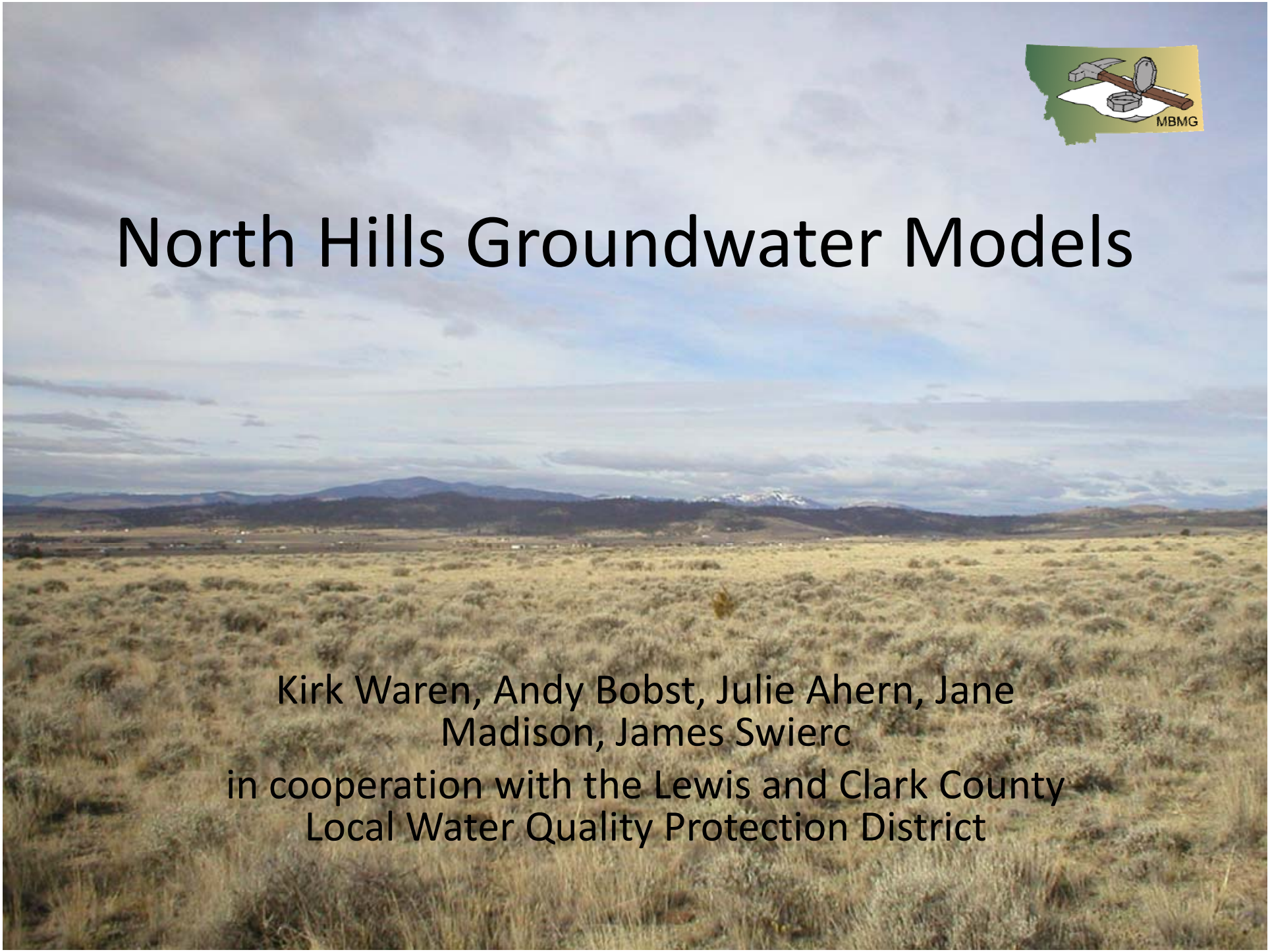
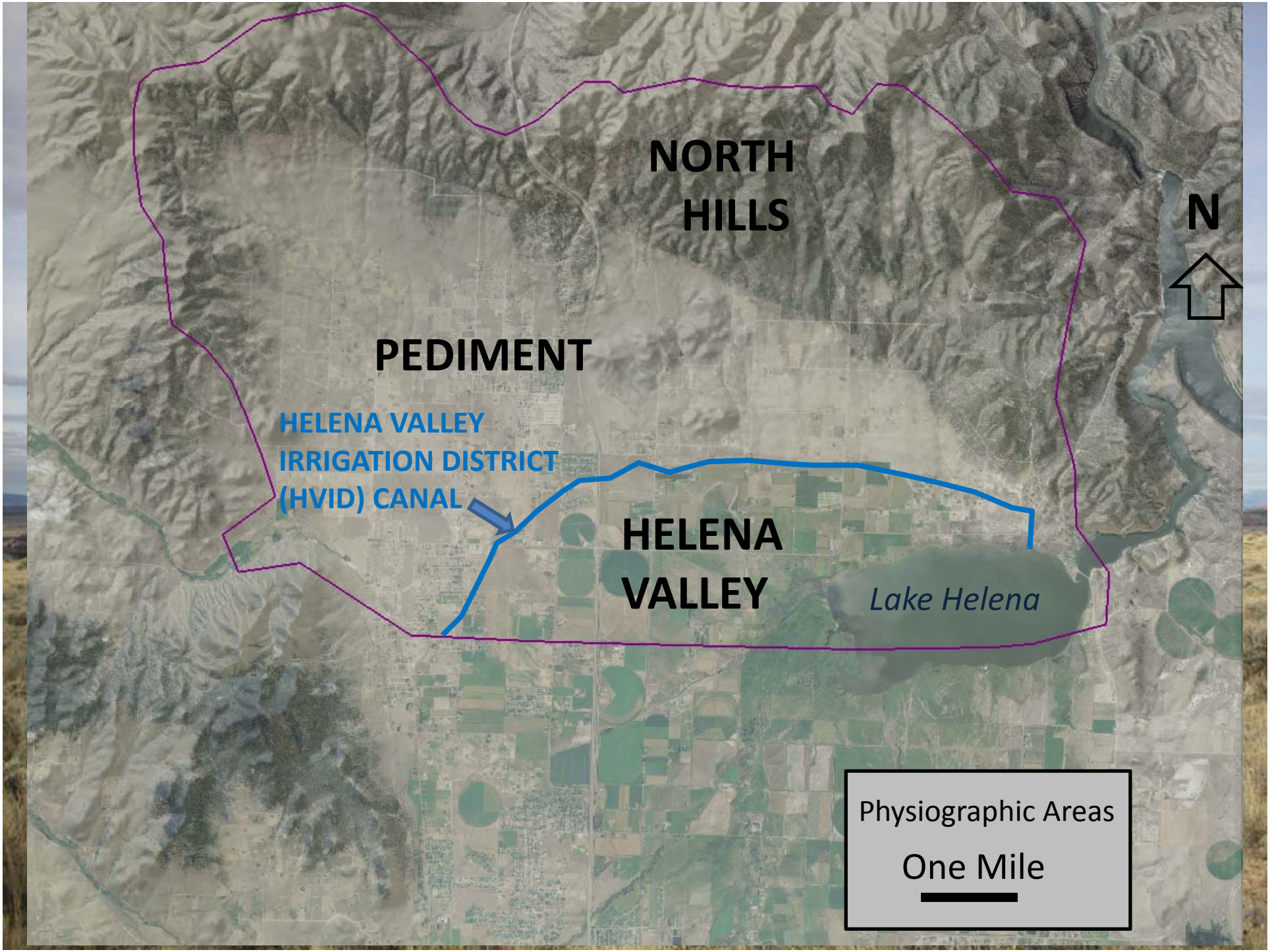
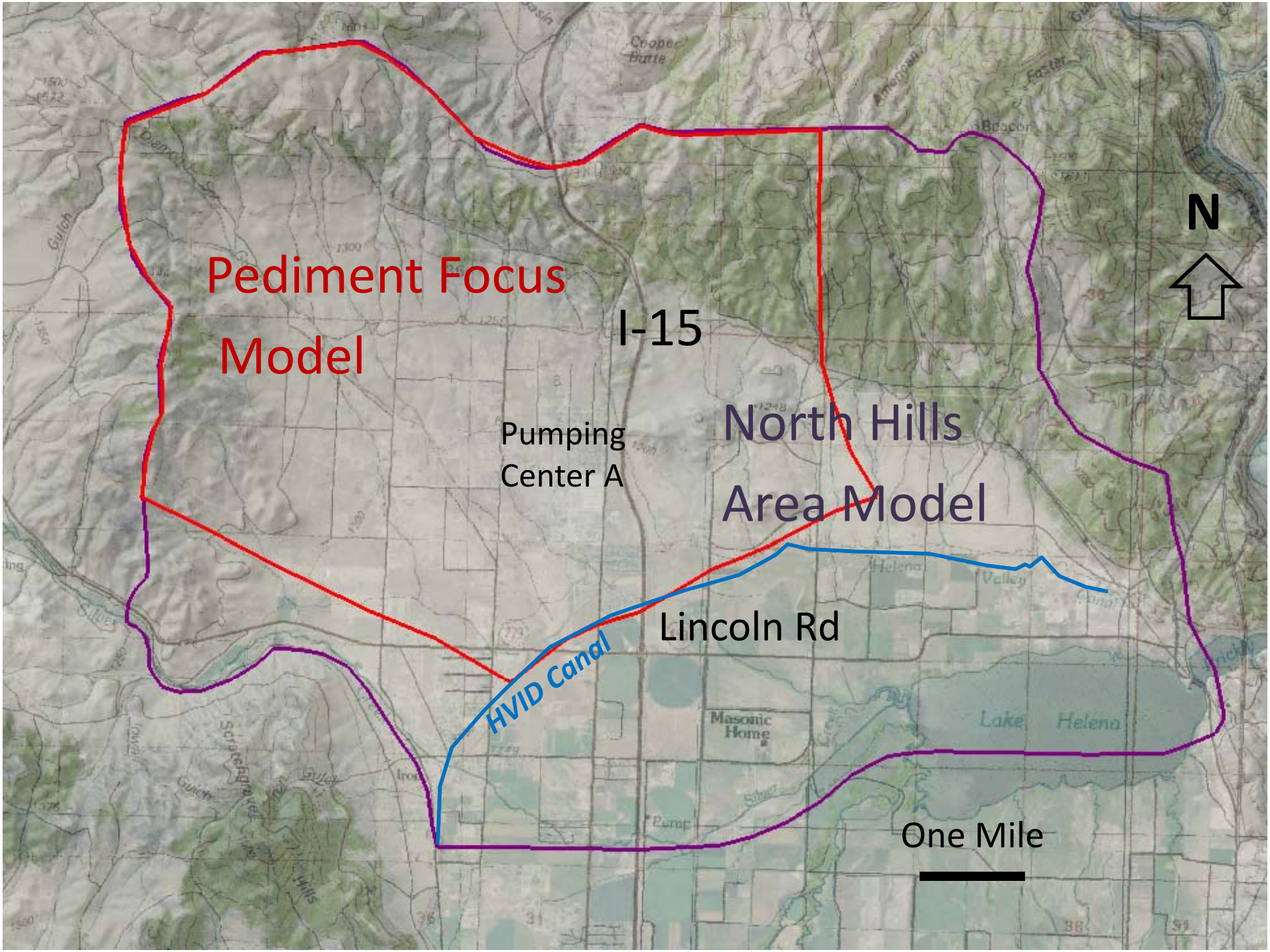


