

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

SUBJECT: WATER RESOURCES

PRESENTER: OTTO MOOSBURNER

**PRESENTER'S TITLE
AND ORGANIZATION: HYDROLOGIST
U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION**

**PRESENTER'S
TELEPHONE NUMBER: (702) 882-1388**

APRIL 24, 1990

POTENTIAL EFFECTS OF SITE CHARACTERIZATION ACTIVITIES

- **WATER QUANTITY**

- **WELL AND AQUIFER PUMP TESTING**
- **WITHDRAWALS FOR WATER SUPPLIES**

- **WATER QUALITY**

- **SEWAGE DISPOSAL**
- **CHEMICAL SPILLS**
- **OTHER INTRUSIONS**

OBJECTIVES OF THE WATER RESOURCES MONITORING PROGRAM

- **CHARACTERIZE WATER RESOURCES WITH RESPECT TO QUANTITY AND QUALITY**
- **DETECT AND DOCUMENT SIGNIFICANT CHANGES IN THE QUANTITY OR QUALITY OF WATER RESOURCES OVER TIME**
- **IDENTIFY ANY SIGNIFICANT, ADVERSE IMPACTS ON WATER RESOURCES WHICH MAY BE DUE TO SITE CHARACTERIZATION**
- **DEVELOP COMPREHENSIVE WATER RESOURCES DATA BASE**

TECHNICAL QUESTIONS

- 1. WHAT IS THE POTENTIAL FOR DEGRADATION OF WATER QUALITY IN THE YUCCA MOUNTAIN AREA?**
- 2. WHAT IS THE POTENTIAL FOR REDUCTION OF WATER RESOURCES IN THE YUCCA MOUNTAIN AREA?**
- 3. WHAT IS THE POTENTIAL FOR LOWERING OF WATER LEVELS AND DECREASES IN SPRINGFLOW ON DEATH VALLEY NATIONAL MONUMENT LANDS?**

TECHNICAL APPROACH

- **INVENTORY, COMPILE, AND EVALUATE AVAILABLE HYDROLOGIC DATA (ONGOING EFFORT)**
- **DESIGN AND INTEGRATE LOCAL AND REGIONAL WATER RESOURCES MONITORING NETWORKS**
- **MONITOR THE QUANTITY AND QUALITY OF WATER RESOURCES**
- **IDENTIFY CHANGES IN WATER RESOURCES AND THE POTENTIAL IMPACT OF SITE CHARACTERIZATION AND MITIGATION ACTIVITIES ON WATER RESOURCES**

DATA INVENTORY, EVALUATION, AND COMPILATION

STATUS/ACCOMPLISHMENTS

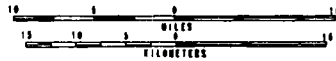
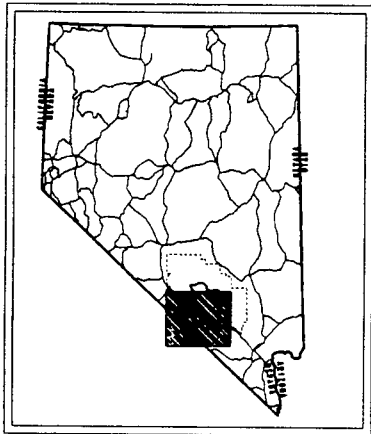
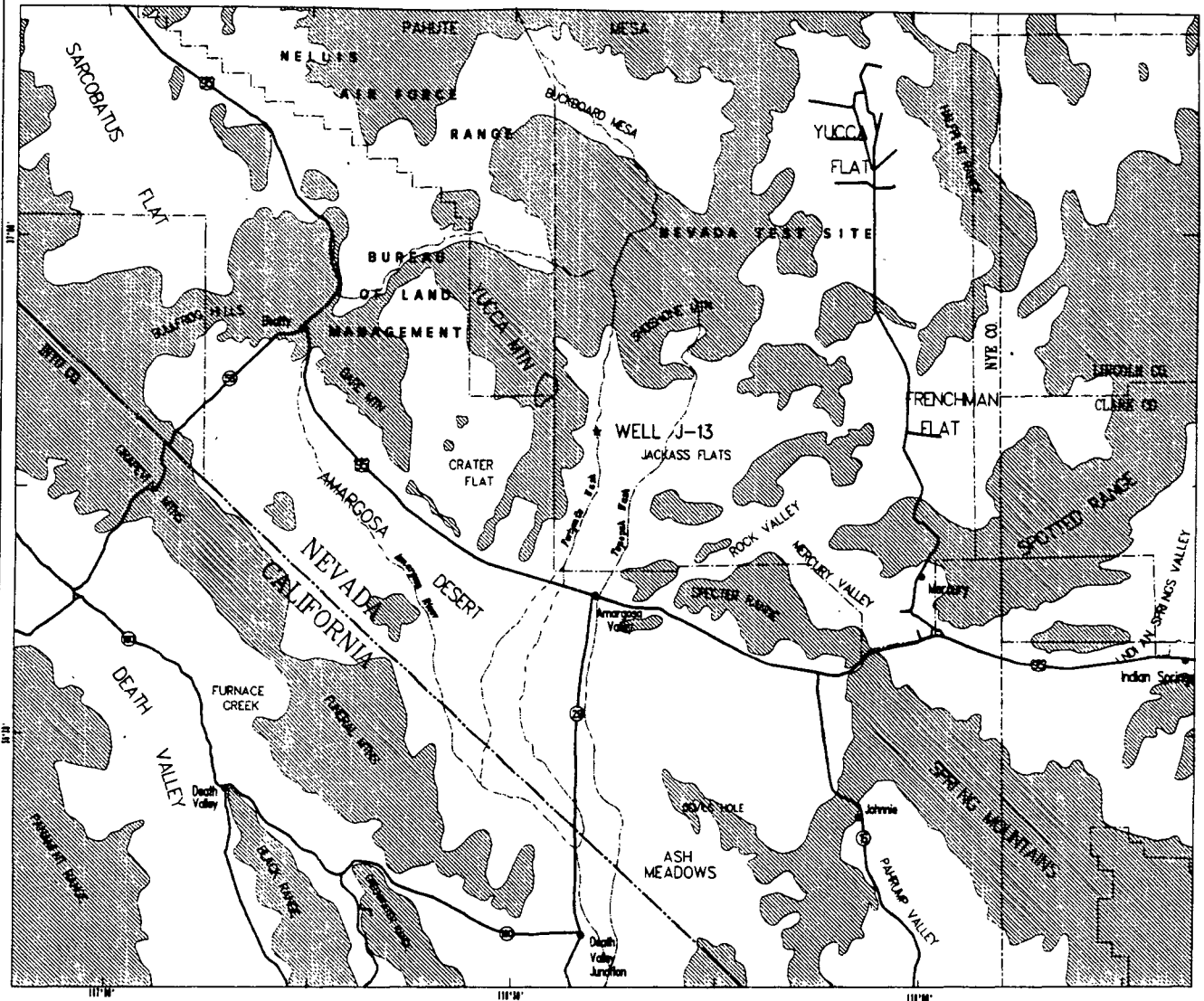
- **REVIEWING YUCCA MOUNTAIN PROJECT SITE CHARACTERIZATION ACTIVITIES**
- **ONGOING CONSULTATIONS WITH NATIONAL PARK SERVICE, AND U.S. FISH AND WILDLIFE SERVICE**
- **EVALUATING TECHNICAL LITERATURE FOR:**
 - **REGIONAL AND LOCAL FLOW SYSTEMS**
 - **PAST AND PRESENT WATER-QUANTITY DATA**
 - **PAST AND PRESENT WATER-QUALITY DATA**

