

2. Robert E. Burning MS 62-55 see pocket 5
in enclosure
all

March 9, 1985

WM DOCKET CONTROL
CENTER

WM Record File

101

WM Project 10

Docket No.

PDR

LPDR

J. L. Tokarz, U.S. Department of Energy and
Members of the Hearing Panel
Federal Building Auditorium
Federal Building
Seattle, Washington

Distribution:

REB	JDB	MRK	JTG	SBilhorn
MOB	HJM	LBH	DEM	ggianatona
(Return to WM, 623-SS)			CFR	J Kennedy C ²

Members of the Panel:

My name is Dr. Steven E. Farkas and I am a Professor of Geology
at Central Washington University in Ellensburg, Wa.

Rec'd fm FR Cook R. Wright
NRC
OSLR

I have studied the basalt flows on the peripheries of the Hanford
Reservation for more than 15 years. I am familiar with the layer
by layer study or stratigraphy of the basalt flows which make up
the Columbia River Basalt Plateau and I am also familiar with the
structural deformation of the basalt flows over most of the basalt
plateau in the State of Washington. In 1971, I was employed by
the Hanford organization for 18 months, during which time I initia-
ted some of the first investigations of the basaltic rocks sponsored
by that organization. Most recently I have completed stratigraphic
and structural studies of the Columbia Plateau for organizations
involved mainly in the search for petroleum resources.

I am opposed to the selection of the Hanford area for a nuclear
high level waste depository for sound scientific reasons. Those
reasons are as follows:

Number 1: Basalt flows are highly permeable to ground
water penetration due to the inherent fractures
which develop in basalt flows when they cool.
In other words, basalt flows become highly
fractured due to shrinkage of the rock as it
cools. Fractures such as these make basalt
flows some of the most remarkable permeable
formations to groundwater movement in the world.

Number 2: Porous and permeable zones also exist between
one basalt flow and another. These zones may
be occupied by sandstones and other sediments.
These sediments offer ready avenues for the
migration of groundwater. They form a classic
example of spring and spring line development
wherever they intersect the surface on the
Columbia Plateau.

Number 3: Channels and caverns exist between the basalt
lava flows due to irregularities which develop

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S.E. Farkas Testimony, Page 2

at the base of a flow during its initial flowage over the surface of the land. These channels occur in a haphazard and random fashion and their occurrence cannot be predicted. Upon cooling, these channels allow ready access to the flowage of fluids. Channels such as these could carry groundwater or other fluids considerable distances underground much the same way as would a randomly intersecting pipeline. Fluids lost in this way are irretrievable.

To illustrate this point a flow in the Upper Grande Ronde Sequence on the Columbia Plateau has been named the Cave Flow because it is extremely cavernous along its bottom surface.

When the geological facts I have just mentioned are considered in the light of the proximity of the Columbia River, it can be logically concluded that there is a real danger of contamination of the Columbia River by the seepage of groundwater contaminated by nuclear high level wastes. I must, therefore, oppose any consideration for the storage of lethal substances in this area.

I am certain that any past or future leakage of nuclear waste at the Hanford site will eventually reach the Columbia River. It is only a matter time before we know how severe the consequences of such leakage will be to the surrounding habitat for man and beast alike.

Dr. Robert E. Browning
MS 623 SS

Summary

State EA
Comments
to Come

PRESENTATION ON EA REVIEW

ENVIROSPHERE COMPANY
SHANNON & WILSON, INC.
COOPER CONSULTANTS, INC.

see ltr. to Tokarz
Jm. Cook
3/9/85 *101*

MARCH 8, 1985

I. INTRODUCTION LOUISE DRESSEN

II. PRESENTATION OF FINDINGS

A. GEOHYDROLOGY DR. HARVEY PARKER

TECTONICS

GEOCHEMISTRY

ROCK CHARACTERISTICS

HUMAN INTERFERENCE

B. TRANSPORTATION ROBERT MOHN

DEFENSE WASTES

RANKING

III. QUESTIONS AND COMMENTS

A. GEOHYDROLOGY

B. TECTONICS

C. GEOCHEMISTRY

D. ROCK CHARACTERISTICS

E. HUMAN INTERFERENCE

F. TRANSPORTATION

G. DEFENSE WASTES

H. RANKING

I. OTHER

FOREWORD

This critique of the U.S. Department of Energy's Draft Environmental Assessment for the reference repository location at the Hanford Site has been conducted on the basis of technical merit and strict compliance with the USDOE General Siting Guidelines, without bias for or against the Hanford alternative. The guidelines explicitly call for assumptions conservative enough to underestimate the potential for a site to meet qualifying conditions (10 CFR 960.3-1-4-2). Most of our comments focus on the degree of conservatism underlying USDOE's conclusions.

The project requires significant advances in the state-of-the-art of many technical specialties, further complicated by extraordinary uncertainties at this stage of site evaluation. It is normal to have differences of opinion among technical experts under these circumstances. No one knows the answers to these significant problems, but we believe that USDOE is more likely to achieve consensus in the technical community by not overstating the ability of the Hanford reference repository location to meet the qualifying conditions.

REVIEW OF RANKINGS

- LIMITED TO HANFORD EA
- NO COMMENT ON CONCLUSIONS FOR OTHER SITES
- UNABLE TO EVALUATE RELATIVE STANDING OF HANFORD
- COMMENTS ON METHODS AND ASSUMPTIONS

APPROACH TO EA REVIEW

- FOCUS ON SITING GUIDELINES
- POSITION ON USDOE ASSESSMENT
 - NO REASON TO DISAGREE
 - DISAGREE, BASED ON INFORMATION IN EA
 - TENTATIVELY DISAGREE, PENDING REEVALUATION
 - TENTATIVELY AGREE, BUT MORE SUPPORT NEEDED
 - CANNOT MAKE INDEPENDENT ASSESSMENT

BASIS FOR COMMENTS

- DATA
- ASSUMPTIONS
- METHODOLOGY
- CONCLUSIONS
- APPROPRIATE CONSERVATISM

NEED FOR CONSERVATISM

GENERAL SITING GUIDELINE 960.3-1-4-2:

"IN DEVELOPING THE . . . BASIS FOR EVALUATION [TO SUPPORT SITE NOMINATION], . . . , ASSUMPTIONS THAT APPROXIMATE THE CHARACTERISTICS OR CONDITIONS CONSIDERED TO EXIST AT A SITE . . . MAY BE USED. THESE ASSUMPTIONS WILL BE REALISTIC BUT CONSERVATIVE ENOUGH TO UNDERESTIMATE THE POTENTIAL FOR A SITE TO MEET THE QUALIFYING CONDITION OF A GUIDELINE; THAT IS, THE USE OF SUCH ASSUMPTIONS SHOULD NOT LEAD TO AN EXAGGERATION OF THE ABILITY OF THE SITE TO MEET THE QUALIFYING CONDITION." (EMPHASIS ADDED)

10 CFR PART 960

DECEMBER 6, 1984

FEDERAL REGISTER, VOL. 49, P. 47756

RECOMMENDATIONS FOR FINAL EA

*Try not to
overstate the
conclusions of the
review*

- MODIFY ANALYSES OF EXISTING DATA
- CONSIDER ADDITIONAL FACTORS
- RECONSIDER METHODS AND ASSUMPTIONS
- USE APPROPRIATE CONSERVATISM
- RECONSIDER FINDINGS AND RANKINGS

OVERVIEW

POSTCLOSURE

● GEOHYDROLOGY ✓

● GEOCHEMISTRY ✓

State agree { ROCK CHARACTERISTICS ✓

CLIMATIC CHANGES ✓

EROSION ✓

DISSOLUTION ✓

● TECTONICS

agree HUMAN INTERFERENCE

● NATURAL RESOURCES ✓

SITE OWNERSHIP AND
CONTROL

PRECLOSURE

State agree { POPULATION DENSITY AND
DISTRIBUTION

METEOROLOGY

OFFSITE INSTALLATIONS AND
OPERATIONS

ENVIRONMENTAL QUALITY

SOCIOECONOMICS ?

