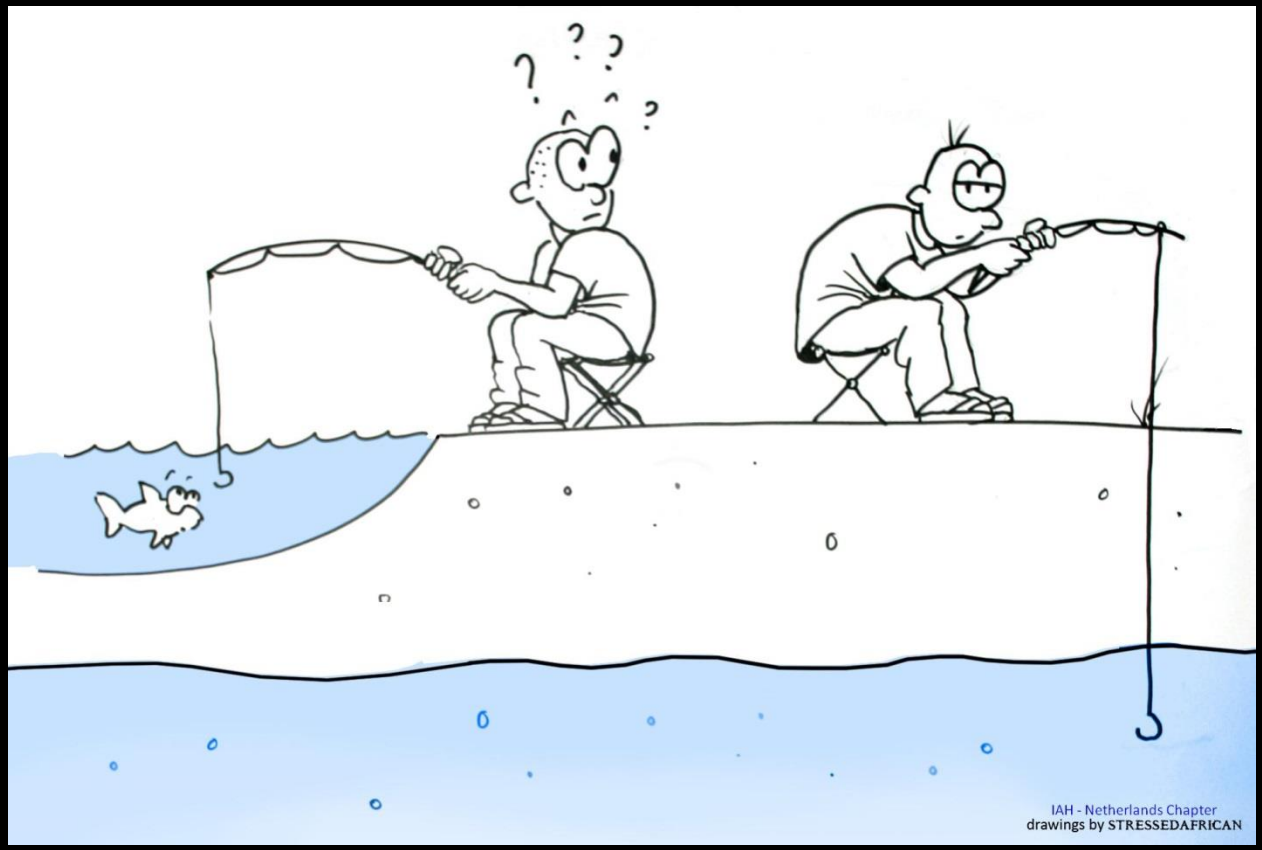
Groundwater Capabilities



Salt water intrusion at Fort Knox

Riverbank infiltration at LWC

Groundwater modeling at Carrollton

Salt water intrusion at Fort Knox

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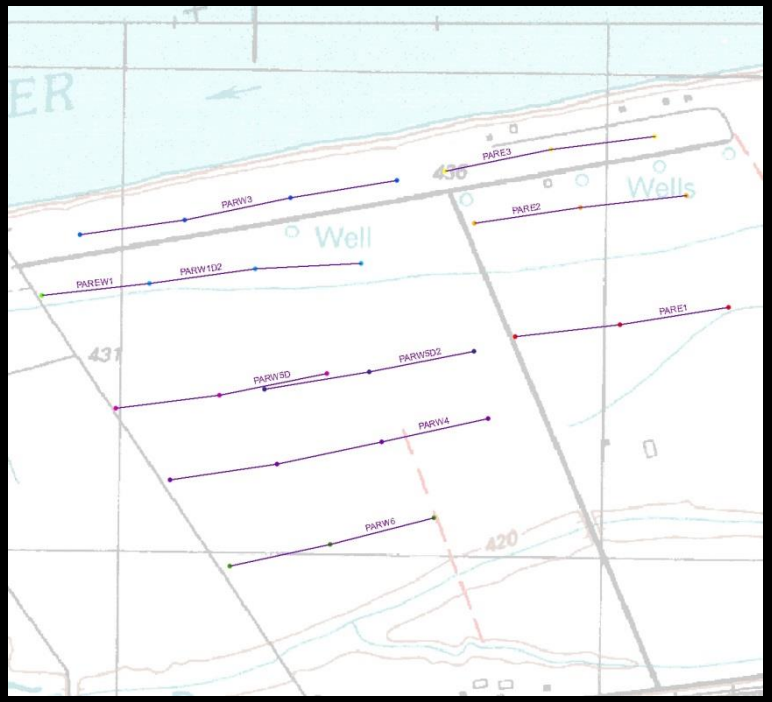
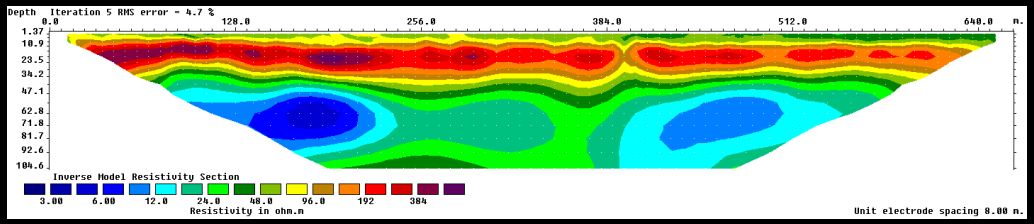
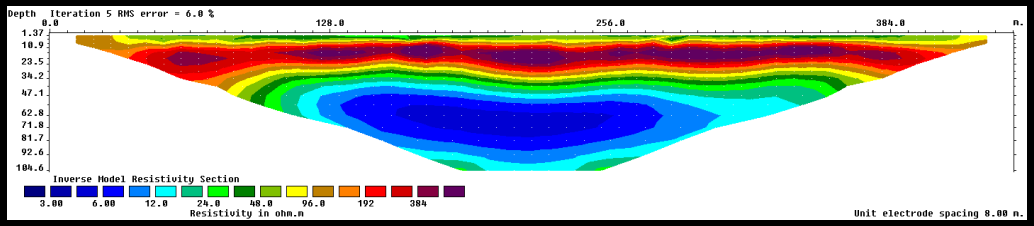
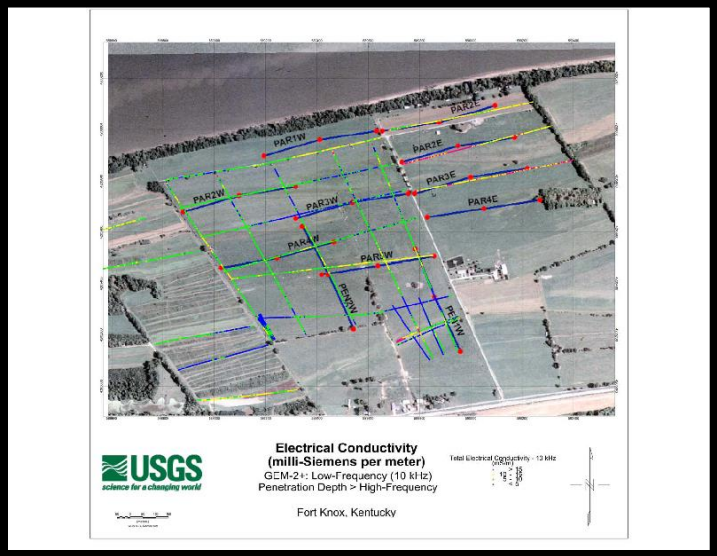
07/31/2007

