ROBERT R. LOUX Executive Director



STATE OF NEVADA



AGENCY FOR NUCLEAR PROJECTS NUCLEAR WASTE PROJECT OFFICE

Capitol Complex Carson City, Nevada 89710 (702) 885-3744

June 3, 1987

WM Record File	WM Project Docket No PDR	
Distribution:	JJL Stablein	ક્રત્ફ
(Return to WM, 623-SS)		

Ms. Nancy Still State Liaison Officer Division of Waste Management U.S. Nuclear Regulatory Commission Washington, DC 20555

Dear Ms. Still:

Per your request enclosed are copies of the DOE handouts from the January 23, 1987 meeting in Carson City with Nevada State Agencies. Purpose of the meeting was to brief State agencies on DOE proposed site characterization activities and to discuss environmental monitoring and mitigation plans for site characterization. No formal meeting notes were prepared.

Should you have any questions relative to the information provided, do not hesitate to contact me.

Sincerely,

Carl A. Johnson Administrator of Technical Programs

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B8132242 WM Project: WH-11 PDR w/encl (Return to WM, 623-SS)

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PRESENTATION TO

NEVADA STATE AGENCIES

BACKGROUND ON

SITE CHARACTERIZATION ACTIVITIES

PRESENTED BY

DONALD L. VIETH DIRECTOR, WASTE MANAGEMENT PROJECT OFFICE

January 23, 1987 United States Department of Energy Nevada Operations Office/Waste Management Project Office



NNWSI PROJECT ORGANIZATION

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PURPOSE OF THE BRIEFING

"PURPOSE OF THE BRIEFING IS TO EDUCATE STATE AGENCY REPRESENTATIVES SO A SUBSEQUENT MEETING ON STATE ENVIRONMENTAL CONCERNS RELATIVE TO SITE CHARACTERIZATION CAN FOCUS ON MEANINGFUL DIALOGUE AS INPUT TO NNWSIS ENVIRONMENTAL MONITORING AND MITIGATION PLAN."

R. LOUX, AUGUST 18, 1986





DOE ENVIRONMENTAL POLICY

"IT IS THE POLICY OF THE DOE TO CONDUCT ITS OPERATIONS IN AN ENVIRONMENTALLY SAFE AND SOUND MANNER."

DOE EXECUTIVE ORDER 5400 October, 1980



PURPOSE OF SITE CHARACTERIZATION

THE PURPOSE OF SITE CHARACTERIZATION "... IS TO ESTABLISH THE GEOLOGIC CONDITIONS AND RANGES OF THE PARAMETERS... RELEVANT TO THE LOCATION OF THE REPOSITORY... TO EVALUATE THE SUITABILITY OF A CANDIDATE SITE FOR THE LOCATION OF A REPOSITORY..."

NWPA, 1982 SECTION 2 (21)



GUIDANCE FOR SITE CHARACTERIZATION

THE SECRETARY... SHALL, TO THE MAXIMUM EXTENT PRACTICIBLE AND IN CONSULTATION WITH THE GOVERNOR OF THE STATE INVOLVED..., CONDUCT SITE CHARACTERIZATION ACTIVITIES IN A MANNER THAT MINIMIZES ANY SIGFNIFICANT ADVERSE ENVIRONMENTAL IMPACTS..."

NWPA, 1982, SECTION 113 (A)

• "THE PURPOSE OF THE EMMP IS TO <u>IDENTIFY</u>, IN CONJUNCTION WITH THE AFFECTED PARTIES, THE <u>SPECIFIC MONITORING</u> <u>PROGRAMS</u> THAT WILL BE USED FOR DETECTING POTENTIALLY SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS RESULTING FROM SITE CHARACTERIZATION ACTIVITES. THE EMMP <u>WILL ALSO PROVIDE A MECHANISM FOR</u> IMPLEMENTING MITIGATIVE ACTION TO MINIMIZE SIGNIFICANT ADVERSE IMPACTS."

> DOE/HQ DRAFT EMMP ATC, APRIL 10, 1986



PURPOSE OF THE ENVIRONMENTAL COMPLIANCE PROGRAM (PERMITS)

THE ENVIRONMENTAL COMPLIANCE PROGRAM IDENTIFIES THE FEDERAL, STATE, AND LOCAL APPROVALS, CONSULTATIONS, AND PERMITS NEEDED FOR SITE CHARACTERIZATION AND DESCRIBES A PLAN FOR OBTAINING THESE APPROVALS.

