

# **Rialto-Colton Groundwater Basin Conceptual Site Model**

**April 12, 2011**

# ***Data Requests Made***

- **West Valley Water District**
- **U.S. Geological Survey**
- **City of Rialto**
- **City of Colton**
- **Fontana Water Company**
- **City of Riverside**
- **GeoLogic Associates**
- **Wildermuth Environmental Inc.**
- **San Bernardino Valley Municipal Water District**

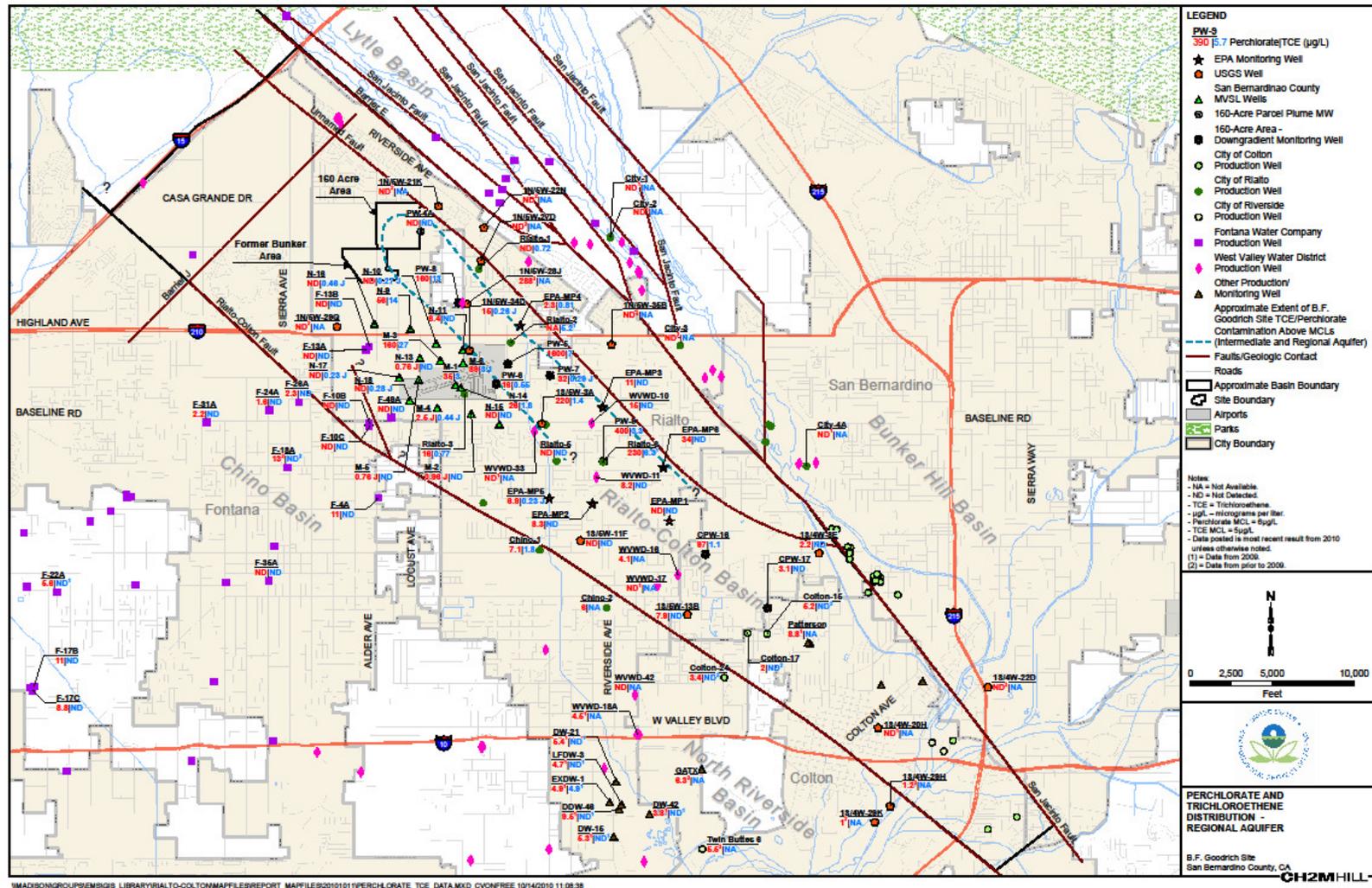
# ***Overall Modeling Objective***

- **Develop and calibrate a basin-wide groundwater flow model of the Rialto-Colton groundwater basin**

## ***Specific Objectives***

- **Develop a groundwater flow model that will be available as a tool to evaluate groundwater flow directions and rates and support investigation activities**
- **Develop a groundwater flow model that will be available to support the evaluation of remedial options for the downgradient areas of the Rialto-Colton Basin**
- **Use the model to test hypotheses regarding leakage of groundwater across faults**

