North Hills Groundwater Models

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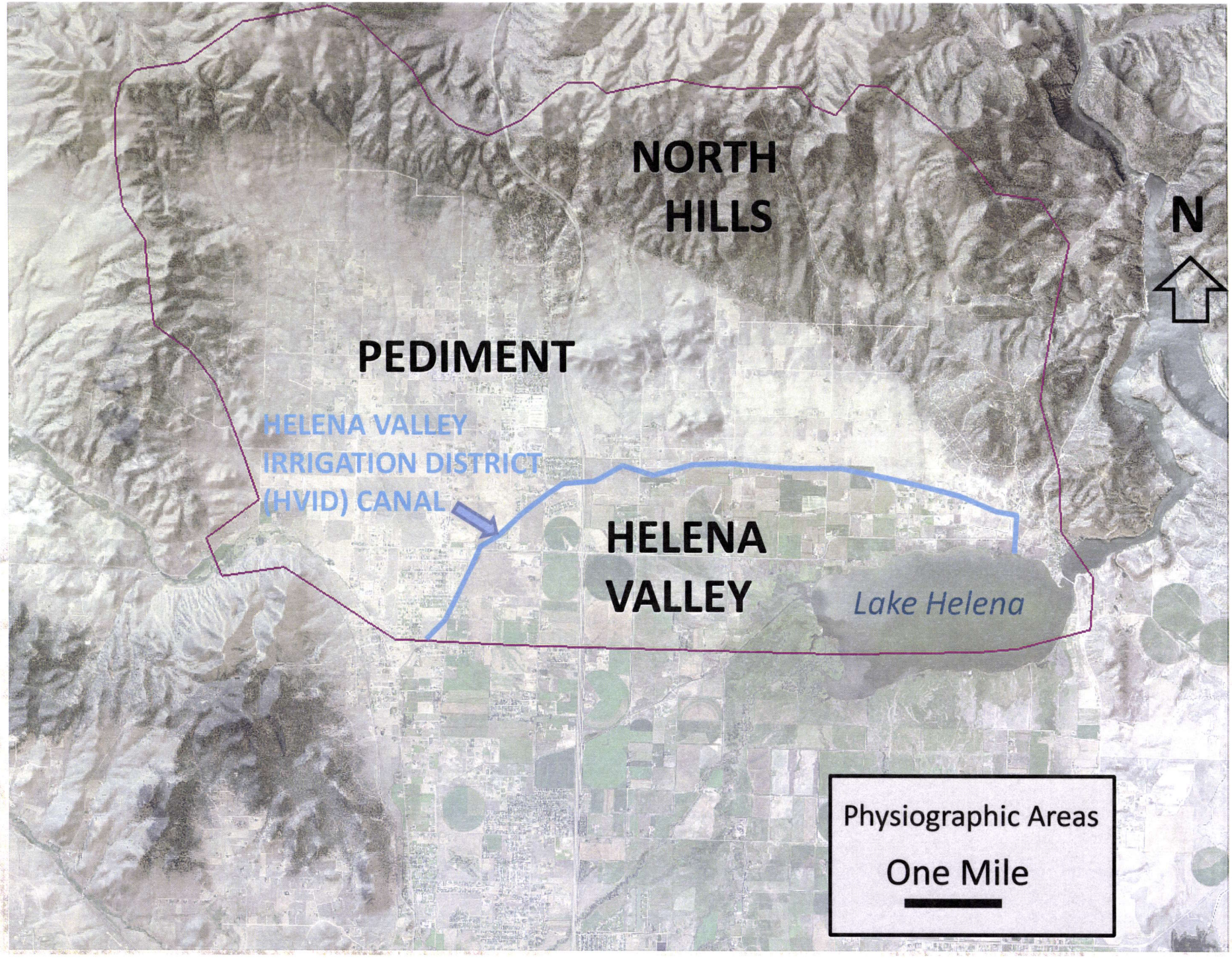
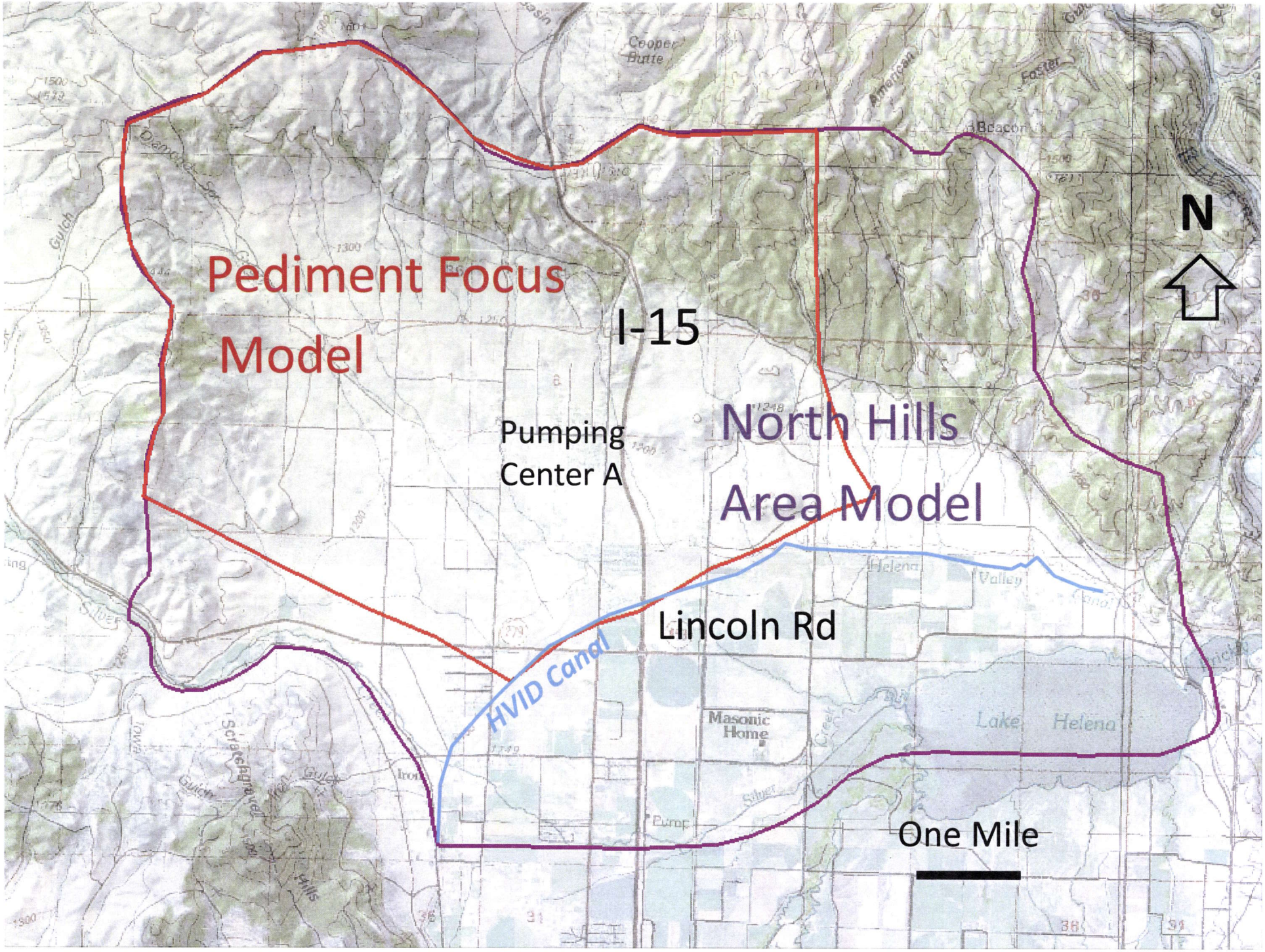
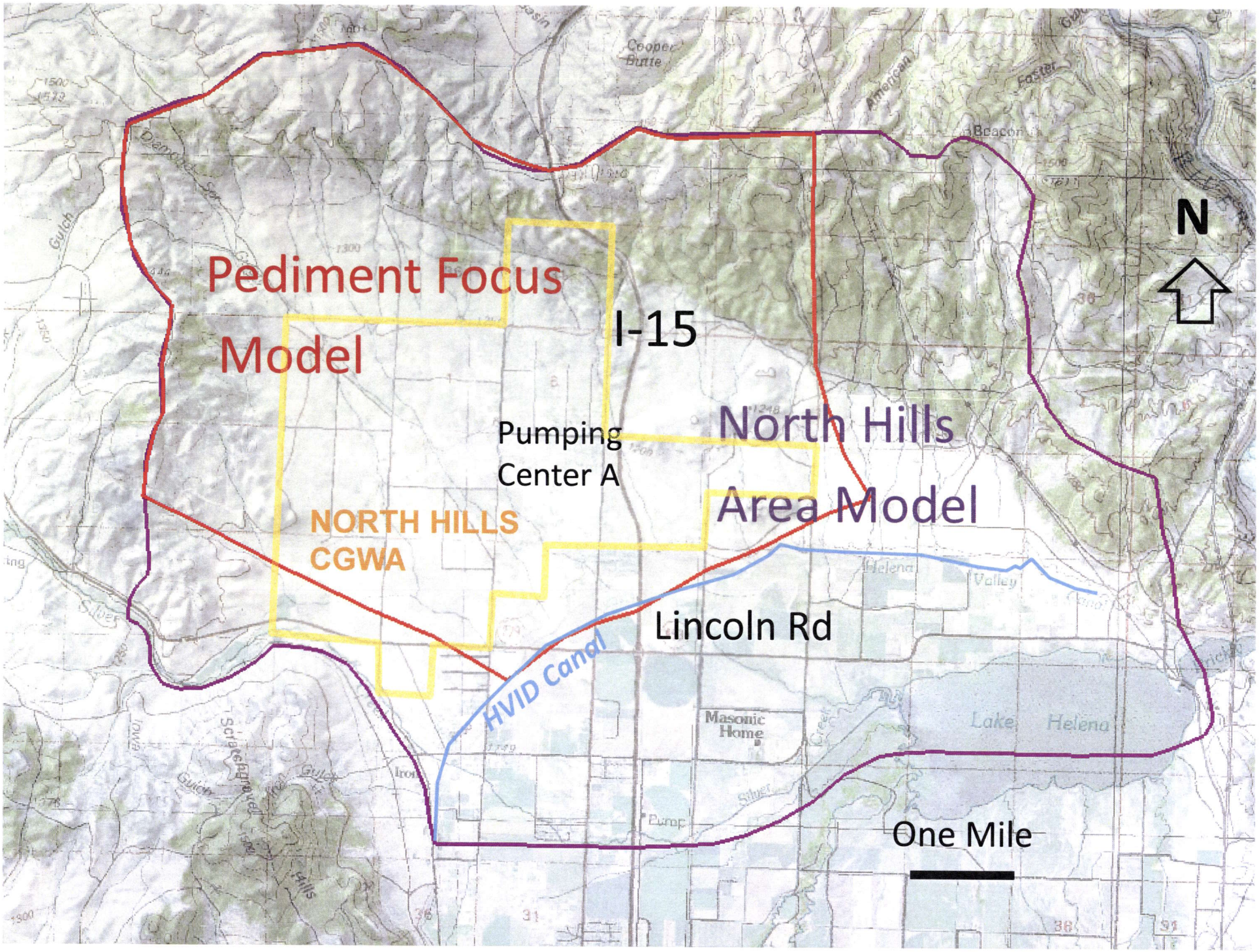
in cooperation with the Lewis and Clark County Local Water Quality Protection District