SITE CHARACTERIZATION

OVERVIEW



BRIEFING SLIDES

- 1. INDEX MAP OF NEVADA (MP-002)
- 2. INDEX MAP OF NTS (MP-032)
- 3. LOOKING SSE: YUCCA MT.; UZ-6; BUSTED BUTTE CTR LEFT (E-16)
- 4. LOOKING SW: YUCCA MT.; UZ-6; CRATER FLAT; BARE MT. (E-20)
- 5. LOOKING N: YUCCA T.; UZ-6; SOLITARIO CYN. (E-1)
- 6. SCHEMATIC OF YUCCA MT. SHOWING REPOSITORY HORIZON (SI-060)
- 7. INDEX MAP OF NTS (MP-032)
- 8. INDEX MAP OF YUCCA MT. (MP-033)
- 9. LOOKING SE: CLOSE-UP OF UZ-6 DRILL PAD (E-30)
- 10. CORE FROM GEOLOGIC HOLE (ONE CORE BOX)(PT-084)
- 11. INSTRUMENTATION OF UZ-1 (NF-3295)
- 12. TRENCHES OVER BOW RIDGE FAULT, WEST SIDE OF EXILE HILL, LOOKING E. TRENCH IS 150' LONG, 25' WIDE, O-12' DEEP.
- 13. LOOKING SE: LITTLE PROW; UZN HOLES ON RIDGE; UZ-1 AND G-1 NEAR LEFT CENTER IN DRILL HOLE WASH (5105-35)



SITE CHARACTERIZATION DEFINITIONS

"<u>SITE CHARACTERIZATION</u>" IS DEFINED IN THE NUCLEAR WASTE POLICY ACT (NWPA) SECTION 2 (21)

"ACTIVITIES, WHETHER IN THE LABORATORY OR IN THE FIELD, UNDERTAKEN TO ESTABLISH THE GEOLOGIC CONDITION AND THE RANGES OF THE PARAMETERS OF A CANDIDATE SITE RELEVANT TO THE LOCATION OF A REPOSITORY, INCLUDING BORINGS, SURFACE EXCAVATIONS, EXCAVATIONS OF EXPLORATORY SHAFTS, LIMITED SUBSURFACE LATERAL EXCAVATIONS AND BORINGS, AND IN SITU TESTING NEEDED TO EVALUATE THE SUITABILITY OF A CANDIDATE SITE FOR THE LOCATION OF A REPOSITORY, BUT NOT INCLUDING PRELIMINARY BORINGS AND GEOPHYSICAL TESTING NEEDED TO ASSESS WHETHER SITE CHARACTERIZATION SHOULD BE UNDERTAKEN."



- THE SITE CHARACTERIZATION PHASE OF THE PROGRAM BEGAN ON MAY 28, 1986 WITH PRESIDENTIAL APPROVAL OF THE DOE NOMINATION OF YUCCA MOUNTAIN FOR SITE CHARACTERIZATION.
- SITE CHARACTERIZATION' IS DEFINED AS THOSE ACTIVITIES UNDERTAKEN TO ESTABLISH THE GEOLOGIC CONDITIONS OF THE SITE. THIS INCLUDES:
 - INTENSE, CLOSE-IN STUDIES OF SITE CHARACTERISTICS.
 - STUDIES OVER A LARGER AREA OF THE PARAMETERS NEEDED TO DEVELOP REGIONAL MODELS.
- SITE CHARACTERIZATION IS DIVIDED INTO TWO PARTS:
 - SURFACE-BASED STUDIES
 - IN SITU TESTING IN THE EXPLORATORY SHAFT FACILITY



SITE CHARACTERIZATION DEFINITION

(CONTINUED)

SITE CHARACTERIZATION INCLUDES:

- GEOLOGY (USGS, LANL, SNL)
 - STRATIGRAPHY, GEOMORPHOLOGY, TOPOGRAPHY, GEOPHYSICS, TECTONICS, VOLCANISM, SEISMICITY, ISOTOPE GEOLOGY
- HYDROLOGY (USGS)
 - STREAMFLOW, SATURATED ZONE HYDROLOGY, UNSATURATED ZONE HYDROLOGY, FUTURE CLIMATE, FUTURE GROUNDWATER CONDITIONS
- GEOCHEMISTRY (LANL)
 - GROUNDWATER CHEMISTRY, NATURAL ISOTOPE CHEMISTRY, HYDROTHERMAL GEOCHEMISTRY, SOLUBILITY, SORPTION AND PRECIPITATION, DYNAMIC TRANSPORT, RETARDATION SENSITIVITY ANALYSIS, DIFFUSION, MINERALOGY AND PETROLOGY



SITE CHARACTERIZATION ACTIVITIES

• THE EMPHASIS FOR THIS BRIEFING IS ON FIELD ACTIVITIES. THERE ARE TWO CATEGORIES

ONGOING FIELD MONITORING ACTIVITIES

THOSE BEGUN PRIOR TO PRESIDENTIAL APPROVAL WHICH WILL CONTINUE THROUGHOUT SITE CHARACTERIZATION. THESE ARE MONITORING ACTIVITIES THAT REQUIRE LONG CONTINUOUS PERIODS OF TIME TO COLLECT DATA, OR MEASURE TRANSIENT EVENTS