DATA INVENTORY, EVALUATION, AND COMPILATION

(CONTINUED)

FUTURE PLANS

- **CONTINUE INVENTORY AND EVALUATION OF INFORMATION**
- **COMPILE HISTORICAL WATER-QUANTITY AND WATER-QUALITY DATA**



GENERAL FEATURES

- ~ Primary Highway
- ~ Secondary Highway
- ~ Light-Only, Improved Road
- ~ Surface Drainage Channel
- ~ State Line
- ~ County Line
- ~ Administrative Boundary
- Conceptual Perimeter Drift Boundary



**YUCCA MOUNTAIN PROJECT
GENERAL FEATURES
OF YUCCA MOUNTAIN AND VICINITY**

General features interpreted and digitized from USGS 1:250,000 scale series maps: Goldfield, NV/CA; Death Valley, CA/NV; Caliente NV/UT; Las Vegas, NV/AZ/CA

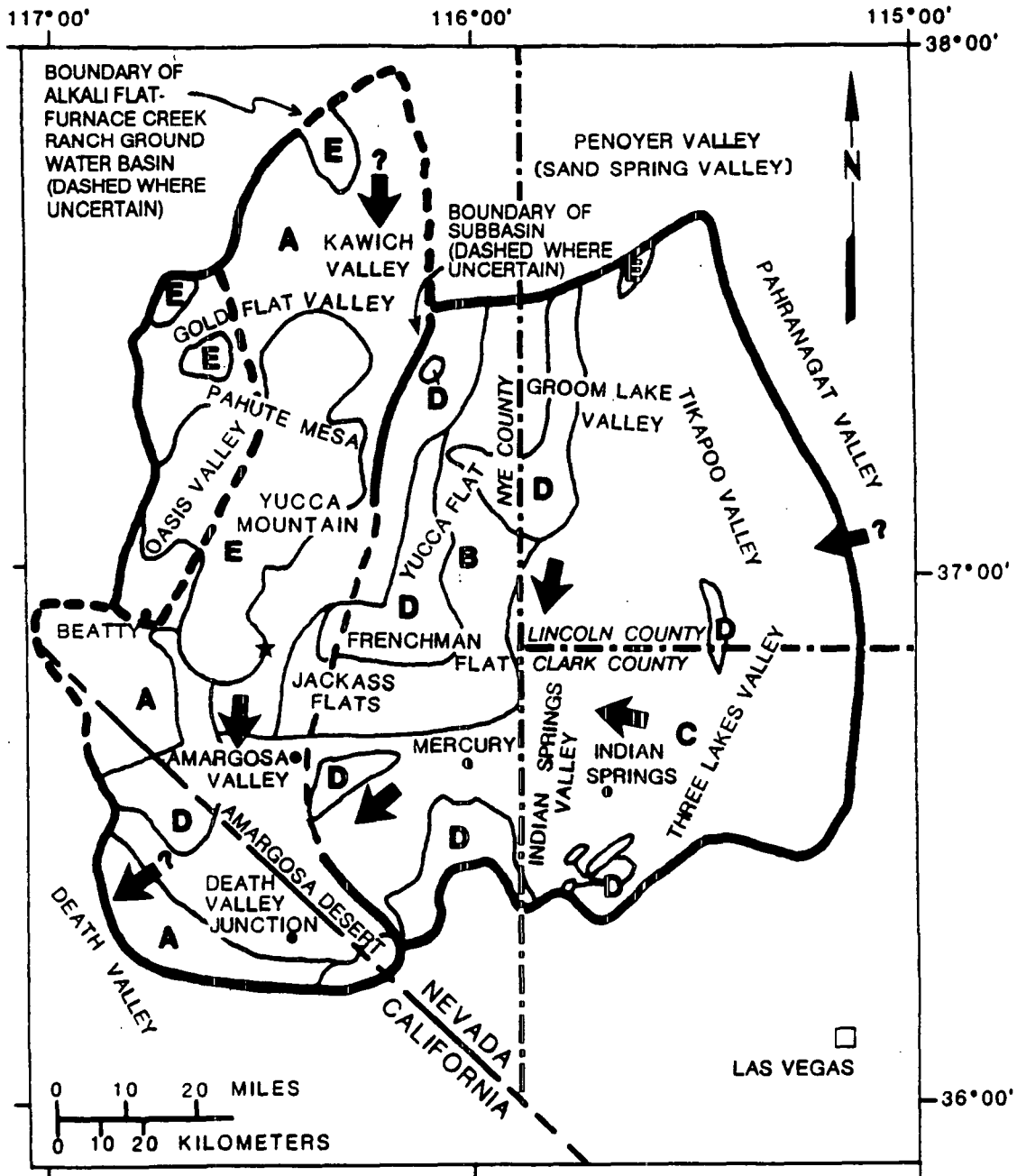
Yucca Mountain Conceptual Perimeter Drift Boundary derived from coordinate data as reported by Sandia National Laboratories Drawing Number R07003A, April 11, 1986.

