PHONE: (612) 894-9359

LINDA L. LEHMAN, P. G.
CONSULTING HYDROGEOLOGIST
5168 W. 141st STREET
SAVAGE, MINNESOTA 55378

Justin Westbrook 23
See Packet I
for ord.

WM DOCKET CONTROL CENTER
WM Record File 101.4
WM Project 10
Docket No.
PDR ✓
LPDR ✓

'85 APR 22 P2:55

Distribution:
Westbrook KENNEDY
WRIGHT
(Return to WM, 623-SS) CFL w/ cover ltr only
cc: Gordon

April 17, 1985

Russell Jim
Yakima Indian Nation
P.O. Box 151
Toppenish, Washington 98948

RE: April 4th technical meeting on BWIP geology and hydrologic testing plans

Dear Russell,

The technical meeting was for the most part a rehashing of major project plans for the benefit of new participants. RHO gave their usual slide shows and handed out copies of the view graphs (attached). The locations of planned seismic and magnetic surveys are shown in the attachments as well as well locations and types of tests planned. RHO did not go into a lot of detail. It seems there were conflicting meetings so the usual large DOE and RHO contingent was not present. Dave Dahlem ran the meeting for DOE and most presentations were done by Sue Price, Steve Baker or Steve Strait.

Basically, what transpired was Bill Brewer argued with RHO concerning the coincidence of earthquake swarms and structural features. He produced a set of maps with overlays which showed the earthquake swarms located at triple junctures of known fractures or faults. The faults and fractures were taken from U-2 photos, Side Looking Airborne Radar (SLAR) and all other data that Brewer had collected. I asked him for a set of maps but he didn't have enough copies, so I think we should officially request them. (Draft request is attached.)

It appears that DOE and RHO have decided to fund the Washington State University (WSU) geophysical well logging proposal. It seems that Jeff Brown from Pullman will be involved, which seemed to please Brewer. Although details were not discussed, it appeared that the proposed work will be done by WSU, as opposed to RHO, but RHO may still be controlling the purse strings.

Brewer also requested a new higher resolution SLAR survey be done on the Hanford site since the Texas sites were getting one. RHO seemed interested in this, possibly as a joint venture between Washington State and DOE.

1334

I took the opportunity to criticize the boundary conditions used in the RHO model and the Interagency approach and mentioned that our studies indicate the Yakima Valley to be geochemically distinct from the Pasco Basin. To my surprise, Baker agreed with my statements. He said he also believed the Yakima Ridge was a ground-water divide and agreed that the USGS use of Sadis Creek and areas in the Yakima Valley were not adequate for boundary condition determination.

I also criticized the fact that RHO had extremely limited field measurements of head in deeper units outside the Hanford Reservation. I also stated we considered field measurements of boundary conditions to be mandatory to verifying flow path predictions. Baker asked if we expected RHO to ring the Pasco Basin with wells. I stated that some wells would be necessary at key locations but we did not expect a lot of them. They then asked where I would place them. I said that modeling work could be undertaken to help determine optimal well locations and that we would certainly like to participate in these decisions. They seemed amenable to this. Therefore, we should undertake some additional tasks to investigate these locations in next year's contract.

Basically, my conclusions regarding the meeting are as follows:

1) It was productive from the standpoint that we got to discuss some of our technical conclusions in the EA which will influence site characterization work planned by RHO.

2) The presentations themselves did not tell us anything new except locations of geophysical surveys.

3) It was also apparent that we need to get an RFP out quickly for a tectonics oriented firm to follow the geology aspects more closely.

4) Some new contract tasks should be investigated for FY 86.

If you have any questions, please feel free to call.

Sincerely,

Linda Lehman

Attachments

cc: Jim Hovis
Dean Tousley
V. V. Nguyen
GeoTrans

101.4 Encl. to ltr. to R. Jim for L. Lehman 4/17/85

UNITED STATES DEPARTMENT OF ENERGY
Basalt Waste Isolation Project

Project Status Meeting on Geosciences Studies
8:30 a.m., Thursday, April 4, 1985
Room G-53, Federal Building, Richland

Introduction - D. H. Dahlem (BWIPO)

Description of Current Activities (BWIP)

- o Geology - S. M. Price
- o Rock Mechanics - D. J. Dodds
- o Hydrology - S. M. Baker
- o Near Field Geochemistry - S. M. Baker

Special Topic - Upper Cold Creek Syncline
Hydrologic Barrier Study (BWIP)

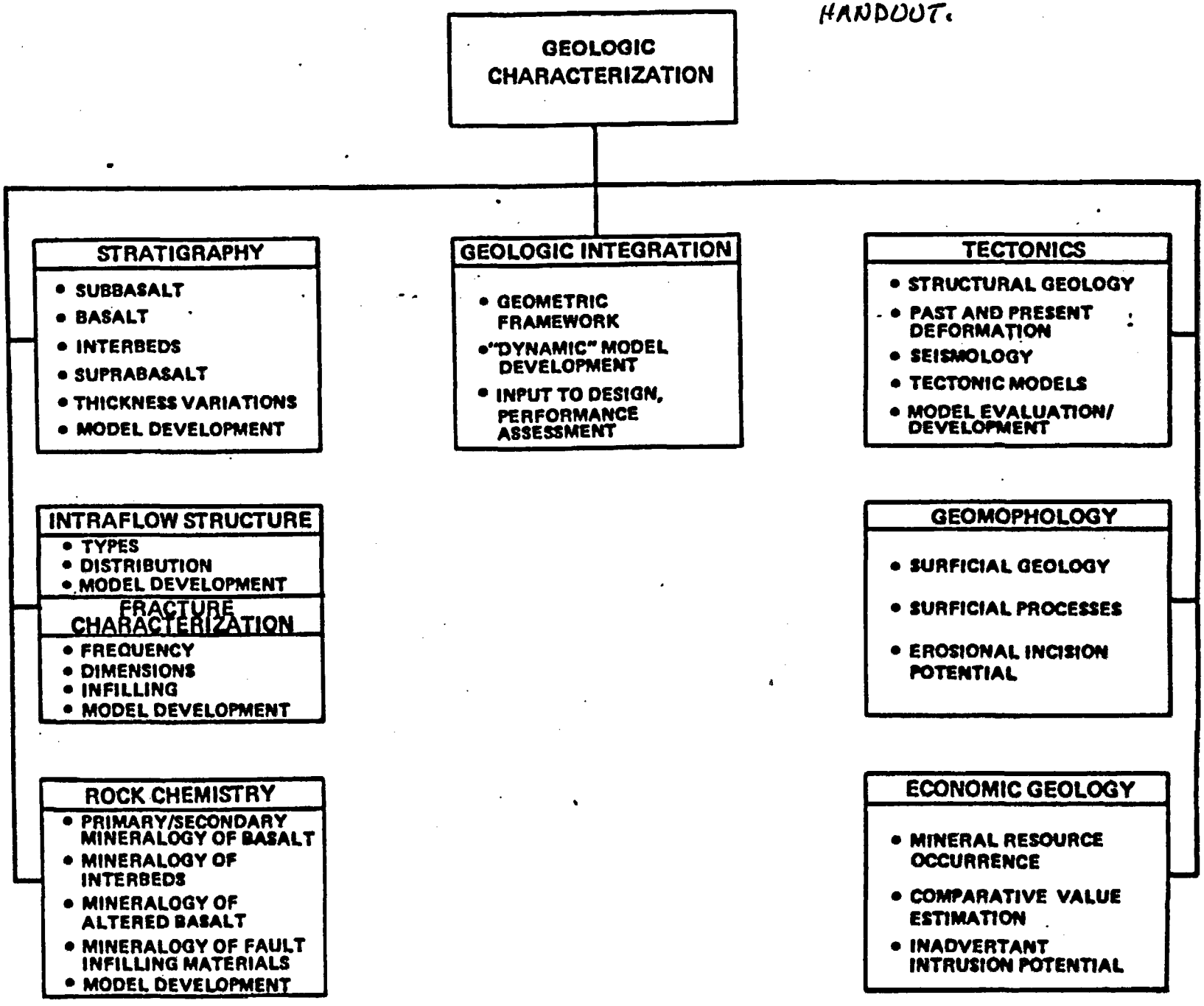
- o Status - S. R. Strait
  A. M. Tallman
  - Hydrologic Studies
  - Gravity and Magnetic Surveys
  - Borehole DH-27 and DH-28 Results
  - Alternative Interpretations
- o Planned Studies - S. R. Strait
  A. M. Tallman
  - Ground Gravity and Magnetic Surveys
  - Seismic Reflection Testing and Verification
  - Deepening of Current Boreholes and Additional Hydrologic Testing
  - Additional Studies

Future Topics for Discussion

ATTENDEE LIST

Anne M. Tallman	Rockwell	(509)376-8712
Steve Baker	Rockwell	(509)376-4764
Ron T. Halfmoon	Nez Perce Tribe	(208)843-2253
Sean C. Muller	Council of Energy Resource Tribes	(303)832-6600
Pat Boileau	DOE-RL	(509)376-5039
John Hutchins	Council of Energy Resource Tribes	(303)832-6600
Phil Brown	Council of Energy Resource Tribes	(303)832-6600
Bill Price	Rockwell	(509)373-4521
Jim Bazemore	Rockwell	(509)376-9188
Art Lassila	DOE-RL	(509)376-6158
Dan Clayton	Shannon & Wilson for DOE	(206)633-5079
Phil Long	Rockwell	(509)376-6246
Ray Lasmanis	State Nuclear Waste Board	(206)459-6372
Bill Brewer	State of Wash.-Nuclear Waste Mgmt	(206)459-6670
Linda Lehman	Yakima Indian Nation	(612)894-9359
Tom Tinsley	DOE-RL	(509)376-8736
Ellen Caywood	Joint Science & Tech. Comm.	(206)786-7285
Bruce Hurley	DOE-RL	(509)376-7059
		FTS 444-7059
F. R. Cook	NRC	(509)943-4669
Steve Strait	Rockwell	(509)373-4226
David H. Dahlem	DOE-RL	(509)376-3022
		FTS 444-3022
Sue M. Price	Rockwell	(509)376-2421
		FTS 444-2421

* PLANNED GEOPHYSICAL SURVEYS ARE SHOWN IN "SPECIAL TOPIC" HANDOUT.



STRATIGRAPHY

OBJECTIVES

- o DEVELOP GRAPHIC, THREE-DIMENSIONAL STRATIGRAPHIC MODELS OF THE RRL AND VICINITY
- o IDENTIFY STRATIGRAPHIC FEATURES POTENTIALLY CONTROLLING GROUNDWATER FLOW SYSTEM GEOMETRY AND AFFECTING DESIGN

ACTIVITIES

- o BASALT
  - UPDATE OF DATA PACKAGE DP-035, "DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS"
  - DOCUMENTATION OF FRENCHMAN SPRINGS MEMBER STRATIGRAPHY
    Regional study - Karl Fecht lead - will be important from hydrologic standpoint
- o SUPRABASALT
  - ISOPACH AND STRUCTURE CONTOUR MAPS OF SUPRABASALT UNITS WITHIN AND ADJACENT TO THE RRL
  - STRATIGRAPHIC SECTION MEASUREMENTS AND CORRELATIONS OF THE SOUTHERN WHITE BLUFFS
  - CORRELATION OF ASH HORIZONS
- o INTERBEDS
  - INTERBED CORRELATION STUDIES
  - PETROGRAPHIC EXAMINATION OF INTERBEDS

INTRAFLOW STRUCTURE AND FRACTURE CHARACTERIZATION

OBJECTIVES

- o IDENTIFY NATURE AND PROBABLE EXTENT OF INTRAFLOW STRUCTURES (entablature, colonade, etc.) AND FRACTURES IN THE CANDIDATE HORIZON FLOWS OF THE RRL
- o DEVELOP GRAPHIC AND STATISTICAL MODELS OF THE OCCURRENCE OF INTRAFLOW STRUCTURES AND FRACTURES WITHIN THE RRL FOR THE PURPOSE OF EVALUATING THE POTENTIAL OF SUCH OCCURRENCE ON FLOW GEOMETRY AND RADIONUCLIDE TRANSPORT

ACTIVITIES

- o INTRAFLOW STRUCTURES
  - UPDATE OF DATA PACKAGE DP-011, "GEOLOGIC THICKNESS DATA-- CANDIDATE REPOSITORY HORIZONS"
  - DOCUMENTATION OF "STRUCTURE, TEXTURE, AND COOLING HISTORY OF COLUMBIA RIVER BASALT FLOWS" NOT ON ACC. LIST - BUT CAN BE OBTAINED - REQUESTED A COPY
  - REPOSITORY LAYOUT STUDY AND INPUT TO SUBSEQUENT DESIGN STUDIES - COHASSET FLOW BELOW VESICULAR ZONE
  - CORE RELOGGING - 'REVISED PROCEDURE'
  - INTRAFLOW STRUCTURE OUTCROP STUDIES, SENTINEL GAP AREA (NOT CURRENTLY USING VANTAGE STUDY AREA)
    50 DATA PTS (MIN) NEEDED FOR STATISTICAL INFERENCE
    PRIMARY FRACTURES - HAS PRIORITY

- FRACTURE CHARACTERIZATION
  - DOCUMENTATION OF DETAILED FRACTURE-WIDTH MEASUREMENT STUDY - WILL BE OUT IN NEXT 6 MOS. ≈30,000 MEAS.
  - SUPPORT TO NEAR SURFACE TEST FACILITY OVERCORING (MOCKUP OF 6' SHAFT - HORIZONTAL DEMO HOLES ARE LOGGED FOR VERTICAL FRACTURES HOLES FROM SHAFT) - TEST EQUIPMENT
  - CORE RELOGGING
  - FRACTURE OUTCROP STUDIES, SENTINEL GAP