# Rialto-Colton Basin Contamination



# EPA Source Area OU Remedy

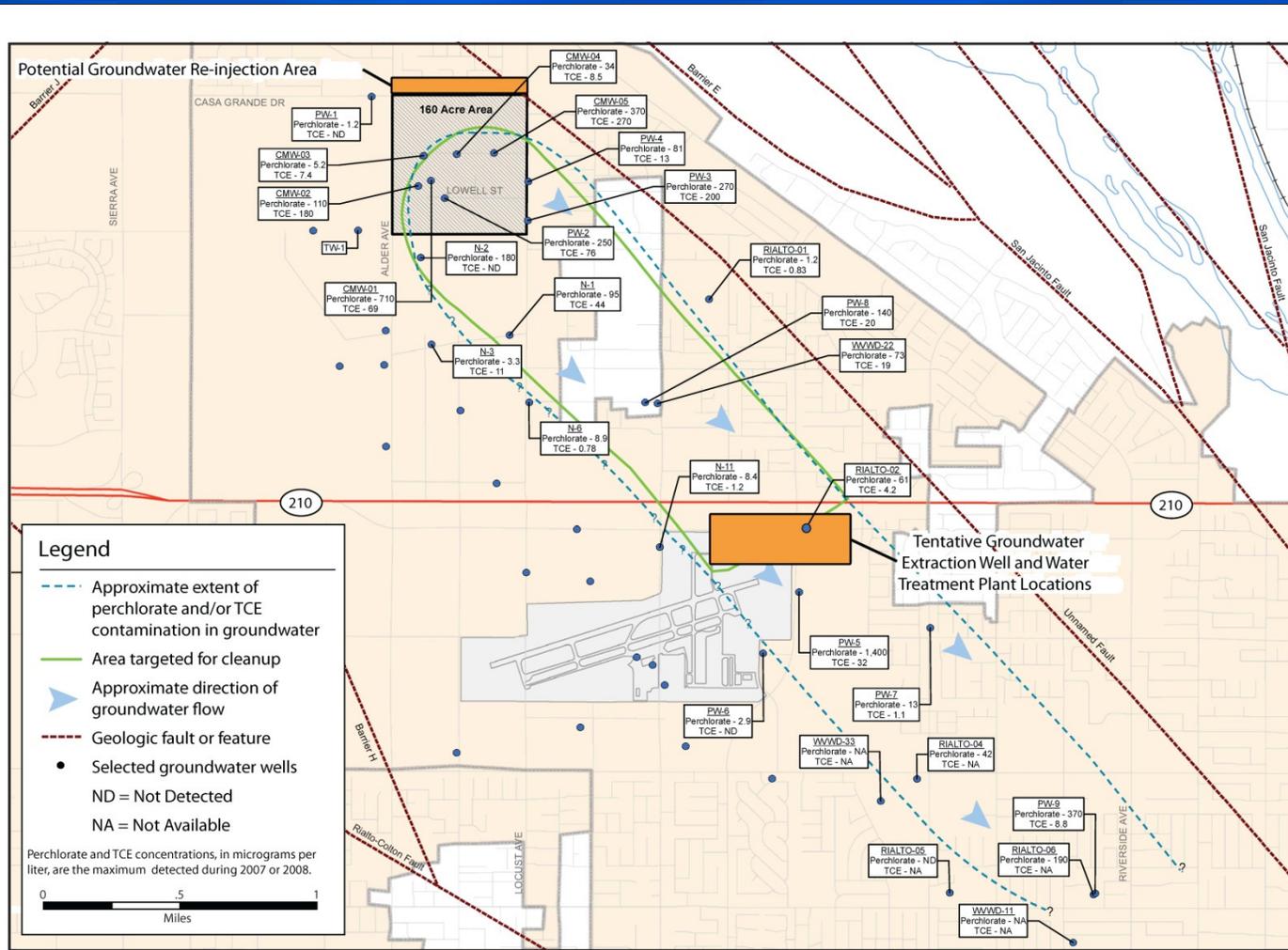


Figure 13. Approximate Extraction, Treatment, and Reinjection Locations

# Rialto-Colton Basin Cross Section

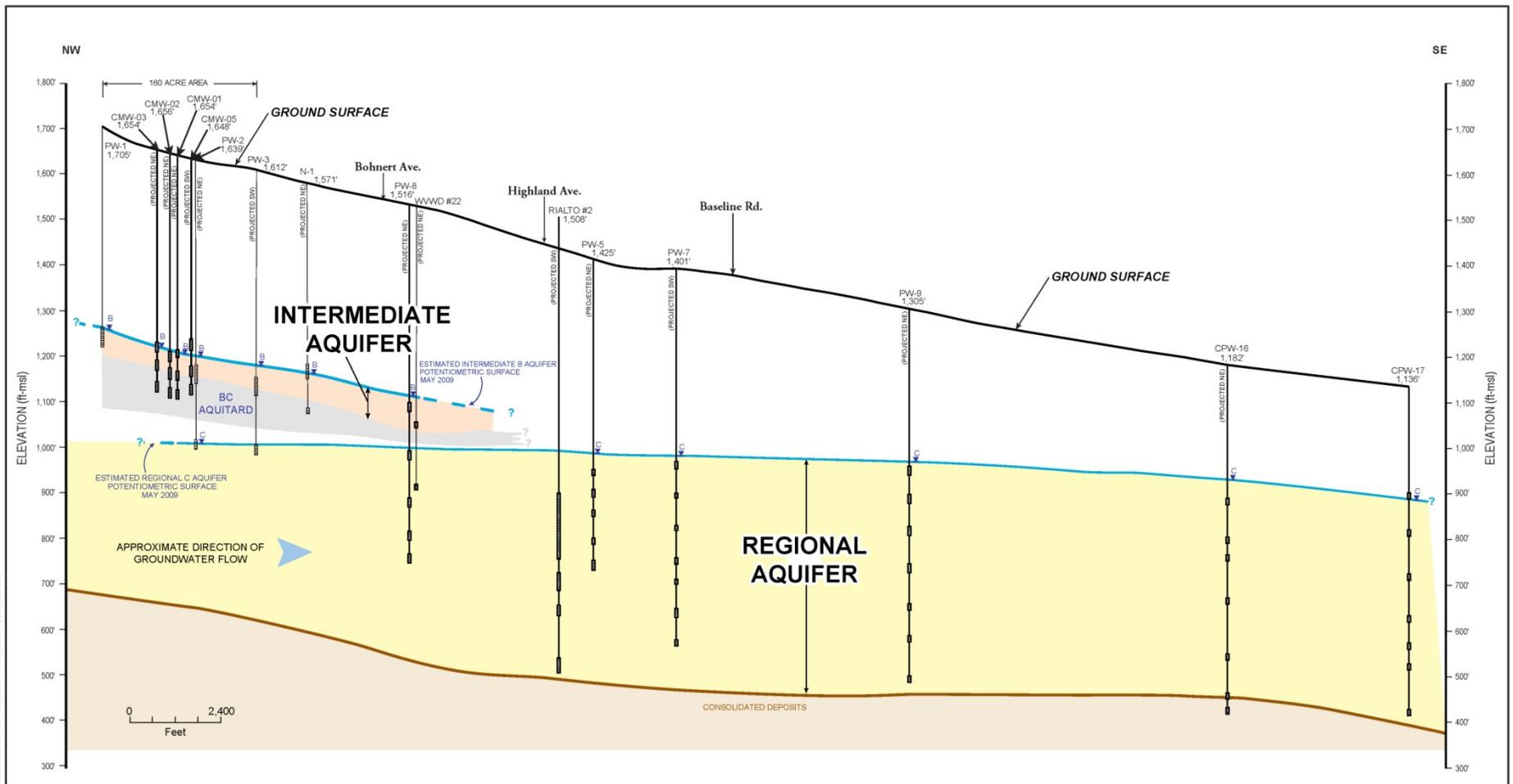


Figure 7. Rialto-Colton Groundwater Basin Aquifers

# Cross Section of Contamination

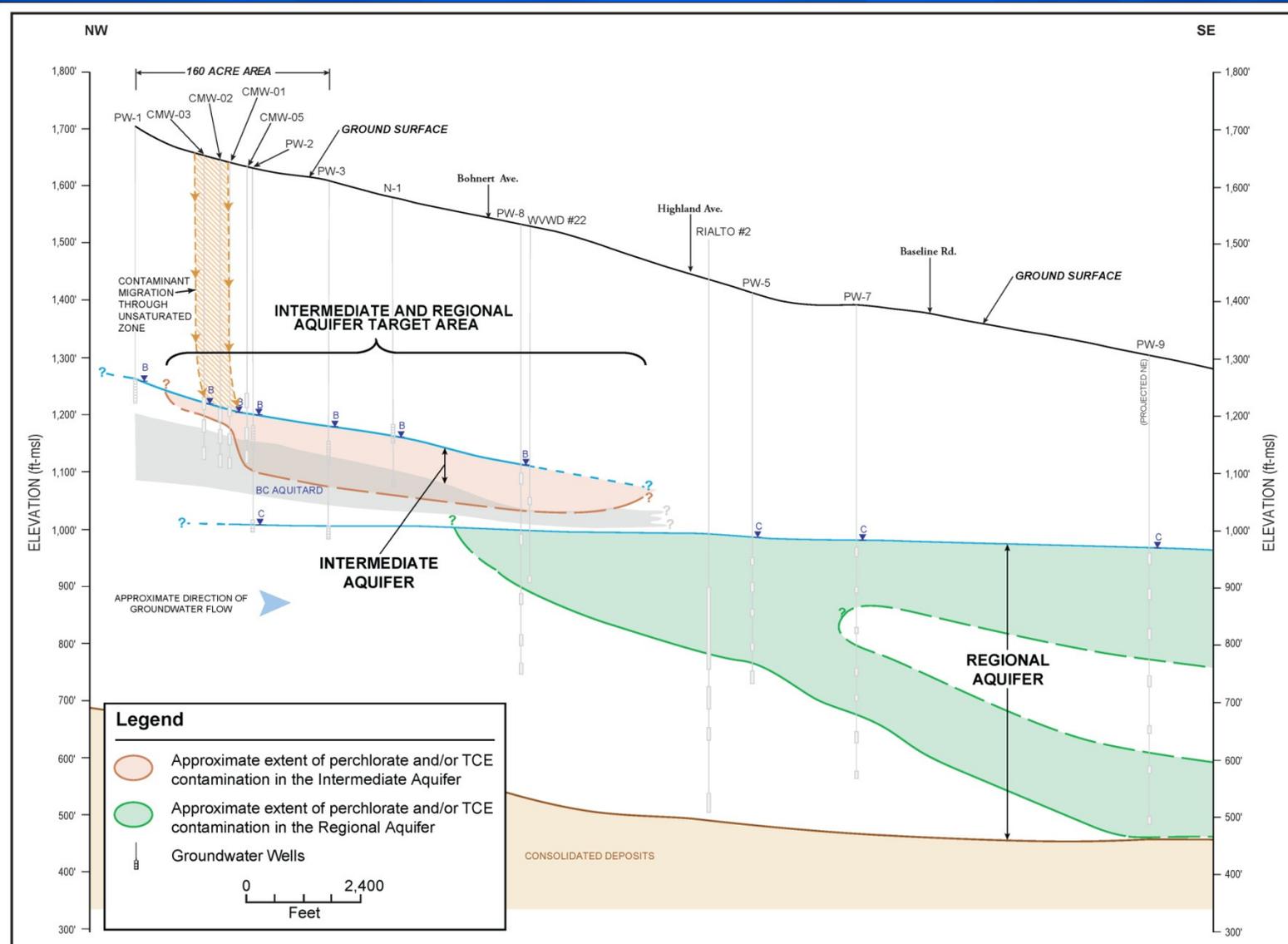
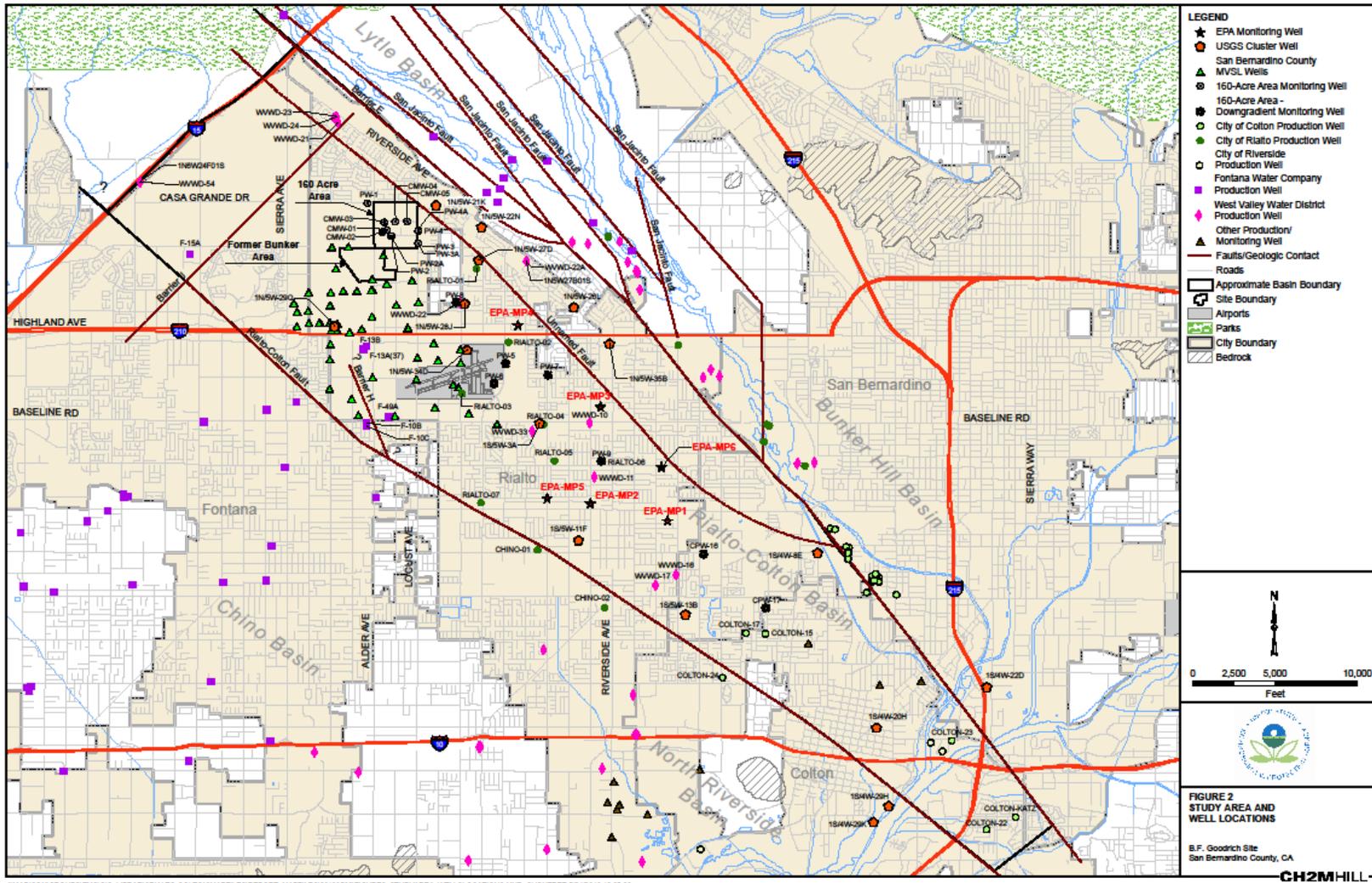


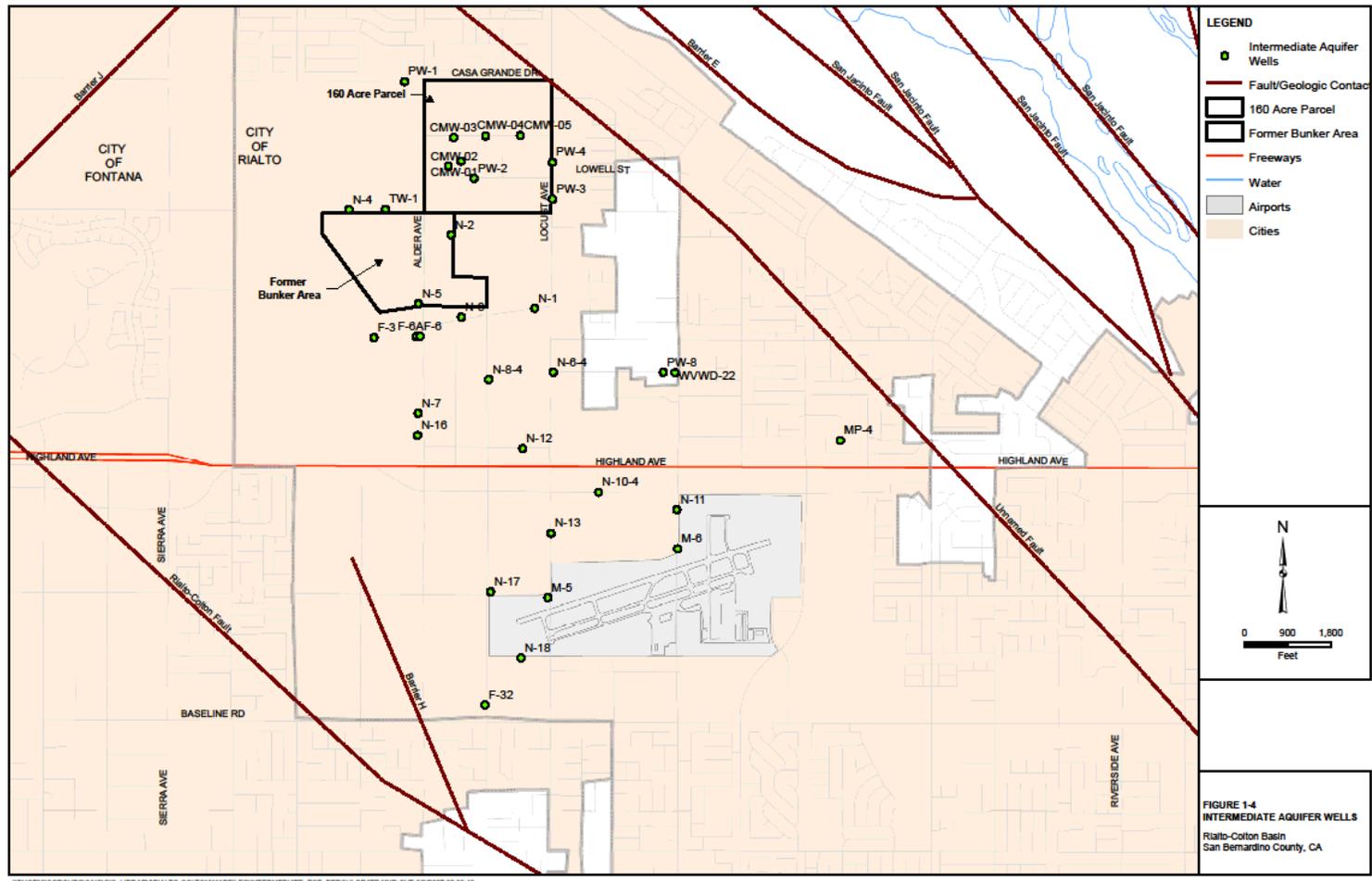
Figure 12. Targeted Area of Groundwater Contamination (Vertical Cross Section)

# Well Locations

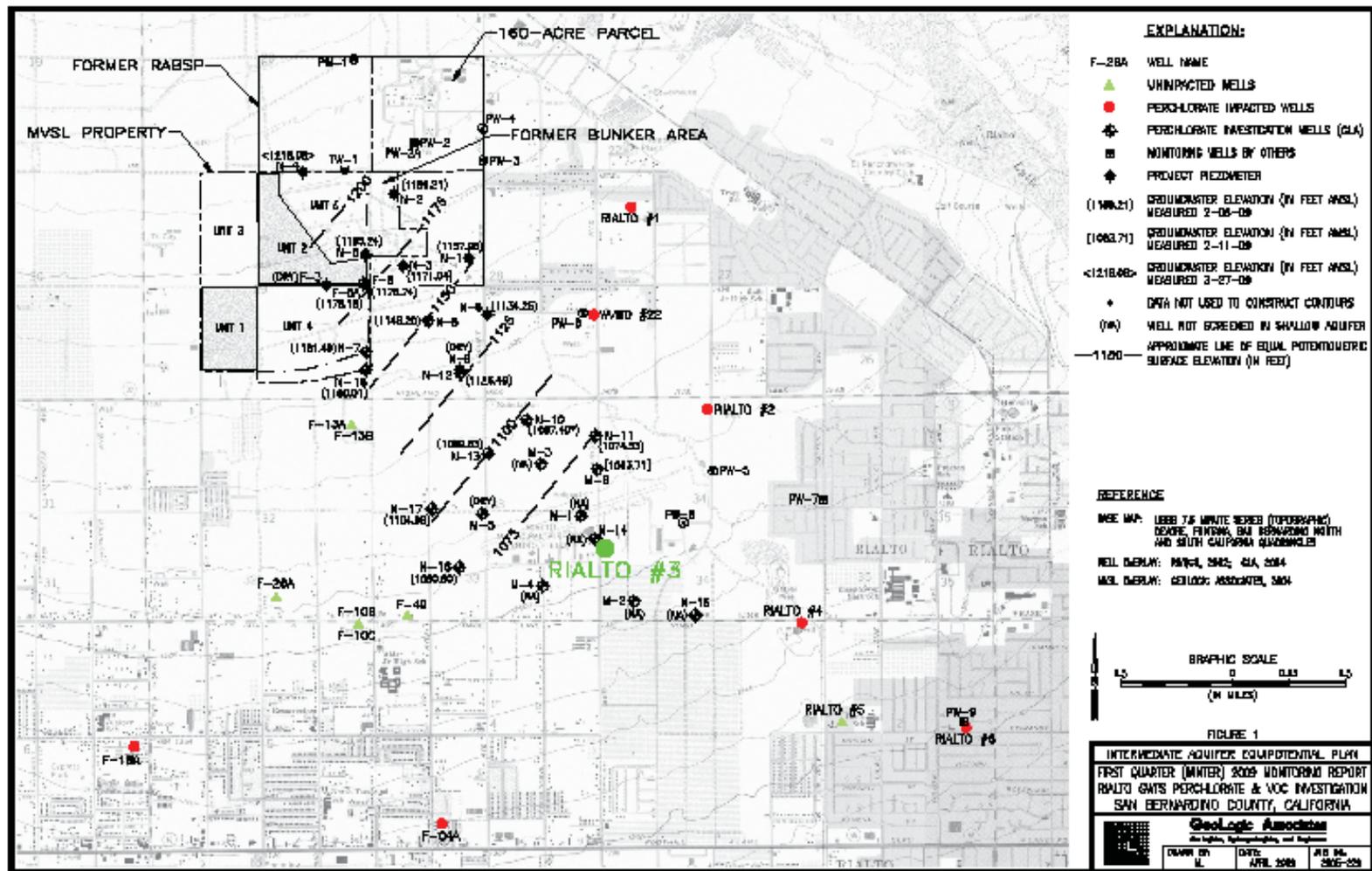


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# Intermediate Aquifer Well Locations