Map compiled in April 1990.



WP-40-034.1

GEOGRAPHIC FEATURES AND GENERALIZED FLOW DIRECTIONS IN AND NEAR STUDY AREA



APPROXIMATE LOCATION OF YUCCA MOUNTAIN SITE

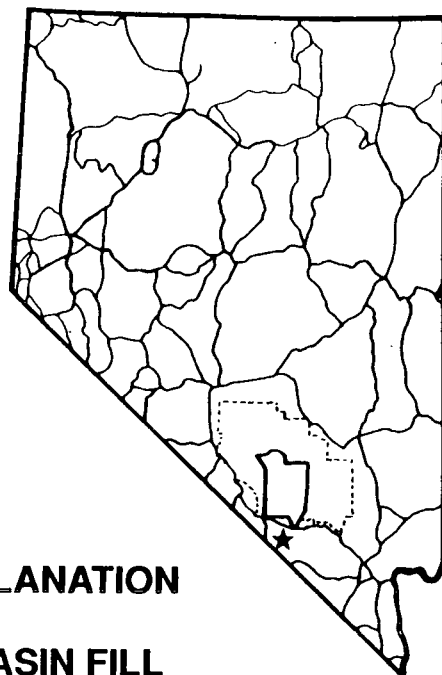


GENERAL DIRECTION OF REGIONAL GROUND-WATER FLOW (QUESTION MARK INDICATES UNCERTAINTY)






- A. VOLCANIC ROCK AQUIFERS AND AQUITARDS OVERLYING CLASTIC AQUITARDS OR LOWER CARBONATE AQUIFER
- B. VOLCANIC ROCK AQUIFERS AND AQUITARDS OVERLYING LOWER CARBONATE AQUIFER
- C. LOWER CARBONATE AQUIFER
- D. CLASTIC AQUITARDS
- E. VOLCANIC ROCK AQUIFER AND AQUITARDS OF CALDERAS

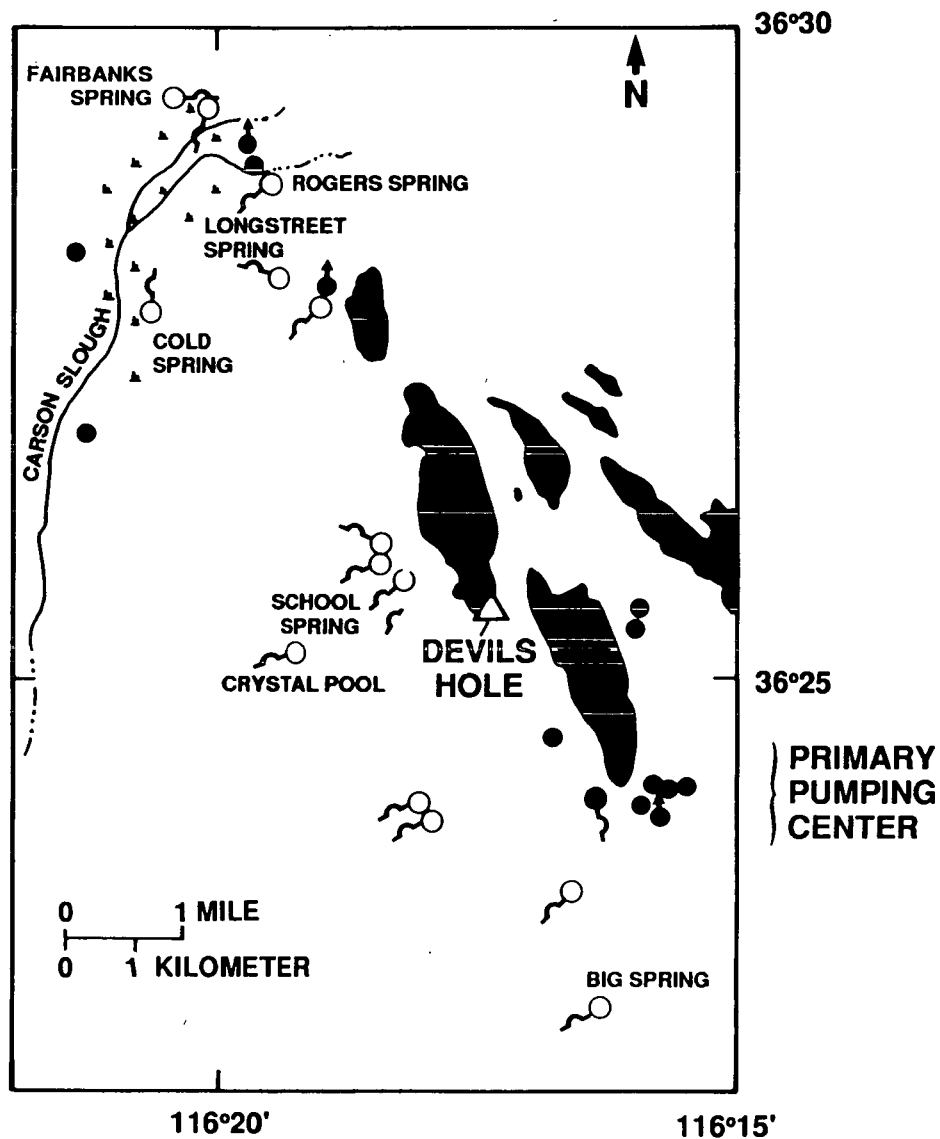
NOTE: FOR CLARITY, VALLEY FILL AQUIFER NOT SHOWN

