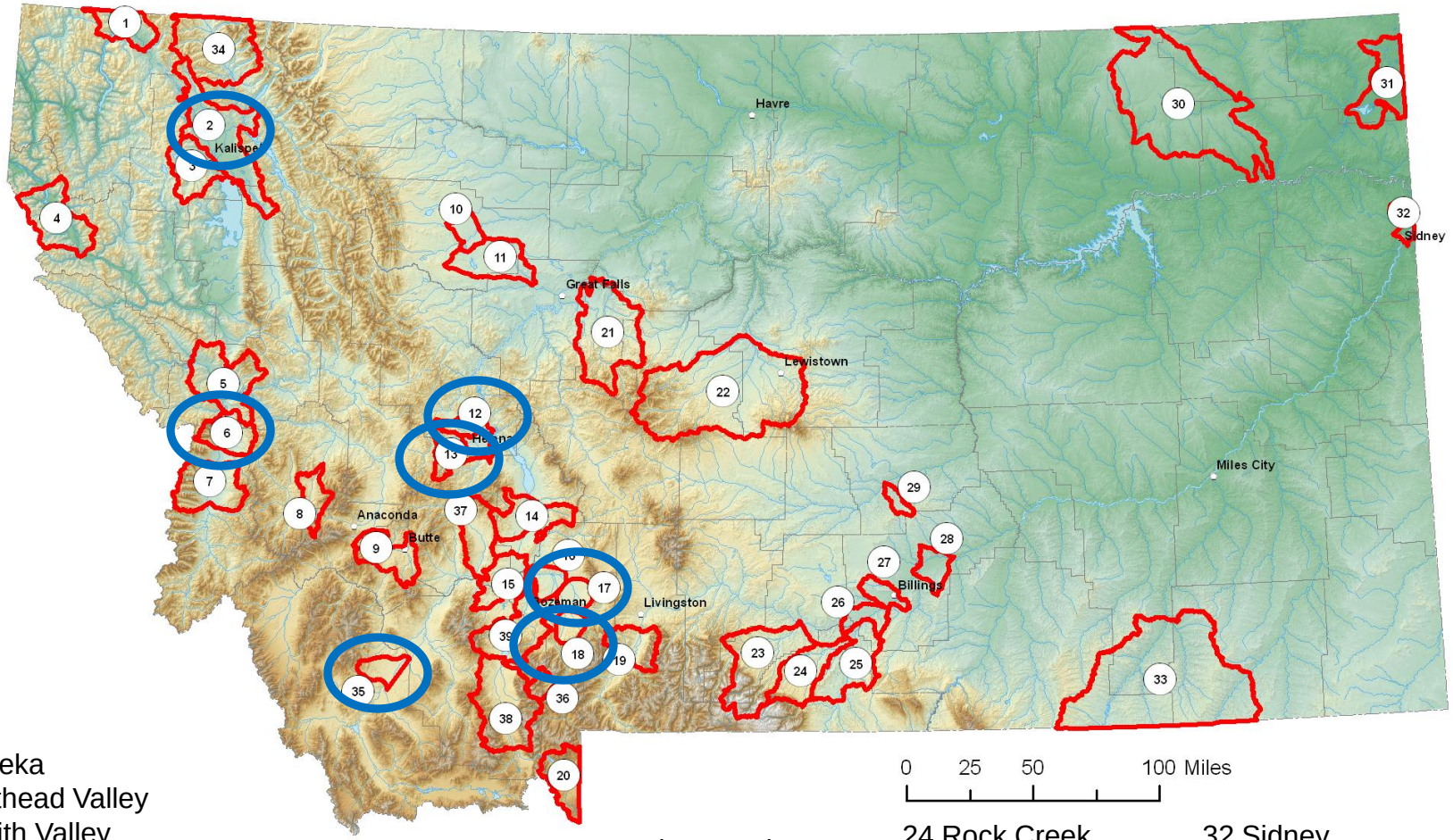
Ground Water Investigation Program
update

(GWIP)

http://www.mbmg.mtech.edu/gwip/gwip.asp

John Wheaton
Montana Bureau of Mines and Geology
Presented to:
Water Policy Interim Committee
Helena January 13, 2010



1 Eureka
2 Flathead Valley
3 Smith Valley
4 Noxon
5 Missoula Valley
6 Florence
7 Hamilton

8 Georgetown Lake
9 Summit Valley
10 Priest Butte Lake
11 Greenfield Bench
12 North Hills
13 Scratchgravel Hills
14 Townsend, Toston

15 Three Forks
16 Manhattan
17 Belgrade
18 Four Corners
19 Pine Creek
20 W.Yellowstone
21 Belt, Monarch
22 Little Belt Mtns
23 Stillwater Valley

24 Rock Creek
25 Prior Mtns
26 Park City
27 West Billings
28 East Billings
29 Roundup
30 Flaxville gravels (several sub basins)
31 Clear Lake

32 Sidney
33 Coalbed methane (several sub basins)
34 NF Flathead
35 Beaverhead – west
36 Big Sky
37 L Boulder
38 Ennis
39 L Madison

Active Projects for the current biennium

North Hills (Helena)
Four Corners (Bozeman)
Belgrade - (Bozeman area)
Lower Beaverhead River west side (Dillon)
Scratchgravel Hills (Helena)
Bitterroot Valley – (Florence)
Flathead Valley Deep Aquifer (Kalispell)

Data Access

http://mbmggwic.mtech.edu/

Drawing Tools | October 20, 2009 Beaverhead Watershed health [Compatibility Mode] - Microsoft PowerPoint

Montana's Ground-Water Information Center (GWIC) | Projects Menu | V.11.2009 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://mbmggwic.mtech.edu/sqlserver/v11/menus/menuProject.asp?mygroup=GWIP&

Most Visited Getting Started Latest Headlines

Groundwater Information Center
Montana Bureau of Mines and Geology
Montana Tech of The University of Montana
1300 West Park Street - Main Hall 314
Butte Montana 59701-8997

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| Home | Well Data | Reports | Data Coop | DrillerWeb | DNRC | Help! |

MbmgGwic Navigation: | Main Menu | SWL Menu | GWCP Map Products | Ground-Water Projects |

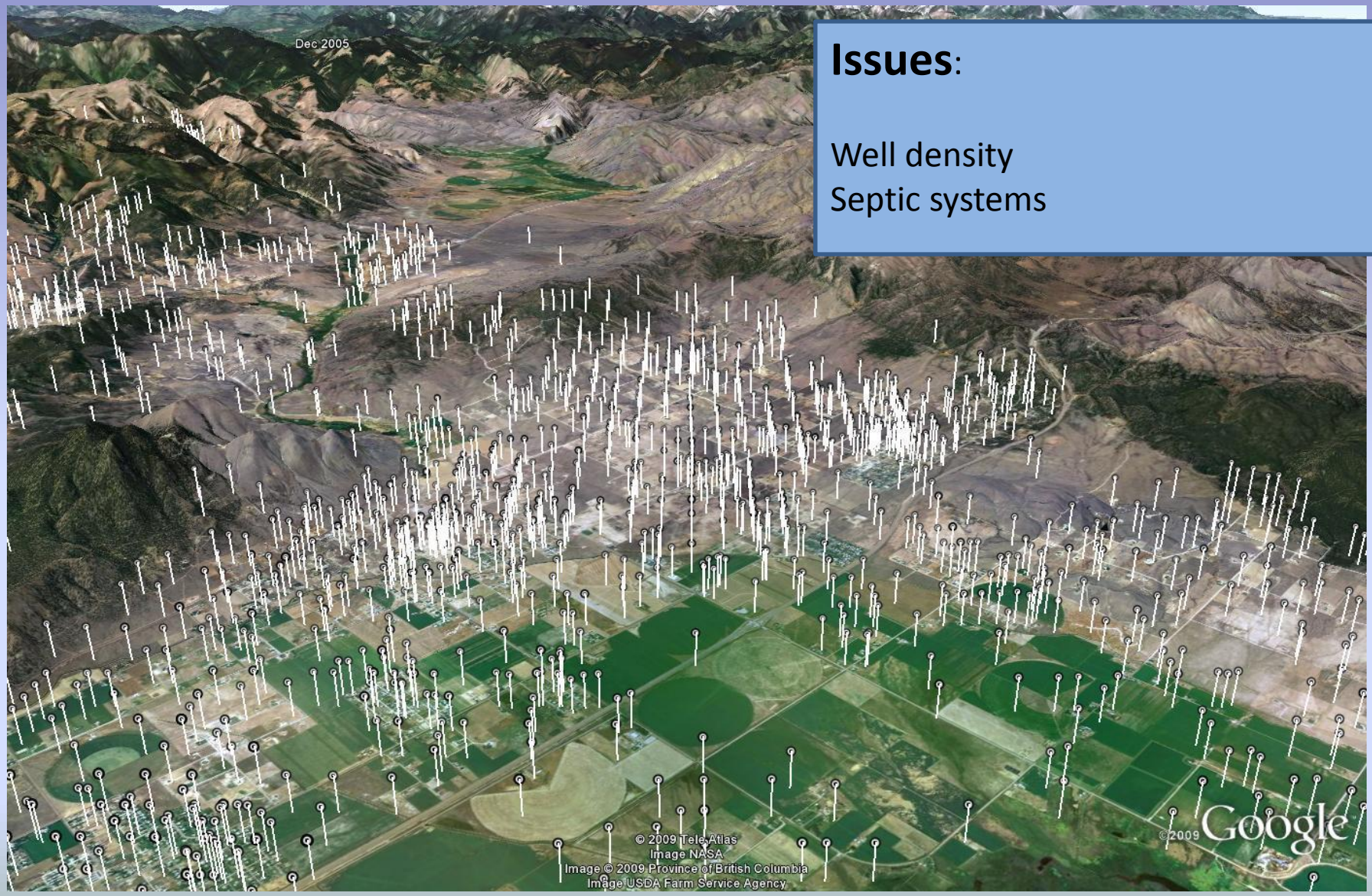
In the tables below are the Montana Bureau of Mines and Geology projects that have data available through GWIC. Use the selection box on the left to choose the GWIC main project area that you want to review. To retrieve data, click on the purple dot that corresponds to the type of data and project you want. If there is no dot in a box then there is no data available at this time.

Project Groups

- Abandoned/Inactive Mines
- Clark Fork River Basin
- Coalbed Methane and Coal Hydrology
- Controlled Groundwater Areas
- DEQ 319 Projects
- General MBMG Program Data
- Ground-Water Characterization Program Data
- Groundwater Investigation Program
- House Bill 831 Project Data
- Regional Water Resource Investigations
- Reports and Maps
- Spring Data
- Statewide Monitoring Network
- Superfund Data
- Yellowstone National Park

Project Name	Site Data	Site Visit Data	Water Quality Data	Isotope Data	Water Level Data	Photo Data	Weather Data
GROUNDWATER INVESTIGATION PROGRAM (*BWIP*)	●	●	●	●	●		
GROUNDWATER INVESTIGATION PROGRAM * FOUR CORNERS - BOZEMAN (*BWIP4C*)	●	●	●	●	●		
GROUNDWATER INVESTIGATION PROGRAM * BELGRADE LOWER WEST GALLATIN (*BWIPBE*)	●	●	●	●	●		
GROUNDWATER INVESTIGATION PROGRAM * BITTERROOT VALLEY NEAR FLORENCE (*BWIPFB*)	●	●	●		●		
GROUNDWATER INVESTIGATION PROGRAM * KALISPELL VALLEY DEEP AQUIFER (*BWIPKL*)	●	●	●		●		
GROUNDWATER INVESTIGATION PROGRAM * LOWER BEAVERHEAD RIVER WEST (*BWIPLB*)	●	●	●		●		
GROUNDWATER INVESTIGATION PROGRAM * NORTH HILLS - HELENA (*BWIPNH*)	●	●	●	●	●		
GROUNDWATER INVESTIGATION PROGRAM * SCRATCH GRAVEL HILLS - HELENA (*BWIPSG*)	●	●	●	●	●		

North Hills - (Helena)
Kirk Waren, Andy Bobst, Julie Ahern



Issues:

Well density
Septic systems

North Hills Area Activities

Coordination:

- Individual landowners
- Lewis and Clark Local Water Quality Protection District
- Helena Valley Irrigation District
- DNRC
- Montana Tech for student project
- Closely coordinated with Scratchgravel Hills GWIP project