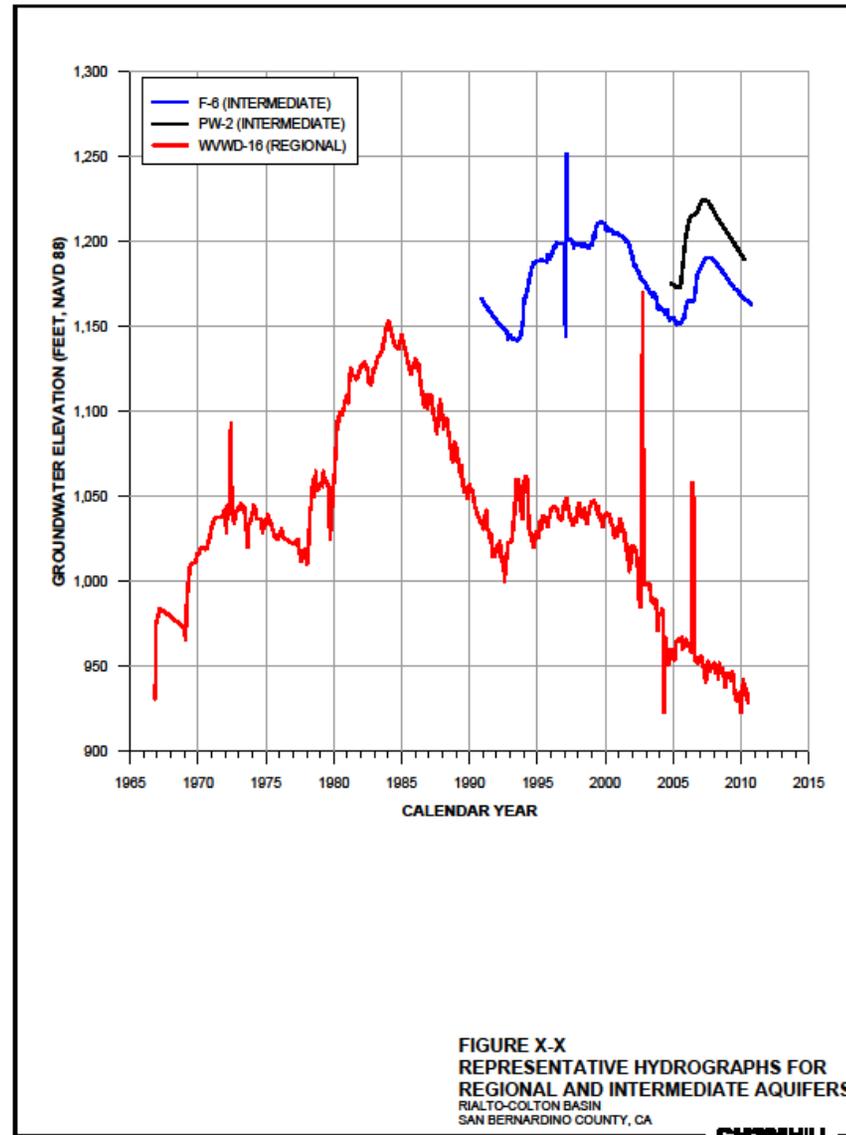


# Intermediate Aquifer Groundwater Levels 2009





# Representative Hydrographs



# ***Rialto Colton Basin Water Budget***

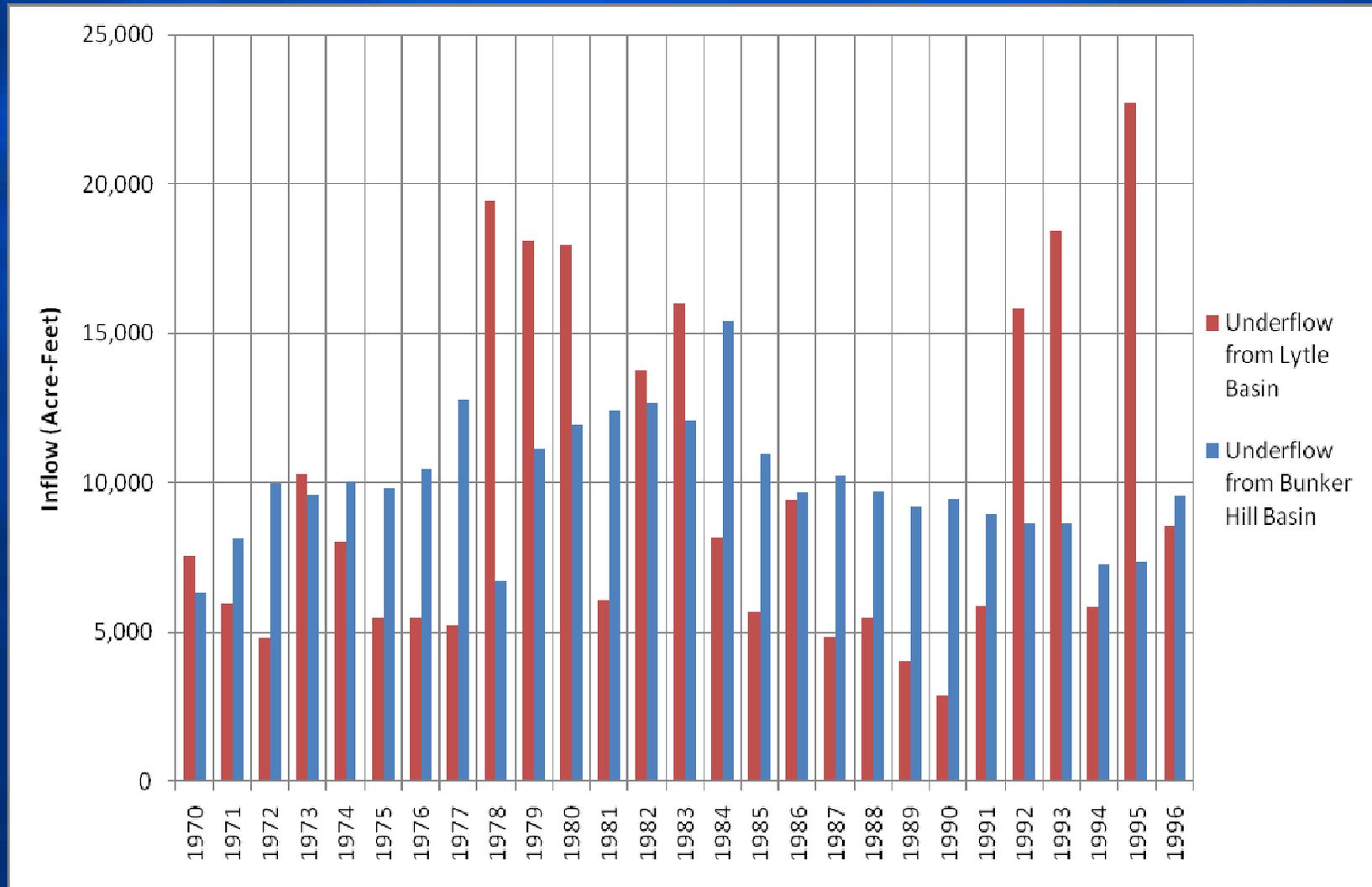
## **■ Recharge**

- Underflow from Lytle and Bunker Hill Basins**
- Infiltration and Deep Percolation from Ungauged runoff (San Gabriels and Badlands)**
- Deep percolation of applied Irrigation water**
- Seepage from Santa Ana River and Warm Creek**
- Deep percolation of rainfall**
- Infiltration of imported water**

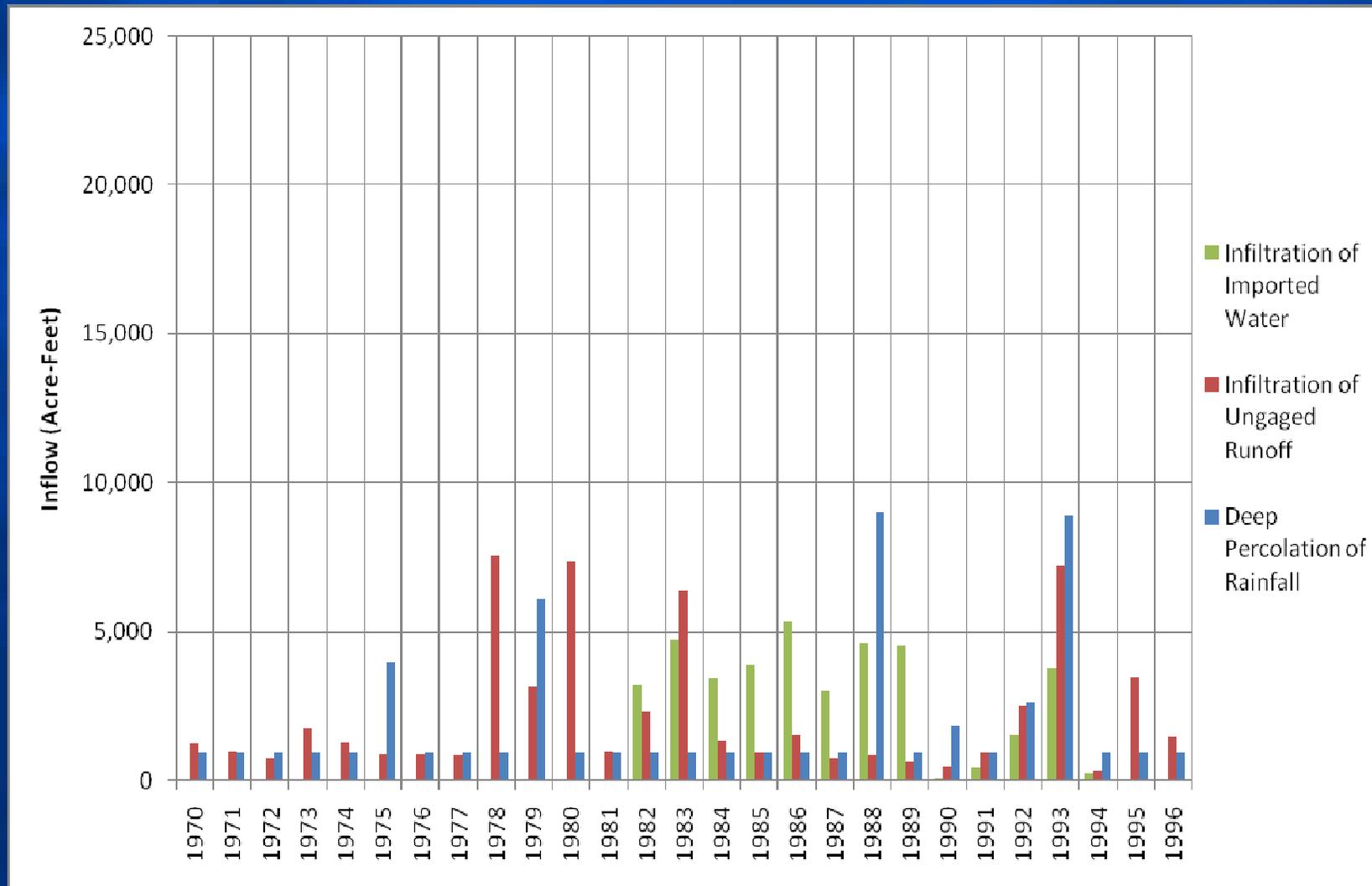
## **■ Discharge**

- Groundwater pumpage**
- Underflow to the Chino Basin**
- Underflow to the North Riverside Basin**
- Seepage to the Santa Ana River and Warm Creek**
- Evapotranspiration**