PLANNED NEW FIELD ACTIVITIES

NONE ARE SCHEDULED TO BEGIN BEFORE APRIL, 1987 (THE SCP IS CURRENTLY SCHEDULED FOR FINAL SUBMITTAL TO DOE HEADQUARTERS IN MARCH, 1987

SURFACE - BASED SITE CHARACTERIZATION



ONGOING FIELD MONITORING ACTIVITIES: GROUNDWATER MONITORING

FOURTEEN WATER TABLE HOLES ARE VISITED ON A REGULAR BASIS TO RECORD THE LEVELS OF THE GROUND WATER TABLE

SEVEN HOLES HAVE BEEN DRILLED SPECIFICALLY TO MONITOR THE HYDROLOGIC CONDITIONS IN THE UNSATURATED ZONE (I.e., ABOVE THE WATER TABLE). TO DATE, ONLY ONE HOLE, UZ-1, HAS BEEN FULLY INSTRUMENTED FOR CONTINUOUS MONITORING.

 CLUSTERS OF SHALLOW HOLES (50 TO 200 FEET DEEP) ARE MONITORED TO MEASURE THE MOISTURE CONTENT OF THE UNSATURATED ZONE NEAR THE SURFACE, USING STANDARD NEUTRON LOGGING TOOLS.

 WATER LEVEL AND PRESSURE ARE RECORDED CONTINUOUSLY IN DRILLHOLES IN DRILLHOLE WASH TO RECORD THE EFFECTS OF TIME-RELATED PHENOMENA ON WATER LEVELS

GROUNDWATER MONITORING AT YUCCA MOUNTAIN



- WATER TABLE HOLES O
- CONTINUOUSLY MONITORED WATER TABLE HOLES +
 - SHALLOW MOISTURE MONITORING HOLES Δ



- NINE STREAM GAGES HAVE BEEN INSTALLED IN DRY WASHES TO MONITOR SURFACE RUNOFF; THREE OF THESE LOCATIONS ALSO HAVE CHANNEL SCOUR CHAINS TO RECORD EROSION DURING SURFACE RUNOFF
- PRECIPITATION IS COLLECTED AT A SITE NORTH OF YUCCA MOUNTAIN FOR ISOTOPE ANALYSES TO HELP DETERMINE PRESENT STORM TRAJECTORIES, AND MODEL FUTURE CLIMATES
- FIVE METEOROLOGICAL MONITORING TOWERS HAVE BEEN INSTALLED AT THE SITE TO GATHER SITE SPECIFIC METEOROLOGIC DATA



GEODETIC SURVEY BENCHMARKS HAVE BEEN INSTALLED AROUND THE SITE TO MONITOR PRESENT-DAY TECTONIC ADJUSTMENTS, USED FOR TECTONIC MODELING AND PREDICTING FUTURE EARTHQUAKE ACTIVITY

 53 SEISMOMETERS HAVE BEEN EMPLACED IN THE REGION AROUND YUCCA MOUNTAIN, DEVELOPED IN CONJUNCTION WITH THE WEAPONS PROGRAM. THIS SEISMIC NETWORK PROVIDES CONTINUOUS MONITORING OF NATURAL AND MANMADE SEISMIC EVENTS



- ADDITIONAL CORED DRILLHOLES ARE PLANNED FOR THE YUCCA MOUNTAIN SITE. THEY WILL PROVIDE INFORMATION ON STRATIGRAPHY AND MINERALOGY/PETROLOGY, AND PROVIDE CORE SAMPLES FOR A VARIETY OF LABORATORY TESTS RANGING FROM GEOCHEMICAL RETARDATION TO ROCK MECHANICS
- HOLES WILL BE DRILLED INTO MAGNETIC ANOMALIES SOUTH OF YUCCA MOUNTAIN AS PART OF THE ASSESSMENT OF POTENTIAL VOLCANIC HAZARDS AT THE SITE
- AN ANGLE HOLE WILL BE DRILLED INTO THE BOW RIDGE FAULT TO INVESTIGATE THE NATURE AND ORIGIN OF CALCITE-SILICA DEPOSITS IN FAULT ZONES
- SHALLOW DRILLHOLES ARE PLANNED IN THE AREA OF THE REPOSITORY SURFACE FACILITIES TO OBTAIN INFORMATION FOR THE DESIGN AND ENGINEERING OF THE BUILDINGS
- TRENCH MAPPING AND SAMPLING ARE PLANNED TO PROVIDE DATA FOR TECTONIC, SEISMIC, AND PALEOCLIMATOLOGIC STUDIES. SHALLOW TRENCHES WILL ALSO BE EXCAVATED IN THE AREA OF THE REPOSITORY SURFACE FACILITIES TO EXPLORE FOR FAULTS



PLANNED NEW FIELD ACTIVITIES: GEOPHYSICS

EACH NEW DRILLHOLE WILL BE LOGGED USING STANDARD OPEN-HOLE AND PRODUCTION LOGGING TECHNIQUES OFFERED BY ESTABLISHED CONTRACTORS

