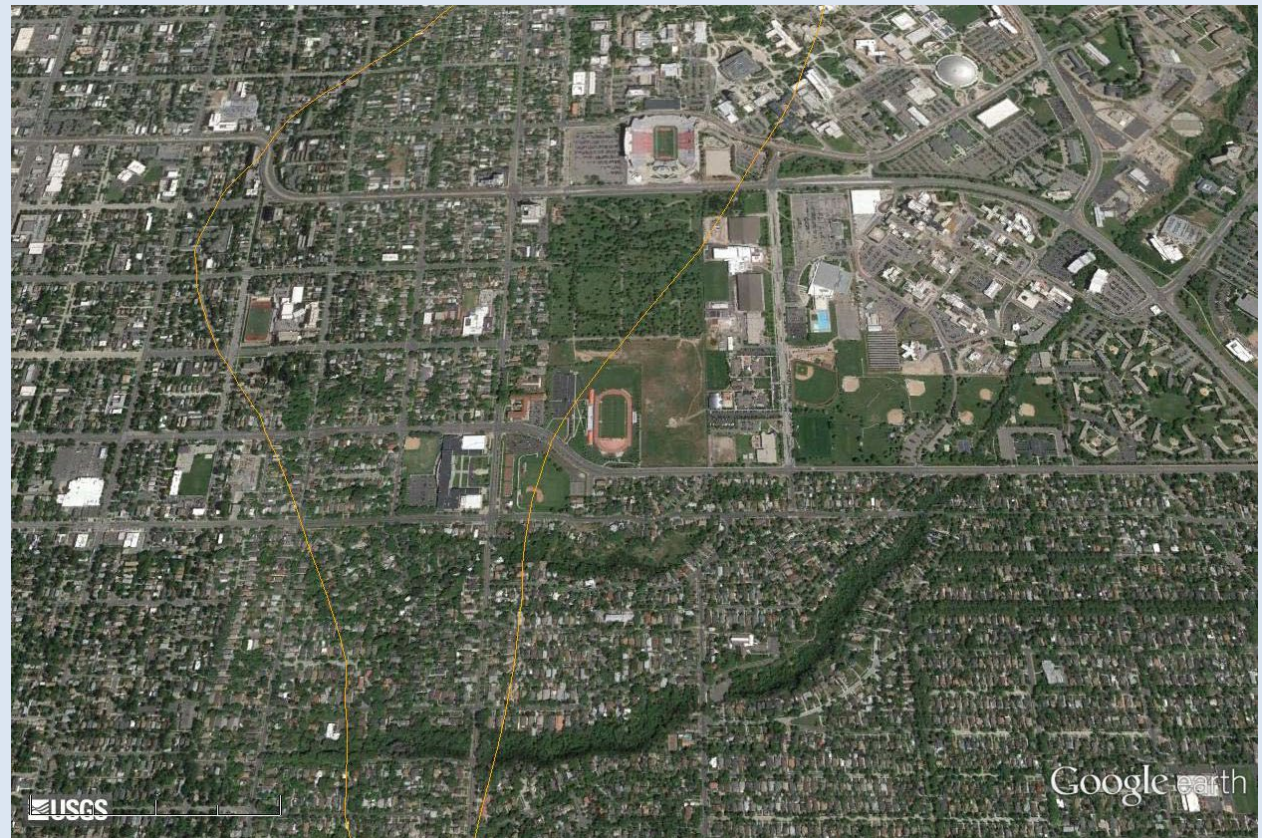


# USGS Groundwater Studies in the 700 South 1600 East Area of Salt Lake City

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Lynette Brooks, and  
Carole Johnson

U.S. Geological Survey  
Utah Water Science Center  
March 28, 2018  
CAG meeting



# Draft USGS Reports

Prepared in cooperation with the EPA

- **Hydrogeology of Basin-Fill Deposits in the Vicinity of 700 South 1600 East, Salt Lake City, Utah**
  - By Susan A. Thiros, Carole Johnson, Bernard Stolp, and Katherine Pappas
- **Numerical Groundwater Model in the Vicinity of 700 South 1600 East, Salt Lake City, Utah**
  - By Lynette Brooks and Bernard Stolp



# Hydrogeology of Basin-Fill Deposits in the Vicinity of 700 South 1600 East, Salt Lake City, Utah

- Purpose and Scope
  - present information to help better understand the basin-fill aquifer system in the study area
  - use available lithologic and geophysical logs, GW levels, streamflow, and precipitation data to describe the hydrogeology of the basin-fill deposits in the study area

