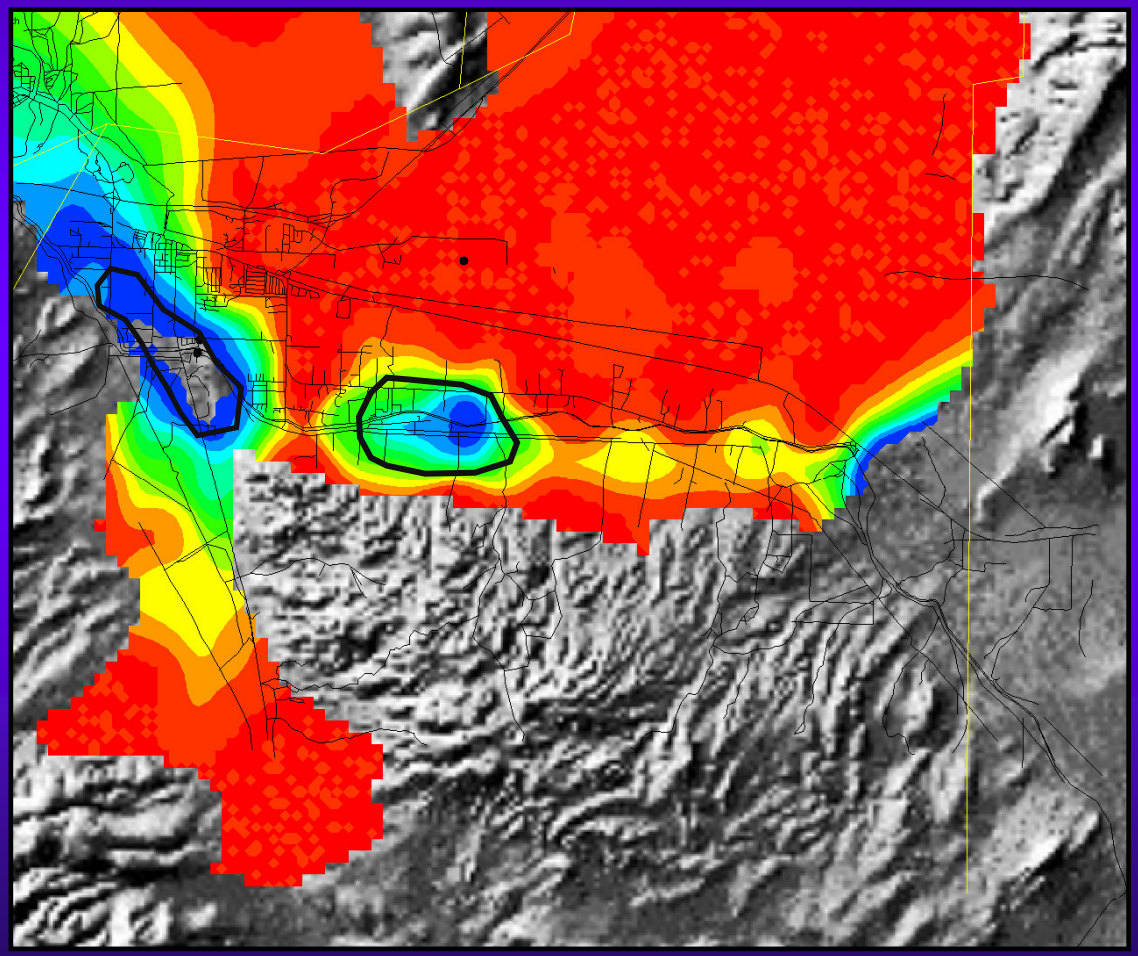
- Truckee River water provides 75% of the water to the Fernley/Wadsworth basins from canal seepage and irrigation recharge
- Under current hydrologic conditions the City of Fernley should be able to pump an additional 4,000 af/yr (2,500 GPM) from the Fernley aquifer system

Conclusions

- Although arsenic concentrations have decreased recently, TDS concentrations have increased
- The change in water quality is most likely due to increases in pumping and drawing in water from different zones
- Treatment will be required for arsenic and possibly other trace elements such as manganese for groundwater pumped from the Fernley area

Conclusions

- Future production wells should be placed in regions of low probability of drawdown and TDS encroachment



Future Research

- Collect additional hydraulic data in the Wadsworth area better understand the interaction between the regional aquifer and the Truckee River
- Modify the existing groundwater model
  - Incorporate new hydraulic data
  - Recalibrate model
  - Convert model to transient
- Simulate various water supply scenarios