● TRANSPORTATION ✓

SURFACE CHARACTERISTICS

● ROCK CHARACTERISTICS
(CONSTRUCTABILITY/COST) ✓

HYDROLOGY

TECTONICS

OTHER

● DEFENSE WASTES (OFFSITE INSTALLATIONS) ✓

● AGGREGATE RANKINGS ✓

POSTCLOSURE GEOHYDROLOGY SITING GUIDELINE

*Lawey Parker
presented to
Sh + W*

- PRESENT & EXPECTED GEOHYDROLOGIC SETTING COMPATIBLE
WITH WASTE CONTAINMENT AND ISOLATION.

Page of Hand

*Look carefully at
Definitions in
Glossary for*

USDOE ASSESSMENT

- AVAILABLE EVIDENCE DOES NOT INDICATE RRL IS UNLIKELY.
TO MEET QUALIFYING CONDITION (LEVEL 3)
- AVAILABLE EVIDENCE APPEARS TO SUPPORT PRELIMINARY
FINDING THAT RRL COULD MEET THIS CONDITION, ALTHOUGH
UNCERTAINTY EXISTS

*best estimate
not*

USDOE POSTCLOSURE GEOHYDROLOGY GUIDELINE ASSESSMENT

QUALIFYING CONDITION

3+

FAVORABLE CONDITIONS

My eval.

- TRAVEL TIME > 10,000 YEARS
- QUATERNARY PROCESSES WILL HAVE NO ADVERSE IMPACTS FOR 100,000 YEARS
- CAN BE READILY MODELED
- FAVORABLE PRE-WASTE EMPLACEMENT CONDITIONS (CONDUCTIVITY, POROSITY, GRADIENT)

+

⊖

+

-

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POTENTIALLY ADVERSE CONDITIONS

- EXPECTED CHANGES COULD INCREASE RADIONUCLIDE TRANSPORT
- GROUNDWATER RESOURCES ALONG FLOW PATH
- GEOLOGIC FEATURES DIFFICULT TO MODEL

+

+

-

DISQUALIFYING CONDITION

- TRAVEL TIME < 1000 YEARS

+

*needs
what about
now based
on existing facts?*

*flow
permeability
issues by more
than 10?*

Robertson USB-S

*NRC
20-40000*

REVIEW COMMENTS ON GEOHYDROLOGY

- MAJOR POTENTIAL LIMITATION TO POSTCLOSURE PERFORMANCE
- UNCERTAINTY OF GROUNDWATER DATA BASE, DEFENSIBLE EVALUATION NOT CURRENTLY POSSIBLE. }
- EVALUATIONS NECESSARY INCLUDE:

A) ~~DEFENSIBLE DATA BASE~~ - *need better.*

- CONDUCTIVITY
- EFFECTIVE POROSITY
- HYDRAULIC GRADIENT

B) REGIONAL GROUNDWATER MODELING

C) FUTURE GROUNDWATER WITHDRAWAL AND IRRIGATION - *effects on grad?*

D) THERMAL BUOYANCY

E) ZONES OF HIGH VERTICAL PERMEABILITY

- REEVALUATE USING ASSUMPTIONS THAT DO NOT OVERESTIMATE ABILITY TO MEET GUIDELINES

Do for EA. outline language.

*use assumption
which
do not
overestimate
assumptions
of parameters*

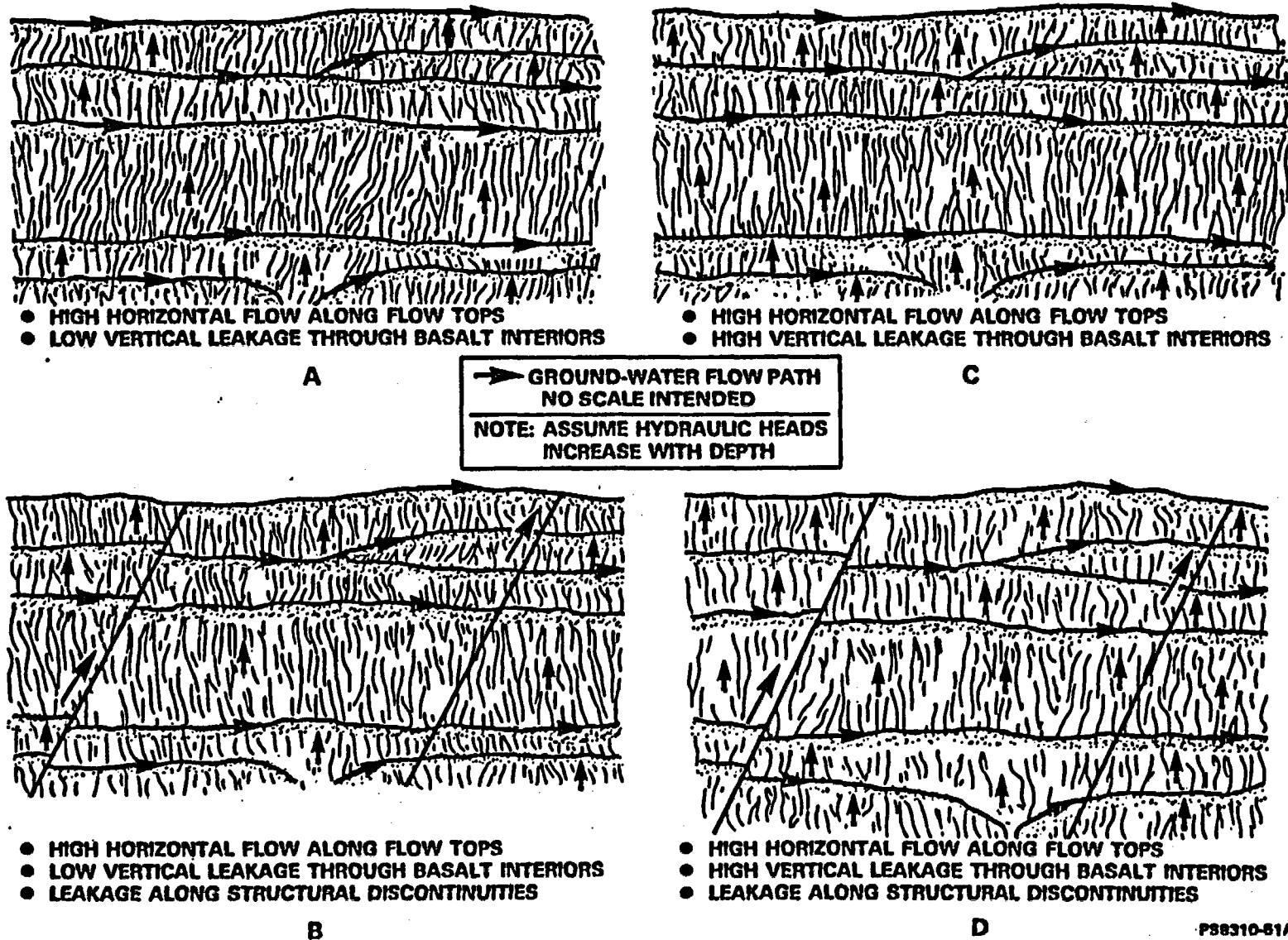
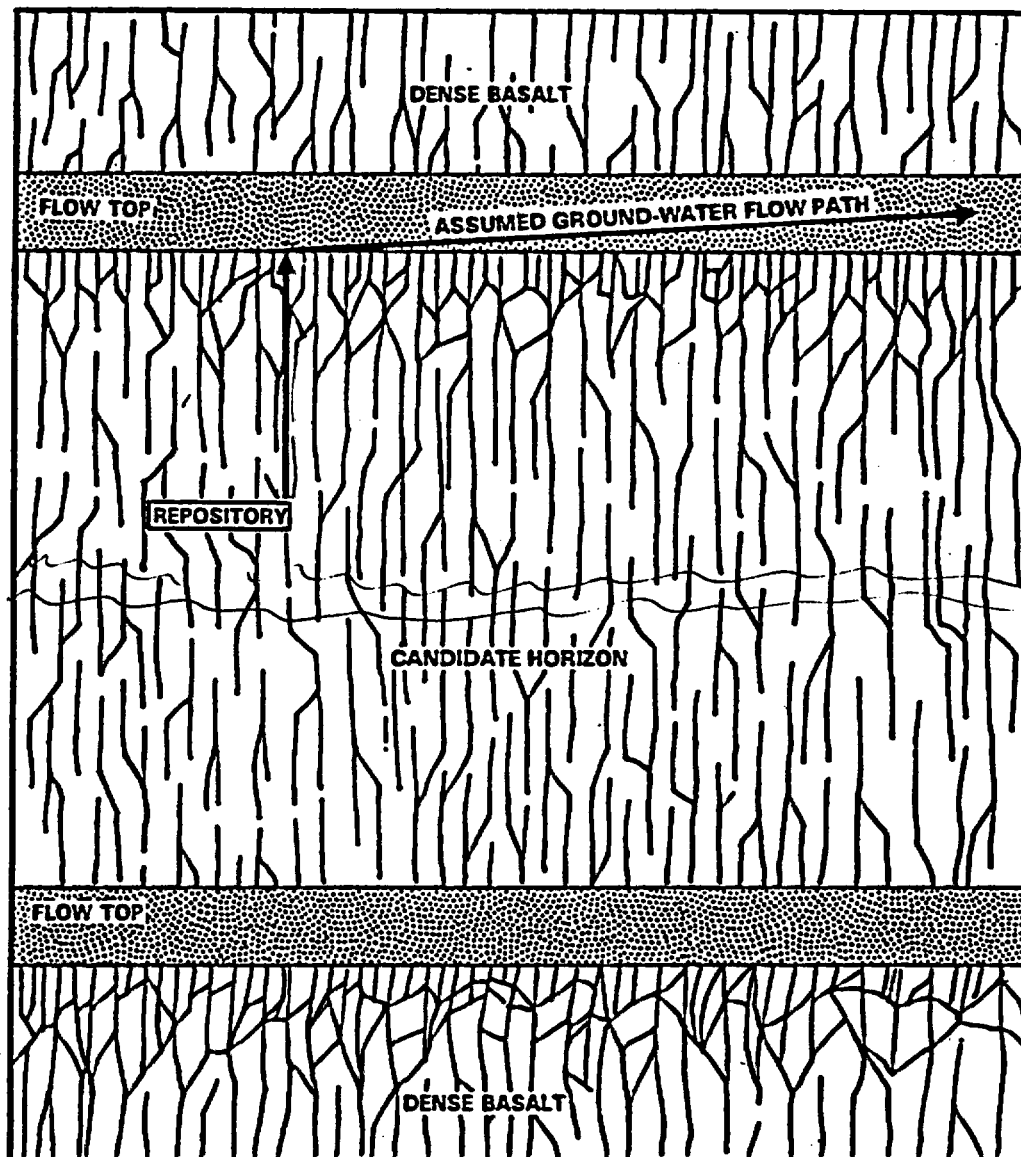


