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MEMORANDUM FOR: Robert E. Browning, Acting Director
Division of Waste Management

FROM: Michael J. Bell, Chief
High-Level Waste Licensing
Management Branch
Division of Waste Management

WM Record File
102

WM Project 11
 Docket No. _____
 PDR
 LPDR

Hubert J. Miller, Chief
High-Level Waste Technical
Development Branch
Division of Waste Management

Distribution: _____

 (Return to WM, 623-SS)

SUBJECT: TRIP REPORT, NWTS ANNUAL MEETING, LAS VEGAS, NEVADA,
DECEMBER 13-17, 1982

During the week of December 13-17, 1982, NRC staff involved in the agency HLW Program attended the NWTS Program Annual Meeting in Las Vegas, Nevada. Staff attended technical sessions describing all aspects of the DOE/NWTS program, visited the facilities at the Nevada Test Site for demonstrating spent fuel storage and handling, and visited the Yucca Mountain Site being considered for site characterization for High-Level Waste Disposal. The Proceedings of the NWTS technical sessions have been published as DOE/NWTS-30.

On December 13, NRC staff gave a series of briefings on the NRC regulatory program. It covered all aspects of our HLW program including: 1) the status of the final technical criteria; 2) a description of the NRC site characterization review process and of NRC preliminary activities; and 3) a description of the NRC technical programs. Staff of WMHL, WMHT and RES participated in the briefings. The briefings on the technical presentations were intended to emphasize NRC independent needs to independently assess the uncertainties in repository performance and how these needs differed from DOE programs that were aimed at finding suitable sites, developing designs, and, eventually, at construction of the facilities. Staff showed how our responsibilities and, therefore our research and technical programs were fundamentally different from DOE's

OFC	: WMHL	: WMHL	: WMHT	:	:	:	:
NAME	: MRKnapp:lmc	: MJBell	: HJMiller	:	:	:	:
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PDR WASTE
WM-11 PDR

Copies of the viewgraphs used in the NRC staff presentations have been placed in the WM Division files under this subject.

Original Signed by
MICHAEL J. BELL

Michael J. Bell, Chief
High-Level Waste Licensing
Management Branch
Division of Waste Management

Original Signed by

Hubert J. Miller, Chief
High-Level Waste Technical
Development Branch
Division of Waste Management

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DATE	: 5/ /83	: 5/ 2/83	: 5/ 2/83	:	:	:

ENCLOSURE
TO: CUSAN
FROM: LOGS
5-2-3

HLW SITE CHARACTERIZATION & PRELICENSING ACTIVITIES

LAS VEGAS

DECEMBER 15, 1982

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 - D. Siting and Design Hydrogeology
S. Coplan
 - E. Performance Assessment
M. Knapp
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4. KEY POINTS OF CONTACT

**BRIEFING ON FINAL 10 CFR PART 60
TECHNICAL CRITERIA**

P. A. COMELLA

DECEMBER 15, 1982

NRC REGULATORY APPROACH:

- **COMMUNICATE BEFOREHAND TO ALL--DOE, CONGRESS, PUBLIC, INDUSTRY--**
- **IN A SIGNIFICANT WAY (THROUGH RULEMAKING)--**
- **HOW THE COMMISSION WILL CARRY OUT ITS RESPONSIBILITIES FOR REGULATING GEOLOGIC DISPOSAL OF HLW**
 - **WHAT THE REGULATORY FRAMEWORK IS (LICENSING PROCEDURES)**
 - **WHAT THE ISSUES IMPORTANT TO LICENSING ARE (TECHNICAL CRITERIA)**

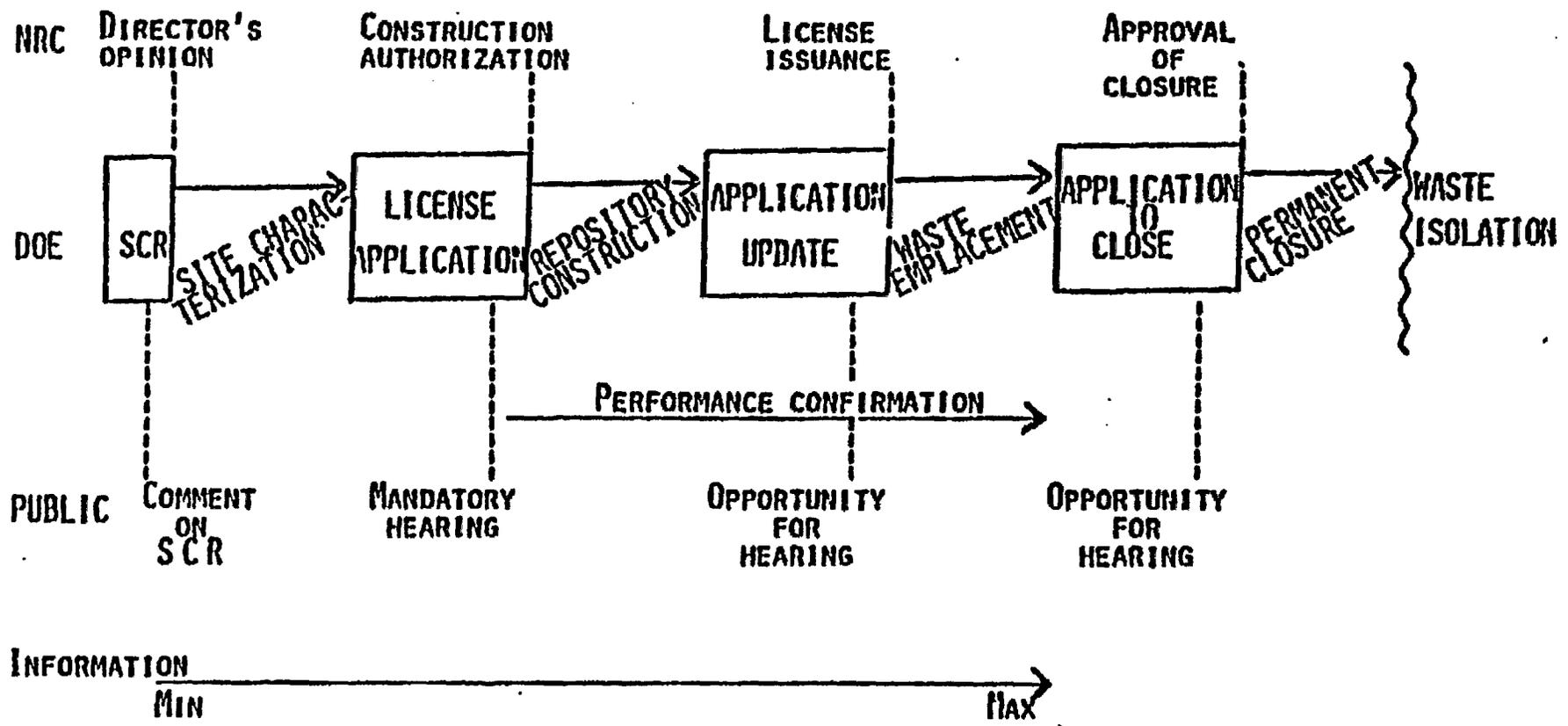
NRC REGULATORY APPROACH: HISTORY

LICENSING PROCEDURES

- **PROPOSED GENERAL STATEMENT OF POLICY, FALL 1978
(FRN AND DISSEMINATION TO STATES)**
- **PROPOSED LICENSING PROCEDURES, FALL 1979
(INFORMAL NOTICE AND COMMENT RULEMAKING UNDER
ADMINISTRATIVE PROCEDURE ACT (APA))**
- **FINAL LICENSING PROCEDURES, WINTER 1981
(INFORMAL NOTICE AND COMMENT RULEMAKING UNDER APA)**

TECHNICAL CRITERIA

- **INFORMAL NOTICE AND COMMENT RULEMAKING UNDER APA**
 - '' **ADVANCE NOTICE OF PROPOSED RULEMAKING, SPRING 1980**
 - '' **PROPOSED TECHNICAL CRITERIA, JULY 1981**
 - '' **FINAL TECHNICAL CRITERIA: UNDER COMMISSION CONSIDERATION**



PROPOSED TECHNICAL CRITERIA: BACKGROUND

- **OVERALL SYSTEM PERFORMANCE STANDARD IDENTIFIED: EPA GENERALLY APPLICABLE ENVIRONMENTAL STANDARD**
- **DEFENSE-IN-DEPTH, MULTIPLE BARRIER APPROACH IMPLEMENTED**
- **MAJOR INDIVIDUAL REPOSITORY COMPONENTS IDENTIFIED**
 - **CONTAINMENT BY WASTE PACKAGES**
 - **RELEASE RATE FROM ENGINEERED BARRIER SYSTEM**
 - **GROUNDWATER TRAVEL TIME**
- **NUMERICAL PERFORMANCE OBJECTIVES FOR THESE COMPONENTS SPECIFIED**
- **SITING AND DESIGN CRITERIA ALSO PROPOSED**

TECHNICAL CRITERIA: BACKGROUND ON PUBLIC COMMENTS

- PROPOSED TECHNICAL CRITERIA PUBLISHED FOR COMMENT JULY 8, 1981
- PUBLIC COMMENT PERIOD CLOSED NOVEMBER 5, 1981
- SEVERAL HUNDRED INDIVIDUAL COMMENTS IN 91 LETTERS
- EVERY ISSUE ON WHICH COMMISSION SOUGHT COMMENT ADDRESSED
 - '' ALTERNATIVE REGULATORY APPROACHES
 - '' RETRIEVABILITY
 - '' HUMAN INTRUSION
 - '' POPULATION DENSITY
 - '' DETAILED DESIGN CRITERIA
 - '' ALARA FOR THE ENGINEERED SYSTEM
- MANY ASPECTS OF RULE ADDRESSED
 - '' TRU WASTES
 - '' BOREHOLE AND SHAFT SEALING
 - '' CREDIT FOR SITE SPECIFIC FACTORS
 - '' DISPOSAL IN UNSATURATED ZONE

STAFF ANALYSIS OF PUBLIC COMMENTS

**OBJECTIVE: SYSTEMATIC AND DOCUMENTED IDENTIFICATION AND CONSIDERATION
OF ALL ISSUES AND TOPICS RAISED IN THE PUBLIC COMMENTS TO
SHOW WHAT WAS DONE IN THE FINAL RULE IN LIGHT OF COMMENTS
RECEIVED AND WHY**

STAFF ANALYSIS CONT'D.

- **LETTERS EXAMINED TO IDENTIFY TOPICS ADDRESSED IN PUBLIC COMMENT**
- **LETTERS SECTIONED INTO INDIVIDUAL VERBATIM CONTEXTED COMMENTS ACCORDING TO TOPIC**
- **INDIVIDUAL COMMENTS COMPILED BY TOPIC**
- **PROPOSED RULEMAKING PACKAGE ANALYZED TOPICALLY BY TEAMS OF COGNIZANT TECHNICAL STAFF IN LIGHT OF COMPILED COMMENTS**
- **ONGOING MANAGEMENT REVIEW OF DRAFT RESPONSES AND RECOMMENDED CHANGES FOR ADEQUACY OF ANALYSIS, COHERENCY, INTERNAL CONSISTENCY, ETC.**
- **INDIVIDUAL COMMENTS AND RESPONSES PRESENTED IN 500-PAGE STAFF ANALYSIS**
- **SYNTHESIS OF INDIVIDUAL COMMENTS AND RESPONSES PRESENTED IN 70 PAGE POLICY OVERVIEW AND SECTION-BY-SECTION ANALYSIS OF CHANGES FROM PROPOSED RULE**
- **CRITICAL TECHNICAL ISSUES TREATED IN RATIONALE DOCUMENT**

TECHNICAL CRITERIA: STATUS

- **EPA STANDARD NOT YET IN PLACE**
- **COMMISSION CONSIDERING HOW TO PROCEED IN ITS ABSENCE**
 - **ASSUME EPA STANDARD AND FINALIZE NUMERICAL PERFORMANCE OBJECTIVES**
 - **WAIT FOR EPA STANDARD BEFORE PROCEEDING**
 - **FINALIZE TECHNICAL CRITERIA EXCEPT FOR NUMERICAL PERFORMANCE OBJECTIVES MOST CLOSELY TIED TO AN EPA STANDARD**

**REGULATORY APPROACH BASED ON
NUMERICAL PERFORMANCE OBJECTIVES FOR INDIVIDUAL BARRIERS**

ENGINEERED SYSTEM:

