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NUCLEAR REGULATORY COMMISSION
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DATE: July 21, 1993

TO: Joseph Holonich

FROM: Philip S. Justus

SUBJECT: YUCCA MOUNTAIN PROJECT ON-SITE LICENSING REPRESENTATIVE'S REPORT FOR MAY AND JUNE 1993

INTRODUCTION

During the ninth and tenth months as On-Site Licensing Representative (OR), I participated in nine site visits including a DOE/NRC Technical Exchange, training in underground miner safety and an Appendix 7 visit of Center for Nuclear Waste Technical Analyses climate experts, and in Las Vegas, two DOE/NRC Meetings, two DOE/NRC Technical Exchanges, and the first meeting of the NAS/NRC Committee on Yucca Mountain Standards, among other things. This report summarizes those activities that I consider particularly relevant to staff work.

A principal purpose of these OR reports is to alert NRC staff, managers and contractors to information from DOE's programs for site characterization, repository design, performance assessment and environmental studies that may be of use in fulfilling NRC's role during prelicensing consultation. Relevant information includes such things as new technical data, DOE's plans and schedules and the status of activities to pursue site suitability and Exploratory Studies Facility (ESF) development. In addition to communication of information, any potential licensing concerns identified are reported, as appropriate. The principal focus of this and future ORs reports will be on DOE's programs for ESF, surface-based testing (SBT), performance assessment, data management systems and environmental studies (at this time, mainly water resources).

EXPLORATORY STUDIES FACILITY (ESF)

1) SURVEY LOCATION OF NORTH PORTAL. The Yucca Mountain Project Office (YMPO) determined that there was a discrepancy in the location (latitude, longitude and altitude) of the starting point of the ESF, North Portal station 0+00. YMPO's review indicated that

the error was due to a contractor not having properly qualified personnel and procedures for conducting conventional leveling geodetic surveys. A subsequent survey by another contractor was conducted, using a global positioning satellite technique. Drawings and geologic maps are being modified to reflect adjusted coordinates. The adjustment was on the order of 0.1 ft horizontal and .45 ft vertical and apparently had no significant effect on the ESF. The ORs will also review the documentation associated with the re-survey.

2) GROUTING ROCK BOLTS IN NORTH PORTAL. YMPO has identified some potentially adverse effects associated with grout used to cement rockbolts in place in the ESF Starter Tunnel: chemical contamination of the rocks and fractures around the bolts, perturbation of the natural underground hydrogeological system and test interference (Determination of Importance Evaluation for ESF Starter Tunnel Drill and Blast Section (DIE)). The M&O has made recommendations to mitigate such effects (i.e., avoidance, set back distance, decision holdpoint) and YMPO has approved the recommendations. Cement grout has been approved for and used for rockbolt anchoring in the first 200 ft of tunnel. For your information, as of about 6/8, actual grout consumption averaged 290 gallons/bolt for the first 28 bolts installed, and 70 gallons/bolt for the next 25 bolts installed. Improved ground conditions, i.e., less leakage into fractures and lithophysae, accounted for the change in quantitites needed. M&O estimated that total grout consumption for the entire starter tunnel should be less than the 60,000 gallons originally requested. Effectively, it appears that a grout curtain is being emplaced around the crown and sides of the starter tunnel. The ORs will continue to observe, review and report on the grouting process.

3) MONITORING ROCKMASS MOVEMENT IN HIGH-WALL AND STARTER TUNNEL. Sandia National Lab (SNL) scientists are monitoring rock creep in the high-wall and within the starter tunnel. This is both a construction monitoring and worker safety consideration. SNL is taking tape extensometer measurements inside the tunnel and load cell measurements in horizontal boreholes in the boxcut high-wall. Initial results apparently show normal deformation pattern for a mine opening. Apparently no significant deformation occurred as a result of the Magnitude 6.0 earthquake of on 5/17. These deformation studies are not considered to be quality-affecting. Nevertheless, the ORs will continue to meet with YMPO staff and contractors to better understand the rock deformation phenomenon and monitoring methods.

4) TUNNEL BORING MACHINE (TBM) CONTRACT AWARDED. On 5/27, DOE awarded a contract to purchase a TBM from Construction Tunneling Services, Inc. (CTS), for about $12M, plus about $800K for state taxes. Specs: 7.6m (25-feet) diameter, 720 tons, new machine, about 8-feet/hour in welded tuff. The machine head is articulated, the cab is fully encased. CTS and YMP are seeking ways to mitigate

grease and oil leakage from the TBM. The TBM is to be delivered and assembled on site about 4/94 and installed in the starter tunnel about 5/94.