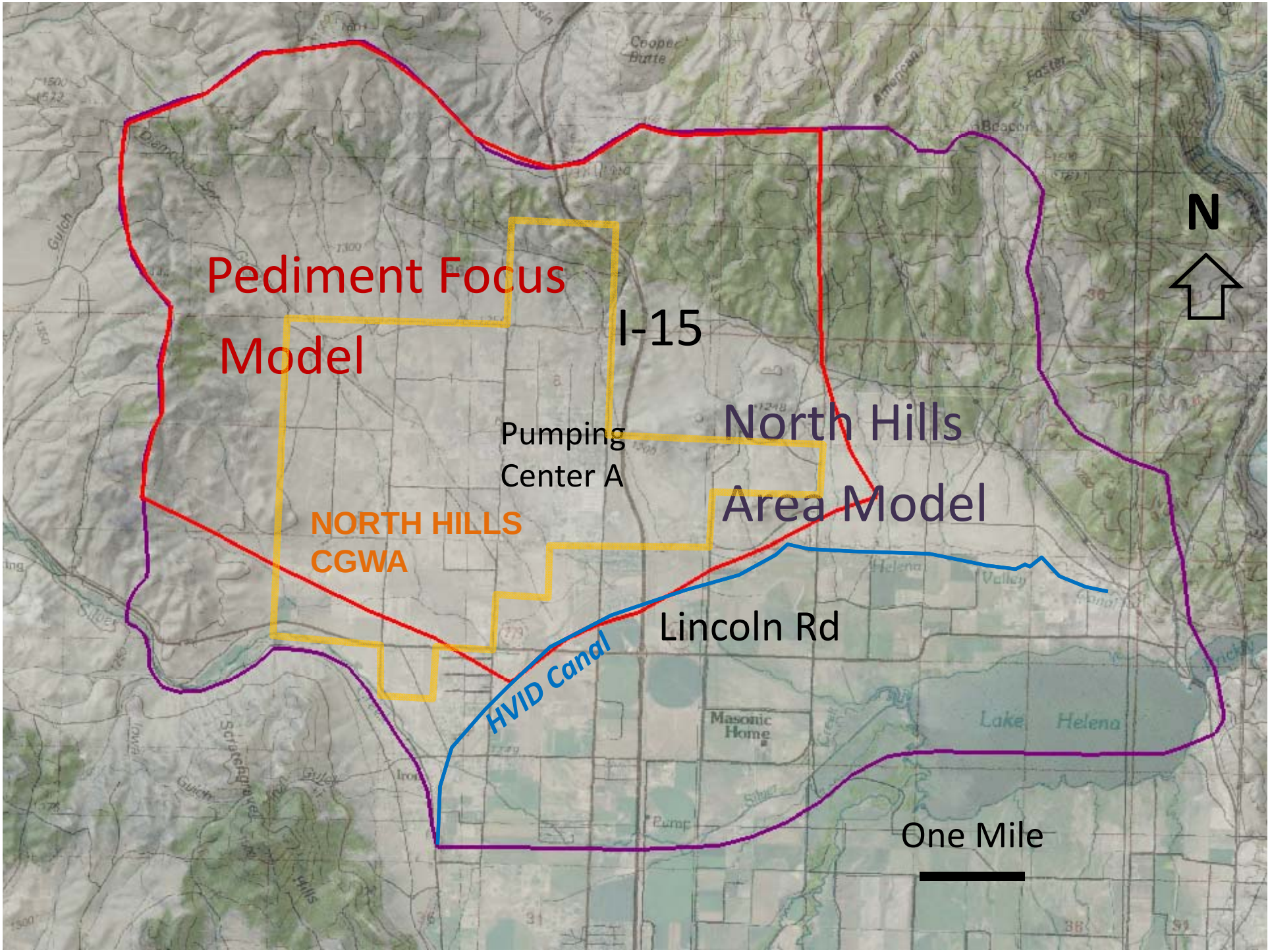
North Hills Groundwater Models

Kirk Waren, Andy Bobst, Julie Ahern, Jane Madison, James Swierc

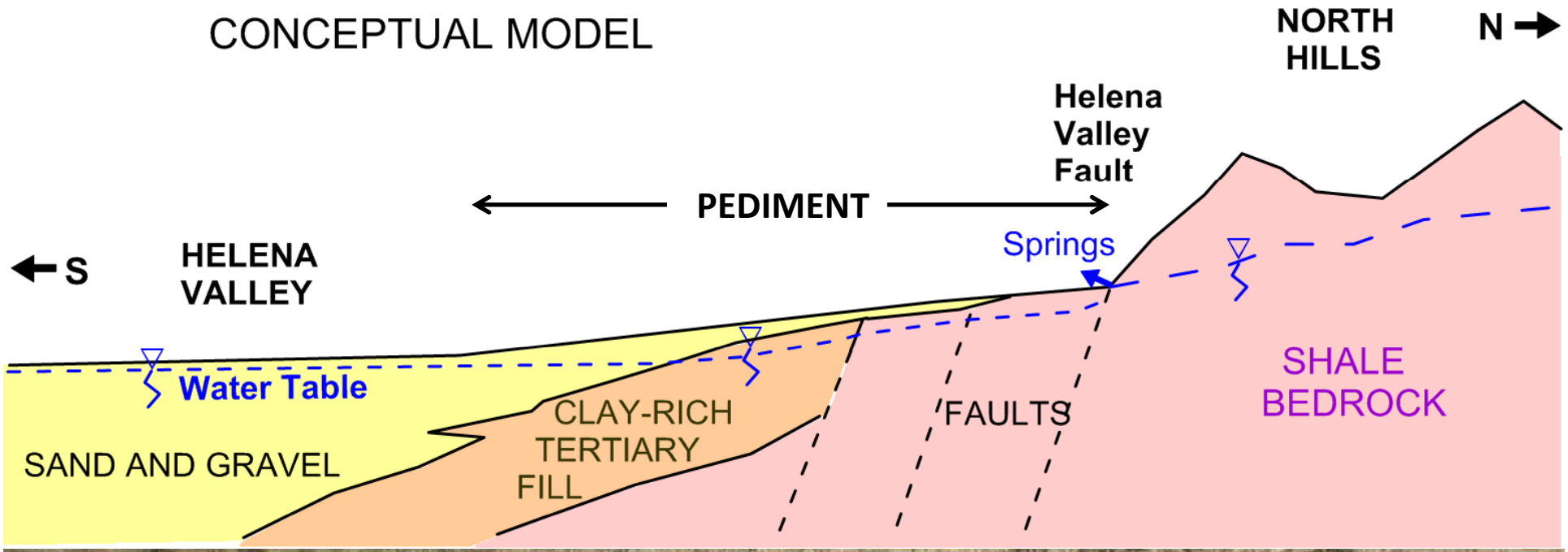
in cooperation with the Lewis and Clark County Local Water Quality Protection District