- **WASTE PACKAGE**
- **UNDERGROUND FACILITY**

GEOLOGIC SETTING

ACCESSIBLE ENVIRONMENT

LIMIT OF DISTURBED ZONE

LIMIT OF ROCK THAT PROVIDES STRUCTURAL SUPPORT

GROUNDWATER
TRAVEL TIME
APPLIES HERE

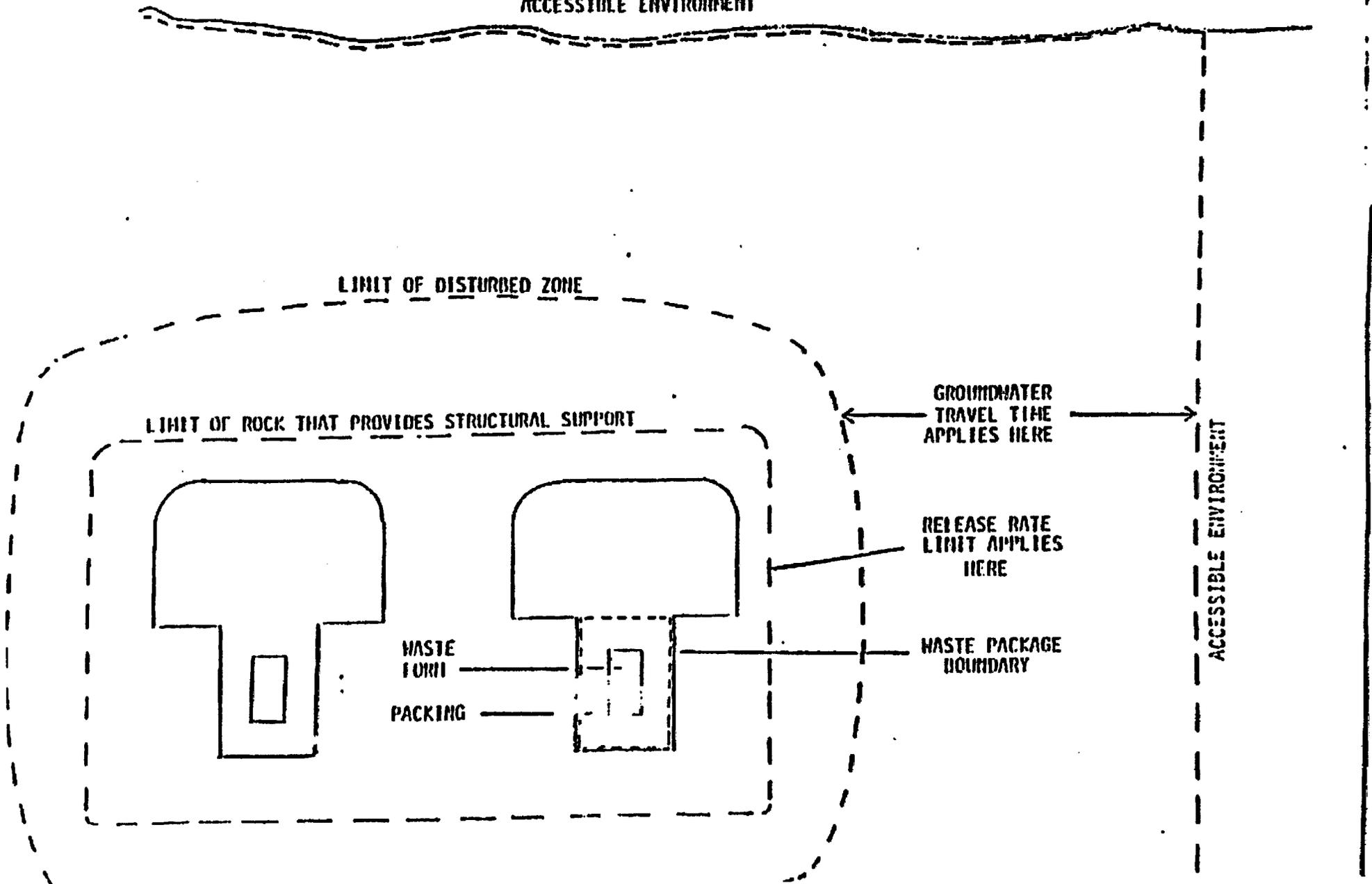
RELEASE RATE
LIMIT APPLIES
HERE

WASTE PACKAGE
BOUNDARY

WASTE
FORM

PACKING

ACCESSIBLE ENVIRONMENT



PUBLIC COMMENT ON REGULATORY APPROACH

COMMENTERS QUESTIONED THE FOLLOWING:

- **RELATIONSHIP BETWEEN NRC PERFORMANCE OBJECTIVES AND EPA STANDARD**
- **LACK OF FLEXIBILITY**
- **DEMONSTRATION OF COMPLIANCE**

ISSUE: RELATIONSHIP BETWEEN NRC PERFORMANCE OBJECTIVES AND EPA STANDARD

STAFF RESPONSE:

- **HAVE DONE ANALYSES OF MODEL REPOSITORY PERFORMANCE IN BASALT, WELDED TUFF AND BEDDED SALT.**
- **EPA STANDARD (DRAFT 19) WAS USED AS OVERALL PERFORMANCE OBJECTIVE.**
- **TOOK INTO ACCOUNT UNCERTAINTIES IN GEOLOGIC DATA EARLIER IDENTIFIED BY NRC AND USED STATISTICAL SAMPLING METHODS TO ASSESS IMPACT ON PERFORMANCE.**
- **EVALUATED IMPACT OF NRC PERFORMANCE OBJECTIVES ON FRACTION OF CASES WHICH EXCEEDED THE EPA STANDARD.**

ISSUE: LACK OF FLEXIBILITY IN PERFORMANCE OBJECTIVES

STAFF RESPONSE:

- **HAVE INCLUDED A QUALITATIVE STATEMENT OF THE PERFORMANCE OBJECTIVE USING LANGUAGE SUGGESTED BY DOE.**
- **HAVE RETAINED NUMERICAL CRITERIA BUT HAVE INCORPORATED A PROVISION THAT ALTERNATIVE CONTAINMENT TIMES, RELEASE RATES AND GROUNDWATER TRAVEL TIMES WILL BE CONSIDERED ON A CASE-BY-CASE BASIS.**
- **HAVE IDENTIFIED THE KINDS OF FACTORS THE COMMISSION WILL CONSIDER**
 - **EPA STANDARD**
 - **AGE AND NATURE OF THE WASTE, AND REPOSITORY DESIGN**
 - **GEOCHEMICAL CHARACTERISTICS OF THE HOST ROCK**
 - **PARTICULAR SOURCES OF UNCERTAINTY IN REPOSITORY PERFORMANCE**

ISSUE: DEMONSTRATION OF COMPLIANCE

STAFF RESPONSE:

60.101 ...ON REASONABLE ASSURANCE...

...IT IS NOT EXPECTED THAT COMPLETE ASSURANCE...CAN BE PRESENTED.

...FOR REPOSITORY PERFORMANCE OVER LONG TIMES INTO THE FUTURE,
THERE WILL INEVITABLY BE GREATER UNCERTAINTIES. PROOF OF
FUTURE PERFORMANCE...IS NOT TO BE HAD IN THE ORDINARY SENSE
OF THE WORD.

...WHAT IS REQUIRED IS REASONABLE ASSURANCE, MAKING ALLOWANCE
FOR THE TIME PERIOD AND HAZARDS INVOLVED, SO THAT THE OUTCOME
WILL BE IN CONFORMANCE WITH THOSE OBJECTIVES AND CRITERIA.

ISSUES RELATED TO RETRIEVABILITY

- MOST COMMENTERS BELIEVED THAT RETRIEVABILITY REQUIREMENT SHOULD BE LINKED TO PERFORMANCE CONFIRMATION PROGRAM.
- MANY COMMENTERS BELIEVED PERFORMANCE CONFIRMATION WAS ACHIEVABLE IN SUBSTANTIALLY LESS TIME THAN SUGGESTED BY NRC AND COULD BE CONDUCTED DURING PERIOD OF WASTE EMPLACEMENT.
- MANY COMMENTERS BELIEVED PERFORMANCE CONFIRMATION PROGRAM WOULD BE SITE SPECIFIC.
- DOE REQUESTED CLARIFICATION OF WHETHER BACKFILLING OR PERMANENT CLOSURE WOULD BE PERMITTED PRIOR TO END OF THE DESIGNED RETRIEVAL PERIOD.

ISSUES RELATED TO HUMAN INTRUSION

- COMMENTERS GENERALLY SUPPORTED THE COMMISSIONS' APPROACH TO DEALING WITH HUMAN INTRUSION
 - AVOID RESOURCES
 - PASSIVE CONTROLS
 - FEDERAL AND OWNERSHIP AND CONTROLS
 - RECORDS
 - PERMANENT MARKERS
- A NUMBER OF COMMENTERS ARGUED THAT WHILE SUCH MEASURES COULD REDUCE THE PROBABILITY OF HUMAN INTRUSION, IT COULD NOT BE RULED OUT
- IN THE FINAL RULE WE ALLOW FOR CONSIDERATION OF HUMAN INTRUSION AS A LOW PROBABILITY EVENT UNDER THE FOLLOWING CIRCUMSTANCES
 - PERMANENT MARKERS SURVIVE
 - UNDERSTANDING OF HAZARDS OF THE WASTE SURVIVE
 - INSTITUTIONS EXIST WHICH CAN RECOGNIZE THE RISK AND TAKE APPROPRIATE ACTION
 - RECORDS ARE PRESERVED AND REMAIN ACCESSIBLE

ISSUES RELATED TO POPULATION DENSITY

- o MANY COMMENTERS AGREED WITH NRC APPROACH NOT TO EXPLICITLY INCLUDE POPULATION DENSITY AS A SITING CRITERION.

- o DOE NOTED TWO TIME PERIODS WERE OF INTEREST, THE EMPLACEMENT PERIOD AND THE POST-CLOSURE PERIOD
 - EMPLACEMENT PERIOD
OFFSITE DOSES LIMITED BY EPA STANDARD AND 10 CFR PART 20 (NORMAL OPERATIONS) AND DESIGN OF SYSTEMS IMPORTANT TO SAFETY

 - POST CLOSURE PERIOD
RELEASE WILL NOT OCCUR FOR A THOUSAND OR MORE YEARS AND POPULATION DENSITY WILL HAVE LITTLE IMPACT.

ISSUES RELATED TO DESIGN/CONSTRUCTION REQUIREMENTS

- DOE THOUGHT GENERAL LEVEL OF DETAIL IN DESIGN SECTION OF RULE WAS APPROPRIATE, BUT HAD SPECIFIC COMMENTS ON A NUMBER OF ITEMS.
- A NUMBER OF OTHER COMMENTERS, HOWEVER, THOUGHT DETAIL WAS EXCESSIVE AND COULD CONSTRAIN DESIGN.
- IN DRAFT FINAL RULE, WE HAVE ELIMINATED MANY OF THE MORE DETAILED REQUIREMENTS OR REWRITTEN THEM TO BE MORE GENERAL AND ALLOW FLEXIBILITY
 - VENTILATION REQUIREMENTS
 - BACKFILL REQUIREMENTS
 - MODULAR DESIGN
 - BOREHOLE AND SHAFT SEALING REQUIREMENTS
- CONSTRUCTION SPECIFICATIONS DELETED IN PART AND CONSTRUCTION RECORDS MOVED TO LICENSING PROCEDURES.
- IN RESPONSE TO INDUSTRY COMMENTS, HAVE GIVEN MORE SPECIFIC DEFINITION OF "IMPORTANT TO SAFETY"

**NRC HLW
SITE CHARACTERIZATION AND
PRELICENSING ACTIVITIES**

H. J. MILLER

DECEMBER 15, 1982

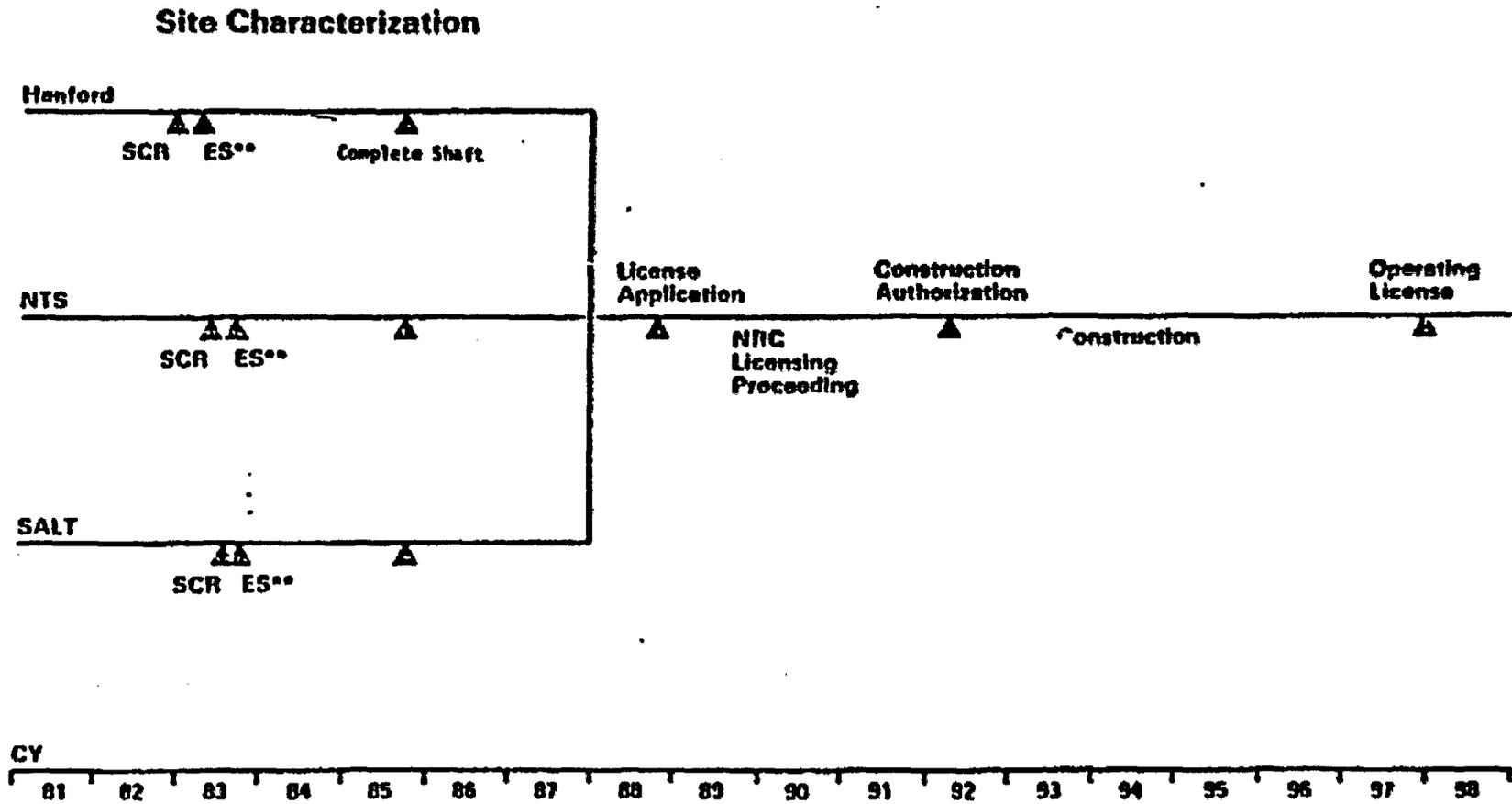
Geologic Repository Technical Issues

- **Conventional**
 - Surface-handling facilities**
 - Mine development**
- **Unconventional/first-of-kind/site-specific**
 - Long-term hazard**
 - Waste heat and radiation**
 - Deep groundwater**
 - Geochemistry**
 - Waste containers**
 - Sealing of openings**