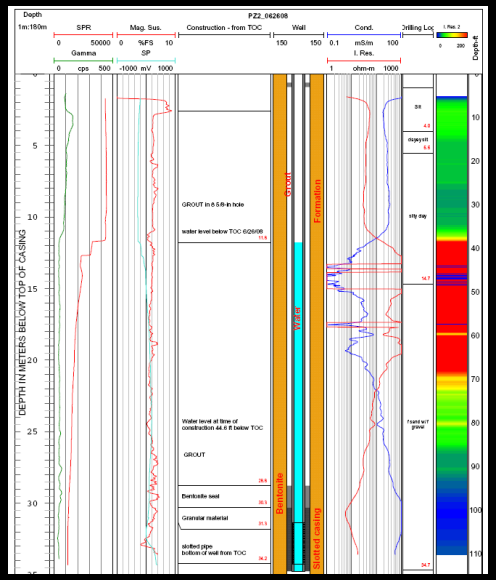

07/30/2007


PARE3
PARW3
PARE2
Well
PAREW1
PARW1D2
PARE1
PARW5D
PARW5D2
PARW4
PARW6
430
431
420


Depth Iteration 5 RMS error = 4.7 %
0.0
128.0
256.0
384.0
512.0
640.0
m.
1.37
10.9
23.5
34.2
47.1
62.8
71.8
81.7
92.6
104.6
Inverse Model Resistivity Section
3.00
6.00
12.0
24.0
48.0
96.0
192
384
Resistivity in ohm.m
Unit electrode spacing 8.00 m.


Depth Iteration 5 RMS error = 6.0 %
0.0
128.0
256.0
384.0
m.
1.37
10.9
23.5
34.2
47.1
62.8
71.8
81.7
92.6
104.6
Inverse Model Resistivity Section
3.00
6.00
12.0
24.0
48.0
96.0
192
384
Resistivity in ohm.m
Unit electrode spacing 8.00 m.


PAR1W
PAR2E
PAR2W
PAR3E
PAR3W
PAR4E
PAR4W
PAR5W
PER4N
PER1W
USGS
science for a changing world
Electrical Conductivity
(milli-Siemens per meter)
GEM-2®: Low-Frequency (10 kHz)
Penetration Depth > High-Frequency
Fort Knox, Kentucky


PZ2_062608
SPR
Mag. Sus.
Construction - from TOC
Wall
Cond.
Gamma
SP
I. Res.
DEPTH IN METERS BELOW TOP OF CASING
GROUT in 6 5/8-in hole
water level below TOC 6/26/08
Water level at time of construction 44.6 ft below TOC
GROUT
Bentonite seal
Granular material
slotted pipe
bottom of well from TOC
Bentonite
Water
Slotted casing
Formation

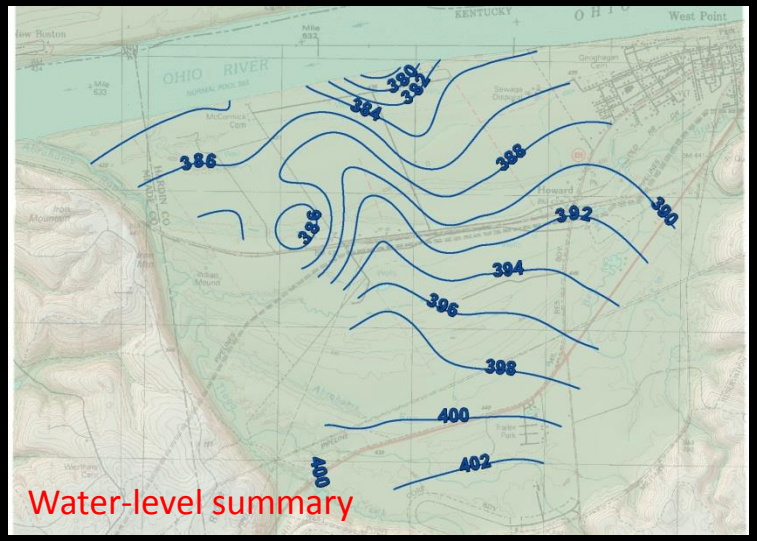
USGS

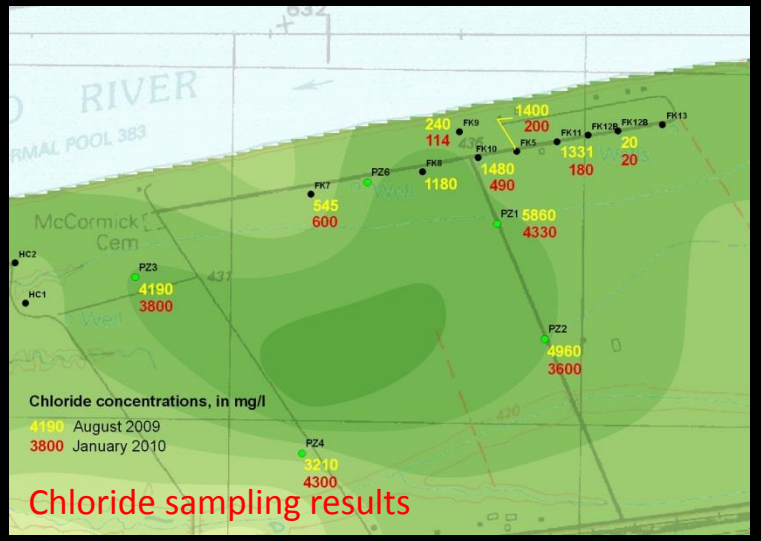
Observation and monitoring well installations