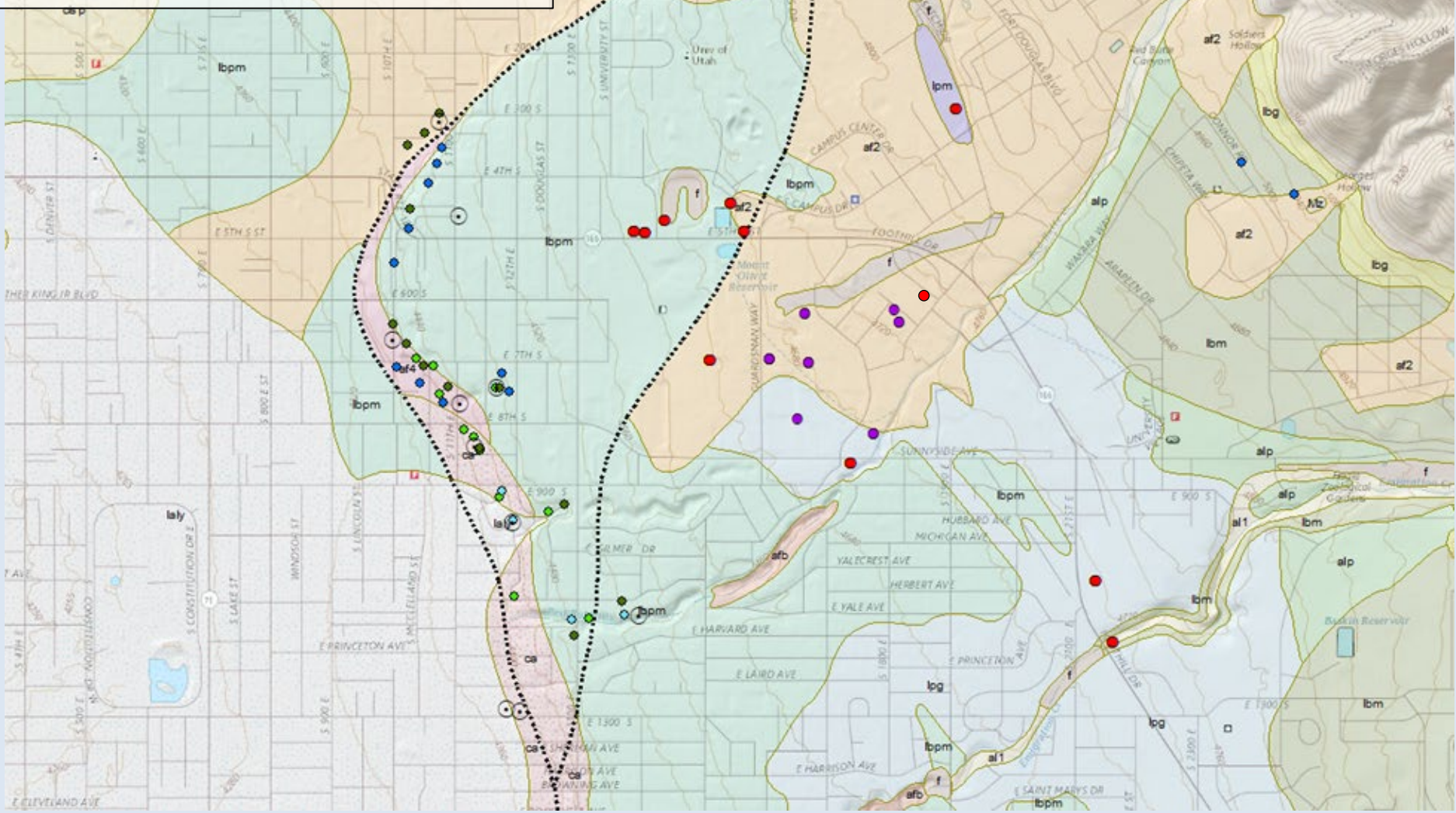
August 2015 – USGS borehole geophysical logging at EPA monitoring wells with Nuclear Magnetic Resonance (NMR), Electromagnetic Induction (EMI), and Natural Gamma tools





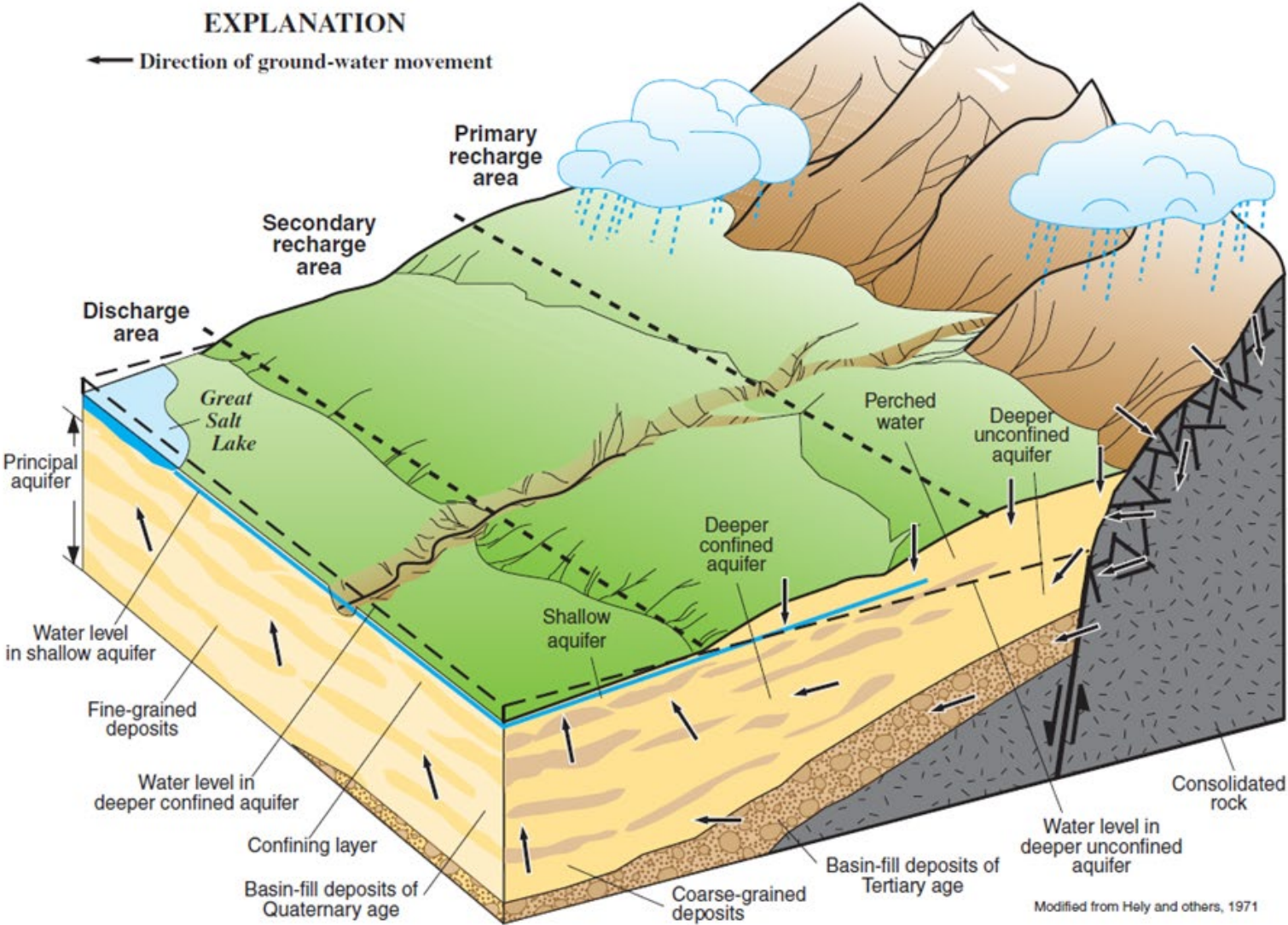
**EXPLANATION**

- Black dashed line – East Bench Fault and fault spur
- Red circle - deeper well
- Purple circle – EPA monitoring well
- Open black circle – spring described by Taylor and Leggette (1949)
- Dark green circle – spring mapped by Marine and Price (1964)
- Light blue circle – spring mapped by Mower and Van Horn (1973)
- Dark blue circle – spring mapped by Van Horn (1980)
- Light green circles – spring described by Utah Department of Environmental Quality (2000, 2012) and First Environment Inc. (2015)