LOCATION OF WELLS, SPRINGS, AND DEVILS HOLE IN THE ASH MEADOWS AREA



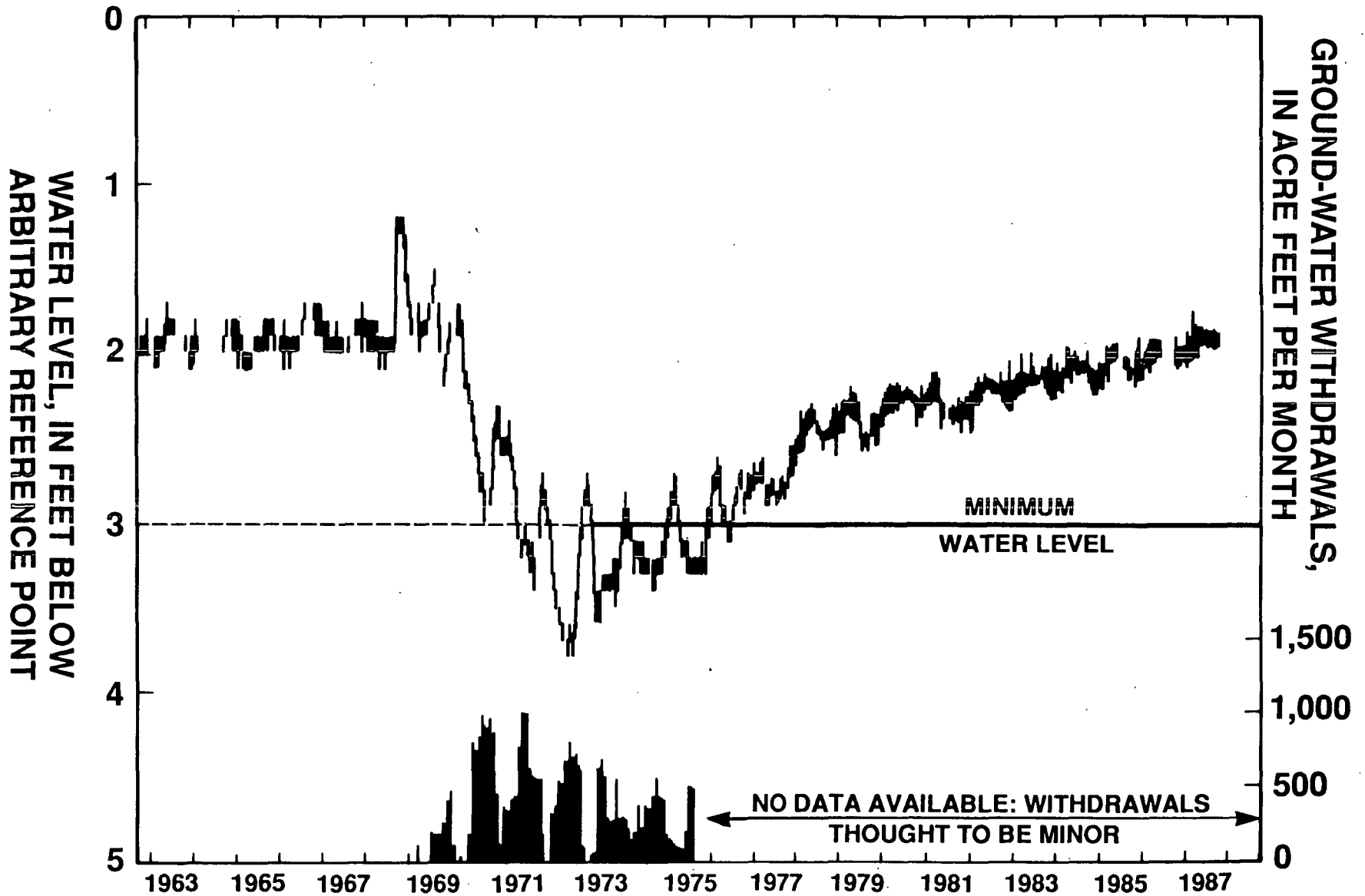
EXPLANATION

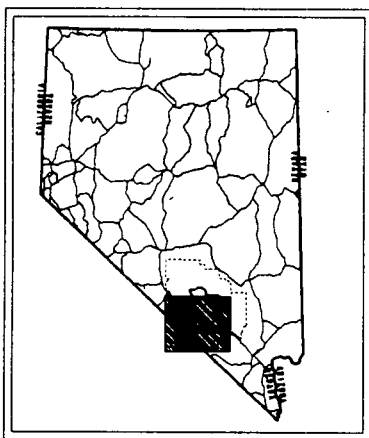
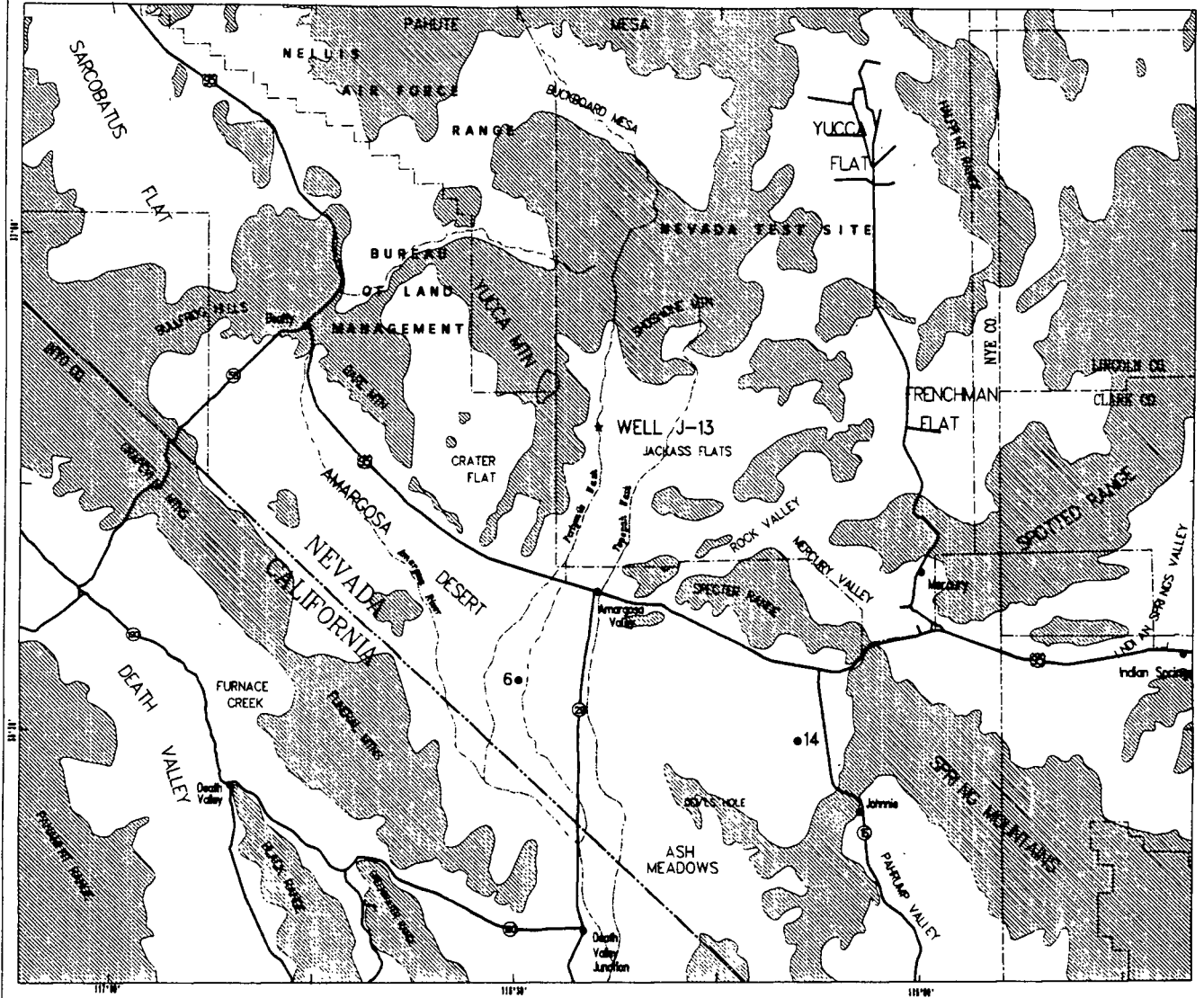
-  BASIN FILL
-  CARBONATE-ROCK OUTCROPS
-  PRODUCTION WELL
-  FLOWING PRODUCTION WELL
-  SPRING