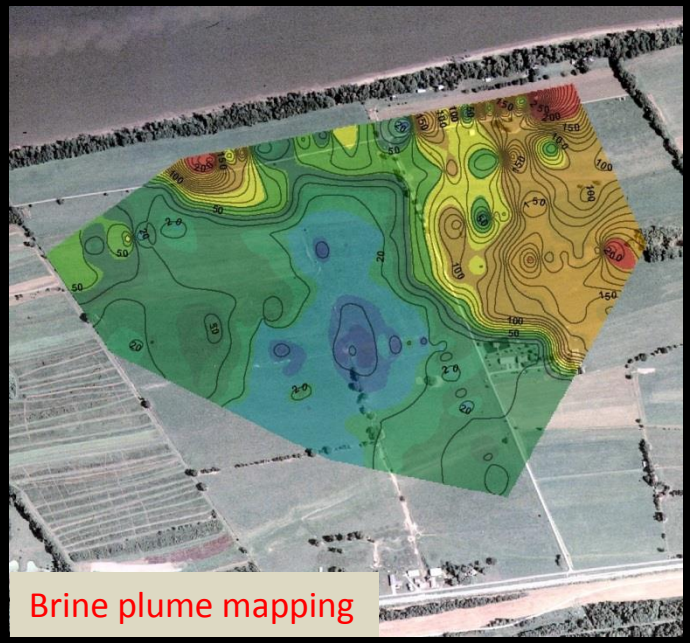
- Water-level and temperature measurements
- Water-quality sampling
- Borehole logging

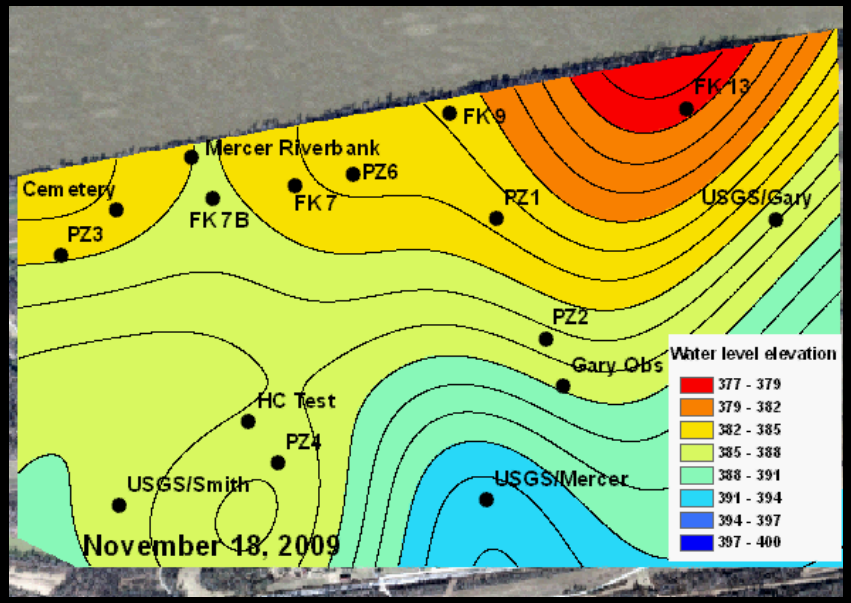
Water-quality sampling

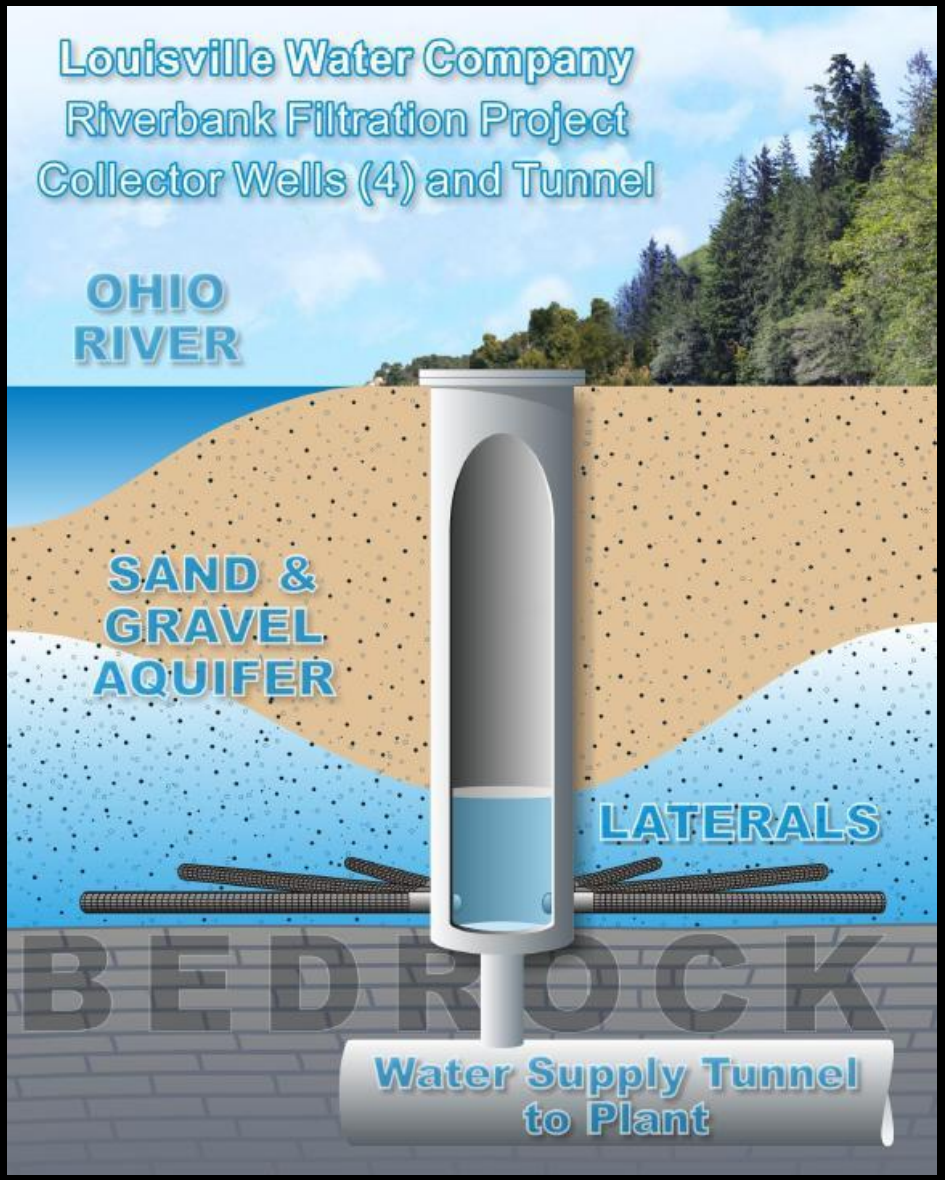
- Dedicated systems
- Screened-auger sampling
- Dedicated field vehicle for sampling