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
N
One Mile


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

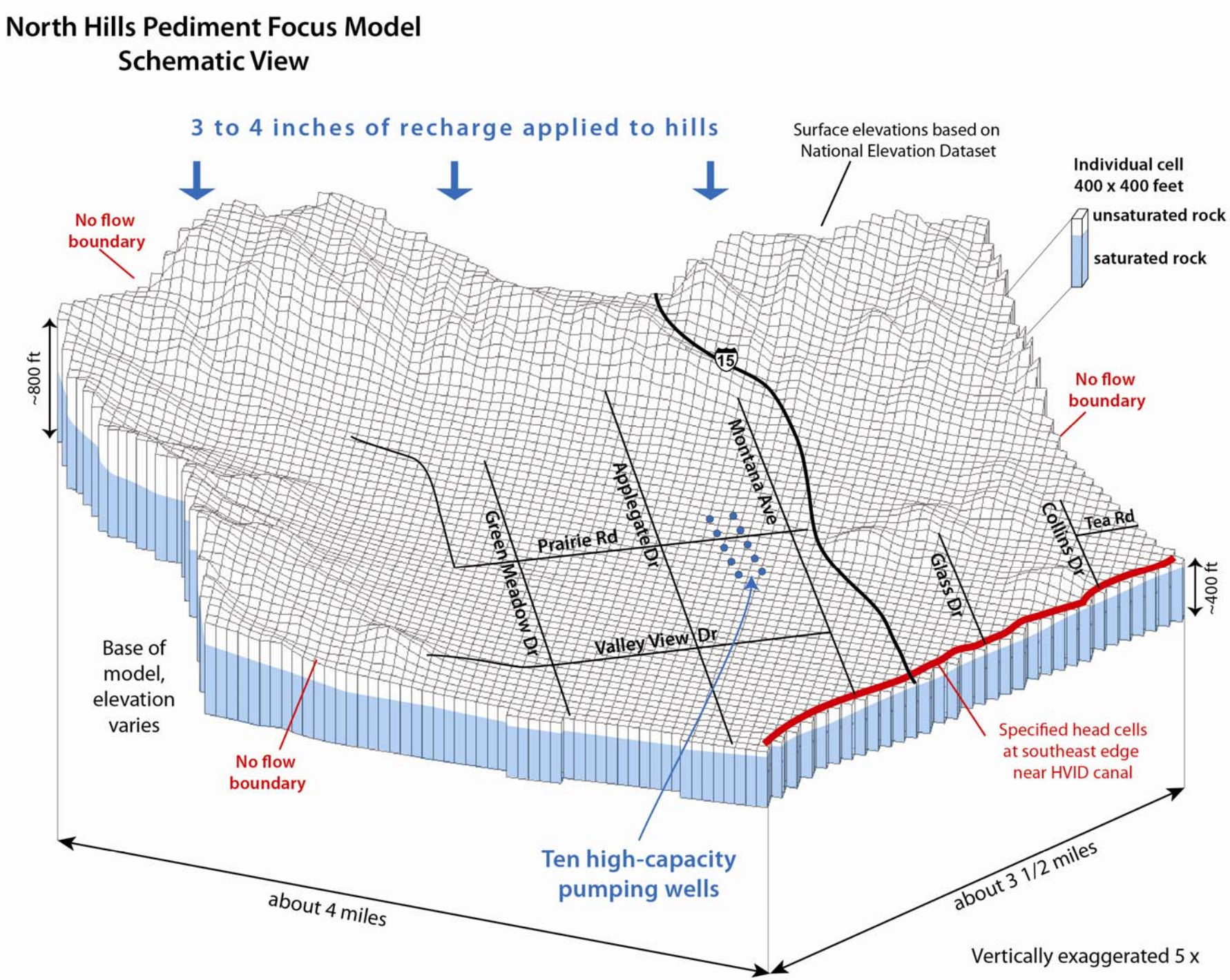
Geologic setting

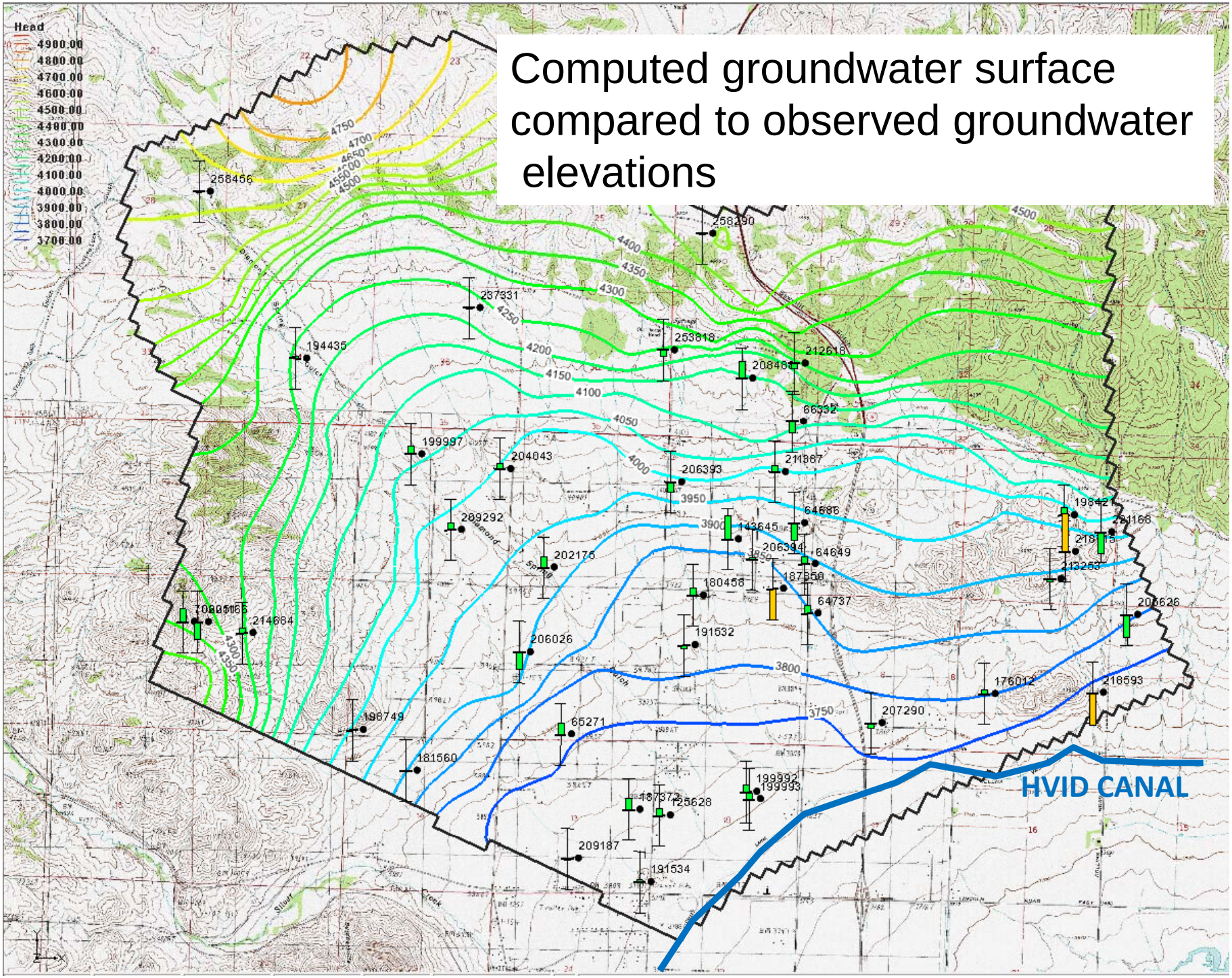


QUATERNARY or VALLEY AQUIFER

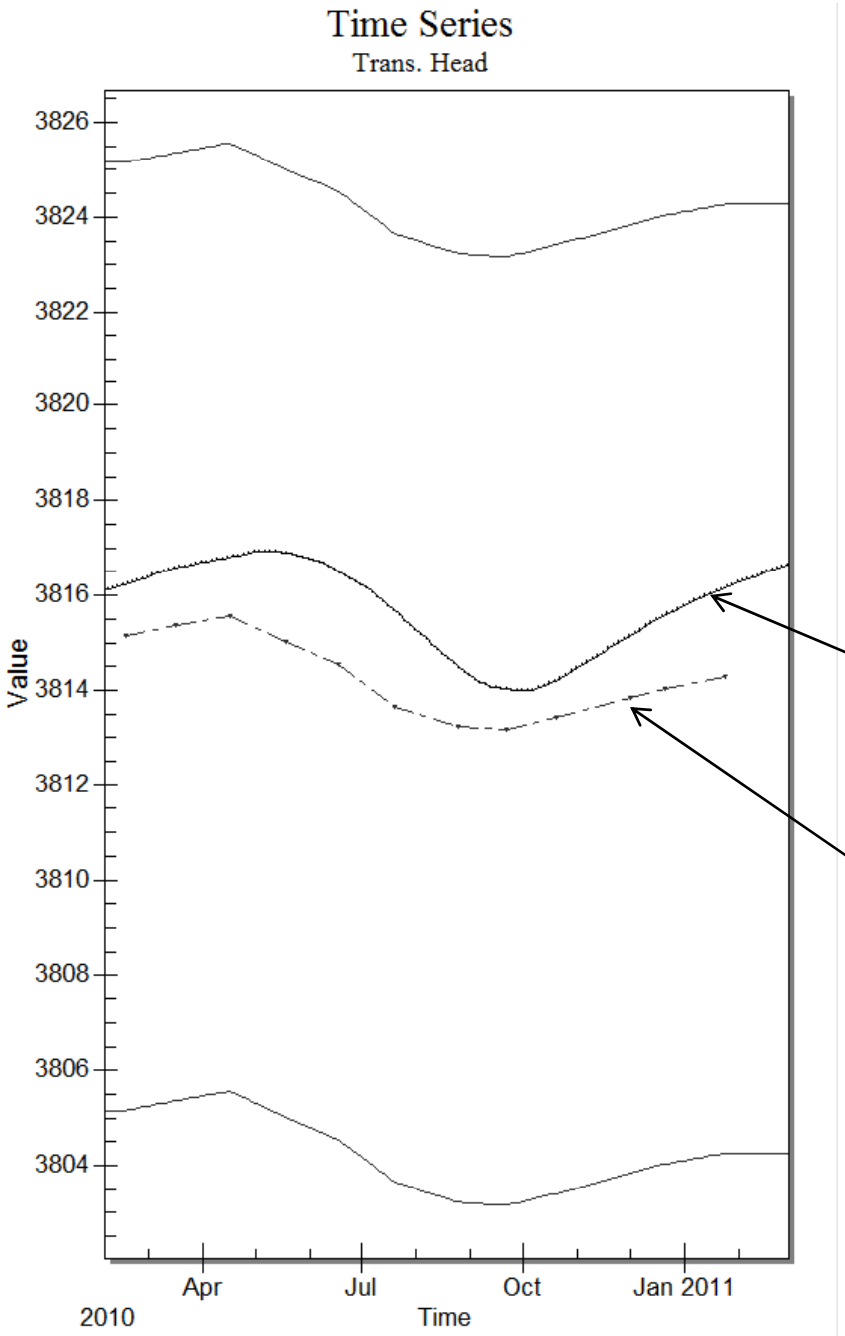
TERTIARY AQUIFER

BEDROCK AQUIFER


North Hills Pediment Focus Model
Schematic View
3 to 4 inches of recharge applied to hills
Surface elevations based on
National Elevation Dataset
Individual cell
400 x 400 feet
unsaturated rock
saturated rock
No flow
boundary
~800 ft
15
No flow
boundary
Montana Ave
Applegate Dr
Prairie Rd
Green Meadow Dr
Valley View Dr
Glass Dr
Collins Dr
Tea Rd
~400 ft
Base of
model,
elevation
varies
No flow
boundary
Specified head cells
at southeast edge
near HVID canal
Ten high-capacity
pumping wells
about 4 miles
about 3 1/2 miles
Vertically exaggerated 5 x


Head
4900.00
4800.00
4700.00
4600.00
4500.00
4400.00
4300.00
4200.00
4100.00
4000.00
3900.00
3800.00
3700.00
Computed groundwater surface compared to observed groundwater elevations
HVID CANAL

