USGS / LANL / LBL SATURATED-ZONE HYDROLOGY STUDIES

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ORGANIZATION

- Why Saturated Zone
- Why Regional Studies
- Overview of Regional Studies
- Overview of Site Studies
- Overview of Modeling Studies
- Introduction of Next Speakers

Why Study Saturated Zone??

- **Last barrier before accessible environment**
- **SZ probably was "written off" too soon**
  - UZ Peer Review team agrees
  - NWTRB (1991) agrees
- **Can be characterized using widely accepted techniques**
- **Level of uncertainty may not be large**
- **Cost/benefit ratio may be favorable**
- **Can be studied using standard surface-based techniques**
- **Will contribute to "scientific confidence" in site**
- **Lower boundary to unsaturated zone**

Why Study Regional Hydrology??

- Provides framework for site studies
- Acquire understanding from previous studies
- Acquire understanding from concurrent studies
- Understand processes not obvious at Yucca Mountain
- Contribute to "scientific confidence" in site
- Acquire information at very low cost

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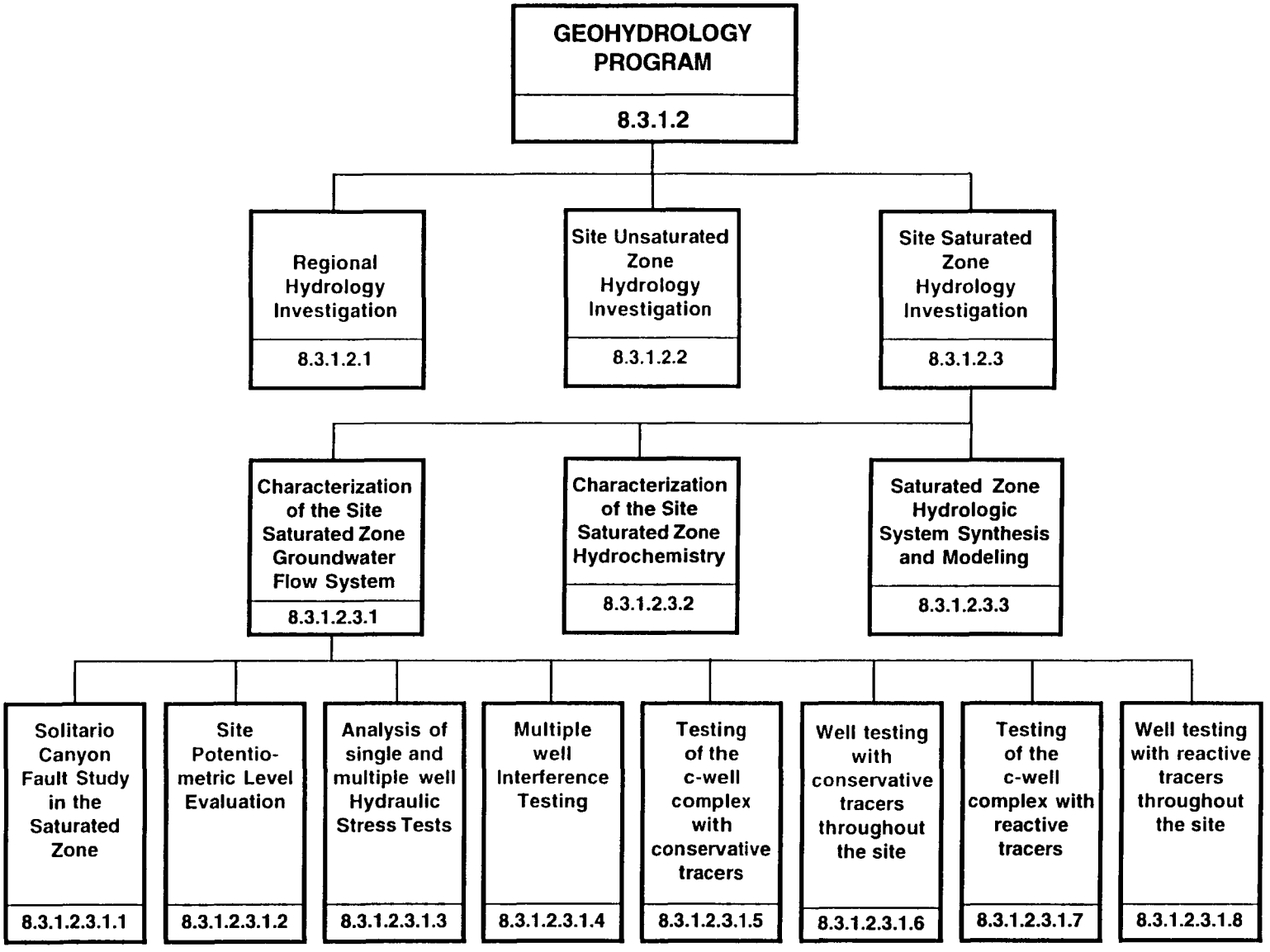

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Regional SZ Studies from SCP/SP