OHIO RIVER
380
382
384
386
388
390
392
394
396
398
400
402
Water-level summary


RIVER
McCormick Cem
240
114
FK9
1400
200
FK11
FK12B
FK12B
FK13
20
20
FK5
1331
180
FK10
1480
490
FK8
1180
PZ6
FK7
545
600
PZ1
5860
4330
HC2
HC1
PZ3
4190
3800
PZ2
4960
3600
Chloride concentrations, in mg/l
4190 August 2009
3800 January 2010
PZ4
3210
4300
Chloride sampling results

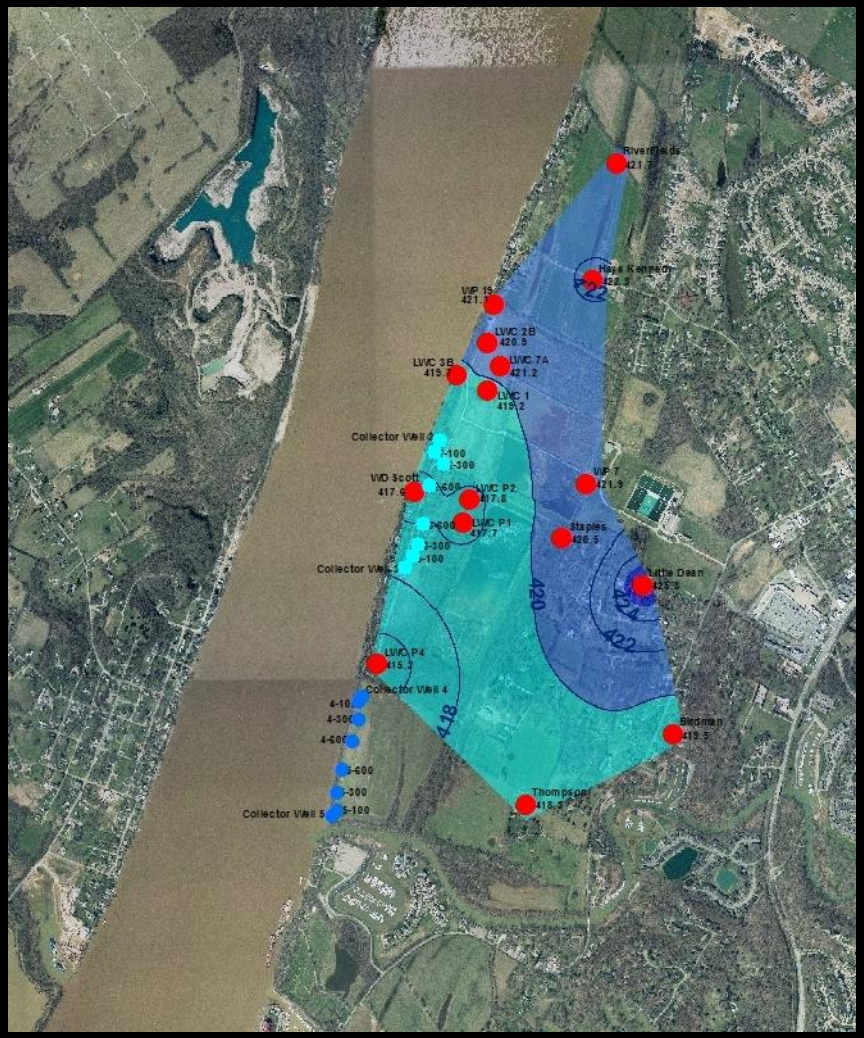

Brine plume mapping


FK 13
FK 9
Mercer Riverbank
PZ6
Cemetery
FK 7B
FK 7
PZ1
USGS/Gary
PZ3
PZ2
Gary Obs
HC Test
PZ4
USGS/Smith
USGS/Mercer
November 18, 2009
Water level elevation
377 - 379
379 - 382
382 - 385
385 - 388
388 - 391
391 - 394
394 - 397
397 - 400



System components:

- Four horizontal collector wells designed for 20 Mgd each
- Collector wells connected by bedrock tunnel approximately 6,700 feet long
- Gravity-fed design with one lift station located on water company property



Field activities at the Louisville Water Co.

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Measuring the drawdown beneath the river surface