• IN SITU STRESS MEASUREMENTS WILL BE MADE USING STANDARD HYDROFRACTURE TECHNIQUES IN SUITABLE HOLES, SUCH AS THE CORED HOLES AND THE VOLCANIC HOLES. THE DATA WILL BE USED IN THE DEVELOPMENT OF THE TECTONIC MODEL OF YUCCA MOUNTAIN, AND TO EVALUATE POTENTIAL SEISMICITY

• FEASIBILITY STUDIES WILL BE CONDUCTED FOR SEISMIC REFLECTION SURVEYS TO STUDY THE STRUCTURAL GEOLOGY AND STRATIGRAPHY NEAR YUCCA MOUNTAIN. SEISMIC REFLECTION SURVEYS WILL BE EXPANDED IF THIS INITIAL STUDY INDICATES THEY ARE FEASIBLE



PLANNED NEW FIELD ACTIVITIES: HYDROLOGY

- ADDITIONAL SHALLOW MOISTURE MONITORING HOLES, EACH ABOUT 50 FEET DEEP, WILL BE DRILLED TO MONITOR NATURAL INFILTRATION NEAR THE SURFACE
- PUMP TESTING AND TRACER TESTING IS SCHEDULED TO BEGIN IN EXISTING WELLS TO INVESTIGATE HYDRAULIC CONDUCTIVITY AND CHEMICAL RETARDATION PROPERTIES ALONG FLOW PATHS IN THE SATURATED ZONE. NON-RADIOACTIVE TRACERS WILL BE USED
- ADDITIONAL STREAM MONITORING GAGES ARE PLANNED FOR FORTY-MILE WASH TO MONITOR SURFACE RUNOFF
- DEEP UNSATURATED ZONE: ADDITIONAL NEW HOLES WILL BE DRILLED TO ABOUT 1500'. TESTED AND INSTRUMENTED AT SEVERAL LEVELS TO INVESTIGATE MOISTURE TRANSPORT, TEMPERATURE AND PRESSURE CONDITIONS ABOVE THE WATER TABLE
- SHALLOW UNSATURATED ZONE: ADDITIONAL HOLES WILL BE DRILLED TO ABOUT 300' TO INVESTIGATE MOISTURE MOVEMENT THROUGH THE UNSATURATED ZONE NEAR THE SURFACE



PLANNED NEW FIELD ACTIVITIES: HYDROLOGY

(CONTINUED)

• A SINGLE HOLE WILL BE DRILLED LATERALLY INTO YUCCA MOUNTAIN TO INVESTIGATE HORIZONTAL VARIATION IN MOISTURE CONDITIONS, TEMPERATURE, AND PRESSURE IN THE UNSATURATED ZONE

- ADDITIONAL HOLES WILL BE DRILLED TO THE WATER TABLE AND APPROXIMATELY 200' BEYOND TO INVESTIGATE SPATIAL AND TEMPORAL VARIATION IN THE LEVEL OF THE WATER TABLE, AND TO COLLECT WATER SAMPLES FOR CHEMICAL AND ISOTOPIC ANALYSES
- A BORE HOLE WILL BE DRILLED ACROSS THE SOLITARIO CANYON FAULT. PUMP TESTS WILL BE CONDUCTED TO INVESTIGATE THE HYDRAULIC CONDUCTIVITY OF THE FAULT ZONE.

• A SERIES OF SMALL PONDING AND RAINFALL SIMULATION EXPERIMENTS IS PLANNED FOR YUCCA MOUNTAIN AND THE IMMEDIATE VICINITY. VARIOUS TESTS WILL BE CONDUCTED TO INVESTIGATE PRECIPITATION INFILTRATION IN DIFFERENT GEOLOGIC SETTINGS



• VARIOUS ACTIVITIES TO EVALUATE PAST HYDROLOGIC CONDITIONS ARE PLANNED. THESE INCLUDE MAPPING AND EVALUATING PAST DISCHARGE AREAS; MAPPING, SAMPLING, AND ANALYZING CARBONATE DEPOSITS IN CAVERNS; AND CONDUCTING CALCITE-VEIN STUDIES

VARIOUS ACTIVITIES ARE PLANNED TO EVALUATE PAST CLIMATES. THESE INCLUDE COLLECTION AND ANALYSIS OF PACKRAT MIDDENS; DRILLING OR TRENCHING IN PLAYAS; AND DRILLING OF LAKE-BED SEDIMENTS AT THE SITE

EXPLORATORY SHAFT



PURPOSE

THE PURPOSE OF THE EXPLORATORY SHAFT FACILITY (ESF) IS TO PROVIDE DIRECT ACCESS TO THE SELECTED HORIZON TO EVALUATE, FROM A SCIENTIFIC AND ENGINEERING PERSPECTIVE, THE GEOLOGICAL, HYDROLOGICAL, AND GEOMECHANICAL ENVIRONMENT FOR THE PURPOSE OF DETERMINING THE SUITABILITY OF THE SITE.