North Hills Area Activities

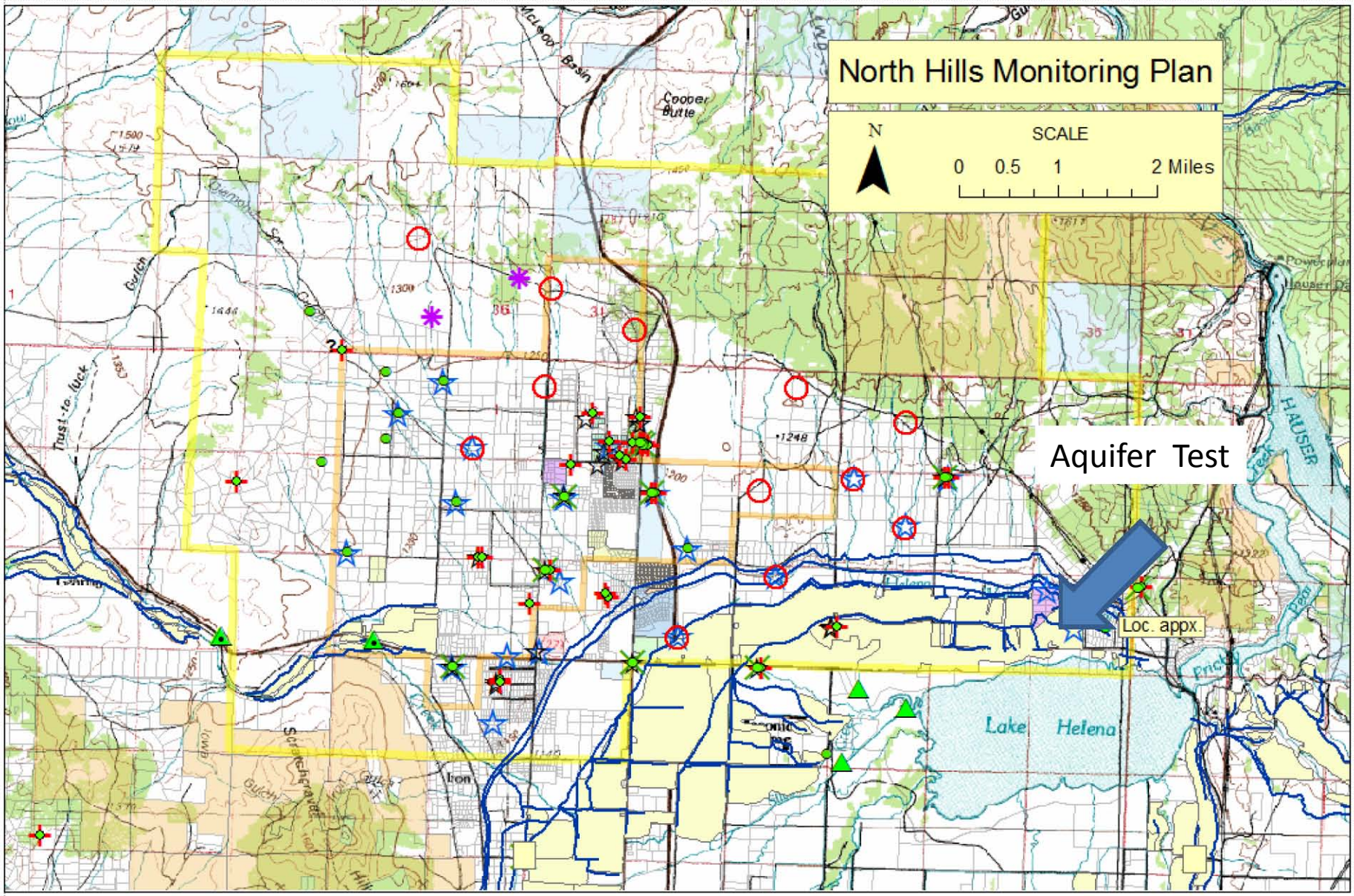
Contracting:

- Sharing an employee with LCWQD
- Contract for a rotosonic drilling test borehole completed – drilling planned in January
- Bid document for drilling aquifer test sites
- Project – Scale Geophysical bid document near completion for bids

North Hills Area Activities

Accomplishments to date:

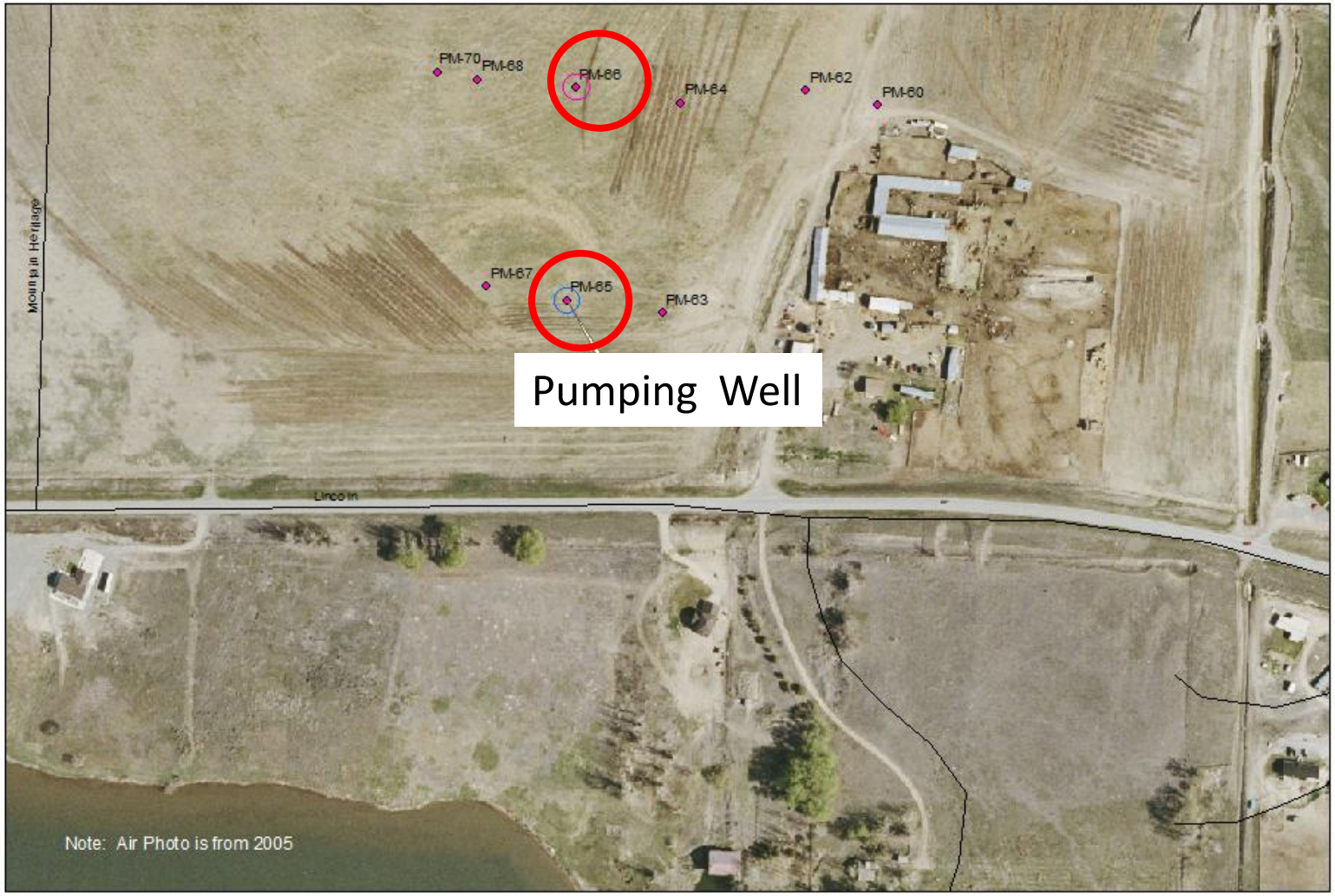
- Long-duration multi-well aquifer test conducted – analysis underway
- Monitoring well network activated
- Three stream monitoring sites with seasonal stage recorders and peizometers in place on Silver Creek
- Geophysical survey by Montana Tech students
- Began compiling existing data: aquifer test geologic and hydrologic
- Phase 1 groundwater model framework in development


North Hills Monitoring Plan
N
SCALE
0 0.5 1 2 Miles
Aquifer Test
Loc. appx.
Lake Helena
HAUSER
Cooper Butte
Trust-to-luck
Madison study network well
Madison study hydrograph
Monthly measurements initiated (minimum)
GWIP stream monitoring site with piezometers
Currently Monitored Wells
Monthly L&C
Quarterly GWAP
Stream L&C/EPA/DNRC
Helena Valley Irrigation District (HVID) and other canals - many measurements being assembled for the Helena Valley HVID ditches, laterals, and drains
Proposed addtional monthly groundwater level monitoring
Proposed exploration drilling and aquifer test sites

Panoramic Meadows Aquifer Test

- 6 day ; average pumping rate = 38.2 gpm
- Used 10 existing subdivision wells (1 pumping, 9 observation)
- Monitor drawdown and recovery to determine aquifer characteristics