Figure 3-37. Alternative concepts for ground-water movement based on anisotropy contrasts and hypothetical structures (after Gephart et al., 1983).



NOTE: NOT TO SCALE. HYDRAULIC HEAD GRADIENT IS LEFT TO RIGHT.

PSB406-172

Figure 6-23. Conceptual model of ground-water flow paths used in site subsystem performance analysis (no scale).

DRAFT EA

POSTCLOSURE TECTONICS SITING GUIDELINE

- FUTURE TECTONIC PROCESSES OR EVENTS ARE UNLIKELY TO LEAD TO RADIONUCLIDE RELEASES
- EVIDENCE BASED ON TECTONIC PROCESSES & EVENTS AND IGNEOUS ACTIVITY DURING THE QUATERNARY PERIOD.

USDOE ASSESSMENT

- AVAILABLE EVIDENCE DOES NOT INDICATE RRL IS UNLIKELY TO MEET QUALIFYING CONDITION (LEVEL 3)
- FINAL CONCLUSION CANNOT BE MADE FROM AVAILABLE DATA

USDOE POSTCLOSURE TECTONICS GUIDELINE ASSESSMENT

QUALIFYING CONDITION

3+

FAVORABLE CONDITION

- PROCESSES OVER 10,000 YEARS HAVE
<1 CHANCE IN 10,000 OF LEADING
TO RADIONUCLIDE RELEASE

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POTENTIALLY ADVERSE CONDITIONS

- ACTIVE TECTONICS DURING QUATERNARY
- HISTORICAL EARTHQUAKE RECURRENCE
COULD AFFECT WASTE CONTAINMENT
- SEISMICITY MAY INCREASE
- HIGHER SEISMICITY THAN REGION
- POTENTIAL FOR SURFACE-WATER
IMPOUNDMENTS
- TECTONIC DEFORMATION COULD
ADVERSELY IMPACT GROUNDWATER
FLOW

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DISQUALIFYING CONDITION

- TECTONIC PROCESSES LIKELY TO
CAUSE LOSS OF WASTE ISOLATION

1+

REVIEW COMMENTS ON POSTCLOSURE
TECTONICS

- INSUFFICIENT DATA FOR REALISTIC ASSESSMENT NOW
- PRELIMINARY EVALUATION OF DESIGN BASIS EARTHQUAKE AND VIBRATORY GROUND MOTION NEEDED
- EVALUATION OF GEOPHYSICAL ANOMALIES NEEDED
- EVALUATION OF ALTERNATIVE TECTONIC MODELS NEEDED
- DISCUSSION NEEDED ON POTENTIAL IMPACT OF TECTONIC STRUCTURES ON GEOHYDROLOGY

Should
use in
EA
assessment

&
permeability
of vertical paths

GEOCHEMISTRY SITING GUIDELINE

- PRESENT AND EXPECTED GEOCHEMICAL CHARACTERISTICS SHALL BE COMPATIBLE WITH WASTE CONTAINMENT AND ISOLATION
- SHALL PERMIT COMPLIANCE WITH REQUIREMENTS SPECIFIED IN SECTION 960.4-1 FOR RADIONUCLIDE RELEASE
- SHALL PERMIT COMPLIANCE WITH REQUIREMENTS SPECIFIED IN 10CFR 60.113 FOR RADIONUCLIDE RELEASES FROM THE ENGINEERED BARRIER SYSTEM

USDOE ASSESSMENT

- AVAILABLE EVIDENCE DOES NOT INDICATE RRL IS NOT LIKELY TO MEET THE QUALIFYING CONDITION (LEVEL 3)
- A FINAL CONCLUSION ON THE QUALIFYING CONDITION CANNOT BE MADE BASED ON AVAILABLE DATA

USDOE GEOCHEMISTRY GUIDELINE ASSESSMENT

QUALIFYING CONDITION

- PRESENT AND EXPECTED CHARACTERISTICS COMPATIBLE WITH WASTE CONTAINMENT & ISOLATION

3+

FAVORABLE CONDITIONS

- NO ADVERSE GEOCHEMICAL IMPACTS FOR 100,000 YEARS
- CONDITIONS INHIBIT RADIO-NUCLIDE TRANSPORT
- FAVORABLE MINERAL ALTERATION
- SOLUTION OF RADIONUCLIDES $\leq 0.001\%/YEAR$ AT 1000 YEARS
- PROCESSES DECREASE RADIONUCLIDE RELEASES BY FACTOR OF 10 RELATIVE TO GROUNDWATER TRAVEL TIME

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POTENTIALLY ADVERSE CONDITIONS

- GROUNDWATER CONDITIONS COULD DEGRADE ENGINEERED BARRIERS
- REDUCTION OF RADIONUCLIDE SORPTION & ROCK STRENGTH
- OXIDIZING CONDITIONS IN HOST ROCK

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Cleveland article shows adverse water at this site.