Note: Well J-13 approx. 20 miles north

WATER-LEVEL FLUCTUATIONS IN DEVILS HOLE AND ESTIMATED MONTHLY GROUND-WATER WITHDRAWALS IN THE ASH MEADOWS AREA





- PROPOSED SITES**
- ★ Production Well J-13
 - Water-Level Monitoring Site

- GENERAL FEATURES**
- Primary Highway
 - Secondary Highway
 - Light-Duty, Improved Road
 - Surface Drainage Channel
 - State Line
 - County Line
 - Administrative Boundary
 - Conceptual Perimeter Drift Boundary

YUCCA MOUNTAIN PROJECT
LOCATIONS OF TWO MONITORING
SITES IN THE AMARGOSA DESERT

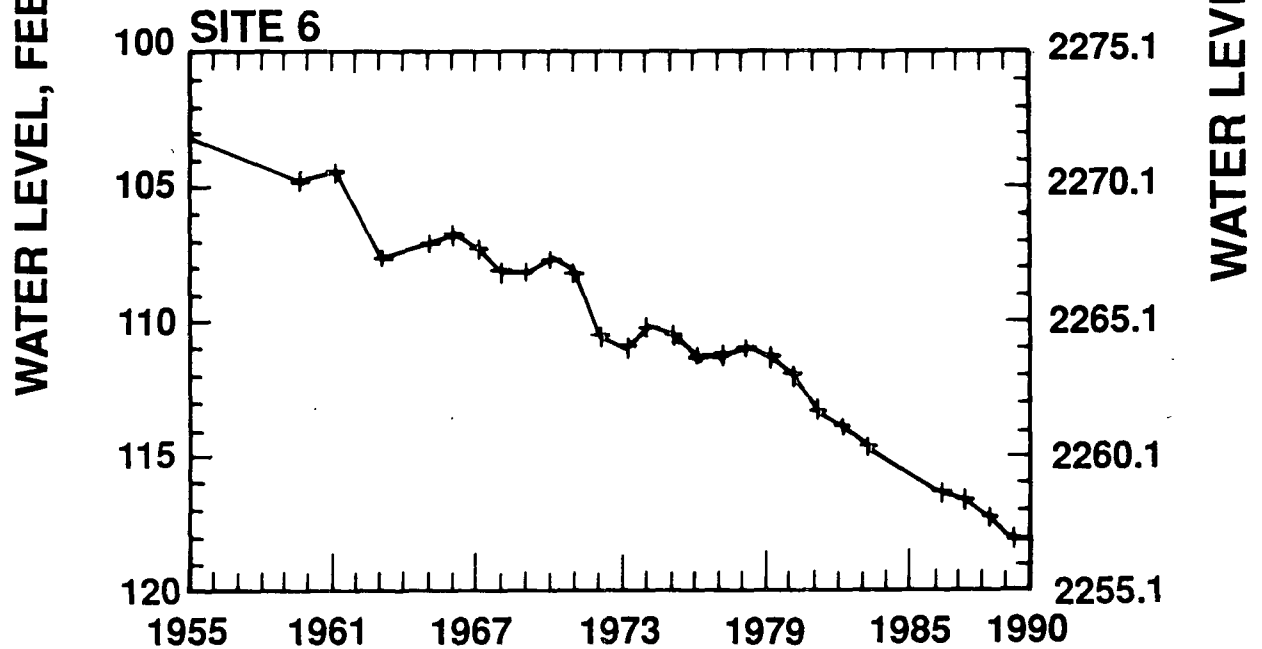
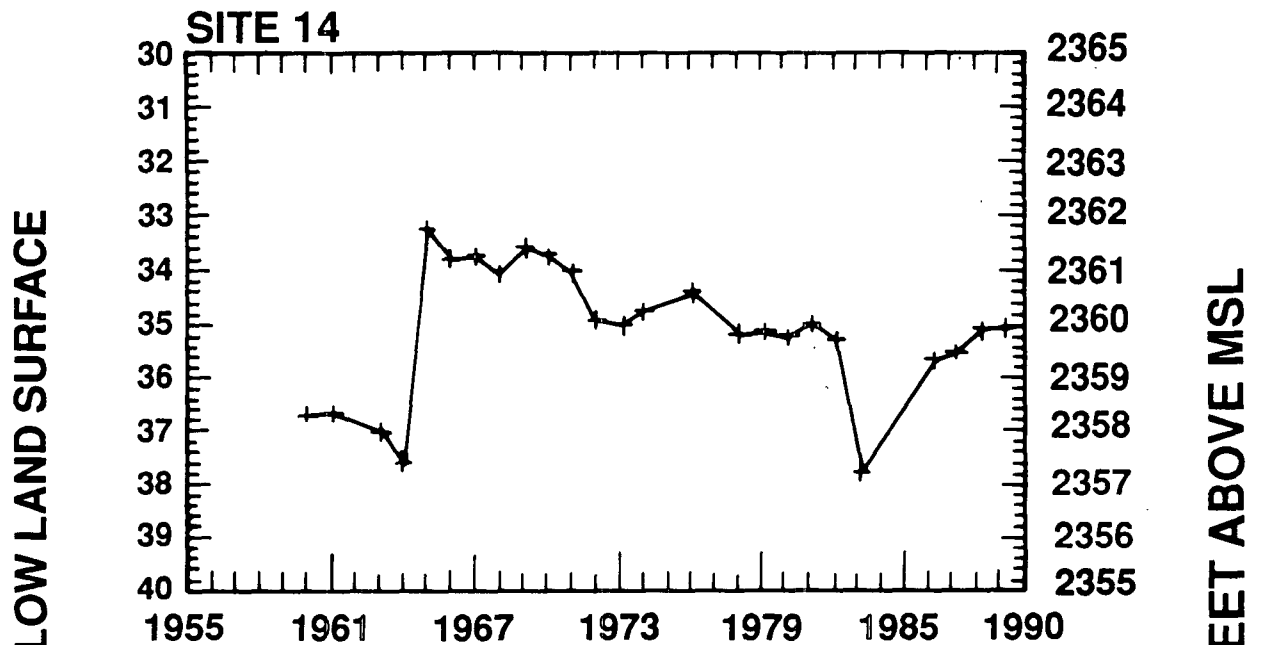
General features interpreted and digitized from USGS 1:250,000 scale series maps: Goldfield, NV/CA; Death Valley, CA/NV; Caliente NV/UT; Las Vegas, NV/AZ/CA