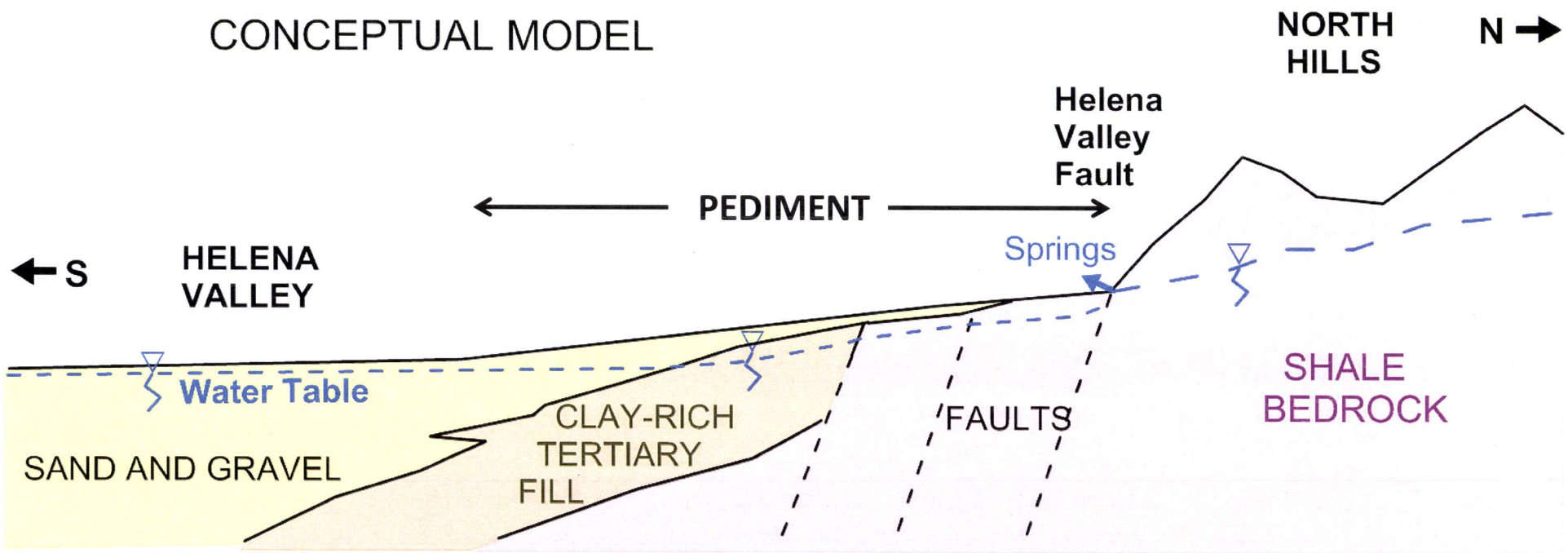
WPIC
September 14, 2011
Exhibit 6


NORTH
HILLS
N
PEDIMENT
HELENA VALLEY
IRRIGATION DISTRICT
(HVID) CANAL
HELENA
VALLEY
Lake Helena
Physiographic Areas
One Mile


Pediment Focus
Model
I-15
Pumping
Center A
North Hills
Area Model
Lincoln Rd
HVID Canal
Masonic
Home
Lake Helena
One Mile
N
Cooper
Butte
American
Beacon
Helena
Valley
Canal
Pump


Pediment Focus
Model
I-15
Pumping
Center A
North Hills
Area Model
NORTH HILLS
CGWA
Lincoln Rd
HVID Canal
Masonic
Home
Lake Helena
One Mile
N