R PARTMENT OF ENERGY N evada N uclear W asle S torage I nvestigations PROJECT	LOCATION	

• COYOTE WASH

EASTERN SIDE OF YUCCA MOUNTAIN

• APPROXIMATE ELEVATION 4,150 FEET ABOVE SEA LEVEL





SHAFTS

THE EXPLORATORY SHAFT FACILITY (ESF) WILL UTILIZE TWO (2) SHAFTS FOR ACCESS TO THE TEST LEVELS.

• ES-1 WILL BE A 12 FT FINISHED INSIDE DIAMETER SHAFT FOR MINING AND EQUIPMENT INSTALLATION WITH BREAKOUTS AT THE 520, 1020/1200, AND 1400 FOOT LEVELS. THE MAIN TEST LEVEL IS AT THE 1020/1200 FOOT LEVELS.

• ES-2 WILL BE A 6 FT FINISHED INSIDE DIAMETER SHAFT FOR VENTILATION AND EMERGENCY EGRESS FROM THE MAIN TEST LEVEL.





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ESF SURFACE FACILITIES

MINE PLANT

- HEADFRAMES
- HOIST HOUSES
- FIRST AID FACILITIES
- WORKING BUILDINGS

AUXILIARY FACILITIES

- VISITORS CENTER
 - LABORATORIES
- OFFICE FACILITIES
- DORMITORIES

• OFFSITE FACILITIES

- WATER TANK
- EXPLOSIVE STORAGE MAGAZINES
- LIQUID WASTE POND
- MUCK STORAGE





THE UNDERGROUND TESTING WILL BE PERFORMED AT THE FOLLOWING LOCATIONS:

TESTING

- 1. IN THE MAIN SHAFT (ES-1)
- 2. AT ALL OF THE BREAKOUT LEVELS
 - 520 LEVEL
 - 1020/1200 MAIN TEST LEVEL
 - 1400 LEVEL



EXPLORATORY SHAFT FACILITY CONCEPTUAL UNDERGROUND LAYOUT 1



SHAFT AND DEMONSTRATION BREAKOUT ROOM (DBM) TESTING

SHAFT WALL MAPPING

- DESCRIBE GEOLOGIC MEDIA
- **PROVIDE FRAMEWORK TO:**
 - EVALUATE ROCK FRACTURING
 - DETERMINE GEOMECHANICAL STABILITY
 - DETERMINE RETARDATION CAPABILITY OF MEDIUM (ROCK)

SHAFT VERTICAL CORING

• PROVIDE DATA TO LOCATE MOST SUITABLE CONDITION FOR BREAKOUTS



SHAFT AND DEMONSTRATION BREAKOUT ROOM (DBM) TESTING

CONTINUED

SHAFT LATERAL CORING

PROVIDE DATA TO DETERMINE BREAKOUT DIRECTION TO MINIMIZE DISTURBANCE OF MEDIA (ROCK)

DEMONSTRATION BREAKOUT ROOM TESTS

- MINING OF ROOMS TO EVALUATE:
 - MINING METHODS
 - ROOM SIZES
 - ROCK MASS RESPONSES
 - MISCELLANEOUS IN-SITU TESTING
 - * / SEISMIC
 - SHAFT DESIGN
 - SLOT STRENGTH TESTS



- DRIFT WALL MAPPING TESTS
- PLATE LOADING TESTS
 - **EXCAVATION EFFECTS TESTS**
- HORIZONTAL STRESS TESTS
- DIFFUSION TESTS
- INFILTRATION TESTS
- BULK PERMEABILITY TESTS
- SEQUENTIAL DRIFT MINING TESTS
- HEATED BLOCK TESTS
- WASTE PACKAGE ENVIRONMENT TESTS



CONTINUED

- CANISTER SCALE HEATER TESTS
- **SLOT STRENGTH TESTS**
 - DEMONSTRATE PROTOTYPE BORING MACHINE



DRIFT WALL MAPPING TESTS

- DOCUMENT LATERAL FRACTURES
- DOCUMENT LITHOLOGIC CONTINUITIES
- INVESTIGATE FAULTING

PLATE LOADING TESTS

- PERFORM REPETITIVE MODULUS OF DEFORMATION MEASUREMENTS FOR PERFORMANCE ASSESSMENT
 - TO DEFINE DEFORMATION BOUNDS
 - TO MONITOR ROCK BOLT LOADING



CONTINUED

EXCAVATION EFFECTS TESTS

- TEST EXCAVATION EFFECTS ON HYDROLOGIC PROPERTIES
- SHAFT CONVERGENCE TESTING

HORIZONTAL STRESS TESTS

- DETERMINE HORIZONTAL STRESSES
- EVALUATE RELAXATION PHENOMENON
- MEASURE SHAFT LINING LOADING



CONTINUED

DIFFUSION TESTS

TO DETERMINE EXTENT OF DIFFUSION ON NON-ABSORBED TRACERS INTO TWO TUFFS (TOPOPAH SPRINGS AND CALICO HILLS) TO EVALUATE RADIONUCLIDE TRANSFER TIMES