5) ESF DESIGN CHANGES UNDER CONSIDERATION. The following are some design changes under consideration: alternatives to the steel arch over the North Portal entry, gradient of north ramp, continuous inclined repository drift network to split-level nearly horizontal drift network. It was considered that the lower gradient of south ramp may make it more desireable as the main waste package entry in future.

6) THERMAL LOADING SYSTEMS STUDIES ON-GOING. At the Technical Project Officer (TPO) meeting on 6/11 that I attended, a comprehensive briefing on the Mined Geologic Disposal System (MGDS) Thermal Loading Study was presented (Enclosure 1). I'll hit just a few highlights below. YMPO identified the importance of developing an interface, among others, between thermal load analysts and multi-purpose canister system developers. The regulatory basis for understanding thermal loading effects was acknowledged and its importance to design was briefly explained. Based only on ambient thermal conditions, it was determined that the radionuclides of greatest concern for compliance are C14, Tc99, I129, Se79. It was concluded that validation of performance predictions requires large scale testing, such as can be had from ESF; that the commonly used uniform disk heat source model does not adequately represent the repository; that loads greater than 57kW/acre can be accommodated in an area smaller than that at YM; that thermal loading is a consideration in pre-closure operations. The MGDS approach includes use of expert peer review to verify analytic codes, 'near-field' calculations by SNL and PA, 'far-field' calculations by LLNL and PA, geochemical evaluations by LANL. FY93 plan includes establishment of thermal goals, or at least make a "Goldilocks decision" as to what is 'too hot' or 'too cold.'

7) STATUS OF MULTI-PURPOSE CANISTER (MPC) STUDIES. I attended a briefing on MPC at the TPO meeting on 6/11 (Enclosure 2). A MPC is a sealed container for spent fuel assemblies that can be used throughout the Civilian Radioactive Waste Management System. Separate overpacks would be used for storage, transportation and disposal. In concept, MPCs are never opened. They could replace the current approach of bare fuel handling at each relocation step. YMPO identified the need to interface with, among others, Defense waste packagers, who are apparently not giving a lot of consideration to MGDS needs. A preliminary conclusion from a MPC feasibility study is that while MPC use in a repository is feasible, large MPCs would not be compatible with low-thermal loading (see Thermal Loading item 6, above). One scenario to be considered includes use of Multi-purpose Universal Containers (MPUs). MPU was described as an MPC in a single multi-purpose overpack. Use of 75 ton and 125 ton MPCs with/without burnup

credit are under study. YMPOs efforts are geared to MPC availability in 1998. A MPC 'implementation' study is due to be completed at end of FY93.

8) STATUS OF IN SITU HEATED-BLOCK TEST. This is a brief summary of a TPO briefing on the subject on 6/11 (Enclosure 3). A large block of tuff (3m x 3m x 4.5m) exposed on Fran Ridge is to be 'wired' for large-scale heater measurements. This is a long-term surface-based proto-type test of the following uncertain effects of simulated radiogenic heat source in fractured welded tuff: would heat conduction dominate heat flow, would a region of above-boiling temperatures surrounding the repository correspond to absence of mobile liquid water around the Waste Package, would fracture density and connectivity be sufficient to promote rock dry-out due to boiling and condensate shedding, would re-wetting of the dry-out zone to ambient saturation significantly lag behind the end of boiling period, would large-scale, buoyant, gas-phase convection eventually dominate moisture movement in the unsaturated zone. Test location is adjacent to Fran Ridge stereophotogrammetric fracture mapping experiment, pavement is cleared, fractures have been mapped by LLNL, Test Planning Package is complete, Job Package is due 7/27, rock saw is due on site mid-July. Small blocks for lab tests are to be shipped in August; the large block is to be readied for instrumentation in September. SNL is involved in, among others, sawing and characterizing the rock and fractures of the in situ block; LLNL is involved in, among others, fracture mapping and data analysis. Test duration is expected to be 5-7 years. At least one ESF Study Plan will be modified to identify ties to the large block test and to reference the controlling Scientific Investigation Plan.