ROCK CHEMISTRY

OBJECTIVES

- o DEVELOP MINERALOGIC DATA TO SUPPORT ESTIMATION OF SORPTION PROPERTIES AND GEOCHEMICAL CONDITIONS IN THE WASTE PACKAGE ENVIRONMENT
- o OBTAIN DATA TO SUPPORT GEOCHEMICAL MODELING OF GROUNDWATER EVOLUTION

ACTIVITIES

- o MINERALOGY OF INTERBEDS STUDY
- o STATUS REPORT ON SECONDARY MINERALS IN FLOW TOPS

DATA COLLECTED DOWN THE COLD CREEK SYNCLINE AS WELL AS RRL

TECTONIC CHARACTERIZATION

OBJECTIVES

- o PROVIDE STRUCTURAL, SEISMICITY, AND IN SITU STRESS DATA FOR INPUT TO RESPOSITORY DESIGN
- o ASSIST IN THE ESTIMATION OF THE POTENTIAL EFFECTS THAT STRUCTURES AND TECTONIC PROCESSES MIGHT HAVE ON GROUNDWATER FLOW PATHS AND TRAVEL TIME
- o PROVIDE INPUT TO AN EVALUATION OF THE OIL AND GAS POTENTIAL OF THE RRL AND VICINITY

ACTIVITIES

- o STRUCTURAL GEOLOGY - DEFINE SECONDARY FEATURES (LOCATIONS)
  - TECTONIC MAP UPDATE - COPIES WILL BE MADE AVAILABLE SOON
  - TOP-OF-BASALT MAP UPDATE 1 - 62,5
  - STATE MAP COMPILATION INPUT
  - STATEWIDE GRAVITY STATION COMPILATION - COOP EFFORT W/ WASH STATE + USGS MAPS + TAPES ARE AVAILABLE 1-100,000 SCALE - OBTAIN FROM USGS
  - LONG OFFSET REFRACTION SURVEY - ROHAY, MALONE ALSO KETCHINGS - PAPER IN SSA AUSTIN, USGS
  - MT SURVEY - 28 STATIONS IN VICINITY OF RATTLESNAKE MT.
  - GEOPHYSICAL SURVEY FILE DATA EVALUATION - ONGOING PROJECT (EVALUATION)
  - GRIDDED GRAVITY SURVEY - BOUGIER MAP IS OUT
  - SEISMIC REFLECTION SURVEY TEST
  - YAKIMA BARRICADE STUDY
  - HORSE HEAVEN HILLS STUDY - MIKE HAYGOOD STUDY COMPLETE THESIS IS AVAILABLE
  - SNIVELY BASIN STUDY
  - VANTAGE ANALOG STUDY
- o PAST AND PRESENT DEFORMATION
  - USGS OPEN FILE REPORT 84-797, "CRUSTAL DEFORMATION NEAR HANFORD, WASHINGTON"
  - STRUCTURAL ROTATION STUDY - SMALL FIRM FROM SANTA BARBARA IS DOING THIS WORK

* U-2 REPORT IS OUT - ANN TALLMAN WILL GIVE ME TITLE — THIS WAS NOT DONE - A FOLLOW UP IS REQUIRED.

- o SEISMOLOGY
  - REGIONAL EASTERN WASHINGTON NETWORK
  - BWIP BASELINE NETWORK
  - SHALLOW BOREHOLE SEISMIC NETWORK, RRL — 7 STATIONS ON TOP OF BASALT - ON LINE
  - DEEP BOREHOLE SEISMOMETER — DC-3 WILL BE INSTALLED THIS FALL (85) AT REPOSITORY DEPTH
  - PROCESSING OF EARTHQUAKE RECORDS
  - SEISMIC DESIGN WORKING GROUP - WOODWARD CLYDE
  - DOCUMENTATION OF SEISMIC DESIGN RECOMMENDATIONS
- o TECTONIC MODELS
  - USGS MEETINGS ON INTERRELATED TOPICS OF TECTONICS, SEISMICITY, AND IN SITU STRESS
  - ASSESSMENT OF TECTONIC MODELS BASED ON EVALUATION OF EXISTING AND NEW DATA - RECENT MEETING WITH USGS (FALL MEETING) LETTER FROM USGS AVAILABLE.

GEOMORPHOLOGY

OBJECTIVES

- o Assess net effect of surficial geology processes – Woodward Clyde Report
- o Provide support to tectonics and paleoclimatology considerations

ACTIVITIES

- o Documentation of paleodrainage of Columbia River system – Carl Fecht. Will be out soon. Joint effort. Wash State GS
- o Input to paleoclimatology planning
- o Input to tectonic evaluation of Quaternary history

ECONOMIC GEOLOGY

OBJECTIVES

- o LOCATE AND DESCRIBE OCCURRENCES OF MINERAL RESOURCES INCLUDING THEIR PAST EXPLOITATION OR FUTURE EXPLOITABILITY
- o MAKE VALUE ESTIMATES OF KNOWN AND POTENTIAL RESOURCES AND COMPARE THESE TO OTHER AREAS OF SIMILAR SIZE IN THE COLUMBIA PLATEAU REGION

ACTIVITIES

- o MONITOR OIL AND GAS EXPLORATION — NOEL CAMPBELL (OR NEWELL?) HAS A REPORT WHICH WILL BE OUT SOON
- o EVALUATION OF RECENT OIL AND GAS EXPLORATION WELLS
- o EVALUATION OF MT DATA
- o BASALT MARGIN STUDY

HYDROTHERMAL RESERVES BEING LOOKED AT

WASH STATE GS HAS PUBLISHED A MAP WHICH DOES NOT SHOW HANFORD AS A PARTICULARLY GOOD GEOTHERMAL RESOURCE.

THERMAL MATURATION STUDIES USING VITRINITE REFLECTIONS FROM SHELL WELLS WASH STATE GS DOING THIS.

ROCKWELL DOING METHANE ANALYSIS — NO DATA FROM SADDLE MTS. WELL ISOTOPIC ANALYSES ARE NOW PUBLISHED

GEOLOGIC INTEGRATION

OBJECTIVES

- o PROVIDE GEOLOGIC DATA BASE
- o DEVELOP GEOLOGIC MODELS OF THE SITE THAT INCLUDE PART, OR ALL OF THE RESULTS OF THE OTHER GEOLOGIC CHARACTERIZATION ACTIVITIES

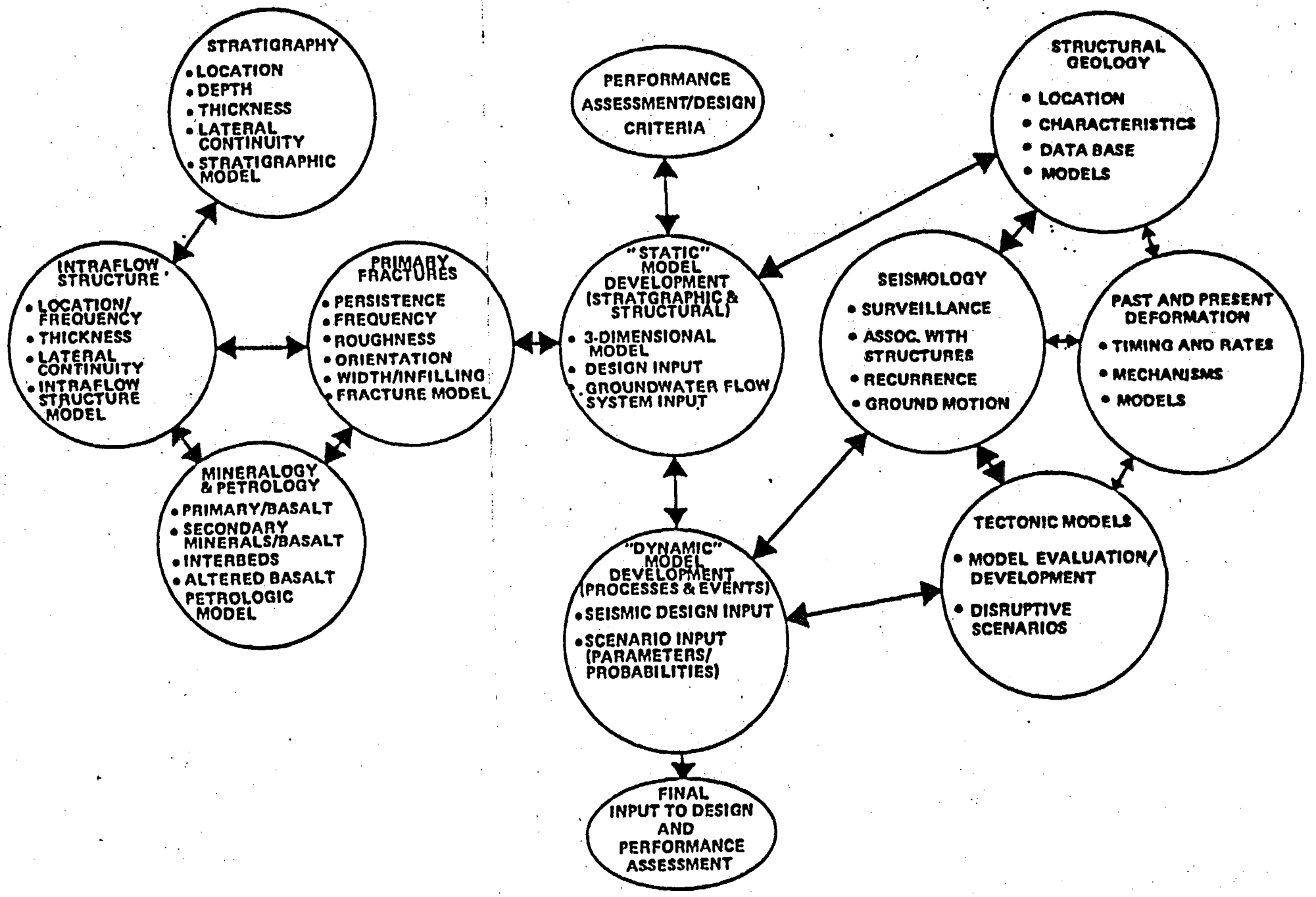
ACTIVITIES

- o MAP INTEGRATION EFFORT - *SERIES OF OVERLAYS BEING PREPARED*
- o PRELIMINARY THREE-DIMENSIONAL STRATIGRAPHIC AND STRUCTURAL MODEL OF THE RRL (INPUT TO DESIGN AND PERFORMANCE ASSESSMENT)
- o SEISMIC DESIGN RECOMMENDATIONS
- o SCENARIO EVALUATION

GEOLOGIC CHARACTERIZATION

(SUMMARY OF DATA NEEDS AND INTERRELATIONSHIPS)

LITHOLOGIC CHARACTERIZATION | GEOLOGIC INTEGRATION | TECTONIC CHARACTERIZATION



ENGINEERING BARRIERS GEOCHEMISTRY OBJECTIVES

- Quantify the Engineered Barrier Geochemistry Environment as Effected by Waste Package Emplacement

- Quantify the Geochemical Behavior of Important Radionuclides in the Engineered Barrier System

- Estimate the Effect of Geochemical Processes on the Radionuclide Isolation Capabilities of the Engineered Barrier System

CURRENT LABORATORY ACTIVITIES

- Spent Fuel/Basalt/Groundwater Hydrothermal Experiments at Expected Repository Temperatures to Quantify Radionuclide Behavior in the Waste Package

- Container Material Corrosion Experiments Under Expected Repository Conditions (Hydrothermal and Steam Environments) to Measure Corrosion Rates

- Packing Material/Groundwater Hydrothermal Experiments to Measure Chemical Stability of Packing Material

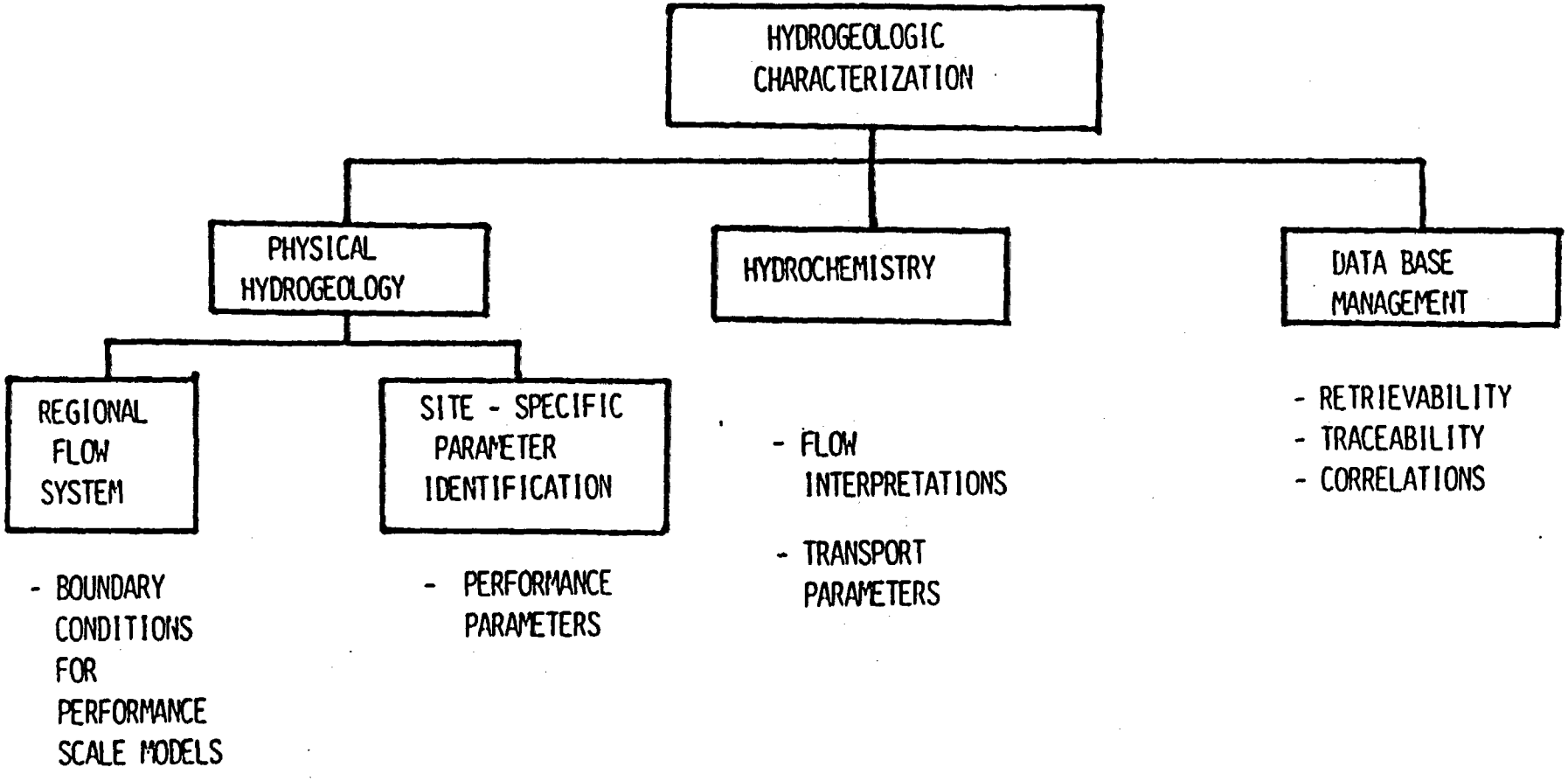
- Sorption/Solubility Experiments with Basalt/Packing Material and Radionuclide-Bearing Groundwater to Quantify Radionuclide Mobility in the Packing Material