Well 64737
State Lands East

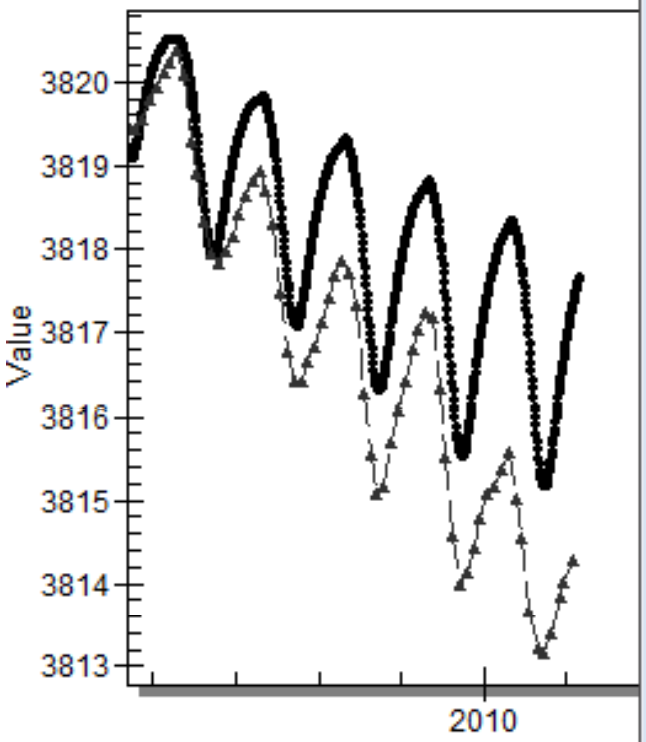


Computed groundwater elevations

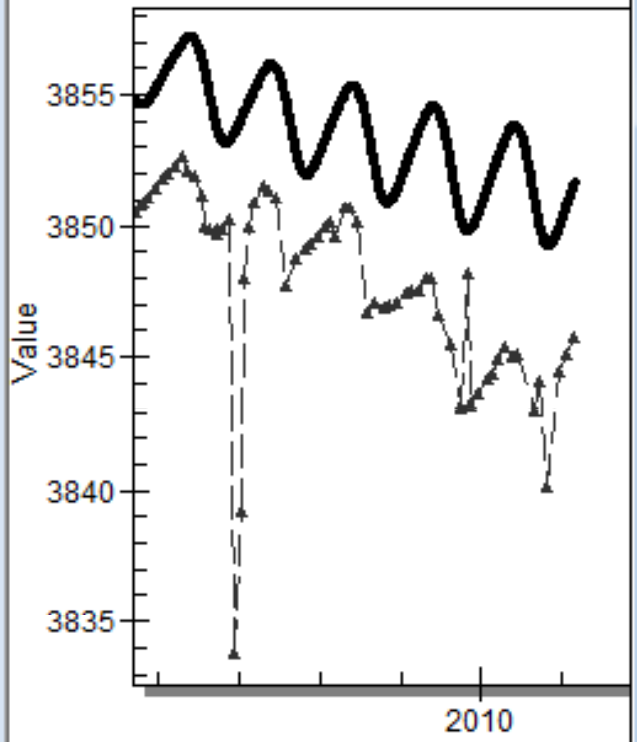
Observed groundwater elevations

Computed vs. observed groundwater levels

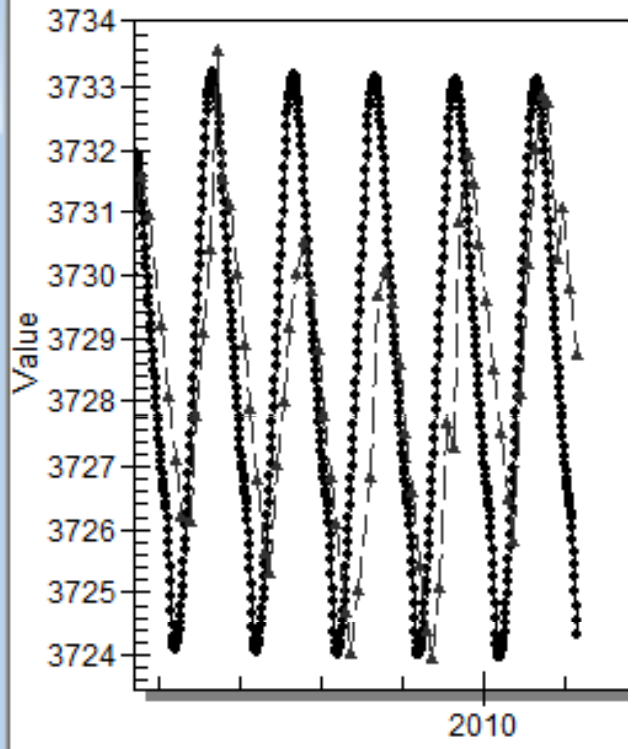
Well 191532 North Hills

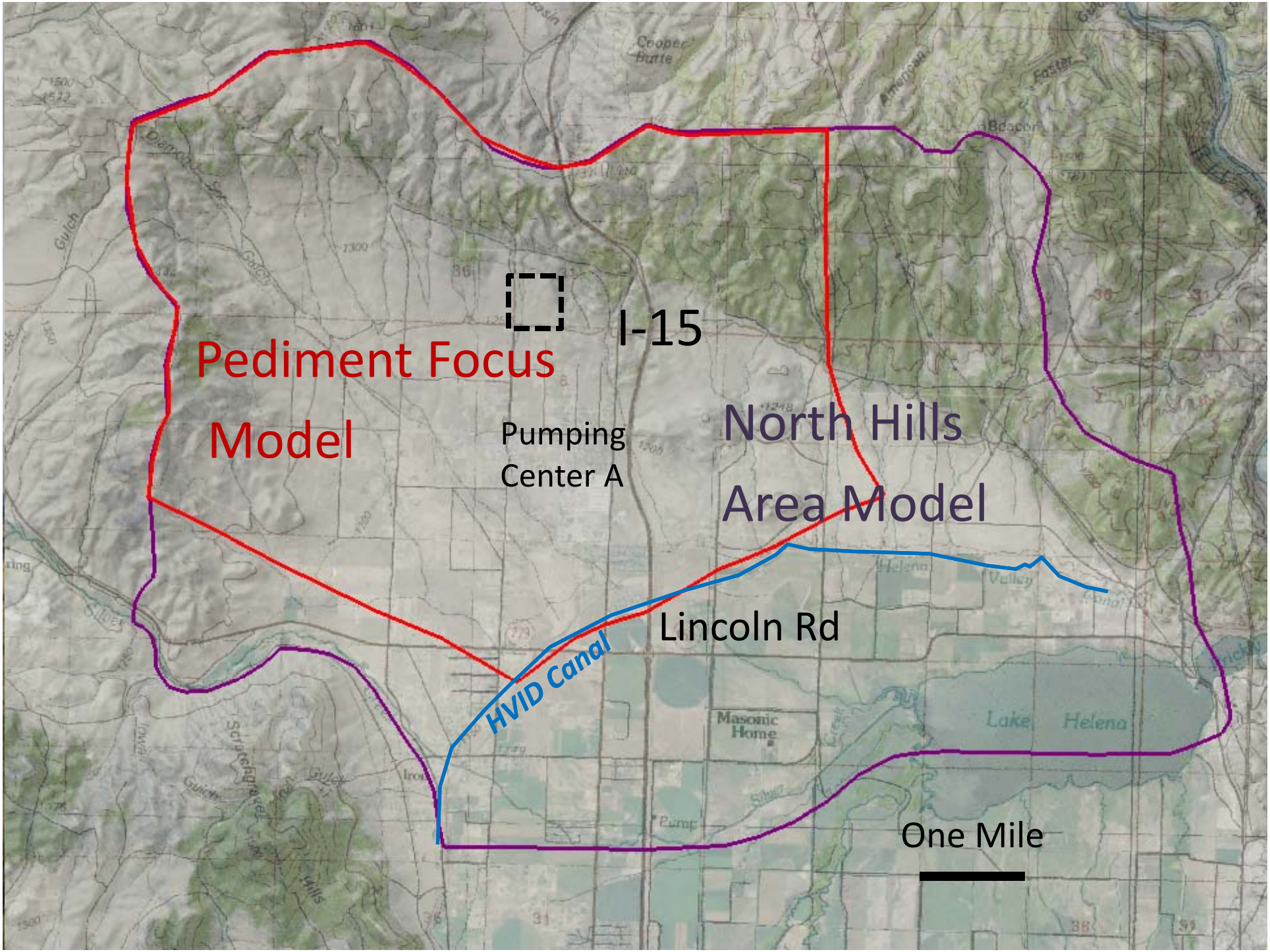


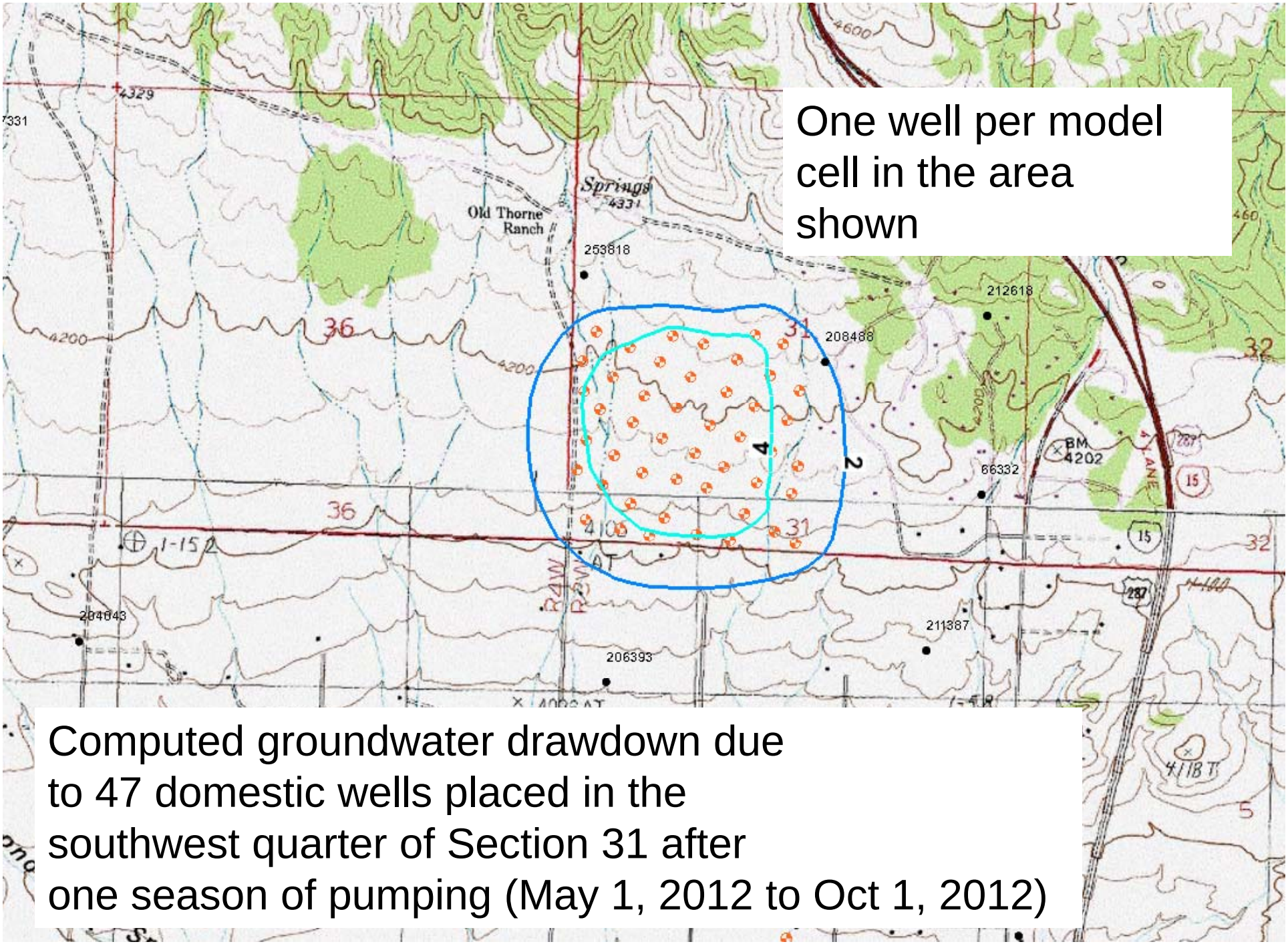
Well 64737 State Lands East



Well 19993 Tangen

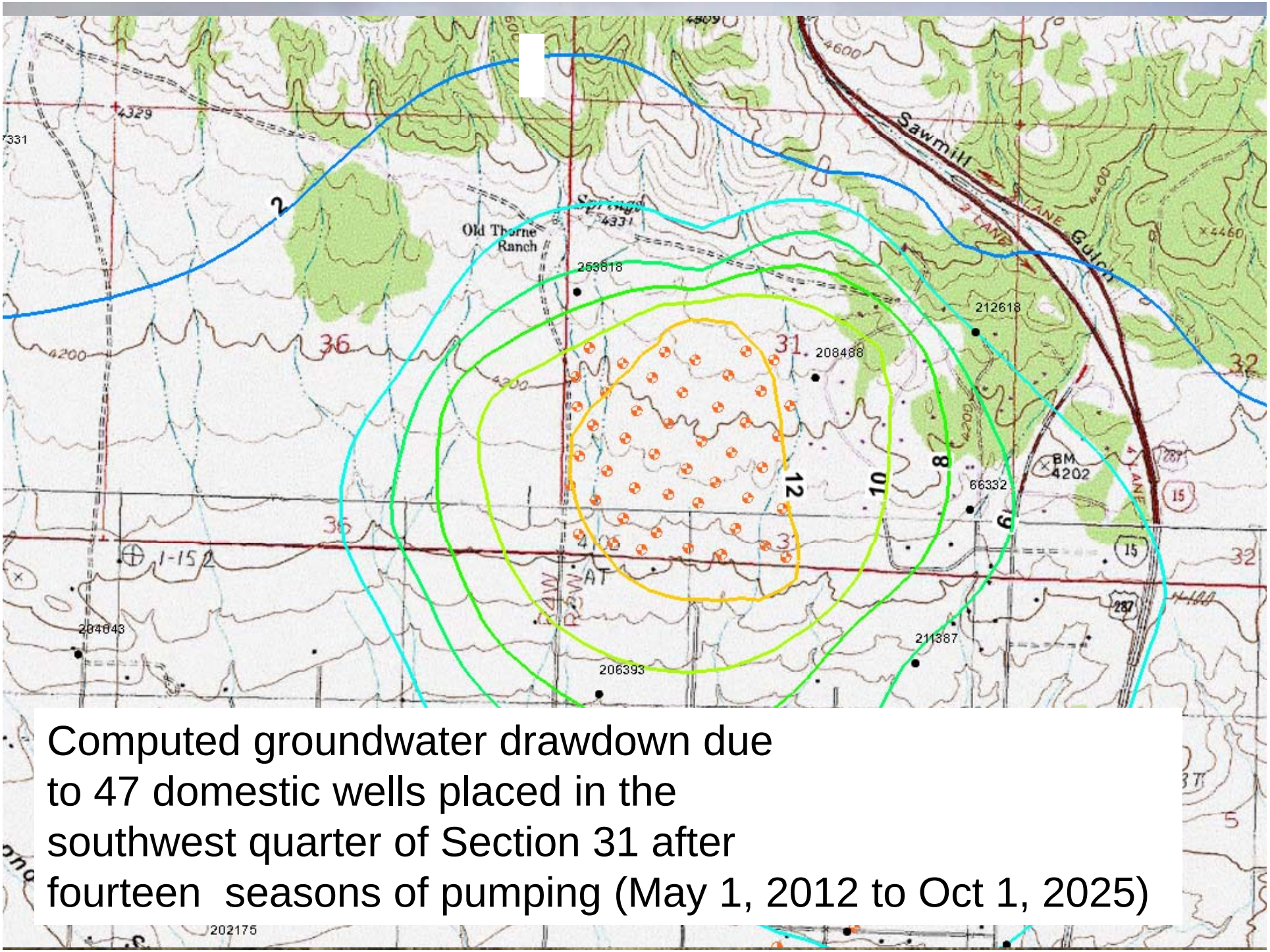



Pediment Focus
Model
Pumping
Center A
I-15
North Hills
Area Model
Lincoln Rd
HVID Canal
Masonic
Home
Lake
Helena
One Mile



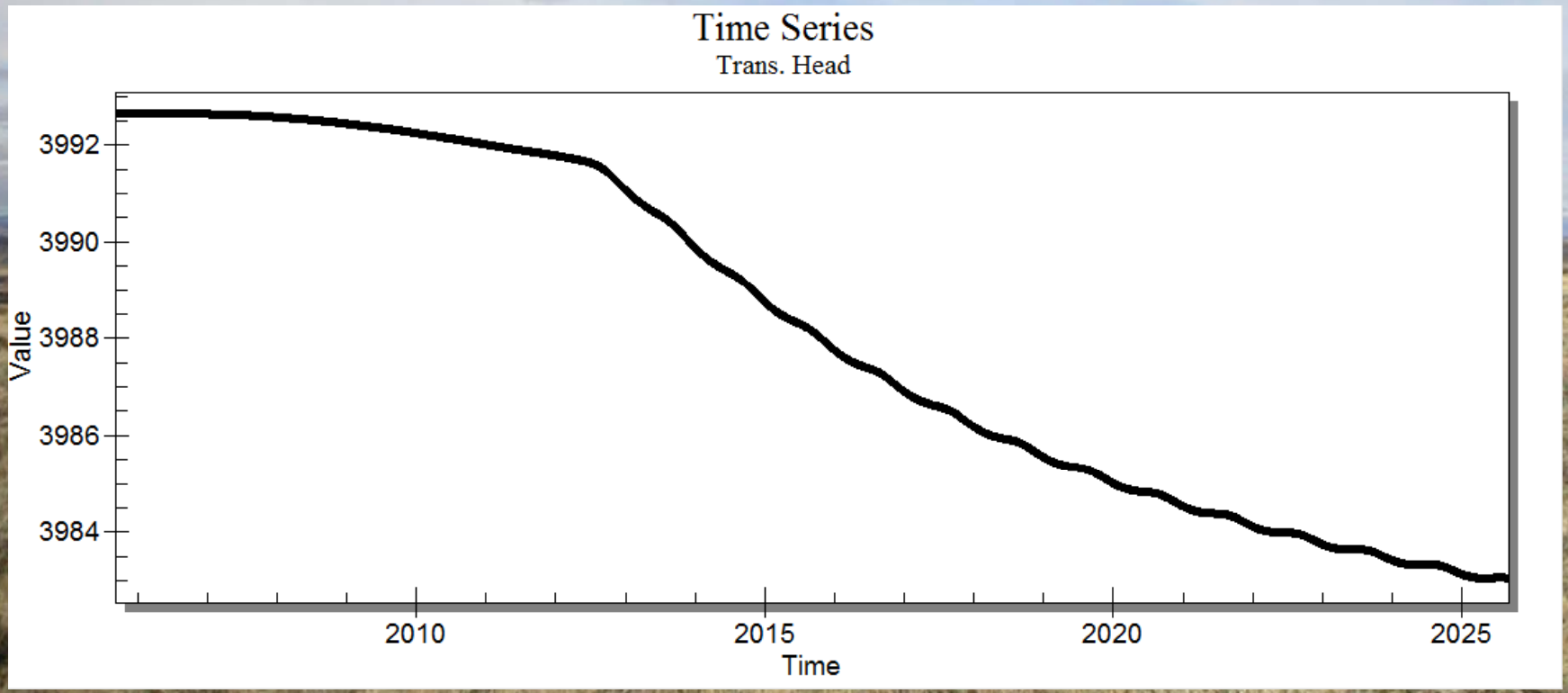
One well per model cell in the area shown