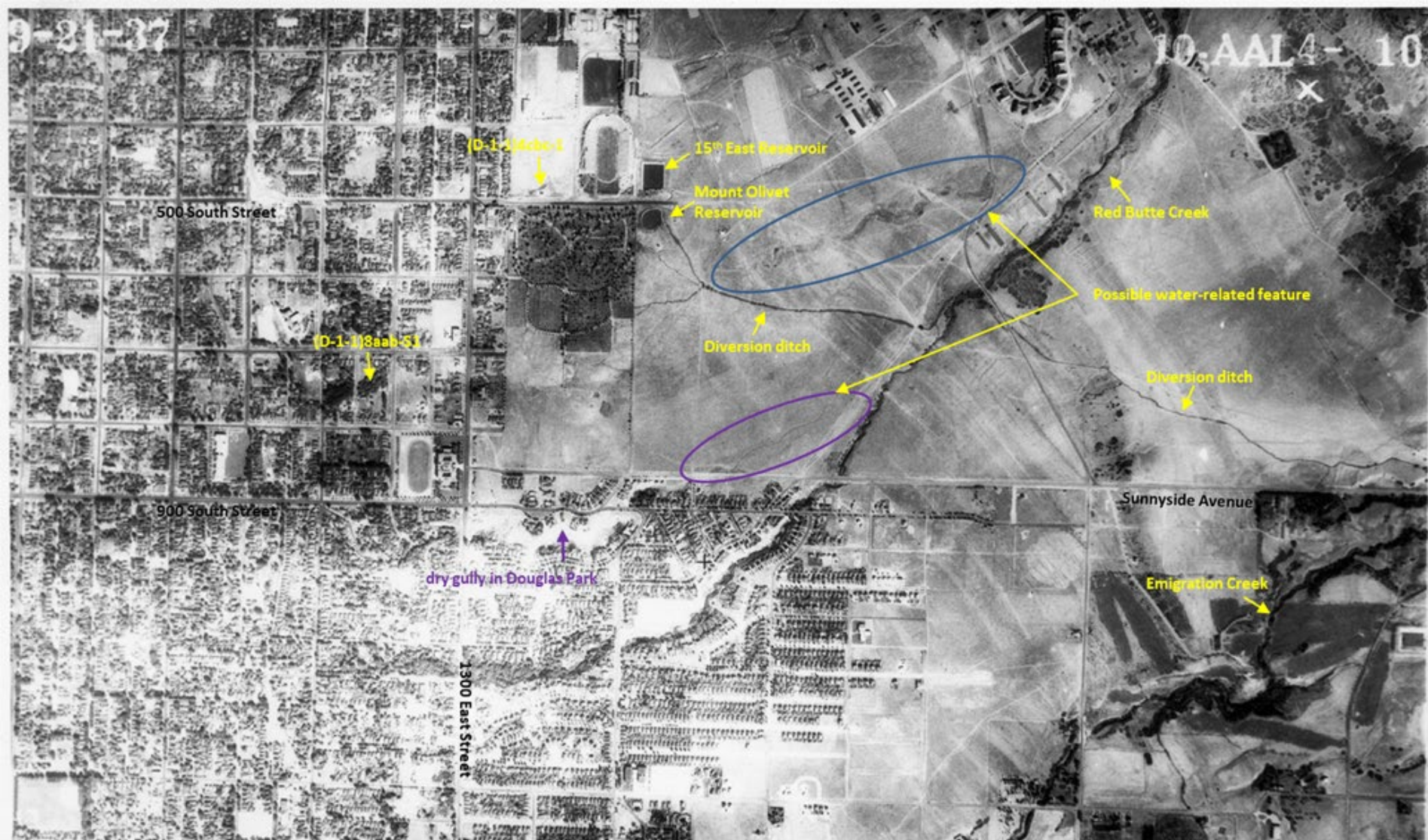


# Generalized block diagram showing the basin-fill deposits and groundwater flow system in Salt Lake Valley

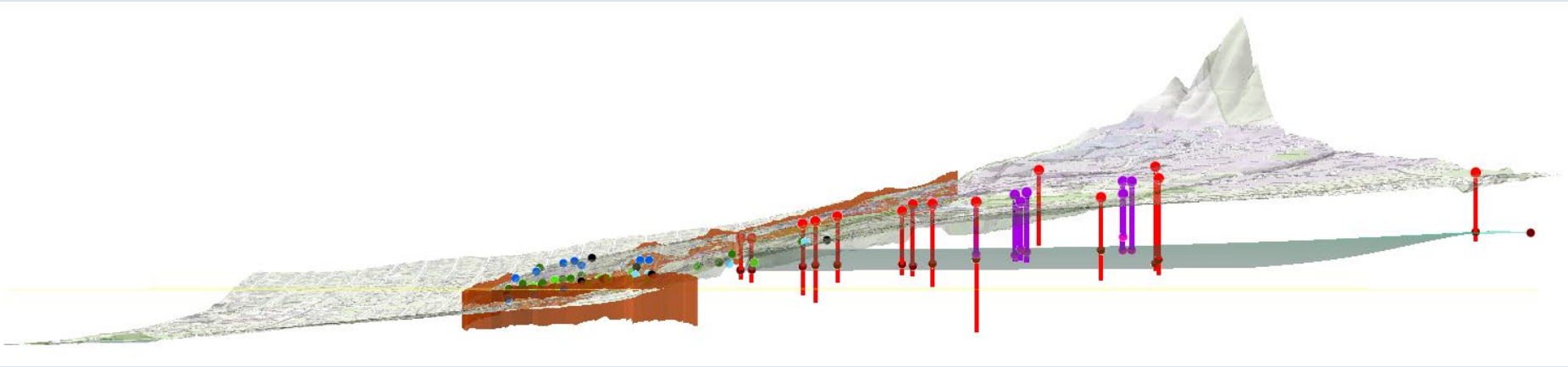




# Aerial photo taken in September 1937 showing Red Butte Creek in Salt Lake City and other water-related features



# Views of area from different perspectives



View looking north from a perspective at 4,400 feet above sea level. An approximate GW surface based on selected water levels measured in deeper wells slopes slightly to the north-northwest.