9) CONTROLS ON USE OF CHEMICAL TRACERS. On 6/30, at the request of J. Gilray, the ORs were briefed on the use of tracers, a quality-affecting activity. Present were S. LeRoy, K. Stetzenbach, J. Martin, R. Craig, R. Leonard, D. Williams, S. Nelson, C. Johnson, C. Newberry, ORs. Basically, tracers are substances mixed with or dissolved in fluids and materials that are introduced into the YM environment that allows the introduced fluids or materials to be identified and distinguished from naturally-occurring fluids and materials. Currently, there are nine approved tracers (Enclosure 4a). For example, sulfur hexafluoride is dissolved in air that is circulated in boreholes that are drilled dry, such as UZ14; lithium bromide is dissolved in water used to mix grout and shotcrete in the ESF. Tracers are selected for certain desireable properties, such as readily detectable and stable for required period of time and conditions (Enclosure 4b). Tracer use is controlled by Underground Injection Permit issued by NV Division of Environmental Protection; by waste isolation evaluations and test interference evaluations performed by M&O and referenced in Job Packages; recorded in Tracers, Fluids and Materials (TFM) database maintained by LANL (Enclosure 4c). The following Study Plans were considered the only ones to direct the use of tracers

for hydrologic work: all are 8.3.1. - 2.2.3, 2.2.4, 2.2.6, 2.2.7. YMPO cited as a "good example of project integration" the case of Neutron holes Job Package where the required Test Interference Evaluation indicated a need to place a tracer control on the drilling fluid, even though the PI didn't need the tracer for his project. The TFM data are stored in the Document Records Center at the Field Operations Center. The ORs will continue to observe and report on the tracer utilization process.

10) STARTER-TUNNEL STATUS. The TBM starter tunnel is advancing by the performance of these activities at the North Portal: drilling and loading explosives, blasting, poling, mucking, drilling and installing rock bolts, grouting the bolts, meshing, fibercreting, mapping. By the end of May 31 rounds had been blasted, pilot drift advanced to 0+99ft, north and south slashes advanced to 0+50ft; pull-tested 12 split set rock bolts, installed 34 split set rock bolts, installed 45 Williams and 20 Tital rock bolts, installed steel lattice girders at entrance, installed 20ft rock bolts in high-wall. By July 7, the Pilot Drive advanced to 155.8 ft., and side slashes to 146 ft.

SURFACE-BASED TESTING (SBT)

1) UZ-14 STATUS. The LM-300 dry-drilling system appears to be working at a faster rate, about 40ft of core and about 40ft of reaming per day, than at the UZ-16 location. This success is being partially attributed to the innovative use of a polycrystalline diamond bit. At end of June about 884 ft had been cored and reamed. The projected total depth is 2000ft. The primary purpose of the UZ boreholes continues to be: 1) measure matrix and fracture hydrologic properties of the unsaturated zone, 2) add information to the geologic framework database, 3) conduct geophysical logs/tests to further characterize the structure and stratigraphic interval penetrated by the borehole. UZ-14 is located about .3mi north of the proposed repository perimeter.

2) GHOST DANCE FAULT ZONE TO BE EXPOSED. YMPO has taken steps to clear-off the Ghost Dance Fault zone on the south flank of Antler Ridge by preparing road-cut type excavations. Work could begin in September.

3) CLOSURE OF TEST PITS AND TRENCH ANNOUNCED. The impending closure of soil test pits for a future road between North and South Portals and the open part of T5A was announced at the Field Test Coordination meeting at Field Operations Center (FOC) on 5/20. I was informed that the test pits had been logged and sampled for geotechnical tests and were generally not suitable for entry. On 6/3 I declined an opportunity to observe them from the rim, after considering that the walls had deteriorated and that logs were not available for field use. Trench T5A had been observed by NRC staff (see OR Reports for Sept/Oct 92, Nov 92 and Feb/Mar 93). On my

discussing the closures with HQ staff, staff decided not to send an observer; staff considers that they were properly notified of the opportunity to observe prior to closure. I've requested location maps of closed excavations and references to documents that confirm completion of planned tests in them. None are available at this time.

4) NO SIGNIFICANT WATER LEVEL RESPONSE TO EARTHQUAKES NEAR BISHOP, CA IN CERTAIN YM WELLS. I attended the 6/11 TPO briefing on "Water level response to May 1993 earthquakes near Bishop, CA" (Enclosure 5). Measurements of water-table and fluid-pressure changes in two wells at YM in response to the earthquakes 75 miles distant showed that the water table moved temporarily. However, after fluctuating for about seven minutes to a maximum of .6 ft after the Magnitude 6 event of May 17, the water level in well H6 resumed its ambient position; smaller magnitude events effected smaller fluctuations (Enclosure 5). The USGS TPO stated that there is no evidence that earthquakes will have significant impact on water levels.