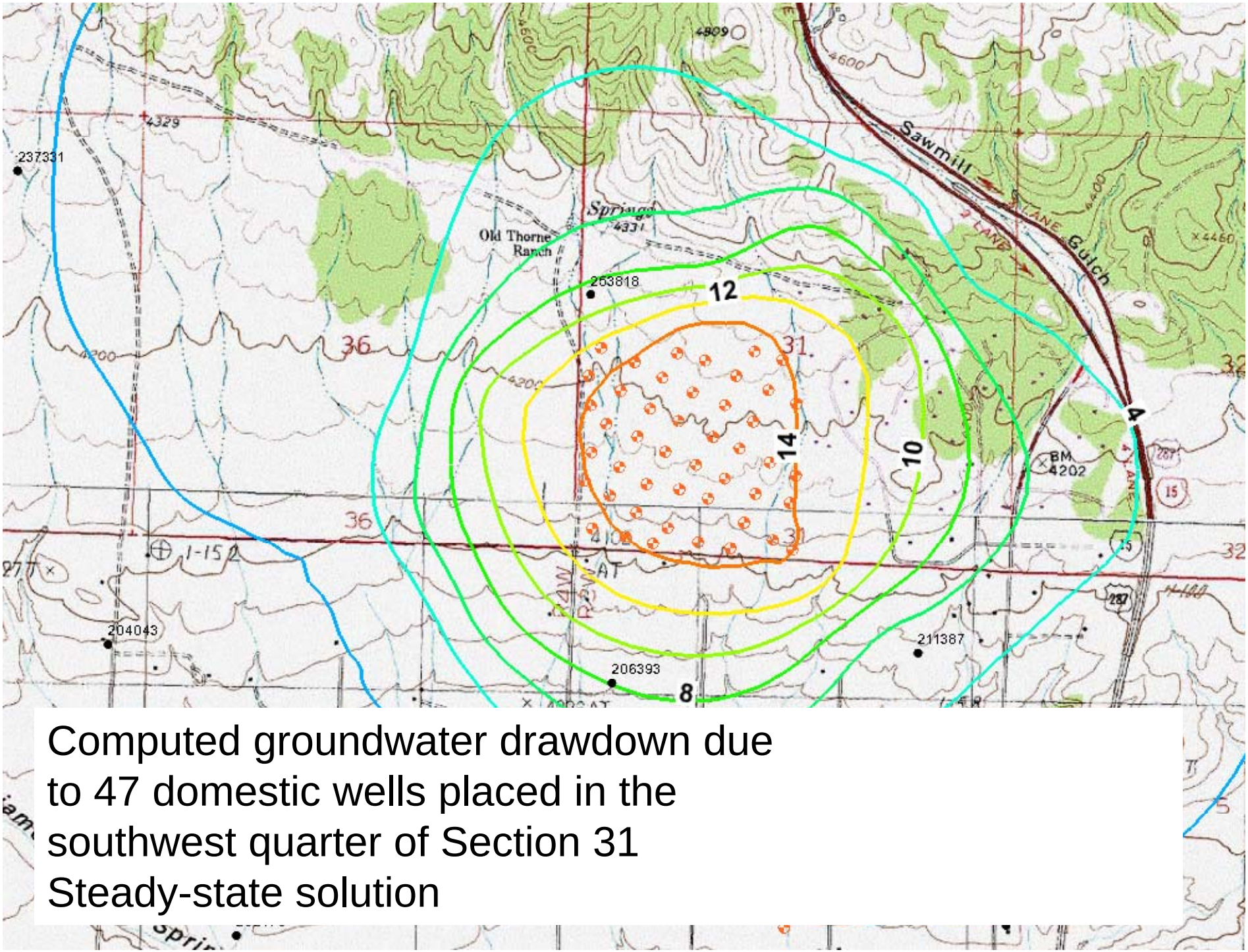
Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31 after one season of pumping (May 1, 2012 to Oct 1, 2012)



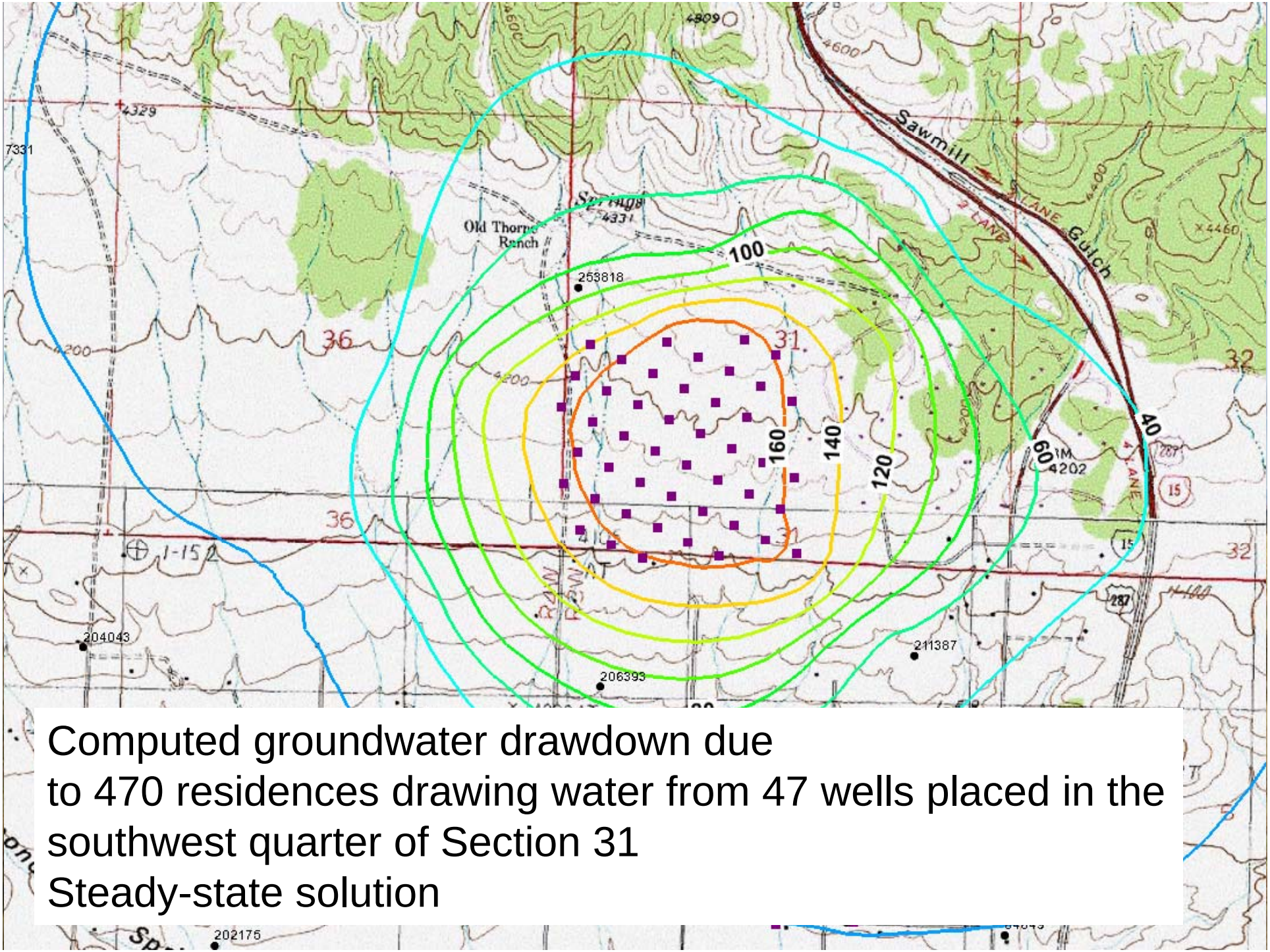
Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31 after fourteen seasons of pumping (May 1, 2012 to Oct 1, 2025)