Geologic setting

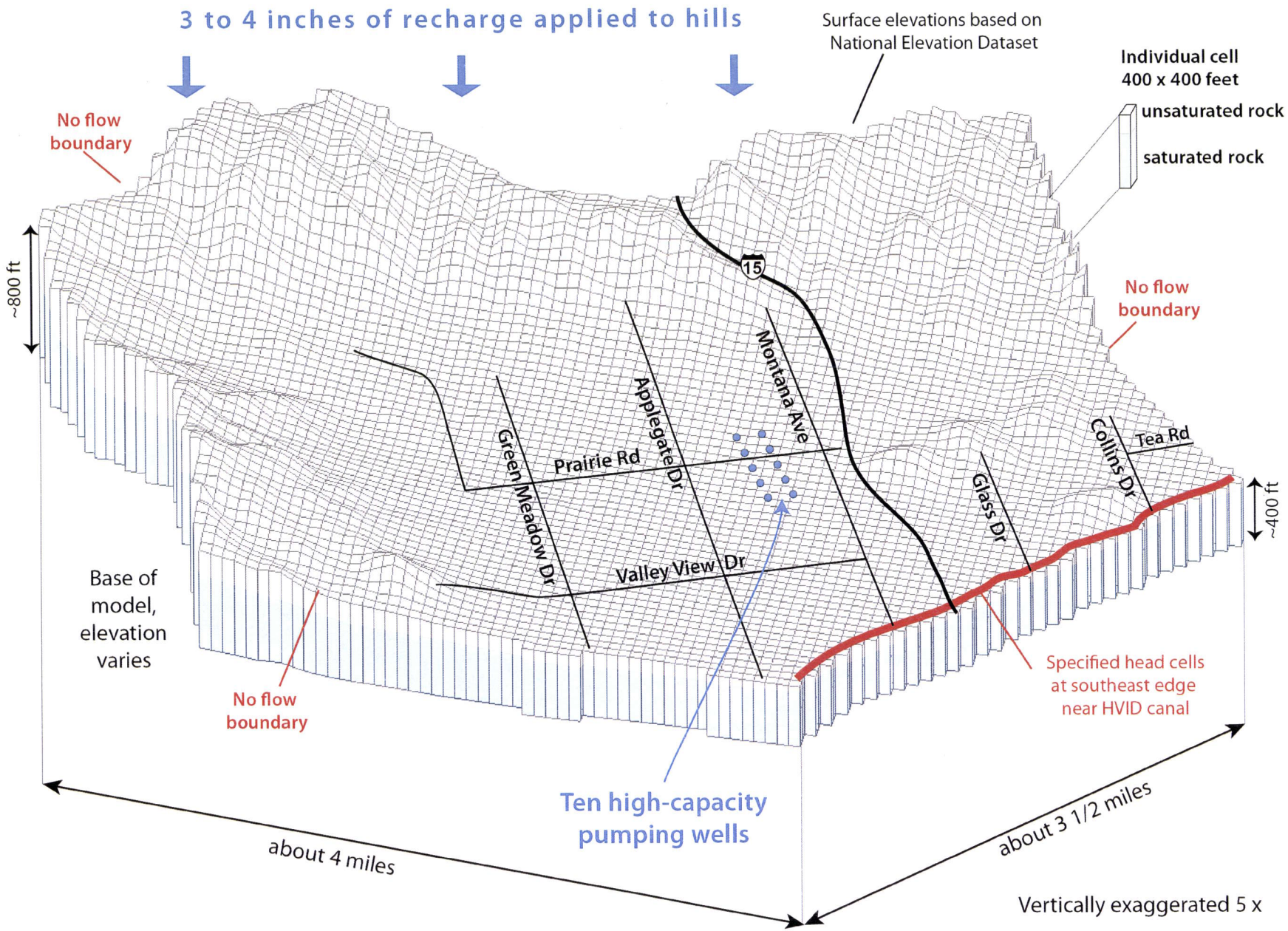


QUATERNARY or VALLEY AQUIFER

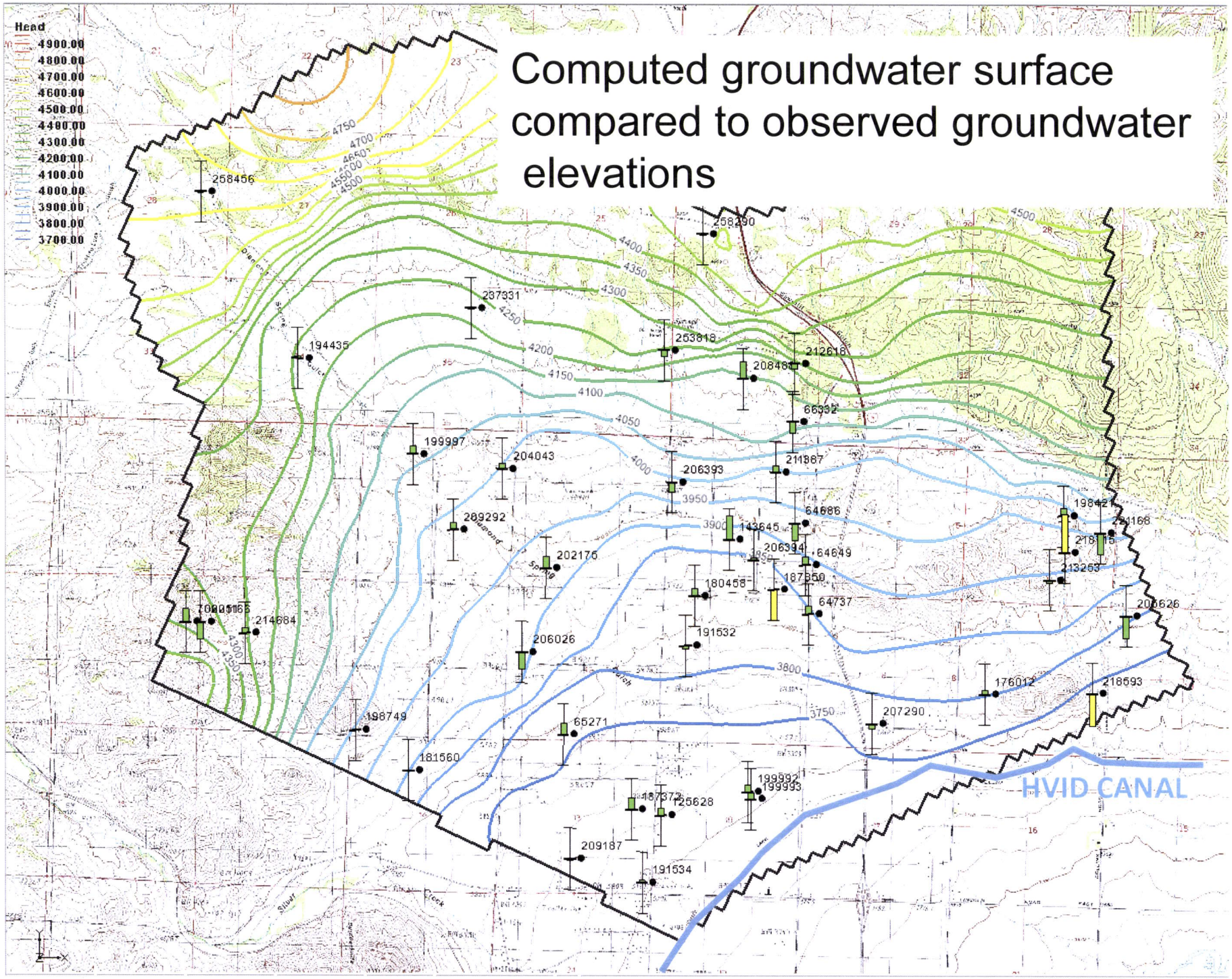
TERTIARY AQUIFER

BEDROCK AQUIFER

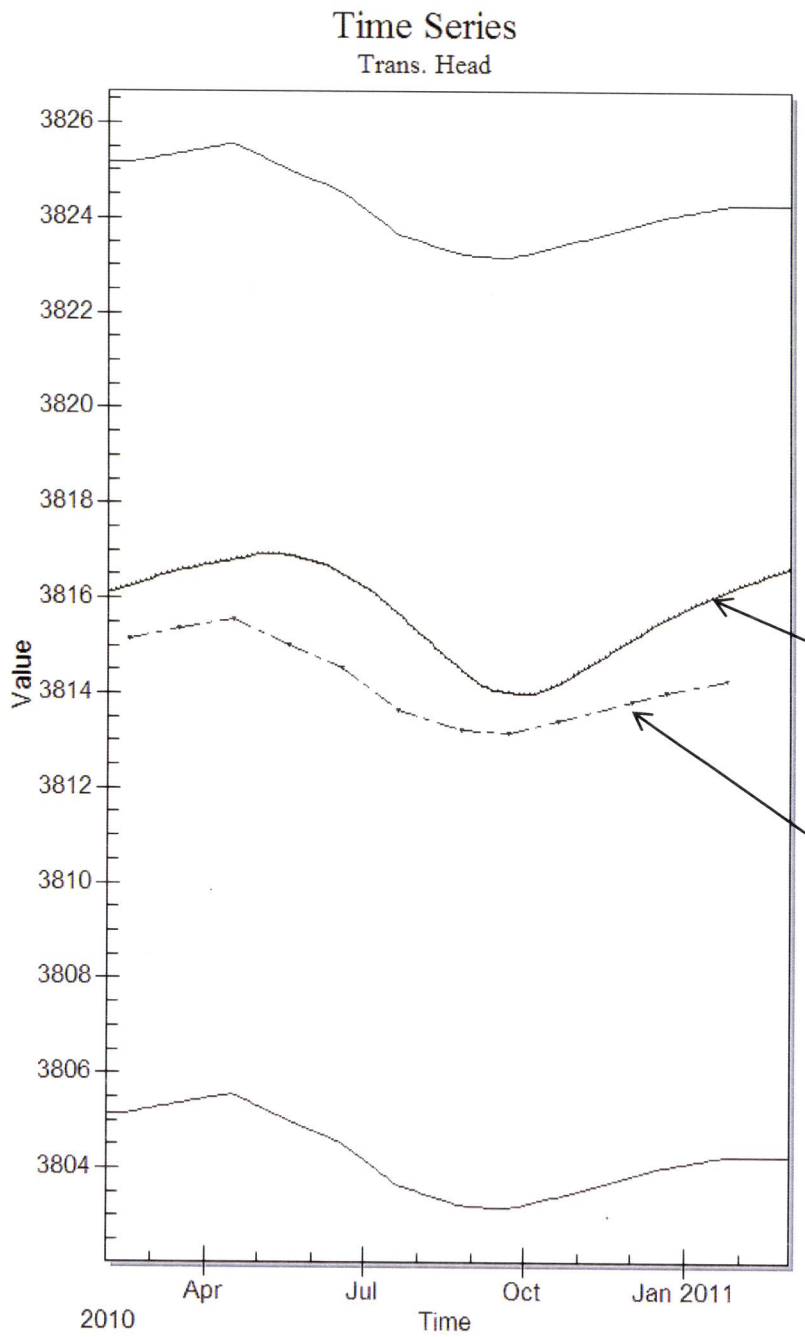
North Hills Pediment Focus Model
Schematic View