HLW REGULATORY APPROACH

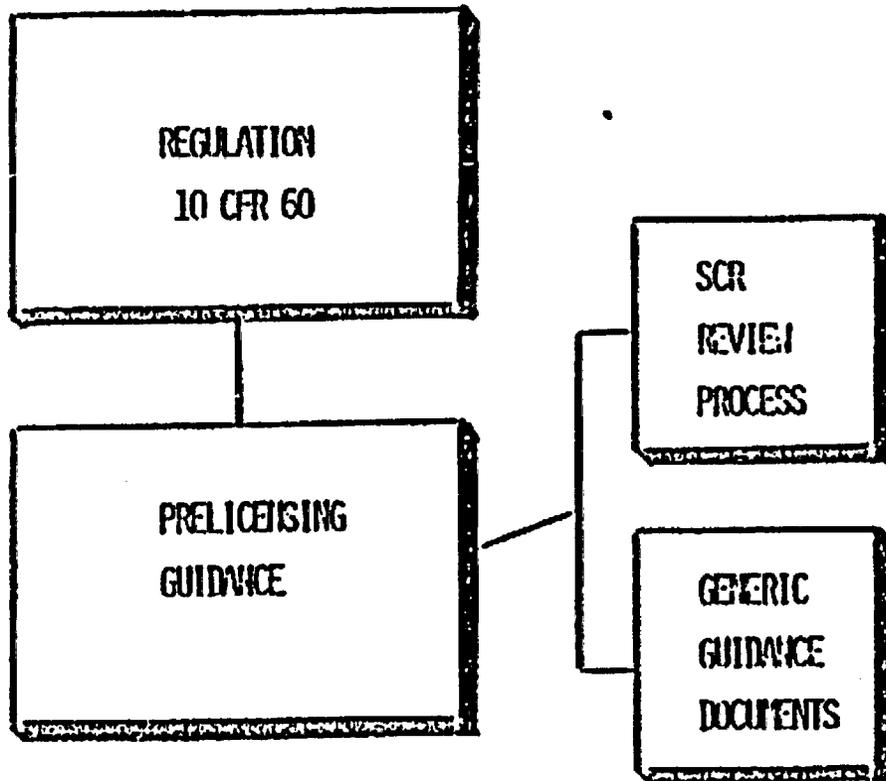
- PRELICENSING NRC-DOE CONSULTATION WITH PUBLIC INVOLVEMENT
 - INFORMAL/FLEXIBLE/INTERACTIVE
 - EARLY SCOPING
 - ONGOING PROCESS
 - SITE-SPECIFIC
- WHAT ARE SPECIFIC LICENSING INFORMATION NEEDS?
- NEEDS FOR COMPLIANCE DETERMINATIONS
 - SPECIFIC ISSUES?
 - WHAT CONSTITUTES ADEQUATE PROGRAMS OF DATA GATHERING AND ANALYSIS?

HLW Repository Development Schedule*



*Schedules based on DOE HLW program plan.

**ES - exploratory shaft.



Site Characterization Report (SCR)

- **First step in informal process for all parties to review DOE site characterization plans**
 - What is known about site?**
 - What are issues?**
 - What investigations are planned for resolving issues?**
- **Review selection of candidate sites**
- **Not a license application**

**SITE CHARACTERIZATION REPORT
10CFR60 REQUIREMENTS
(SECT. 60.11)**

DESCRIPTION OF SITE TO BE CHARACTERIZED

CRITERIA USED TO ARRIVE AT CANDIDATE AREA

METHOD BY WHICH SITE WAS SELECTED FOR SC

**IDENTIFICATION OF ALTERNATIVE MEDIA AND SITES WHERE
DOE INTENDS TO CONDUCT SC**

**DECISION PROCESS BY WHICH SITE WAS SELECTED - INCLUDING
PUBLIC, INDIAN TRIBAL AND STATE VIEWS**

DESCRIPTION OF SC PROGRAM

**EXTENT OF PLANNED EXCAVATION AND PLANS FOR IN SITU
TESTING**

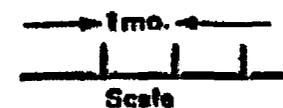
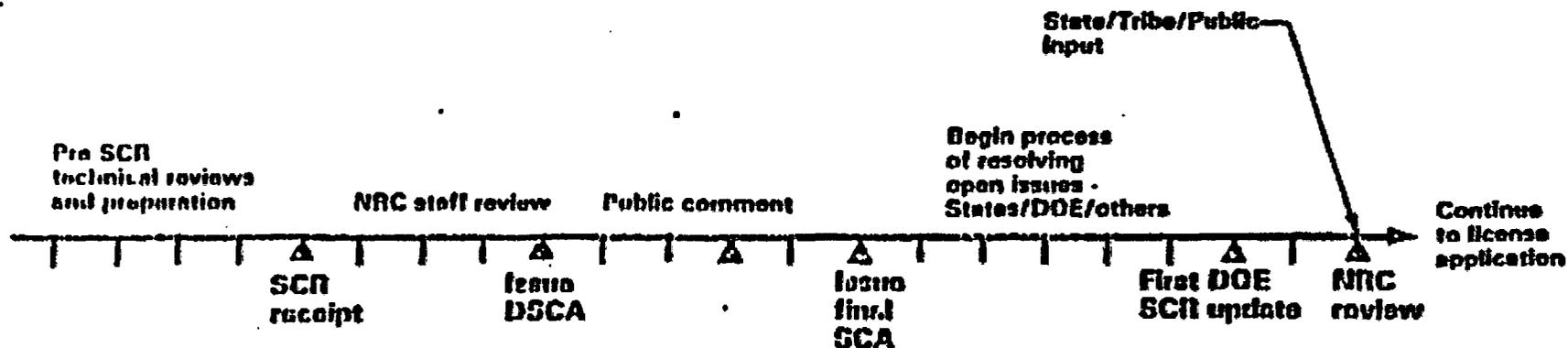
REPOSITORY CONCEPTUAL DESIGN

SAFETY CONTROL PROGRAMS

**ALL SC PLANS (IN SOME LEVEL OF DETAIL) FOR
GENERATING INFORMATION REQUIRED FOR FULL
10CFR60 LICENSE REVIEW**

DESCRIPTION OF QUALITY ASSURANCE PROGRAM

Site Characterization Review Process



NRC Site Characterization Analysis (SCA)

Advisory opinion

Critique

Focus on major issues and concerns

Basic thrust and approach of DOE program

**Comprehensive summary of all identified open issues
and concerns**

Detailed issues to be followed

Site Characterization Analysis

- **Begins process -- not an end point**
- **Minimum required:**
 - Assure major issues and associated licensing information needs identified**
 - Comment on major thrust and strategy of DOE plans**
 - Comment on detailed plans for any investigations now on critical path for licensing**
 - Open items identified for continued followup discussion**
- **Level of detail is major variable**
 - Broad test strategy**
 - Detailed test methods and data analysis procedures**
- **Reaching of consensus on details of all site characterization plans not required at this time**
 - Investigations have different lead times**

DIRECTOR'S OPINION

NRC REGULATION (10CFR60.11(e))

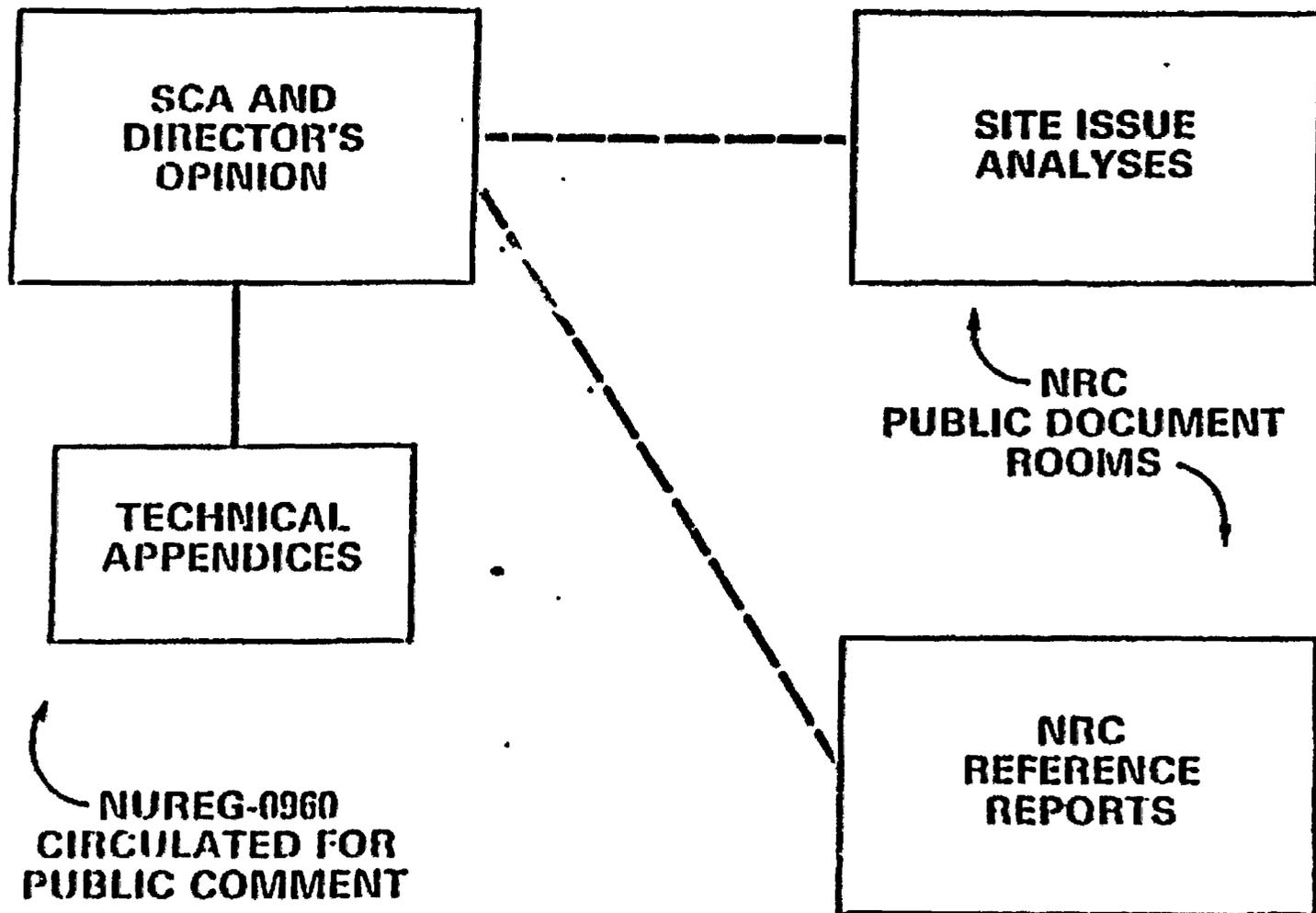
"Included in the final site characterization analysis shall be either an opinion by the Director that he has no objection to the DOE's site characterization program, if such an opinion is appropriate, or specific objections of the Director to DOE's proceeding with characterization of the named site."