Assessment of Waste Package 3.3 inches poor considers future mechanism.

Optimistic picture. Fracture zone any barrier

REVIEW COMMENTS ON GEOCHEMISTRY

- INSUFFICIENT DATA TO CONSERVATIVELY CONCLUDE:
 - (1) CONDITIONS INHIBIT RADIONUCLIDE TRANSPORT
 - (2) SOLUTION OF RADIONUCLIDES $\leq 0.001\%$ /YEAR
AT 1000 YEARS
 - (3) CONDITIONS WOULD NOT RESULT IN REDUCTION
OF ROCK STRENGTH AND SORPTION
 - (4) REDUCING CONDITIONS EXIST IN HOST ROCK
- VALIDITY OF SOME LABORATORY TESTING METHODS
IS IN QUESTION
- GEOCHEMICAL PROCESSES IN BASALT/GROUNDWATER MAY
INCREASE RADIONUCLIDE TRANSPORT & MOBILITY
 - (1) METHANE
 - (2) FLUORIDE
 - (3) HIGH TEMPERATURE

PRECLOSURE ROCK CHARACTERISTICS
SITING GUIDELINE

- **HOST ROCK CAN ACCOMMODATE REPOSITORY**
- **NO UNDUE HAZARD TO PERSONNEL**
- **TECHNOLOGY IS REASONABLY AVAILABLE**
- **COSTS ARE REASONABLE**

USDOE ASSESSMENT

- **AVAILABLE EVIDENCE DOES NOT INDICATE THAT THE
RRL IS UNLIKELY TO MEET THE QUALIFYING CONDITION
(LEVEL 3)**
- **CONSTRUCTION METHODS ARE AVAILABLE**
- **CONDITIONS NOT EXPECTED TO CAUSE UNDUE RISK**
- **IN SITU TESTING AND NUMERICAL ANALYSES NEEDED
TO FULLY ASSESS ROCK BURSTS AND OPENING INSTABILITIES**

USDOE PRECLOSURE ROCK CHARACTERISTICS
GUIDELINE ASSESSMENT

Summary

USDOE
ASSESSMENT

QUALIFYING CONDITION

3+

FAVORABLE CONDITIONS

- HOST ROCK ALLOWS FLEXIBILITY
- MINIMAL UNDERGROUND SUPPORT

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POTENTIALLY ADVERSE CONDITIONS

- HOST ROCK ALLOWS LITTLE FLEXIBILITY
- HIGH TECHNOLOGY REQUIRED FOR SHAFTS OR MINING
- EXTENSIVE MAINTENANCE NEEDED
- SAFETY HAZARDS
- STRATIGRAPHIC OR STRUCTURAL FEATURES COULD COMPROMISE PERSONNEL SAFETY

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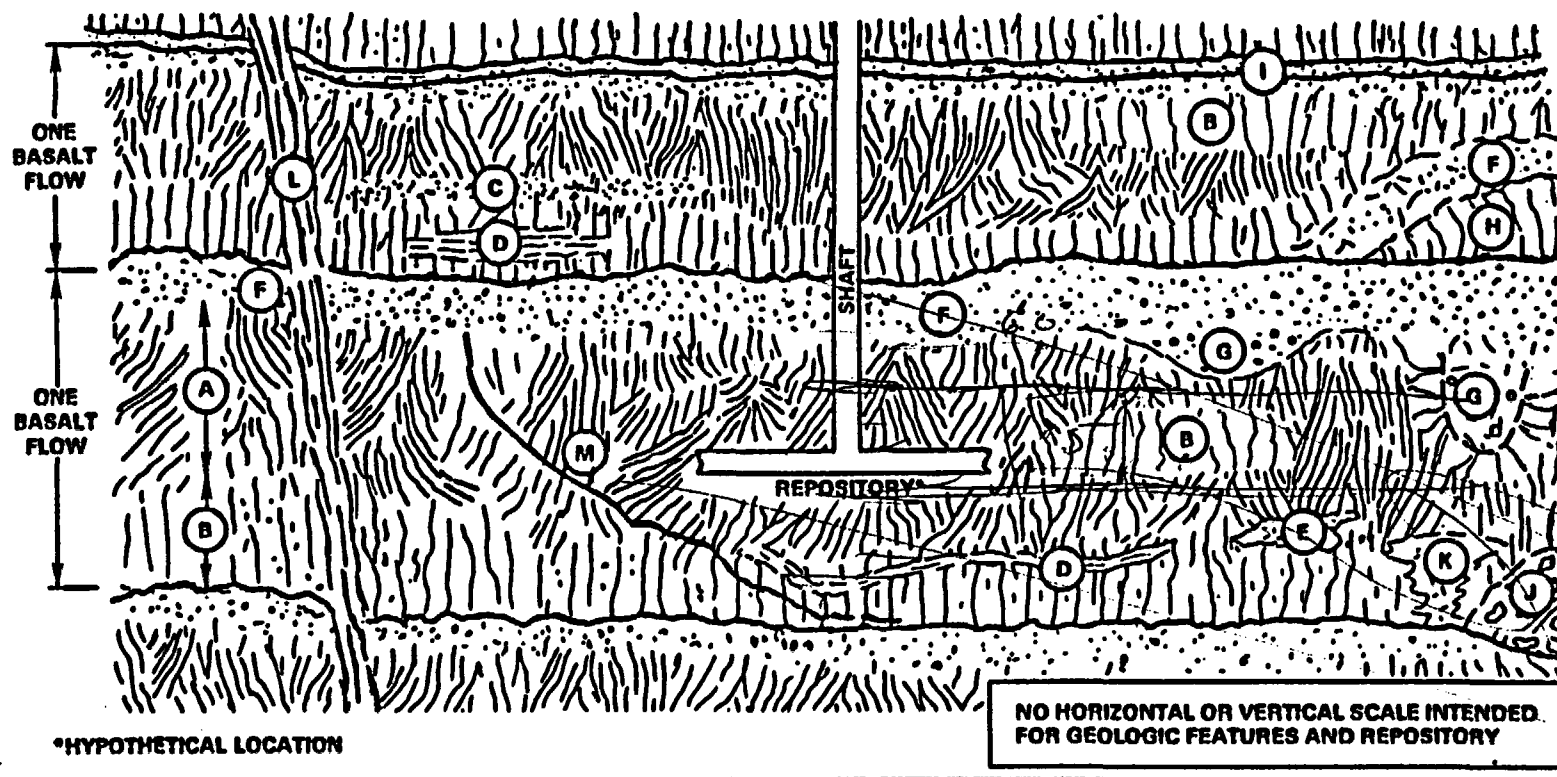
DISQUALIFYING CONDITION

- SIGNIFICANT SAFETY RISK TO PERSONNEL

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REVIEW COMMENTS ON PRECLOSURE
ROCK CHARACTERISTICS

- REEVALUATE UNDERGROUND CONSTRUCTION COSTS
CONSIDERING UNCERTAINTIES
 - (1) IN SITU STRESS
 - (2) ANOMALIES
 - (3) GROUNDWATER INFLOW
- CHARACTER AND UNPREDICTABILITY OF INTERNAL STRUCTURES AND ANOMALIES *see next page*
- DEFENSE WASTE INCREASES CHANCES OF ENCOUNTERING GEOLOGIC ANOMALIES
- SHAFT DRILLING WOULD BE DEVELOPMENTAL
- CONTINGENCY PLANS FOR INCOMPLETE SHAFT OR INADEQUATE SEALING
- RECONSIDER PLANS AND EFFECTS OF HIGH IN SITU STRESS ON SAFETY AND COST *State wants to look at costs.*



PS8310-50B

Figure 3-36. Hypothetical composite cross section of possible geologic features in a layered basalt sequence (after Gephart et al., 1983).