GENERAL OBJECTIVES: HYDROLOGIC INVESTIGATION

GROUNDWATER FLOW SYSTEM

- o FLOW PATHS
  - FLOW TOPS
  - STRUCTURES
  - INTERBEDS
  - DENSE INTERIORS
- o FLOW POTENTIAL
  - CURRENT WATER LEVELS
  - HYDRAULIC STRESS
    - WATER USE — TIED TO RESOURCE POTENTIAL
    - CLIMATIC CHANGE
- o HYDROCHEMICAL EVOLUTION
  - FLOW SYSTEM HISTORY INTEGRATED OVER TIME AND SPACE
  - CONCEPTUAL FLOW MODEL
- o SOLUTE TRANSPORT
  - SPECIATION
  - RADIONUCLIDE RETARDATION
  - SOLUBILITY

BWIP HYDROGEOLOGY PROGRAM



REGIONAL GROUNDWATER FLOW SYSTEM

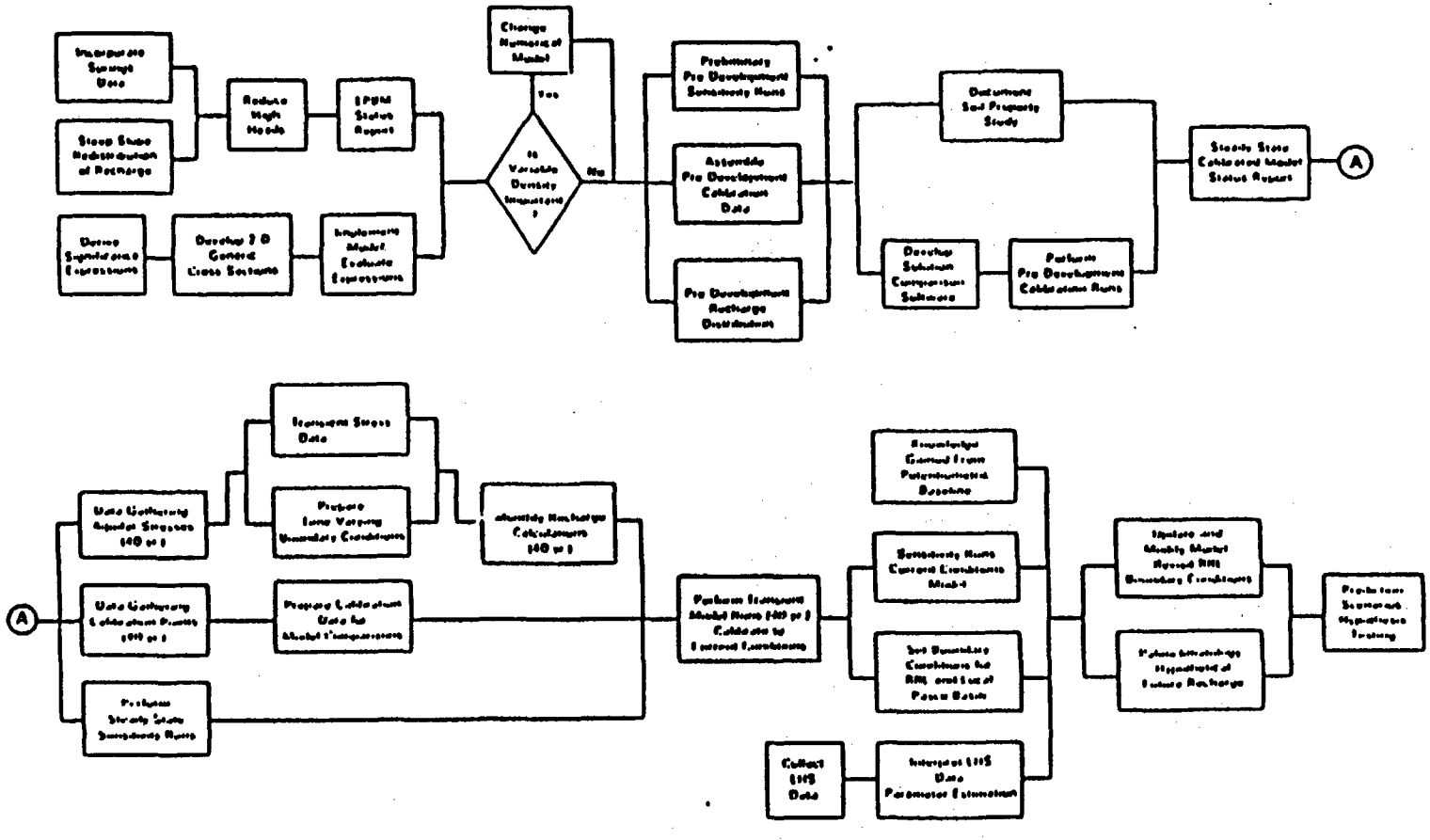
OBJECTIVES

- o General understanding of groundwater flow system
- o Range of boundary conditions for performance scale activities

ACTIVITIES

- o Field data collection
  - Regional hydraulic stress assessment with time (USGS)
  - Regional well water level measurements (USGS)
  - Hanford water level monitoring
  - Pollen analyses (lake bed cores) planned
- o Climatology studies (being planned)
  - Predict possible range of climate conditions
  - Calibrate the predictions to past climate
- o Regional flow system studies
  - Interagency hydrology working group (extended Pasco Basin)
  - Regional groundwater flow system parameter estimation study being planned (includes structural control)

PROPOSED REGIONAL INVESTIGATION LOGIC



SITE - SPECIFIC PARAMETER IDENTIFICATION PROGRAM

OBJECTIVES

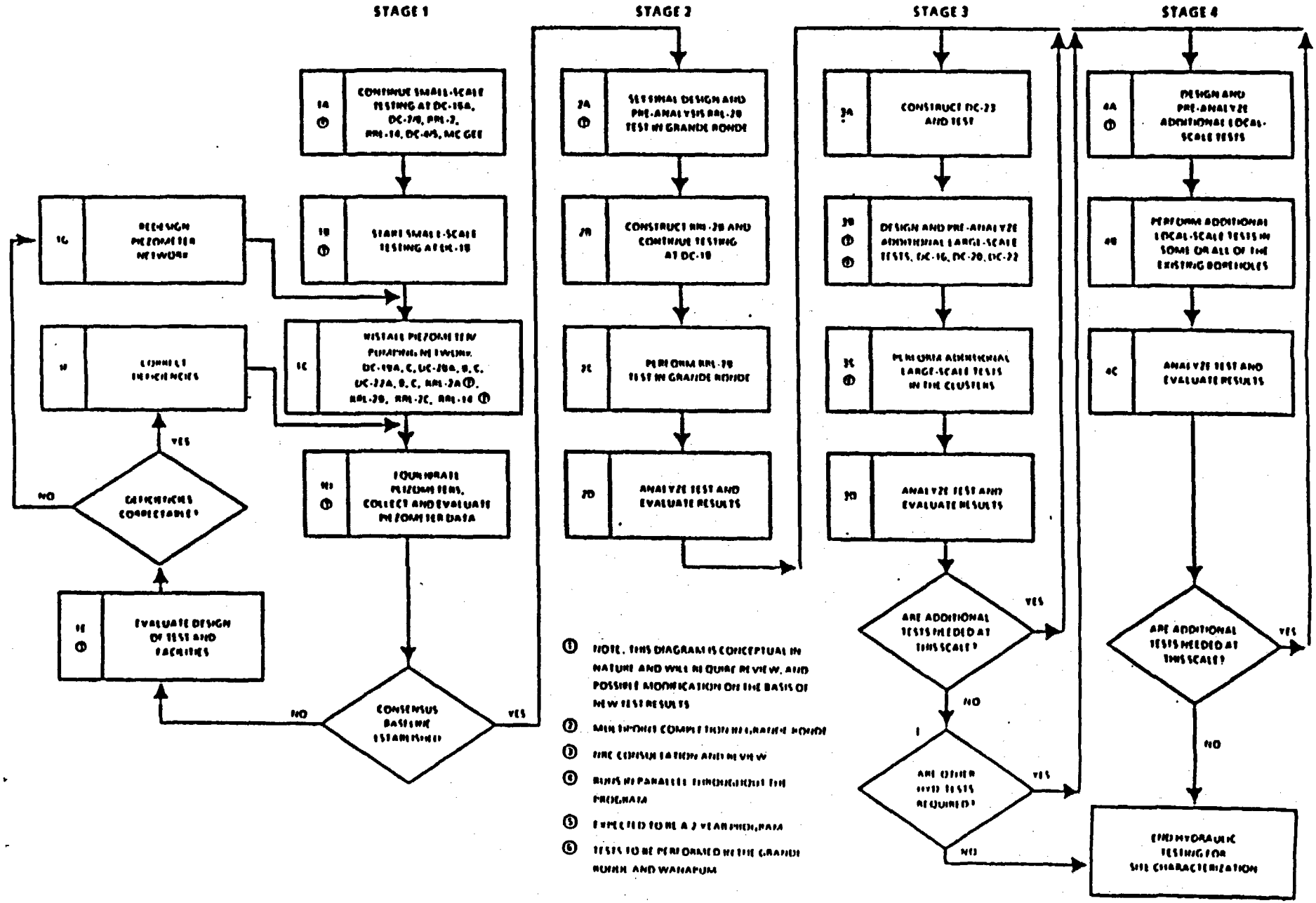
- o Determine groundwater flow potentiometric surface
- o Determine three dimensional hydraulic properties
  - conductivities of flow paths
  - effective porosity
  - storage coefficient
  - dispersion

ACTIVITIES

- o Groundater monitoring
- o Large-scale hydraulic stress tests planned
- o Tracer tests
- o Small scale hydraulic stress tests
- o Exploratory shaft testing planned

LOGIC DIAGRAM FOR BWIP HYDROLOGIC TEST STRATEGY ①

(AFTER NUCLEAR REGULATORY COMMISSION, 1983)



① NOTE, THIS DIAGRAM IS CONCEPTUAL IN NATURE AND WILL REQUIRE REVIEW, AND POSSIBLE MODIFICATION ON THE BASIS OF NEW TEST RESULTS