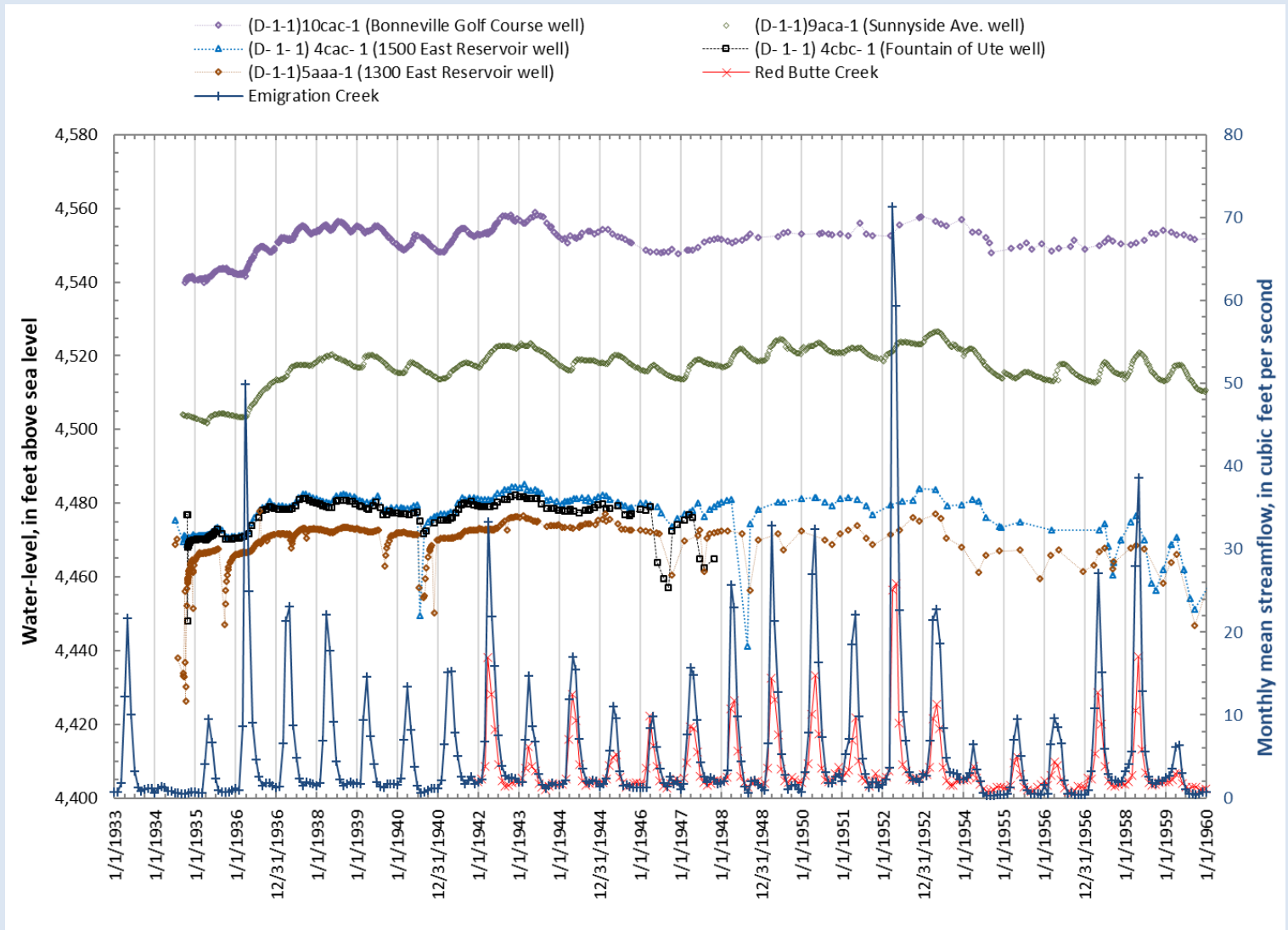
# Views of area from different perspectives



View looking north from a higher perspective. The approximate GW surface based on selected water levels measured in deeper wells intersects land surface in the Red Butte Creek channel at about 1400 South, near where springs have been mapped.