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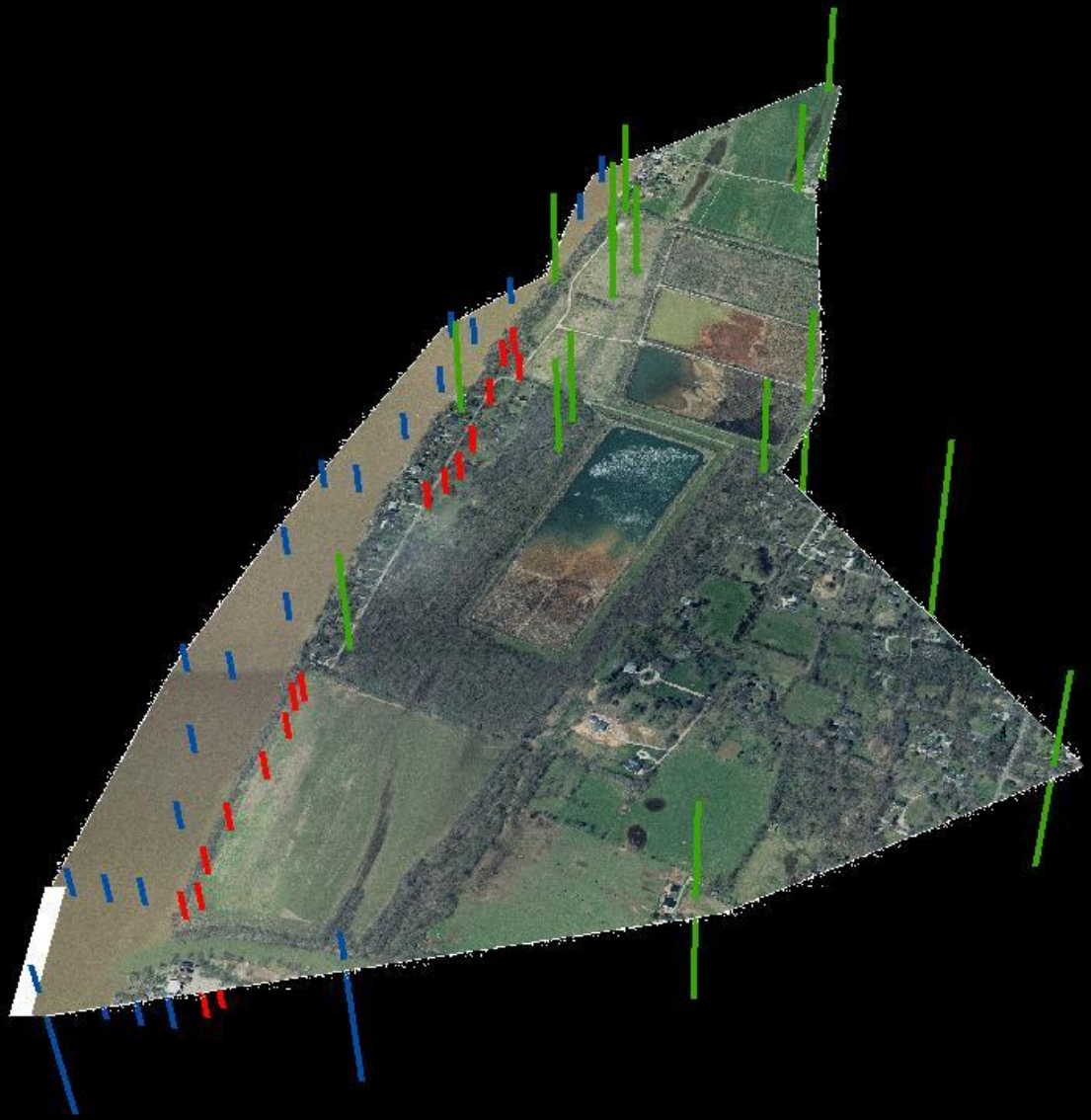
USGS