COMMENT ON SCR COMPLETENESS AND ADEQUACY IN TWO PARTS

ISSUES

PLANS

SCA Documents and Availability



OUTLINE OF DRAFT SCA

EXECUTIVE SUMMARY

DIRECTOR'S OPINION

1. INTRODUCTION - DESCRIPTION OF LICENSING AND SITE CHARACTERIZATION PROCESS
2. DESCRIPTION OF SITE AND CONCEPTUAL DESIGN
3. SITE SELECTION PROCESS
4. GROUNDWATER FLOW
5. GEOLOGIC STABILITY
6. GEOCHEMICAL RETARDATION
7. DESIGN OF FACILITIES
8. WASTE PACKAGE
9. INSTITUTIONAL AND ENVIRONMENTAL FACTORS
10. QUALITY ASSURANCE PROGRAM
11. PERFORMANCE ASSESSMENT
12. SUMMARY OF NRC CONCERNS/COMMENTS/OPEN ITEMS

APPENDICES

DETAILED SYSTEMATIC TABULATION/EVALUATION OF
SCR ISSUES

SITE UNCERTAINTY AND SENSITIVITY ANALYSIS

OTHER SELECTED DETAILED TEAM EVALUATIONS

10 CFR 60

NRC Division of Waste Management HLW Licensing

WMHT

- **Project management**
- **Site investigations**
- **Facility design**

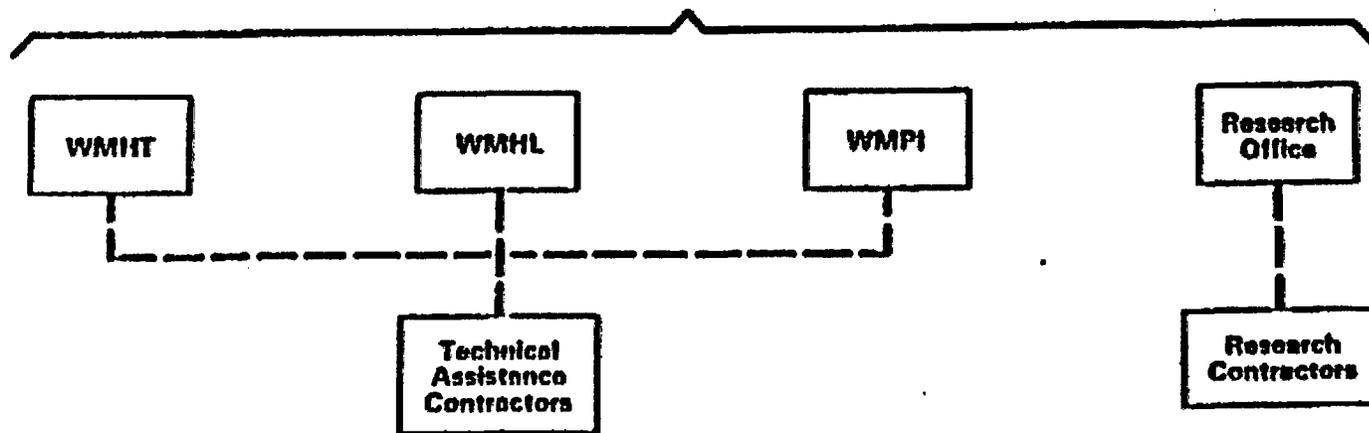
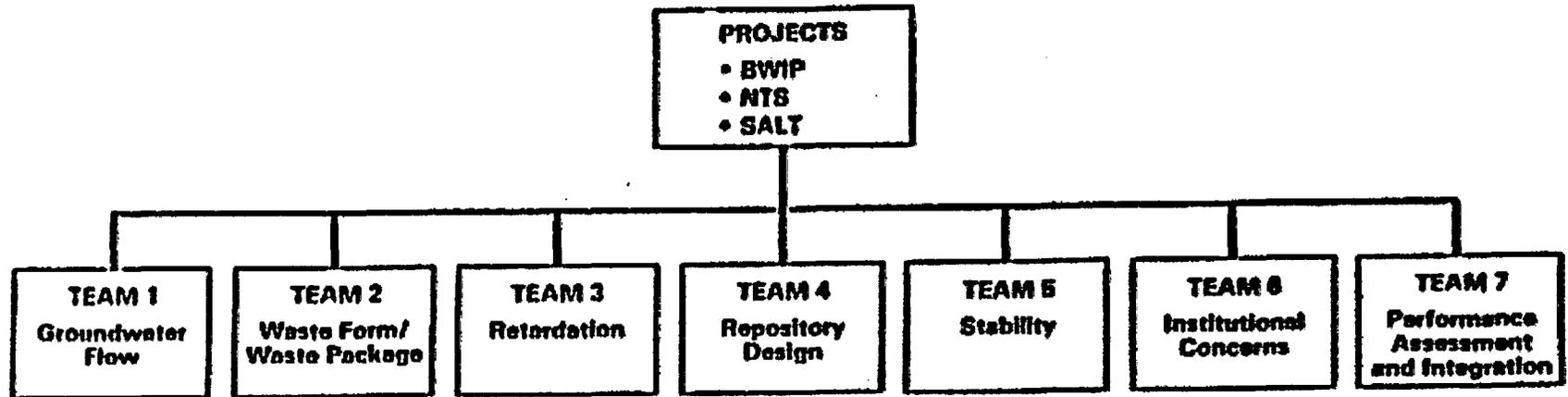
WMHL

- **Regulation development**
- **Computer modeling**
- **Waste containers**

WMPI

- **State participation**

SCR Review Projects



**PRELICENSING GUIDANCE
DOCUMENTS**

- o PURPOSE: SAME AS SCR REVIEW PROCESS**
 - ESTABLISH LICENSING INFO NEEDS**
 - ESTABLISH WHAT CONSTITUTES ADEQUATE DATA GATHERING AND ANALYSIS PROGRAM**

- o APPROACH:**
 - ADDRESS SELECTED SINGLE ISSUES**
 - TACKLE MULTI-SITE ISSUES EFFICIENTLY**
 - CONSULTATION WITH**
 - PUBLIC**
 - DOE**
 - OTHER FEDERAL AGENCIES**
 - TECHNICAL COMMUNITY**
 - FLEXIBILITY TO ACCOUNT FOR DEVELOPMENTAL PROGRAM NATURE**

**PRELICENSING
GUIDANCE
DOCUMENTS**

- o VARIETY OF FORMS AND STARTING POINTS**
 - REG. GUIDE**
 - STAFF TECHNICAL POSITIONS**
 - STAFF REVIEW PLANS**
 - NATIONAL STANDARDS EFFORTS**
 - ANS**
 - ASTM**
 - ADDITIONAL STANDARDIZATION EFFORTS**
 - MCC**
 - DOE LICENSING TOPICAL REPORT REVIEWS?**

**PRELICENSING GUIDANCE DOCUMENTS
CURRENT PLANS**

- o REGULATORY GUIDES**
 - o FORMAT AND CONTENT GUIDES ONLY**
 - o SCR - R.G. 4.17 (COMPLETED)**
 - o SAR**
 - o ER**

- o STAFF TECHNICAL POSITIONS - TENTATIVE PLANS**
 - o DOCUMENTATION OF CODES (COMPLETED)**
 - o BENCHMARKING OF COMPUTER CODES**
 - o GEOCHEMISTRY - SOLUBILITY DETERMINATIONS**
 - o POST EMPLACEMENT MONITORING**
 - o WASTE PACKAGE RELIABILITY**
 - o BOREHOLE AND SHAFT SEALS**

- o STAFF REVIEW PLANS**
 - o SCR (COMPLETED)**
 - o QUALITY ASSURANCE (DRAFT COMPLETED)**
 - o SAFETY ANALYSIS**

NRC HLW Program Development

- **Develop Regulation**
- **Reviews of DOE site and laboratory investigations**
 - Hanford**
 - Nevada test site**
 - Gulf Coast - salt domes**
 - Bedded salt**
- **Site Characterization Report review**
- **Develop guidance documents**

TECHNICAL PROGRAM OVERVIEW

M. KNAPP

DECEMBER 15, 1982

OVERVIEW OF TECHNICAL ISSUES

- o NRC ACTIVITIES
- o BROAD ISSUES IN GEOLOGIC DISPOSAL
- o TECHNICAL PROGRAM OBJECTIVES

12/15/82

NRC PRELICENSING ACTIVITIES

- o DEVELOP REGULATIONS
- o REVIEW DOE SITE CHARACTERIZATION AND DEVELOPMENT PROGRAMS
- o DEVELOP REGULATORY POSITIONS - GUIDANCE DOCUMENTS
- o DEVELOP STAFF LICENSING CAPABILITIES

ISSUES

o DEFINITION OF ISSUE

- QUESTION THAT MUST BE ANSWERED OR RESOLVED TO COMPLETE LICENSING ASSESSMENT OF SITE AND DESIGN SUITABILITY IN TERMS OF 10 CFR 60 PERFORMANCE OBJECTIVES AND REQUIREMENTS, AND TO MAKE NEPA FINDINGS
- QUESTION ABOUT APPLICABLE PROCESSES/CONDITIONS/SITE FEATURES
- NOT A FUNCTION OF DEGREE OF CONTROVERSY

- o BROAD ISSUES
 - RELATE DIRECTLY TO 10 CFR 60 PERFORMANCE OBJECTIVES

- o SPECIFIC ISSUES
 - INFORMATION FOR RESOLVING BROAD ISSUES
 - CONDITIONS AND PROCESSES
 - METHODS OF DATA COLLECTION AND ANALYSIS ADDRESSED
UNDER EACH ISSUE
 - MANY LEVELS OF DETAIL

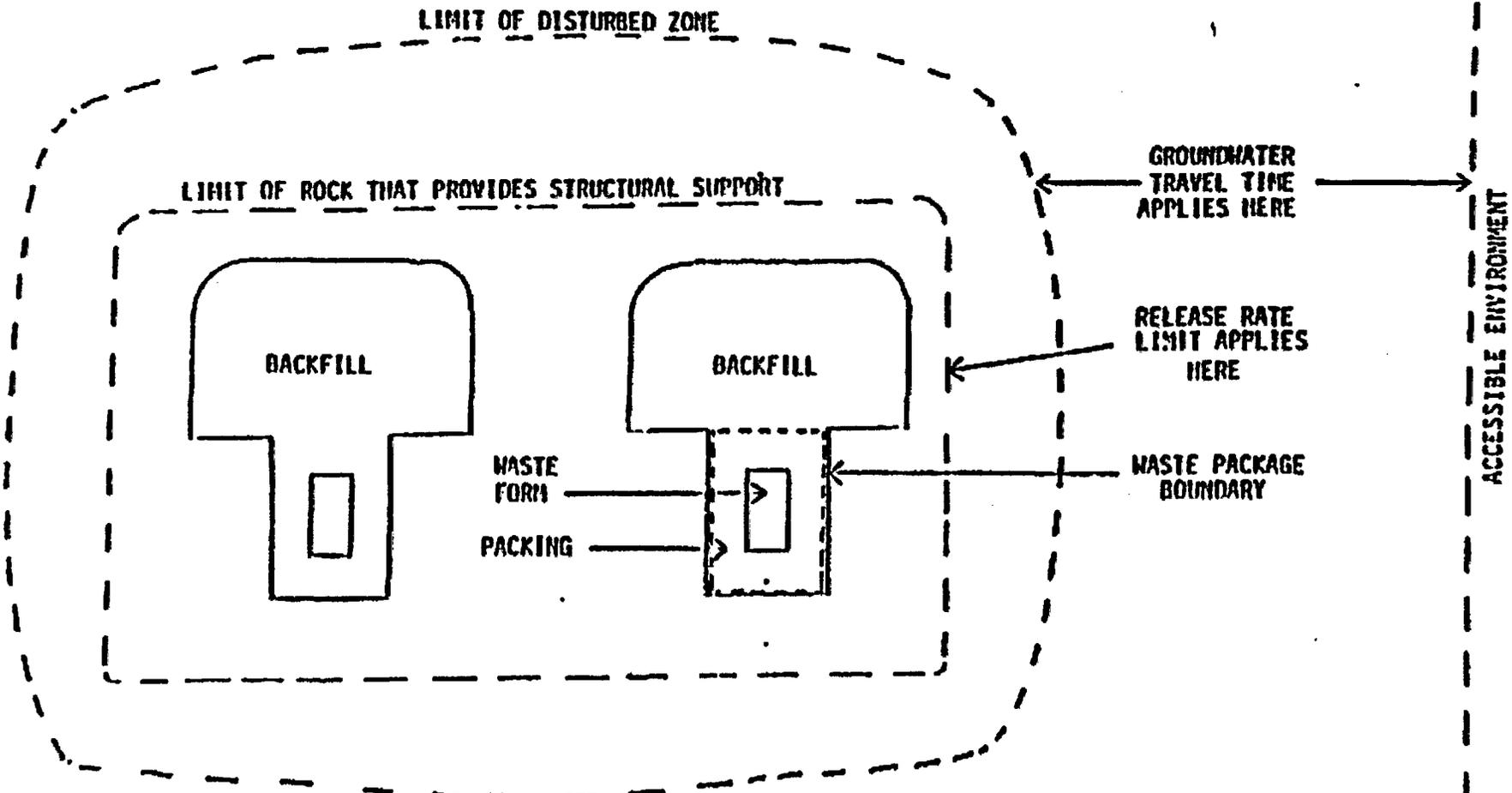
BROAD ISSUES RELATED TO OPERATIONAL PERFORMANCE

- o HOW DO THE DESIGN CRITERIA AND CONCEPTUAL DESIGN ADDRESS RELEASES OF RADIOACTIVE MATERIALS TO UNRESTRICTED AREAS WITHIN THE LIMITS OF PART 20?

- o HOW DO THE DESIGN CRITERIA AND CONCEPTUAL DESIGN ACCOMMODATE THE RETRIEVABILITY OPTION?

ACCESSIBLE ENVIRONMENT

1. WHAT IS THE PRE-WASTE ENPLACEMENT GROUNDWATER TRAVEL TIME ALONG THE FASTEST PATH OF RADIONUCLIDE TRAVEL FROM THE DISTURBED ZONE TO THE ACCESSIBLE ENVIRONMENT?



BROAD ISSUES RELATED TO POST-CLOSURE PERFORMANCE

1. WHAT IS THE PRE-WASTE EMPLACEMENT GROUNDWATER TRAVEL TIME ALONG THE FASTEST PATH OF RADIONUCLIDE TRAVEL FROM THE DISTURBED ZONE TO THE ACCESSIBLE ENVIRONMENT?
2. WHEN AND HOW DOES WATER CONTACT
 - THE BACKFILL?
 - THE WASTE PACKAGE?
 - THE WASTE FORM?
3. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM
 - THE WASTE FORM?
 - THE WASTE PACKAGE?
 - THE BACKFILL?
 - THE DISTURBED ZONE?
 - THE FAR FIELD TO THE ACCESSIBLE ENVIRONMENT?