# Deeper wells

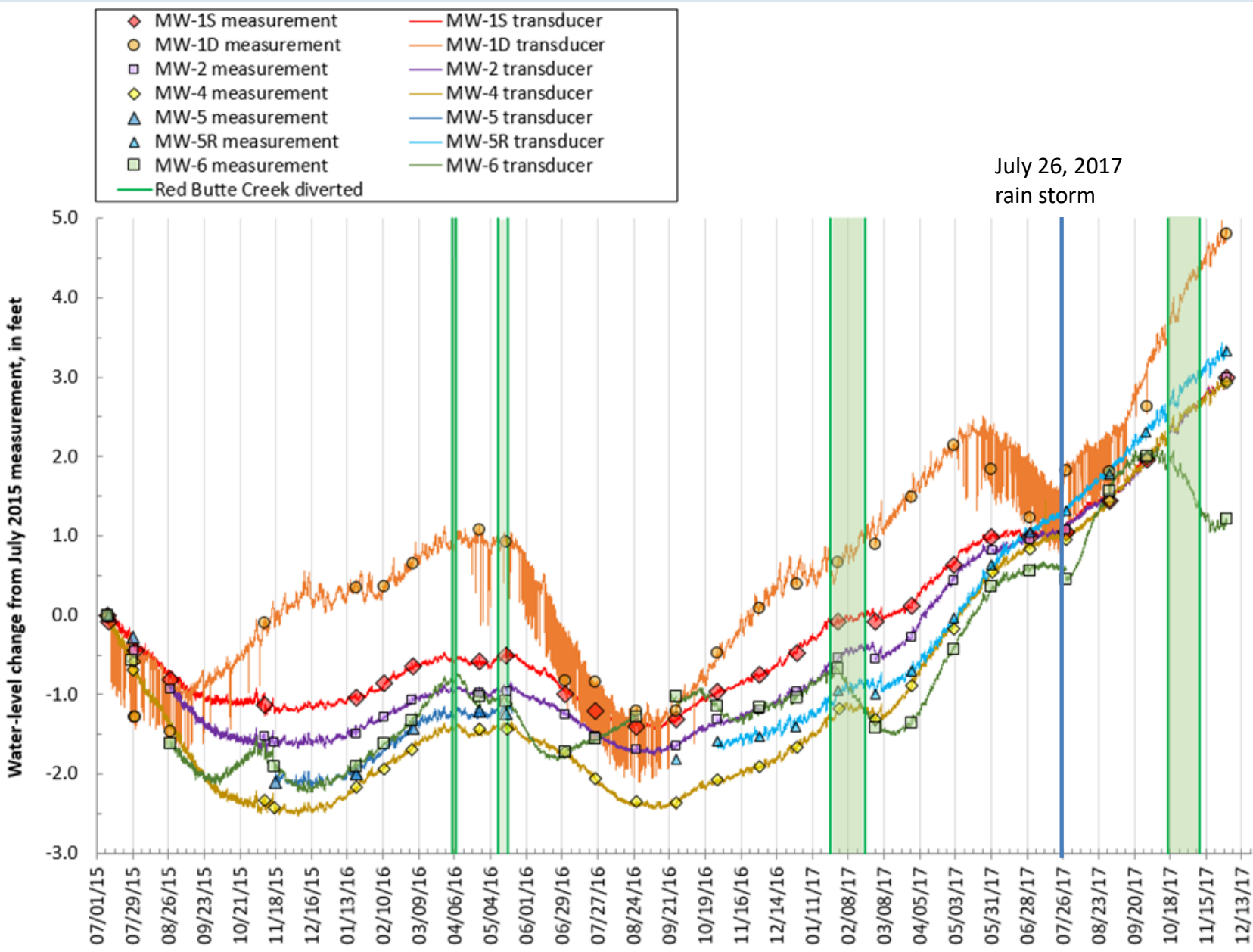


Water levels in selected wells and monthly mean streamflow at Emigration and Red Butte Creeks, 1933-59





# Water-level change from measurement made in July 2015 at monitoring wells in the Sunnyside Park area, 2015-17



# Locations and Sources of Recharge to the Groundwater System

- At and near the mountain front
  - Precipitation runoff
  - Seepage from streams
  - Subsurface mountain-block inflow
- In the valley
  - Seepage from streams, diversions, precipitation, unconsumed irrigation water
  - Leaking pipes



# Seepage from Red Butte Creek (RBC) in Valley

Photo taken on March 29, 2017 looking north at culvert on RBC north of Veterans Affairs Medical Center/Sunnyside Park boundary

Downstream of this culvert, RBC streamflow at Miller Park gaging station was about 11 ft<sup>3</sup>/s.