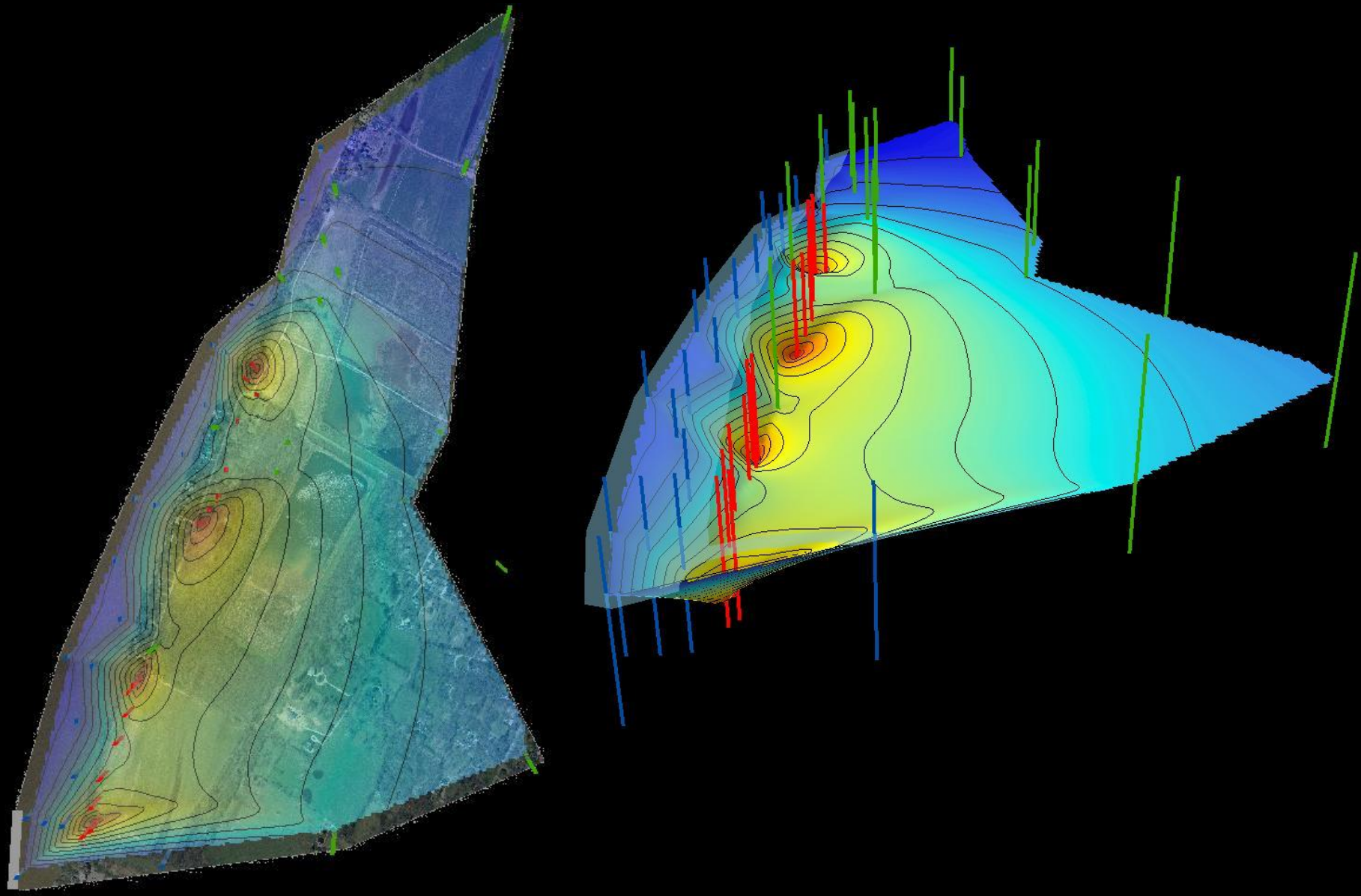


WY 2012 well network

Red – collector wells and piezometers

Green – observation well network

Blue – river piezometers



Groundwater potentiometric surface – July 2012

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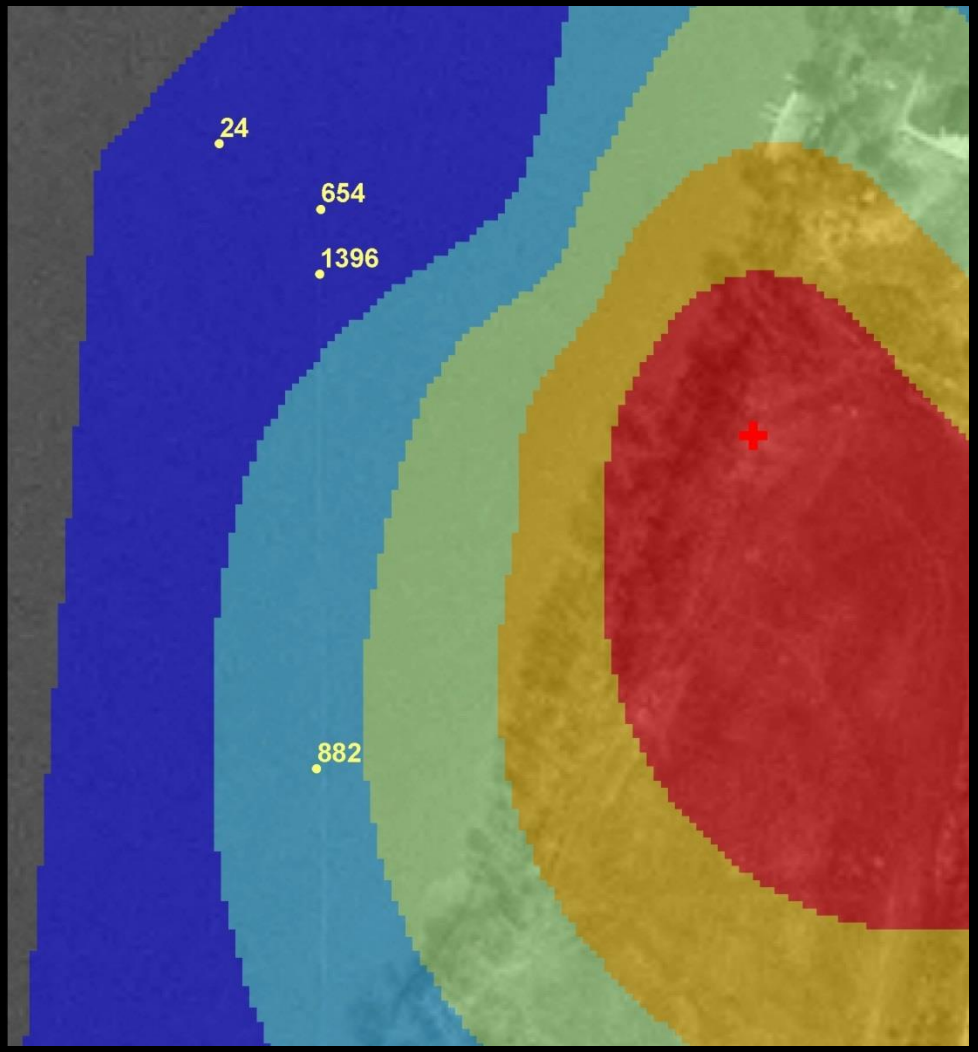
USGS