5) EARTHQUAKE SWARM 30KM EAST OF YM RECORDED. Beginning 5/15, with a cluster of 17 earthquakes on 5/16-17, earthquakes up to about magnitude 3.6 occurred near the Rock Valley Fault zone, about 30km east of YM. On 5/30, a shallow focus Magnitude4.0 occurred on the edge of the aftershock zone of the swarm. Data from the Rock Valley events were masked by the Bishop, CA events that began on 5/17. The Rock Valley activity is about 15km east of the Little Skull Mountain activity that occurred about 11 months earlier.
Information received in the OR office on these events were transmitted to HQ staff upon receipt. Automatic notification of such events will be discussed at a future meeting on notification protocols (see OR report for April 93).

6) NRC/DOE SITE VISIT ON QUATERNARY FAULT STUDIES. On 5/25-26 I attended a NRC/DOE public site visit held for the main purpose of discussing DOE progress on Quaternary fault studies; ESF mapping and its seismic hazard analysis accelerated program initiative were also discussed (see Holonich to Shelor, 6/16/93, Summary of May 25-26, 1993 Site Visit). This was the first 'site visit' interaction to occur, as defined in the "Procedural Agreement Between DOE and NRC..." (see GENERAL item 9, below).

7) OR REVIEW OF YMPO BOREHOLE GEOPHYSICS QA PROGRAM AT YM. The Yucca Mountain Project Office (YMPO) is taking steps to perform geophysical logging of its boreholes in and around Yucca Mountain for purposes of site characterization. YMPO has convened a Geophysical Integration Task Force and named a Geophysical Logging Coordinator to, among other things, consolidate the participants' various technical justifications and requests for rock properties as measured in boreholes by geophysical logging methods and, also, to facilitate procurement of logging services. Two QA control documents guiding borehole geophysical investigations are presently available and others are being prepared. The On-Site reps are

closely following YMPO's implementation of the technical and QA plans to obtain geophysical data from boreholes.

GENERAL

1) DOE/NRC MANAGEMENT MEETING ON TOPICAL REPORTS. On 5/3 I attended the Management Meeting on Topical Reports in Las Vegas. The purpose of the meeting was to obtain comments from DOE and interested parties on the NRC staff's draft Topical Report Review Plan. Completion of this plan is needed to proceed with staff review of the DOE Topical Report on Extreme Erosion. (See Holonich to Shelor July 16, Minutes from the May 3, 1993, Technical Exchange on Topical Reports.)

2) SEISMIC ZONE CHANGE. YMPO announced at the Site Visit to YM on 5/25 that it had recently changed the seismic design basis of the ESF from Uniform Building Code Seismic Zone 3 to Zone 4 at .3g. The basis for the change was not discussed. The ORs will send information on the bases for the change when available.

3) CORE LOGGING RESPONSIBILITY. YMPO has taken action to qualify SAIC staff to log core at the drill site (see OR Report for April 93, GENERAL, item 4h). When completed, USGS, SNL and SAIC staff will be authorized to produce quality affecting logs that consider lithologic characteristics and various rock, mineral and structural properties visible in core and outcrop samples. YMPO is taking this opportunity to establish uniform criteria for picking stratigraphic units that will help ensure consistent picks by scientists in the various DOE participants (see OR Report for Feb/Mar 93, ESF, item 7). Current practice allows the use of Scientific Notebook method for rock descriptions. ORs will continue to report on the evolution of criteria by which rock units are defined and how well the process of application of the criteria is developing.

4) NATURAL ANALOG STUDY OF A HYDROTHERMAL SYSTEM. At the TPO meeting on 5/7 W. Glassley, LLNL, discussed, "Validation of hydrogeochemical codes using the New Zealand Geothermal System" (Enclosure 17e). He discussed, among other things, requirements for model simplification and validation, efforts to identify key processes, and examples from the active hot watery volcanic field. This is part of the LLNL effort to develop capability to forecast chemical conditions that may affect waste package performance, to establish mineralogical and chemical properties of the 'near-field' that will control source terms and radionuclide transport scenarios and to determine the effect of mineralogical and chemical changes on the site hydrology that will occur during the thermal evolution of the repository. The LLNL effort is concerned about processes and conditions, such as the following, that it considers may be important for the Yucca Mountain case: reaction kinetics, ion exchange, sorption, aqueous speciation, rock and fracture

permeability, imbibition characteristics, connectivity of pores and fracture roughness. The influence of thermal evolution and radiation on these processes and conditions is also under consideration. The work is continuing.