Yucca Mountain Conceptual Perimeter Drift Boundary derived from coordinate data as reported by Sandia National Laboratories Drawing Number R07002A, April 11, 1986.

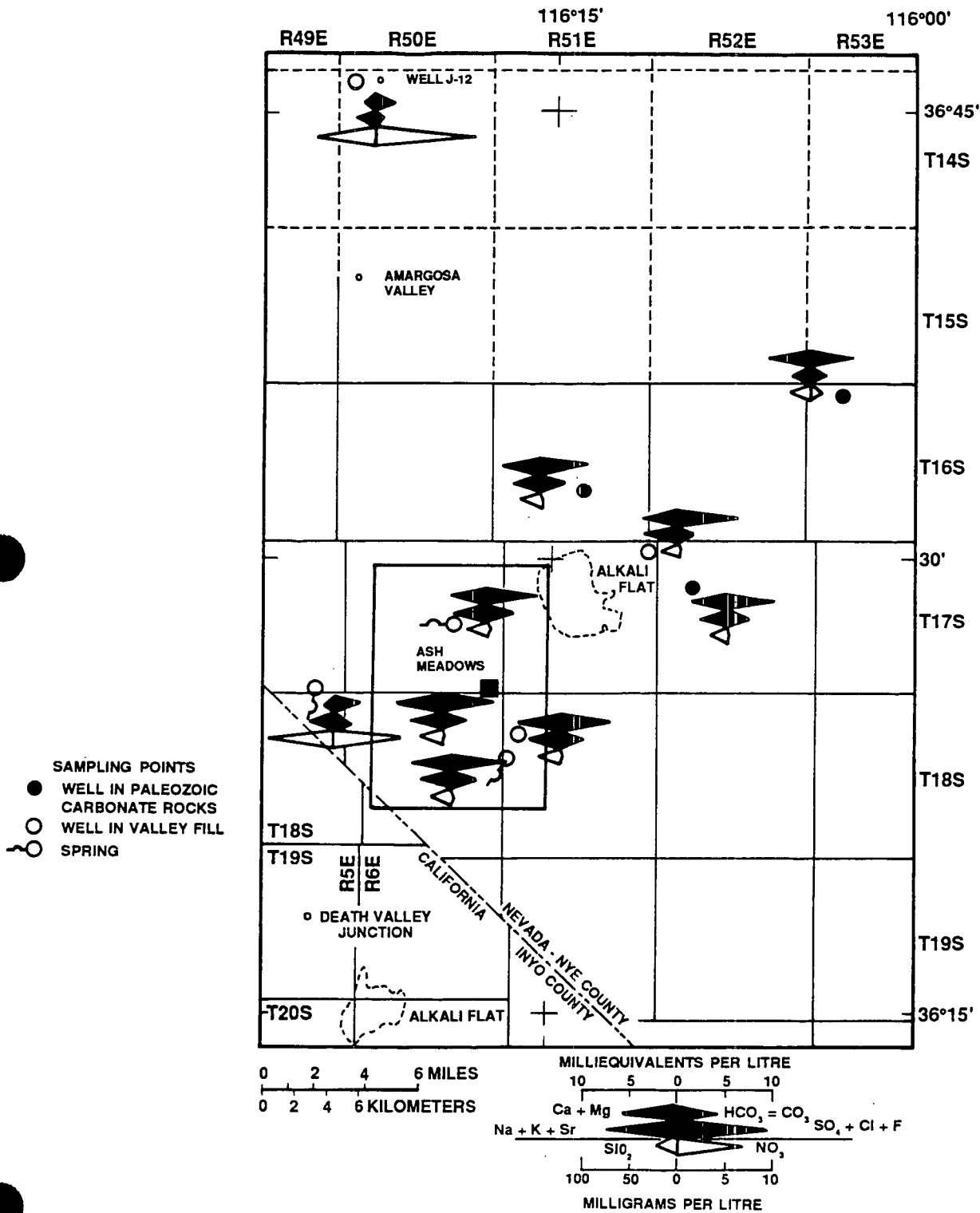
Map compiled in April 1990.