- Assessment of regional data
- Regional potentiometric levels and hydrogeologic framework (include hydrochemical data collection)
- Fortymile Wash recharge study (close to Y.M.)
- Evapotranspiration discharge study (close to Y.M.)
- Various modeling activities (discuss later)

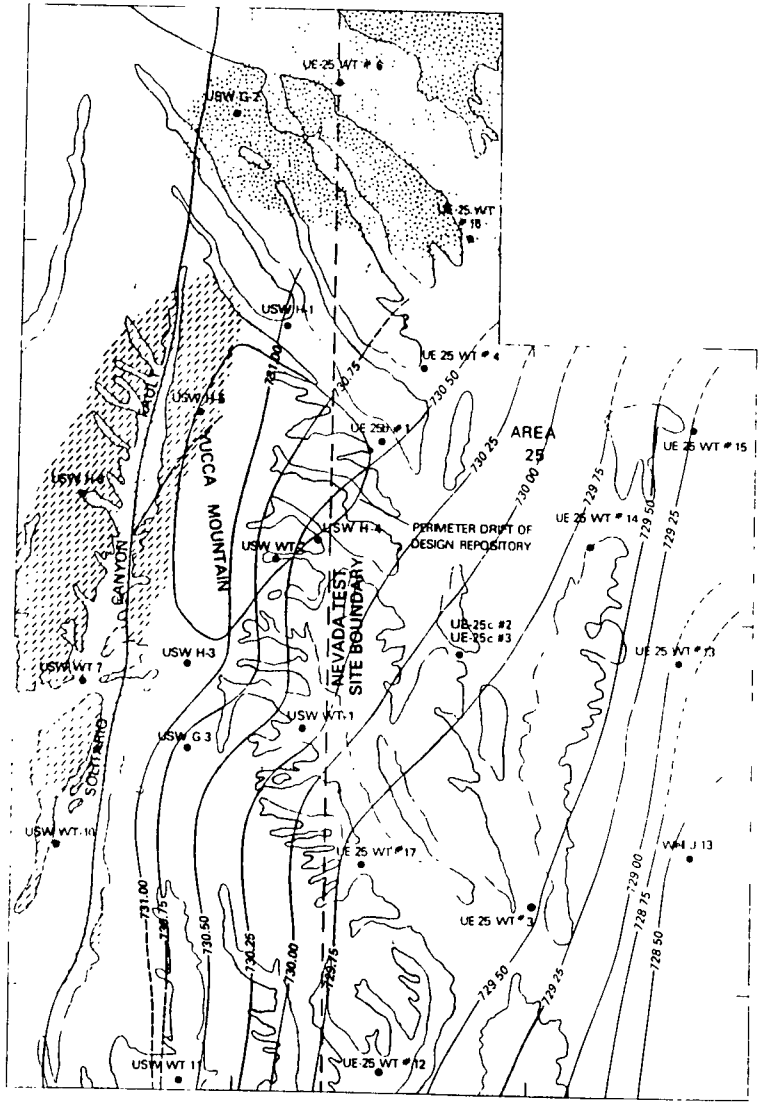
Site SZ Studies from SCP/SP

- **Potentiometric Levels**
  - Determine direction of flow
  - Cause of large hydraulic gradient (and moderate hydraulic gradient)
  - Determine stability of water table
  - Provide estimates of hydraulic properties
- **C-Well Hydraulic Tests**
  - Develop methods for site (Primary)
  - Characterize C-Well site (Secondary)
  - Packers and transducers already in place
  - Doing prototype testing at Raymond, Calif. site (with LBL)
- **C-Well Conservative Tracer Tests (USGS)**
  - Develop methods for site (Primary)
  - Characterize C-Well site (Secondary)
  - Doing prototype testing at Raymond, Calif. site (with LBL)

Site SZ Studies from SCP/SP

(CONTINUED)

[REVISED POTENTIOMETRIC MAP BY ERVIN AND OTHERS]



Site SZ Studies from SCP/SP

(CONTINUED)

- **C-Well Reactive Tracer Tests (LANL)**
  - Develop methods for site (Primary)
  - Characterize C-Well site (Secondary)
- **Conservative Tracer Tests Throughout Site (USGS)**
  - Characterize Y.M. SZ transport characteristics
- **Reactive Tracer Tests Throughout Site (LANL)**
  - Characterize Y.M. retardation characteristics

Site SZ Studies from SCP/SP

(CONTINUED)

- **Solitario Canyon Fault Study (SZ)**
  - Determine if S.C. Fault is conduit or barrier
  - Understand why moderate hydraulic gradient exists west of Y.M.
  - Learn something about effect of Ghost Dance Fault (indirect result)
- **Saturated Zone Hydrochemistry**
  - Assessment of existing data set
  - Characterize regional hydrochemistry (flow paths)
  - Characterize site hydrochemistry
  - Evaluate UZ-SZ interface (flux estimates)
  - Provide data vital to retardation studies
- **Various modeling activities (discussed next)**

Modeling Studies

[WHY CONSTRUCT A MODEL?]