Computed groundwater surface compared to observed groundwater elevations



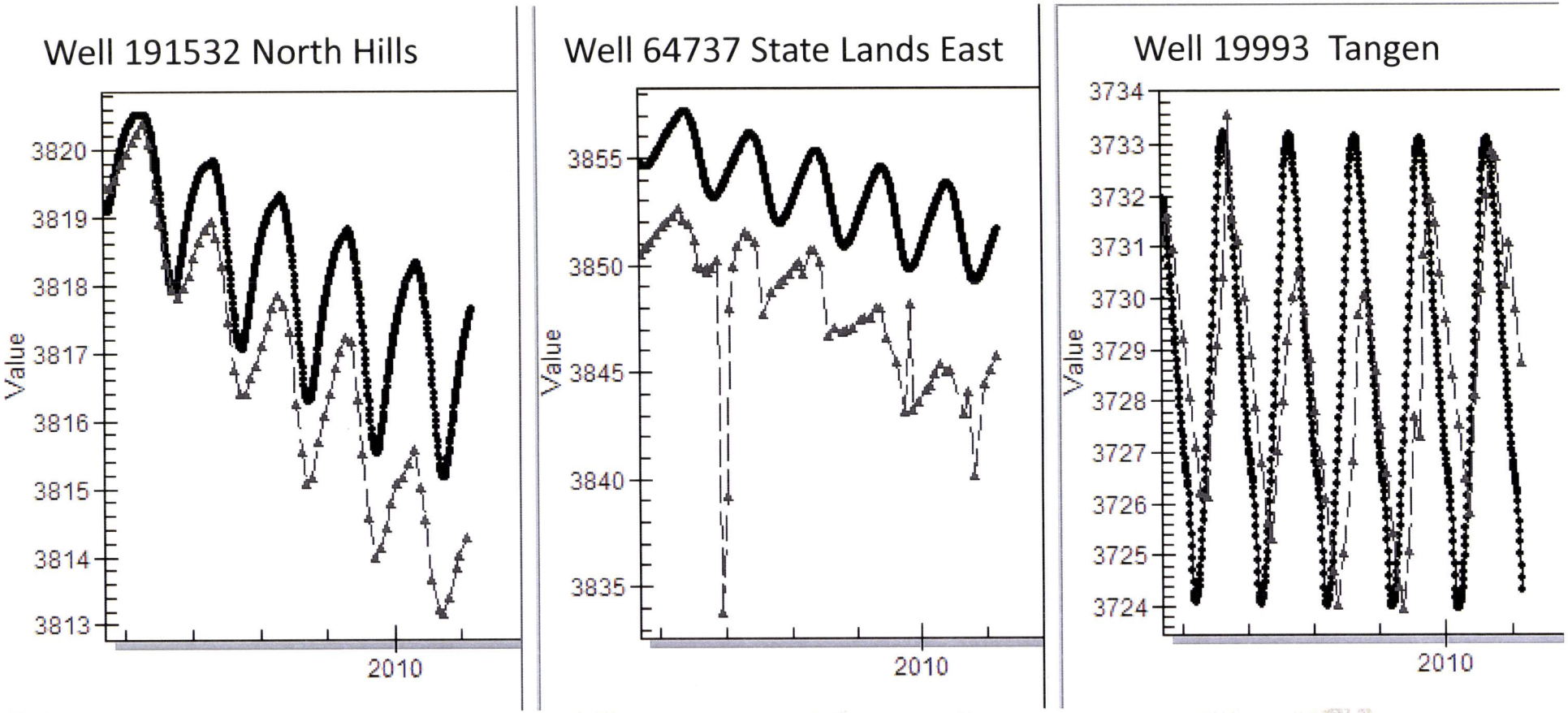
Well 64737
State Lands East

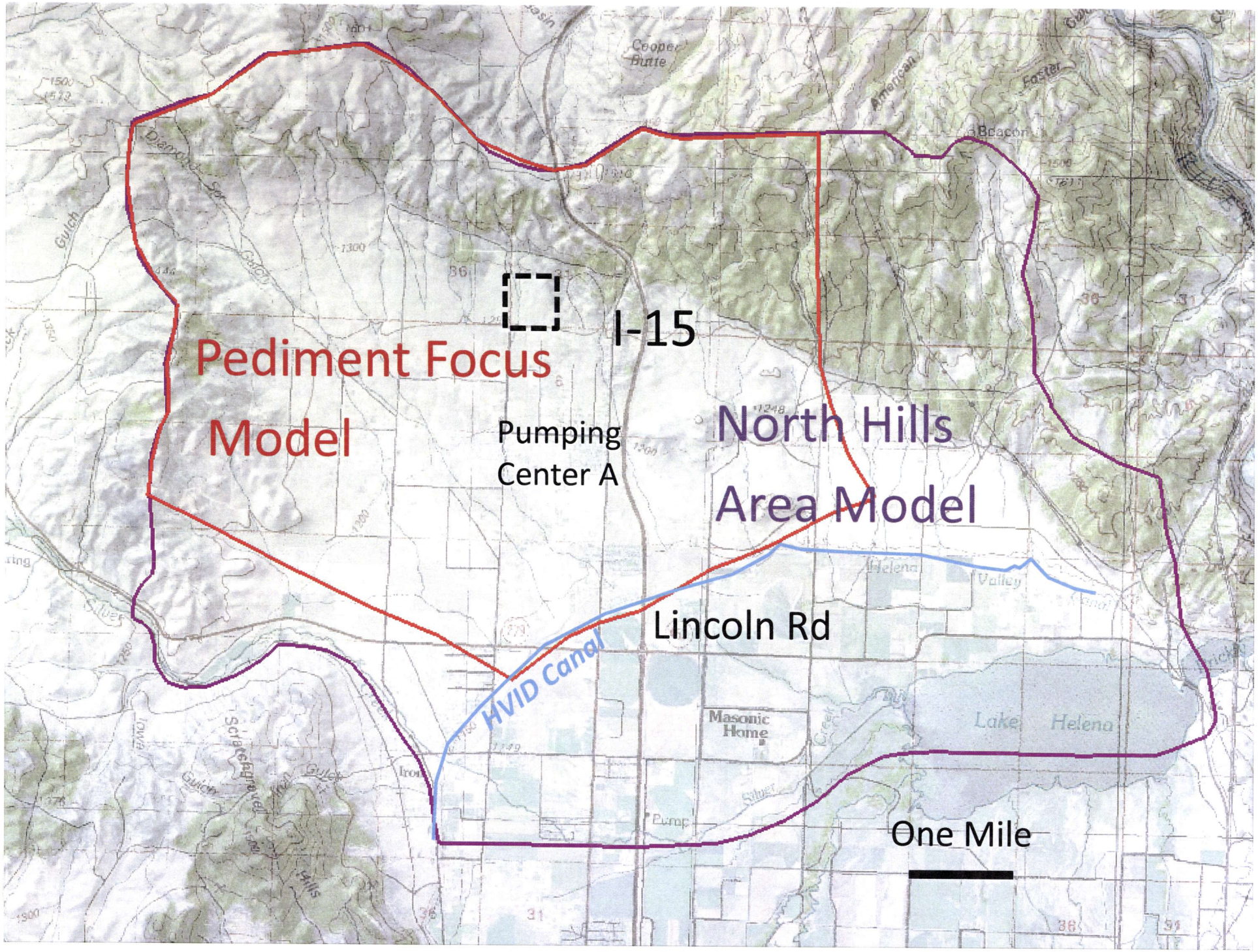


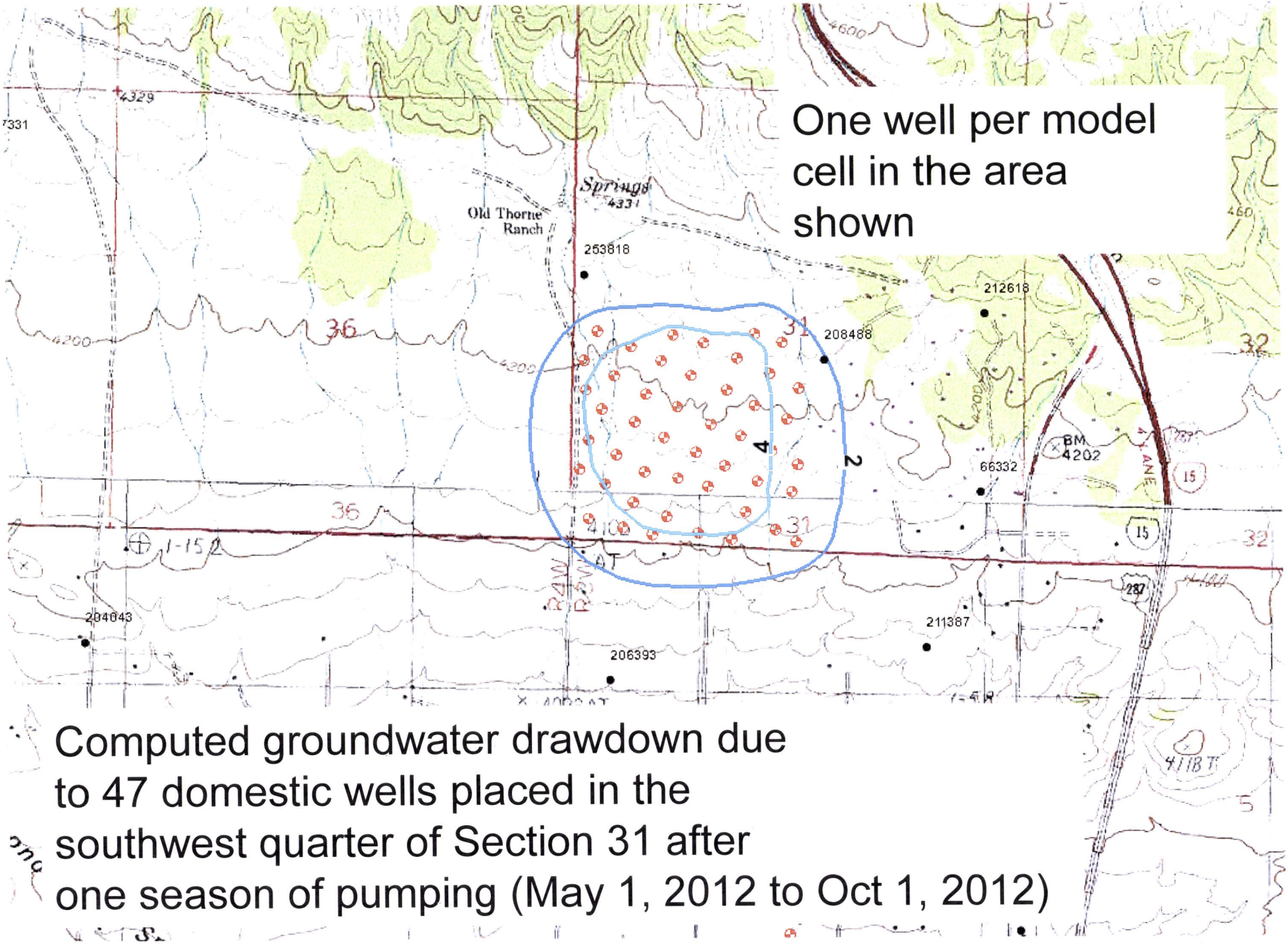
Computed groundwater elevations

Observed groundwater elevations

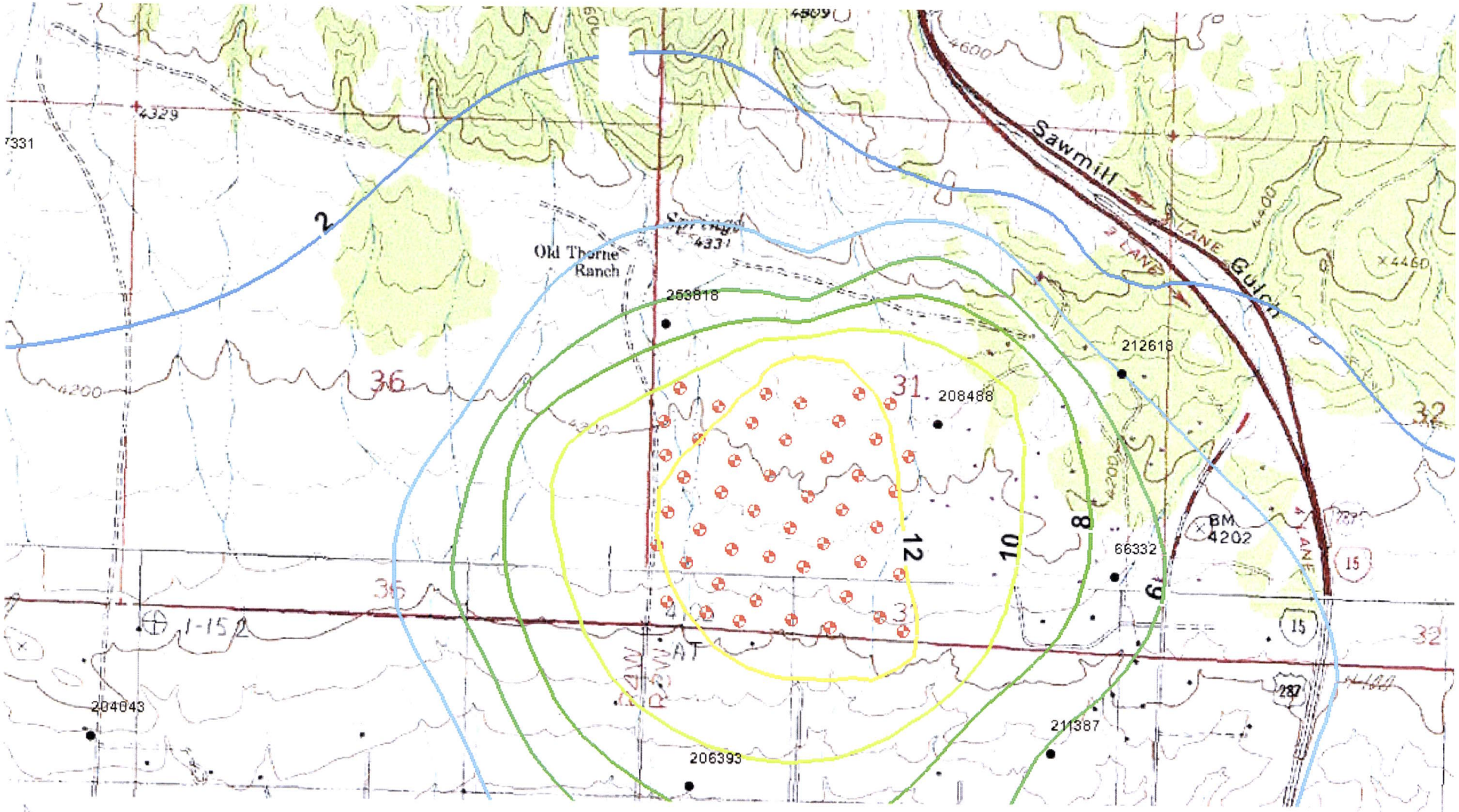
Computed vs. observed groundwater levels




Pediment Focus
Model
I-15
Pumping
Center A
North Hills
Area Model
Lincoln Rd
HVID Canal
One Mile
Cooper Butte
Beacon
Helena
Valley
Lake Helena
Masonic Home
Pump