WATER LEVELS AT SELECTED SITES IN THE AMARGOSA DESERT



DISTRIBUTION OF SOME CONSTITUENTS OF WATER SAMPLES FROM THE ASH MEADOWS REGION



MONITORING NETWORK DESIGN

STATUS/ACCOMPLISHMENTS

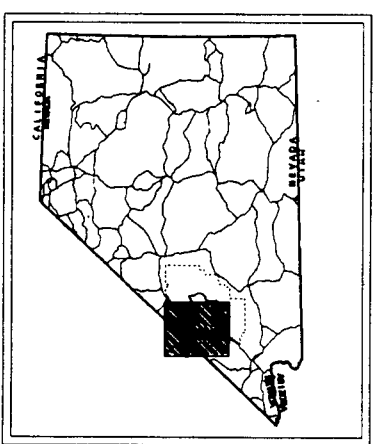
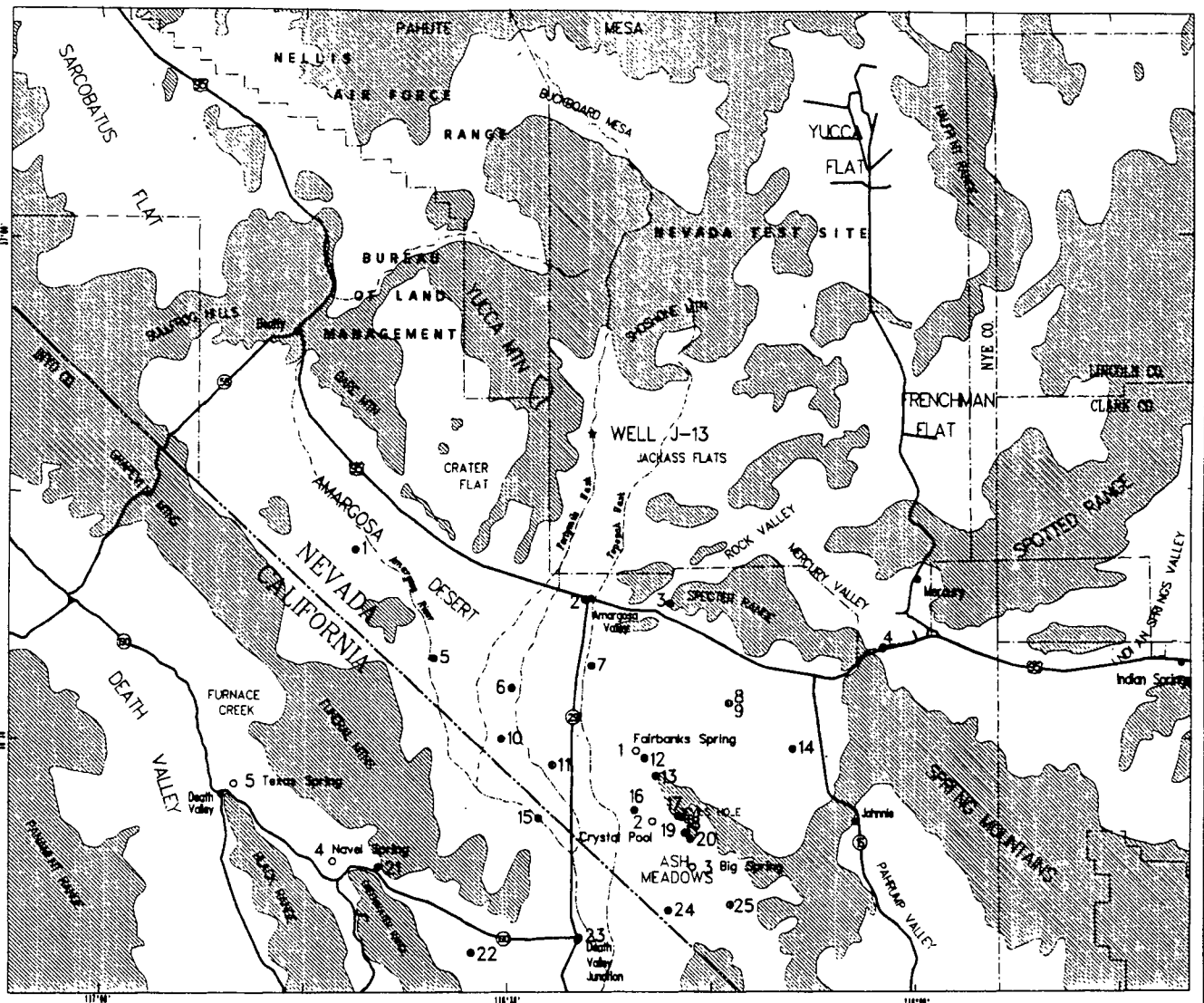
- **CONSULTING WITH NATIONAL PARK SERVICE AND U.S. FISH AND WILDLIFE SERVICE TO ADDRESS CONCERNS ABOUT WATER RESOURCES IN ASH MEADOWS AND DEATH VALLEY NATIONAL MONUMENT**
- **DESIGNED NETWORK TO MONITOR GROUND-WATER LEVELS AND SPRING DISCHARGES IN:**
 - **ASH MEADOWS AND DEATH VALLEY NATIONAL MONUMENT**
 - **AMARGOSA DESERT (TO COMPLETE SOUTHERN PART OF REGIONAL MONITORING NETWORK)**
- **SUBMITTED DRAFT REPORT DETAILING PROPOSED MONITORING OF GROUND-WATER LEVELS AND SPRING DISCHARGES IN SOUTHERN PART OF REGIONAL MONITORING NETWORK TO THE NPS FOR REVIEW**

MONITORING NETWORK DESIGN

(CONTINUED)