② MEASUREMENTS COMPLETED IN RRL-RATTLE SNAKE

③ SITE CONFIRMATION AND REVIEW

④ BEING PERFORMED IN PARALLEL WITH EXISTING PIEZOMETER PROGRAM

⑤ EXPECTED TO BE A 2 YEAR PROGRAM

⑥ TESTS TO BE PERFORMED IN THE GRANDE RONDE AND WANAPUM

HYDROCHEMISTRY

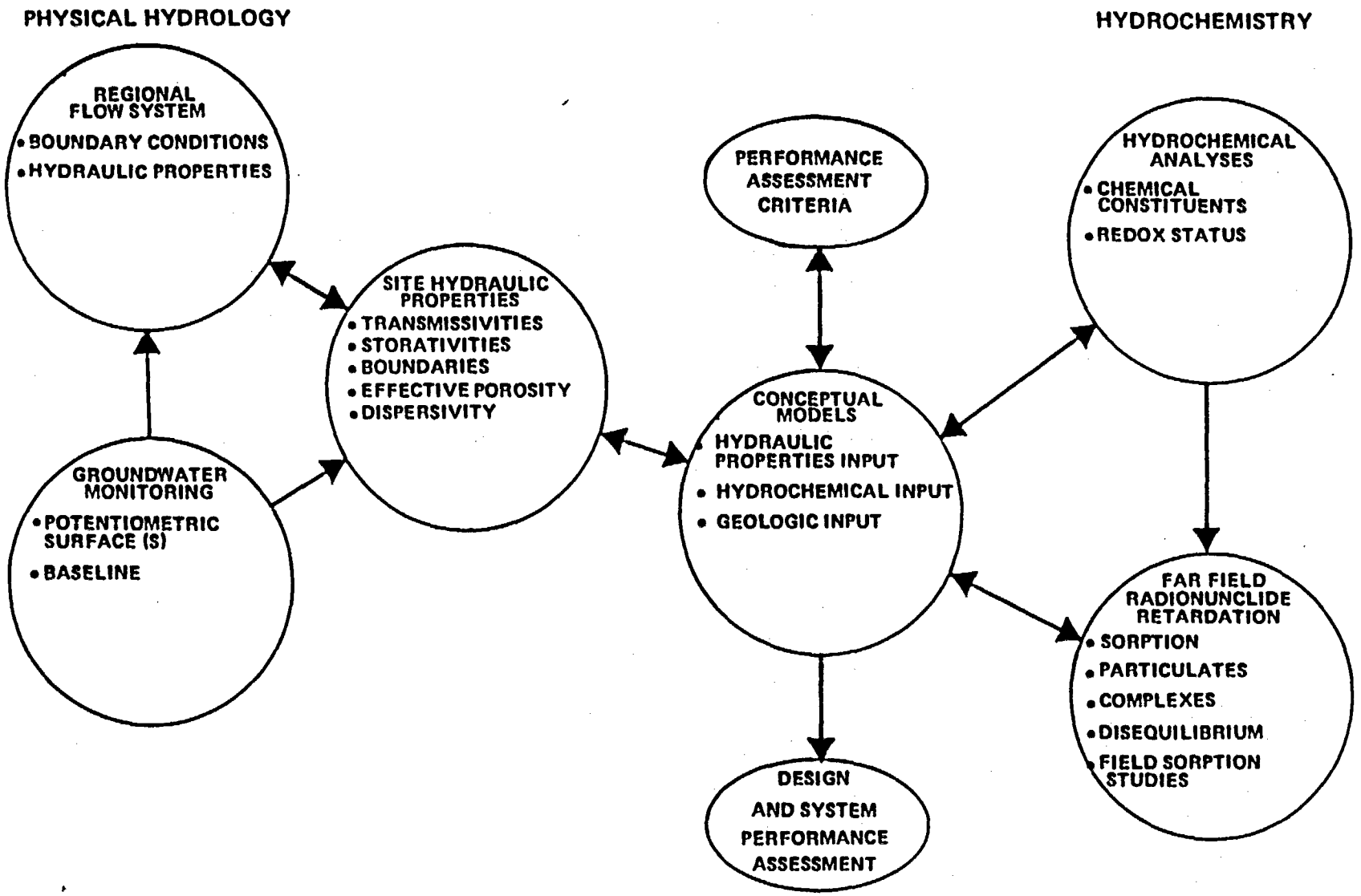
OBJECTIVES

- o UNDERSTANDING THE GROUNDWATER FLOW SYSTEM
- o ESTABLISH GROUNDWATER CHEMISTRY BASELINE FOR OTHER SITE CHARACTERIZATION ACTIVITIES
- o DETERMINE RADIONUCLIDE RETARDATION PARAMETERS FOR PERFORMANCE ASSESSMENT ACTIVITIES

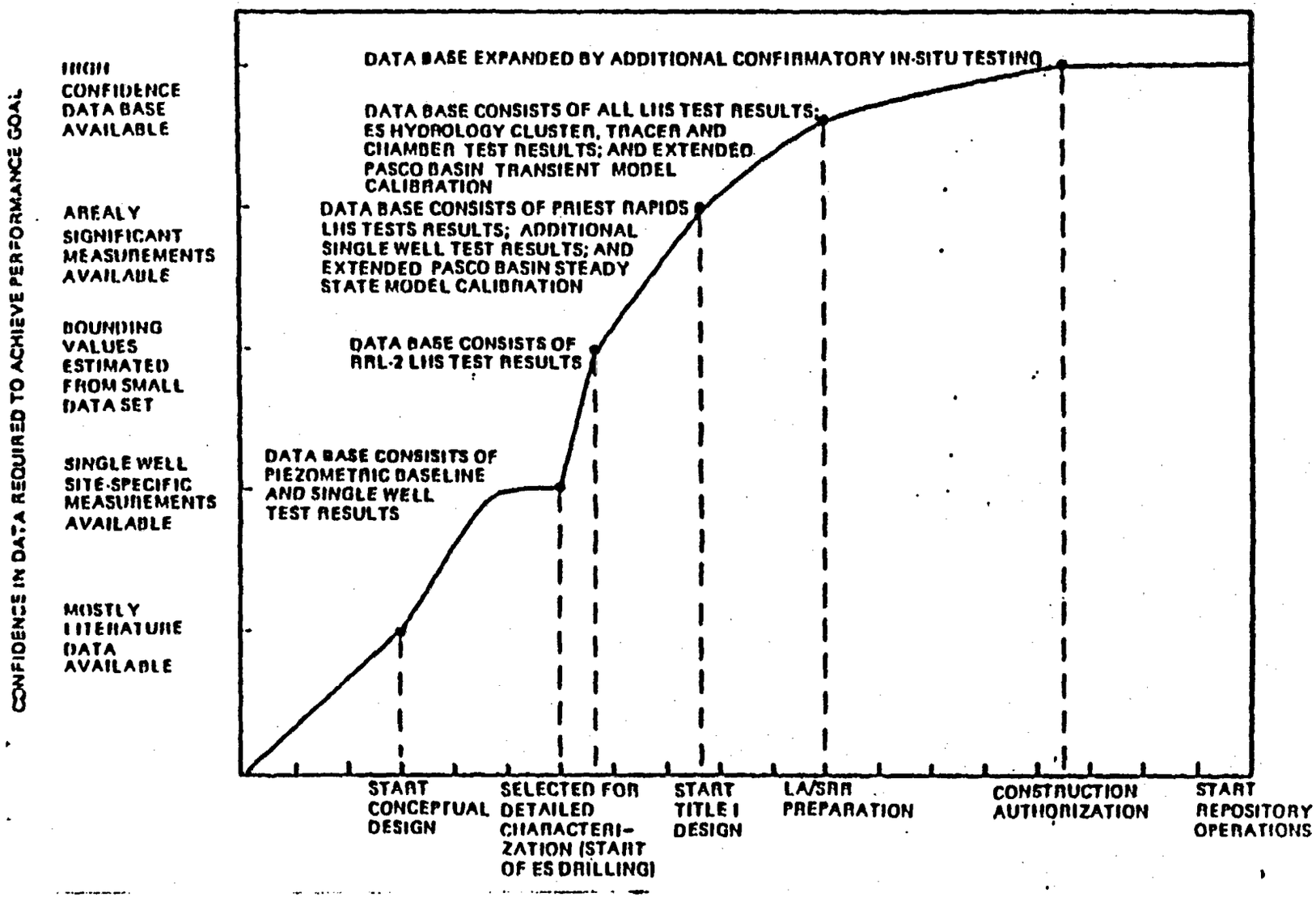
ACTIVITIES

- o GROUNDWATER CHEMISTRY BASELINE FOR PRECIPITATION, SPRINGS, UNCONFINED AQUIFER, CONFINED FLOW SYSTEMS
  - MAJOR, MINOR TRACE PARAMETER CONCENTRATIONS
  - STABLE AND RADIOACTIVE ISOTOPE CONCENTRATIONS
  - DISSOLVED GAS CONCENTRATIONS
  - ORGANIC CONCENTRATIONS
- o CONCEPTUAL GROUNDWATER FLOW MODEL
  - SPATIAL DISTRIBUTION OF CHEMISTRY PARAMETERS
  - GEOCHEMICAL MODELING - EQ3 - EQ6 TOM WOOLERY AT LLL
  - DETERMINE FLOW DIRECTIONS AND GENERAL FLOW RATES
- o LAB RADIONUCLIDE RETARDATION STUDIES: BATCH AND COLUMN
  - SORPTION/DESORPTION
  - SOLUBILITY
  - COMPLEXATION
  - SPECIATION
- o FIELD SCALE RADIONUCLIDE TRANSPORT STUDIES (BEING PLANNED)
  - TRACER TESTS
  - NATURAL RADIONUCLIDE CONCENTRATION
  - NATURAL PARTICULATES