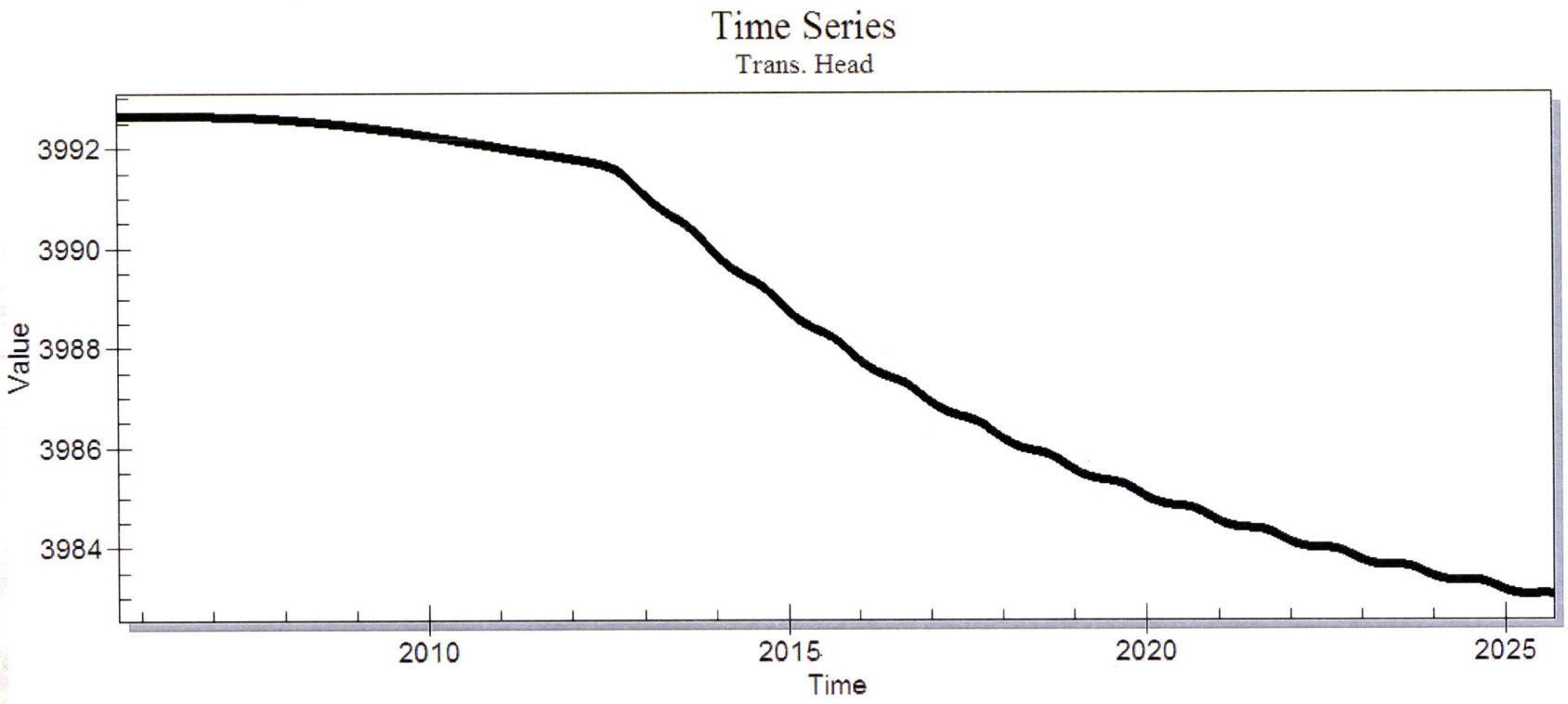


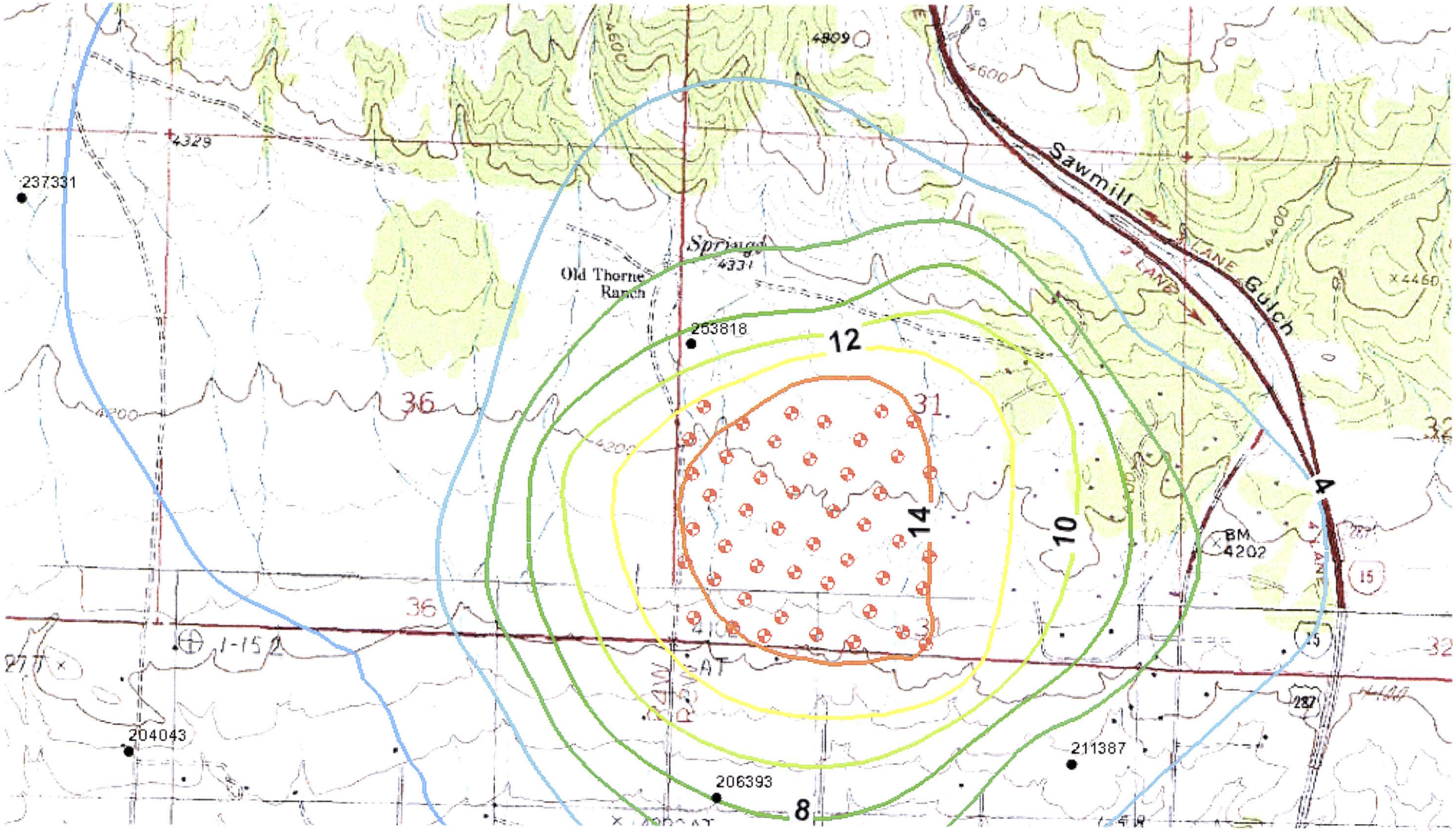
Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31 after one season of pumping (May 1, 2012 to Oct 1, 2012)



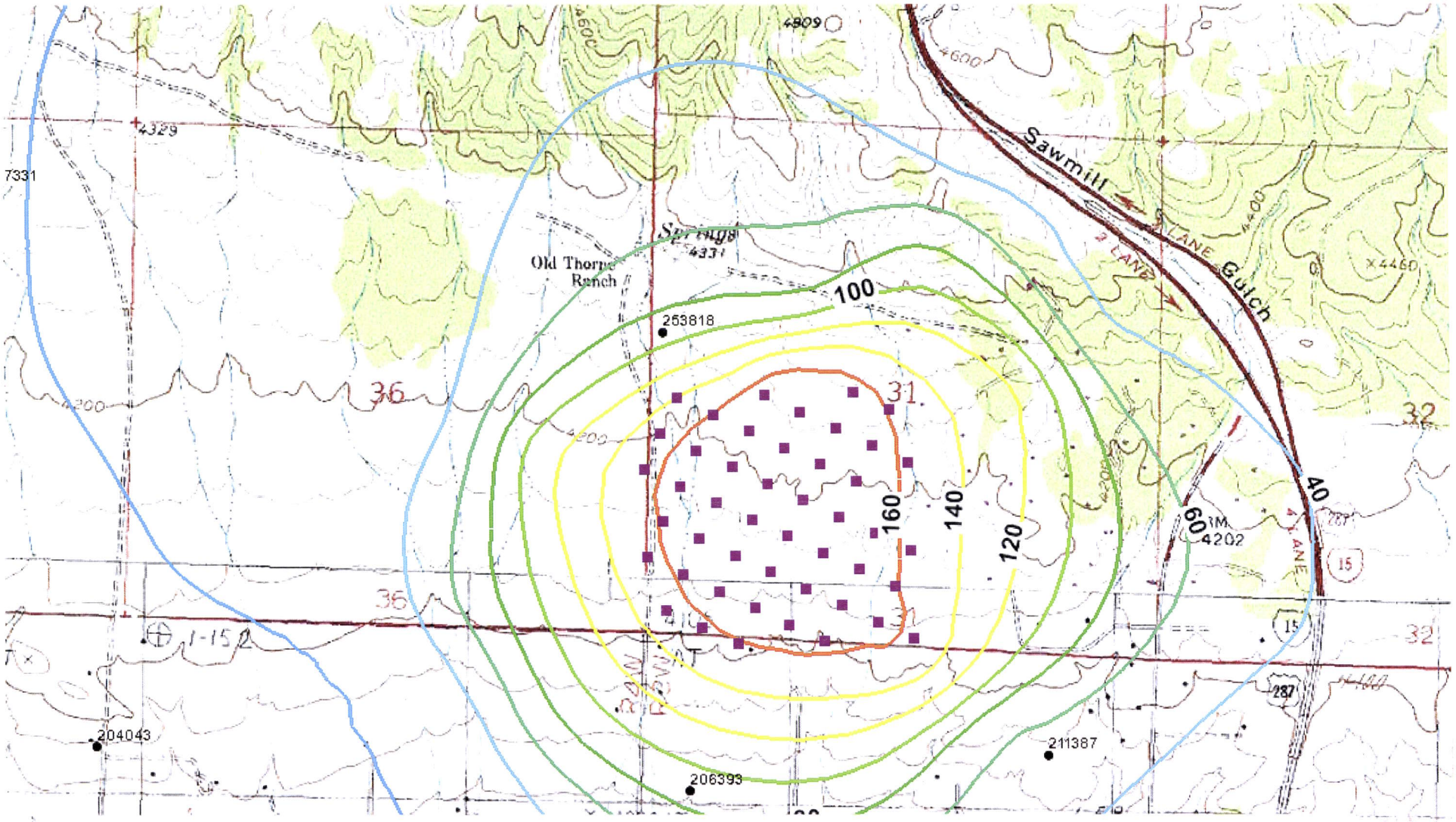
Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31 after fourteen seasons of pumping (May 1, 2012 to Oct 1, 2025)

Drawdown impacts over time at well 206393 located about ¼ mile downgradient of the devopment