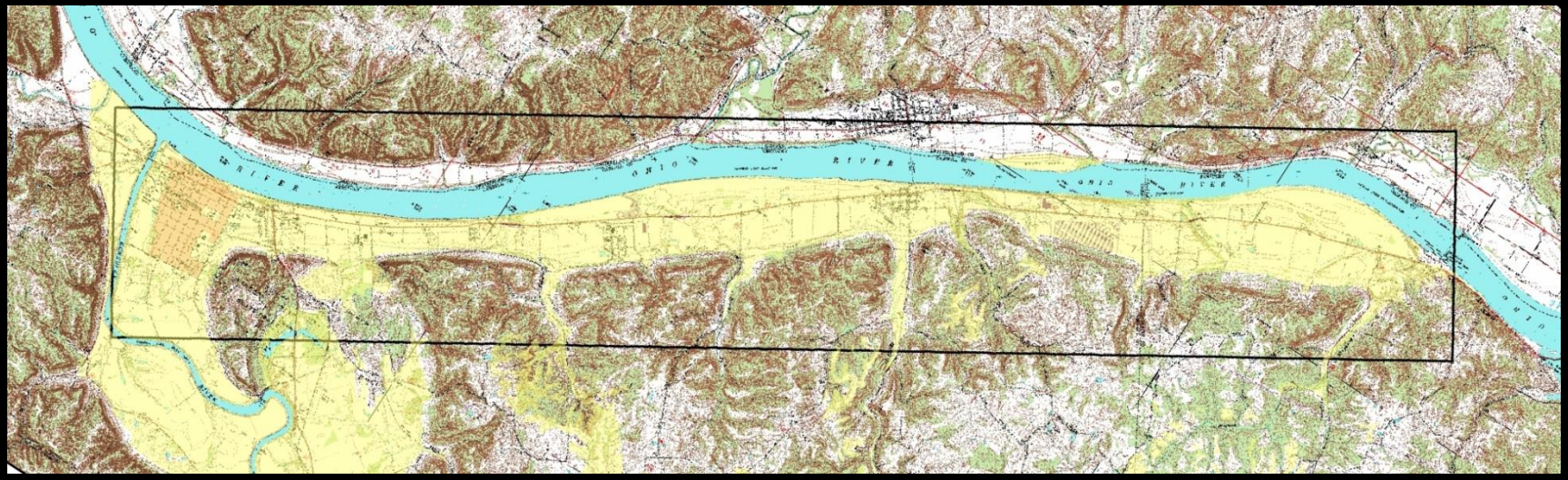

08/26/2003

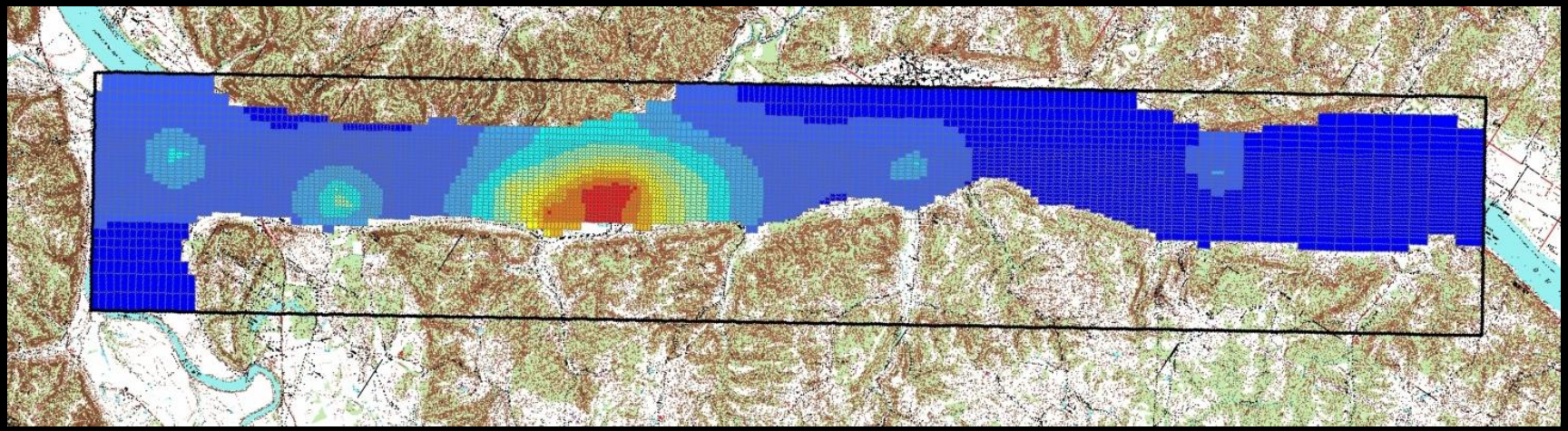

08/21/2003

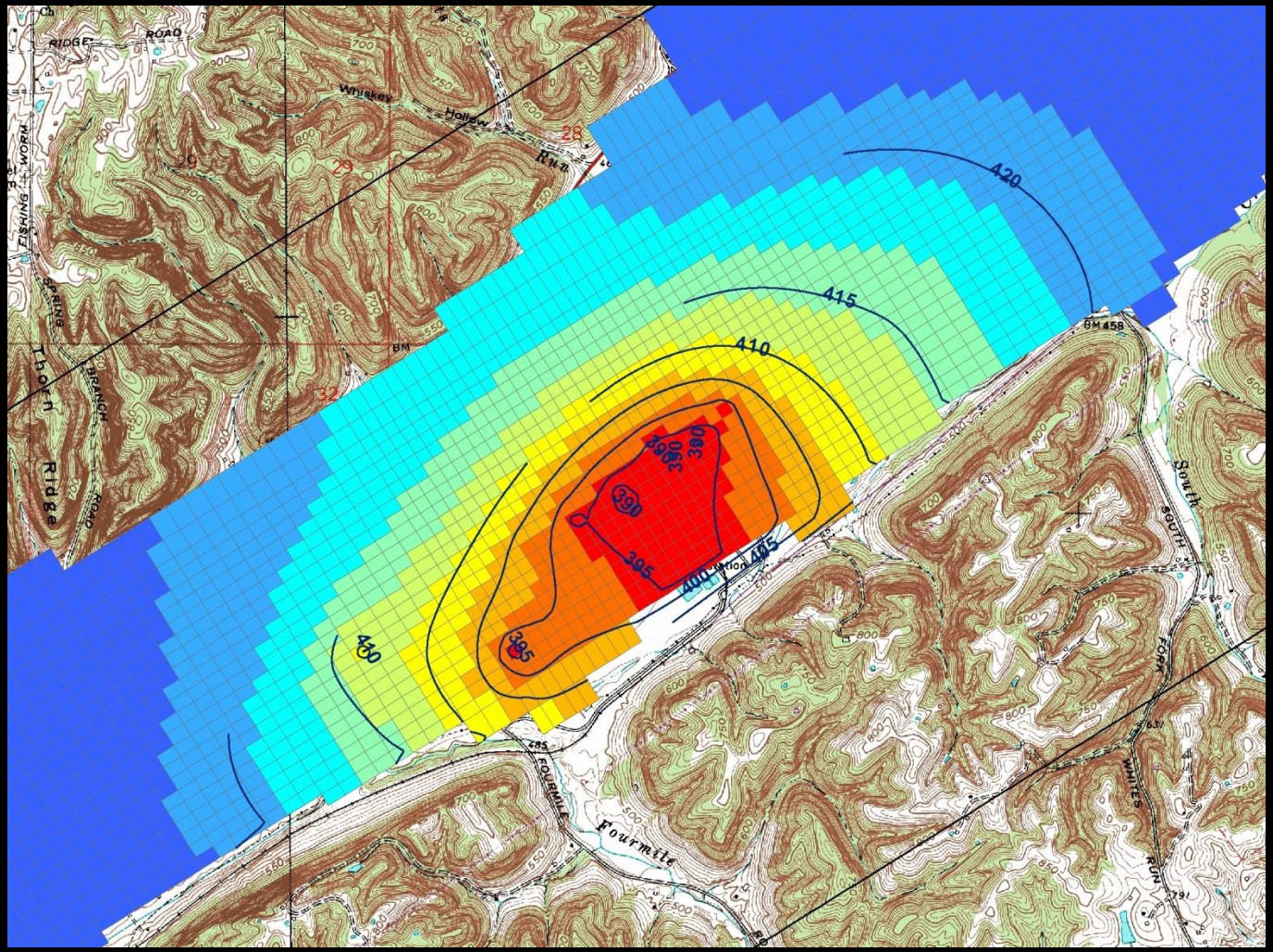


Infiltration Rates

- Estimate development potential
- Track changes in riverbed conditions over time
- Provide more accurate parameters for model simulations