GWIP Project Area: North Hills, Lewis and Clark County



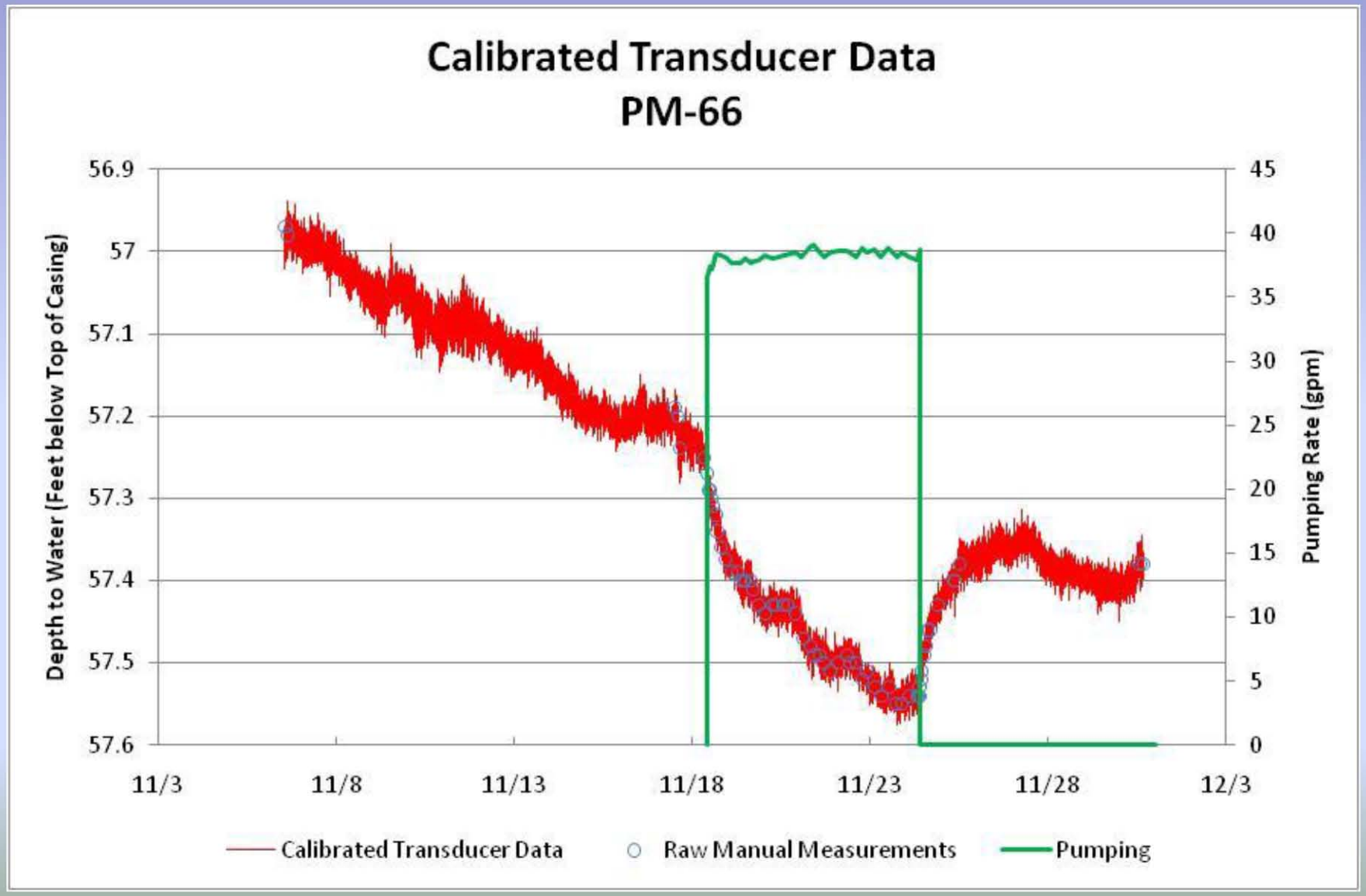
Panaramic_Meddows_Wells

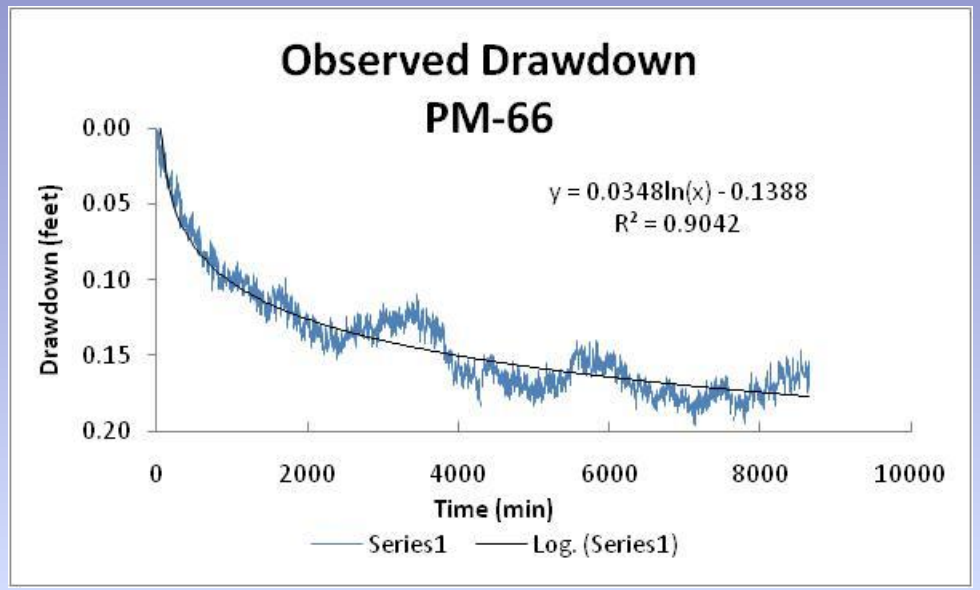
Panoramic Meadows Pump Test

N

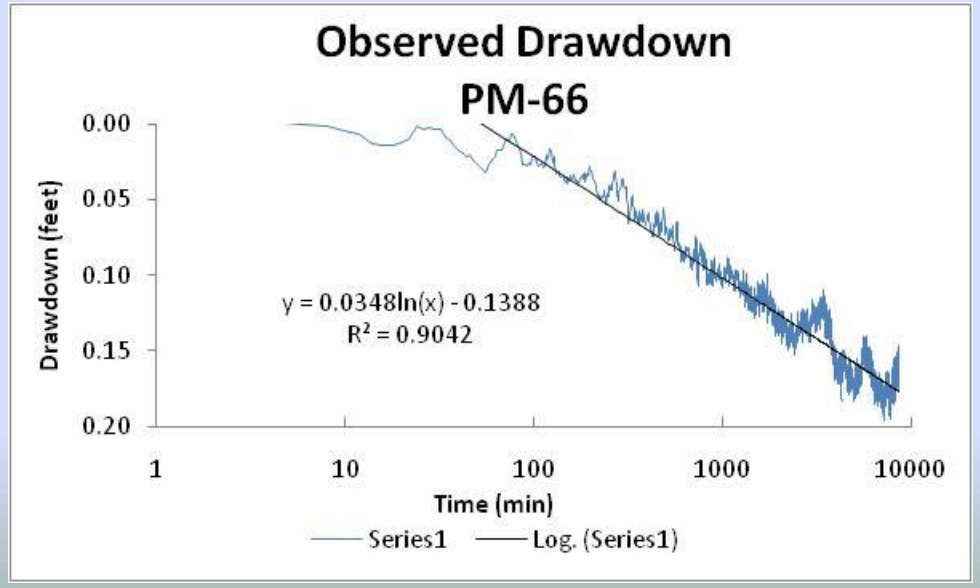
0 70 140 280 Feet

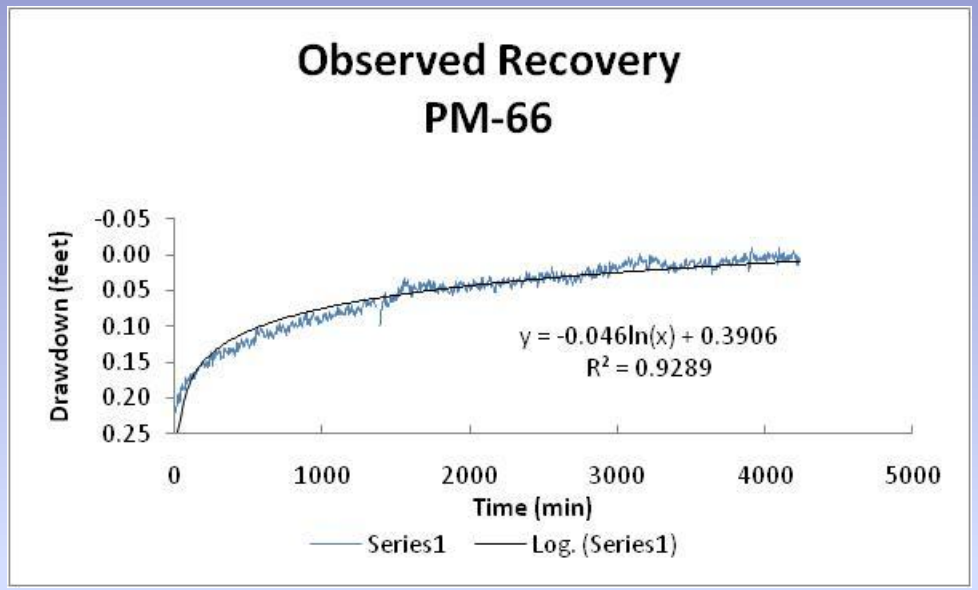
ALB; 12/31/09


Calibrated Transducer Data
PM-66
Depth to Water (Feet below Top of Casing)
56.9
57
57.1
57.2
57.3
57.4
57.5
57.6
Pumping Rate (gpm)
45
40
35
30
25
20
15
10
5
0
11/3
11/8
11/13
11/18
11/23
11/28
12/3
Calibrated Transducer Data
Raw Manual Measurements
Pumping

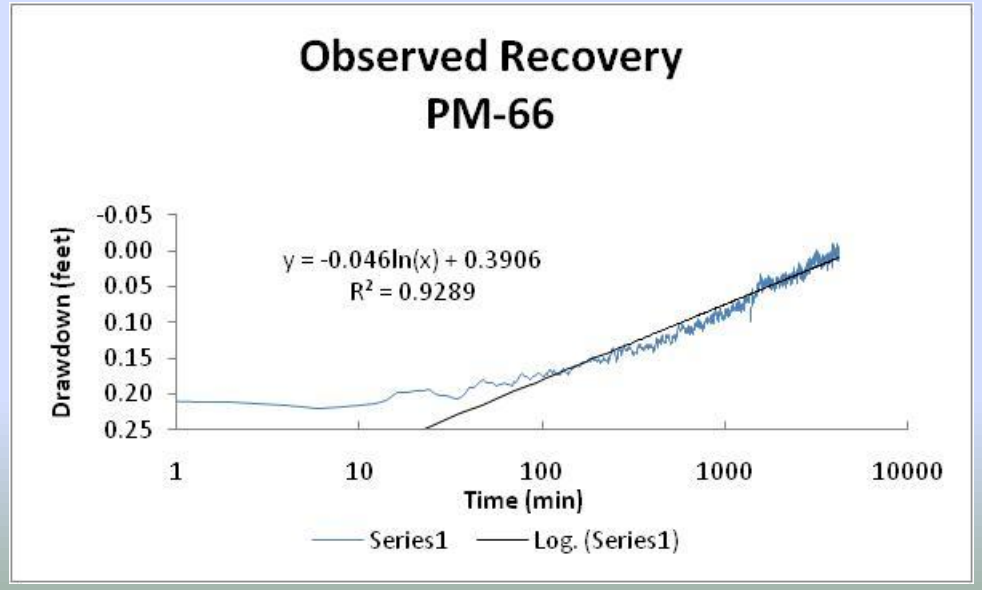


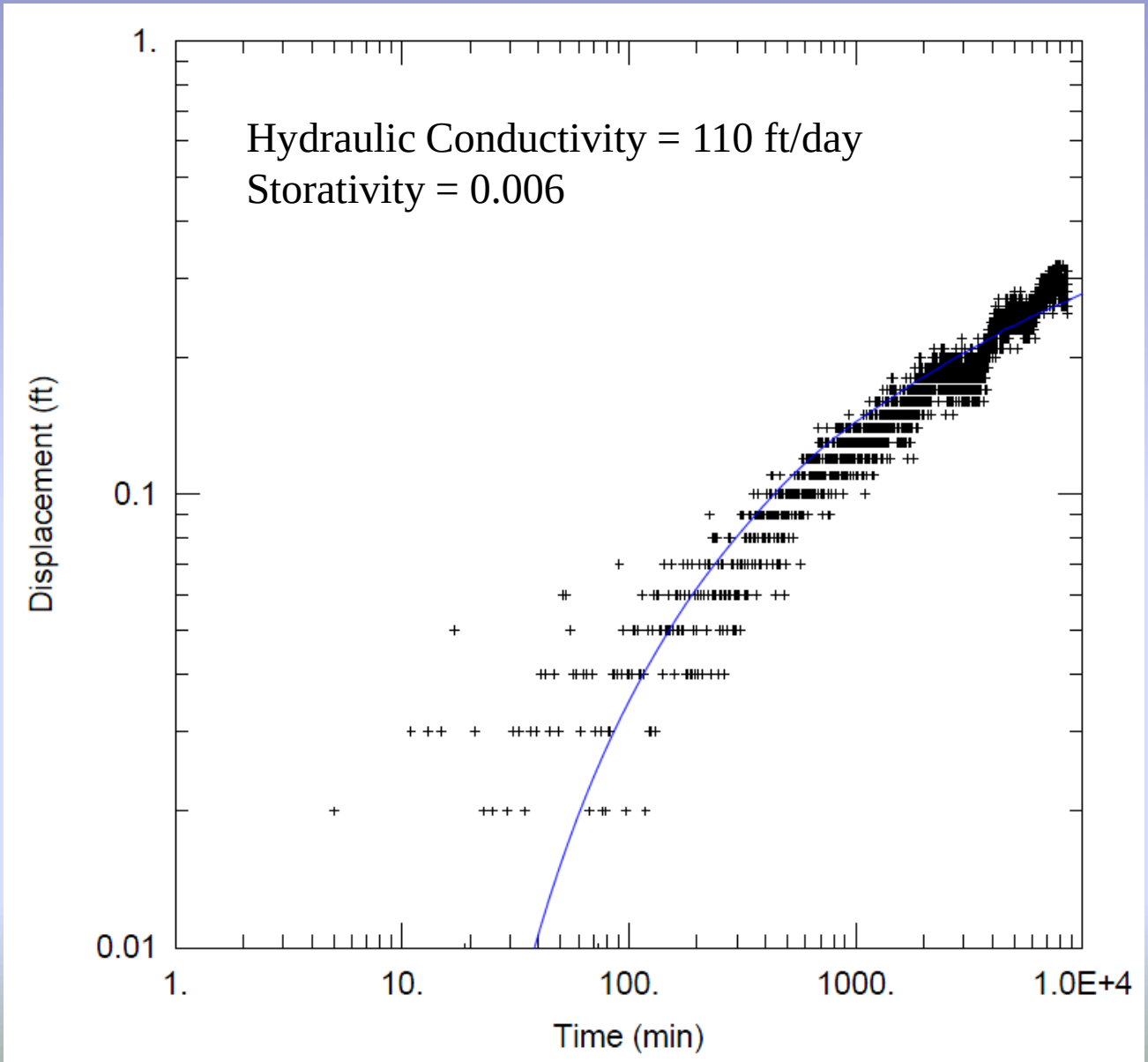
Drawdown in PM-66





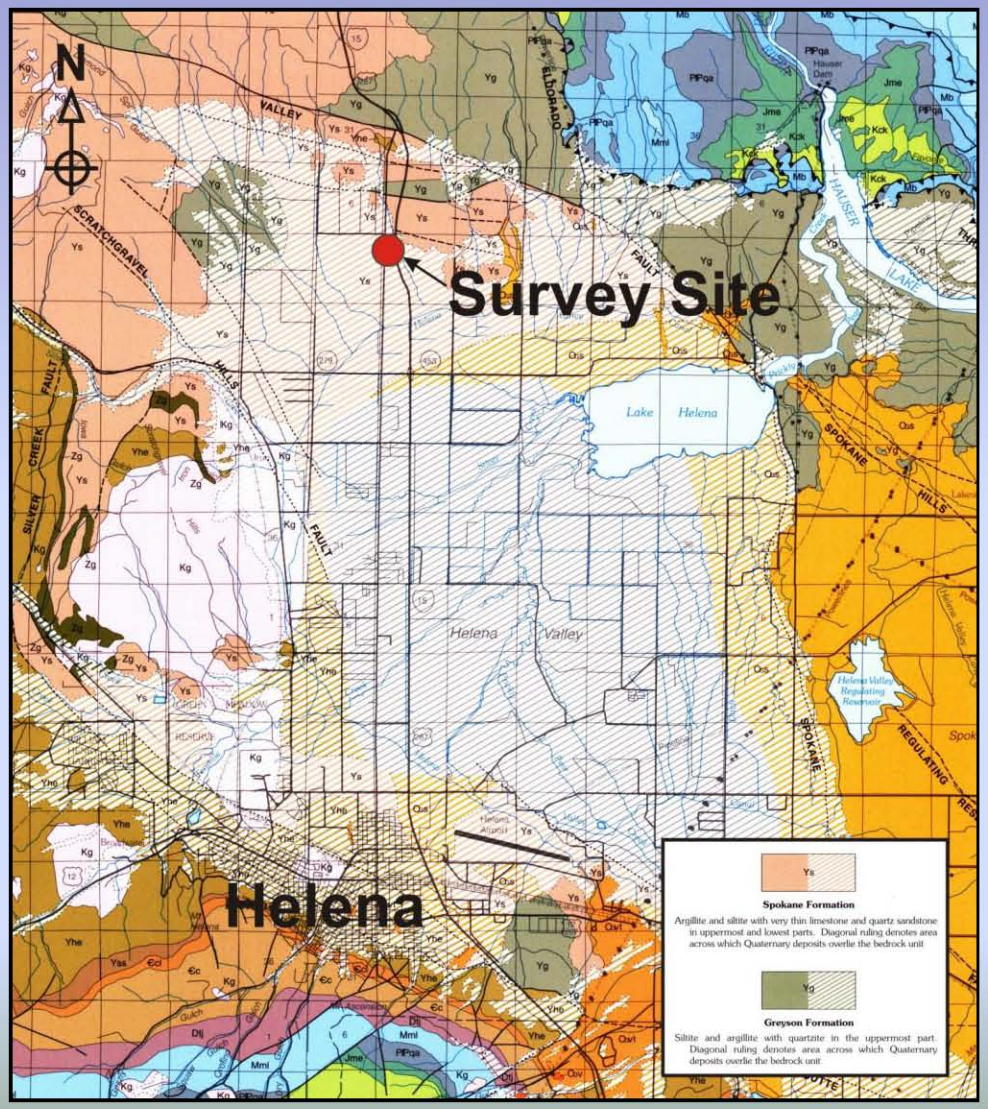
Recovery in PM-66




Hydraulic Conductivity = 110 ft/day
Storativity = 0.006
Displacement (ft)
1.
0.1
0.01
1.
10.
100.
1000.
1.0E+4
Time (min)