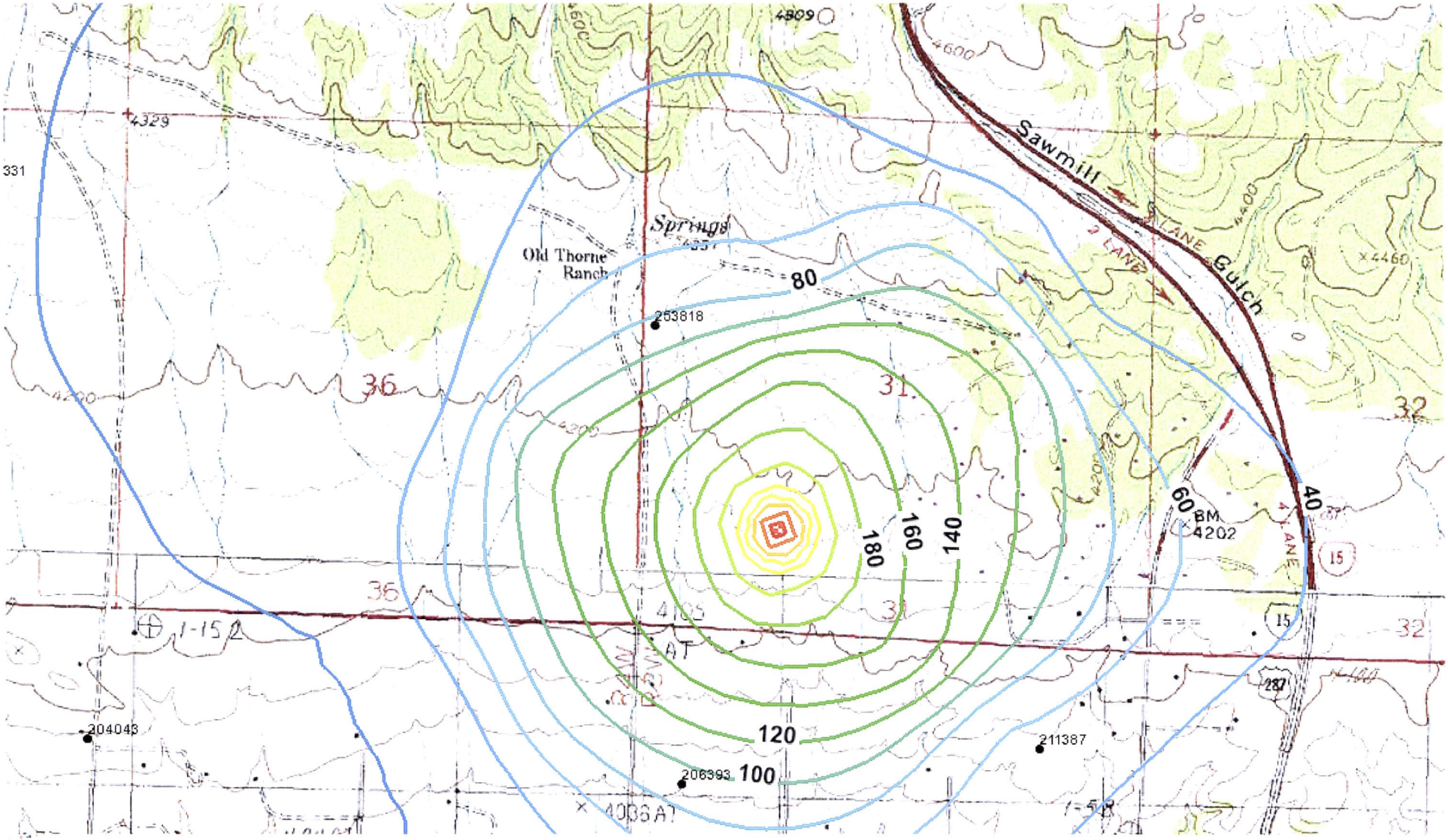


Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31
Steady-state solution



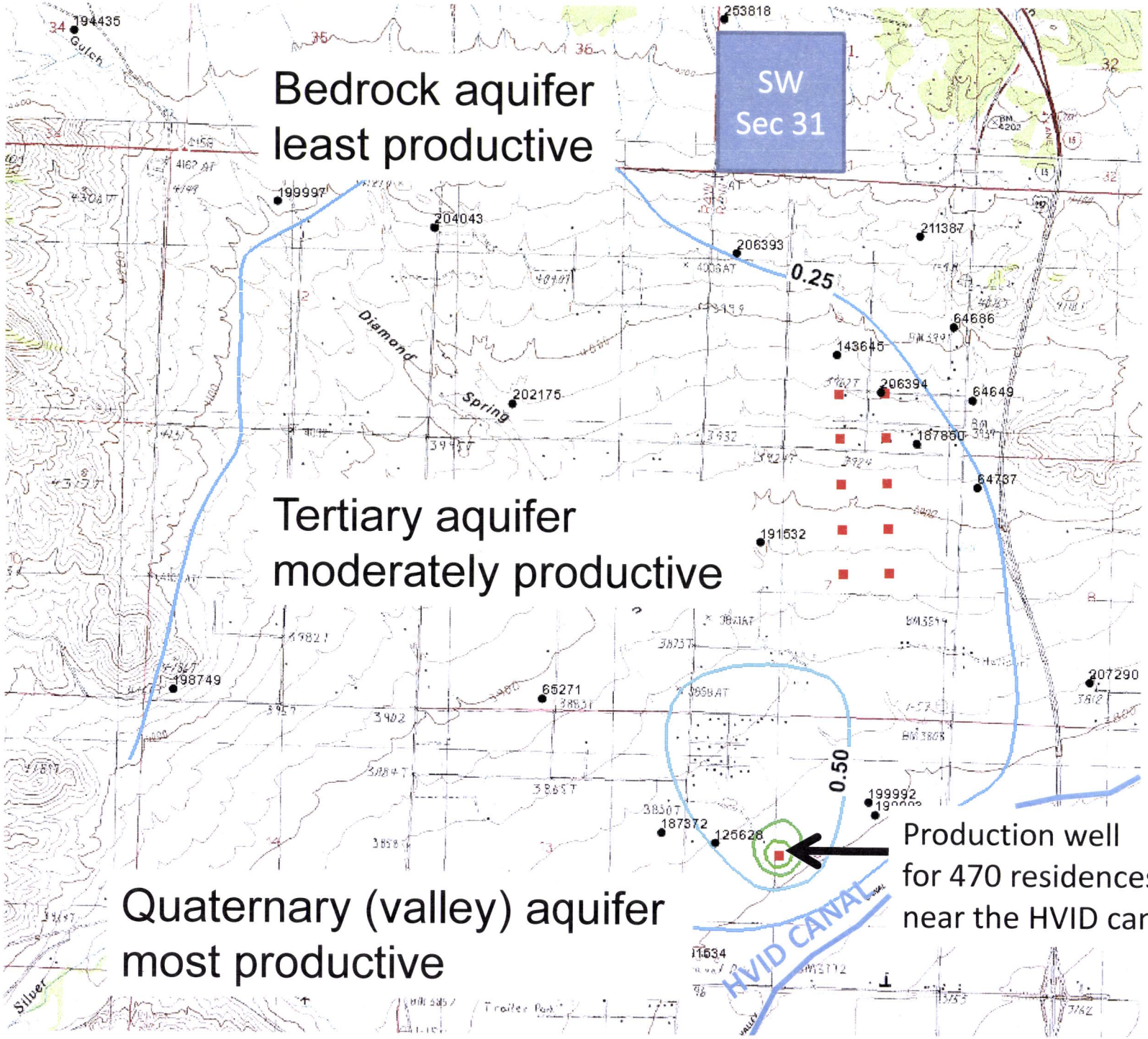
Computed groundwater drawdown due to 470 residences drawing water from 47 wells placed in the southwest quarter of Section 31

Steady-state solution

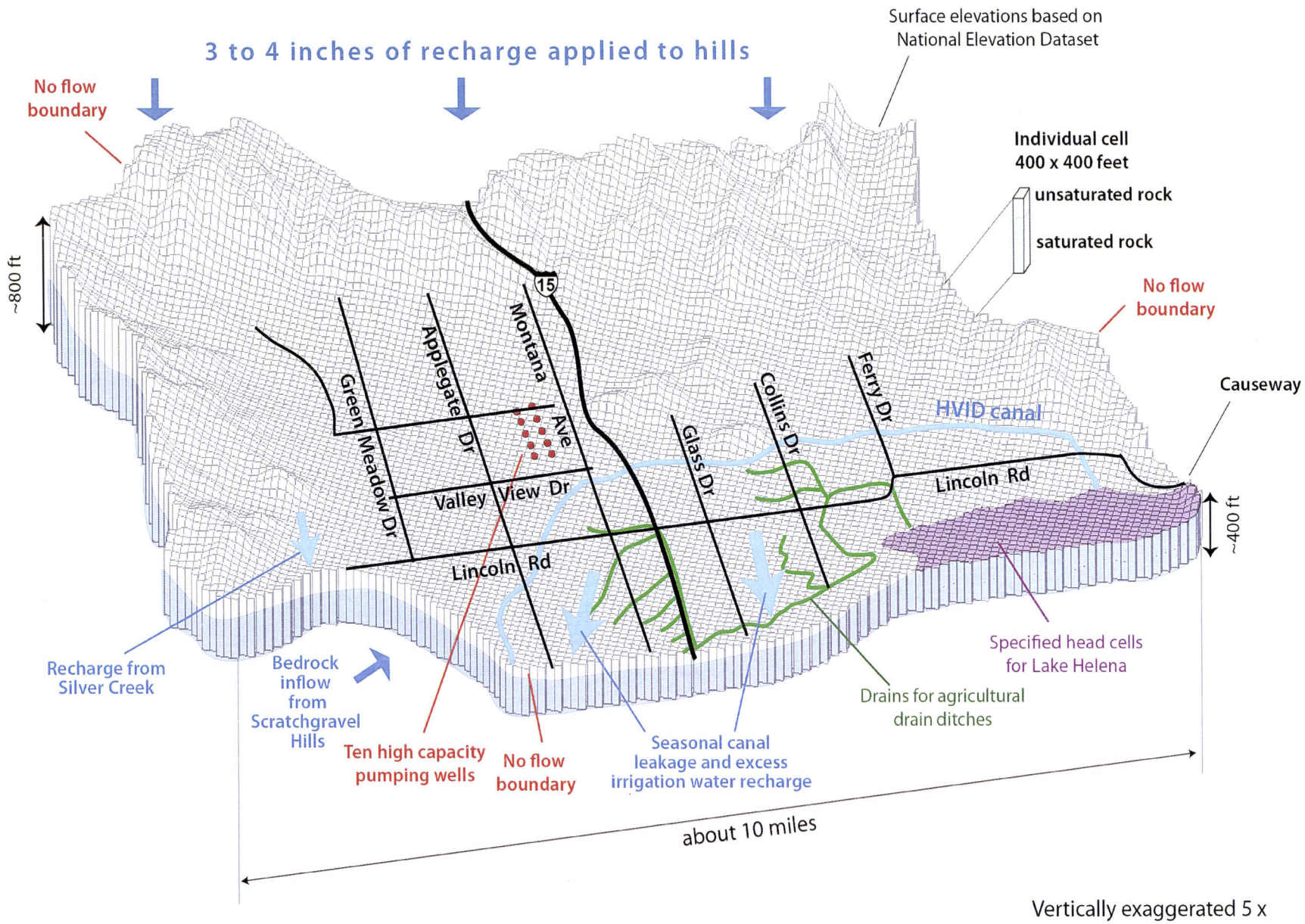


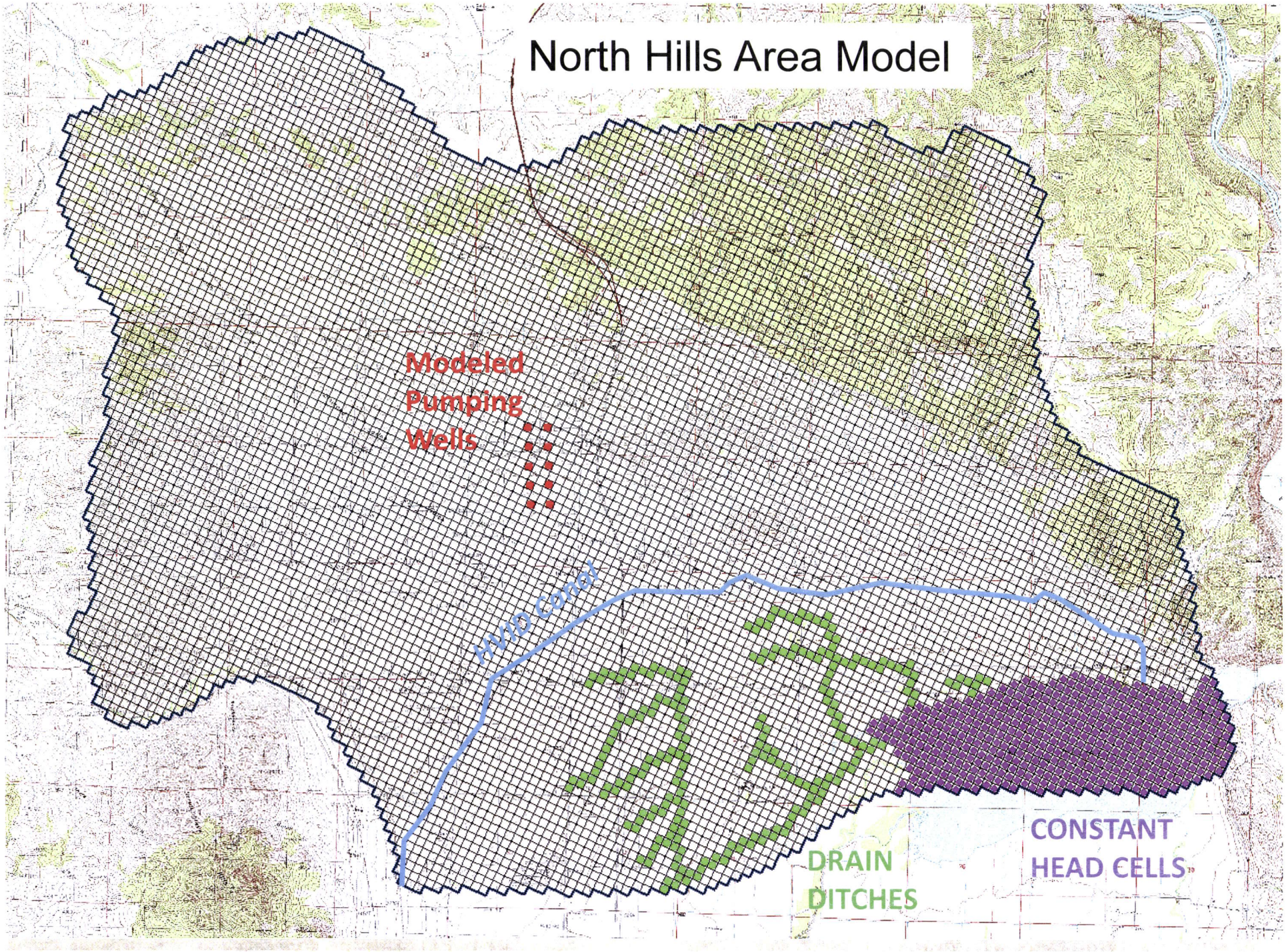
Computed groundwater drawdown due to 470 domestic residences placed in the southwest quarter of Section 31 – with one public water supply well