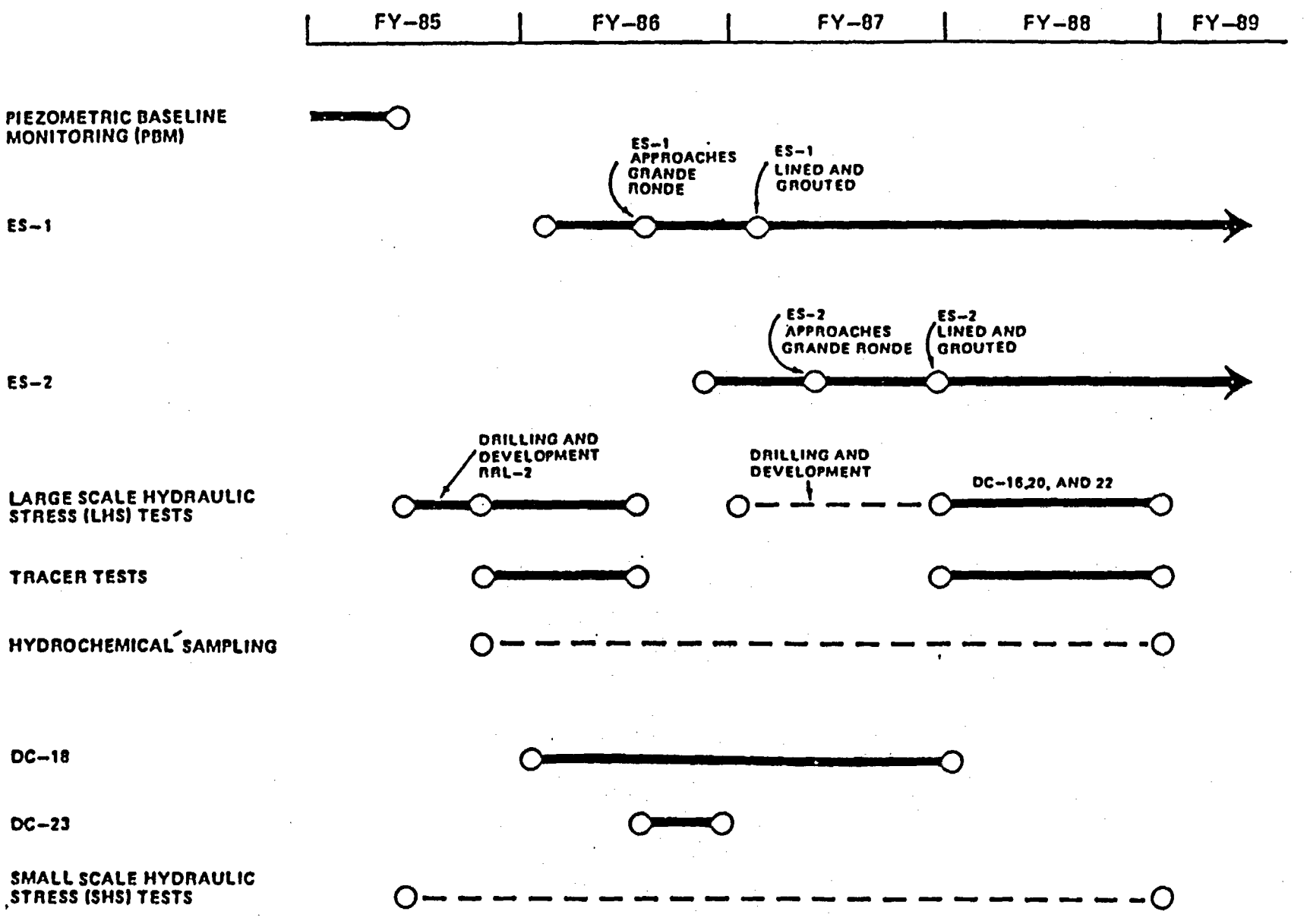
HYDROLOGIC CHARACTERIZATION PLAN



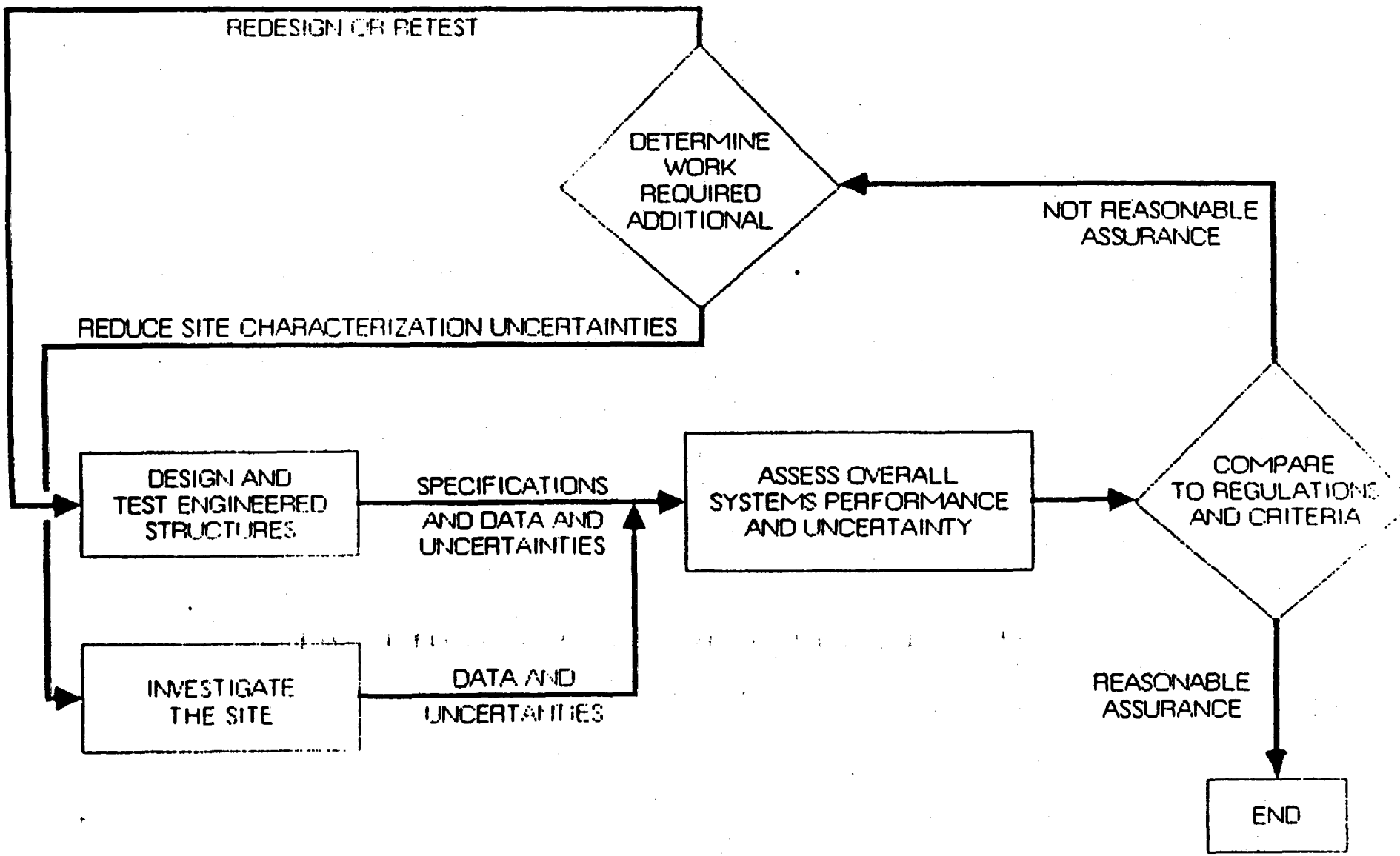
DEVELOPMENT OF REASONABLE ASSURANCE



HYDROLOGIC CHARACTERIZATION



DETERMINATION OF DATA ADEQUACY



GEOMECHANICS TESTING

1988-89 TIME FRAME

- o ROCK STRESS
- o ROCK MASS MODULUS
- o ROCK MASS STRENGTH
- o THERMAL PROPERTIES
- o GEOPHYSICAL TESTING
- o LABORATORY TESTING
- o GEOMECHANICAL MODELING
- o MISC. AND DEVELOPMENT

ROCK STRESS

- IN SITU STRESS:
  - OVERCORING
  - USBM
  - DOORSTOPPER
  - CSIRO (GAGES) TRIPLE AXES OTHERS ARE 2 AXES
- SKIN STRESS:
  - SMALL FLAT JACK TEST

ROCK MASS MODULUS

- PLATE BEARING TESTING:
  - RIGID
  - FLEXIBLE
  - 0.5 METER PLATE
  - 1.0 METER PLATE
- LARGE FLAT JACK
- BOREHOLE TESTING
- BLOCK TEST

ROCK MASS STRENGTH TESTING

- JOINT SHEAR TESTING

  LARGE DISCONTINUITIES

  COLUMN JOINTING

- GEOPHYSICAL (DYNAMIC MODULUS) P + S WAVES

  CROSS-HOLE
  REFRLECTIVE SURVEYS

  LAB TESTING
  UPGRADING PLAN AND FACILITIES

GEOMECHANICS MODELING

- o COORDINATE MODELING PLAN WITH A/E
- o BENCHMARK ADINA - WILL PICK UP ABACUS AS WELL
- o BENCHMARK STEADY FLOW

MODEL VALIDATION TESTING

- o CANISTER HOLE HEATER TEST - SEVERAL MONTHS DURATION INSITU TEST
- o MINE BY TEST

DEFLECTOMETER DEVELOPMENT

MISCELLANEOUS

- o SUPPORT TESTING - ROCK BOLT + GROUTING TESTS
- o SITE SPECIFIC ROCK MASS CHARACTERIZATION SYSTEM
- o COMPLETION OF:
  - HEATER TESTS #1 AND #2
  - REPORTS BEING COMPLETED

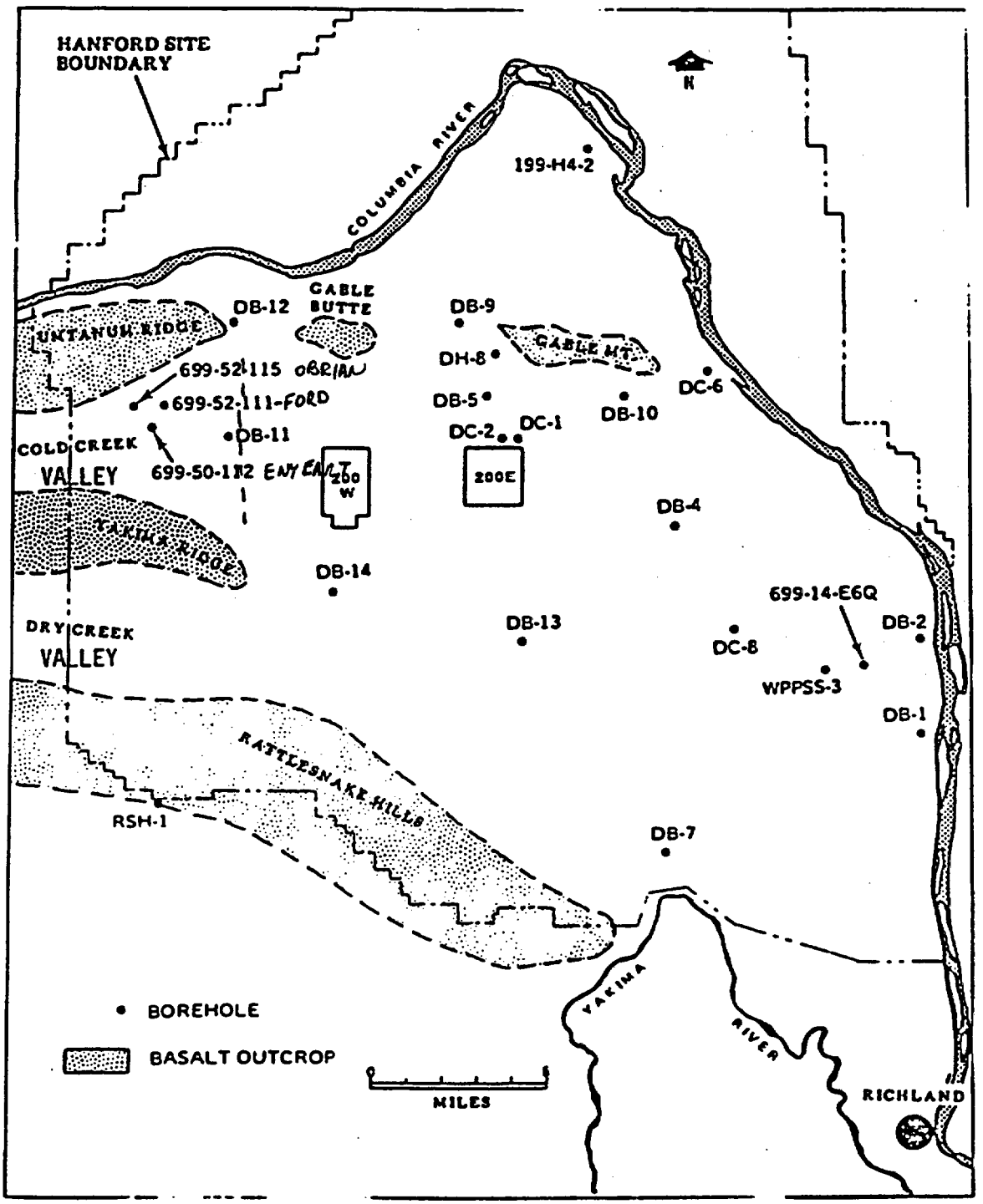
DEVELOPMENT OF: METHODS TO MEASURE STRESSES IN FLOWTOPS

- o JOINTED OVERCORING
- o BOREHOLE MODULUS
- o TRIAXIAL SHEAR

SPECIAL TOPIC

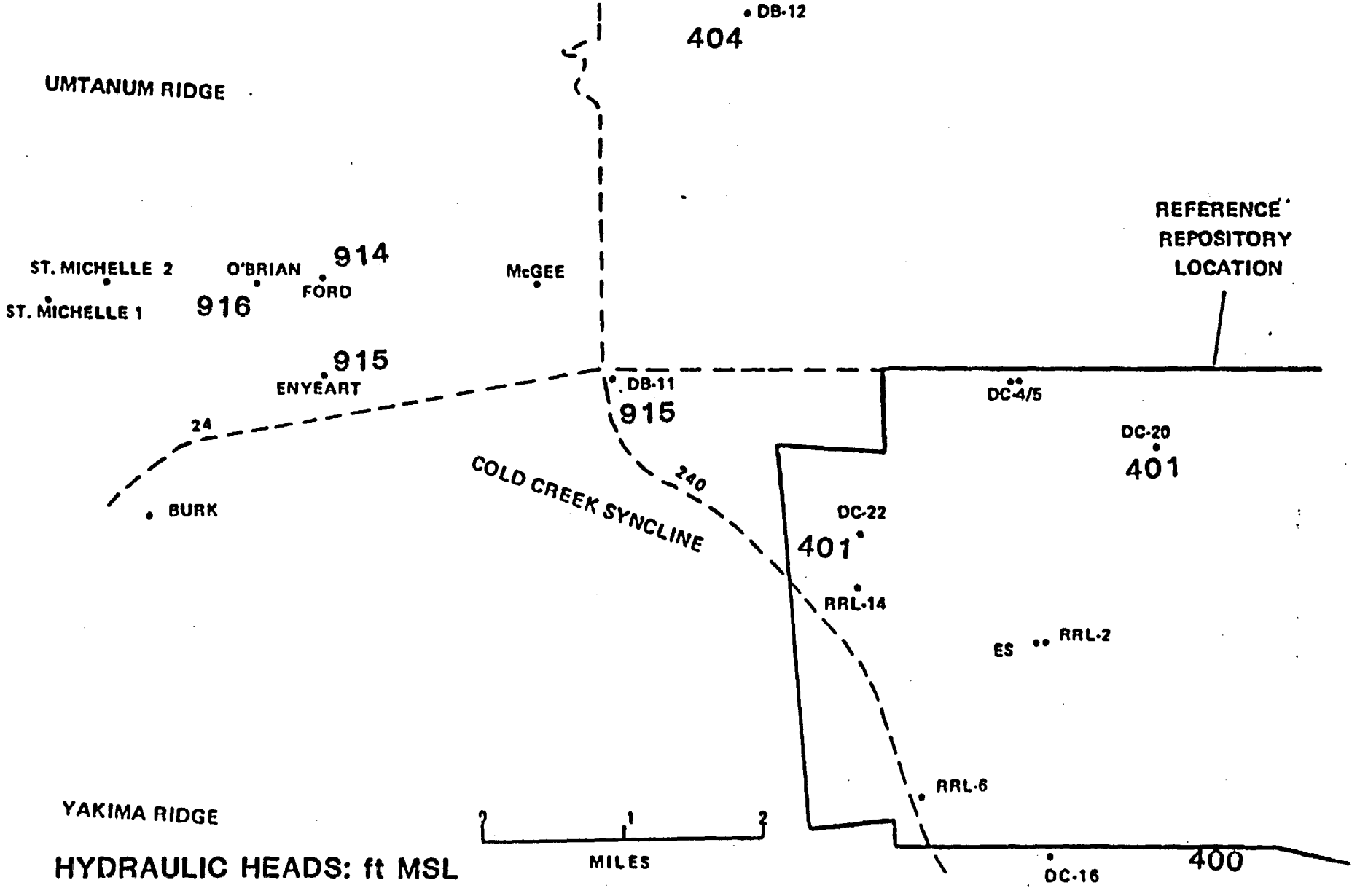
UPPER COLD CREEK SYNCLINE

HYDROLOGIC BARRIER



Wells with Hydrologic information
(from Gephart and others, 1979)

PRIEST RAPIDS INTERFLOW
HYDRAULIC HEADS (3/85)