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

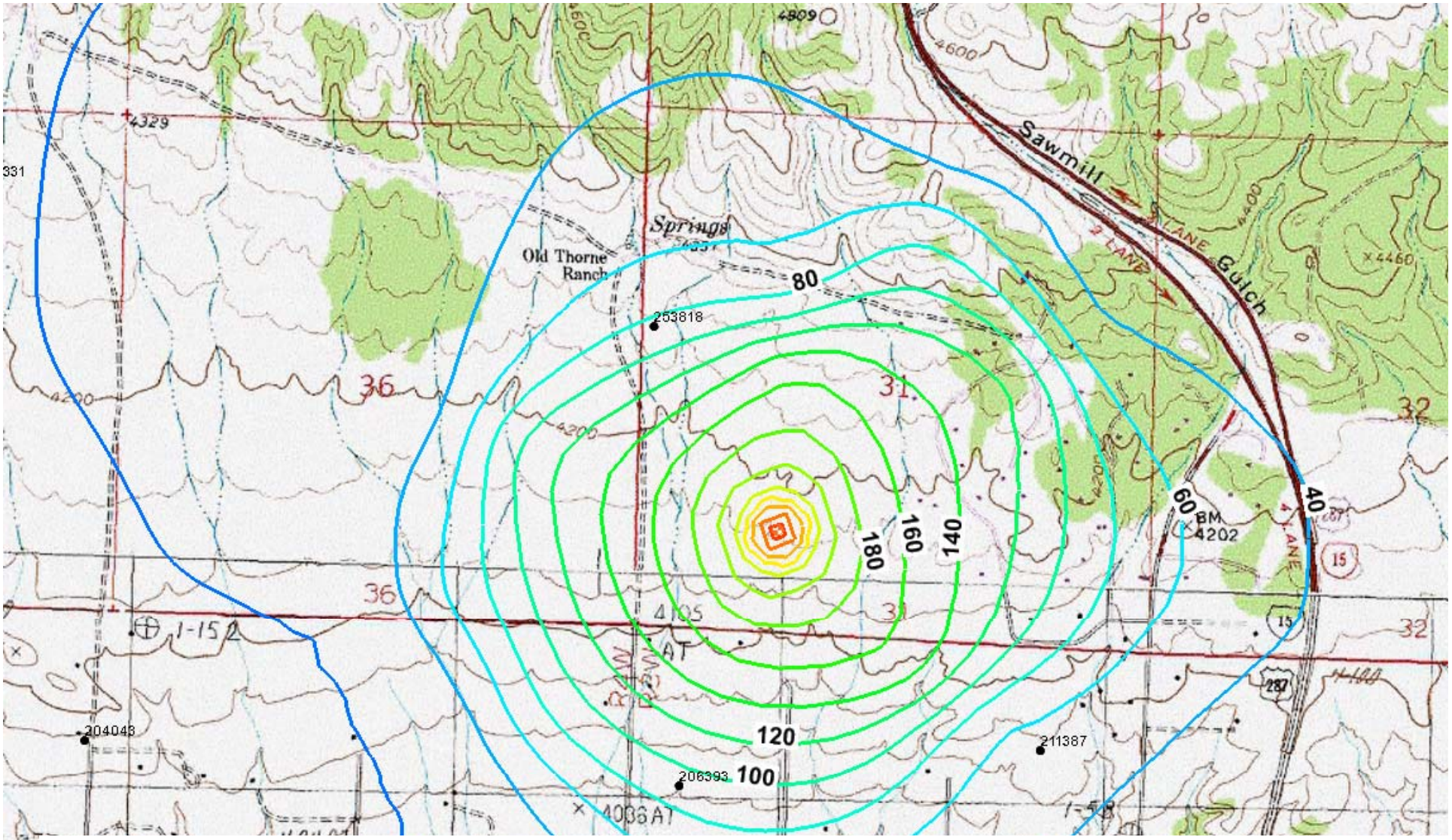




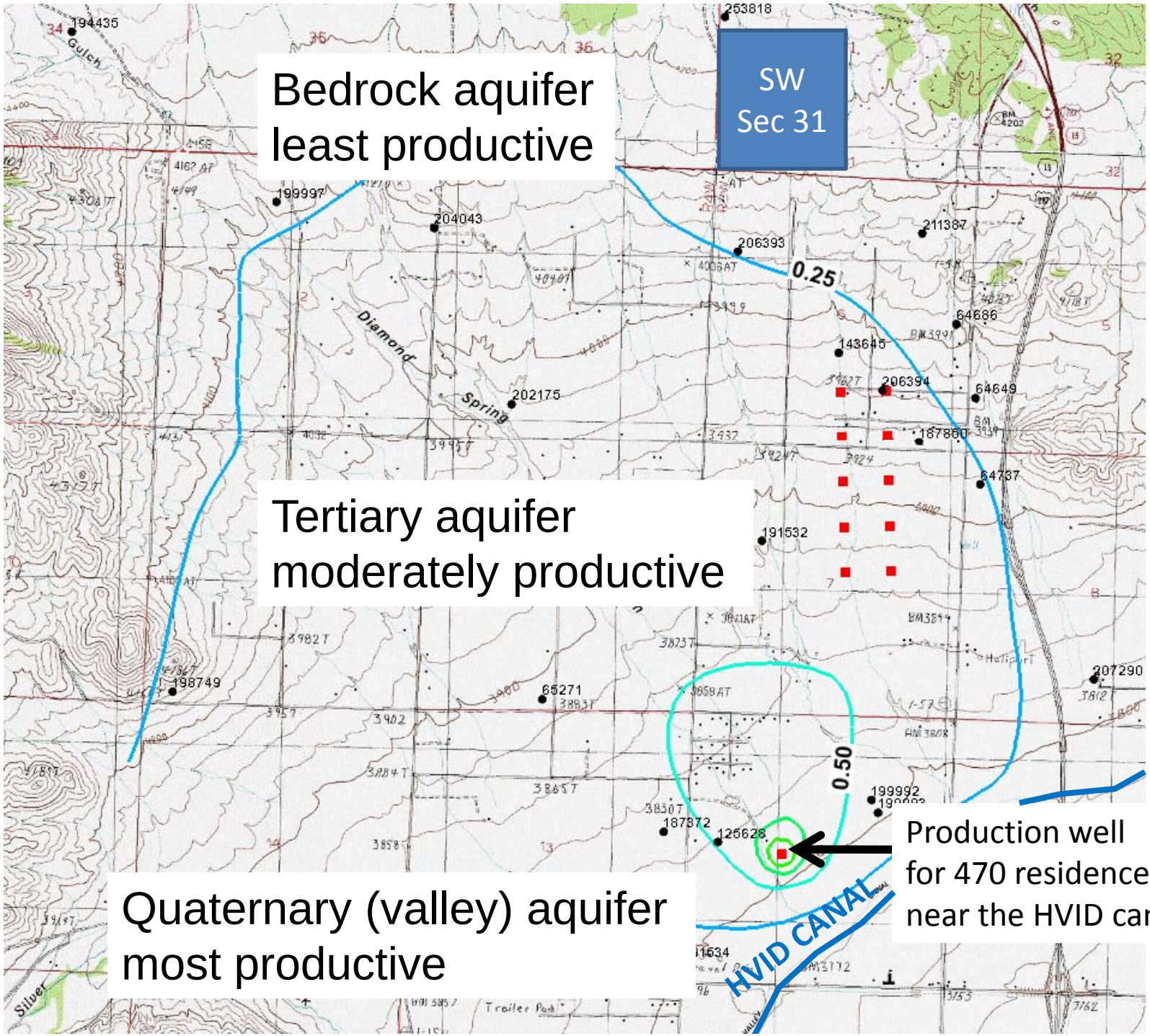
Computed groundwater drawdown due to 47 domestic wells placed in the southwest quarter of Section 31
Steady-state solution



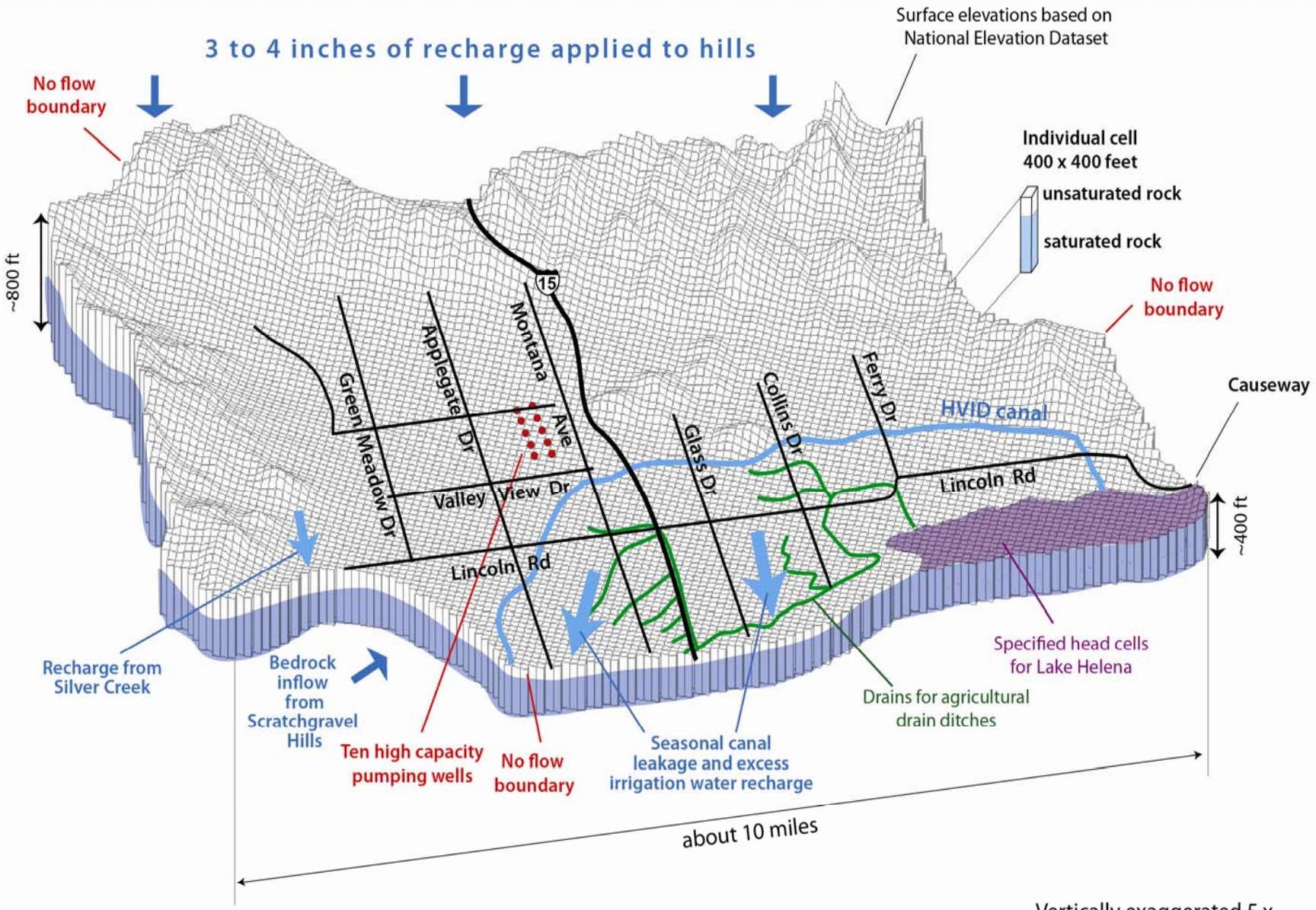
Computed groundwater drawdown due
to 470 residences drawing water from 47 wells placed in the southwest quarter of Section 31
Steady-state solution