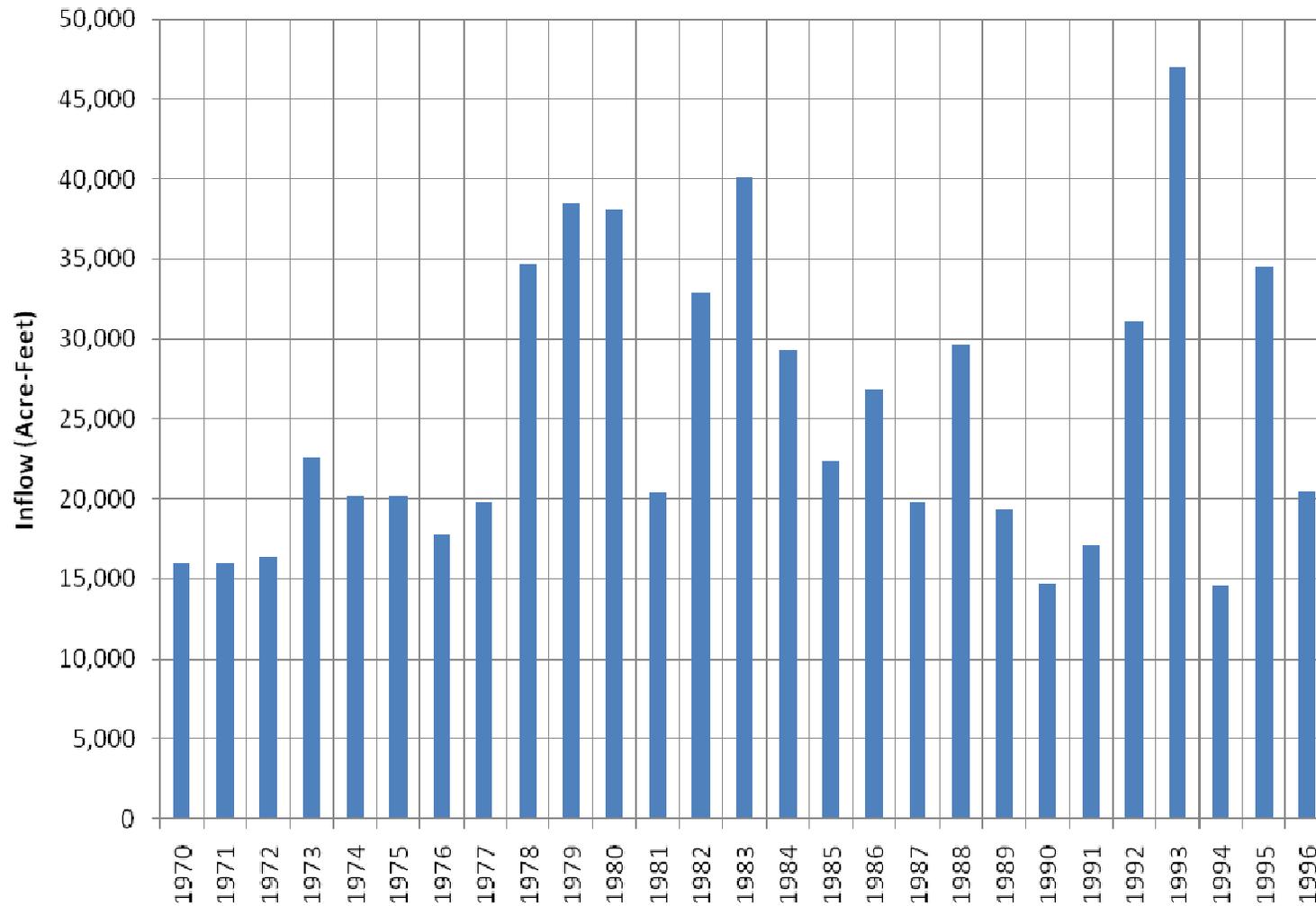
# Estimated Recharge (USGS, 2001)



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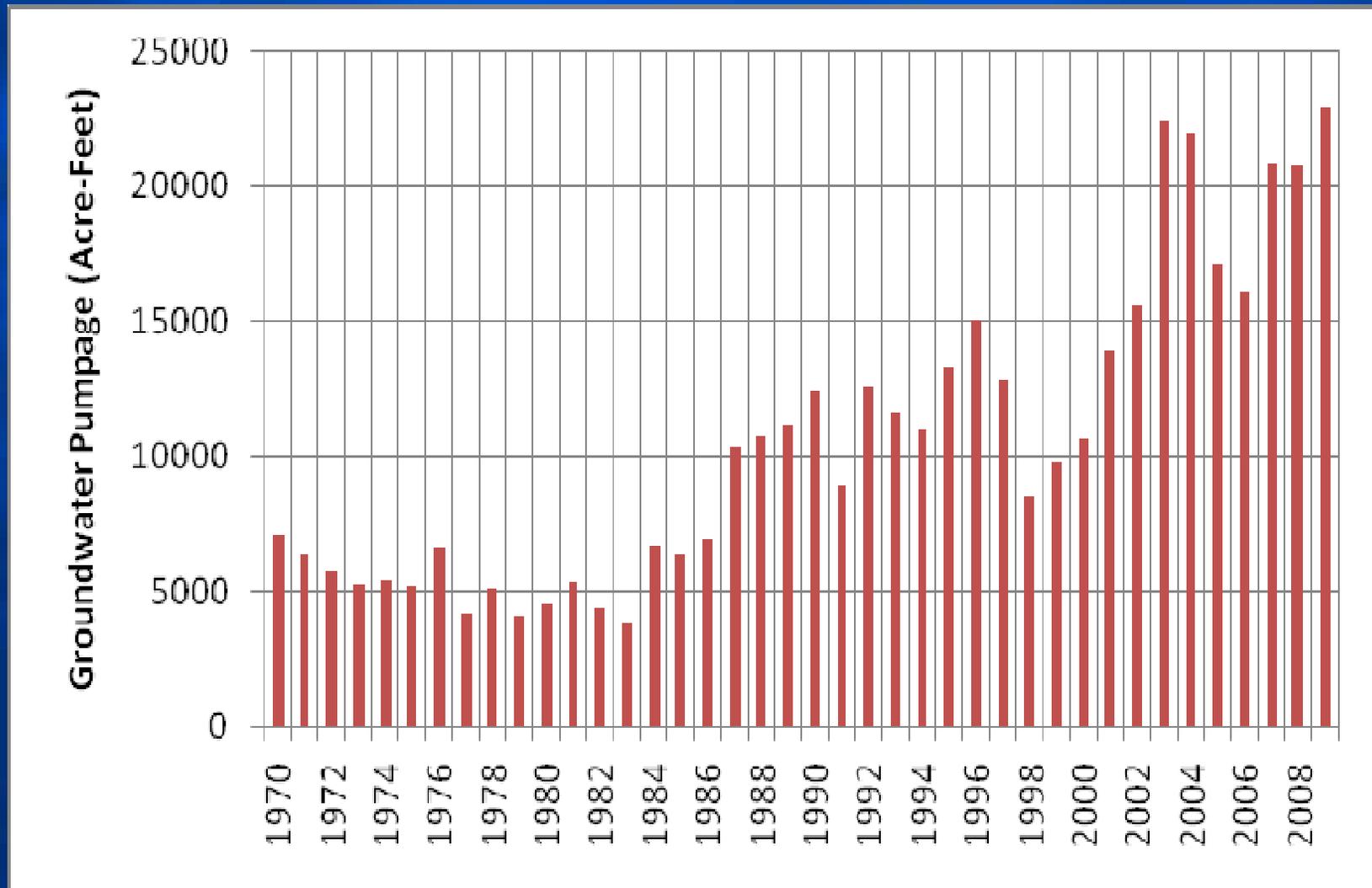
# Total Estimated Recharge



# *Recharge*

- Seepage loss from Santa Ana and Warm Creek will be estimated by model.
- Irrigation return flow will be estimated based on land use in the basin
- Deep percolation of precipitation has been calculated based on proportion of precipitation using Turner (1986).

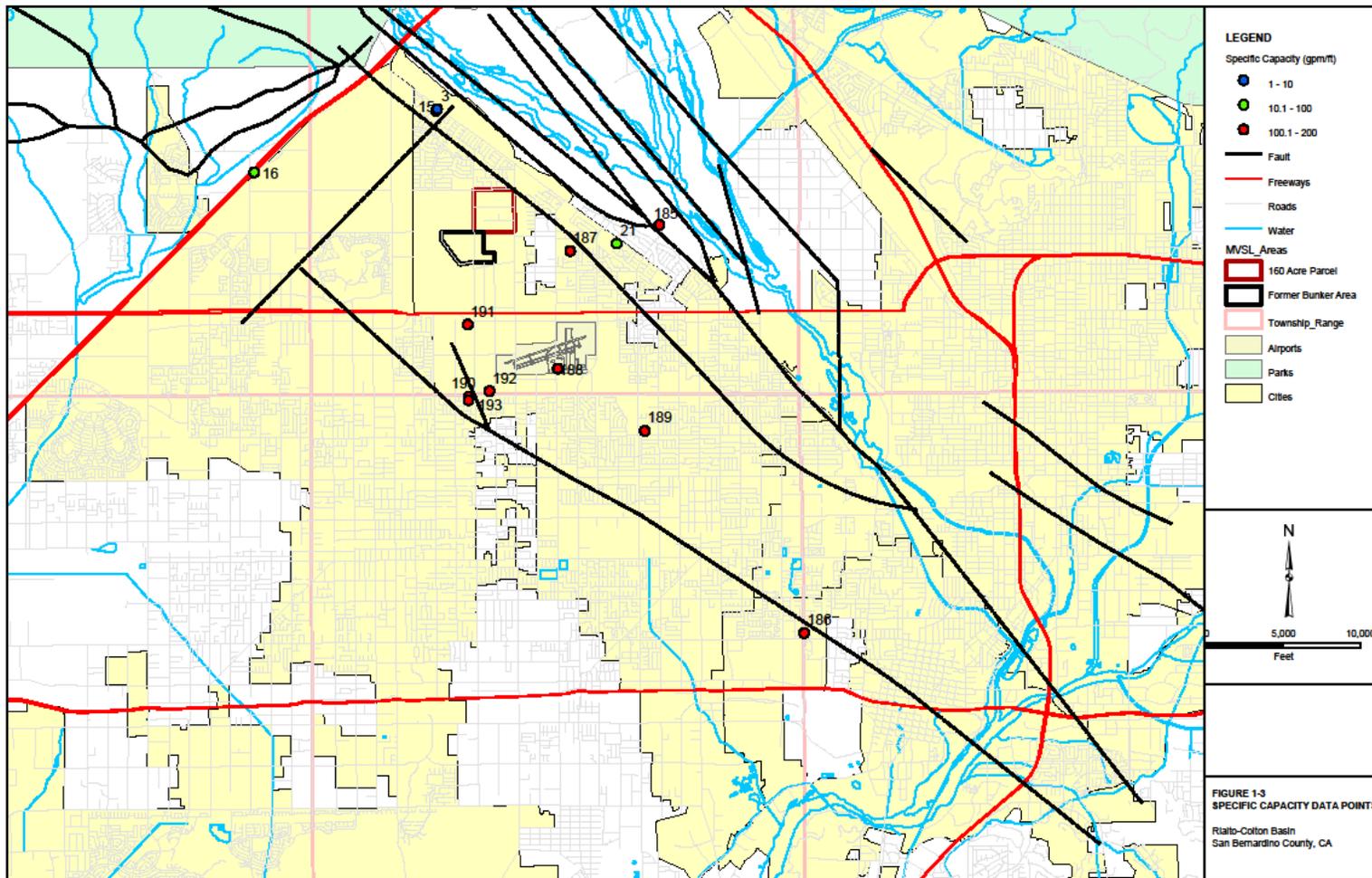
# Reported Pumping Discharge



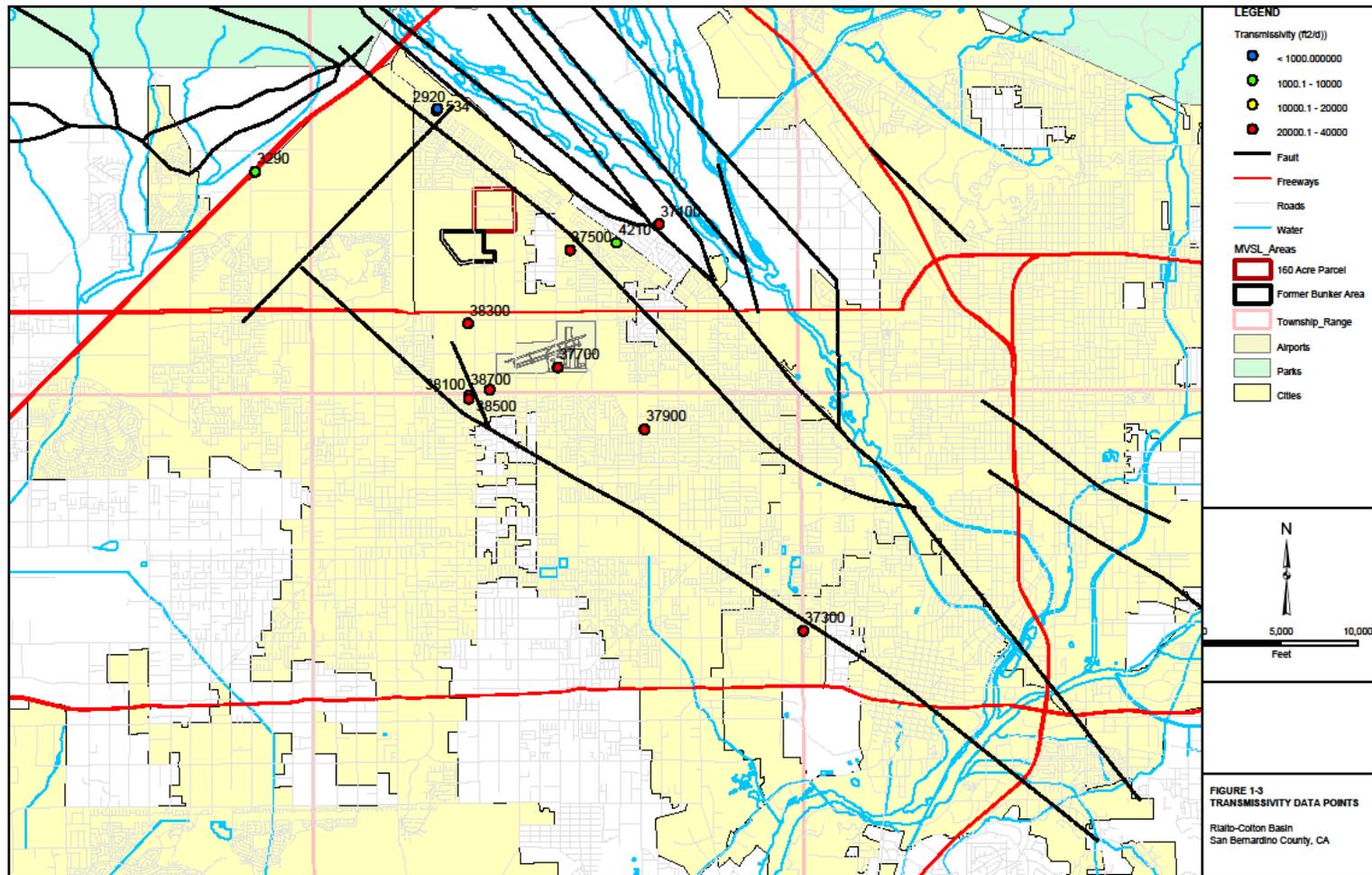
# ***Discharge***

- **Discharge from Rialto Colton basin to Chino and North Riverside Basins will be estimated by model.**
- **Discharge from aquifer to Santa Ana River and Warm Creek will be estimated by model.**
- **Evapotranspiration will only be active in the southern portion of the basin where groundwater levels are shallow.**