SITE-SELECTION CONSIDERATIONS

- **WELL CONSTRUCTION AND SPRING CLASSIFICATION INFORMATION**
- **REGIONAL AND LOCAL (PROXIMITY TO SITE CHARACTERIZATION ACTIVITIES OR ENVIRONMENTALLY SENSITIVE AREAS) COVERAGE**
- **WATER USE (AMOUNT AND DISTRIBUTION)**
- **MAGNITUDE OF WELL OR SPRING DISCHARGE**
- **AVAILABILITY OF HISTORICAL DATA**
- **TECHNICAL NEEDS OF AND INTEGRATION WITH OTHER PROGRAMS IN THE AREA**



- PROPOSED SITES**
- ★ Production Well J-13
 - Water-Level Monitoring Site
 - Spring-Discharge Monitoring Site

- GENERAL FEATURES**
- Primary Highway
 - Secondary Highway
 - - - Light-Duty, Improved Road
 - - - Surface Drainage Channel
 - - - State Line
 - - - County Line
 - - - Administrative Boundary
 - - - Conceptual Perimeter Drift Boundary

YUCCA MOUNTAIN PROJECT
SOUTHERN REGIONAL
WATER-LEVEL AND SPRING-DISCHARGE
PROPOSED MONITORING SITES

General features interpreted and digitized from USGS 1:250,000 scale series maps: Goldfield, NV/CA; Death Valley, CA/NV; Caliente NV/UT; Las Vegas, NV/AZ/CA

Yucca Mountain Conceptual Perimeter Drift Boundary derived from coordinate data as reported by Sandia National Laboratories Drawing Number R07002A, April 11, 1986.

Proposed water-level monitoring site and proposed spring-discharge monitoring site locations were derived from coordinate data as reported by Walker and Eskin, 1983 (sites 5, 6, 10); Thordarson, 1987 (sites 3, 4); Johnston, 1988 (sites 8, 9); Dudley and Larson, 1976 (sites 12, 18-20); driller's logs and other well-construction documentation; or as stored in the U.S. Geological Survey's NWIS computerized database.

Map compiled in April 1990.



MONITORING NETWORK DESIGN

(CONTINUED)

FUTURE PLANS

- **CONTINUE REFINEMENTS AND MODIFICATIONS TO SOUTHERN PART OF REGIONAL MONITORING NETWORK DUE TO:**
 - **ANALYSIS OF DATA COLLECTED**
 - **ERRORS IN REPORTED WELL LOCATION OR WELL DESTRUCTION**
 - **INACCURATE OR UNAVAILABLE WELL CONSTRUCTION DATA**
 - **SITE ACCESSIBILITY**

MONITORING NETWORK DESIGN

FUTURE PLANS (CONTINUED)

- **OBTAIN ACCESS TO RESTRICTED LOCATIONS IN SOUTHERN PART OF REGIONAL MONITORING NETWORK**
- **DESIGN REMAINING PART OF REGIONAL MONITORING NETWORK**
- **DESIGN LOCALIZED MONITORING NETWORK**

MONITORING OF WATER QUANTITY AND QUALITY

STATUS/ACCOMPLISHMENTS

- **FOR SOUTHERN PART OF THE REGIONAL MONITORING NETWORK, DATA WERE COMPILED ON:**
 - **WELL CONSTRUCTION AND SITE LOCATIONS**
 - **WATER-LEVELS AND SPRING DISCHARGES (FROM STATE ENGINEER AND NPS)**
- **COLLECTED INITIAL WATER-LEVEL DATA AT SELECTED WELLS**

MONITORING OF WATER QUANTITY AND QUALITY

(CONTINUED)

FUTURE PLANS:

- **SOUTHERN PART OF THE REGIONAL MONITORING NETWORK**
 - **CONTINUE COLLECTION OF BACKGROUND WATER-LEVEL DATA AT WELLS**
 - **COLLECT BACKGROUND SPRING-DISCHARGE DATA AT SPRINGS**
 - **COLLECT BACKGROUND WATER-QUALITY DATA AT SPRINGS AND SELECTED WELLS**
- **COLLECT BACKGROUND WATER-LEVEL AND SPRING-DISCHARGE DATA AT SELECTED SITES IN THE NORTHERN PART OF THE REGIONAL MONITORING NETWORK**

EVALUATION OF CHANGES AND IMPACTS

STATUS/ACCOMPLISHMENTS

- **EVALUATING VARIOUS PREDICTIVE ANALYSIS TECHNIQUES INCLUDING MODELLING FOR USE IN PREDICTING POTENTIAL WATER-RESOURCE IMPACTS WHICH MAY RESULT FROM SITE CHARACTERIZATION ACTIVITIES**
- **ESTIMATED EFFECT OF INCREASED WATER WITHDRAWALS FROM WELL J-13 ON REGIONAL WATER-LEVELS UTILIZING THEIR EQUATION AND EXISTING ESTIMATES OF AQUIFER TRANSMISSIVITY AND STORATIVITY**

TYPES OF ANALYTIC TOOLS (PRELIMINARY LIST)

● WATER QUANTITY

- HYDROGRAPH ANALYSIS**
- STATISTICAL ANALYSIS**
- QUANTITATIVE ANALYSIS METHODS**
- DIGITAL FLOW MODELS**

● WATER QUALITY

- PRESENCE OR ABSENCE OF CONSTITUENT
(SYNTHETIC ORGANICS)**
- COMPARISON WITH NATURAL BACKGROUND**
- STATISTICAL ANALYSIS**
- GEOCHEMICAL MODELS**
- DIGITAL SOLUTE TRANSPORT MODELS**

INTERDISCIPLINARY INTERACTIONS

- **OBTAIN DATA ON LOCAL AND REGIONAL SZ HYDROLOGY, PALEOHYDROLOGY, AND SZ HYDROCHEMISTRY FROM SITE CHARACTERIZATION STUDY PLANS**
- **OBTAIN INFORMATION ON FACILITIES DESIGN FROM ENGINEERING**
- **OBTAIN DATA ON RADIOLOGICAL WATER ANALYSES FROM RADIOLOGICAL MONITORING PROGRAM**
- **PROVIDE WATER SAMPLES TO RADIOLOGICAL PROGRAM FOR ANALYSIS**
- **PROVIDE INFORMATION ON WATER RESOURCES TO TERRESTRIAL ECOSYSTEMS STUDIES**
- **SHARE WATER RESOURCE DATA WITH OTHER STATE AND FEDERAL EFFORTS**