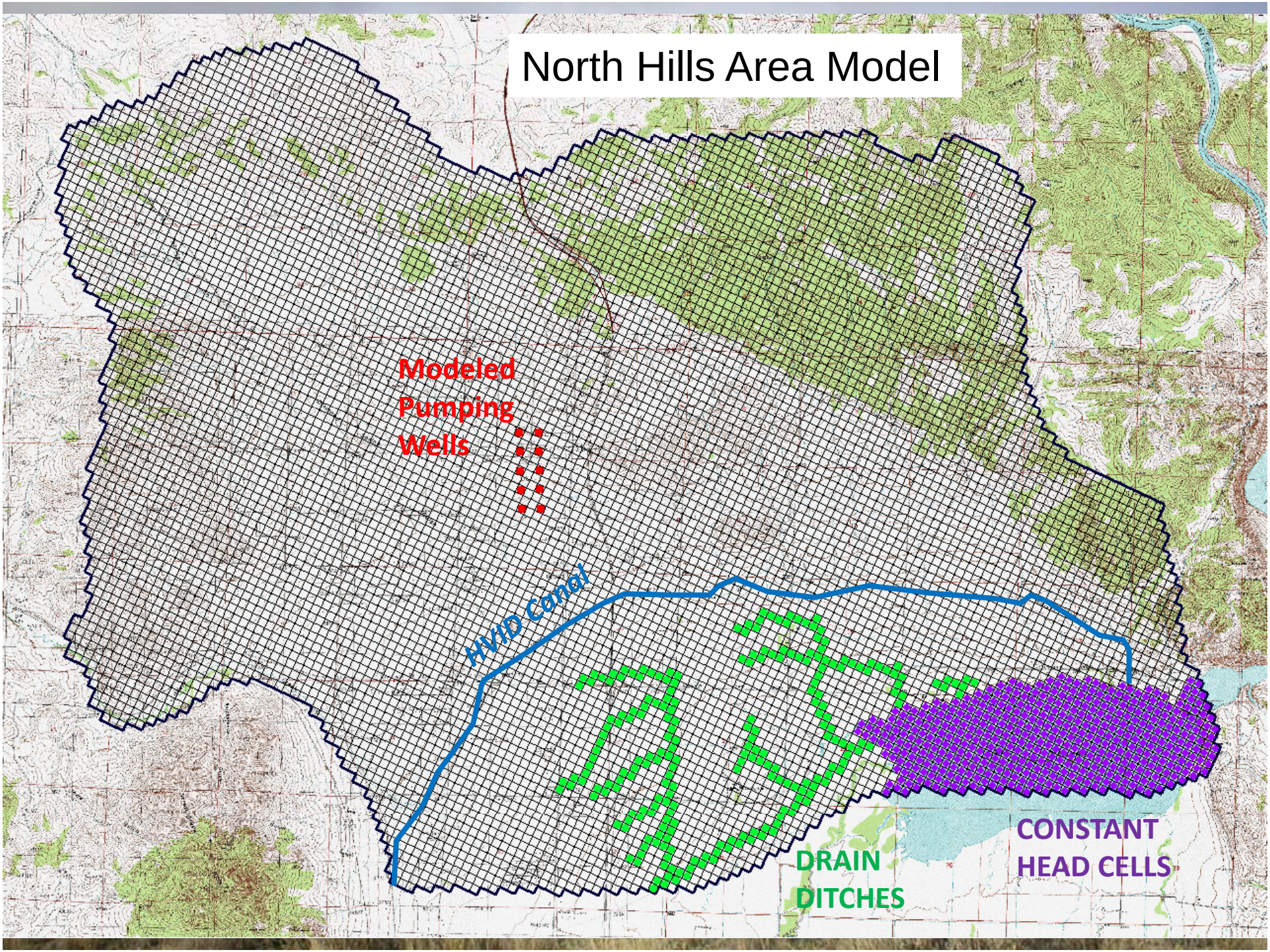


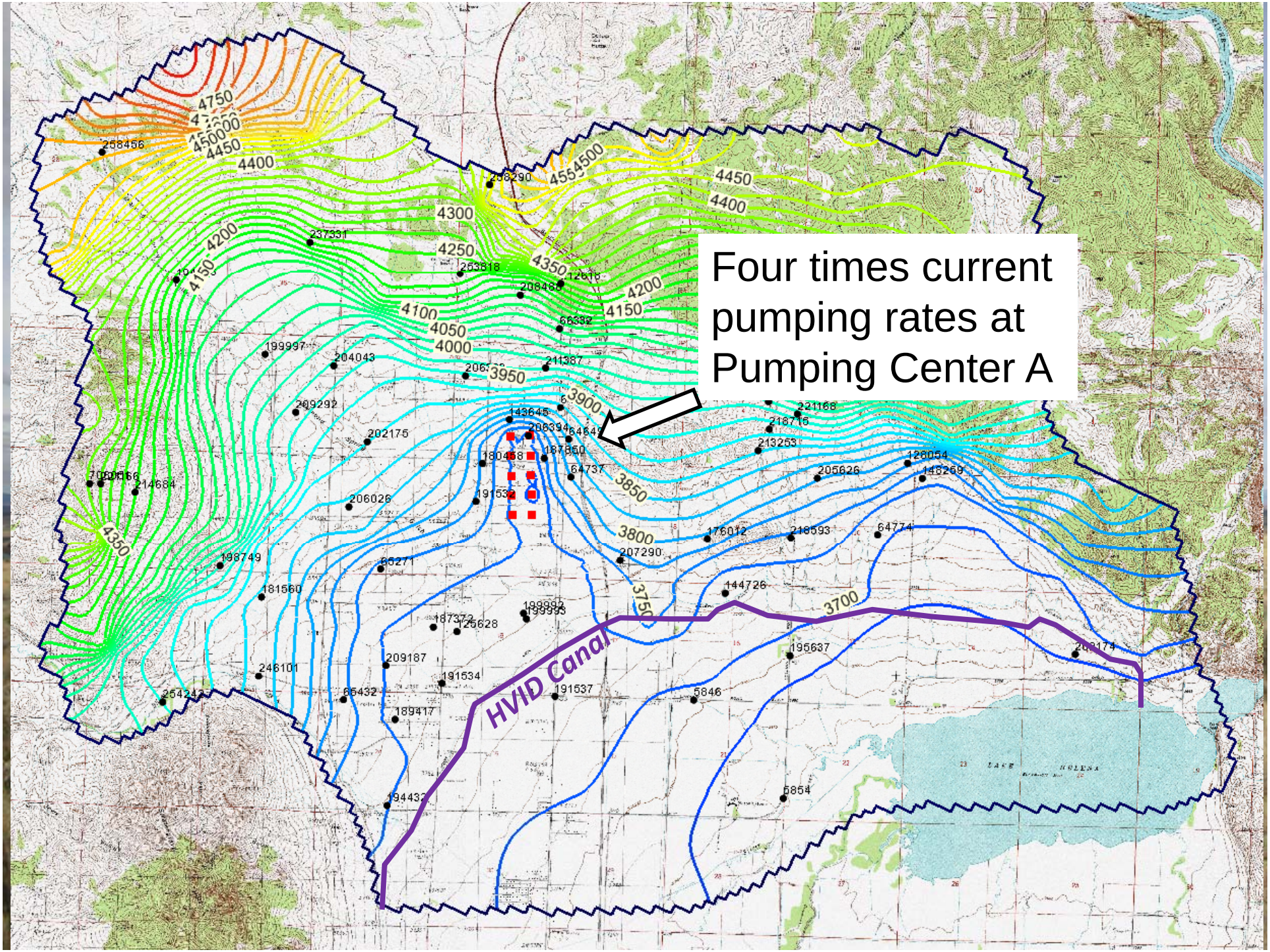
Computed groundwater drawdown due to 470 domestic residences placed in the southwest quarter of Section 31 – with one public water supply well
Steady-state solution


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
Gulch
Silver
194435
253818
199997
204043
206393
211387
64686
143645
206394
64649
202175
187860
64737
191532
198749
65271
207290
199992
187372
125628

North Hills Area Model
Schematic View



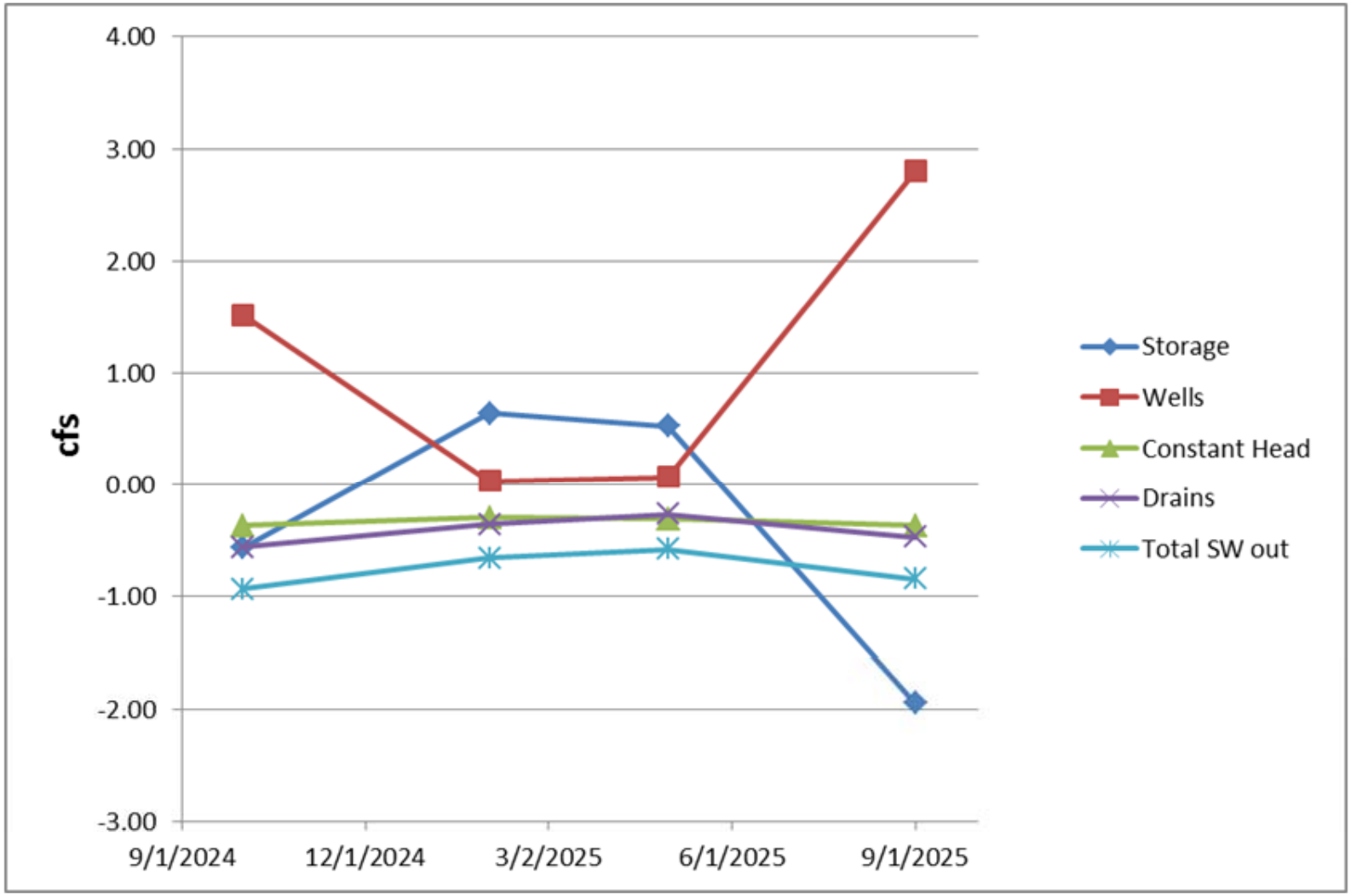

North Hills Area Model
Modeled
Pumping
Wells
HVID Canal
DRAIN
DITCHES
CONSTANT
HEAD CELLS


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
253818
208468
66332
199997
204043
211387
209292
143645
206394
202175
180458
187850
64737
214684
206026
191532
221168
218715
213253
128054
148259
205626
176012
218593
64774
207290
198749
65271
181560
144726
199992
199993
187372
125628
209187
191534
191537
246101
65432
189417
195637
5846
5854
194432
LAKE HELENA

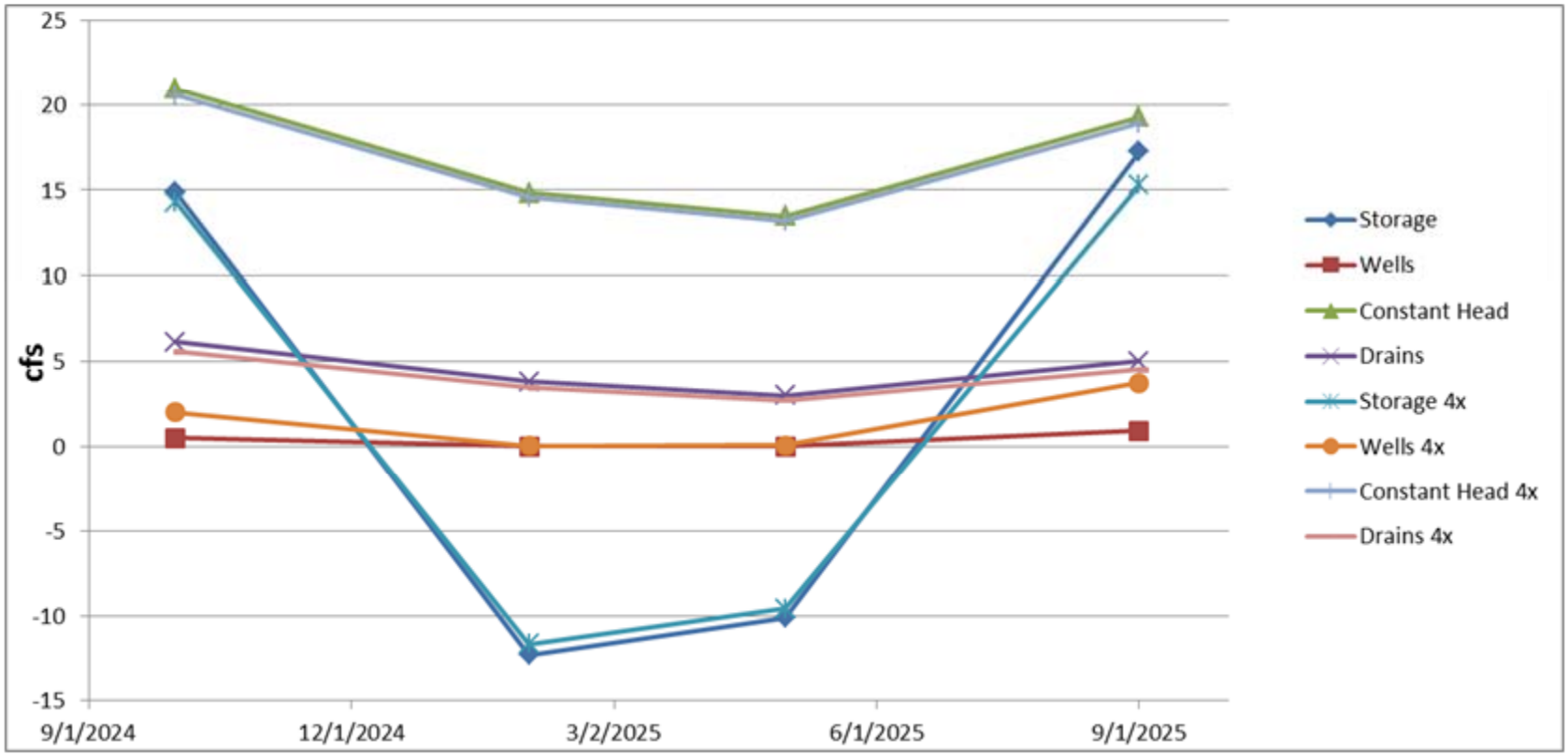
North Hills Groundwater Models capabilities:

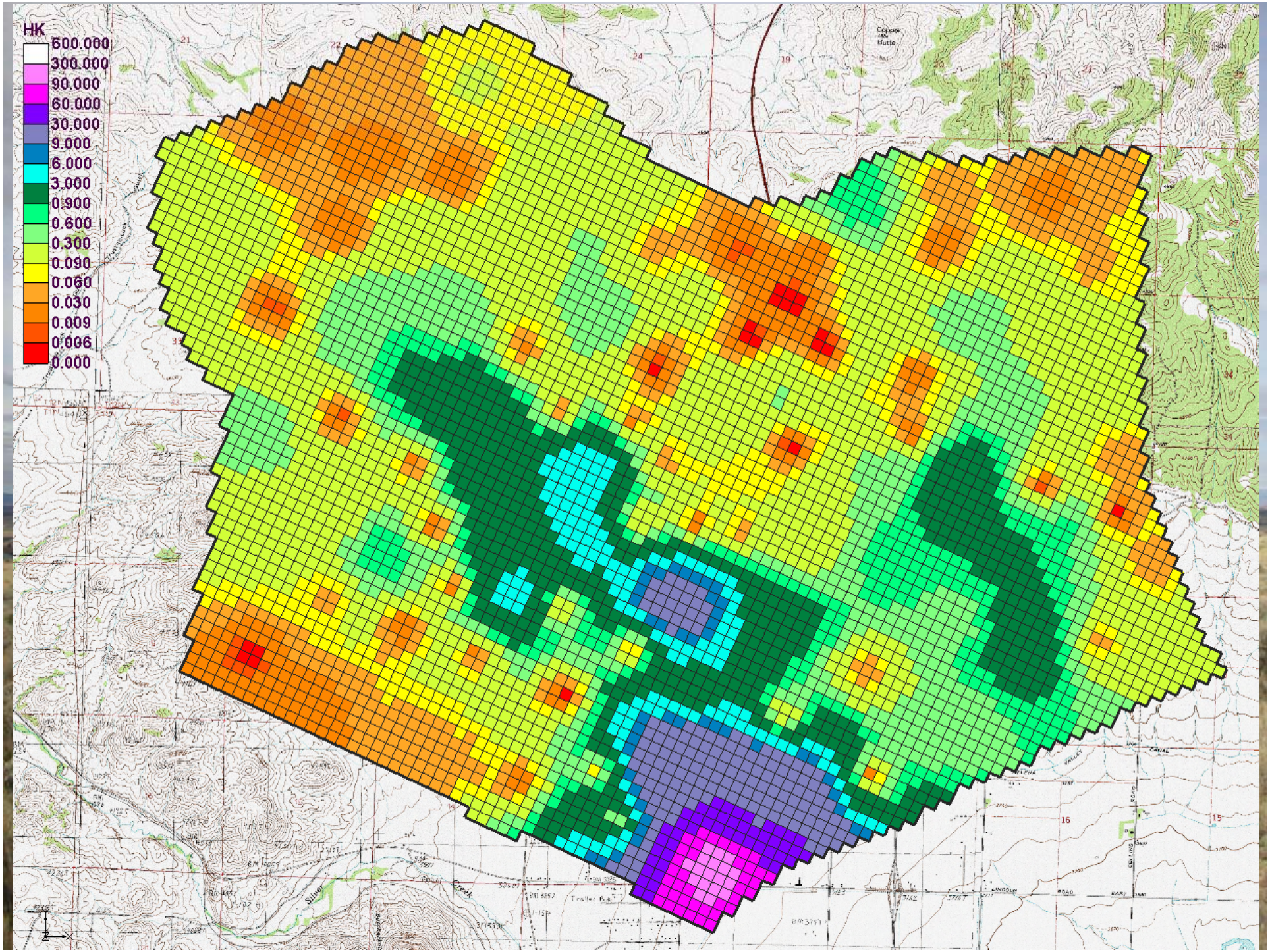
- Estimate drawdown from additional groundwater withdrawals
- Estimate drawdown or recovery from increases or decreases in pumping in current developments
- Estimate timing and magnitude of impacts of groundwater pumping to Lake Helena (Missouri River)
- Analyze the effects of other hydrologic changes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

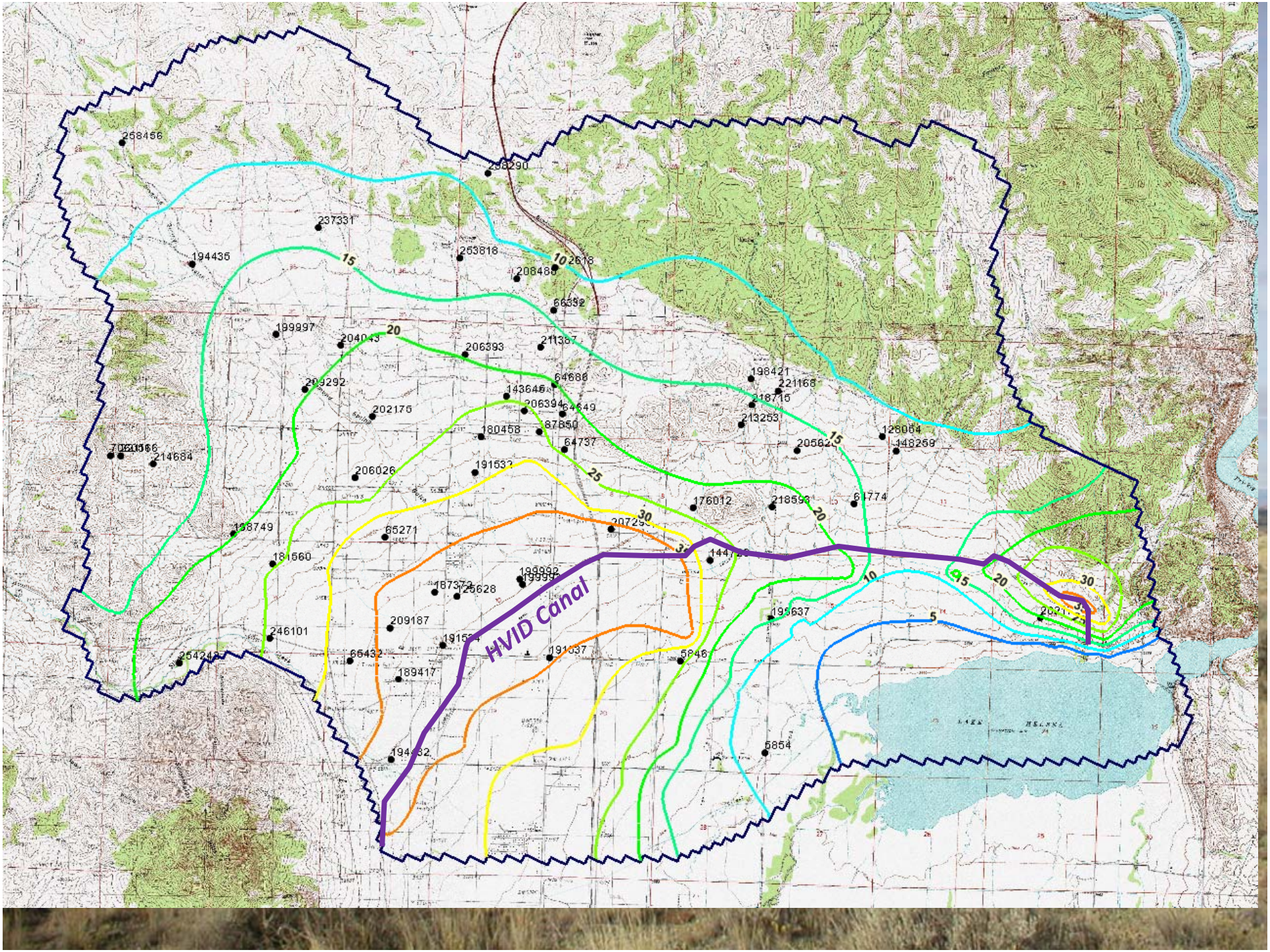
Water Budget Impacts of Pumping

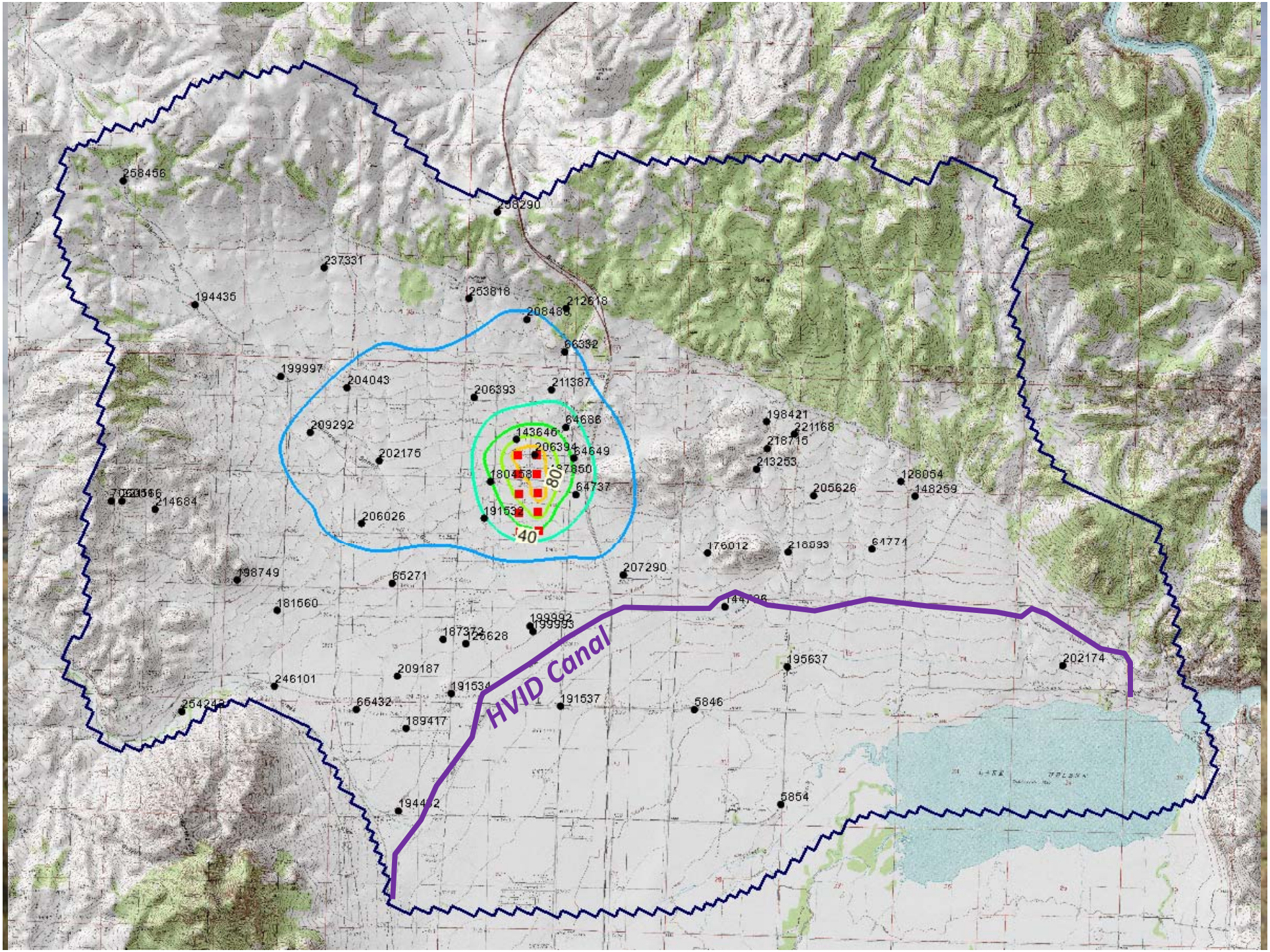


Water budget




HK
600.000
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
253818
208488
66332
199997
204043
206393
211387
64686
143645
206394
64649
202175
180458
87850
64737
214684
206026
191532
198421
221168
218715
213253
128064
148259
176012
218593
64774
65271
181560
199992
187372
125628
209187
246101
65432
189417
191537
5846
195637
5854
194482
LAKE HELENA
10
15
20
25
30
5



258456
258290
237331
194435
253818
212618
208488
66332
199997
204043
206393
211387
209292
64686
143646
206394
64649
202175
180458
87850
64737
214684
206026
191532
40
80
198421
221168
218715
213253
128054
148259
205626
176012
216093
64771
207290
198749
65271
181560
199992
199993
187372
125628
209187
246101
191534
191537
65432
189417
195637
202174
5846
5854
HVID Canal