INFILTRATION TESTS

- PROVIDE HYDRAULIC INFORMATION
- PROVIDE TRANSPORTATION INFORMATION
- **PROVIDE PROPERTIES OF THE ROCK MATRIX**



BULK PERMEABILITY TESTS

- MAP FRACTURES
- DETERMINE OVERALL ROCK MASS
- INVESTIGATE MASS TRANSPORT PHENOMENON
- DEVELOP CAPABILITIES FOR ESTIMATING HYDROLOGICAL PROPERTIES

SEQUENTIAL DRIFT MINING TESTS

- VALIDATE GEOMECHANICAL MODEL
- DEFINE LIMITS FOR RELAXED ZONE
- IMPROVE MINING EVALUATIONS

CONTINUED



HEATED BLOCK TESTS

- TO MAKE THREE DIMENSIONAL DEFORMATION AND TEMPERATURE TESTS
- MEASURE FRACTURE PERMEABILITIES
- MONITOR CHANGES IN MOISTURE CONTENT
- EVALUATE CROSS BOREHOLE POTENTIALS

WASTE PACKAGE ENVIRONMENT TESTS

- PROVIDE NEAR FIELD INFORMATION TO ASSESS WASTE PACKAGE PERFORMANCE
- TEST PACKAGE COMPONENTS

CONTINUED



CONTINUED

CANISTER SCALE HEATER TESTS

- MEASURE TEMPERATURE CHANGES AND VOLUMETRIC DEFORMATIONS
- OBSERVE THE THERMOMECHANICAL RESPONSE
- MONITOR HYDROTHERMAL WATER MIGRATION

SLOT STRENGTH TESTS

- DETERMINE BEARING STRENGTHS AND RELATE TO EXISTING DATA (LAB TESTS RESULTS)
- MEASURE STRESSES TO ASSESS ROCK MASS STRENGTHS



CONTINUED

DEMONSTRATE PROTOTYPE BORING MACHINE

- DEMONSTRATE THE FEASIBILITY OF BORING AND LINING LONG HORIZONTAL BOREHOLES
- **TEST AND EVALUATE CUTTER EFFICIENCIES**
- EVALUATE CHIP REMOVAL SYSTEM
- EVALUATE EFFECTS OF SIMULTANEOUS DRILLING AND LINING TECHNIQUES



ENVIRONMENTAL MONITORING AND MITIGATION FOR SITE CHARACTERIZATION

January 23, 1987

United States Department of Energy Nevada Operations Office/Waste Management Project Office





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DEVELOPMENT OF NNWSI PROJECT WORKING DRAFT ENVIRONMENTAL MONITORING AND MITIGATION PLAN (EMMP) FOR SITE CHARACTERIZATION

- OCTOBER 28, 1985:
- NNWSI PROJECT MEETS WITH NEVADA STATE AND LOCAL PLANNING GROUP
- JANUARY 14, 1986:
- NNWSI PROJECT MEETS WITH NEVADA STATE AND LOCAL PLANNING GROUP
- FEBRUARY 21, 1986: NNWSI PROJECT MEETS WITH NEVADA STATE AND LOCAL GOVERNMENT PLANNING GROUP. ALL AGREE TO DEVELOP AND EXCHANGE LISTS OF ISSUES
 - MARCH 26, 1986: NNWSI PROJECT SENDS LIST OF ISSUES TO STATE OF NEVADA
 - APRIL 10, 1986: EMMP ANNOTATED TABLE OF CONTENTS IS DRAFTED
- MAY 8, 1986: ECG MEETING IN WASHINGTON, D.C. STATE REPRESENTATIVES
 ATTEND
 - MAY 28, 1986: FINAL ENVIRONMENTAL ASSESSMENT FOR YUCCA MOUNTAIN RELEASED
- JUNE 9, 1986: STATE TRANSMITS COMMENTS ON EMMP ANNOTATED TABLE OF CONTENTS TO DOE/HQ
- JUNE 25, 1986: DOE/HQ TRANSMITS GUIDANCE ON MONITORING AND MITIGATION PLANS TO PROJECT OFFICES
 - AUGUST 1986: EMMP ANNOTATED TABLE OF CONTENTS IS FINALIZED