# Specific Capacity at Production Wells



# Transmissivity at Production Wells



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# ***Model Development***

- **The groundwater model is designed to encompass the entire Rialto Colton Basin including a narrow fringe beyond the basin boundaries.**
- **The preliminary design is a hybrid of the upper basin model (GeoLogic) and the USGS (2001) model.**

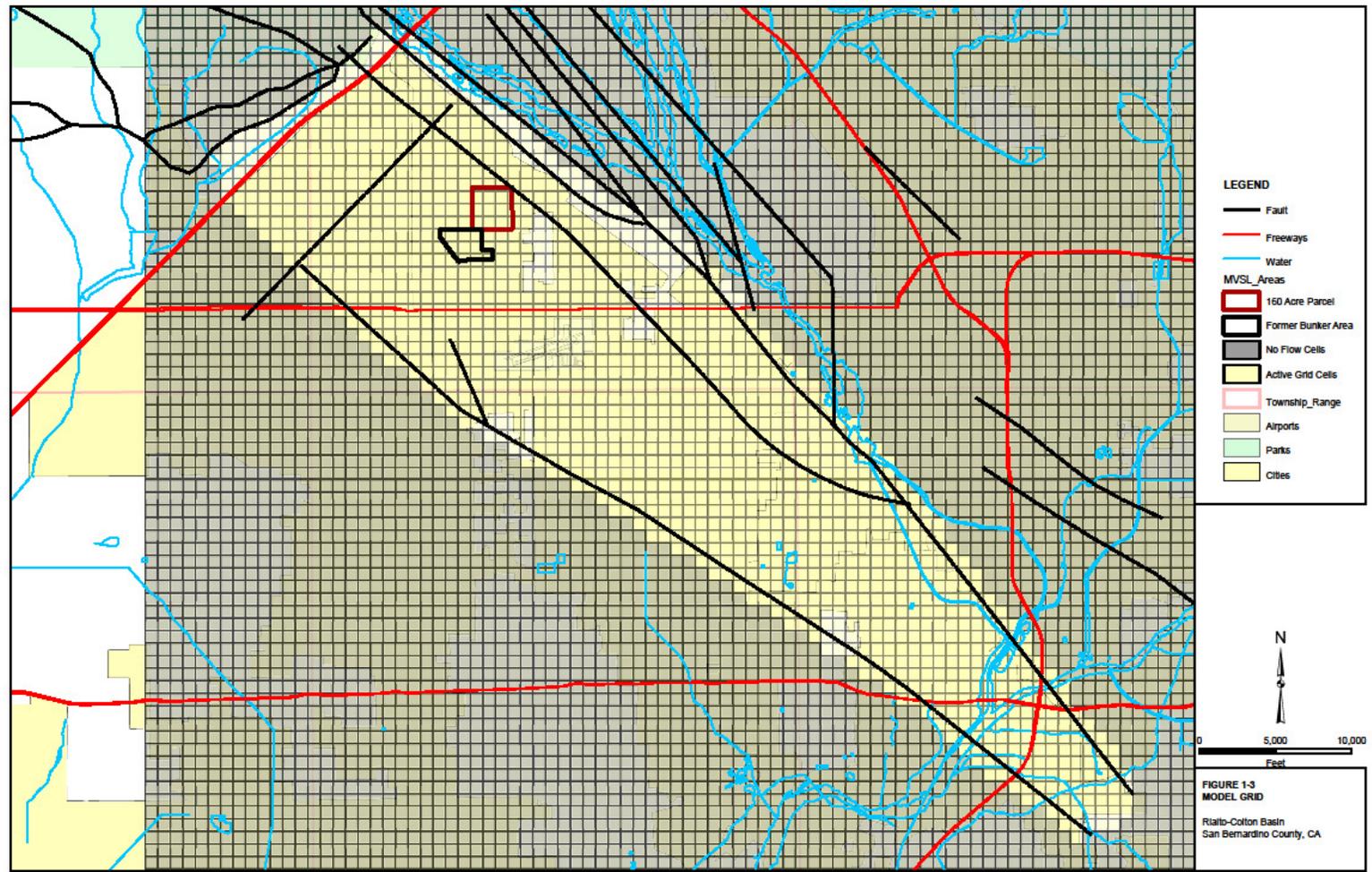
# ***Model Construction***

- **The groundwater flow model will be constructed using the MODFLOW-SURFACT modeling platform**

# ***Grid Development***

- Preliminary grid resolution is equal to the USGS (2001) model, 820 feet by 820 feet
- Grid will likely be refined in areas that are key to evaluation of potential remedial alternatives

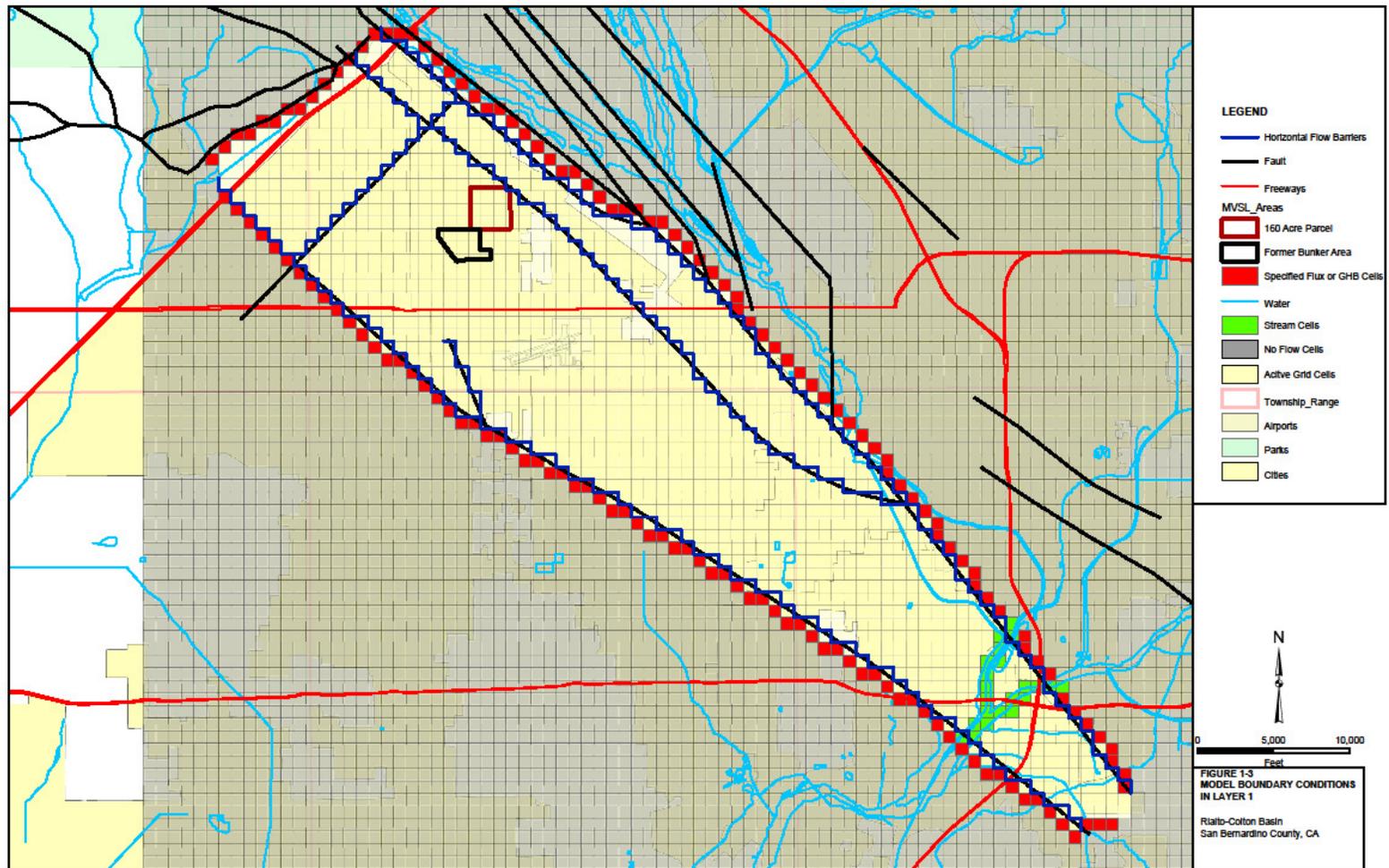
# Preliminary Model Grid



# ***Model Boundary Conditions***

- **The model will include specified flux, stream, and general head boundaries**
- **The narrow fringe of cells outside of the RC Basin will be populated using properties from the Danskin (Bunker Hill Basin) model and the Wildermuth (Chino Basin) model.**
- **Horizontal flow barriers will be placed along fault boundaries.**