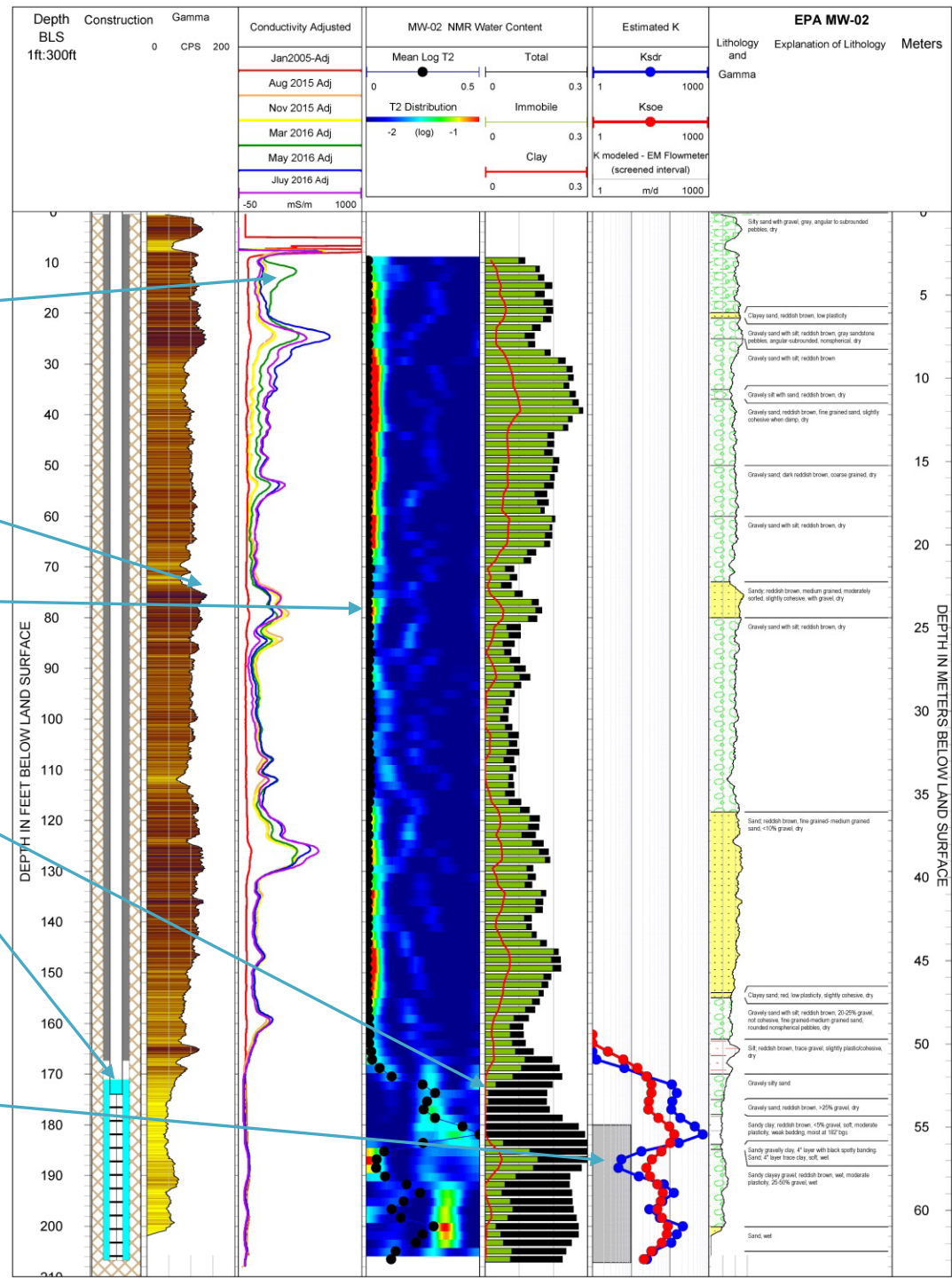


- RBC streamflow at gaging station 101772200 in Red Butte Canyon peaked on May 28, 1983 at 105 ft<sup>3</sup>/s and on May 17, 1984 at 101 ft<sup>3</sup>/s, more than 4 times the mean peak streamflow from WY 1964 to 2016
- RBC streamflow at Miller Park gaging station peaked on July 26, 2017 at 168 ft<sup>3</sup>/s



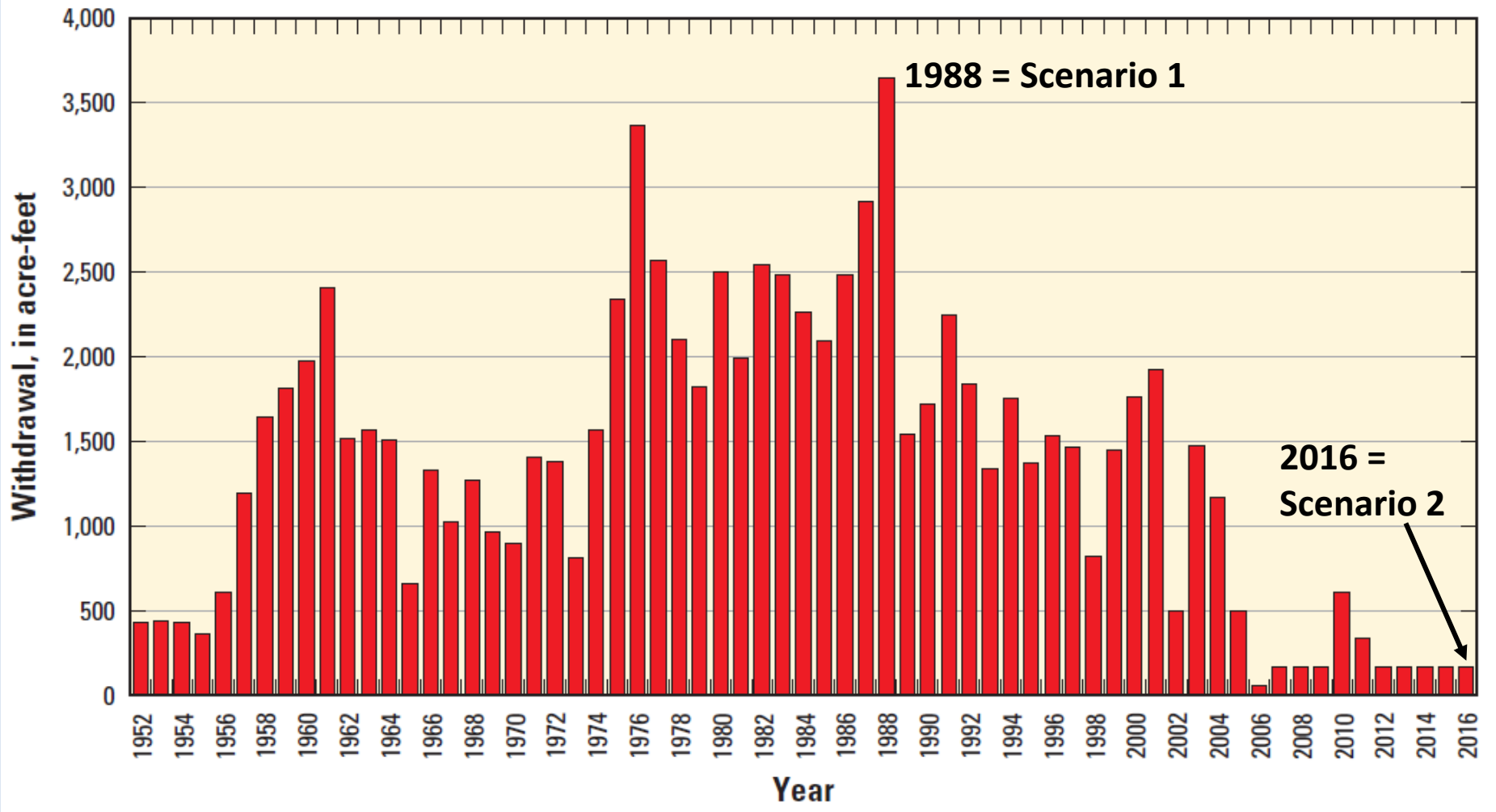
# Borehole Geophysical Logs

- EMI time series show downward movement of GW with different chemistry
- High gamma coincide with high immobile water content (NMR early time decay)
- Saturated water at 170 ft in low gamma sand and dirty gravel = larger pores = mobile water
- Low hydraulic conductivity, fine-grained zone, with increase in immobile water content (0.15) at 185-191 ft