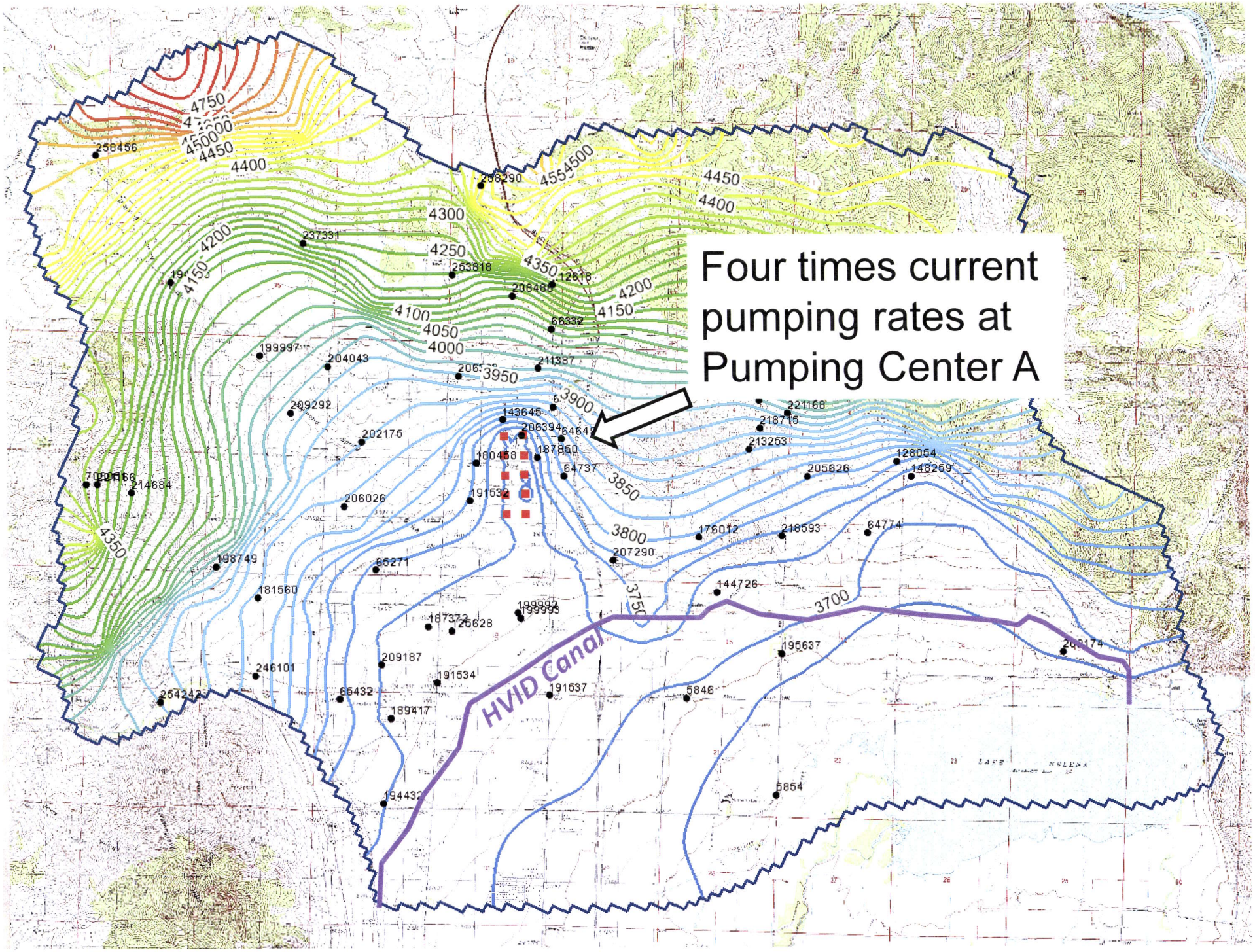
Steady-state solution


Bedrock aquifer
least productive
SW
Sec 31
Tertiary aquifer
moderately productive
Quaternary (valley) aquifer
most productive
Production well
for 470 residences
near the HVID canal
HVID CANAL
0.25
0.50
Diamond
Spring
Silver
Gulch
194435
253818
199997
204043
206393
211387
64686
143645
206394
64649
187880
64737
191632
202175
198749
65271
207290
199992
187372
125628
11634

North Hills Area Model
Schematic View



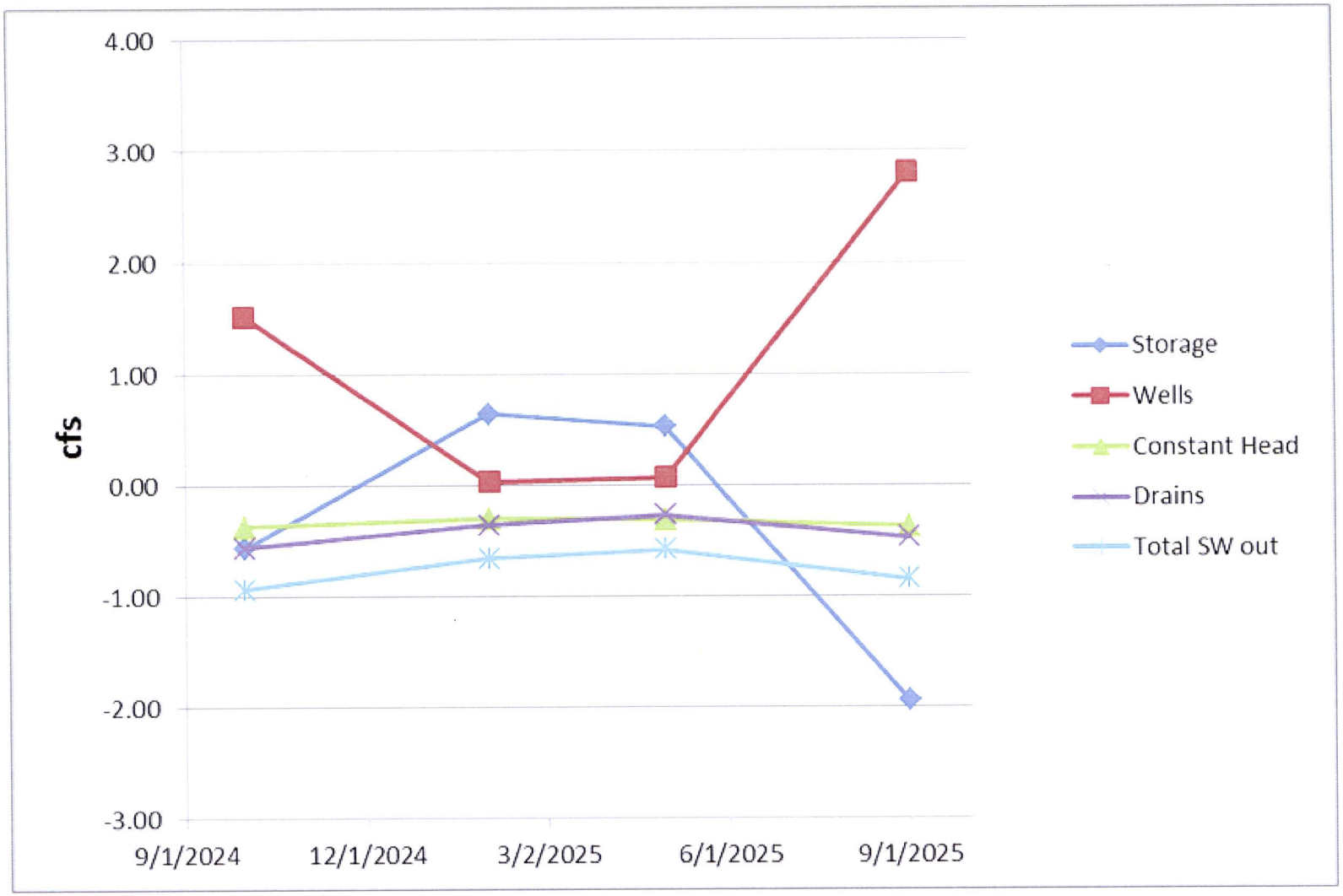

North Hills Area Model
Modeled
Pumping
Wells
HVID Canal
DRAIN
DITCHES
CONSTANT
HEAD CELLS


Four times current pumping rates at Pumping Center A
HVID Canal
4750
4500
4450
4400
4300
4250
4200
4150
4100
4050
4000
3950
3900
3850
3800
3750
3700
4350
258456
237331
199997
204043
209292
202175
214684
206026
198749
181560
246101
254242
209187
191534
189417
194432
187372
25628
199993
191537
5846
5854
195637
144726
207290
176012
218593
64774
205626
128054
148259
221168
218716
213253
143645
206394
64649
187860
64737
191532
180468
66332
241387
206290
263818
12618
206468
237331
66271
66432

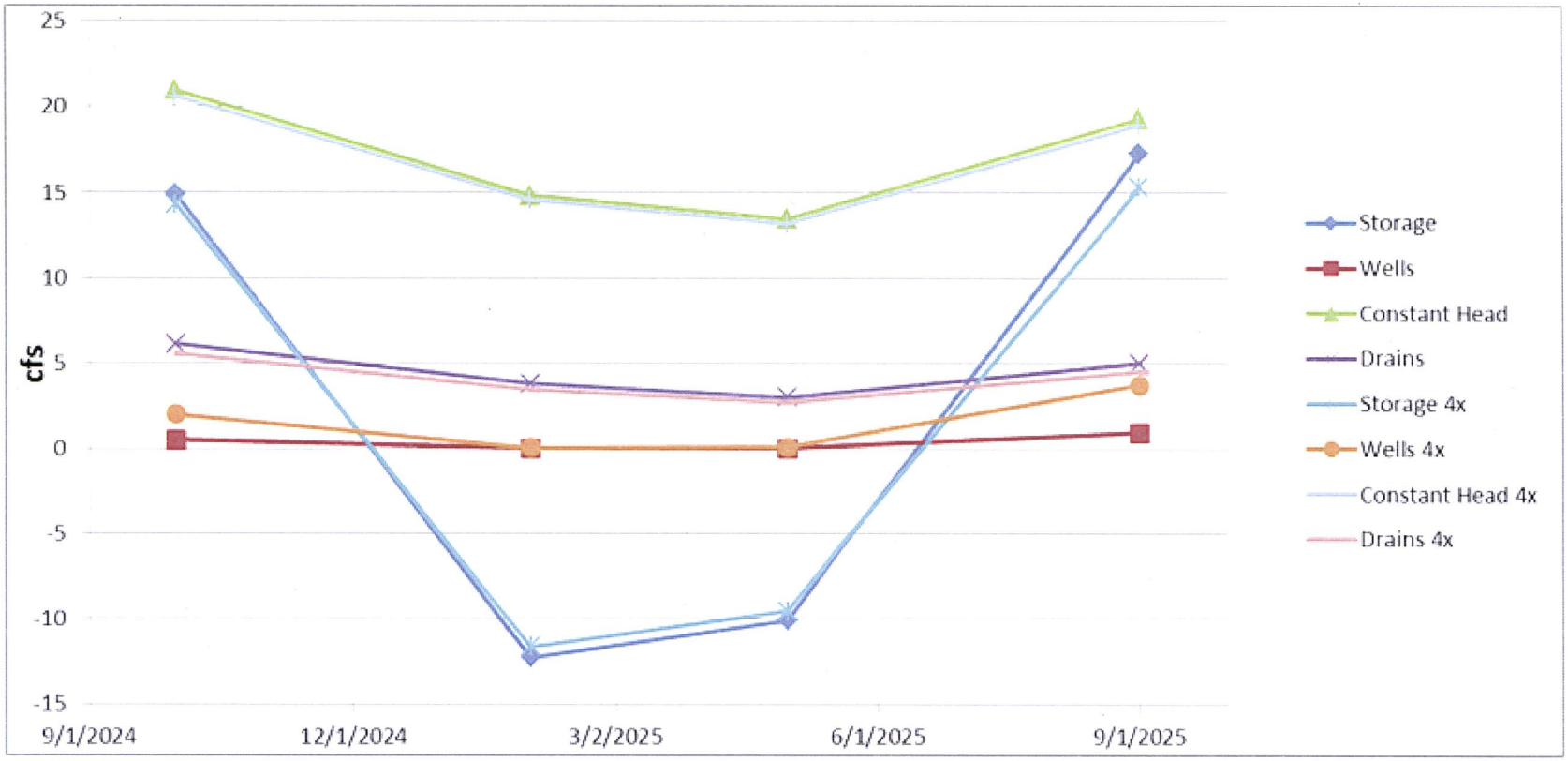
North Hills Groundwater Models capabilities:

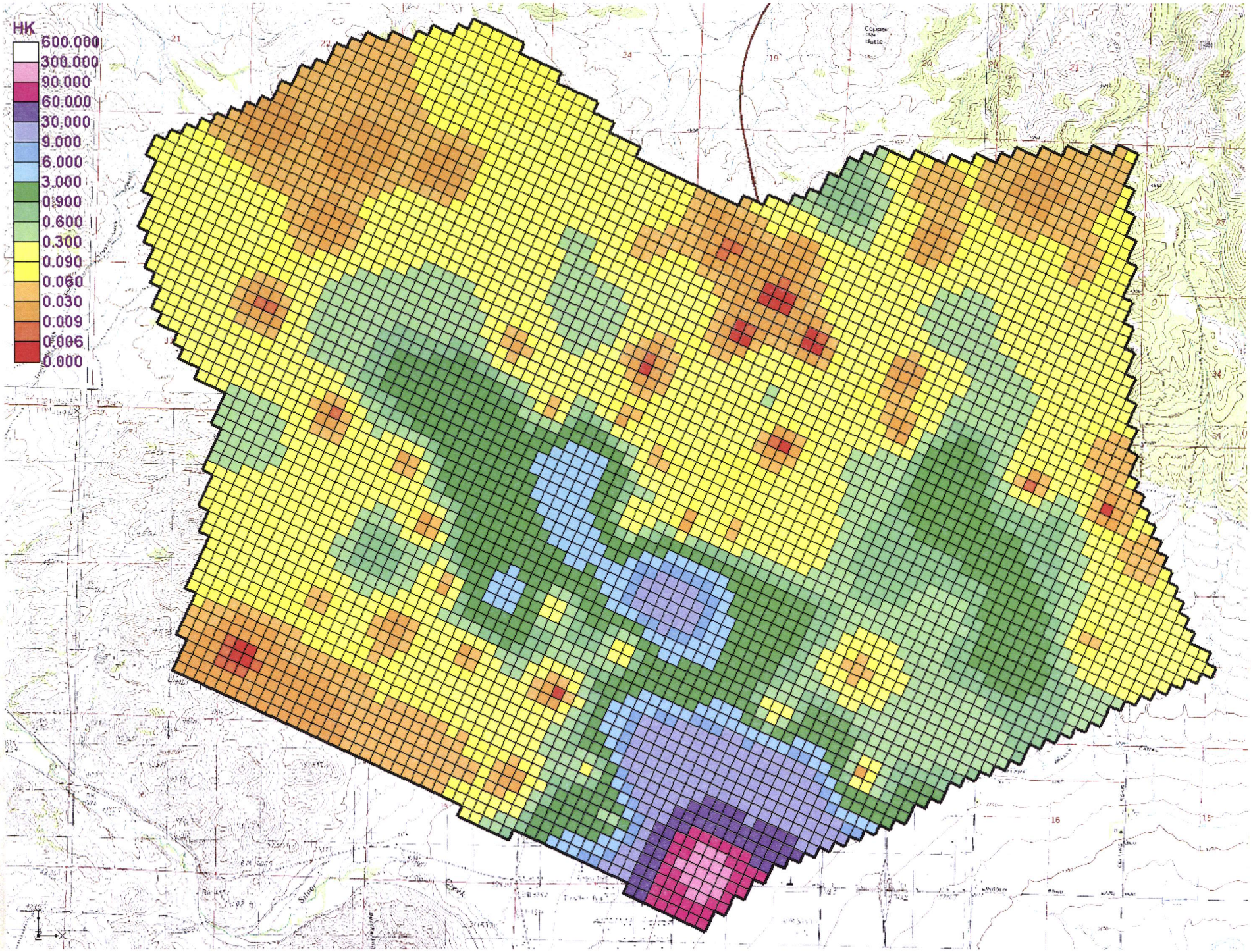
- Estimate drawdown from additional groundwater withdrawals
- Estimate drawdown or recovery from increases or decreases in pumping in current developments
- Estimate timing and magnitude of impacts of groundwater pumping to Lake Helena (Missouri River)
- Analyze the effects of other hydrologic changes such as draughts, changes in irrigation practices, etc.

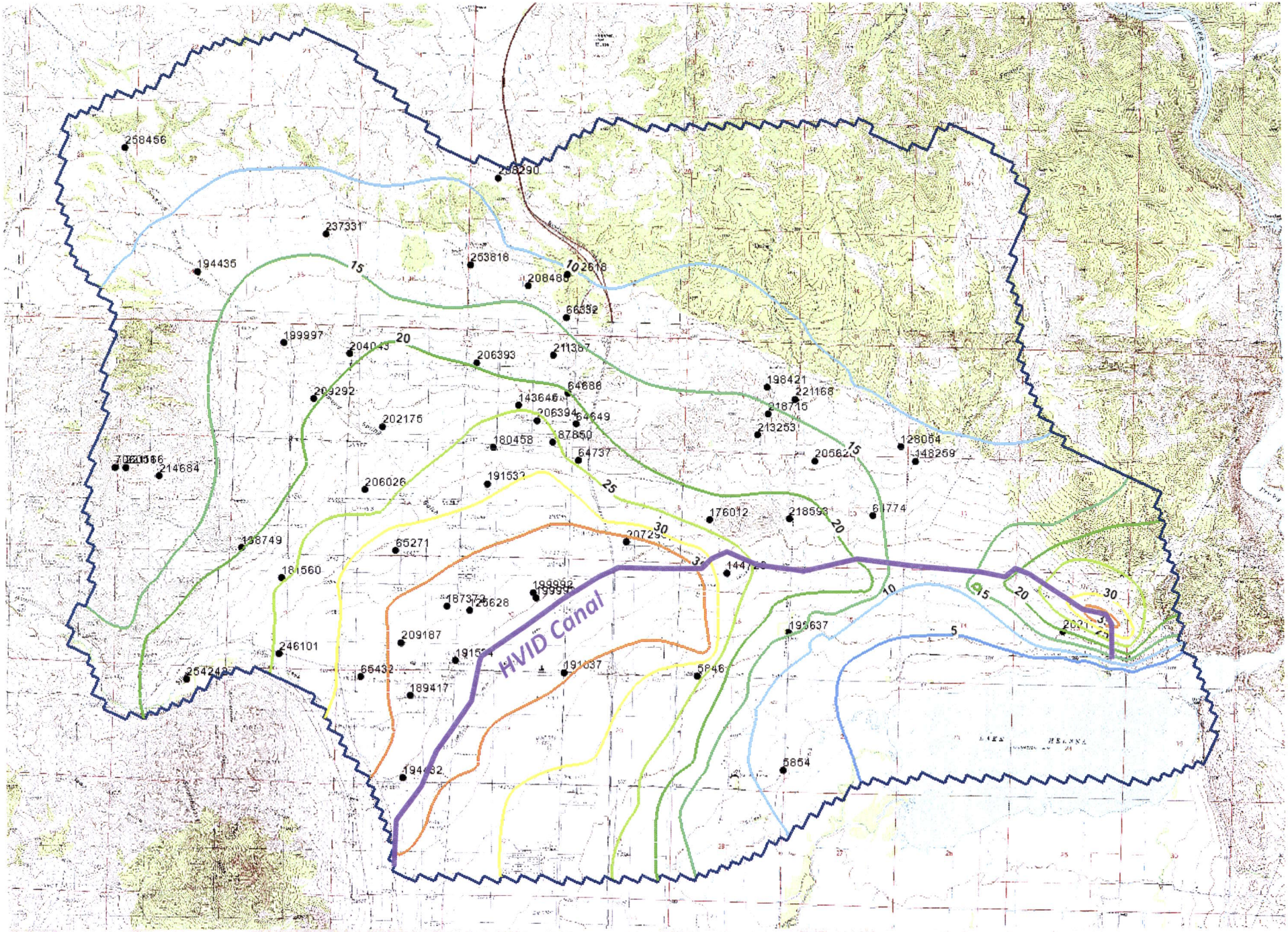
Water Budget Impacts of Pumping



Water budget




HK
500.000
300.000
90.000
60.000
30.000
9.000
6.000
3.000
0.900
0.600
0.300
0.090
0.060
0.030
0.009
0.006
0.000


HVID Canal
258456
237331
194435
253816
208486
66332
199997
204043
206393
211387
209292
143646
64686
198421
221168
202176
206394
64649
218715
213253
180458
67850
64737
128064
148269
214684
206026
191533
176012
61774
138749
65271
181560
207250
144
199997
187372
25628
209187
199637
246101
191537
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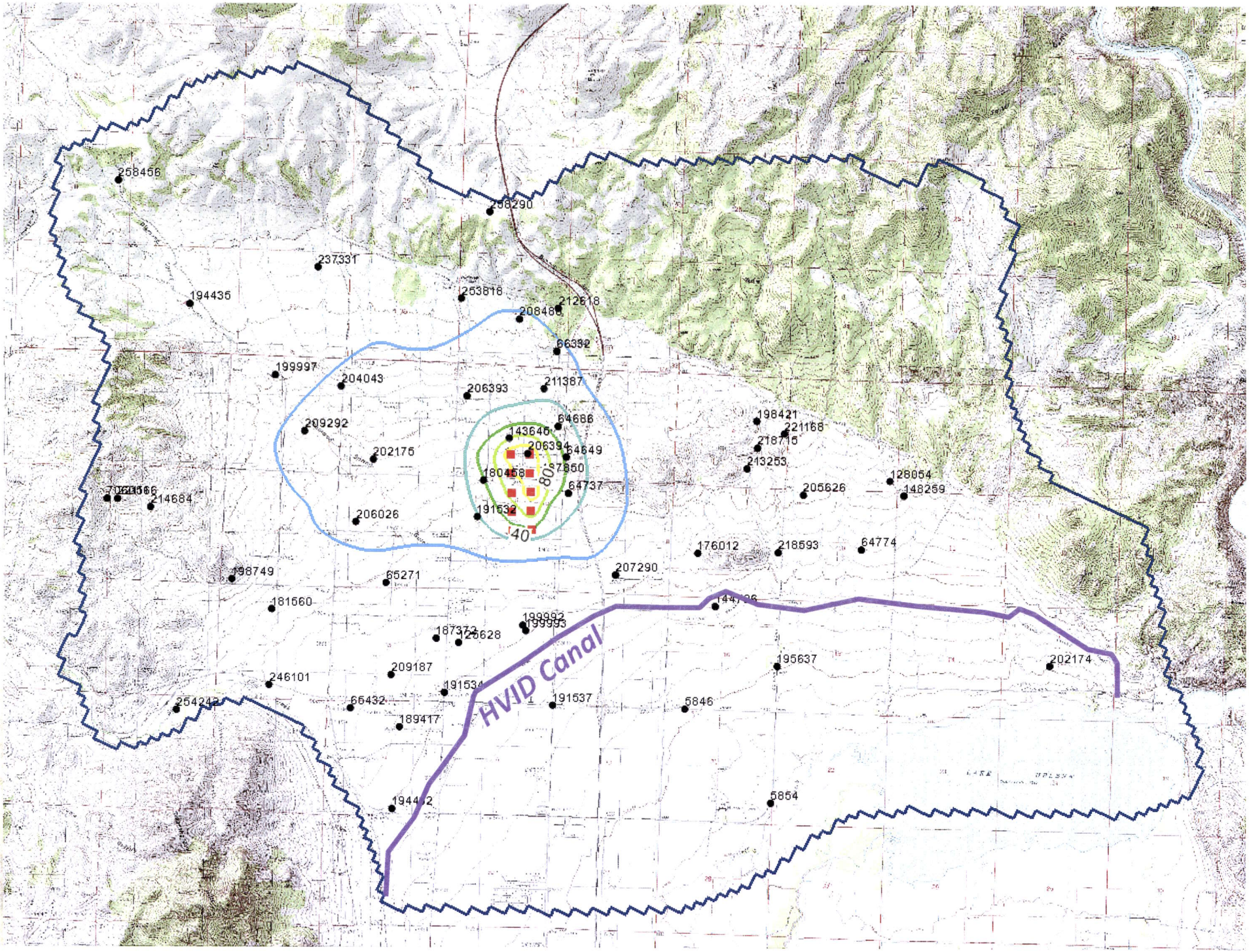
194432
15
20
25
30
10
5


258456
258290
237331
194435
253818
212618
208486
66332
199997
204043
206393
211387
209292
143646
64686
206394
64649
202175
180458
87850
64737
214684
206026
191532
80
40
198421
221168
218715
213253
128054
205626
148259
176012
218593
64774
207290
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65271
181560
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199993
187372
125628
209187
246101
191534
191537
65432
189417
5846
195637
202174
5854
HVID Canal