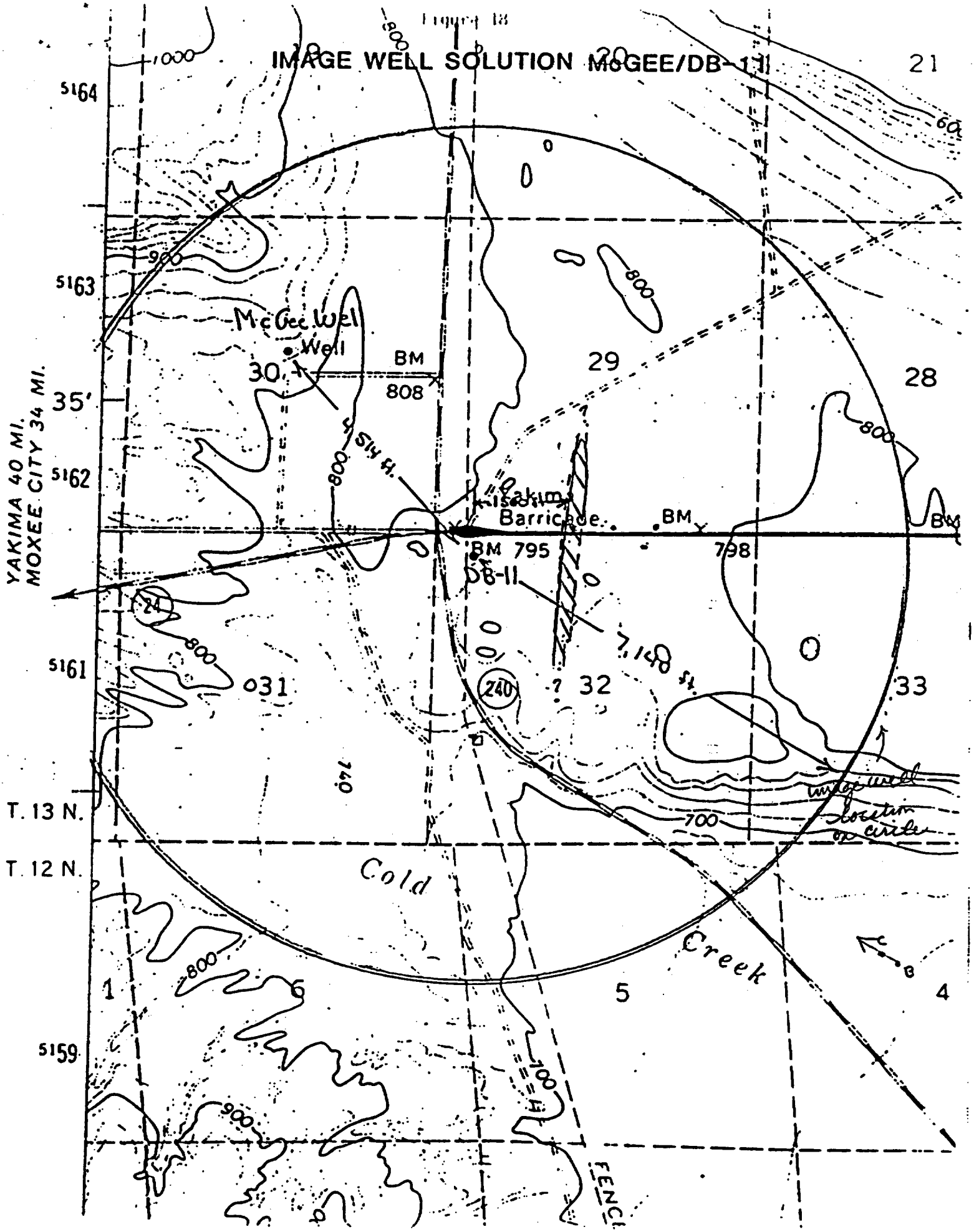
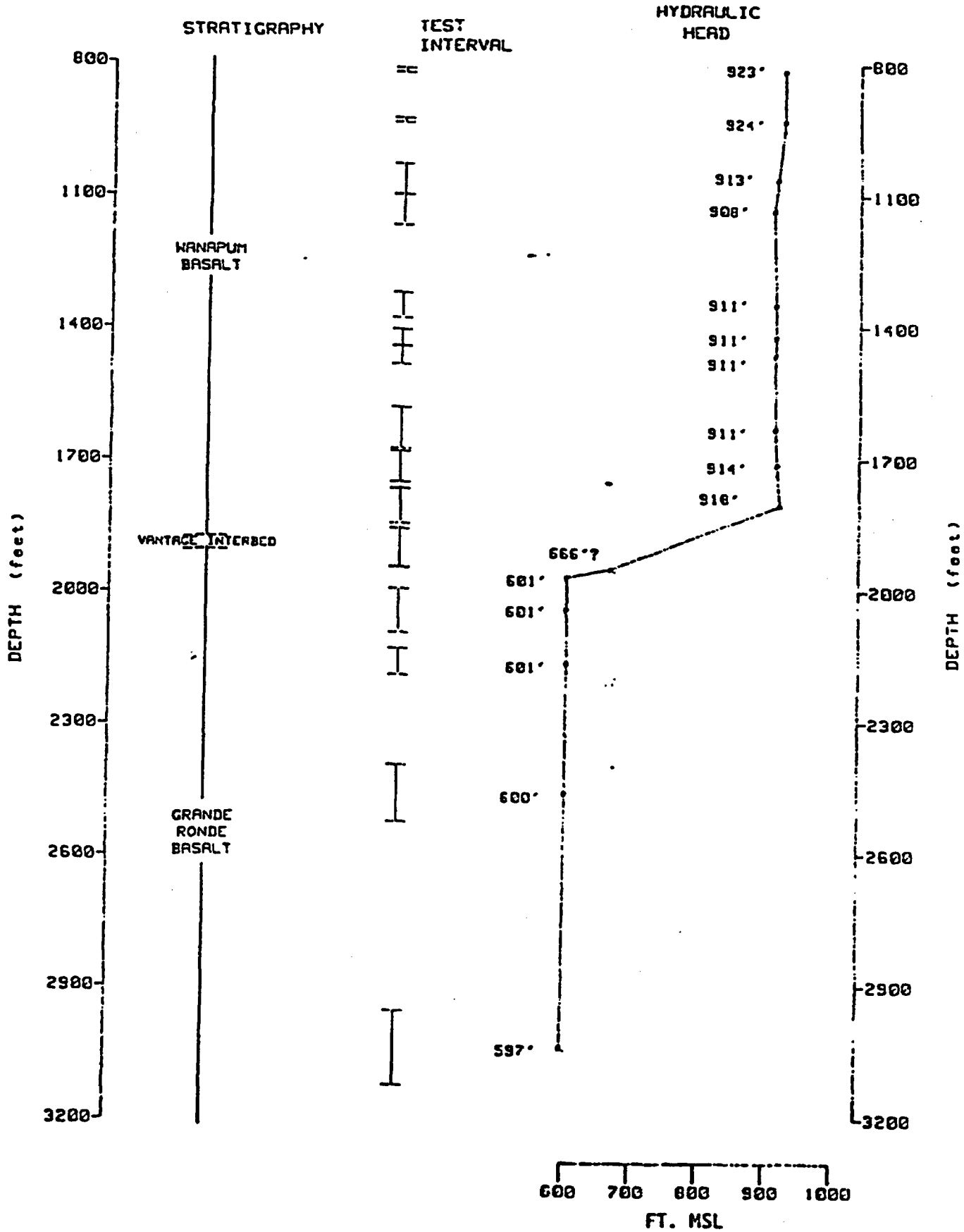


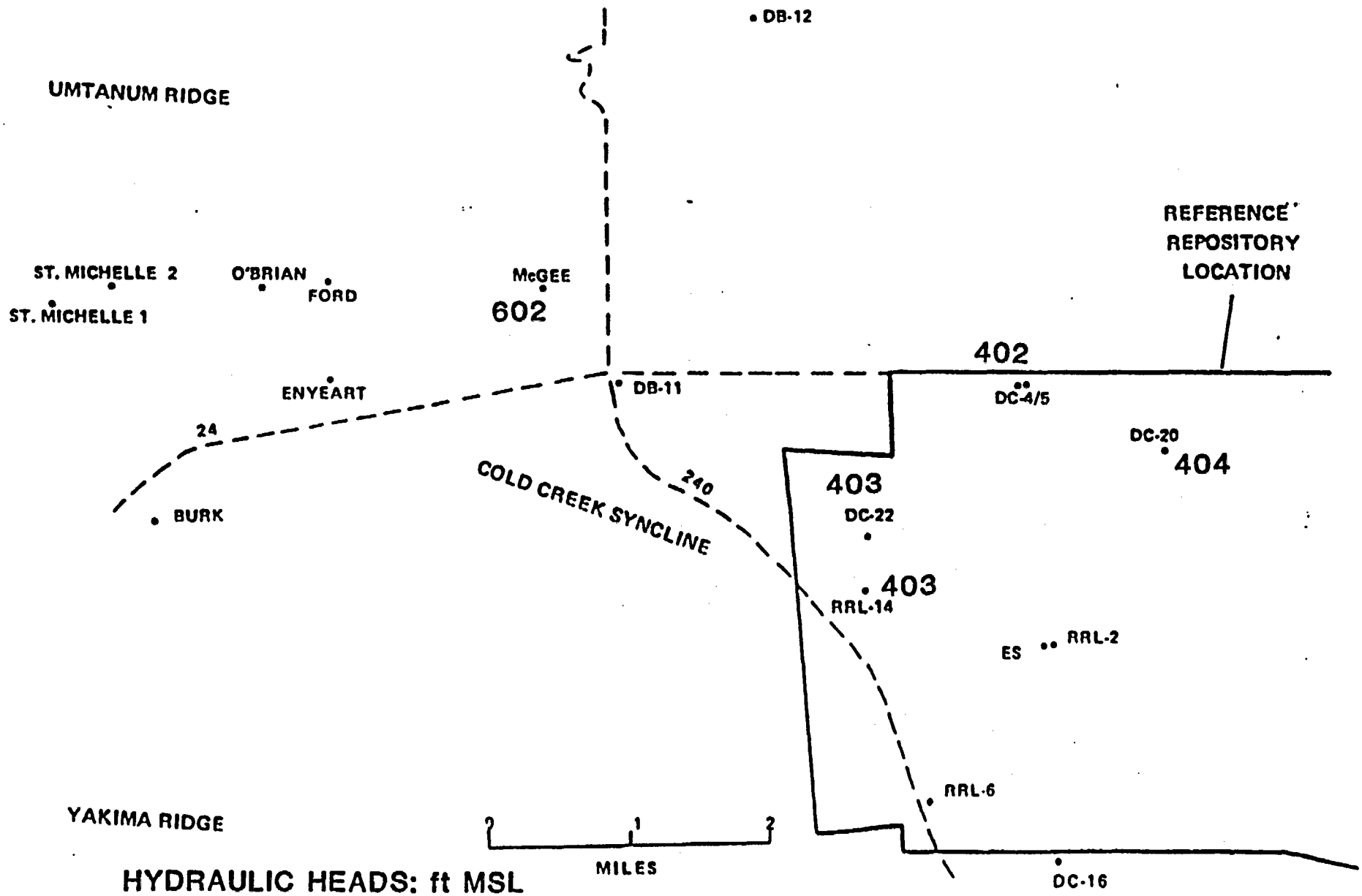
IMAGE WELL SOLUTION McGEE/DB-11
21
5164
5163
5162
5161
5159
YAKIMA 40 MI.
MOXEE CITY 34 MI.
McGee Well
Well
BM
808
30
29
28
35
Yakima
Barricade
BM
BM 795
798
DB-11
031
32
33
240
T. 13 N.
T. 12 N.
Cold
Creek
1
5
4
FENCE
700
800
900
1000

PRELIMINARY

VERTICAL HYDRAULIC HEAD DISTRIBUTION AT THE McGEE WELL



GRANDE RONDE HYDRAULIC HEADS (3/85)



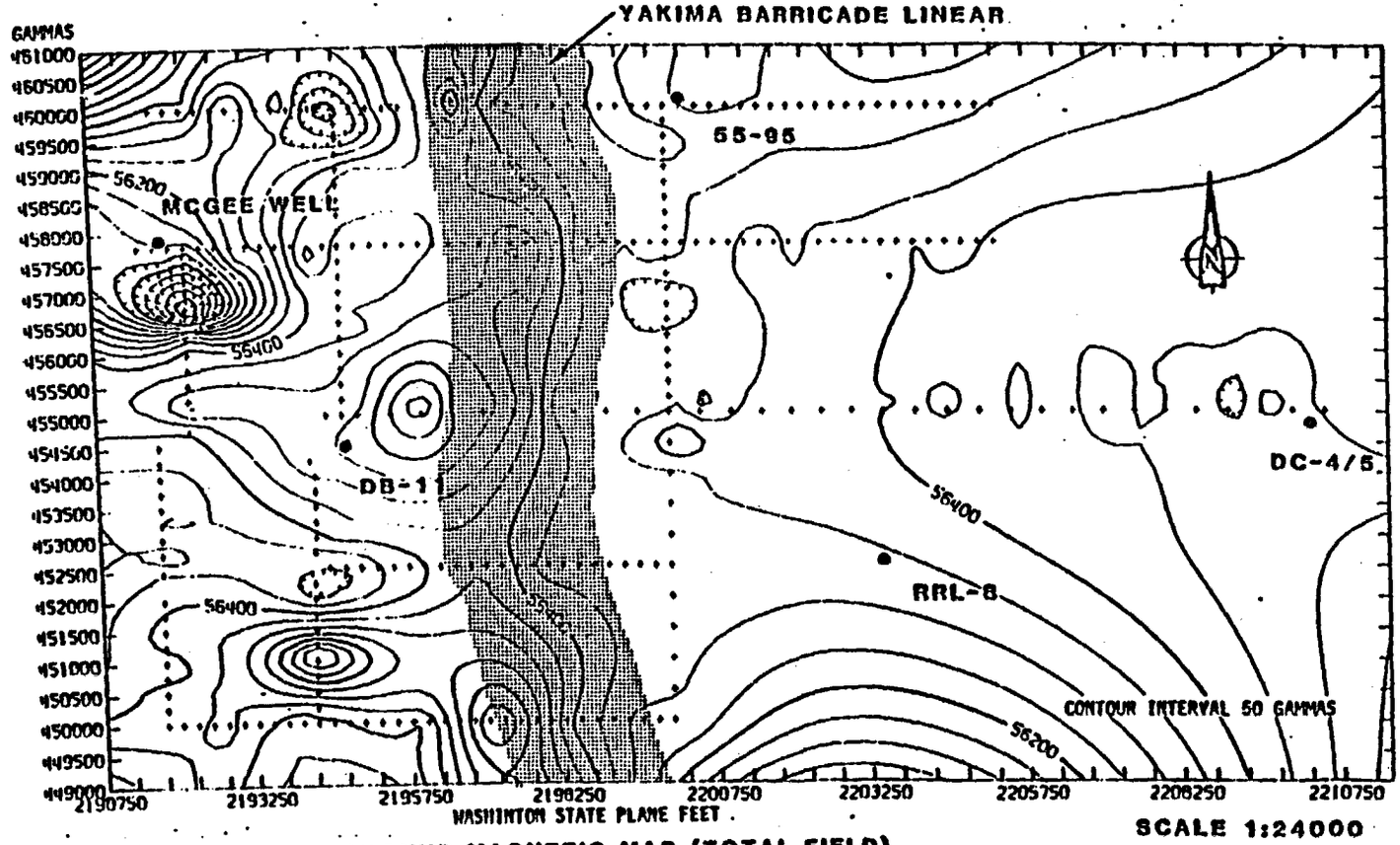


FIGURE 6 GROUND MAGNETIC MAP (TOTAL FIELD)