- SEPTEMBER 2, 1986: NNWSI PROJECT TRANSMITS PRELIMINARY WORKING DRAFT EMMP FOR DOE/HQ REVIEW
- SEPTEMBER 10, 1986: ECG MEETING IN WASHINGTON, D.C. STATE REPRESENTATIVES ATTEND
- OCTOBER 22, 1986: DOE/HQ TRANSMITS COMMENTS ON PRELIMINARY WORKING DRAFT EMMP TO PROJECT OFFICE
- NOVEMBER 5-6, 1986: NNWSI PROJECT MEETS WITH DOE/HQ TO CLARIFY AND RESOLVE COMMENTS RECEIVED
- DECEMBER 1, 1986: NNWSI PROJECT TRANSMITS REVISED WORKING DRAFT EMMP TO NEVADA STATE AND LOCAL GROUP REPRESENTATIVES
- JANUARY 21, 1987: ECG MEETING IN LAS VEGAS, NV. STATE AND LOCAL REPRESENTATIVES ATTEND
- JANUARY 23, 1987: NNWSI PROJECT MEETS WITH STATE REPRESENTATIVES



PURPOSE AND SCOPE OF NNWSI PROJECT SITE CHARACTERIZATION ENVIRONMENTAL MONITORING AND MITIGATION PROGRAM

- PRIMARY PURPOSE OF MONITORING AND MITIGATION PROGRAM IS TO DOCUMENT COMPLIANCE WITH SECTION 113(a) OF THE NUCLEAR WASTE POLICY ACT, WHICH REQUIRES SITE CHARACTERIZATION ACTIVITIES TO BE CONDUCTED IN A MANNER THAT MINIMIZES ANY SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS
- MONITORING AND MITIGATION PROGRAM IS NOT INTENDED TO BE A COMPREHENSIVE IMPACT ANALYSIS OR A COMPREHENSIVE MONITORING PROGRAM
- SCOPE OF MONITORING IS LIMITED TO SITE CHARACTERIZATION ACTIVITIES THAT HAVE A POTENTIAL TO GENERATE SIGNIFICANT ADVERSE IMPACTS
- THE PRIMARY MITIGATION STRATEGY FOR ANY ACTUAL SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS WILL BE, TO THE EXTENT PRACTICABLE, CHANGES IN THE WAY SITE CHARACTERIZATION ACTIVITIES ARE CONDUCTED

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U.S. DEPARTMENT OF ENERGY



COMPONENTS OF NNWSI PROJECT ENVIRONMENTAL MONITORING AND MITIGATION PLAN

- EXECUTIVE SUMMARY
- INTRODUCTION
- SITE CHARACTERIZATION PROGRAM SUMMARY
- POTENTIALLY SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS
- ENVIRONMENTAL MONITORING AND MITIGATION
- METHODOLOGY FOR MODIFYING THE EMMP



- SITE PREPARATION AND CONSTRUCTION FOR SURFACE-BASED TESTING
 - · CLEARING AND GRADING FOR CONSTRUCTION OF DRILL PADS WHERE REQUIRED
 - PREPARATION OF TRENCHES FOR GEOLOGIC STUDY
 - PREPARATIONS FOR GEOPHYSICAL STUDIES
 - CLEARING OF BEDROCK SURFACES FOR PAVEMENT STUDIES
 - PREPARATIONS FOR INFILTRATION STUDIES
 - ROAD CONSTRUCTION AND IMPROVEMENT



- SITE PREPARATION AND CONSTRUCTION FOR EXPLORATORY SHAFT FACILITY (ESF)
 - CLEARING, GRADING, AND CUT AND FILL OPERATIONS FOR ESF PADS AND STRUCTURES
 - ACCESS ROAD CONSTRUCTION AND IMPROVEMENT
 - CONSTRUCTION OF UTILITY SERVICES
 - CONSTRUCTION OF SHAFTS AND UNDERGROUND ROOMS



NNWSI PROJECT EA APPROACH TO ASSESSING ENVIRONMENTAL IMPACTS FROM SITE CHARACTERIZATION

EA EVALUATED POTENTIAL EFFECTS OF SITE CHARACTERIZATION ACTIVITIES IN SEVERAL DISCIPLINES

- GEOLOGY
- HYDROLOGY
- LAND USE
- SOILS
- ECOSYSTEMS

- AIR QUALITY
- NOISE
- AESTHETICS
- ARCHAEOLOGY
- **TRANSPORTATION**

U.S. DEPARTMENT OF ENERGY



NNWSI PROJECT EXAMPLE SUMMARY OF ENVIRONMENTAL EFFECTS ASSOCIATED WITH SITE CHARACTERIZATION (FINAL EA, MAY 1986)

ECOSYSTEMS

ACTIVITY

SURFACE-BASED STUDIES - REMOVAL OF HABITAT

ENVIRONMENTAL

EFFECTS

- DUST ON VEGETATION
- LOSS OF EPHEMERAL WATER BASINS
- INCREASED NOISE LEVELS
- VEGETATION LOSS FROM FLUID CONTAMINATION

STANDARD OPERATING PRACTICE

CONDUCT PRECONSTRUCTION SURVEYS TO AVOID SENSITIVE SPECIES, MINIMIZE OFF-ROAD DRIVING, DUST CONTROL, RECLAIM DISTURBED AREAS, BERM ROCK STORAGE PILE