HUMAN INTERFERENCE
(NATURAL RESOURCES) SITING GUIDELINE

- FUTURE GENERATIONS WILL NOT BE LIKELY TO AFFECT WASTE CONTAINMENT AND ISOLATION, AND
- NATURAL RESOURCES AT OR NEAR SITE WILL NOT BE LIKELY TO GIVE RISE TO INTERFERENCE ACTIVITIES LEADING TO RADIONUCLIDE RELEASE

USDOE ASSESSMENT

- AVAILABLE EVIDENCE DOES NOT INDICATE THAT RRL IS UNLIKELY TO MEET THIS QUALIFYING CONDITION (LEVEL 3)
- A FINAL CONCLUSION CANNOT BE MADE FROM AVAILABLE DATA

USDOE NATURAL RESOURCES GUIDELINE ASSESSMENTS

QUALIFYING CONDITION

3+

FAVORABLE CONDITIONS

- NO COMMERCIALY VALUABLE NATURAL RESOURCES
- GROUNDWATER WITH $\geq 10,000$ PPM DISSOLVED SOLIDS ALONG TRAVEL PATHS

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POTENTIALLY ADVERSE CONDITIONS

- ECONOMICALLY EXTRACTABLE RESOURCES OR RESOURCES OF GREATER VALUE THAN NEARBY
- PAST MINING ACTIVITIES COULD AFFECT WASTE ISOLATION
- PAST DRILLING COULD AFFECT WASTE ISOLATION
- VALUABLE RESOURCE NOT WIDELY AVAILABLE
- FUTURE HUMAN ACTIVITIES COULD ADVERSELY IMPACT GROUNDWATER SYSTEM

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DISQUALIFYING CONDITIONS

- PATHWAYS TO ACCESSIBLE ENVIRONMENT VIA PREVIOUS ACTIVITIES
- FUTURE RESOURCE EXPLOITATION OUTSIDE CONTROL AREA WOULD LEAD TO LOSS OF WASTE ISOLATION

1+

1+

**REVIEW COMMENTS ON POSTCLOSURE NATURAL
RESOURCES**

- **FURTHER EVALUATION OF NATURAL GAS POTENTIAL
AT RRL IS NEEDED**
- **EVALUATE GROUNDWATER WITHDRAWAL IMPACT**

TRANSPORTATION SITING GUIDELINE

(1) LOCAL ACCESS ROUTES

- NO USE CONFLICT
- AVAILABLE TECHNOLOGY
- NORMAL DOT AND NRC PERFORMANCE STANDARDS
- NO UNACCEPTABLE RISK OR ENVIRONMENTAL IMPACT

(2) PUBLIC AND ENVIRONMENT PROTECTED FROM HAZARD

USDOE TRANSPORTATION GUIDELINE ASSESSMENT

QUALIFYING CONDITION

3+

FAVORABLE CONDITIONS

*local
factor*

- ACCESS ROUTES FROM LOCAL HIGHWAYS/
RAILROADS
- PROXIMITY OF LOCAL HIGHWAYS/RAILROADS
- PROXIMITY TO REGIONAL TRANSPORTATION
FACILITIES
- AVAILABILITY OF REGIONAL RAIL SYSTEM
- TOTAL SYSTEM COST/RISK < OTHER SITES
- AVAILABILITY OF CAPABLE AND WILLING
CARRIERS
- ABSENCE OF LEGAL IMPEDIMENTS
- ACCIDENT RESPONSE PLANS/CAPABILITIES
- SEASONAL TRANSPORTATION DISRUPTIONS
NOT ROUTINE

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+

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*2x time
A unit of
lowest
cost/risk
score*

POTENTIALLY ADVERSE CONDITIONS

- ACCESS CONSTRUCTION EXPENSE > OTHER
SITES
- HAZARDOUS TERRAIN FOR ACCESS
- LOCAL ROADS/RAILROADS REQUIRE UPGRADING
- LOCAL CONDITION CAUSING COSTS, IMPACTS
OR RISKS > OTHER SITES

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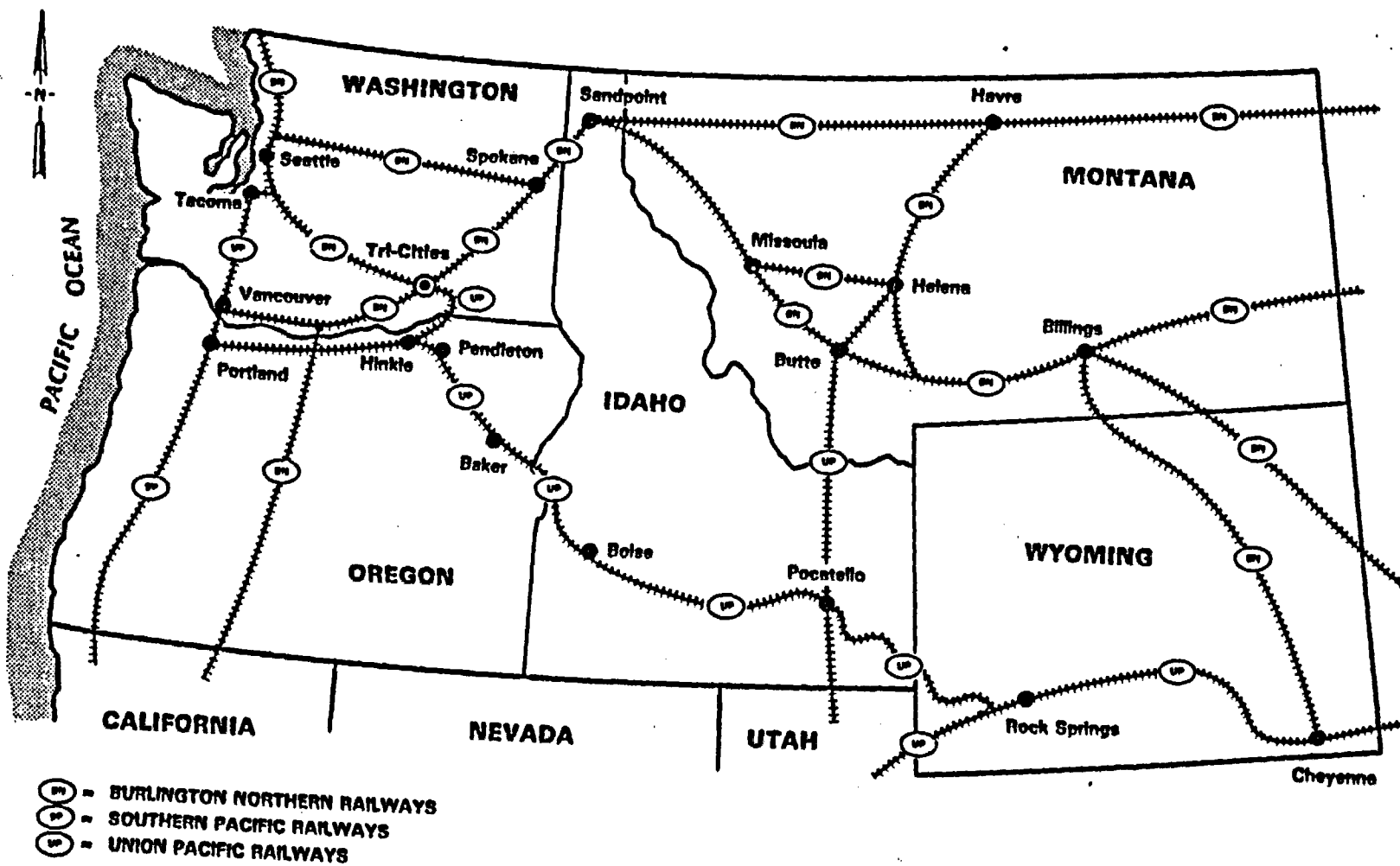
USDOE ASSESSMENT