# Boundary Conditions

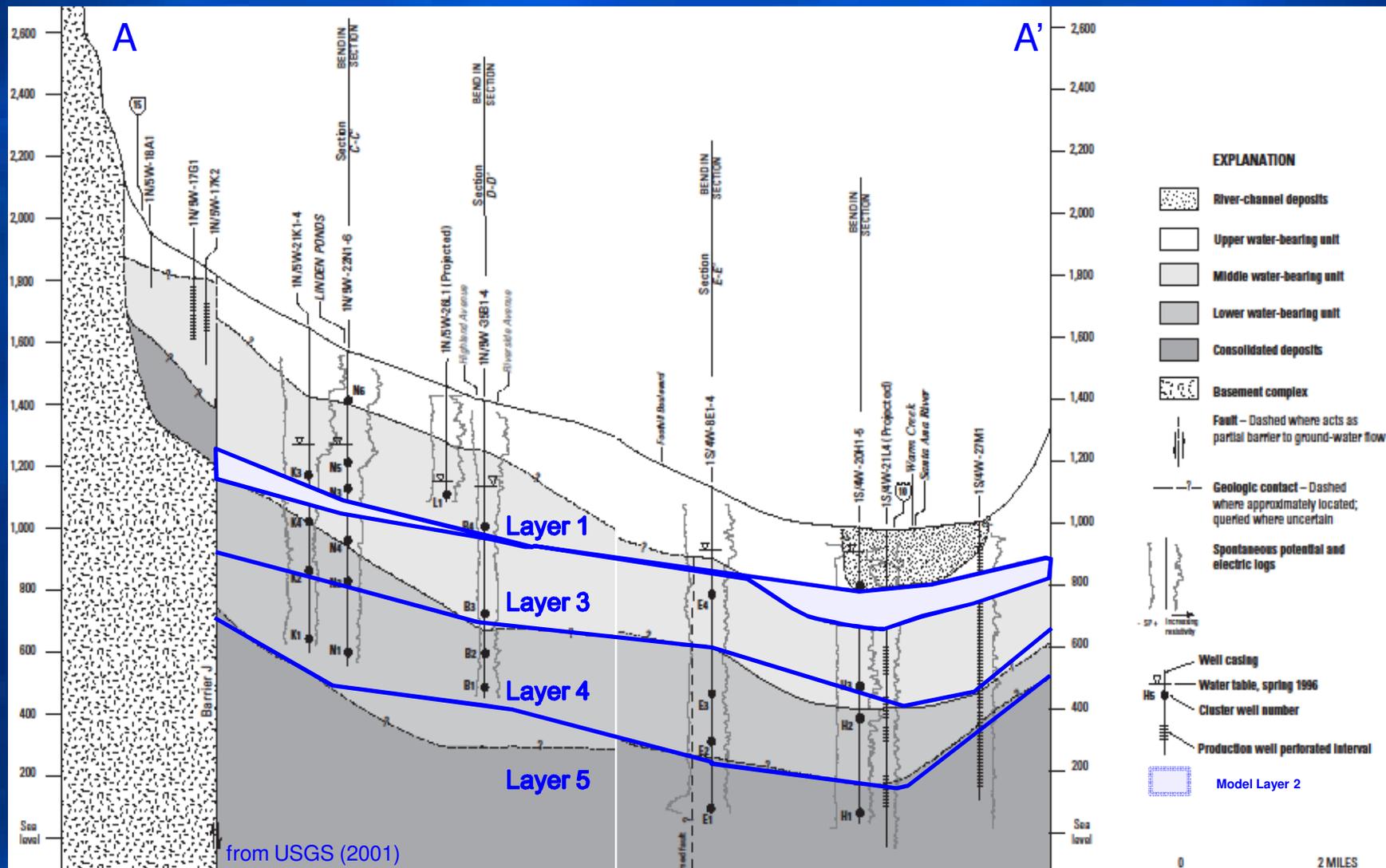


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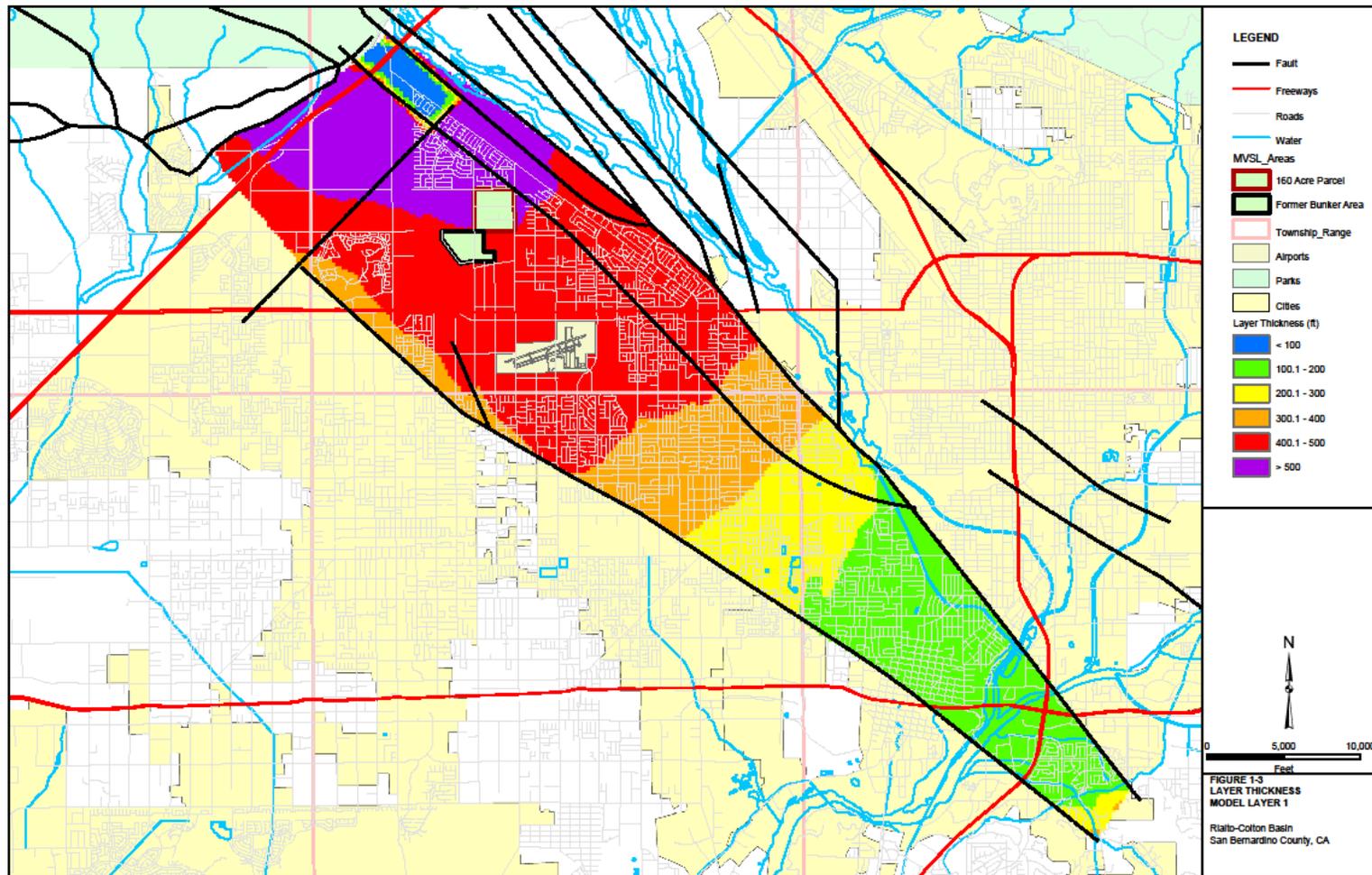
# ***Model Layering***

- **The model will consist of five layers:**
  - **Layer 1 represents the Intermediate aquifer in the upper basin and transitions into River Channel deposits in the southern basin.**
  - **Layer 2 represents the confining layer in the upper basin and transitions into the USGS Upper water-bearing unit.**
  - **Layer 3 represents the upper zone of the Regional aquifer (approximates USGS Middle water-bearing unit).**
  - **Layer 4 represents the lower zone of the Regional aquifer (approximates USGS Lower water-bearing unit).**
  - **Layer 5 represents the Consolidated deposits.**