ESTIMATED SIGNIFICANT IMPACT

1

NONE



NNWSI PROJECT THOUGHT PROCESS FOR IDENTIFYING SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS FOR MONITORING

ANALYSES IN EA WERE BASED ON SETS OF ASSUMPTIONS HAVING VARYING DEGREES OF UNCERTAINTY OR VARIABILITY

EA ANALYSES WERE REEXAMINED WITH RESPECT TO THE POTENTIAL FOR VARIABILITY IN RESULTS

- VARIABILITY WAS EITHER NONEXISTENT, INSIGNIFICANT, OR SIGNIFICANT FOR EACH TECHNICAL DISCIPLINE
- ONLY THOSE TECHNICAL DISCIPLINES THAT CONTAINED SIGNIFICANT LEVELS OF UNCERTAINTY OR VARIABILITY IN PREVIOUS ANALYSES WERE IDENTIFIED FOR MONITORING FOR THE POTENTIAL FOR SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACTS

U.S. DEPARTMENT OF ENERGY



NNWSI PROJECT TECHNICAL DISCIPLINES IDENTIFIED FOR ENVIRONMENTAL MONITORING

- AIR QUALITY
 - TOTAL SUSPENDED PARTICULATES (TSP)

RADIOLOGICAL LEVELS

RADON AND RESUSPENSION OF CONTAMINATED MATERIALS

• ARCHAEOLOGICAL/HISTORICAL RESOURCES

- PRECONSTRUCTION SURVEYS FOR LOCATIONS OF SITES

• TERRESTRIAL ECOSYSTEMS

PRE- AND POST-CONSTRUCTION SURVEYS FOR AFFECTED BIOTA INCLUDING SENSITIVE SPECIES AND THEIR HABITATS



NNWSI PROJECT EXAMPLE ENVIRONMENTAL MONITORING PROGRAM

AIR QUALITY

BASELINE MONITORING (PRIOR TO CONDUCTING NEW SITE CHARACTERIZATION ACTIVITIES)

- PARTICULATE MONITORS INSTALLED IN THE VICINITY OF PROPOSED ACTIVITIES
- DATA REPORTED QUARTERLY IN SPECIFIC AIR QUALITY DATA REPORTS AND INCLUDED IN 6 MONTH EMMP UPDATE/PROGRESS REPORTS

IMPACT MONITORING (DURATION OF SITE CHARACTERIZATION)

- MAY REQUIRE THE USE OF EPA AND STATE APPROVED COMPUTER MODELS TO PREDICT MAXIMUM IMPACT AREAS
- MAY REQUIRE ADDITIONAL MONITORS AS DATA IS EXAMINED FROM THE BASELINE PHASE
- DATA REPORTED QUARTERLY IN SPECIFIC AIR QUALITY DATA REPORTS AND INCLUDED IN 6 MONTH EMMP UPDATE/PROGRESS REPORTS



NNWSI PROJECT CURRENT ESTIMATED SCHEDULE FOR INTERACTIONS WITH STATE IN REVISING THE EMMP/SMMP

- WORKING DRAFT EMMP AND SMMP TO STATE
- STATE BRIEFING ON SITE CHARACTERIZATION ACTIVITIES, EMMP, AND SMMP
- TECHNICAL WORKSHOP ?
- FORMAL STATE COMMENTS TO PROJECT OFFICE
- COMMENT CLARIFICATION WORKSHOP ?
- REVISED EMMP AND SMMP TO HEADQUARTERS
- HEADQUARTERS TRANSMITS COMMENTS TO PROJECT OFFICE
- PROJECT OFFICE INCORPORATES DOE/HQ COMMENTS AND TRANSMITS EMMP AND SMMP FOR HQ CONCURRENCE
- RELEASE EMMP AND SMMP
- EMMP AND SMMP UPDATE/PROGRESS REPORTS

DECEMBER 1, 1986 JANUARY 23, 1987 FEBRUARY 1987 MARCH 1, 1987 MARCH_1987 APRIL 1987 MAY 1987 JUNE 1987 JULY 1987

6 MONTH INTERVALS

SMMSCP.BRA 1/23/87 12.



NNWSI PROJECT MONITORING AND MITIGATION UPDATE/PROGRESS REPORTS

REPORTING OF MONITORING DATA

- REPORTING OF CHANGES IN SITE CHARACTERIZATION ACTIVITIES AND SIGNIFICANCE OF CHANGES
- ASSESSMENT OF IDENTIFIED POTENTIALLY SIGNIFICANT ADVERSE IMPACTS FROM THOSE NEW ACTIVITIES

IMPLEMENTATION OF NEW, OR MODIFICATION OF EXISTING MONITORING PROGRAMS IF REQUIRED

IDENTIFICATION OF MITIGATION STRATEGIES IF IMPACT THRESHOLDS ARE BEING EXCEEDED