ACCESSIBLE ENVIRONMENT

LIMIT OF DISTURBED ZONE

LIMIT OF ROCK THAT PROVIDES STRUCTURAL SUPPORT

BACKFILL

BACKFILL

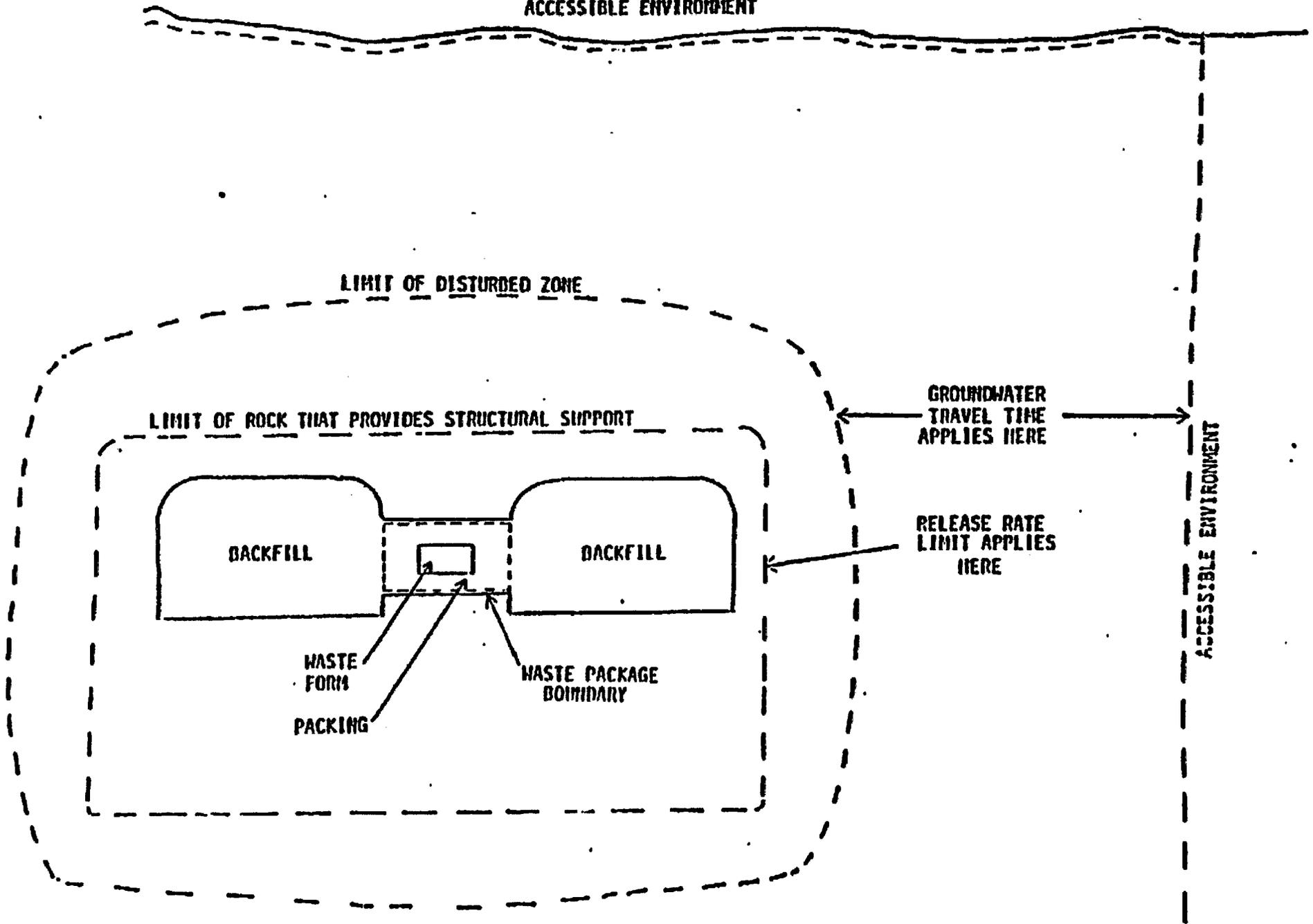
WASTE
FORM
PACKING

WASTE PACKAGE
BOUNDARY

GROUNDWATER
TRAVEL TIME
APPLIES HERE

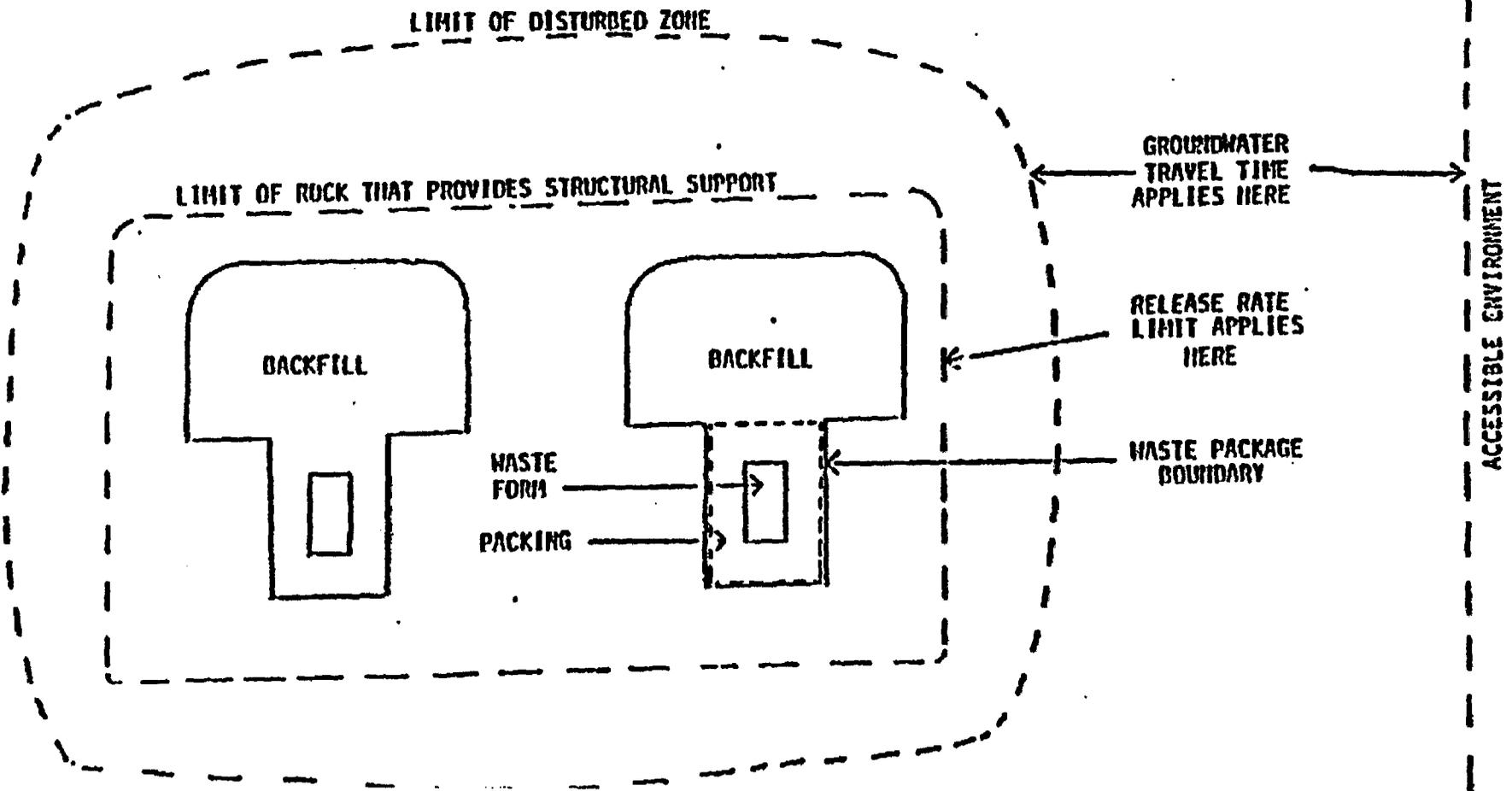
RELEASE RATE
LIMIT APPLIES
HERE

ACCESSIBLE ENVIRONMENT

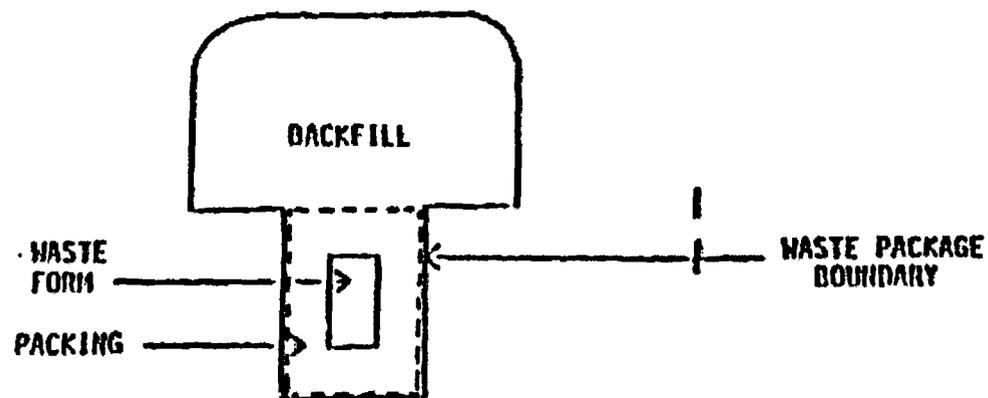


ACCESSIBLE ENVIRONMENT

2. WHEN AND HOW DOES WATER CONTACT THE BACKFILL?
3. WHEN AND HOW DOES WATER CONTACT THE WASTE PACKAGE?



4. WHEN AND HOW DOES WATER CONTACT THE WASTE FORM?
5. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE WASTE FORM?
6. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE WASTE PACKAGE?

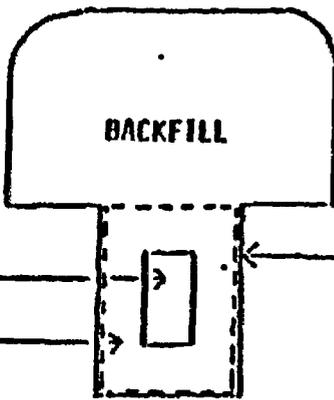
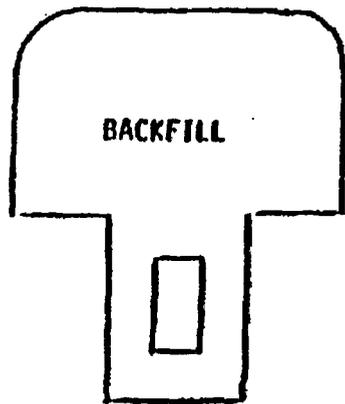


ACCESSIBLE ENVIRONMENT

7. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE BACKFILL?
8. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE DISTURBED ZONE?
9. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE FAR FIELD TO THE ACCESSIBLE ENVIRONMENT?