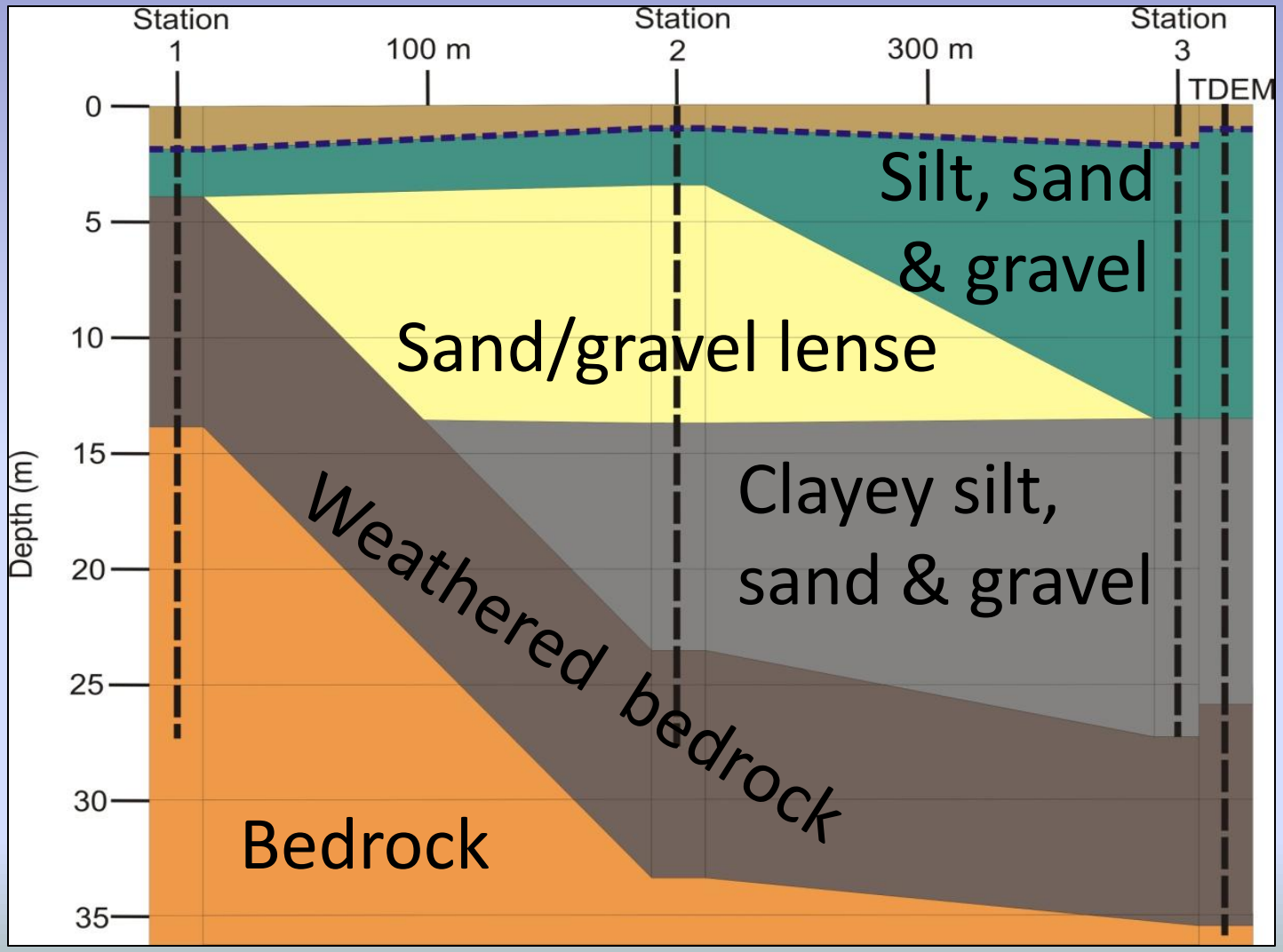
Geophysical Test Site – MT Tech

students Brian Williams and David Sunwall



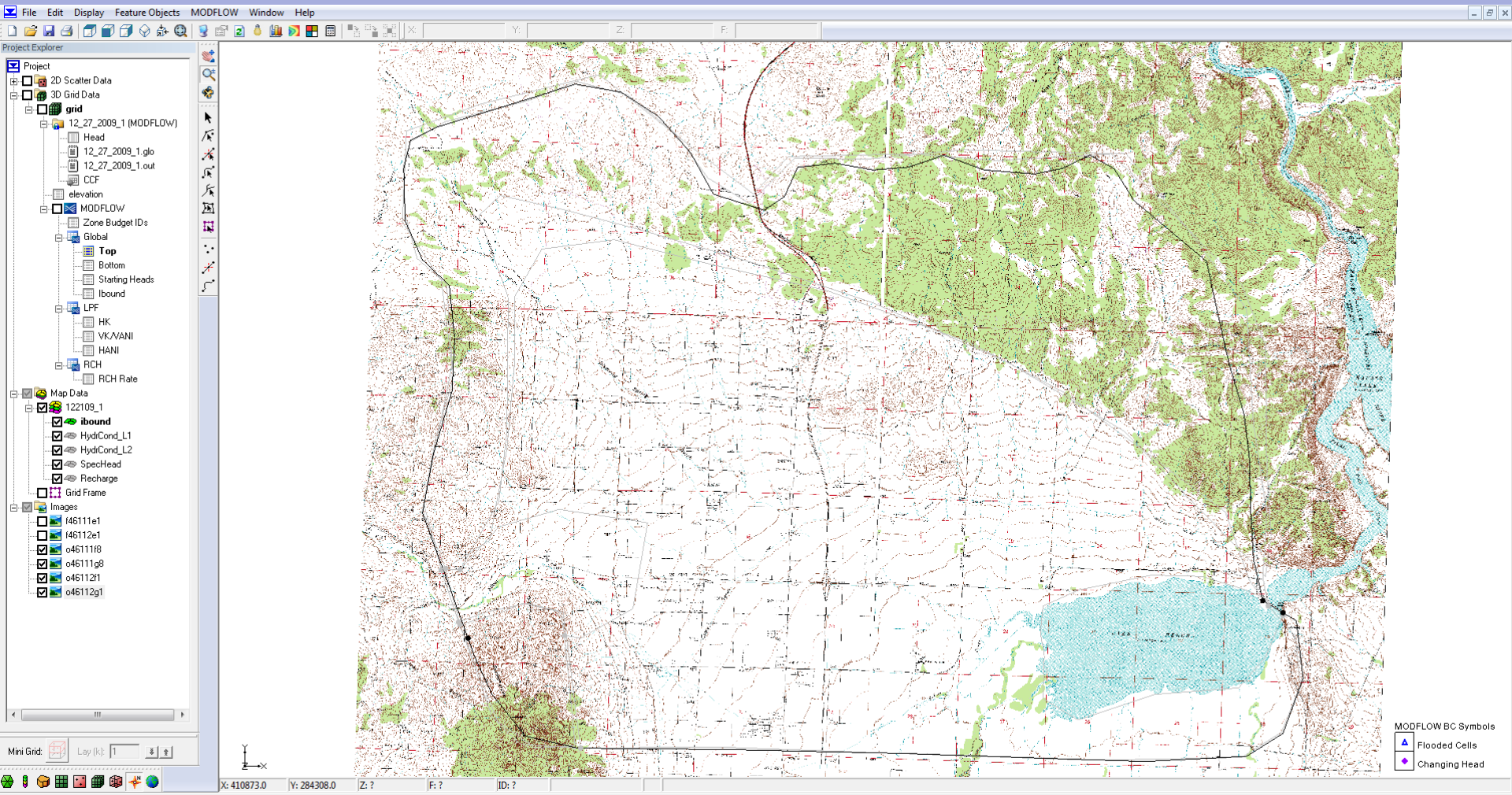
Geophysical profile

N S

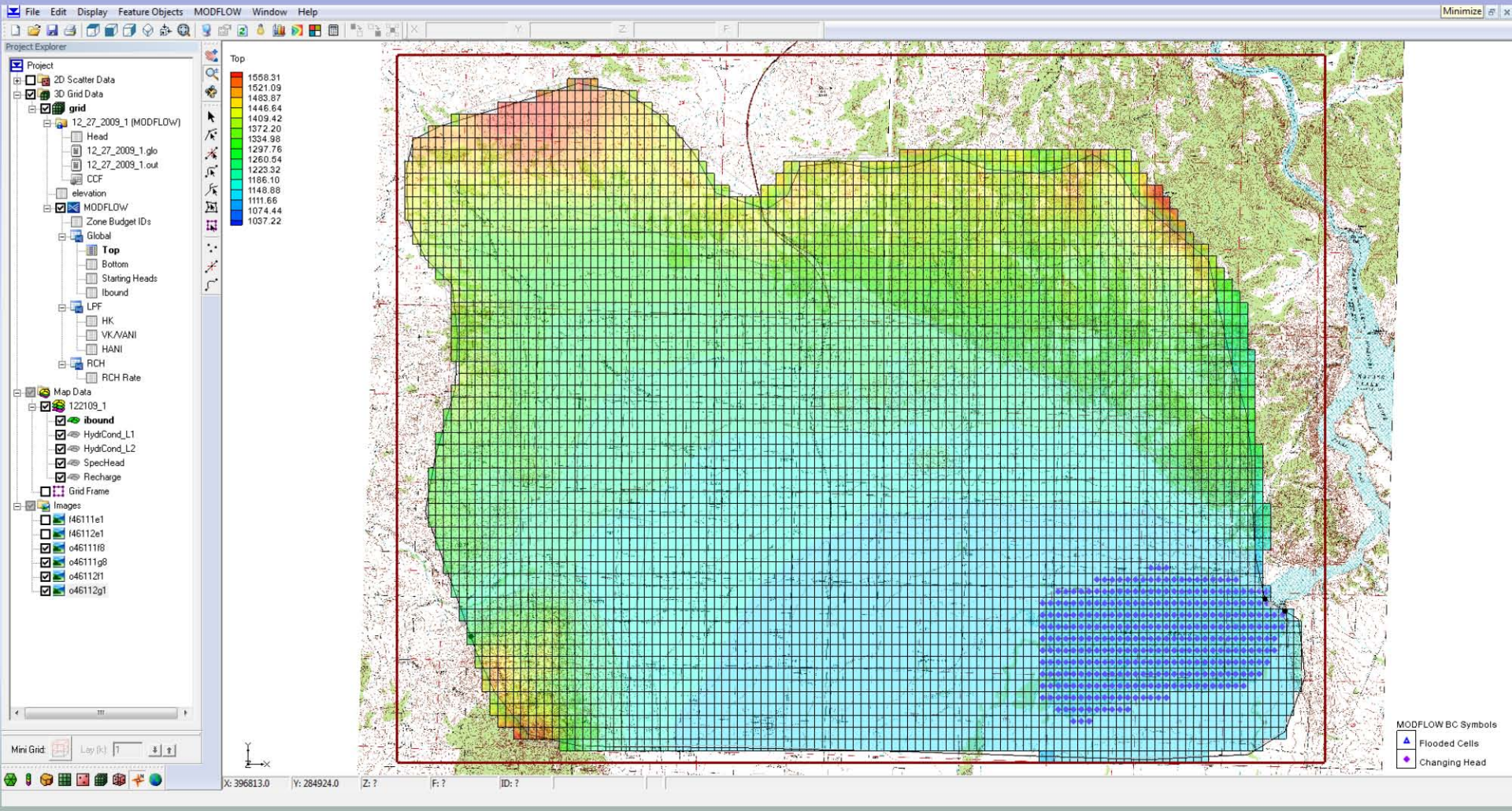


Stage 1 groundwater model – based on basic map and elevation data

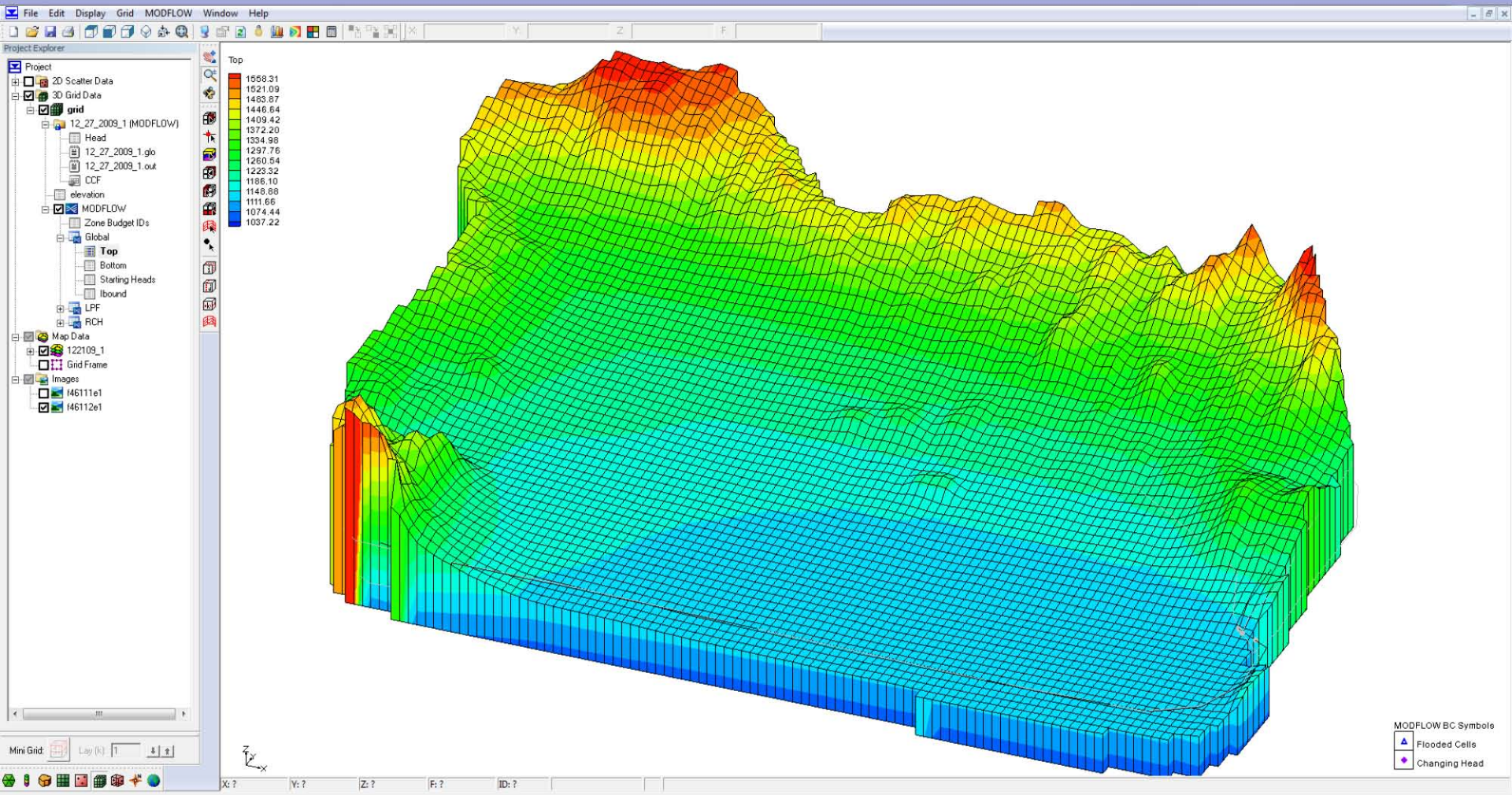
- Define area with maps



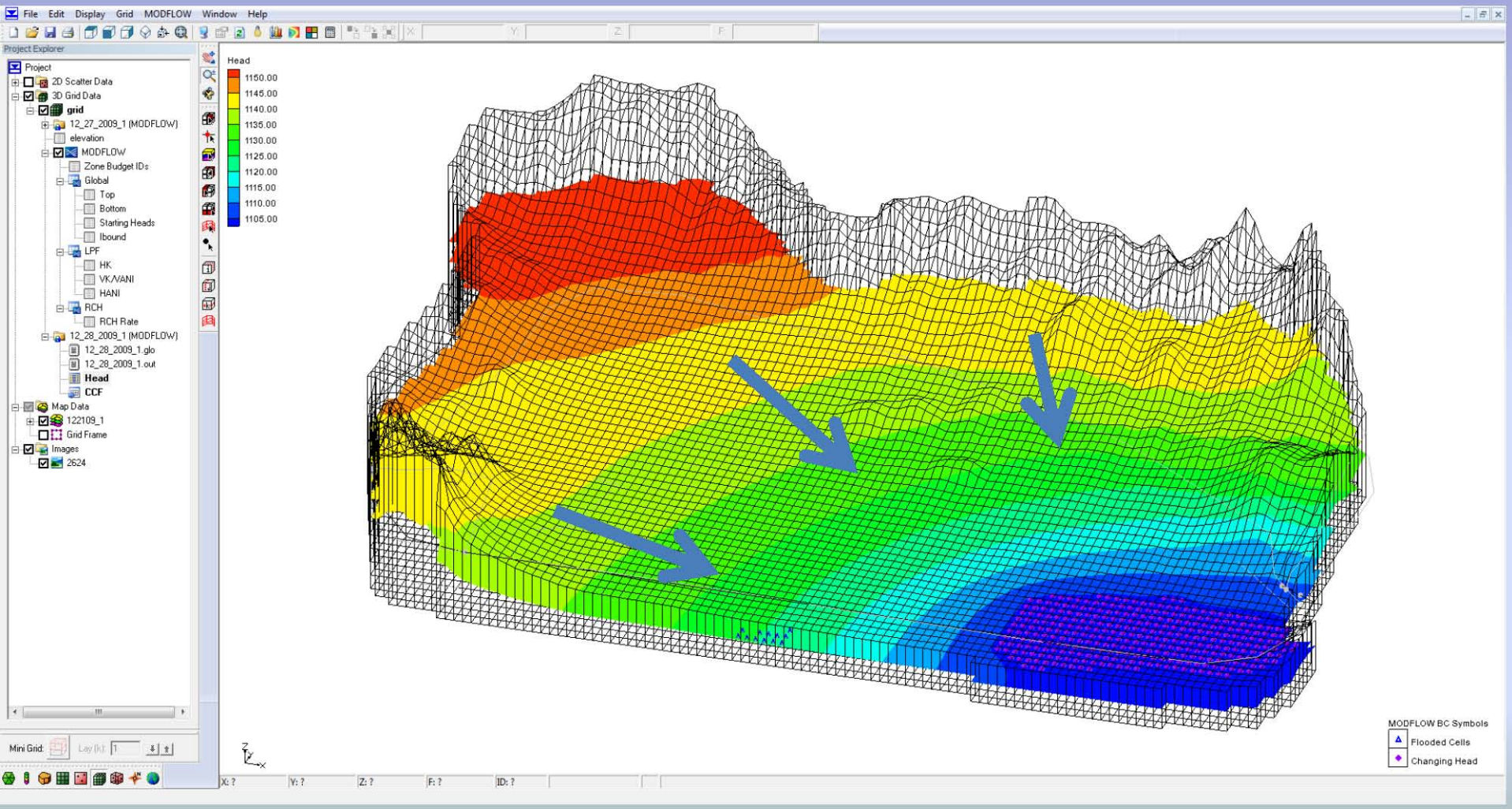