- AVAILABLE EVIDENCE DOES NOT SUPPORT A FINDING THAT THE REFERENCE REPOSITORY LOCATION IS NOT LIKELY TO MEET THE QUALIFYING CONDITION (LEVEL 3)
- A FINAL CONCLUSION CANNOT BE MADE BASED ON CURRENTLY AVAILABLE DATA
- HANFORD RANKS HIGHEST WITH RESPECT TO LOCAL AND REGIONAL CONDITIONS:
 - SHORT ACCESS ROUTES
 - FEW LOCAL HAZARDS
 - CONVENIENT ACCESS TO NATIONAL HIGHWAY NETWORK
 - MINIMUM RELIANCE ON LOCAL ROADS
 - ROUTINE WEATHER DISRUPTIONS NOT EXPECTED
- HANFORD HAS HIGHEST TOTAL LIFE-CYCLE COST AND RISKS

REVIEW COMMENTS ON TRANSPORTATION

- DRAFT EA CONCENTRATES ON LOCAL RATHER THAN REGIONAL AND NATIONWIDE FACTORS.
- WHEN TOTAL SYSTEM IS CONSIDERED, EVALUATION IS BASED ON GENERIC UNIT RISK FACTORS; NOT ROUTE-SPECIFIC CONDITIONS.

- EVALUATION OF IMPACTS, COSTS, RISKS AND DISRUPTION POTENTIAL CONSTRAINED BY NARROW STUDY AREA BOUNDS. *look at manually exposed corridors*



PS8401-184

Figure 3-43. Major Pacific Northwest rail lines providing access to the Tri-Cities, Washington.

DEFENSE WASTES

SITING GUIDELINES IMPACTED:

- PRECLOSURE RADIOLOGICAL SAFETY - OFFSITE
INSTALLATIONS AND OPERATIONS
- TRANSPORTATION
- EASE AND COST OF CONSTRUCTION - ROCK
CHARACTERISTICS

DEFENSE WASTES AND REPOSITORY OPERATION

POTENTIALLY ADVERSE CONDITION (OFFSITE INSTALLATIONS):

PRESENCE OF NEARBY POTENTIALLY HAZARDOUS
INSTALLATIONS THAT COULD ADVERSELY AFFECT
REPOSITORY OPERATION OR CLOSURE

REVIEW COMMENTS AND RECOMMENDATIONS:

- RRL LOCATION BELOW 200-WEST AREA AND
ADJACENT TO 200-EAST AREA AND COMMERCIAL
LOW-LEVEL WASTE SITE
- PRESENCE OF HIGH-LEVEL WASTE STORAGE
TANKS, TRANSURANIC WASTES AND LOW-LEVEL
RADIOACTIVE WASTES
- IMPACT ON EFFECTIVE MONITORING OF
REPOSITORY PERFORMANCE, PARTICULARLY, <
ABILITY TO DIFFERENTIATE AMONG RELEASES -

*what about existing effects on wastes and
how ~~they~~ their release would be affected.*

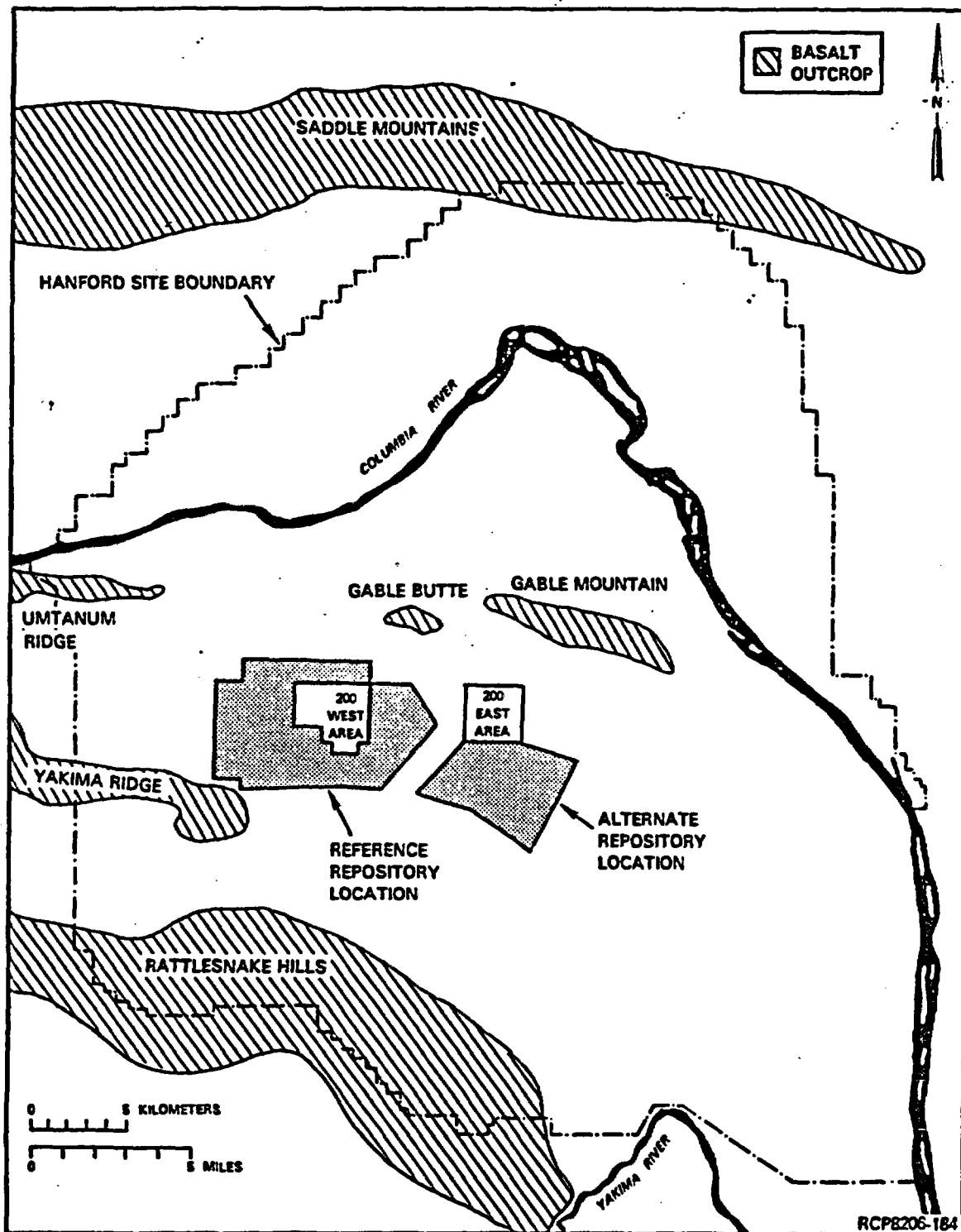


Figure 2-26. Location of the reference repository location and alternate repository location.