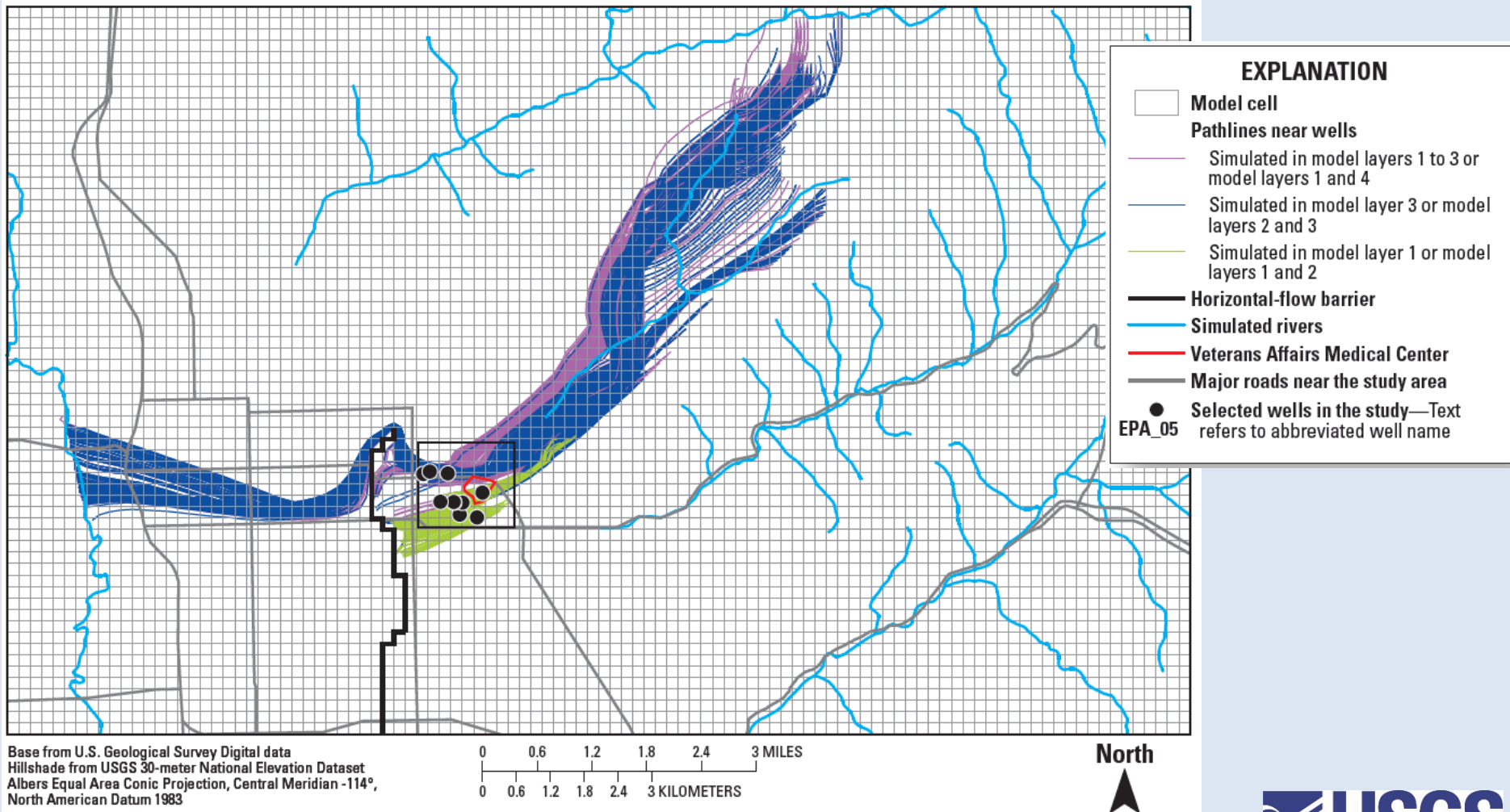


# Numerical Groundwater Model in the Vicinity of 700 South 1600 East, Salt Lake City, Utah



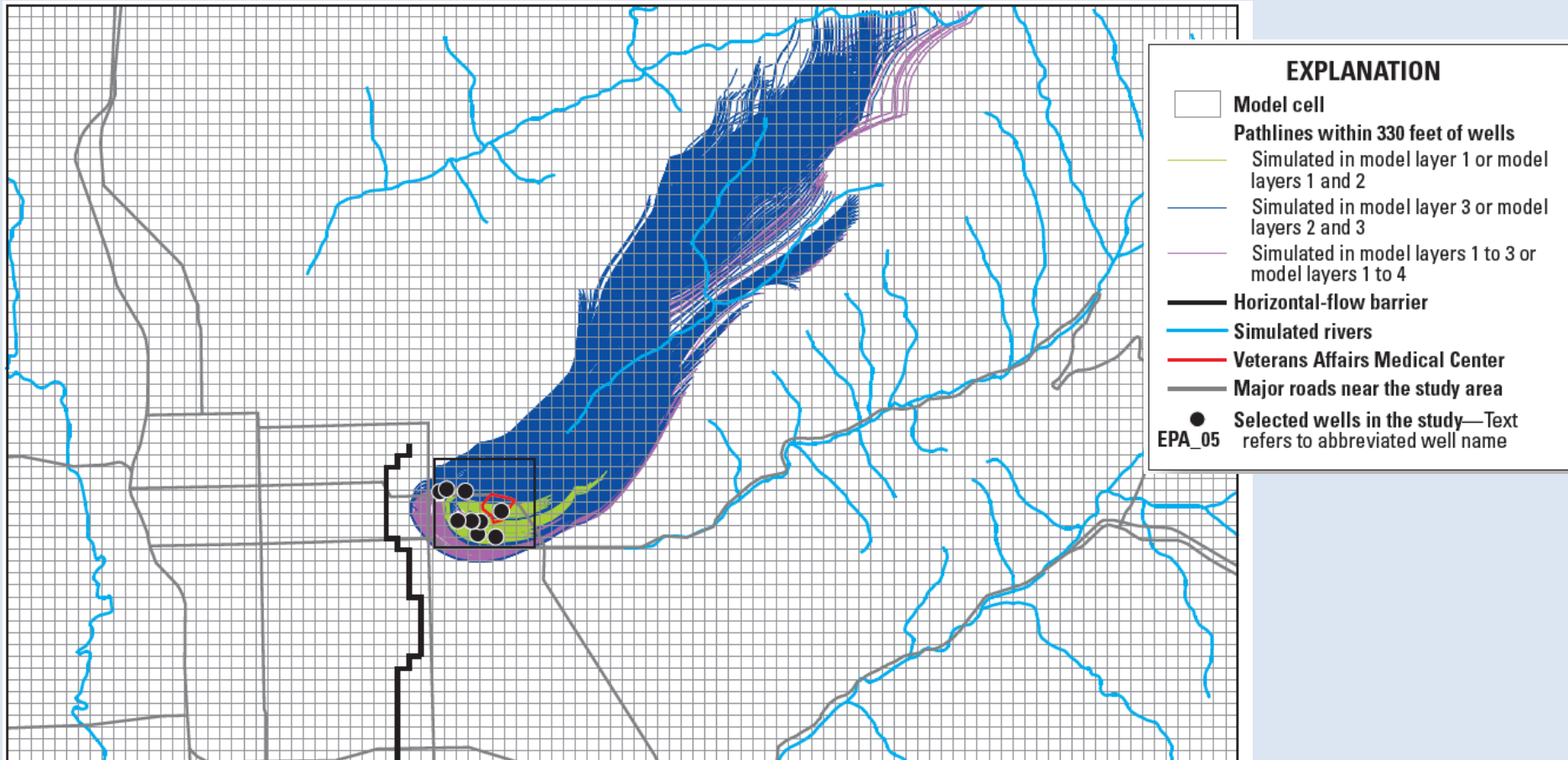
Groundwater withdrawal near the 700 South 1600 East study area