LIMIT OF DISTURBED ZONE

LIMIT OF ROCK THAT PROVIDES STRUCTURAL SUPPORT

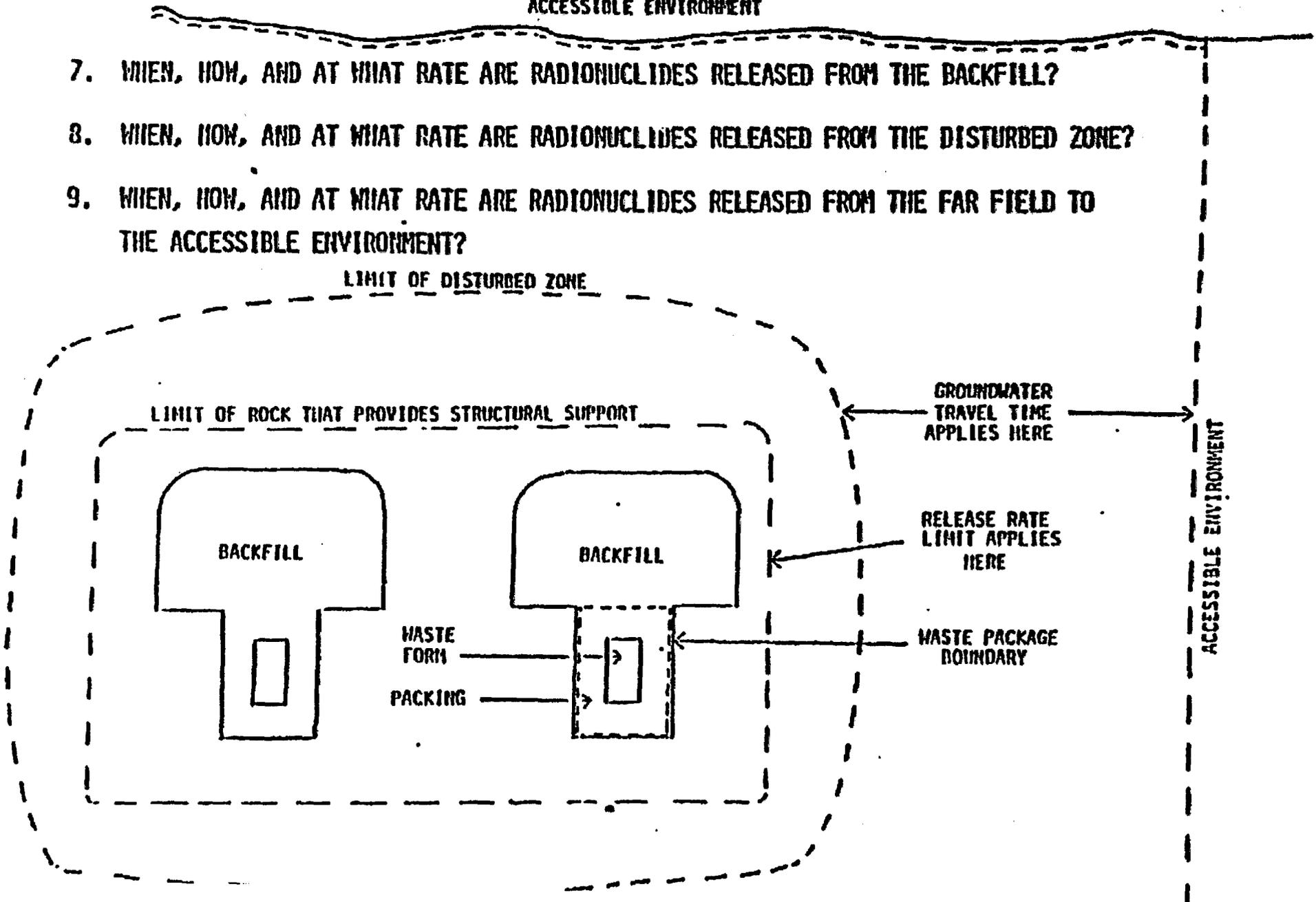


GROUNDWATER TRAVEL TIME APPLIES HERE

RELEASE RATE LIMIT APPLIES HERE

WASTE PACKAGE BOUNDARY

ACCESSIBLE ENVIRONMENT



TECHNICAL PROGRAM OBJECTIVES

- o SPECIFIC ISSUE REVIEWS
- o BROAD ISSUE REVIEWS
- o RESEARCH

AGENCY ACTIVITIES

DOE

- o DESIGN, CONSTRUCT, AND OPERATE REPOSITORY
- o DEVELOP APPROPRIATE TECHNOLOGY
- o INVESTIGATE SITE AND GATHER DATA

NRC

- o DEVELOP REGULATIONS AND GUIDANCE
- o REVIEW DOE PROGRAMS
- o IDENTIFY AND UNDERSTAND PROBLEMS AND UNCERTAINTIES

DOE PROGRAM

- o TECHNOLOGY DEVELOPMENT
 - DESIGNS
 - TEST METHODS
 - INSTRUMENTATION
- o DATA GENERATION

NRC PROGRAM

- o RESEARCH
 - UNDERSTAND BASIC PHENOMENA
 - UNDERSTAND LIMITATIONS AND UNCERTAINTIES ASSOCIATED WITH DATA AND TEST METHODS
- o TECHNICAL ASSISTANCE
 - CRITICAL REVIEW OF DOE
 - DEVELOP STAFF LICENSING CAPABILITY
 - DEVELOP REGULATORY POSITIONS IN LIGHT OF RESEARCH RESULTS

BASES FOR TECHNICAL PRIORITIZATION

- o SIGNIFICANCE TO REPOSITORY PERFORMANCE
- o EXTENT OF UNCERTAINTY
- o POTENTIAL FOR SUCCESS
 - IMPACT
 - LIKLIHOOD
- o TIMING

PERFORMANCE ASSESSMENT

M. KNAPP

DECEMBER 15, 1982

PERFORMANCE ASSESSMENT - MAJOR ISSUES

- **GROUNDWATER TRAVEL TIME**
- **COMPLIANCE WITH EPA STANDARD**
- **PRE CLOSURE RISK ANALYSIS**

PERFORMANCE ASSESSMENT - MAJOR ACTIVITIES

MODEL AND CODE DEVELOPMENT

MODEL AND CODE EVALUATION

MODEL AND CODE APPLICATION

TYPES OF PRODUCTS

CODE - COMPUTER PROGRAM DEBUGGED AND RUNNING AT BROOKHAVEN WHICH CORRECTLY SOLVES EXAMPLE PROBLEMS

SEMINAR - TECHNICAL PRESENTATION TO TRAIN STAFF IN THE THEORY AND MODELS APPLIED BY THE CODE, HOW TO OPERATE THE CODE, AND THE LIMITATIONS OF THE CODE.

SELF-TEACHING CURRICULUM - DOCUMENTATION OF THE SEMINAR MATERIAL, PRESENTED SUCH THAT AN INDIVIDUAL CAN LEARN TO OPERATE THE CODE ALONE.

USER'S MANUAL - A DESCRIPTION OF THE INPUT AND OUTPUT OF A CODE.

MODEL AND CODE DEVELOPMENT PRODUCTS

● DONE

- SWIFT
- NWFT/DVM
- LHS
- PRESS
- DNET
- PATH1
- DOSHEM
- DPCT

● PLANNED* AND UNDER WAY

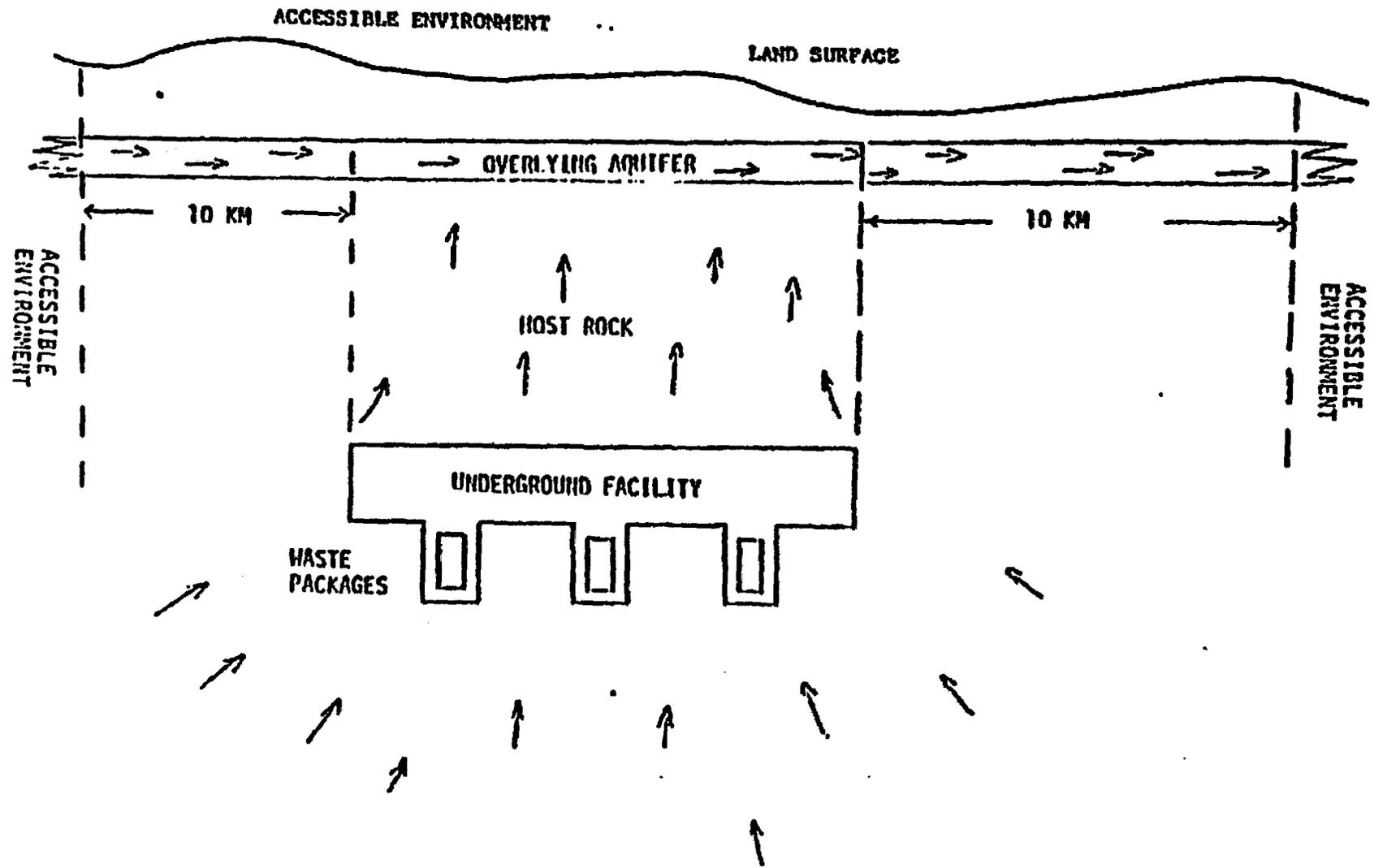
- GENERALIZED DUAL POROSITY VERSION OF NWFT/DVM
- DUAL POROSITY VERSION OF SWIFT
- THREE-DIMENSIONAL UNSATURATED FLOW MODEL
- UNSATURATED TRANSPORT NETWORK MODEL*

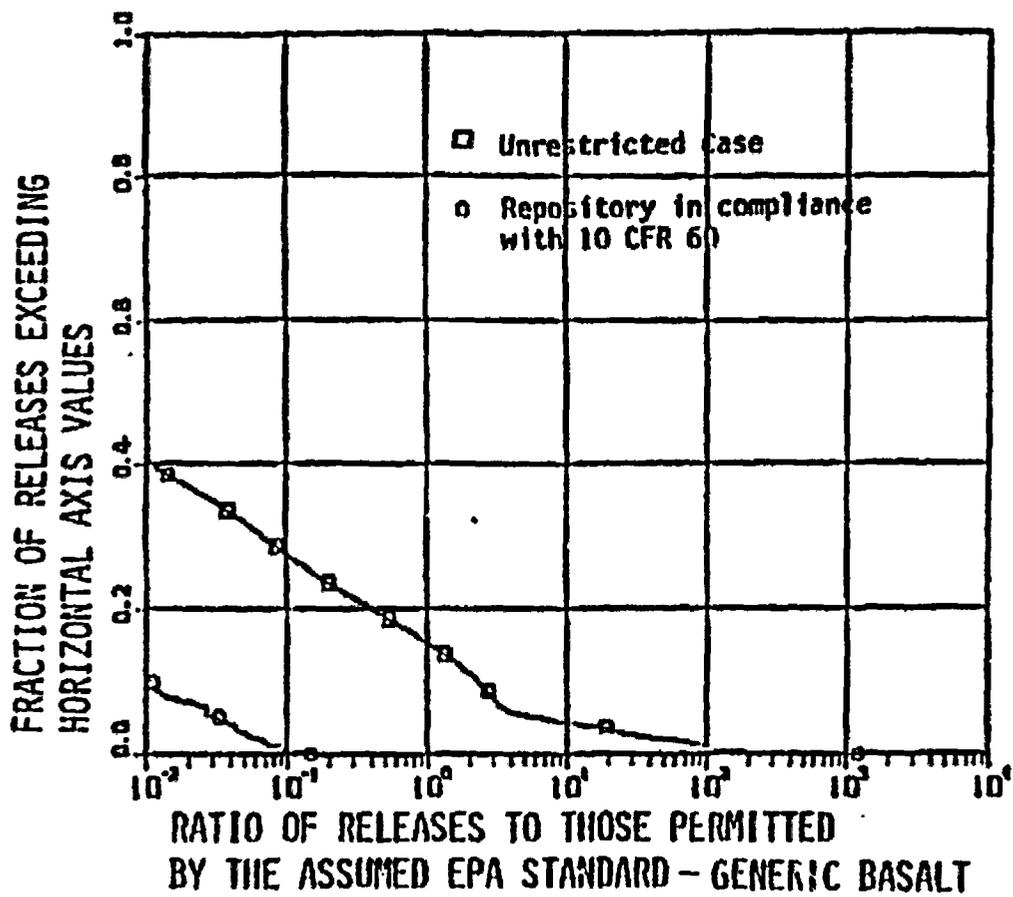
MODEL AND CODE EVALUATION

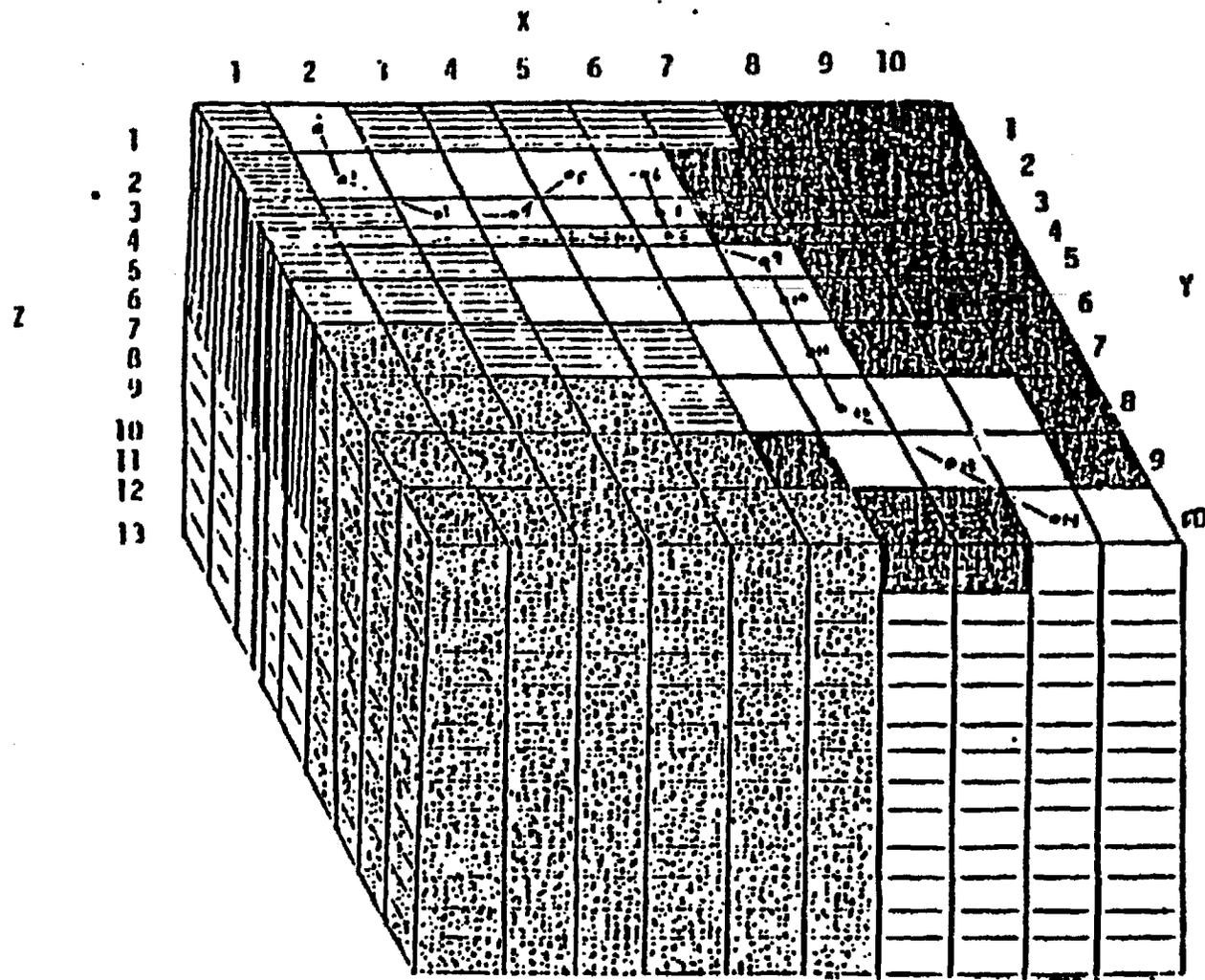
- **REVIEW OF NRC FUNDED PRODUCTS**
- **CODE IDENTIFICATION AND SUMMARIZATION**
- **BENCHMARKING PROBLEM DEVELOPMENT AND PUBLICATION**
- **BENCHMARKING EXECUTION AND DOCUMENTATION**