5) 'SLAEM' SATURATED ZONE CODE BEING EVALUATED. YMPO reported that it is evaluating the saturated zone code SLAEM. This information was relayed to HQ.

6) PHOTOGRAPHIC AND VIDEOTAPE RECORDS OF ESF/SBT PROGRESS. You should now be receiving on a monthly basis a videotape of ESF and SBT progress made by YMPO during the previous month and a set of color photographs of selected monthly activities. Upon request for same, I have been assured by Mr. Gertz that the request itself was reasonable and not unduly costly to the YMP and that other organizations, such as TRB and State of NV, routinely receive such materials. This office is also furnished a set by YMPO. The YMPO will accept reasonable requests for copies of 35mm slides in its slide library. Enclosed for your information is a menu of topics for which slides are available (Enclosure 8).

7) PUBLIC MEETING OF NAS/NRC COMMITTEE ON TECHNICAL BASIS FOR YUCCA MOUNTAIN STANDARD. On 5/27-28 in Las Vegas, I attended the first meeting of the National Academy of Sciences/National Research Council's Committee on Technical Basis for Yucca Mountain Standard. This Committee was formed in response to Energy Policy Act of 1992 (PL 102-486), Section 801(a)(2) to conduct a study to provide findings and recommendations on the technical bases for reasonable standards for protection of the public health and safety... At the press conference on 5/27, Chairman R. Fri stated that the Committee would address the tech basis for a radiological health and safety standard to determine the characteristics of the process for EPA to determine if a site meets acceptable standards. Also, the Committee would not address, in its words, the social judgment of how safe is safe enough (Enclosure 9a is agenda, 9b lists members).

M. Federline presented the NRC staff views on environmental standards for disposal of high-level waste (Enclosure 9c). She described the basic safety goal as a "societal pledge to future generations:" 1) provide future societies with the same protection from radiation we would expect for ourselves; 2) provide that protection in a way that does not impose a burden on future societies. In other words, we will do today whatever is necessary to ensure an adequate level of radiation protection. Ms. Federline discussed the staff views on seven major issues that the Committee should address: 1) health-based vs. technology based standards; 2) individual vs. population protection; 3) fundamental vs. derived standard; 4) active institutional control; 5) probabilistic standards; 6) ALARA; 7) 10000-yr period of concern. The OR office has additional handouts from the meeting.

8) GOLD MINING IN BULLFROG HILLS AND BARE MOUNTAIN, NYE COUNTY,

NV. On 5/27 at UNLV, I attended a lecture sponsored by the Geological Society of Nevada, by Dr. S. Weiss, Mackay School of Mines, UNR, "Mid-Miocene precious metal deposits of the Bullfrog Hills and Bare Mountain, Nye County, NV: variable relations to magmatic and tectonic activity in the southwestern NV volcanic field" (Enclosure 10 is the abstract). His investigations of the age and origin of gold deposits being mined today 15-30 miles from YM, the active mines closest to YM, appear relevant to natural resource considerations and regional tectonics of YM. He found that gold-silver mineralization occurred about 9-11 million yrs ago (mya) in quartz-calcite veins and breccia along detachment fault and faults in the upper plate of the detachment in the Bullfrog Hills. The mineralization apparently accompanied extensional faulting and hydrothermal activity and in some cases followed volcanic activity by 1-1.5 my. Mineralization occurred in the waning stages of Timber Mountain igneous activity. He indicated that conditions deep beneath YM were analogous to those of the Bullfrog Hills. In contrast, the gold-silver deposits on the east flank of Bare Mountain (mines are visible from Yucca crest) apparently developed about 13-12.5 mya, perhaps continuing to 11-12 mya. These are related to silicic porphyry dikes and high-angle fractures/faults above and below the Fluorspar Canyon segment of the regional detachment system. Dr. Weiss suggested that a large pluton occurs below Bare Mountain. The DOE has plans to evaluate the literature which bears on YM natural resource considerations, such as Dr. Weiss's work, the NRC staff will have an opportunity to review DOE's conclusions and supporting bases then.