DEFENSE WASTES AND TRANSPORTATION

EA ASSUMPTIONS (TRANSPORTATION)

- (1) 6,720 TRUCK SHIPMENTS FROM SAVANNAH RIVER PLANT
- (2) 4-6% INCREASE IN SHIPMENTS OVER COMMERCIAL WASTES

USDOE COMMINGLING STUDY

- (1) 20,000 TRUCK SHIPMENTS FROM SAVANNAH RIVER (AND IDAHO FALLS)
- (2) 12-18% INCREASE IN SHIPMENTS OVER COMMERCIAL WASTES

REVIEW COMMENTS AND RECOMMENDATIONS

- (1) RECOGNIZE LIKELIHOOD OF COMMINGLING
- (2) RESOLVE QUANTITIES OF DEFENSE WASTES AND ASSOCIATED TRANSPORTATION REQUIREMENTS
- (3) REASSESS TRANSPORTATION IMPACTS TO REFLECT DEFENSE WASTE SHIPMENTS

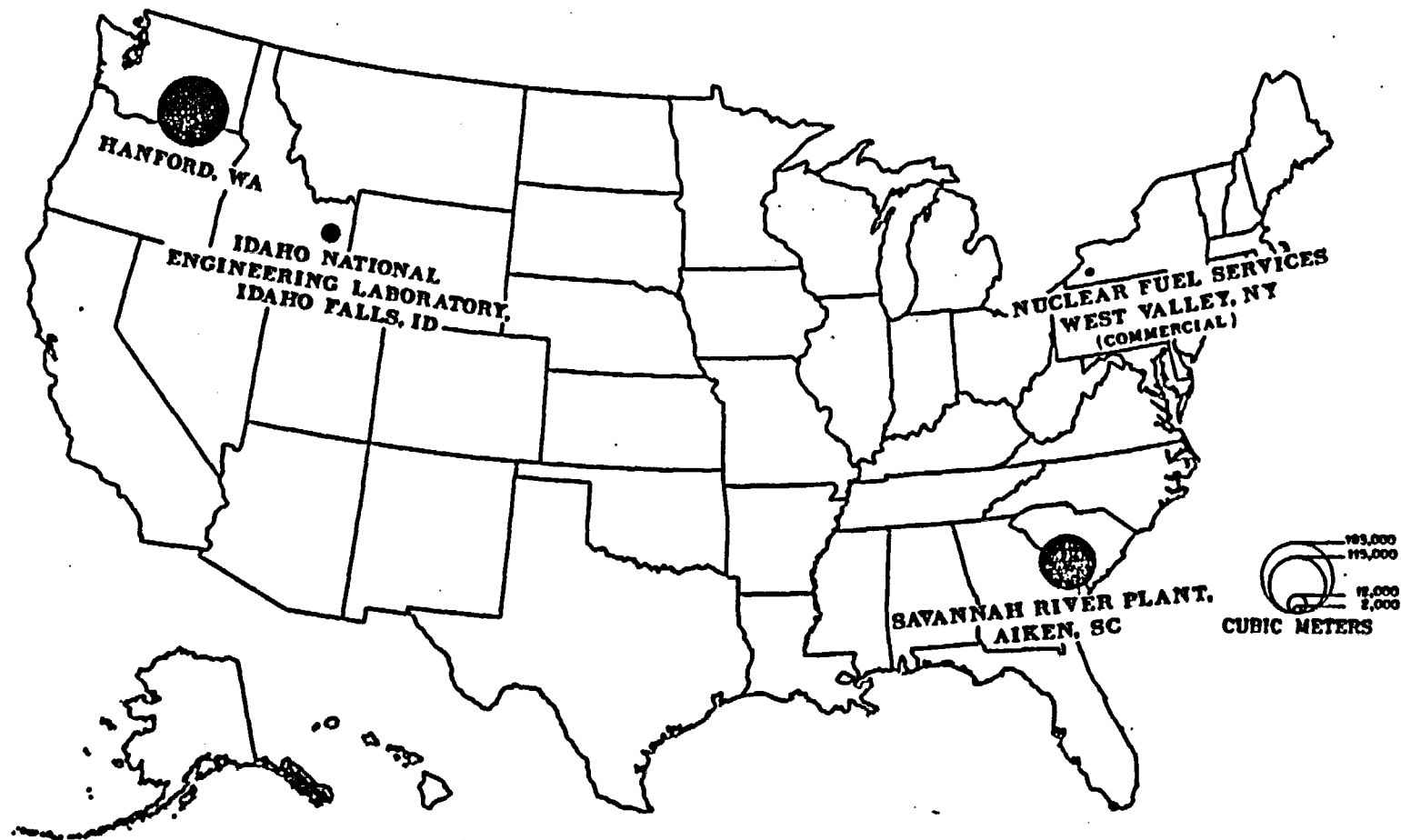


Fig. 2.4. Location and total volume of HLW through 1983.