MODEL AND CODE APPLICATION

- PROVIDE RATIONAL FOR 10 CFR 60
- REVIEW EPA STANDARD
 - NECESSITY AND SUFFICIENCY
 - ACHIEVABILITY
 - COMPATIBILITY WITH 10 CFR 60
- REVIEW SCRS
 - HYDROLOGIC MODELING
 - PERFORMANCE ASSESSMENT
- PROVIDE GUIDANCE FOR NRC RESEARCH







APPLICATION OF SWIFT TO MANFORD SITE HYDROGEOLOGY (AFTER LEHMAN AND QUINN)

HYDROGEOLOGIC MODELING - HANFORD SITE

- NPC MODELS CAN REPRODUCE DOE MODELING RESULTS IF THE DOE ASSUMPTIONS ARE USED.
- THE CURRENTLY AVAILABLE DATA BASE IS INADEQUATE TO PERMIT CONFIDENT SELECTION OF BOUNDARY CONDITIONS AND INPUT PARAMETERS

SUMMARY OF PERFORMANCE ASSESSMENT CONTRACTS

<u>TITLE</u>	<u>NRC MANAGER</u>	<u>CONTRACTOR</u>
REPOSITORY SITE DEFINITION AND TECHNOLOGY TRANSFER (A-1158)	M. J. WISE	SANDIA (SNL)
TECHNICAL ASSISTANCE FOR PERFORMANCE ASSESSMENT (A-1165)	M. J. GORDON	SANDIA
MAINTENANCE OF COMPUTER PROGRAMS (A-1166)	M. J. WISE	SANDIA
BEDDED SALT REPOSITORY SITE DEFINITION (A-1168)	M. J. WISE	SANDIA
BENCHMARKING OF COMPUTER CODES AND LICENSING ASSISTANCE (B-6985)	D. J. FEHRINGER	TEKNEKRON (TEK)
WASTE ISOLATION METHODOLOGY (A-1192)	R. L. SHEPARD	SANDIA
RISK METHODOLOGY OTHER THAN BEDDED SALT (A-1266)	R. L. SHEPARD	SANDIA
WASTE MANAGEMENT TECHNICAL REVIEW (B-6694)	C. C. ENG	SCIENCE APPLICATIONS INC. (SAI)
UNCERTAINTIES IN LONG-TERM PERFORMANCE AND REVIEW PANEL (A-9041)	J. D. RANDALL	OAK RIDGE (ORNL)

**NRC GEOCHEMISTRY PROGRAM
PRESENTED AT
NHTS PROGRAM MEETING**

DECEMBER 15, 1982

**BROAD POST-CLOSURE PERFORMANCE ISSUES
ADDRESSED IN GEOCHEMISTRY PROGRAM**

- #7 WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE BACKFILL?**
- #8 WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE DISTURBED ZONE?**
- #9 WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE FAR FIELD TO THE ACCESSIBLE ENVIRONMENT?**

BROAD ISSUES IN GEOCHEMISTRY

- 0 INITIAL CONDITIONS
- 0 ENVIRONMENT OF WASTE PACKAGE
- 0 SOLUBILITY OF RADIONUCLIDES
- 0 MOBILITY OF RADIONUCLIDE SPECIES
- 0 UNCERTAINTY AND RELEVANCE OF DATA
- 0 GEOCHEMICAL TRANSPORT MODELING

BROAD ISSUE - INITIAL CONDITIONS

0 SPECIFIC ISSUE (SITE-SPECIFIC DATA NEEDS)

- DETAILED CHARACTERIZATION OF WASTE PACKAGE
- DETAILED CHARACTERIZATION OF HOST ROCK CHEMISTRY,
PETROLOGY, AND MINERALOGY
- DETAILED CHARACTERIZATION OF GROUNDWATER CHEMISTRY

BROAD ISSUE - DATA UNCERTAINTY RELEVANCE

0 SPECIFIC ISSUES (SOLUBILITY AND MOBILITY DATA)

- VERIFICATION OF DATA DOCUMENTATION OAK RIDGE NATIONAL LAB
- REPRODUCIBILITY AND UNCERTAINTY OF DATA OAK RIDGE NATIONAL LAB
LAWRENCE BERKELEY LAB
- FIELD COMPARISON STUDIES BATTELLE PACIFIC NORTHWEST LAB,
AUSTRALIAN AEC
- RELEVANCE OF DATA TO PERFORMANCE OAK RIDGE NATIONAL LAB
ASSESSMENT LAWRENCE BERKELEY LAB, AUSTRALIAN AEC

BROAD ISSUE - GEOCHEMICAL TRANSPORT MODELING

0 SPECIFIC ISSUES (PERFORMANCE ASSESSMENT CONSIDERATIONS)

- HYDROLOGIC MODEL CAPABILITIES
- GEOCHEMICAL MODEL CAPABILITIES
- COUPLING OF MODELS
- DATA BASE REQUIREMENTS
- MODEL VALIDATION

SUMMARY OF IIRC GEOCHEMISTRY CONTRACTS

<u>TITLE/EIN#</u>	<u>IIRC MANAGER</u>	<u>CONTRACTOR</u>
MODIFICATION OF BACKFILL (A2239)	ALEXANDER	ARGONNE NATIONAL LAB/UNIV. OF MICHIGAN
LABORATORY ANALOGS (A2230)	ALEXANDER	ARGONNE NATIONAL LAB
ORE BODY ANALOGUES (B6661)	BIRCHARD	AUSTRALIAN ATOMIC ENERGY COMM.
NATURAL ACTINIDE COMPLEXATION (B7057)	BIRCHARD	COLUMBIA UNIV.
GEOCHEMICAL ASSESSMENT OF WASTE ISOLATION (B3040)	ALEXANDER	LAWRENCE BERKELEY LAB
VALENCE EFFECTS ON ADSORPTION (B0462)	BIRCHARD	OAK RIDGE NATIONAL LAB
MOBILITY OF HANFORD REACTOR RADIONUCLIDES (B2380)	BIRCHARD	BATTELLE PACIFIC NORTHWEST LAB
<u>TECHNICAL ASSISTANCE</u>		
TECHNICAL ASSISTANCE IN GEOCHEMISTRY (B0287)	BROOKS	OAK RIDGE NATIONAL LAB
CONFIRMATORY EXPERIMENTS (B0290)	BROOKS	OAK RIDGE NATIONAL LAB

NRC WASTE PACKAGE TECHNICAL ACTIVITIES

PRESENTED AT

NWTS PROGRAM INFORMATION MEETING

DECEMBER 15, 1982

3. WHEN AND HOW DOES WATER CONTACT THE WASTE FORM?
4. WHEN, HOW AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE WASTE FORM?
5. WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE WASTE PACKAGE?

- CANISTER CORROSION
- LEACHING PROCESSES
- PACKING CHEMISTRY

BROAD ISSUES - WASTE PACKAGE

- 0 LONG TERM DURABILITY OF WASTE PACKAGE WITH RESPECT TO CONTAINMENT AND CONTROLLED RELEASE OF RADIONUCLIDES
- 0 QUALITY CONTROL/ASSURANCE AND RELIABILITY OF WASTE PACKAGE MANUFACTURING
- 0 ENGINEERING AND DESIGN OF WASTE PACKAGE WITH RESPECT TO SAFE HANDLING AND EMPLACEMENT/RETRIEVAL

BROAD ISSUE - LONG TERM CONTROLLED RELEASE

0 SPECIFIC ISSUE (WASTE FORM)

- STABILITY (THERMAL/RADIATION INDUCED PHASE CHANGE,
TRANSMUTATION) - BATTELLE COLUMBUS LABORATORY
- LEACHING SURFACE (THERMAL/RADIATION STRESS, GRAIN
BOUNDARY) - IQHA STATE UNIV.
- LEACHING MECHANISM FOR LONG TERM PREDICTION - UNIV. OF FLORIDA
- GEOCHEMISTRY

BROAD ISSUE - LONG TERM CONTAINMENT

0 SPECIFIC ISSUE (CANISTER/OVERPACK)

- GENERAL AND LOCALIZED CORROSION (RATE AND MECHANISM FOR LONG TERM PREDICTION) - BROOKHAVEN NATIONAL LAB/BATTELLE COLUMBUS LAB
- STRESS CORROSION CRACKING - BATTELLE COLUMBUS LAB
- HYDROGEN EMBRITTLEMENT - BROOKHAVEN NATIONAL LAB
- PACKING/GROUND WATER/CANISTER INTERACTION - BATTELLE COLUMBUS LAB
- RELIABILITY OF MANUFACTURING AND SEALING

BROAD ISSUE - LONG TERM CONTROLLED RELEASE

0 SPECIFIC ISSUE (PACKING)

- LONG TERM STABILITY (HYDRATION--DEHYDRATION, MINERALOGY) -
ARGONNE NATIONAL LAB/UNIV. OF MICHIGAN
- PERMEABILITY - ARGONNE NATIONAL LAB
- SOLUBILITY/PRECIPITATION - LAWRENCE BERKELEY LAB

BROAD ISSUE - LONG TERM DURABILITY

0 SPECIFIC ISSUE (OVERALL PACKAGE)

-- SYNERGISM - ARGONNE NATIONAL LAB

-- NUMERICAL MODELING FOR QUANTIFICATION OF PACKAGE
FAILURE AND RADIONUCLIDE SOURCE TERM FOR SUBSEQUENT
RADIONUCIDE TRANSPORT CALCULATION - BATTELLE COLUMBUS LAB

SUMMARY OF WASTE PACKAGE CONTRACTS

<u>TITLE</u>	<u>NRC MANAGER</u>	<u>CONTRACTOR</u>
THERMAL STRESS IN GLASS (B6340)	KIM	IOWA STATE UNIV.
SURFACE PROPERTY OF WASTE FORM (B6352)	KIM	UNIV. OF FLORIDA
CONTAINER ASSESSMENT (A3237)	MCNEIL	BROOKHAVEN NATIONAL LAB
MODIFICATION OF BACKFILL (A2239)	ALEXANDER	ARGONNE NATIONAL LAB/ UNIV. OF MICHIGAN
LONG PERFORMANCE OF PACKAGE (B6764)	KIM	BATTELLE COLUMBUS LAB
OVERVIEW/SCHEDULE DOCUMENT (A3163)	COOK	BROOKHAVEN NATIONAL LAB
REVIEW OF DGE WASTE PACKAGE PROGRAM (A3164)	COOK	BROOKHAVEN NATIONAL LAB
REVIEW OF WASTE PACKAGE VERIFICATION TEST (A3167)	COOK	BROOKHAVEN NATIONAL LAB
DRAFT STAFF TECHNICAL POSITION (A3168)	COOK	BROOKHAVEN NATIONAL LAB

SITING AND DESIGN HYDROGEOLOGY

S. COPLAN

DECEMBER 15, 1982

BROAD ISSUES ADDRESSED IN HYDROGEOLOGY PROGRAM

- o WHEN AND HOW DOES WATER CONTACT THE BACKFILL?
- o WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE DISTURBED ZONE?
- o WHEN, HOW AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE FARFIELD TO THE ACCESSIBLE ENVIRONMENT?
- o WHAT IS THE PRE-WASTE EMPLACEMENT GROUNDWATER TRAVEL TIME ALONG THE FASTEST PATH OF RADIONUCLIDE TRAVEL FROM THE DISTURBED ZONE TO THE ACCESSIBLE ENVIRONMENT?