9) NRC/DOE PROCEDURAL AGREEMENT AND PROJECT-SPECIFIC AGREEMENT. On 5/20, two revised agreements took effect that outline the procedures for NRC staff consultation and exchange of information which the staff and DOE and its designated contractors will observe in connection with the characterization of sites under Nuclear Waste Policy Act of 1982. The Procedural Agreement revisions focused on guidelines for conducting technical exchanges, site visits, licensing and management meetings and QA audits and surveillances. The Project-Specific Agreement, "Agreement Between the U.S. DOE Office of Civilian Radioactive Waste Management and the NRC Division of High-Level Waste Management During Site Characterization Programs and Prior to the Submittal of an Application for Authorization to Construct a Repository" includes revised guidelines which govern the conduct of this OR office, such as communications between points of contact from NRC and DOE project offices, acquisition of samples during site characterization activities by NRC contractors, and specific OR responsibilities and authority (see Shelor to Holonich, June 7, 1993).

10) NRC/DOE INTERACTIONS SCHEDULING MEETING AND APPENDIX 7 VISITS. I attended the scheduling meeting on 6/7 in Las Vegas as an observer. The purpose of the meeting was to schedule interactions

in the July to December 1993 timeframe. Site visits, technical exchanges and meetings were scheduled (see Holonich to Shelor, 6/22/93, Minutes from the 6/7/93 Interactions Scheduling Meeting. The only interaction scheduled for NV is the 7/27-28 ESF Design Technical Exchange.

11) NRC/DOE TECHNICAL EXCHANGE ON GEOPHYSICAL INTEGRATION. I attended the NRC/DOE TE on 6/8 in Las Vegas as an observer. The purpose of the meeting was to discuss DOE's efforts related to the integration of geophysical tests and activities for site characterization of YM. Also, R. Dyer stated that the TE was a review of the geophysics program (see Holonich to Shelor, 6/30/93, Summary of 6/8/93 Technical Exchange). Handouts are on file in OR office.

12) DOE/NRC TECHNICAL EXCHANGE ON VOLCANISM STUDIES. I attended the TE held in Las Vegas on 6/9 as an observer. The purpose of the TE was to hold discussions on DOE volcanism studies and to discuss LANL preliminary draft report, "Status of Volcanic Hazard Studies for YM Site Characterization Project." DOE explained the status and results of its volcanism studies guided by three Study Plans. It was emphasized that the draft report under review was not a topical report (see Holonicht to Shelor, 6/30/93, Summary of 6/9/93 Technical Exchange). Handouts are on file in the OR office.

13) NATURAL ANALOG TO BASALTIC VOLCANO 'PLUMBING' SYSTEM. On 6/10 I attended a briefing at UNLV by volcanologist Dr. J. Mills on the volcanic geology of the Hoover Dam area, especially the Fortification Hills basalts (FHB), AZ. Briefing was in preparation of a field trip he was to lead to FHB for three Center and one NRC HQ staff and me (I didn't attend field trip; see Center's Dr. B. Hill's trip report for details). The FHB are about 5.9 million years old; consist of 65-70 flows totalling about 200-300 feet thick; flows apparently were fed by a 1m dike exposed for miles with a relief of about 1000 ft. The dike (plumbing system) is fairly simple in form and can be traced into the FHB. This makes it a candidate for a study of the nature of upward flow of basalt magma through a long fracture about 1m wide in a geologic situation similar to that of YM, a natural analog to a future basaltic volcano that might erupt at or near YM. Considering that the FHB filled a topographically low spot 5.9mya and is now a prominent mountain, a considerable amount of erosion has occurred in the Hoover Dam area since 5.9mya to produce the reversal of topography. NRC Office of Research is considering sponsoring independent research on the FHB natural analog.

14) OBSERVE CROSS SECTION OF FRACTURED WELDED TUFFS ALONG COLORADO RIVER. On 6/12 I rafted down the Colorado River from Hoover Dam, NV to Willow Beach, AZ guided by Dr. Gene Smith, UNLV, sponsored by the Las Vegas Chapter of the Assoc. of Engineering Geologists. The tuffs exposed along the River overlap the age and composition of those in the vicinity of YM, although the basalts are generally

older. The tuffs and basalts in the canyon are fractured and faulted (both steeply and shallow dipping) and tilted as at YM. I observed and felt springs, some hot, that offered evidence of groundwater flow around Hoover Dam through fractures. The hydrologist on board considered that, because of the topographic relief in the canyon and the hydraulic head induced by the dam, we were witnessing an example of groundwater flow through fractured welded tuff, i.e., fracture flow in an unsaturated zone. For your information, this opportunity is available to visitors thru commercial rafters in Boulder City, NV.