# Particle path lines in Scenario with 2016 withdrawals that pass within 330 feet of selected wells





# Particle path lines in Scenario with 1988 withdrawals that pass within 330 feet of selected wells



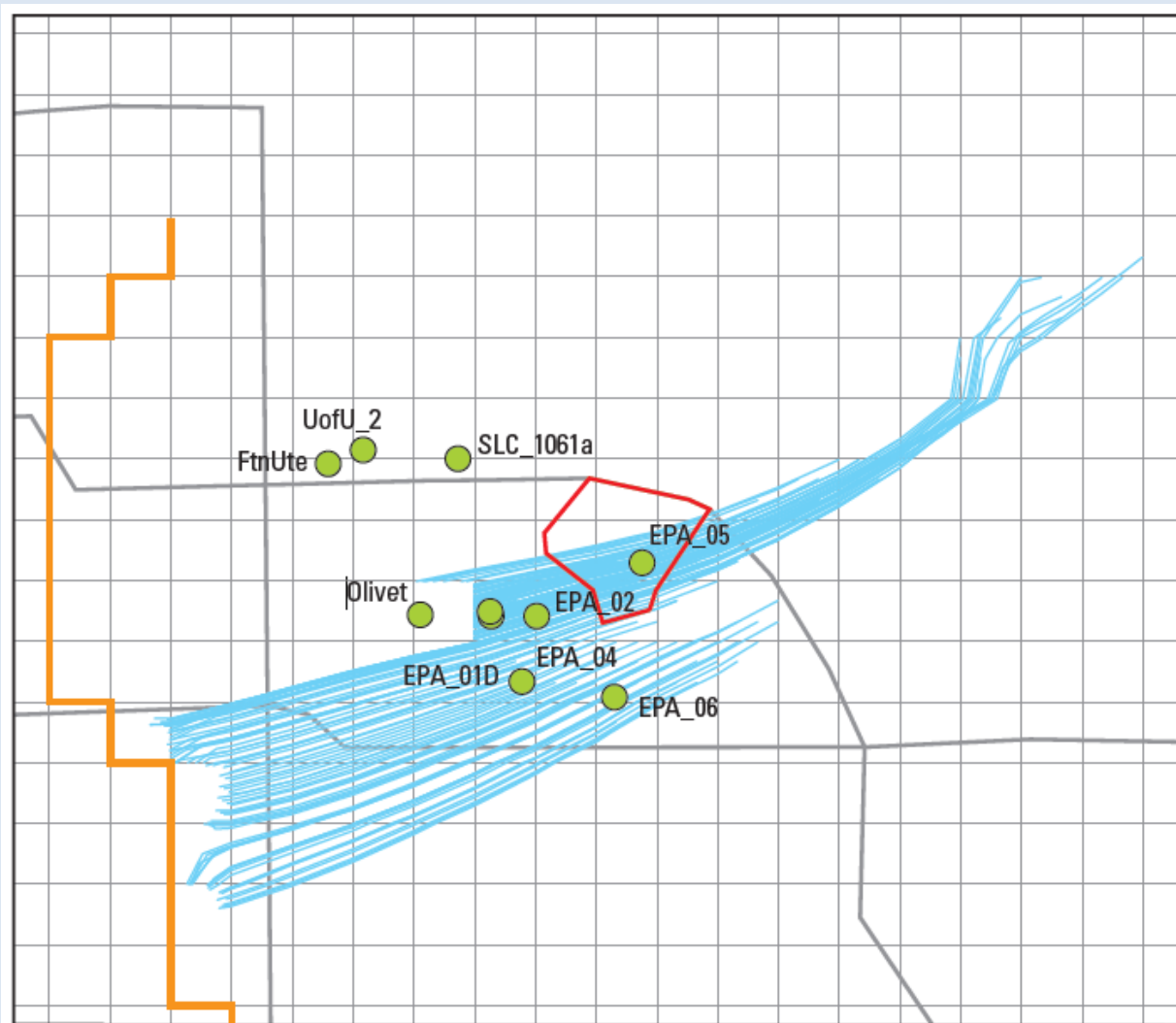
Base from U.S. Geological Survey Digital data  
Hillshade from USGS 30-meter National Elevation Dataset  
Albers Equal Area Conic Projection, Central Meridian -114°,  
North American Datum 1983

0 0.6 1.2 1.8 2.4 3 MILES  
0 0.6 1.2 1.8 2.4 3 KILOMETERS

North



# Particle path lines in Scenario with 2016 withdrawals in vicinity of simulated East Bench Fault that pass within 330 feet of selected wells simulated in model layer 1 or model layers 1 and 2



Inset enlarged to 167 percent