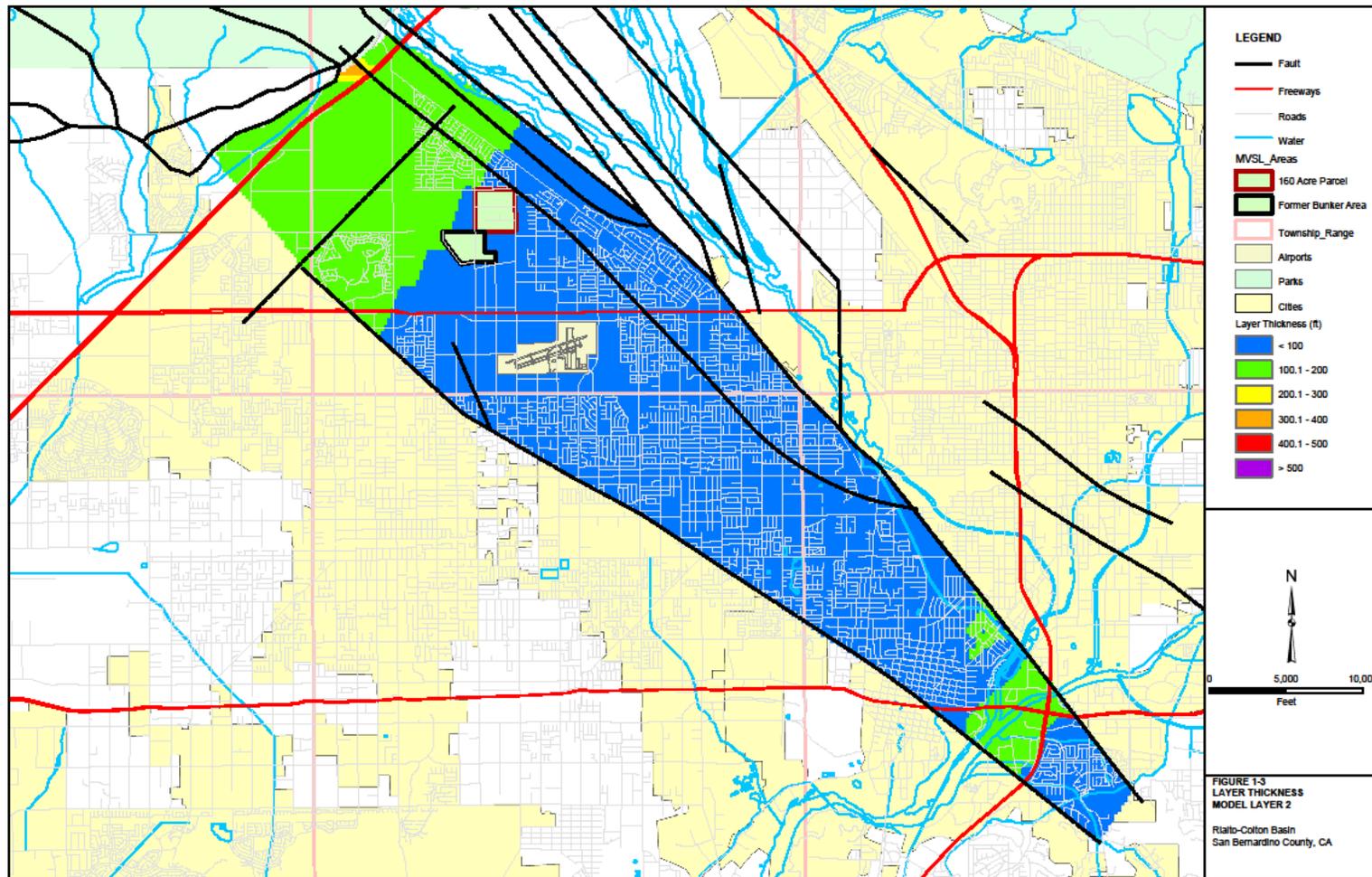
# Model Layering



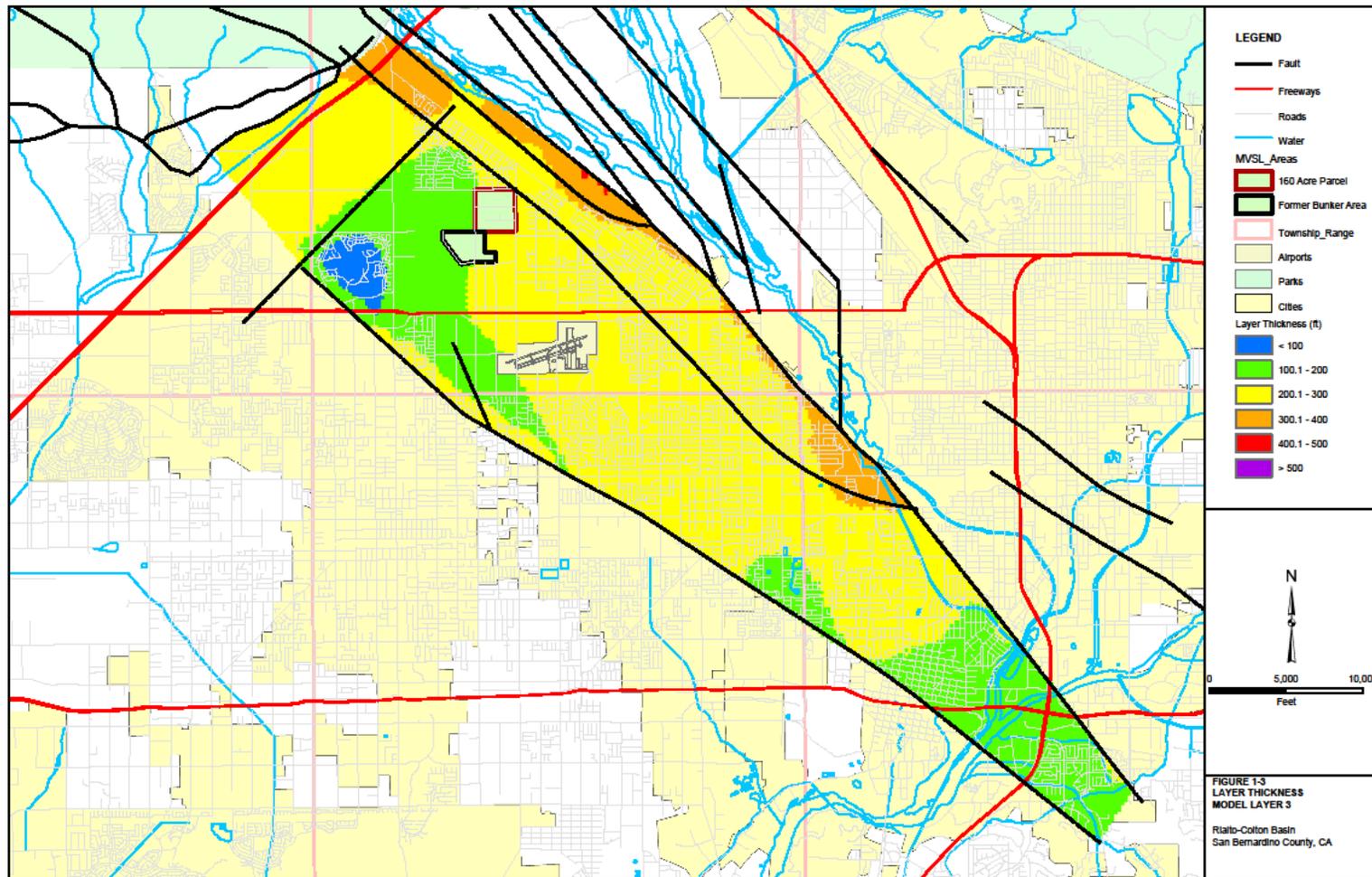
# Thickness – Model Layer 1



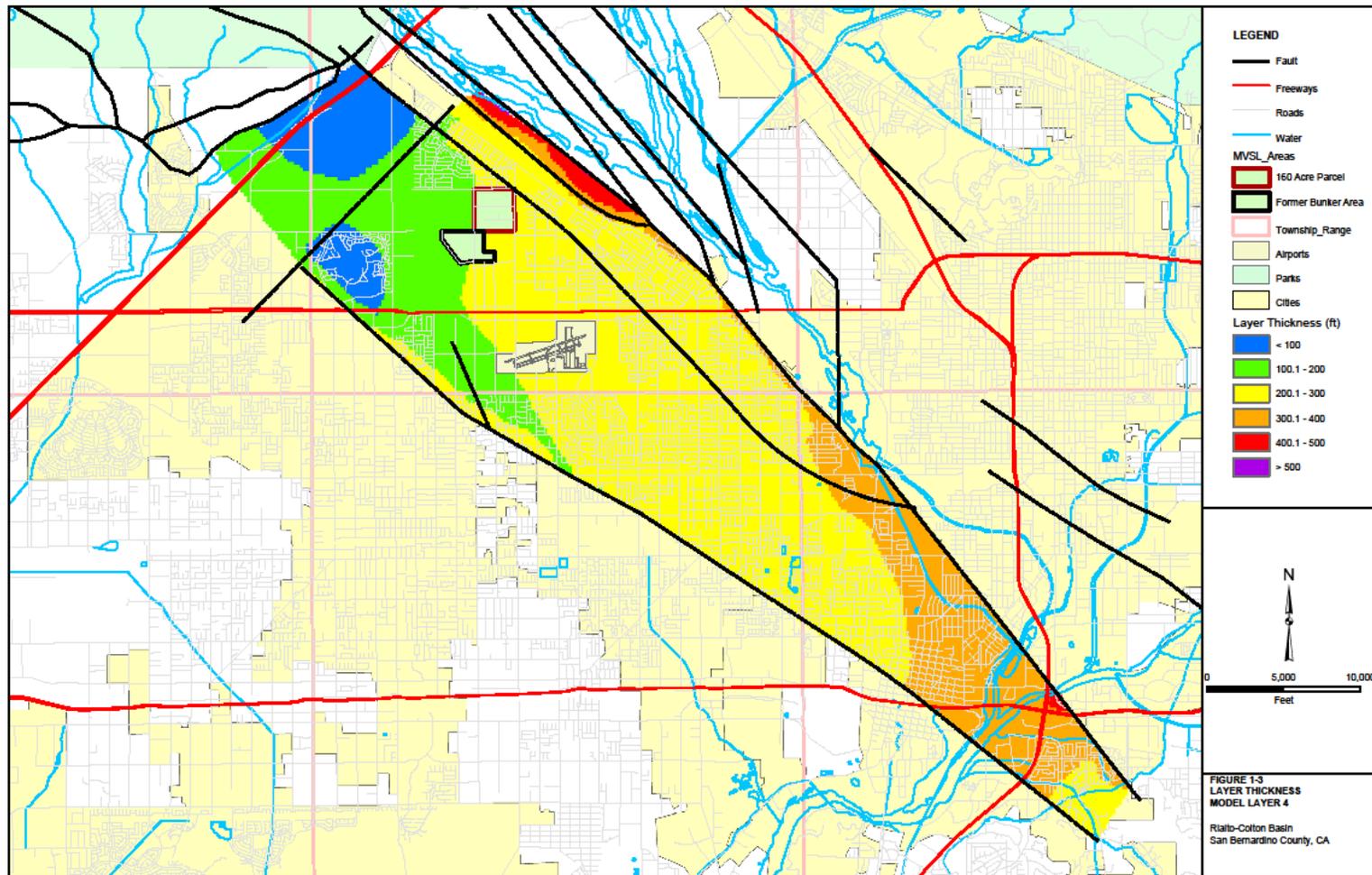
# Thickness – Model Layer 2



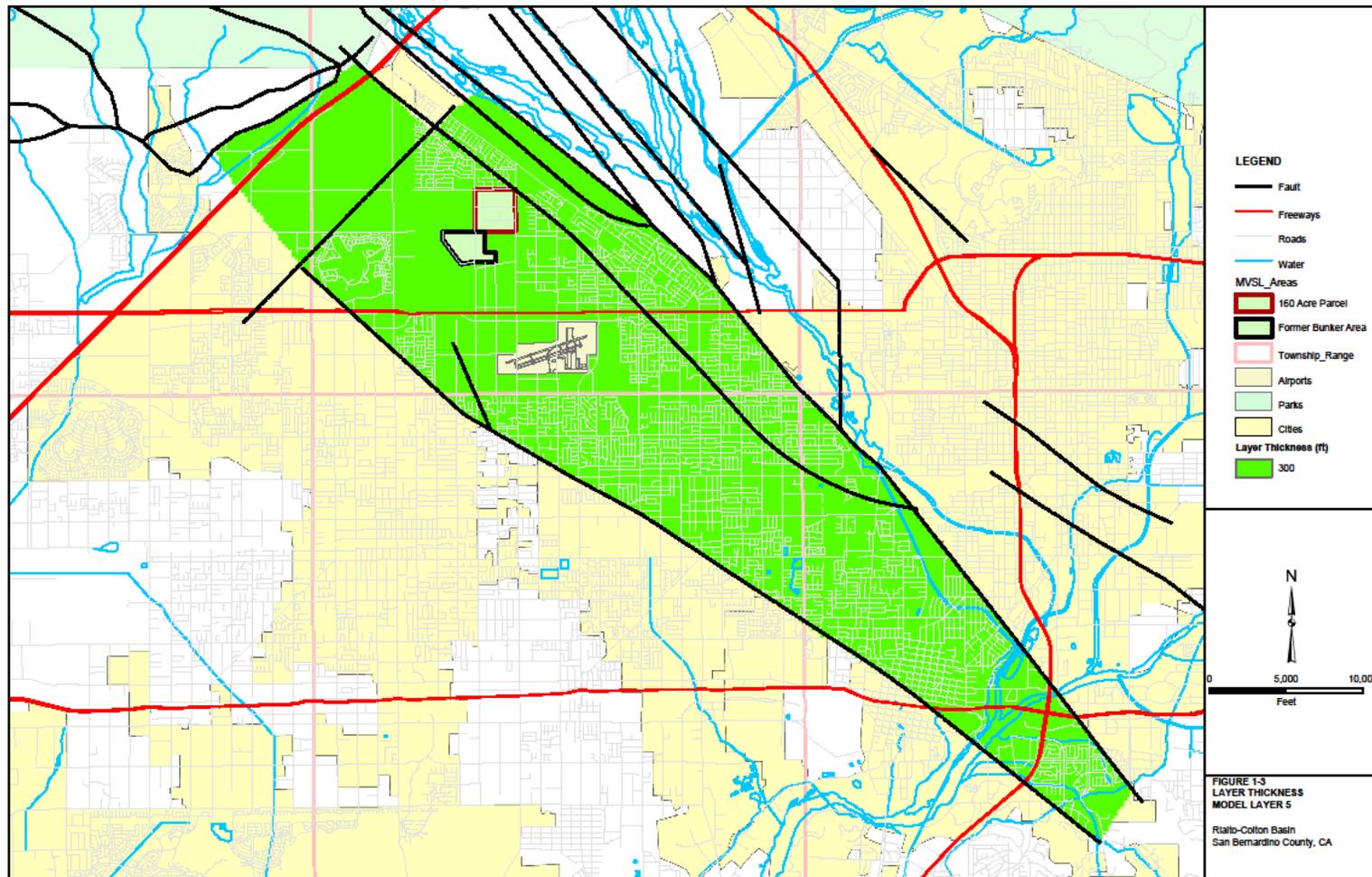
# Thickness – Model Layer 3



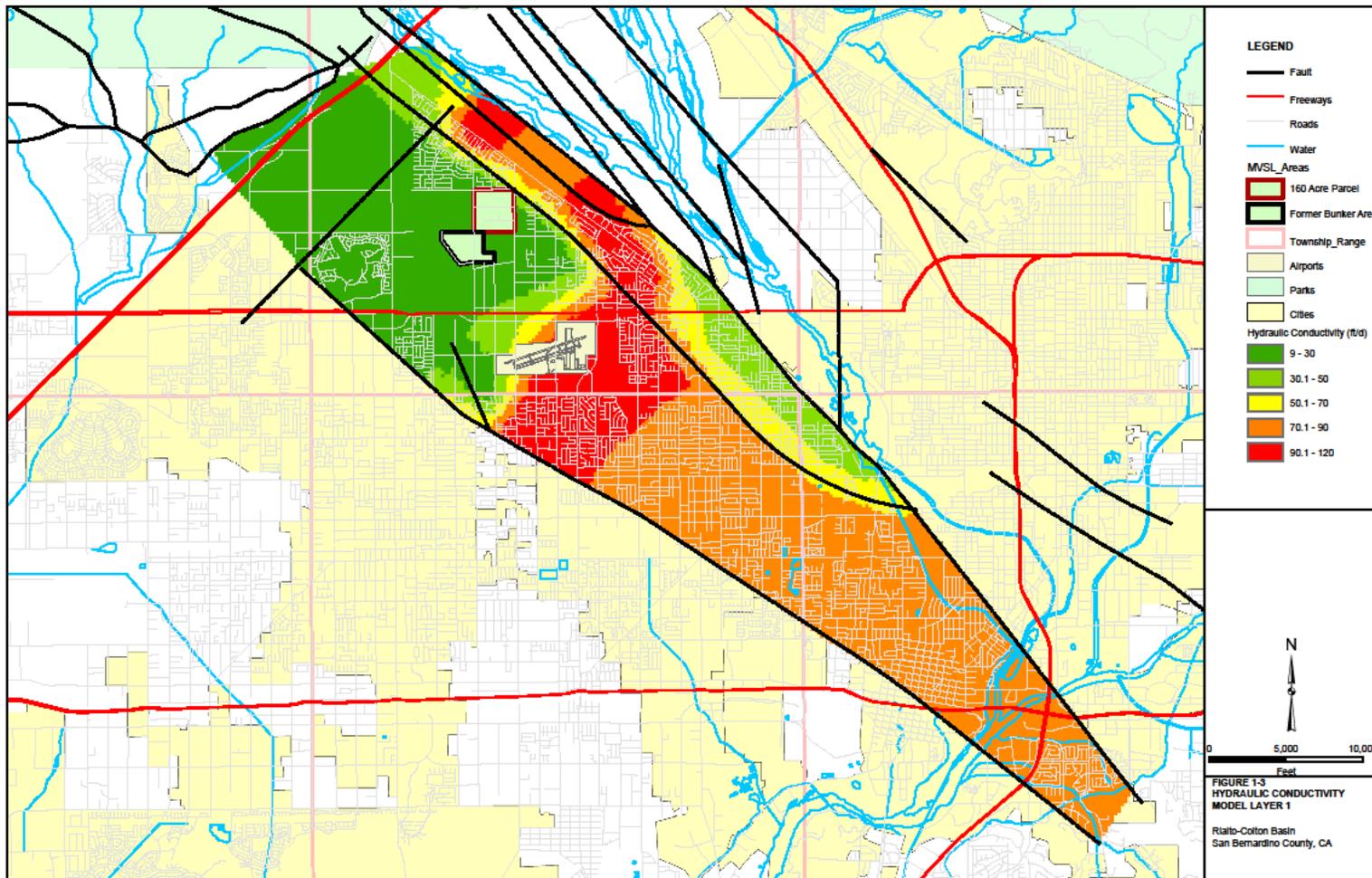
# Thickness – Model Layer 4



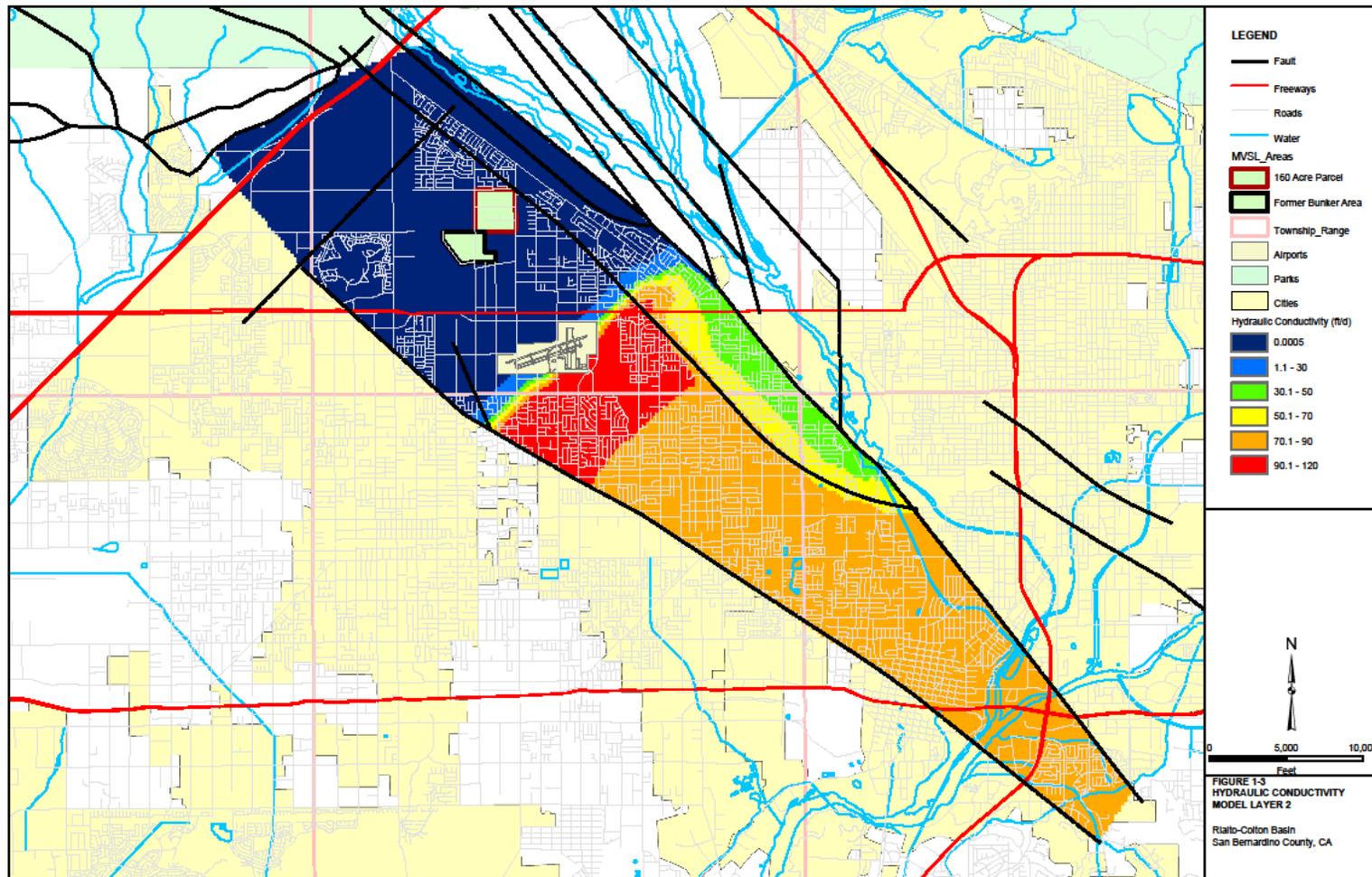
# Thickness – Model Layer 5



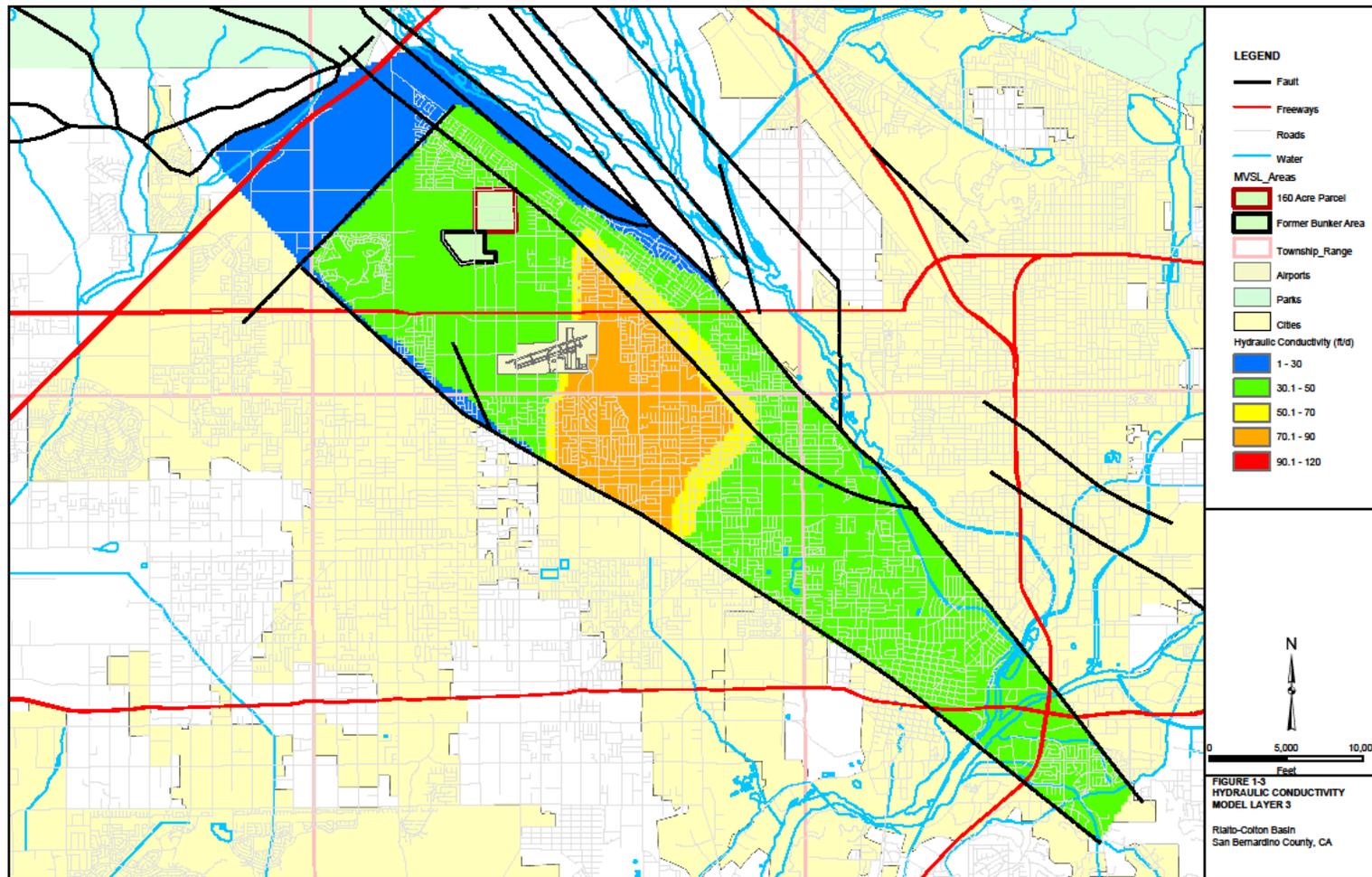
# Hydraulic Conductivity – Model Layer 1



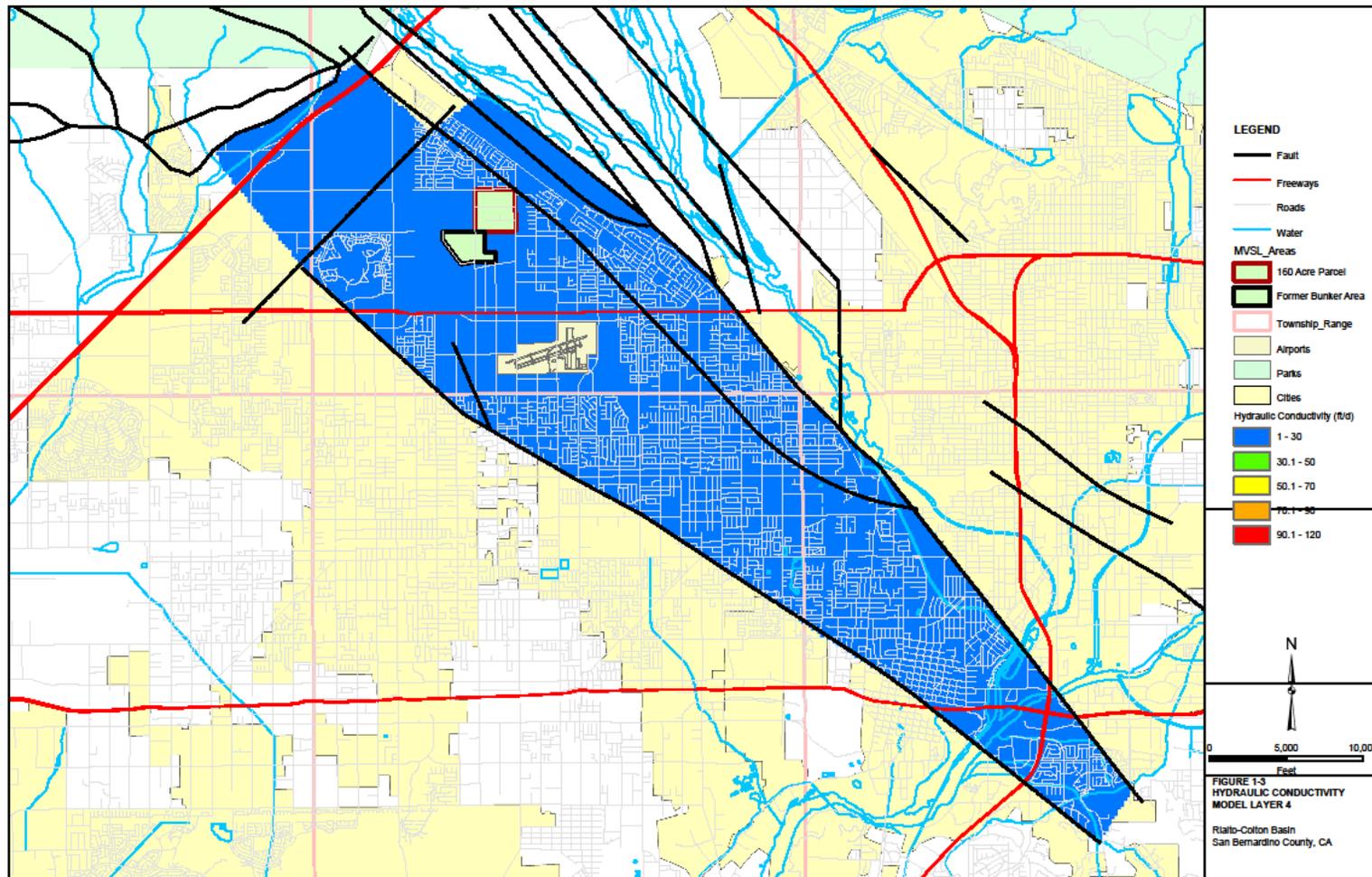
# Hydraulic Conductivity – Model Layer 2



# Hydraulic Conductivity – Model Layer 3

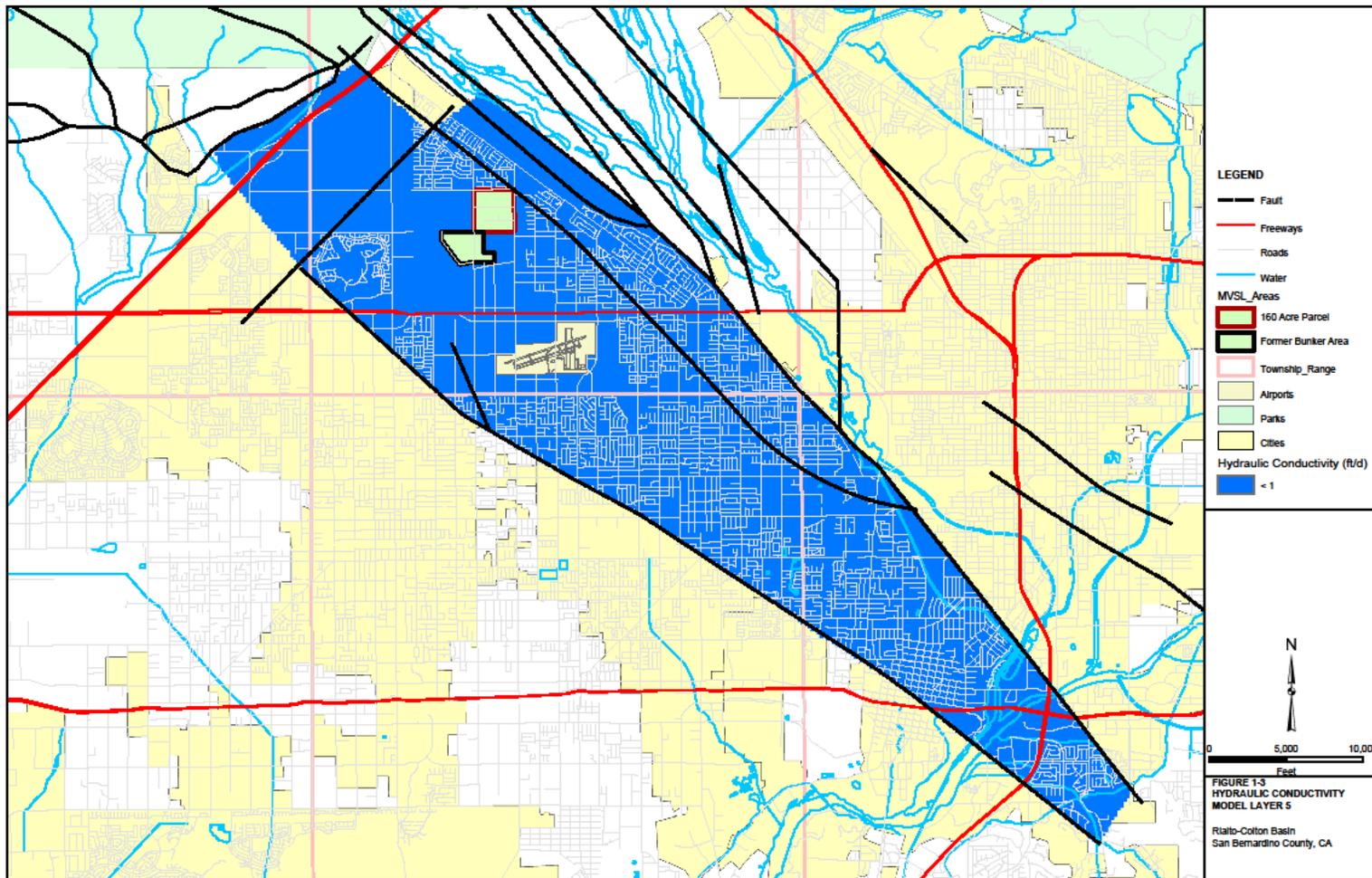


# Hydraulic Conductivity – Model Layer 4



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# Hydraulic Conductivity – Model Layer 5



# ***Vertical Hydraulic Conductivity***

- **Initial estimates of vertical hydraulic conductivity will be taken from USGS (2001).**
- **These values will be adjusted during model calibration.**

## *Next Steps*

- **Construct, refine, and calibrate groundwater model.**
- **Use the model to evaluate the rate and direction of groundwater flow to and from neighboring basins and within the Rialto Colton basin**
- **Use model to assess possible remedial options and their effectiveness in the downgradient areas of B.F. Goodrich Site contamination**