P60729 •TKBMPLT4F 01/18/82

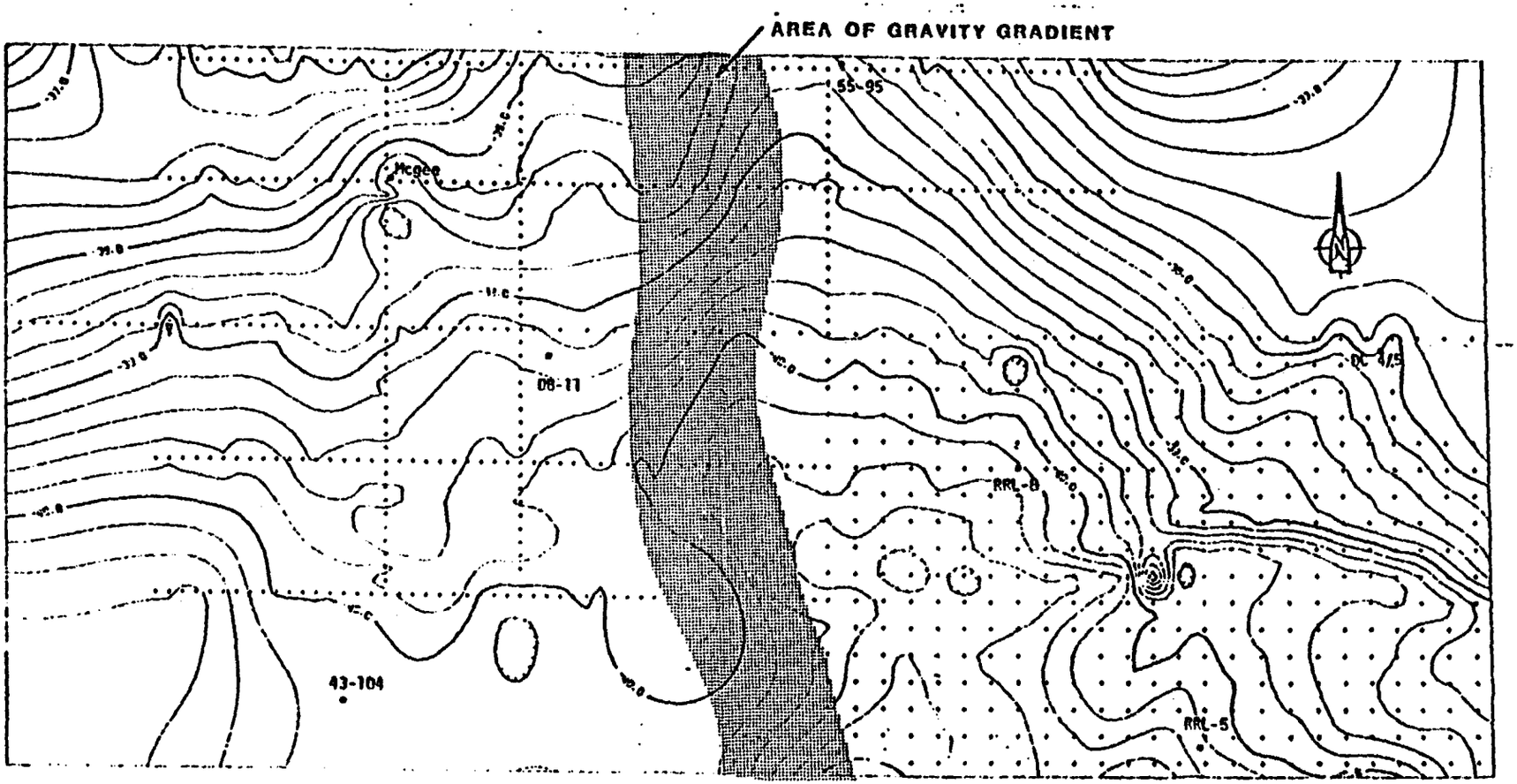
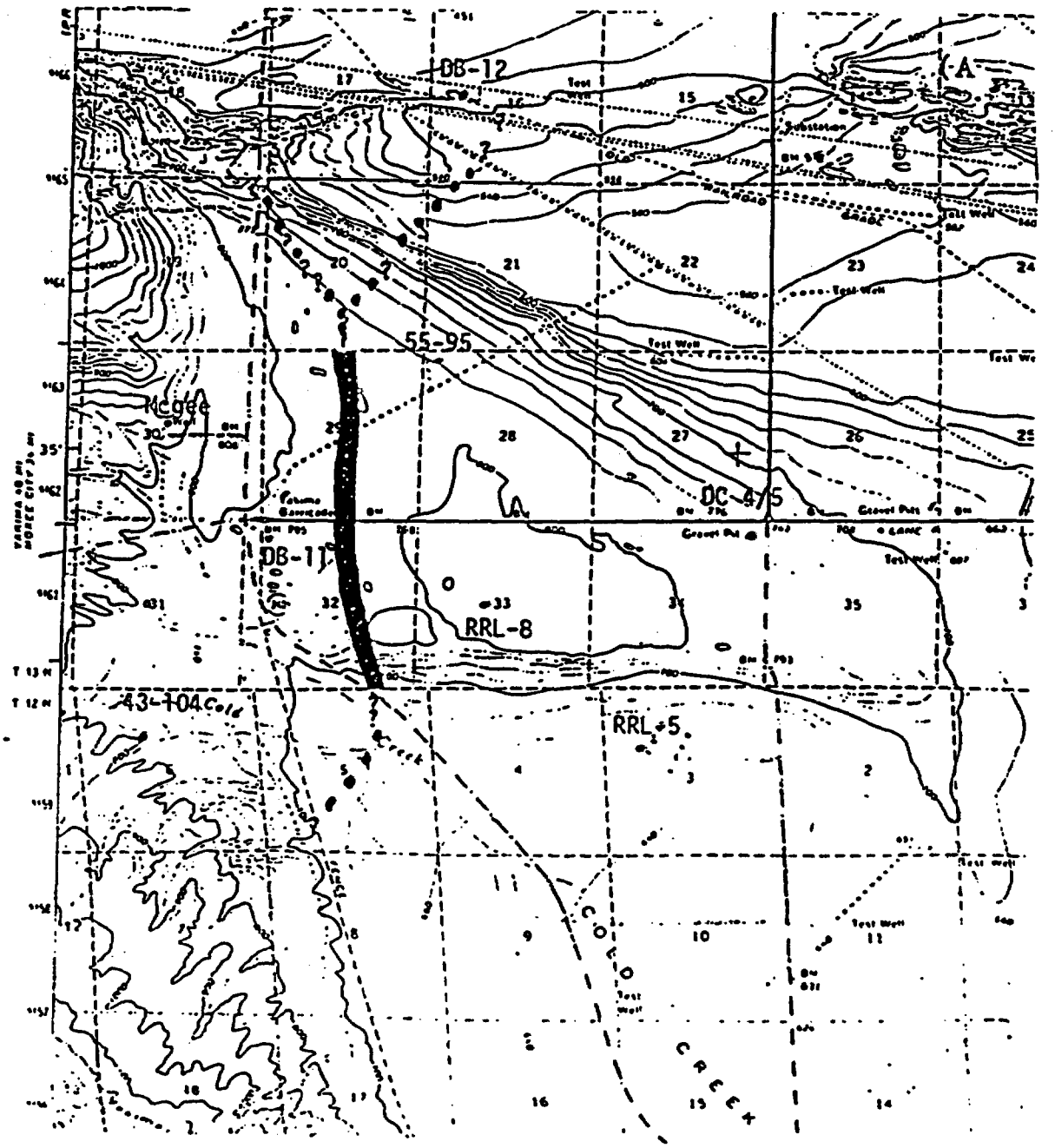
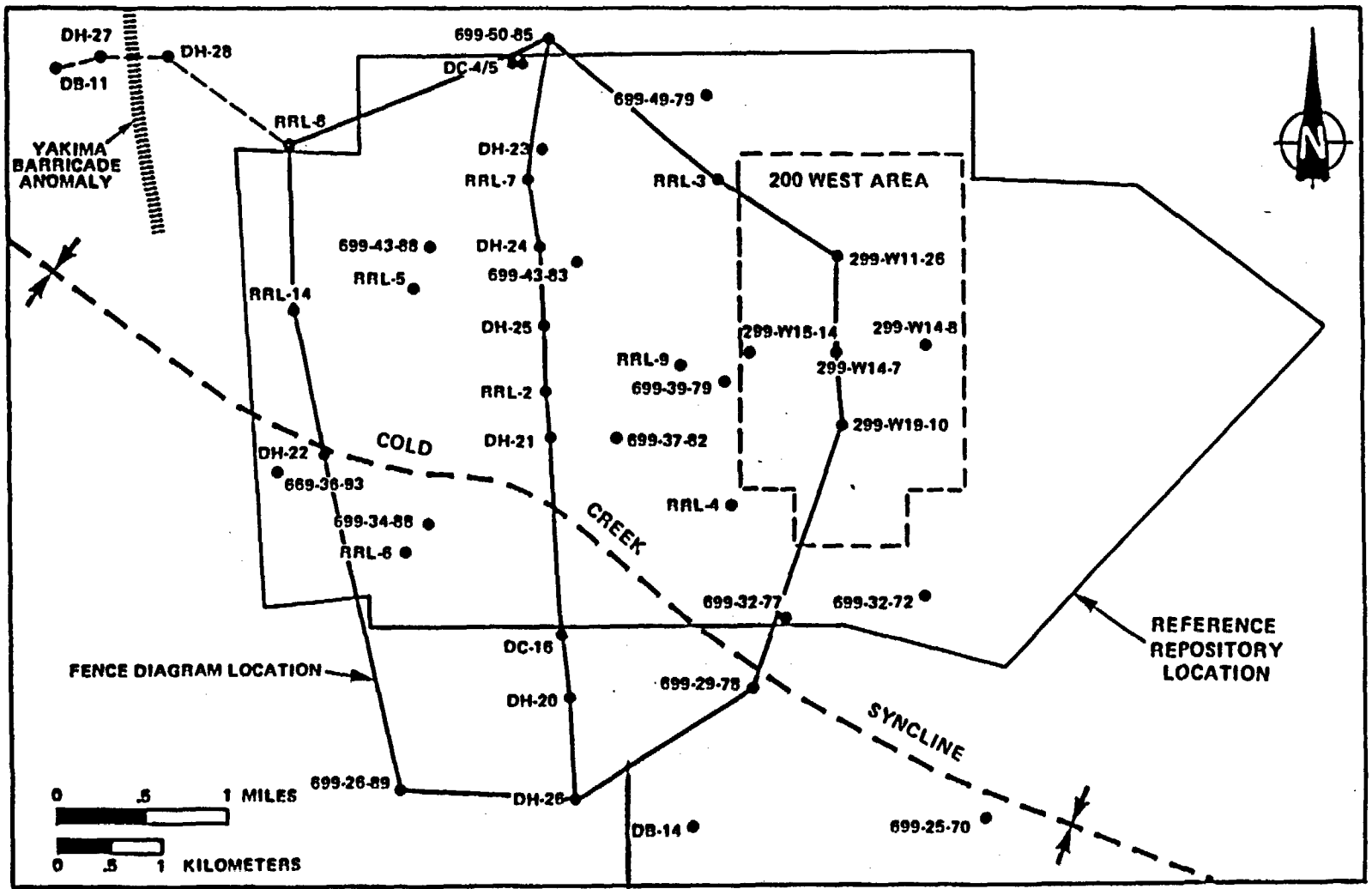


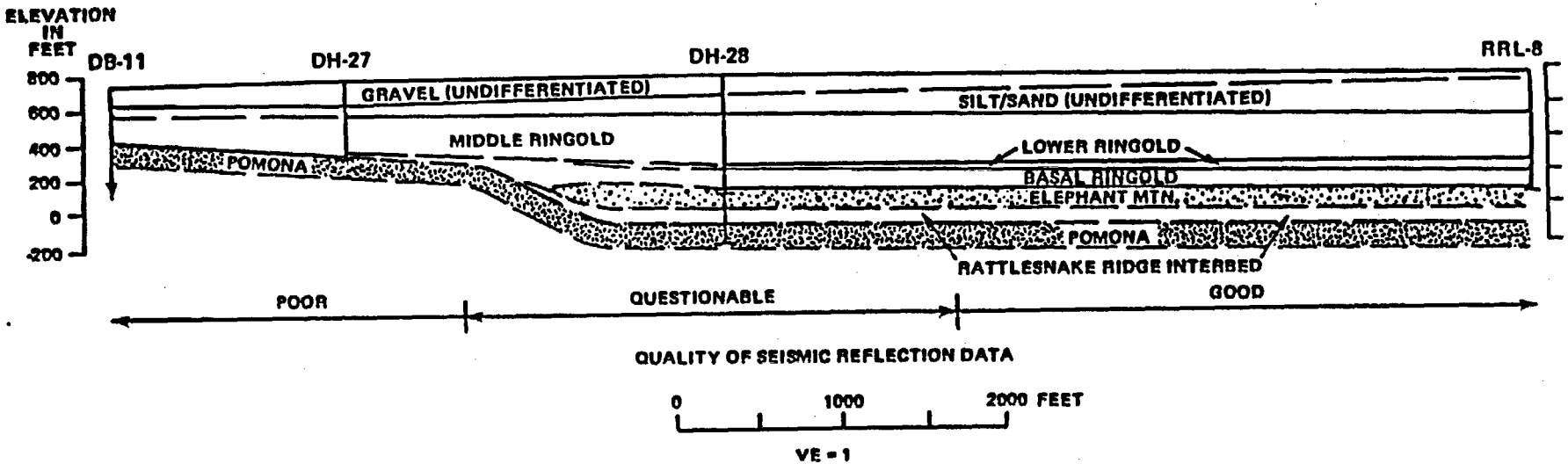
FIGURE 5. Simple Bouguer Gravity Map (scale 1:24000).
Contour Interval 0.2 mgal