- Assign model grid and active cell areas



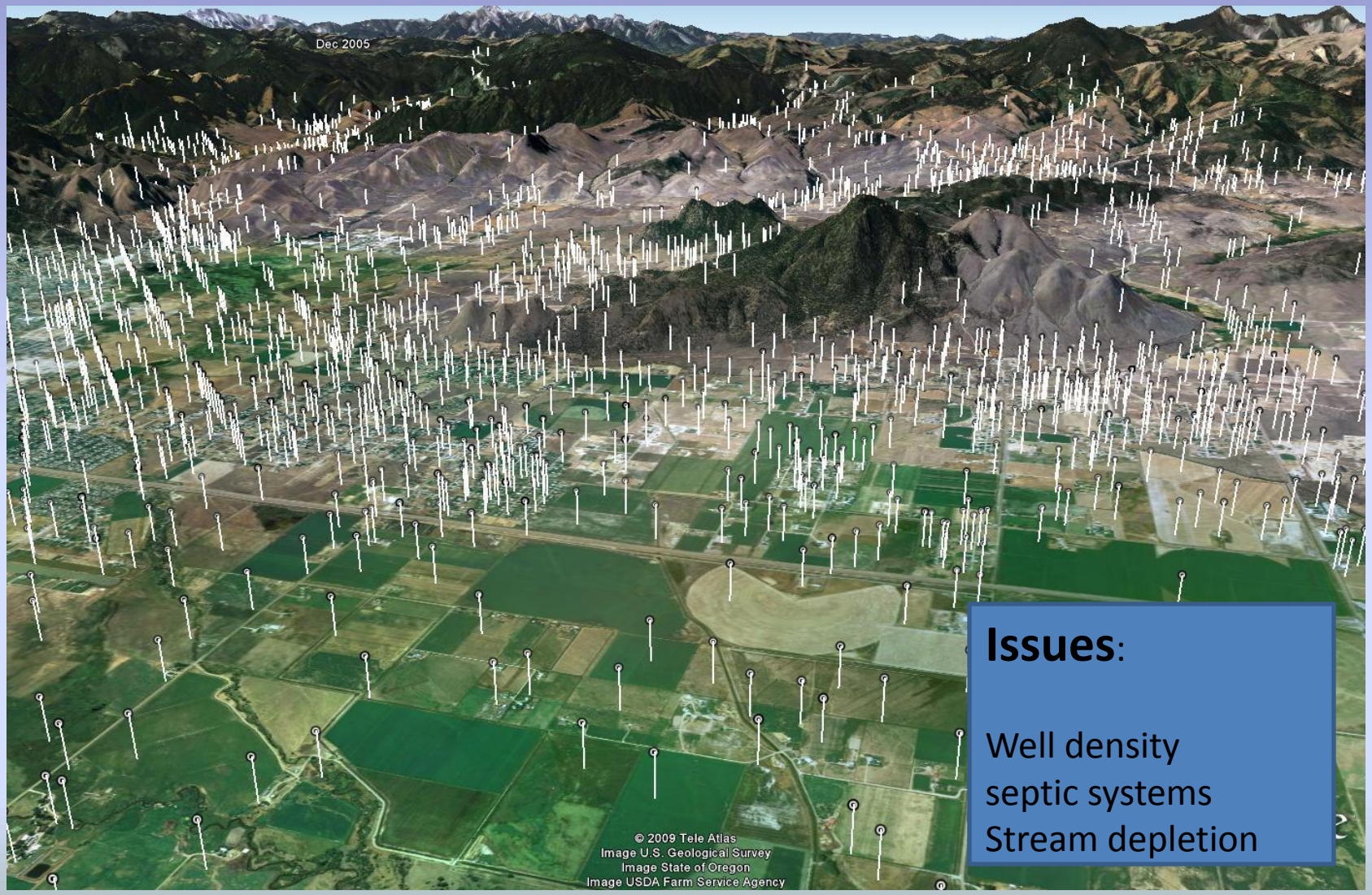
- Assign elevations using Digital Elevation Models (DEM's)



- Preliminary groundwater surface generated from areal recharge and known water elevation of the Lake Helena discharge zone, arrows showing groundwater flow direction



Scratch Gravel Hills today
Kirk Waren, Andy Bobst, Julie Ahern



Issues:

Well density
septic systems
Stream depletion

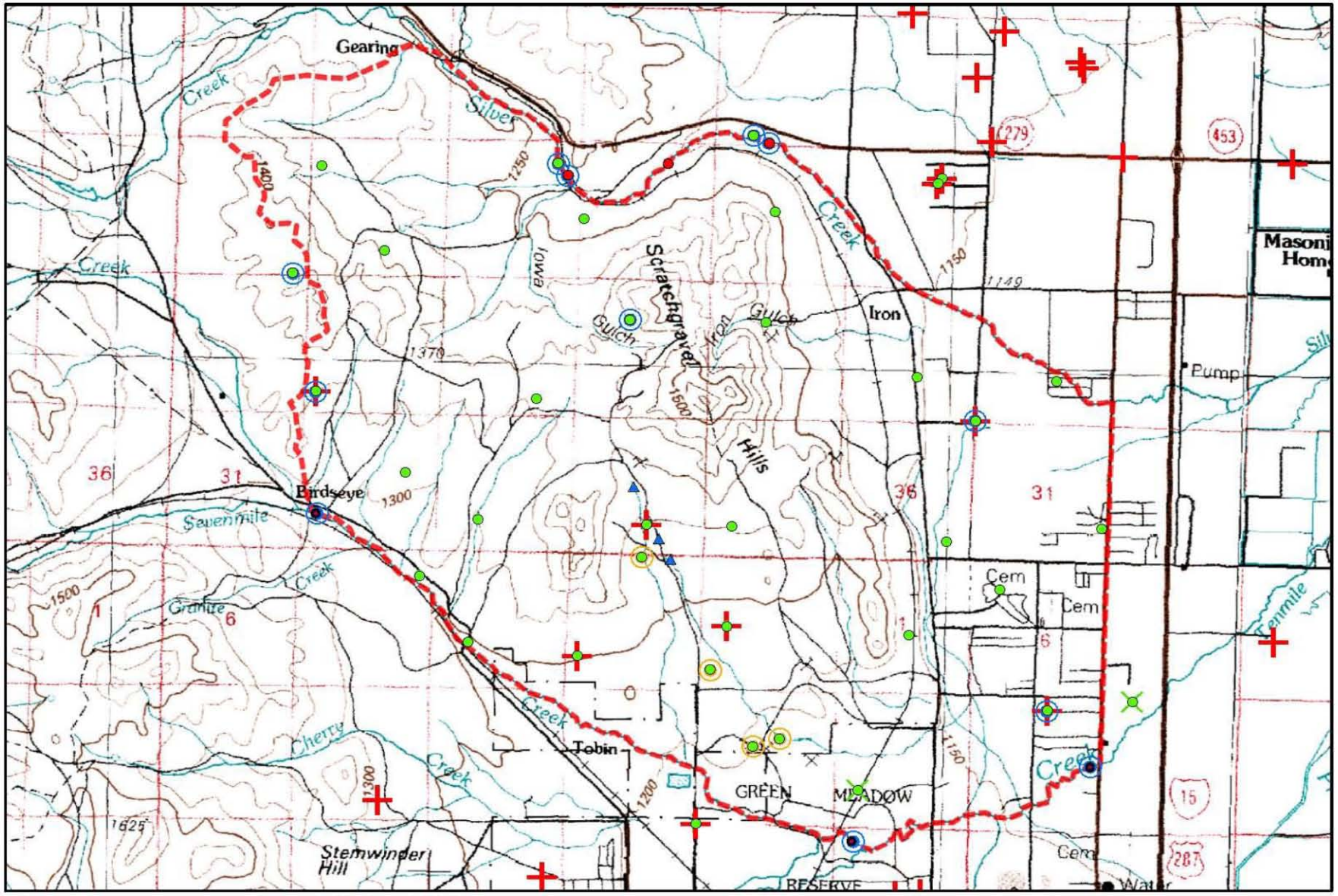
Scratchgravel Hills Area Activities

Coordination:

- DNRC Water Resources Division
- Lewis and Clark County Water Quality Protection District
- Lewis and Clark County Conservation District
- Lake Helena Watershed Monitoring Committee
- EPA
- Montana Watershed Coordinating Council

Scratchgravel Hills Activities

- Three stream monitoring sites and Geoprobe wells installed along Silver Creek
- Three gauging stations along Sevenmile Creek
- Monitoring well network activated
- Drilling and aquifer test site proposed
- Geophysical Investigation of faults planned
- Preliminary groundwater model under construction



SG Monitored Springs

Actual Piezo Locations

Proposed Piezo Locations

Proposed Mon Wells (monthly)

Proposed MBMG Transducer Sites

DNRC Transducer Sites

Currently_Monitored_Wells

Monitoring

Monthly L&C

Quarterly GWAP

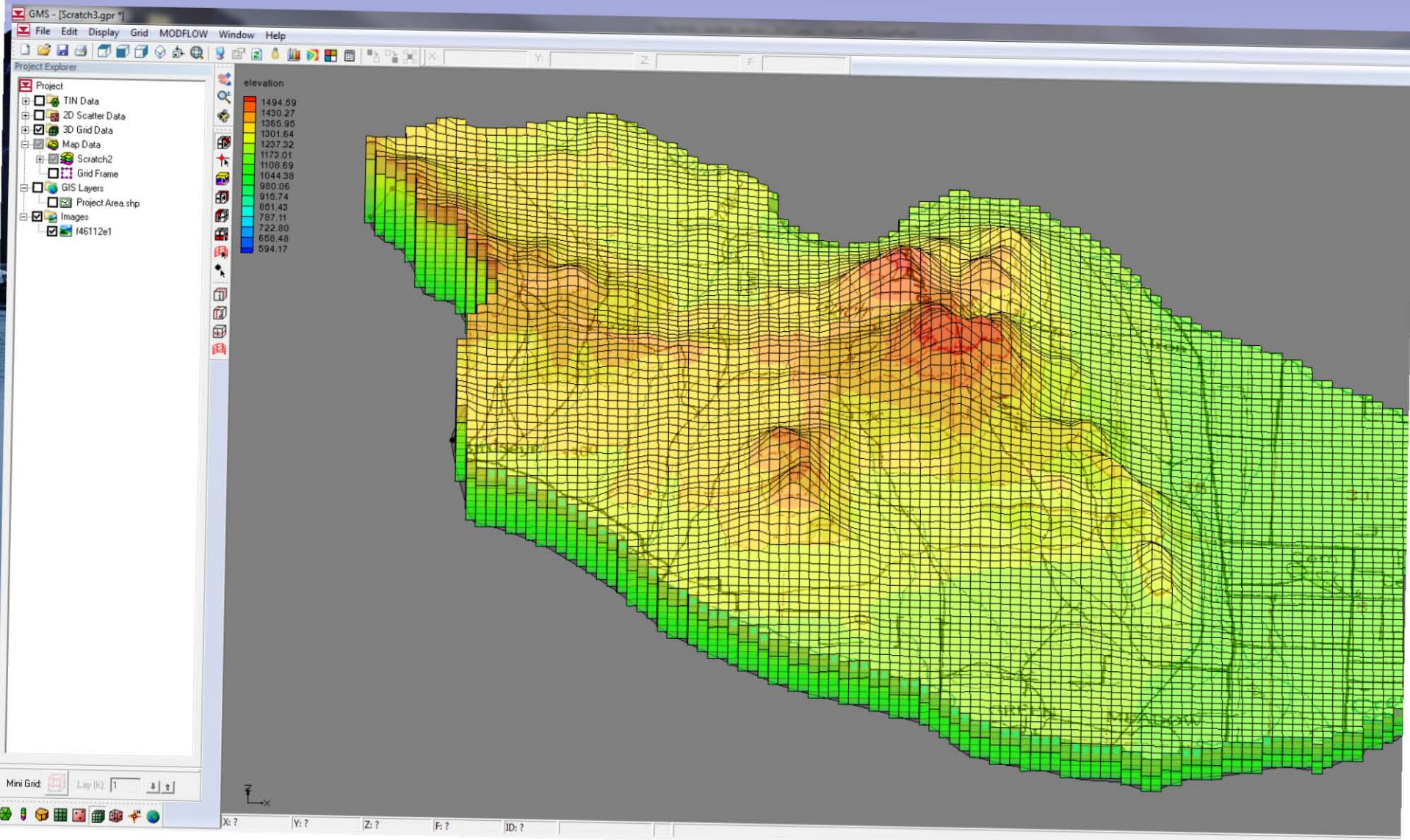
Proposed Scratchgravel Monitoring Plan

N

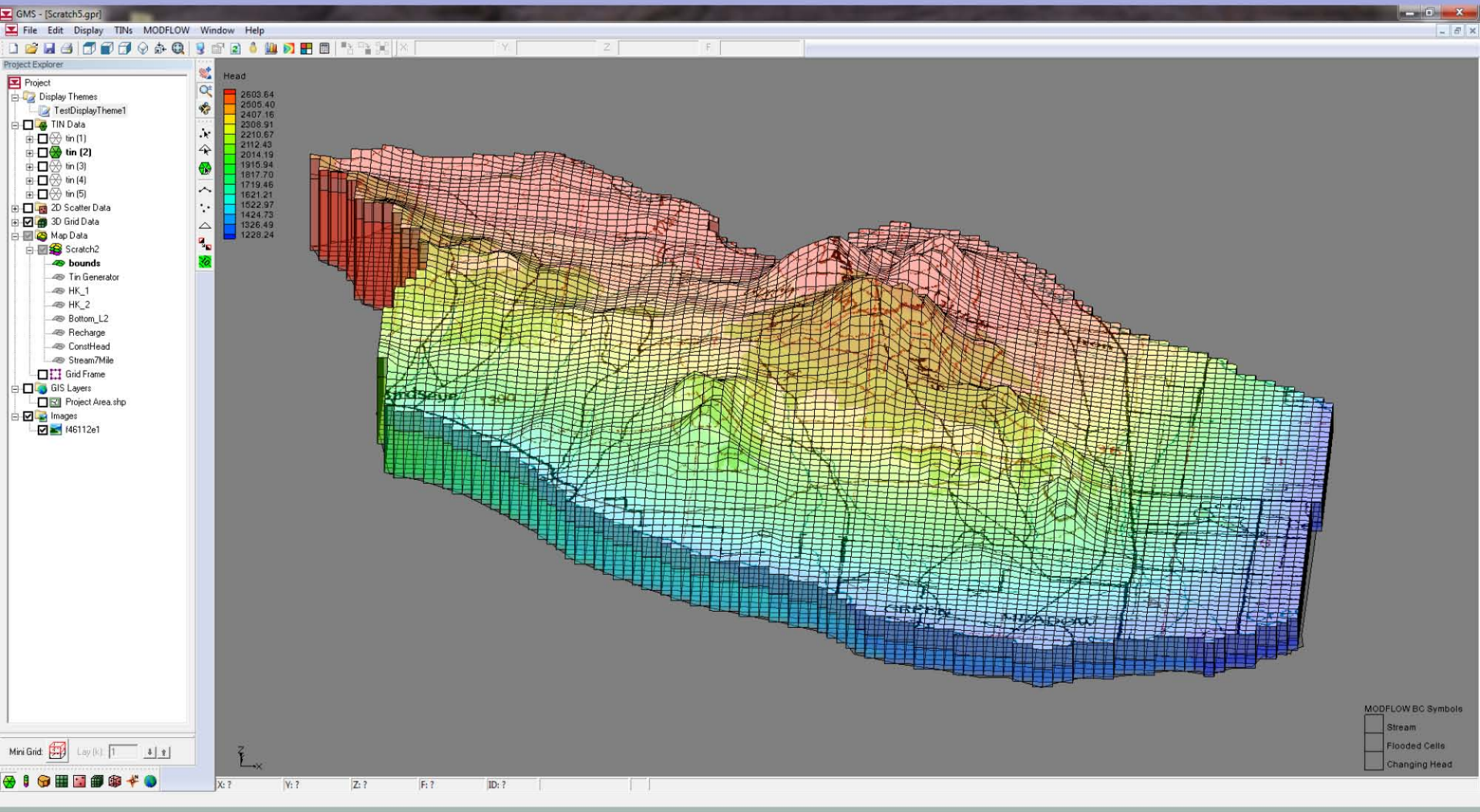
0 0.25 0.5 1 1.5 2 Miles

ALB; 12/8/09

- Early formulation and testing of the Scratchgravel groundwater model format is underway

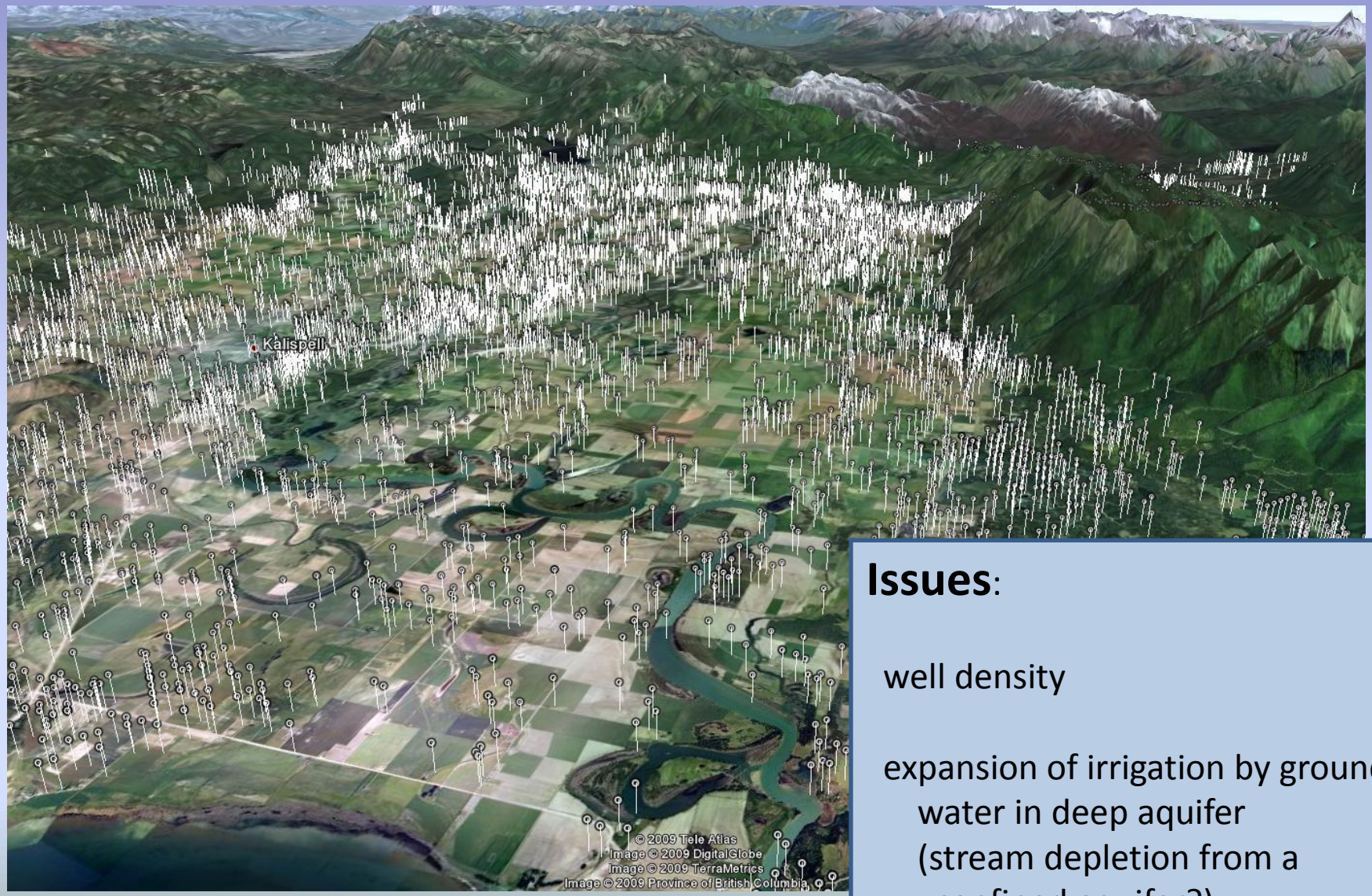


- Testing stream flow routing package on Sevenmile Creek



Flathead Valley – Deep Aquifer

J. Wheaton, G. Smith



Issues:

well density

expansion of irrigation by ground water in deep aquifer (stream depletion from a confined aquifer?)