BROAD ISSUES - HYDROGEOLOGY

- o CONTROLLING PROCESSES AND PARAMETERS
- o METHODS OF SITE CHARACTERIZATION
- o FLOW MODELS
- o NATURE OF ISSUES
 - SITE SPECIFIC
 - MANY ARE STRAIGHT FORWARD/CONVENTIONAL
 - SOME LARGE AREAS OF UNCERTAINTY

BROAD ISSUE - PROCESSES AND PARAMETERS

o FLOW IN FRACTURED ROCK

- SATURATED

- UNSATURATED

o THERMAL EFFECTS

U OF A, LBL, GAI, WA, GEOTRANS

BROAD ISSUE - SITE CHARACTERIZATION METHODS

- o GROUNDWATER DATING
- o FRACTURE CHARACTERIZATION
- o DISPERSIVITY EXTRAPOLATION
- o UNCERTAINTY IN CONVENTIONAL PROCEDURES

U OF A, LBL, GAI, WA, GEOTRANS

SUMMARY OF HYDROGEOLOGY CONTRACTS

<u>TITLE</u>	<u>NRC MANAGER</u>	<u>CONTRACTOR</u>
GROUNDWATER TRANSPORT (B5753)	J.R. RANDALL/F.L. DOYLE	UNIVERSITY OF ARIZONA (U OF A)
UNSATURATED FLOW & TRANSPORT (B7291)	T. NICHOLSON	UNIVERSITY OF ARIZONA (U OF A)
GROUNDWATER DATING (B6628)	F.L. DOYLE	UNIVERSITY OF ARIZONA (U OF A)
GEOTECHNICAL SCIENCES PROGRAM (B3109)	J. CORRADO	LAWRENCE BERKELEY LABORATORY (LBL)
TECHNICAL ASSISTANCE IN HYDROGEOLOGY (B7330)		
R/JP	T. VERMA	GOLDER ASSOCIATES (GA) WILLIAMS ASSOCIATES (WA)
NIMS1	J. POHLE	WILLIAMS ASSOCIATES (WA) GEOTRANS

BROAD ISSUES ADDRESSED IN DESIGN PROGRAM

LONG TERM

- o WHEN AND HOW DOES WATER CONTACT THE WASTE PACKAGE?
- o WHEN, HOW, AND AT WHAT RATE ARE RADIONUCLIDES RELEASED FROM THE BACKFILL?

OPERATIONAL

- o HOW DO THE DESIGN CRITERIA AND CONCEPTUAL DESIGN ADDRESS RELEASES OF OF RADIOACTIVE MATERIALS TO UNRESTRICTED AREAS WITHIN THE LIMITS OF PART 20?
 - STABILITY
 - SYSTEMS IMPORTANT TO SAFETY
- o HOW DO THE DESIGN CRITERIA AND CONCEPTUAL DESIGN ACCOMMODATE THE RETRIEVABILITY OPTION?
 - STABILITY

BROAD ISSUES - DESIGN

- o RELEASE RATE FROM ENGINEERED BARRIER SYSTEM
- o BOREHOLE AND SHAFT SEALS
- o OPERATIONAL
 - SAFETY
 - RETRIEVABILITY
- o NATURE OF ISSUES
 - SITE AND DESIGN SPECIFIC
 - MANY ARE STRAIGHT FORWARD/CONVENTIONAL
 - SOME LARGE AREAS OF UNCERTAINTY

BROAD ISSUE - ENGINEERED BARRIER SYSTEM

- o LONG TERM PERFORMANCE
- o THERMAL LOADING
- o COMPLEX INTERACTIONS

GAT, IBI.

BROAD ISSUE - BOREHOLE AND SHAFT SEALING

- o LONG TERM PERFORMANCE
- o THERMAL LOADS
- o TESTING AND VERIFICATION

U OF A

BROAD ISSUE - OPERATIONAL

o SAFE EMPLACEMENT

- STABILITY OF OPENINGS
- SYSTEMS IMPORTANT TO SAFETY

o RETRIEVAL

- TIMING OF BACKFILL

GAT, IRL, EI

SUMMARY OF DESIGN CONTRACTS

<u>TITLE</u>	<u>NRC MANAGER</u>	<u>CONTRACTOR</u>
IDENTIFICATION OF DESIGN PARAMETERS AND APPROPRIATE IN SITU TEST METHODS FOR REPOSITORY DESIGN (B6983)	L. HARTUNG	GOLDER ASSOCIATES (GAI)
EVALUATION OF RETRIEVAL ALTERNATIVES (B7327)	L. CHASE	ENGINEERS INTERNATIONAL (EI)
EVALUATION OF ENGINEERED BARRIER SYSTEMS (B6986)	C.L. PITTIGLIO	GOLDER ASSOCIATES (GAI)
EVALUATION OF BOREHOLE AND SHAFT SEALING (B6995)	F.L. DOYLE	UNIVERSITY OF ARIZONA (U OF A)
ROCK MECHANICS TESTING (B7115)	T. SCHMITT	ASTM
BENCHMARKING DESIGN CODES (B6985)	D. FEHRINGER	TEKNEKRON (TRI)
REVIEW OF REPOSITORY DESIGN (B7328)	T. SEAMANS	USBM/ENGINEERS INTERNATIONAL
GEOTECHNICAL SCIENCES PROGRAM (B3109)	J. CORRADO	LAWRENCE BERKELEY LABORATORY (LBL)

NRC PRODUCTS

LAS VEGAS

DECEMBER 15, 1982

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SELECTED NRC PRODUCTS
HIGH-LEVEL WASTE PROGRAM*

REGULATION

o	10 CFR Part 60, "Final Licensing Procedures"	F.R. Notice	Feb. 25,
o	10 CFR Part 60, "Proposed Technical Criteria"	"	July 8, 1'
o	10 CFR Part 60, "Final Technical Criteria"	"	Early 198
o	10 CFR Part 60, Rationale for Performance Objectives	NUREG-____	Early 198

GUIDANCE DOCUMENTS/TECHNICAL POSITIONS

o	Site Characterization Format and Content Guide	Reg. Guide 4.17 " " "	(Draft) A (Final) J
o	Environmental Report Format and Content Guide	Reg. Guide ____ " " "	(Draft) S (Final) S
o	Safety Analysis Report Format and Content Guide	Reg. Guide ____ " " "	(Draft) S (Final) S
o	Construction Authorization Review Plan	F.R. Notice of Availability	Sept. 198
o	Technical Position - Borehole and Shaft Seal	" "	Sept. 198
o	Technical Position - Waste Package Performance After Repository Closure	" "	Sept. 198
o	Technical Position - Post Emplacement Monitoring of the Waste Package	" "	Sept. 198
o	Technical Position - Reliability of the Waste Package	" "	Sept. 198
o	Technical Position - Speciation and Solubility (Draft)	" "	Sept. 198
o	Quality Assurance Review Plan		(Prelimin Nov. 1982 Nov. 1983
o	Technical Position - Documentation of Models (Draft)	F.R. Notice of Availability NUREG-0856 "	(Draft) J (Final) A

* All cited reports are, or will be upon completion, available in the NRC public document room.

SELECTED NRC PRODUCTS
HIGH-LEVEL WASTE PROGRAM

SITE REVIEWS/SCR REVIEW PROCESS

o	BWIP Site Characterization Analysis	NUREG-0960	Apr. 1983
o	NNWSI Site Characterization Analysis	NUREG-_____	
o	Salt Site Characterization Analysis	NUREG-_____	
o	Site Characterization Review Plan (Rev. 1)		Nov. 1982
o	Comments on DOE Periodic Site Characterization Activity Reports		Every 6 months per site
o	Staff Review of Basalt Waste Isolation Project (BWIP)	Letter Report	Sept. 1981
o	Staff Review of Basalt Waste Isolation Project (BWIP)	Letter Report	Nov. 1981
o	Staff Review of Basalt Waste Isolation Project (BWIP)	Letter Report	March 1982
o	Staff Review of Nevada Test Site	Letter Report	May 1981
o	Staff Review of Nevada Test Site	Letter Report	May 1982
o	Staff Review of Bedded Salt	Letter Report	May 1981
o	Staff Review of Salt Domes	Letter Report	Jan. 1982

DEVELOPMENT OF NRC ASSESSMENT CAPABILITIES*

o	Repository Site Definition in Basalt. Pasco Basin, WA (Sandia)	NUREG/CR-2352	March 1982
o	An Appraisal of Nuclear Waste Isolation in the Vadose Zone in Arid and Semi-Arid Region (with emphasis on the Nevada Test Site). [Lawrence Berkeley Labs (LBL)]	NUREG/CR-_____	March 1982
o	Selected Hydrologic and Geochemical Issues in Site Characterization for Nuclear Waste Disposal (LBL)	NUREG/CR-_____	Dec. 1981
o	Status of Geochemical Problems Relating to Burial of HLW (LBL)	NUREG/CR-_____	Feb. 1982

* This work also supports regulatory guidance and SCR and Site Reviews.

**SELECTED NRC PRODUCTS
HIGH-LEVEL WASTE PROGRAM**

o	Cross-Borehole Fracture Mapping Using Electromagnetic Geotomography [Lawrence Livermore Labs (LLL)]	LLL (Research Topical Report)	May 1982
o	Evaluation of Engineered Barrier Performance (GAI)	NUREG/CR-_____	June 1983
o	In-Situ Testing for Design and Construction (GAI)	NUREG/CR-3065	Nov. 1982
o	Evaluation of Alternative Shaft Sinking Techniques (GAI)	NUREG/CR-2854	July 1982
o	Identification of Factors Which Influence Repository Design - Tuff (GAI)	NUREG/CR-2614	March 1982
o	Identification of Factors Which Influence Repository Design - Domal Salt (GAI)	NUREG/CR-2613	March 1982
o	Relationship of an In-Situ Test Facility to a Deep Geologic Repository for High-Level Nuclear Waste (GAI)	NUREG/CR-2959	Oct. 1982
o	Assessment of Waste Retrieval Alternatives (EI)	NUREG/CR-_____	Nov. 1983
o	Recommended Standard Testing Procedures for Rock Mechanics (ASTM)	ASTM-_____	1983
o	Evaluation of Geotechnical Surveillance Techniques for Monitoring High-Level Waste Repository Performance (Agapito)	NUREG/CR-2547	Dec. 1981
o	Nuclear Waste Management Technical Support in the Development of Nuclear Waste Form Criteria for the NRC	NUREG/CR-2333 BNL/NUREG-S1458	
	Task 1 Waste Package Overview	Vol. I	Feb. 1982
	Task 2 Alternative TRU	Vol. II	Feb. 1982
	Task 3 Waste Inventory Review	Vol. III	Feb. 1982
	Task 4 Test Development Review	Vol. IV	Feb. 1982
	Task 5 National Waste Package	Vol. V	Feb. 1982
	Brookhaven National Laboratory (BNL)		
o	Review of DOE Waste Package Program National Waste Package Program (BNL)	NUREG/CR-2482 BNL-NUREG-51494 Vol. 1	Feb. 1982
o	Waste Package Verification Tests - Packaging Material Testing Required to Demonstrate Compliance with Radionuclide Containment Criteria (BNL)	NUREG/CR-_____ BNL/NUREG-_____	Feb. 1983

**SELECTED NRC PRODUCTS
HIGH-LEVEL WASTE PROGRAM**

o	Review of DOE Waste Package Program - Assessment of West Valley Waste Package Program (BNL)	BNL/NUREG-_____	Feb. 1983
o	Review of DOE Waste Package Program - Part 1 Near Field Repository Conditions Part 2 Uniform and Pitting Corrosion Data Requirements for TiCode-12 Waste Containers (BNL)	BNL/NUREG-_____	Feb. 1983
o	SWIFT Model-Coupled, Groundwater, Heat and Solute Transport (Sandia)	NUREG/CR-0424	1978
o	DNET Report & User's Guide-Geomechanics and Fluid Flow in Salt (Sandia)	NUREG/CR-_____	1982
o	NWFT Model-Solute Transport (Sandia)	NUREG/CR-1190	1980
o	DVM Method of Solving Convective Dispersion Equation-Solute Transport (Sandia)	NUREG/CR-1376	1980
o	Pathways Model-Environmental Radionuclide Transport (Sandia)	NUREG/CR-1636 (Vol. 1)	1981
o	Dosimetry & Health Effects (Sandia)	NUREG/CR-2166	1981
o	A Summary of Repository Siting Models (Teknekron/Geotrans)	NUREG/CR-2782	1982
o	Benchmark Problems for Repository Siting Models	NUREG/CR-3066	To be put
o	Calculations of Radionuclide Releases from Hypothetical Nuclear Waste Repositories in Basalt, Bedded Salt and Tuff	SAND 82-1557	1982
o	Valence Effects on Adsorption [Oak Ridge National Lab (ORNL)]	ORNL-TR*	Feb. 198:
o	Mobile Anionic and Non-ionic Species [Pacific National Lab (PNL)]	PNL TR	March 19:
o	Improvements Achieved in Procedures and Theory for Evaluating Backfill Effectiveness (LBL)	LBL TR	Feb. 198
o	Amorphous Iron Hydroxide Controls on Uranium Actinide and Technetium Mobility Identified in Field and Lab (Australian Atomic Energy Commission (AAEC)/(ORNL))	AAEC/ORNL TR	March 19

* TR - Research Topical Reports.

**SELECTED NRC PRODUCTS
HIGH-LEVEL WASTE PROGRAM**

o	Method for Characterizing Geochemical Retardation in the Field (AAEC)	AAEC TR	Oct. 1982
o	Field & Theoretical Invest. of Mass and Energy Transport in Subsurface Materials at Waste Disposal Sites [University of Arizona (U of AZ)]	U of AZ TR	Feb. 1982
o	Geomorphic Aspects of Nuclear Waste Disposal [Colorado State University (CSU)]	CSU TR	Sept. 1982
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o	Polyaxial Testing of Borehole Plug Performance (U of AZ)	U of AZ TR	July 1982
o	Corrosion Study of HLW Container Materials (BNL)	BNL/NUREG 51449	1981-1982

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