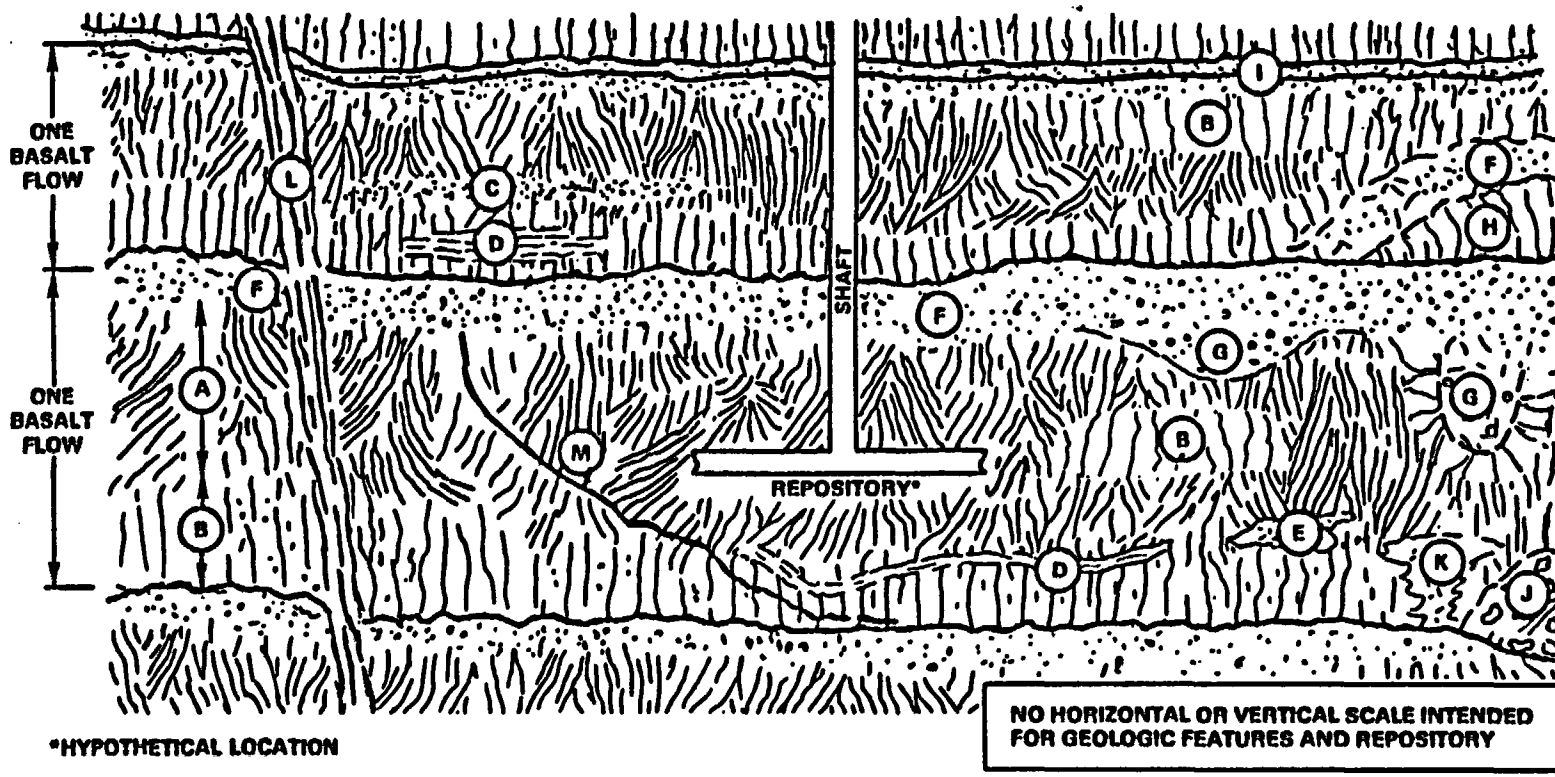
DEFENSE WASTE AND ROCK CHARACTERISTICS

FAVORABLE CONDITION (ROCK CHARACTERISTICS):

HOST ROCK SUFFICIENTLY THICK AND Laterally EXTENSIVE TO ALLOW FLEXIBILITY IN SELECTING DEPTH, CONFIGURATION AND LOCATION OF UNDERGROUND FACILITY

COMMENTS:

- COMMINGLING APPEARS LIKELY
- USDOE HAS ASSUMED (IN COMMINGLING STUDY) THAT REPOSITORY WOULD BE AUGMENTED TO ACCOMMODATE 10,000 MTHM OF DEFENSE WASTE
- THIS COULD REQUIRE UP TO 70% ADDITIONAL UNDERGROUND STORAGE (DEPENDING ON EFFECT OF LOWER HEAT CONTENT) } ? why.
- GREATER SPACE REQUIREMENTS INCREASE THE LIKELIHOOD OF ENCOUNTERING GEOLOGIC ANOMALIES, WITH POTENTIAL IMPACT ON CONSTRUCTABILITY AND COST



**FLOW INTERIOR
DISCONTINUITIES**

- A ENTABLATURE JOINTS
- B COLONNADE JOINTS
- C VESICULAR ZONE
- D PLATY ZONE
- E LOCAL FRACTURED ZONE

FLOW CONTACT

- F FLOW TOP
- G LOCAL THICKENING OF FLOW-TOP BRECCIA
- H FLOW TERMINATION
- I SEDIMENTARY INTERBED
- J PILLOW BRECCIA
- K SPIRACLE OR SPIRACLE-LIKE FEATURE

**BEDROCK STRUCTURAL
DISCONTINUITIES**

- L FAULT OR FRACTURE ZONE, HINGE OF FOLD, OR SHEAR ZONE
- M LOCALIZED TECTONIC FRACTURE

P38310-608

Figure 3-36. Hypothetical composite cross section of possible geologic features in a layered basalt sequence (after Gephart et al., 1983).

AGGREGATE SITE RANKINGS

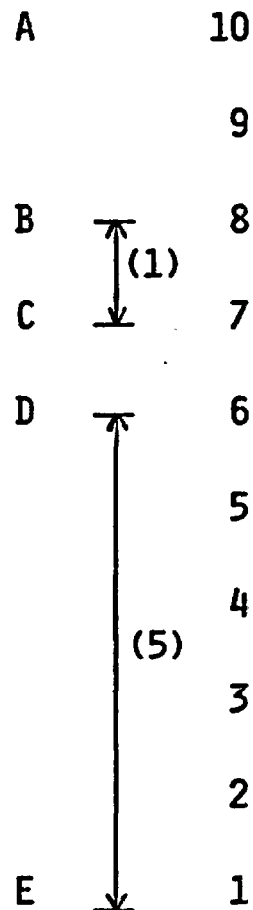
GUIDANCE PROVIDED IN USDOE SITING GUIDELINES:

- COMPARISON AMONG SITES SHALL BE BASED ON THE POST-CLOSURE AND PRECLOSURE GUIDELINES.
- ORDER OF IMPORTANCE ESTABLISHED:
 - 1. POSTCLOSURE
 - 2. PRECLOSURE
 - (A) PRECLOSURE RADIOLOGICAL SAFETY
 - (B) ENVIRONMENT, SOCIOECONOMICS AND TRANSPORTATION
 - (C) EASE AND COST OF DEVELOPMENT AND OPERATION
- RELATIVE SIGNIFICANCE OF ANY TECHNICAL GUIDELINE TO ITS SYSTEM GUIDELINE IS SITE SPECIFIC; EVALUATION MUST RETAIN SOME CONSIDERATION OF THE CONTRIBUTIONS MADE TO SYSTEM PERFORMANCE.

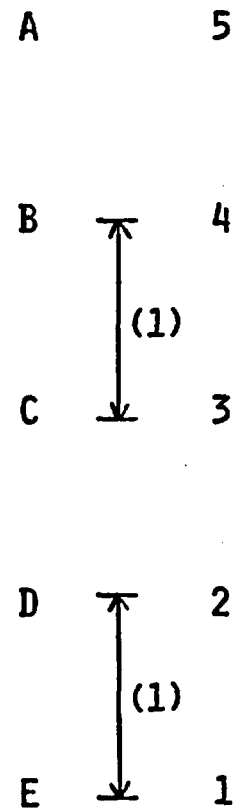
AGGREGATE SITE RANKINGS

COMMENT: ORDINAL METHODS (AVERAGING AND PAIR-WISE COMPARISON) FAIL TO CAPTURE RELATIVE SUITABILITY.

COMPARATIVE EVALUATION (& UTILITY ESTIMATION RATING)



AVERAGING METHOD RATING*



RECOMMENDATION: USE METHODS WHICH CAN REFLECT DIFFERENCES IN THE RATING SCALE.

*SIMILAR DISADVANTAGE APPLIES TO PAIRWISE-COMPARISON METHOD.

AGGREGATE SITE RANKINGS

COMMENT: NO REFLECTION OF RELATIVE IMPORTANCE OF
TECHNICAL GUIDELINES WITHIN GUIDELINE
GROUPS.

EXAMPLE: SITE OWNERSHIP AND CONTROL CONSIDERED OF
EQUAL IMPORTANCE WITH GEOHYDROLOGY.

RECOMMENDATION: WEIGHT GUIDELINES WITHIN GROUPS
TO REFLECT RELATIVE CONTRIBUTION
TO SYSTEM PERFORMANCE.

*] weight
method.*

AGGREGATE SITE RANKINGS

COMMENT: LIMITED SENSITIVITY TESTING.

PROCEDURAL STEP

SENSITIVITY TESTING

SITE RATING

NO

GUIDELINE WEIGHTING

NO

GUIDELINE GROUP
WEIGHTING

YES

} give results
& QA. applied?
Independence.

RECOMMENDATION: INCLUDE SYSTEMATIC AND COMPLETE
SENSITIVITY TESTING AS INTEGRAL
PART OF METHODS USED.

AGGREGATE SITE RANKINGS

COMMENT: LACK OF DOCUMENTATION FOR AGGREGATE RANKING.

- PARTICIPANTS IN COMPARATIVE SITE RANKINGS
- INDIVIDUAL COMPARATIVE RANKING RESULTS
- ALTERNATE GUIDELINE GROUP WEIGHTS AND RESULTS

RECOMMENDATION: INCLUDE COMPLETE INFORMATION ON SCORING, WEIGHTING AND SENSITIVITY TESTING.

*General lack of documentation.
who park:
compare ranking by entire
Weights.
Fuller presentation.*