a Kalispell valley

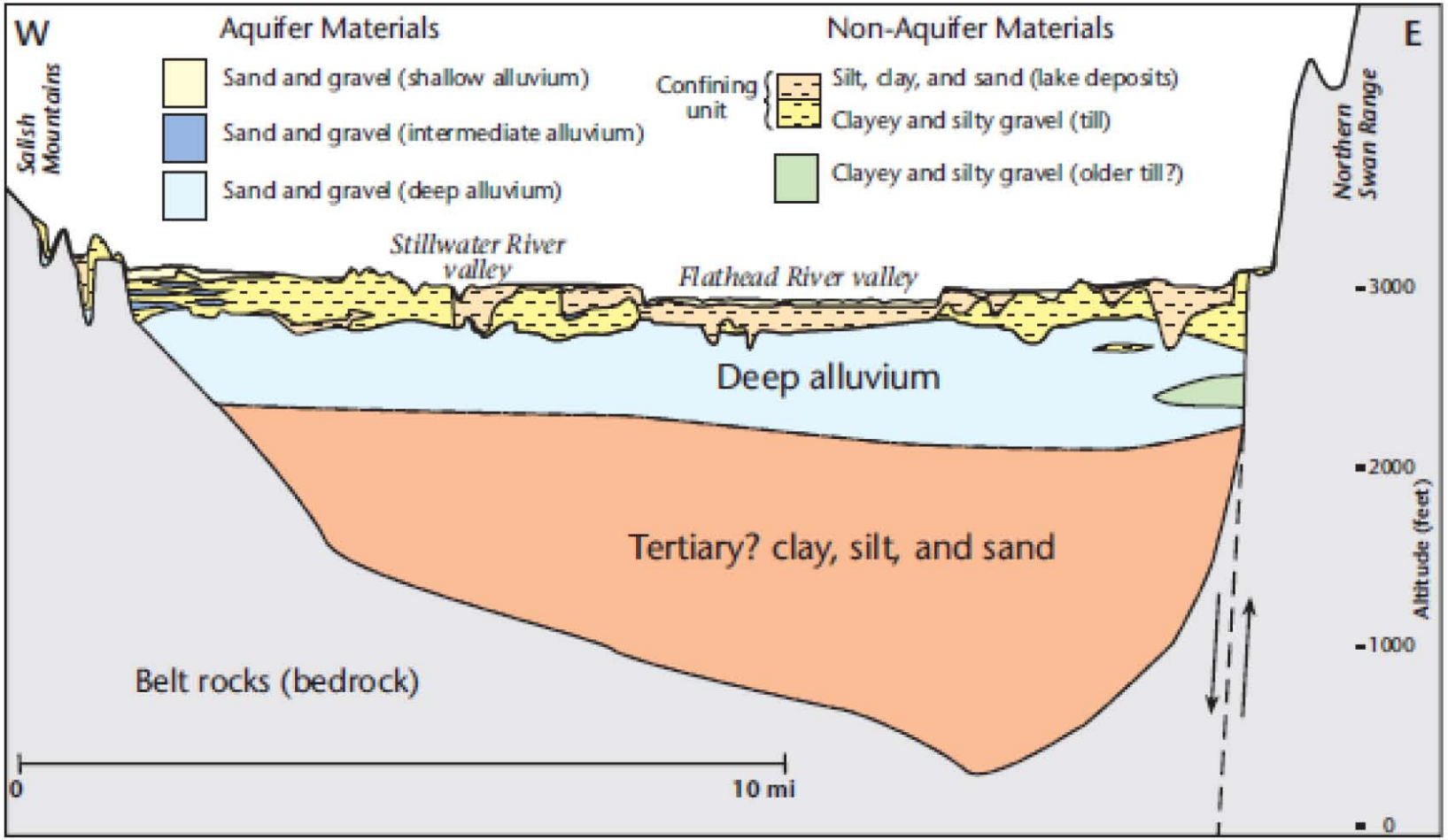


Figure 10. (a) A nearly valley-wide confining unit separates shallow and deep alluvial units in the Kalispell valley.