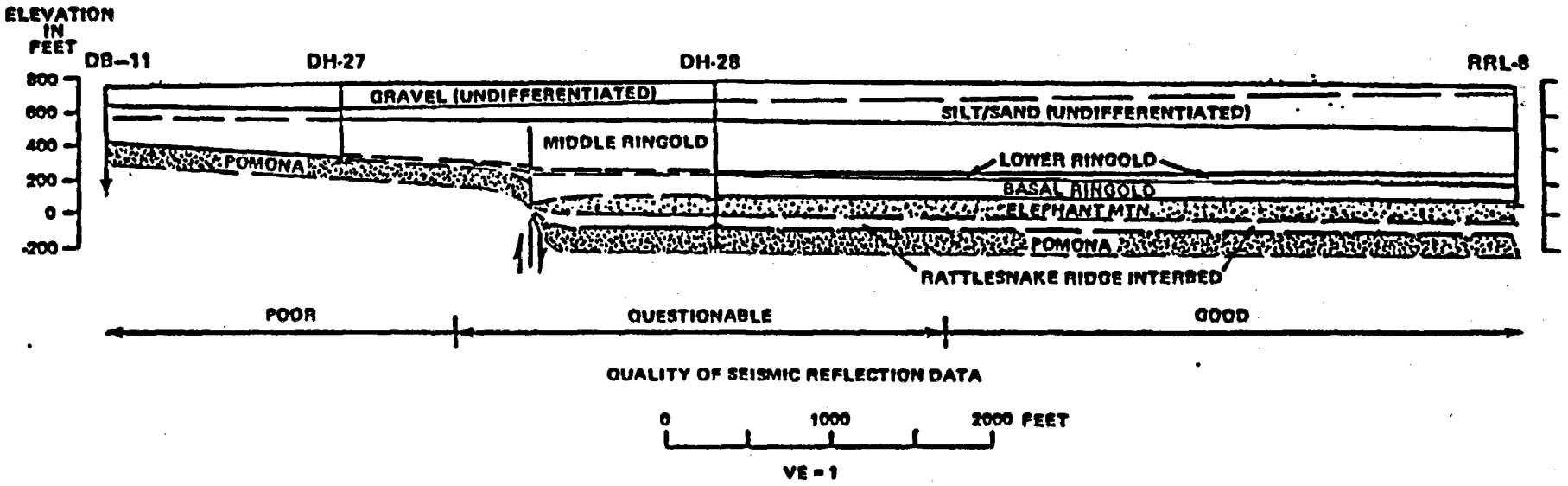
Proposed Location of Hydrologic Barrier



BOREHOLE LOCATIONS



POSSIBLE STRUCTURAL INTERPRETATION FROM
DRILL HOLES DH-27 and DH-28 (MONOCLINE)



POSSIBLE STRUCTURAL INTERPRETATION FROM
DRILL HOLES DH-27 AND DH-28 (FAULT)

OVERALL OBJECTIVES

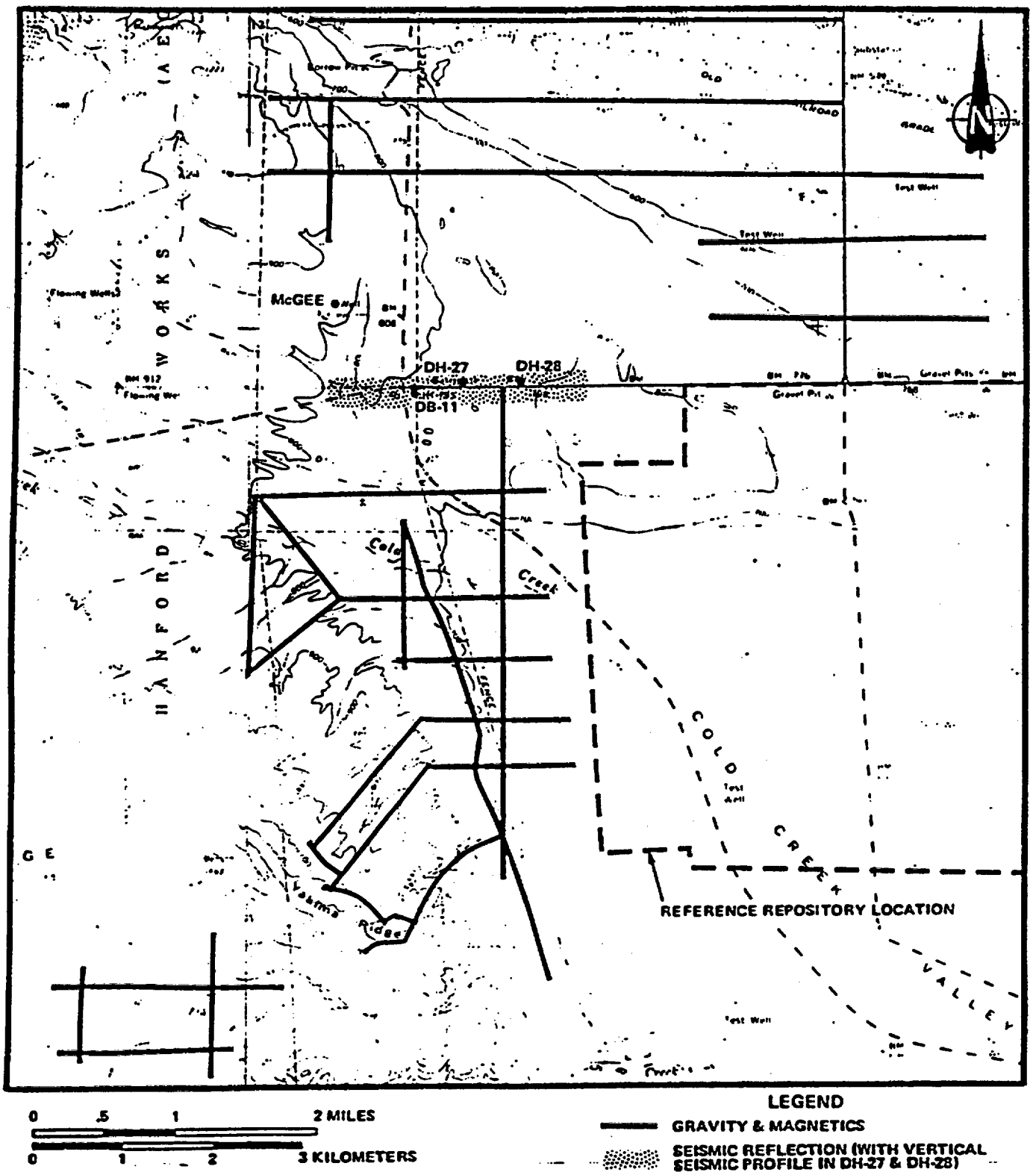
- DETERMINE DIMENSIONS OF THE HYDROLOGIC BARRIER.
- DETERMINE THE PRESENT GEOLOGIC AND HYDROLOGIC CHARACTERISTICS.
- ASSESS FUTURE GEOLOGIC AND HYDROLOGIC CHARACTERISTICS.

TABLE 1

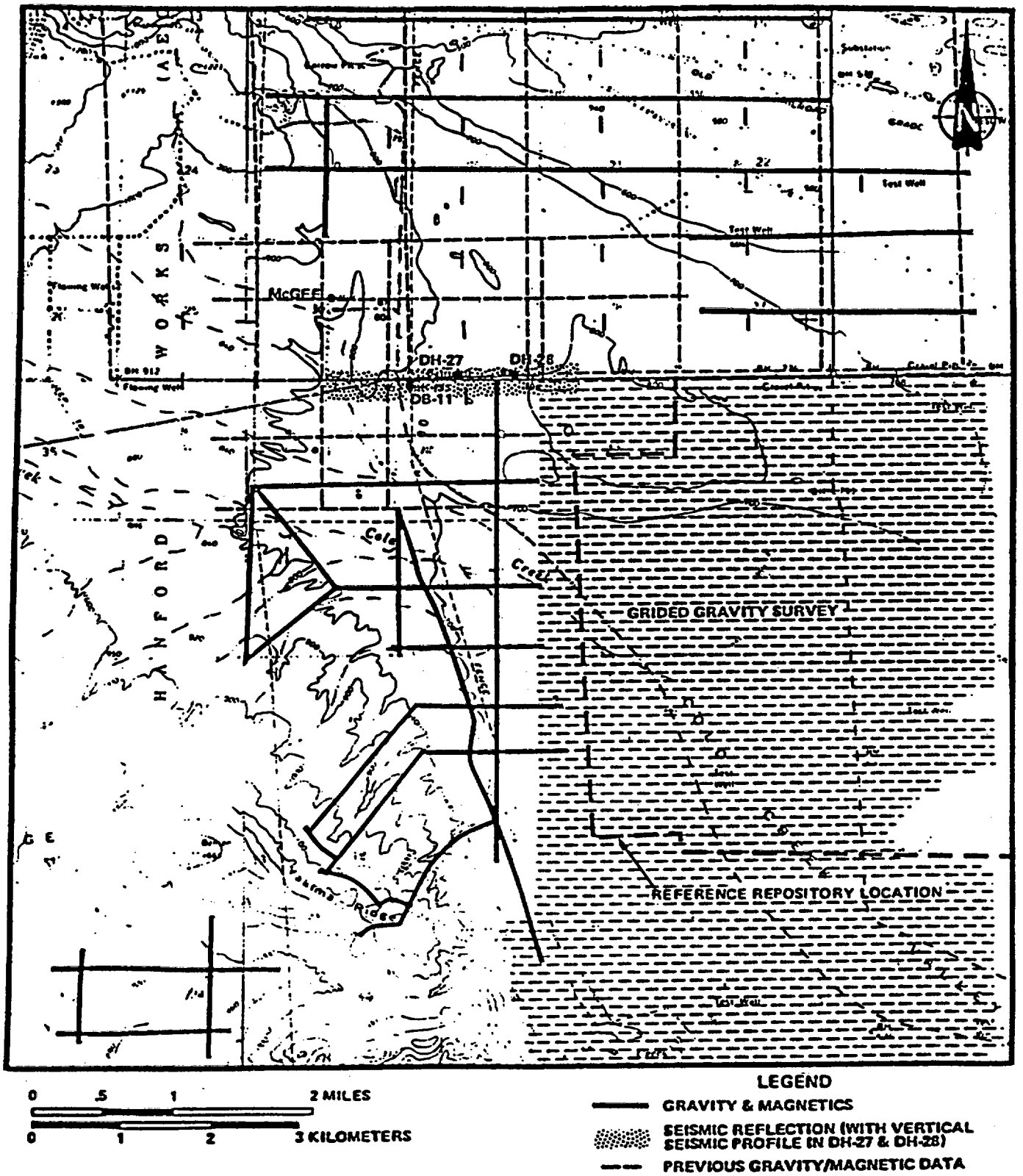
FY85 OBJECTIVES AND PLANS

OBJECTIVES	PLANS
1. Determine the northern and southern extent of geophysical gradients (gravity and magnetics).	Conduct 50 line miles of both gravity and magnetic surveys. JULY
2. Refine location of geophysical gradients and geologic interpretation with seismic reflection data.	Conduct testing and verification of seismic methodology. MAY Conduct one to three lines of seismic reflection in Yakima Barricade area (dependent on testing). AUGUST
3. Refine the location of the hydrologic barrier on the basis of hydraulic head observations within the Selah interbed at DH-27 and DH-28.	Deepen DH-27 and DH-28 through the Selah interbed. Install packers and piezometers in DH-27 and DH-28 to obtain head differences in the Selah interbed and obtain water samples for chemical analyses. APRIL
4. Documentation of results.	Compile status report and update FY86 plans. SEPT.

SOME CROSS HOLE WORK WILL BE DONE - USP
WILL EVENTUALLY DRILL THRU BARRIER



PLANNED GEOPHYSICAL SURVEYS
FOR YAKIMA BARRICADE STUDY FY-85



PREVIOUS AND PLANNED GEOPHYSICAL SURVEYS

TABLE 2

OVERALL OBJECTIVES AND GENERAL PLANS FOR FY86+

OBJECTIVES	PLANS
1. Determine location and dimensions of hydrologic barrier.	Locate and drill 3 wells into the Priest Rapids for constant discharge pumping tests and hydrochemical analyses. Assess need for additional wells for constant discharge pumping tests on basis of initial tests. Assess need for additional geophysics and seismic data on basis of initial tests.
2. Determine present geologic and hydrologic characteristics.	Assess structure through borehole verification A. Structure Verification 1 to 3 boreholes to a maximum depth of 1500 feet B. Age Determination of Last Activity 2-10 closely spaced boreholes through sediments Assess hydraulic properties of the structure through additional hydrologic testing at different scales.
3. Determine future geologic and hydrologic characteristics.	Develop conceptual and numerical models.
4. Documentation of Results	Compile status reports and update plans; compile final report.

RHO-BW-SA-212 P

Structures, Textures, and Cooling Histories of Columbia River Basalt Flows

Date Manuscript Completed: May 1984

P. E. Long
Basalt Waste Isolation Project

B. J. Wood
Northwestern University
Evanston, Illinois

To be submitted to
Geological Society of America Bulletin

Prepared for the U.S. Department of Energy
under Contract DE-AC06-77RL01030

Rockwell International
Rockwell Hanford Operations
Energy Systems Group
P.O. Box 800
Richland, Washington 99352