15) ATTEND PUBLIC MEETINGS ON ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT (ER&WM) FOR NEVADA TEST SITE. I attended the two public meetings of DOE's Nevada Operations Office (NVO) on the FY94 budget and plans for ER&WM, on 6/15 and 6/22 in Las Vegas with J. Gilray. My purpose was to identify any methods used or results from NTS ER&WM activities that might be transferrable to YMP. There is apparently no formal connection between the two programs. However, there are connections of geography, geology, hydrology, technical organizations (such as REECo, RSN, EG&G, DRI, USGS, LLNL, SNL, LANL) and regulatory organizations (EPA, State DEP). An informal interprogram technical working group exists. Cooperation on such matters as transportation routing, land use planning along YMP/NTS border and site characterization technology might benefit both programs. Many pamphlets which describe the NVO ER&WM programs and plans and FY94 budget are on file in the OR office (Enclosure 14 is the agenda for the 6/15 meeting).

16) MEETING OF THE NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL BOARD ON RADIOACTIVE WASTE MANAGEMENT. On 6/24 I attended the NAS/NRC Board meeting with J. Linehan and J. Gilray, in Las Vegas (Enclosure 15 is the agenda). The apparent purpose of the meeting was for DOE to update the Board on the status and direction of the YMP and HLW programs under the new Secretary of Energy. Major consideration was given to the report on DOE's proposed alternative strategy for the OCRWM program. The handouts were distributed at HQ by J. Linehan. Copies are on file in the OR office.

17) YM EMERGENCY RESPONSE GRID SYSTEM. An Emergency Response Grid System for the YM area is now in use (Enclosure 16; sent to you on 6/4). This system is designed to facilitate, among other things, the communication of one's location on site to those who may have to physically get to you or for authorities to expeditiously describe a place for you to go. To be effective, at least one copy of this map should accompany each field radio. Therefore, the ORs are placing a copy of this map in the field vehicle, in the NRC FOC office and in the NRC Las Vegas office. NRC staff and contractors who visit the site in rented vehicles may sign out a radio at the FOC for use while in the vicinity of YM. In such a case, the staff/contractor in charge should obtain a copy of the gridded map

from one of the above sources (also, copies may be obtained at FOC from Supply Office or Ranch Control).

ON-SITE REP (OR) ACTIVITIES

1) SELECTED ACTIVITIES. a) CONDUCT REGIONAL GEOLOGY FIELD TRIP. On 5/4 I conducted a field trip for the Director, Repository Licensing and Quality Assurance Project Directorate and his program assistant to show them evidence of active tectonism, Quaternary volcanism and dynamic geomorphic processes for purpose of comparison to YM terrain. The focus was on the Spring Mountains-Death Valley area, NV and CA. Features observed included abandoned Quaternary lake shorelines, left-lateral strike-slip faulted Quaternary basaltic volcano, fault scarps, tilted and faulted volcanic tuff, playa lake and evaporites, active alluvial fans, abandoned and active spring deposits and the high-relief topography of the Basin and Range under the influence of the Death Valley seismogenic zone.

b) SCHOOL VOLUNTEER. On 5/21 I gave an illustrated overview of the high-level radioactive waste management program to a junior high school class in the Juvenile Court Schools, Las Vegas. The class had visited YM two days earlier and had questions. I had helped the teacher make arrangements with YMPO for the class trip.

c) DISCUSS ROLE AND OPERATIONS OF ON-SITE REP WITH EPA OFFICIAL. On 5/24 J. Gilray and I met in the OR office with J. Benetti of EPA at HQ request. We answered his questions on the role of the ORs and how we function in Las Vegas. EPA is considering the establishment of an oversight group for the Waste Isolation Pilot Project.

d) MEET MS. LINDA M. SMITH. The ORs were introduced to Ms. Smith on 6/7, her first day as Acting Associate Director for Geologic Disposal, by Mr. C. Gertz. During a brief meeting, Ms. Smith stated that Mr. Gertz would be responsible for all quality affecting work (including planning and budget) and she would have responsibility for the rest.

e) TECHNICAL PROJECT OFFICE (TPO) MEETING - MAY. The TPO meeting for May was held on 5/7. For completeness in reporting about TPO meetings and for the record, I'm enclosing the handouts (I did not attend this meeting): Agenda, Enclosure 17a; C. Gertz overview presentation, 17b; Wm. Simeca ESF status, 17c; R. Dyer SBT Status, 17d; Wm. Glassley on Validation of Hydrogeochemical Codes using the New Zealand Geothermal System, 17e; A. Flint on Changing Water Levels During Drilling of Test Well UE-25 UZ-16, 17f.