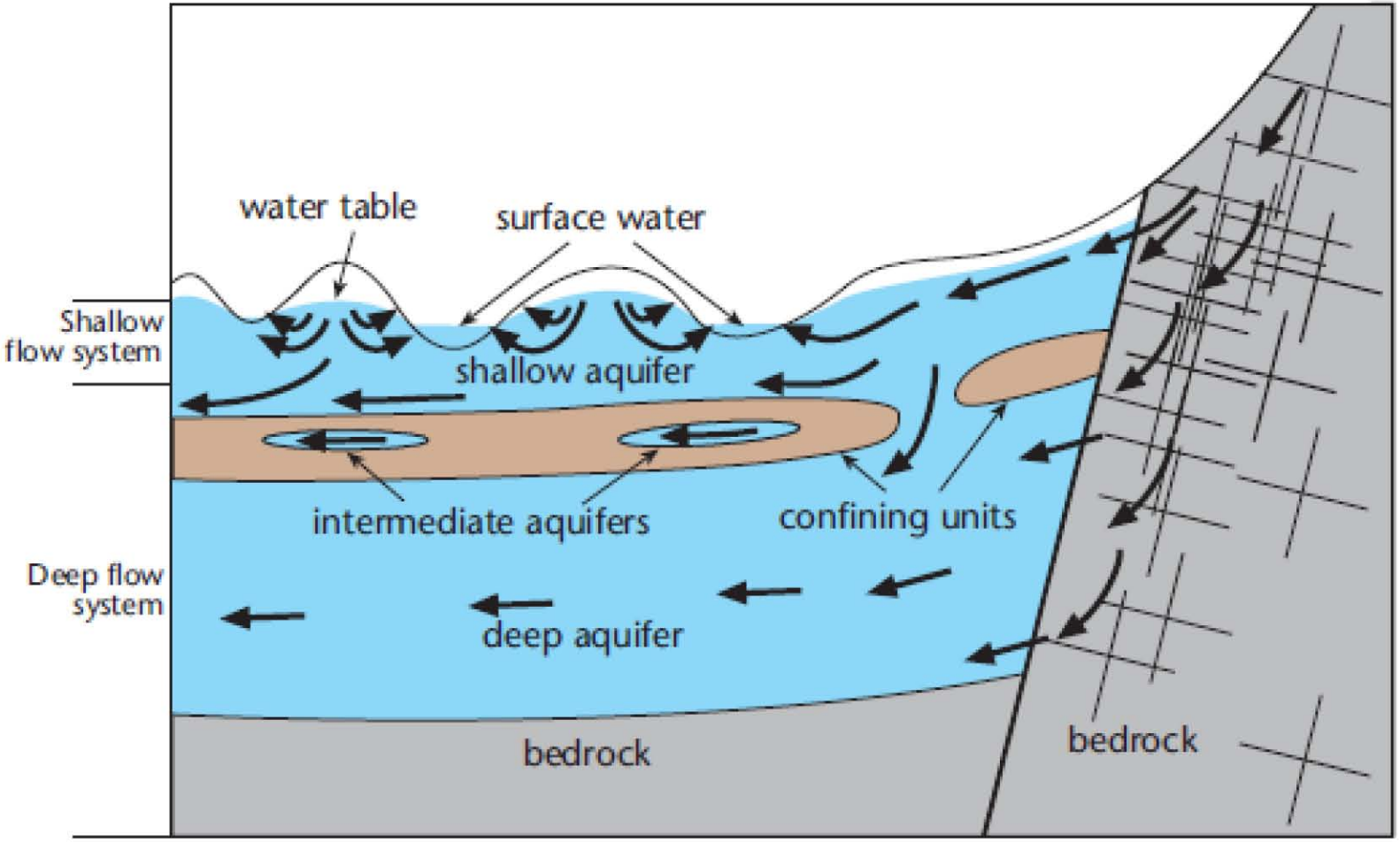
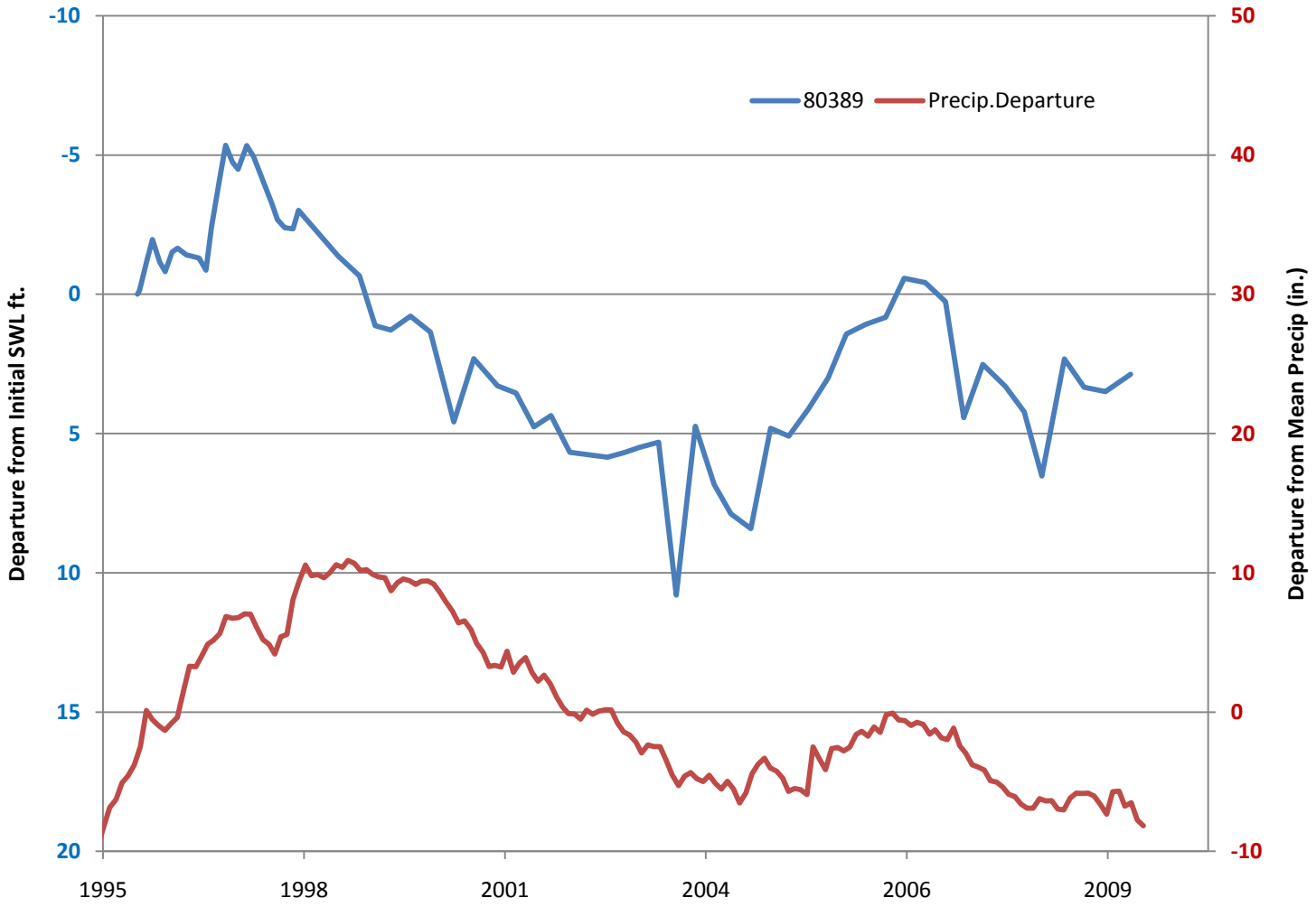
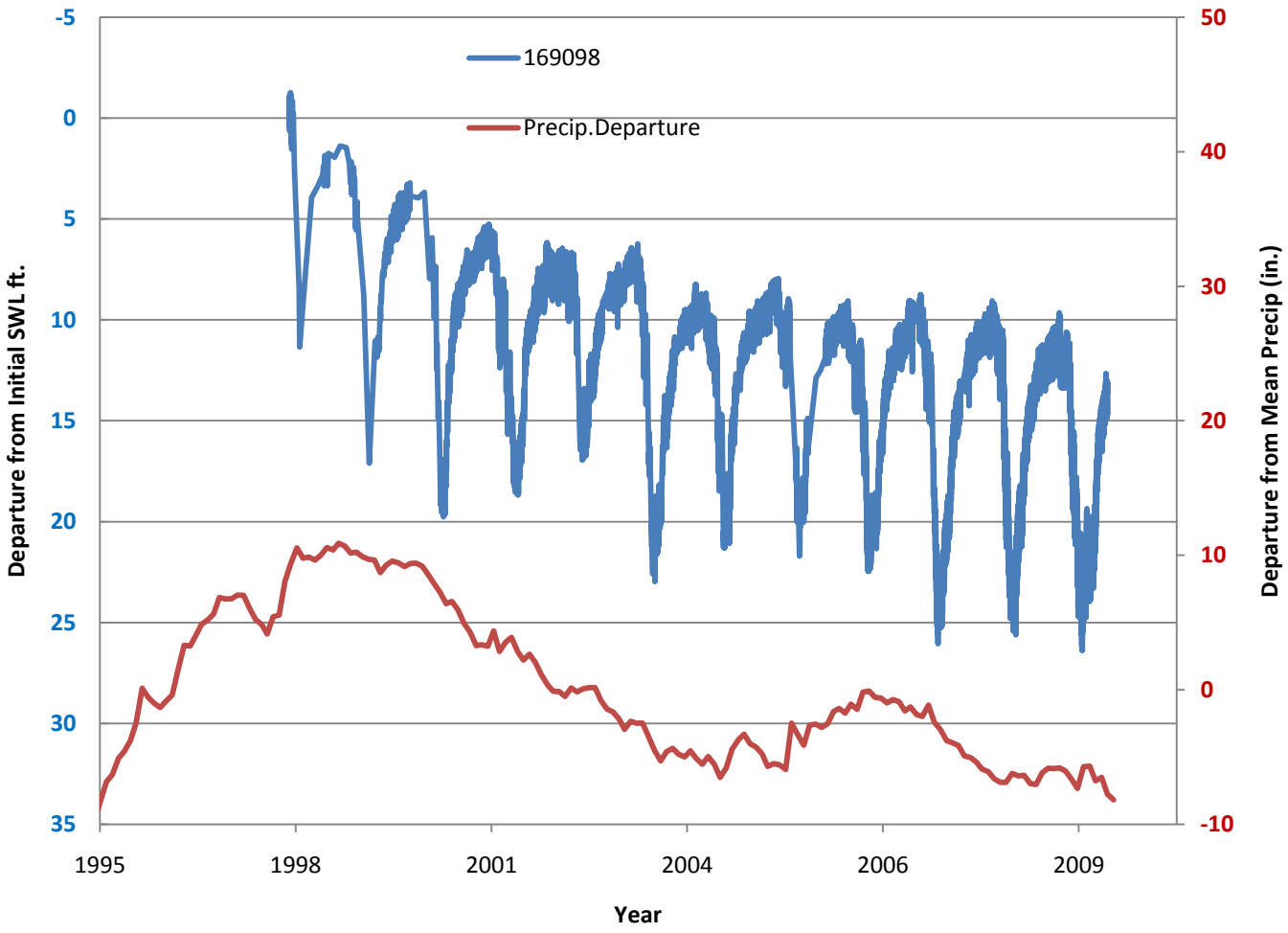
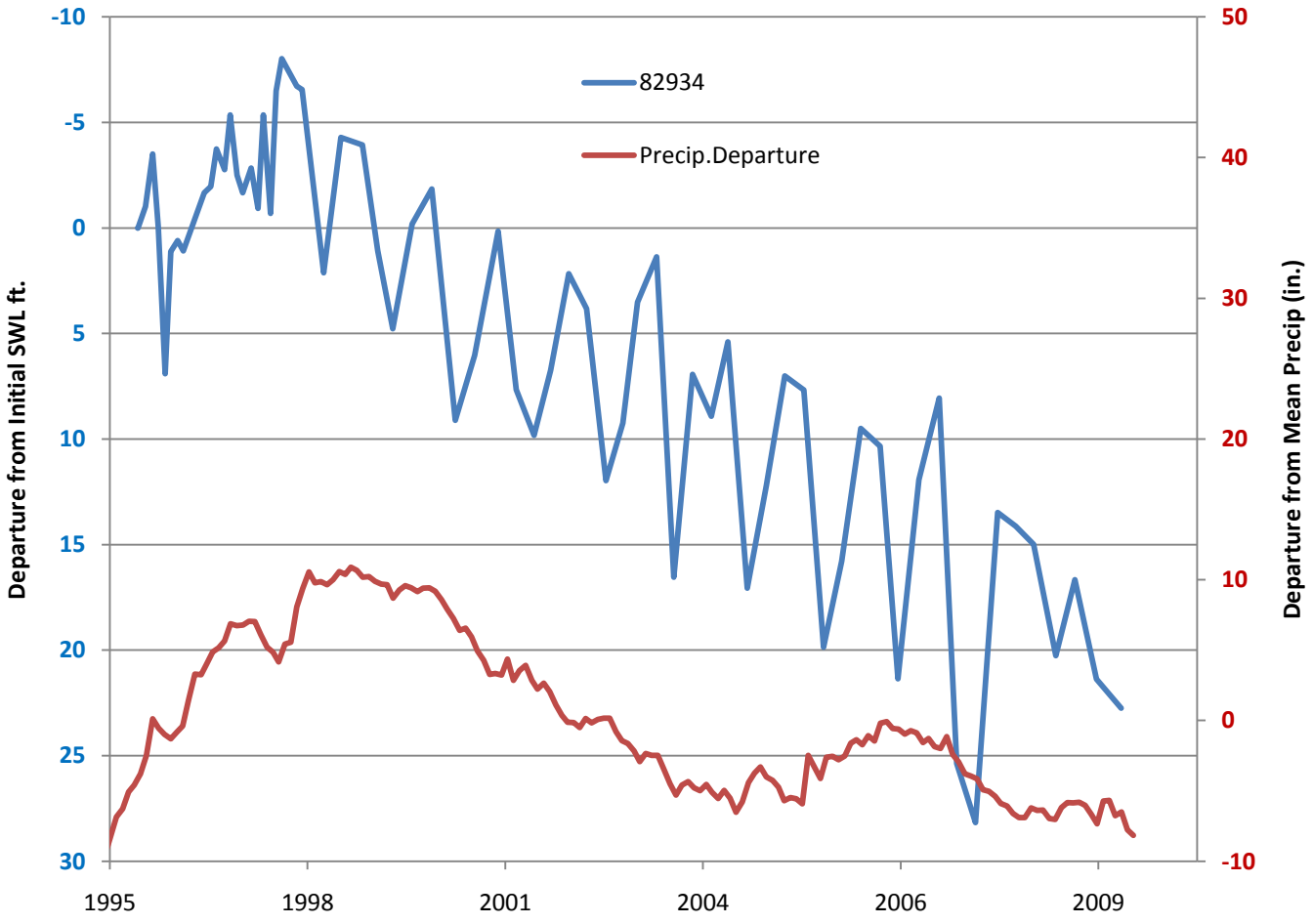


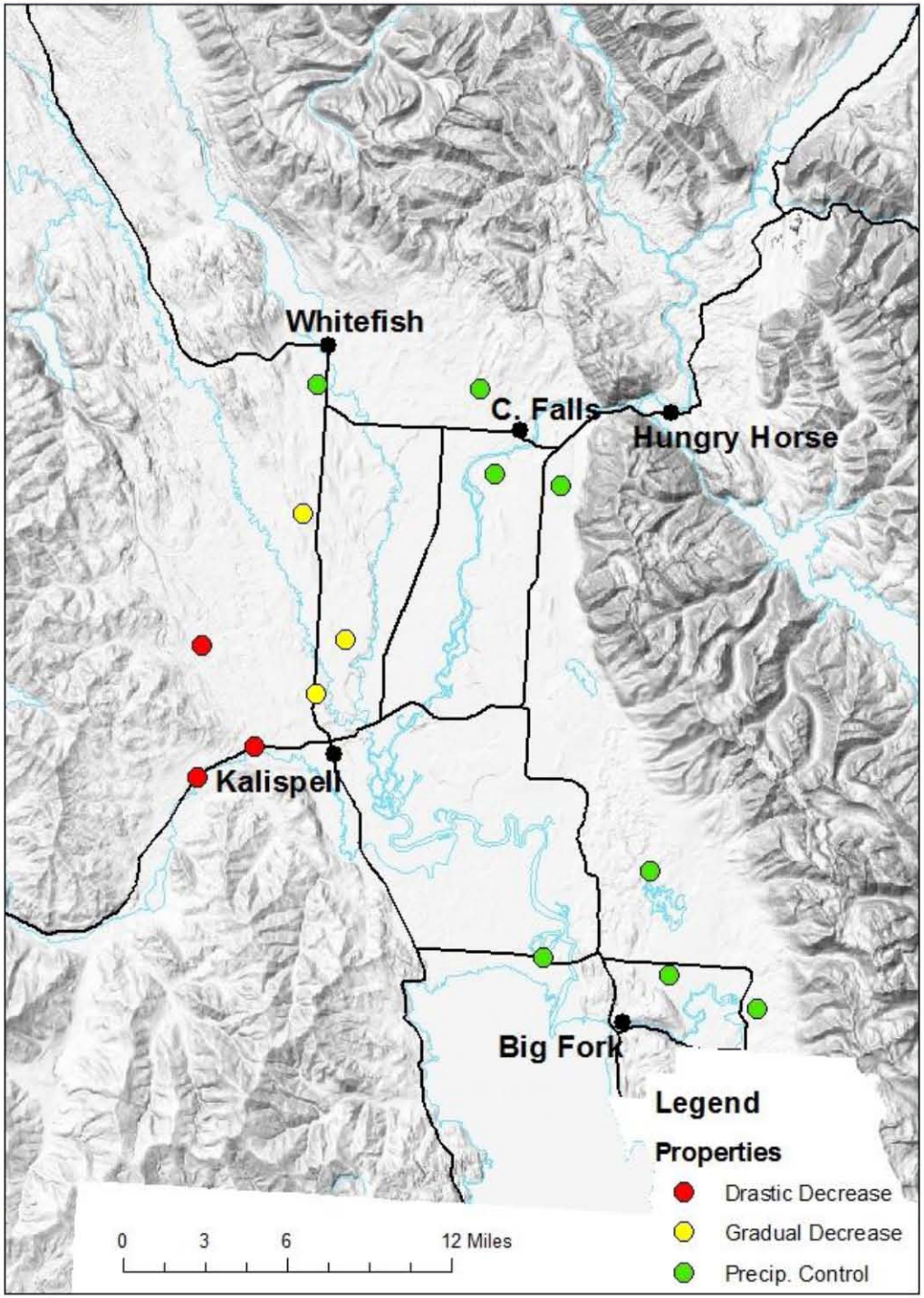
Figure 20. Schematic diagram showing vertical relationships between the aquifers and nonaquifers in the Flathead Lake area. Shallow aquifers occur in shallow alluvium. Confining units in till or glacial-lake deposits in many, but not all, areas separate shallow aquifers from deep alluvial aquifers. Intermediate aquifers are within the confining zones where local sand and gravel units occur, and are commonly of limited geographic extent. Deep alluvial or bedrock aquifers occur either in pre-glacial sand and gravel deposits below the confining units or in fractured bedrock, respectively. In a few subareas aquifers sometimes occur in Tertiary materials (not shown).


Departure from Initial SWL-
80389- Precip. Control
80389
Precip.Departure
Departure from Initial SWL ft.
Departure from Mean Precip (in.)
-10
-5
0
5
10
15
20
50
40
30
20
10
0
-10
1995
1998
2001
2004
2006
2009


Departure from Initial SWL-
169098- Gradual Decrease
169098
Precip.Departure
Departure from Initial SWL ft.
Departure from Mean Precip (in.)
Year
-5
0
5
10
15
20
25
30
35
50
40
30
20
10
0
-10
1995
1998
2001
2004
2006
2009

Departure from Initial SWL-
82934- Dramatic Decrease




Whitefish
C. Falls
Hungry Horse
Kalispell
Big Fork
Legend
Properties
Drastic Decrease
Gradual Decrease
Precip. Control
0
3
6
12 Miles

QUESTIONS ?