- See if regulations can be met
- Do Performance Assessment calculations
- Synthesize data
- Are data sets internally consistent?
- Are processes understood?
- Is data set adequate?
- Where is further data required?

CONCLUSION: CONSTRUCT MODELS FOR DIFFERENT PURPOSES

Modeling Studies

[WHAT KIND OF MODELS?]

- Geologic Models
- Climate Models
- Flow Models
- Transport Models
- PA Models

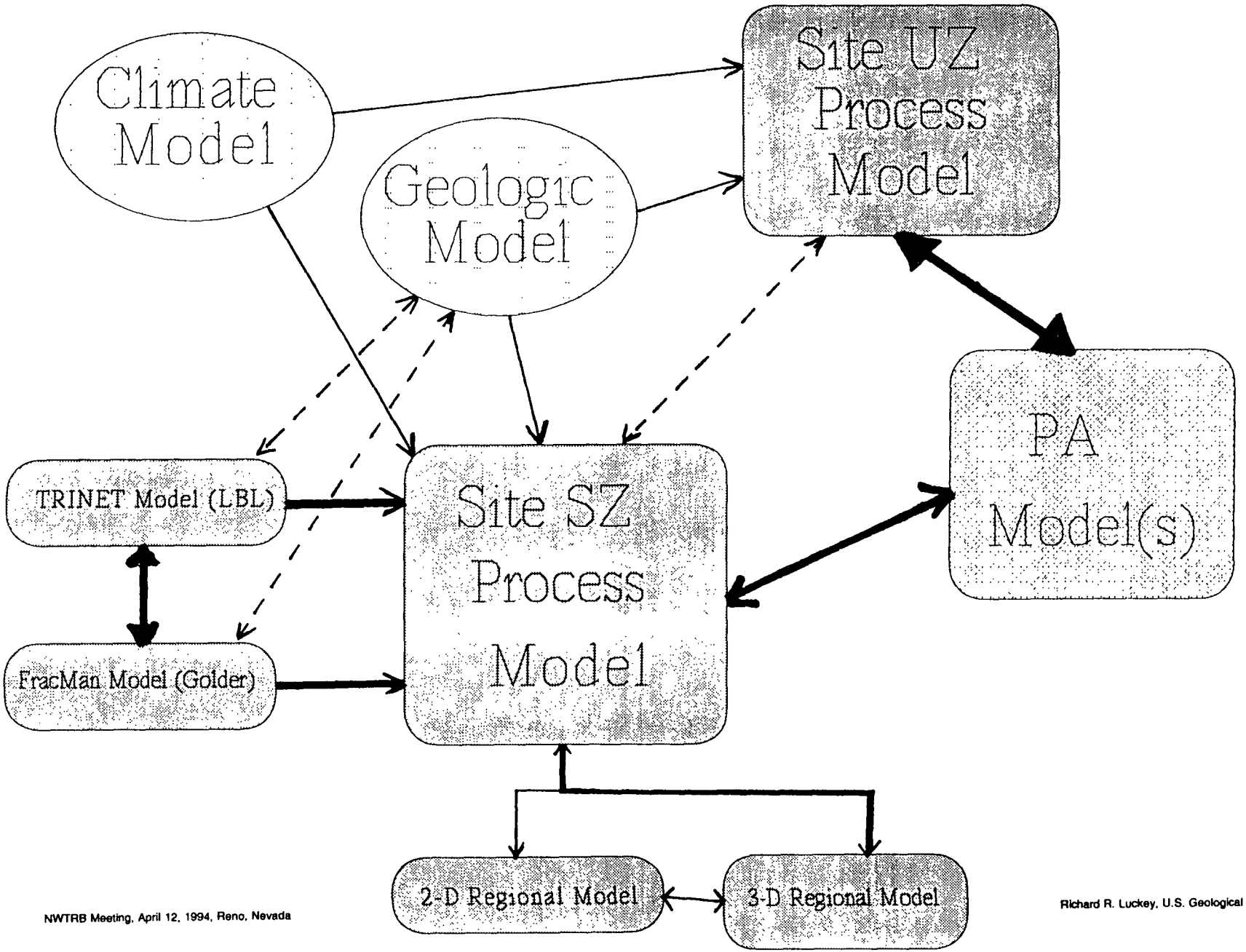
CONCLUSION: MANY DIFFERENT TYPES OF MODELS

Issues for SZ Modeling

- Fracture flow or porous media equivalent?
- Discrete features important?
- 2-D or 3-D?
- Steady state or transient?
- Boundaries of model?
- Appropriate level of detail?

SZ Process Modeling

[WHAT IS GOING ON?]



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Hydrology Potpourri

- **Kenzi Karasaki - LBL - TRINET Fracture Model**
  (PIECE OF MODELING PICTURE)

- **Bill Steinkampf - USGS - UZ-14 Hydrochemical Data**
  (PIECE OF UNSATURATED ZONE PICTURE)

- **Zell Peterman - USGS - Isotopes**
  (PIECE OF HYDROCHEMISTRY PICTURE)