OHIO RIVER





Carrollton modeling results

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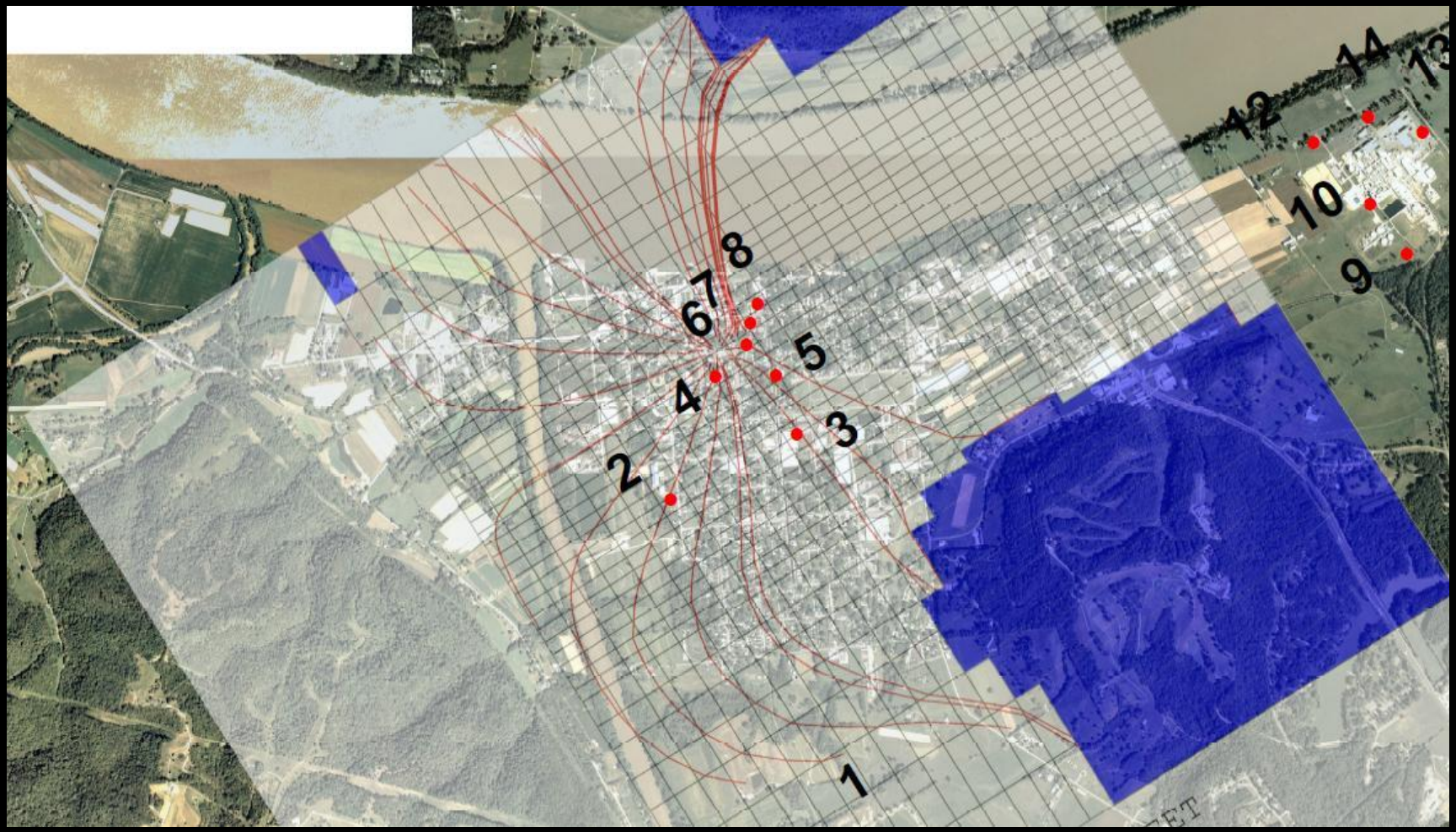

Carrollton model application – contributing areas

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Ohio River Alluvial Aquifer near Carrollton
Groundwater Obseravtion Well Network

USGS science for a changing world

Well name:	Barry Brown	Latitude:	38 40 27
Site ID:	384027085105201	Longitude:	085 10 52

MP (measuring point) description: Top of 6" coupling flush w/ concrete - 1 ft above ground

Date	Time	Hold	Cut	Depth to water	MP elevation	Water elevation
9/7/2010	1055	62.00	2.67	59.33	482.91	423.58
11/4/2011	1000			57.60	482.91	425.31
11/82012	1015			60.00	482.91	422.91
					482.91	
					482.91	
					482.91	
					482.91	

Method of measurement: m-scope

Measurement personnel: Chris Rose

Contact information Telephone: 502-732-7065

Email: crosewwtp@att.net

Remarks

Well description

6" steel casing in concrete base - total depth 78 ft

Location map

Near intersection of 4th St. and Polk

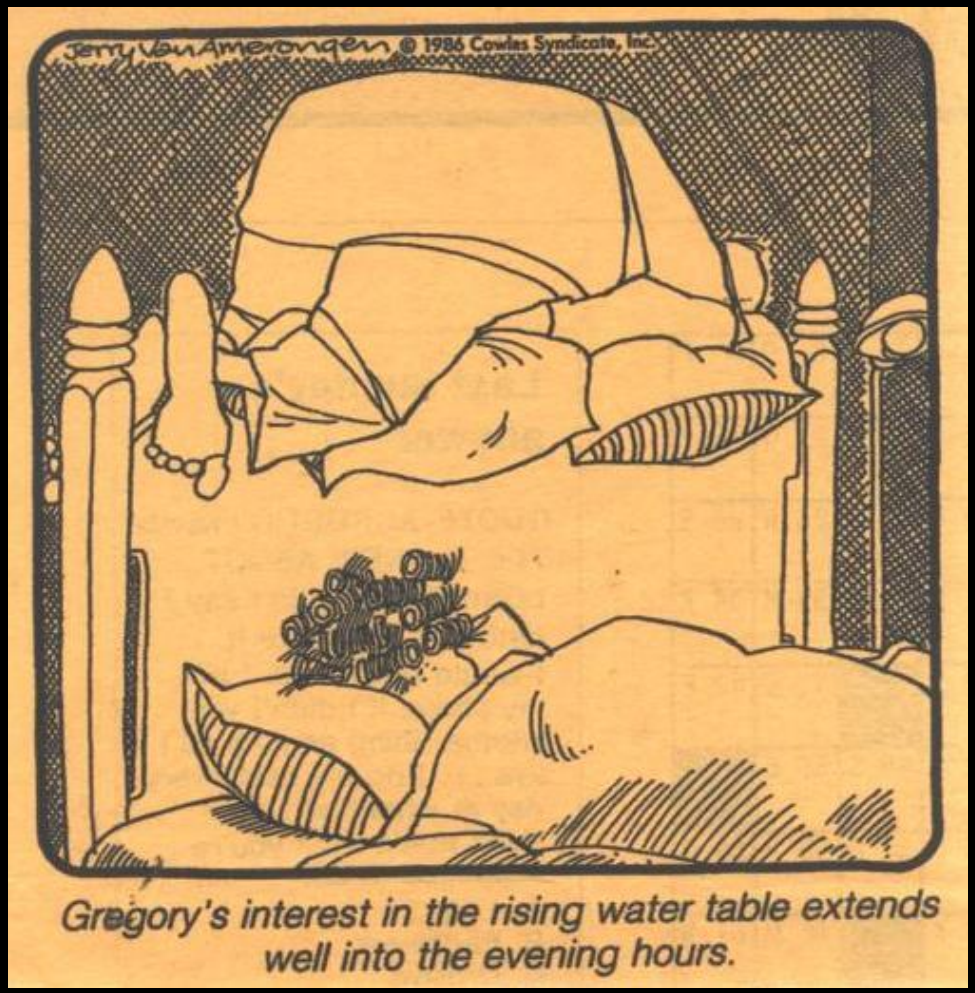

09/09/2010


09/10/2010


06/05/2009


06/05/2009


09/07/2010



Questions,
Comments,
General accusations?