f) TECHNICAL PROJECT OFFICER (TPO) MEETING - JUNE. I attended the TPO meeting on 6/11 as an observer. The agenda is Enclosure 18a. Mr. C. Gertz summarized the principal events of the past month

(Enclosure 18b). Mr. T. Petrie provided the status of the ESF (Enclosure 18c). Dr. R. Dyer provided the status of SBT and Underground Testing (Enclosure 18d).

g) ATTEND EXIT AUDIT - REECO. I represented NRC at the post-audit review of the REECo audit on 6/25 in Las Vegas. The NRC audit report should be reviewed for details. The Chief Auditor indicated, in summary, that all QA elements audited were satisfactory except for the following: Element 4.0, Procurement, was unsatisfactory because of lack of commercial grade justification, use of unqualified suppliers, among others. Element 14.0, Inspection, Test and Operating Status, was unsatisfactory in area of surveying activities. Ten Corrective Action Requests were issued, 3 against M&O, 7 against REECo. One recommendation, on rockbolt activities: it seems unnecessary for AE to sign all holdpoints, redundant. I thanked the parties for the opportunity for NRC to participate as observers. I reported the exit audit statements to NRC HQ QA staff and OR J. Gilray.

h) NYE COUNTY SEEKS TECHNICAL COOPERATION WITH YMPO. I talked briefly with Nye County representative P. Niedzielski-Eichner about the County's cooperative venture with YMPO. Nye County is negotiating with YMPO to drill a borehole near the repository boundary. The borehole might be co-located with a YMPO borehole such that dual-well tests could be performed. By 6/30, the County had not selected its on-site representative.

i) FIELD VEHICLE ORDERED. The 1985 Bronco is scheduled for replacement in about 18 months. At HQ staff request, I have requested a 4dr 4WD 5-passenger vehicle. GSA indicates that the Las Vegas office is likely to get either a Ford Explorer, Jeep Cherokee or Chevy Blazer S10.

j) TRAINING COURSE FOR NEW UNDERGROUND WORKERS. I passed the two-day course, held at the FOC on 6/21-22. I am now certified to go unattended into the ESF and to escort groups of up to five people into the ESF.

k) APPENDIX 7 VISIT OF CENTER CLIMATOLOGISTS TO YUCCA MOUNTAIN AND VICINITY. I escorted a Center group on an Appendix 7 visit to Yucca Mountain and facilities on 6/29; there were 13 of us. L. McKague conducted tours through Amargosa Desert and Spring Mountains. The purpose of the visit was to offer views of the topography which affects the regional climate and of the vegetation indicative of the present climate, to provide the expert panelists an opportunity to confirm their elicited predictions. The trip is part of an IPA Phase 2.5 trial expert elicitation exercise to provide the NRC and Center staffs experience in the expert elicitation process. L. McKague was the Center lead and J. Park the NRC lead. Enclosure 19 is the itinerary prepared by Center.

1) APPENDIX 7 VISIT TO EVALUATE DOE GIS CAPABILITIES. An Appendix 7 visit has been arranged, at HQ request, for two NRC and two Center staff to meet with YMP contractors in Denver, 8/10, to evaluate Lynx system (USGS) and in Las Vegas, 8/11, to evaluate Earth Vision system (EG&G). S. McDuffie is the NRC lead, A. Simmons is the DOE lead. A fact sheet is available from OR office.

2) NRC STAFF VISITORS. The following NRC staff visited the site and/or attended meetings in Las Vegas in May: C. Abrams, H. Astwood, Wm. Boyle, M. Federline, J. Furth, A. Garcia, J. Holonich, J. Kotra, J. Linehan, K. McConnell, Wm. Reamer; in June: C. Abrams, R. Carlson, K. McConnell, A.K. Ibrahim, J. Trapp, S. McDuffie, E. O'Donnell, Wm. Belke, J. Linehan, J. Park.

Enclosures:

1.	TPO Meeting, Thermal Loading Study, Satterlie,		6/11
2.	" " Multi-Purpose Canister Study, Vawter		"
3.	" " Large Block Test, Wilder		"
4a.	Briefing on Tracers, Overview		6/30
4b.	" " " , Selection		"
4c.	" " " , Controls		"
5.	TPO Meeting,	Hayes	6/11
6.	Withdrawn		
7.	Withdrawn		
8.	YMPO Categories of 35 mm Slides		
9a.	NAS/NRC Comm. on Tech. Basis EPA Std., Agenda		5/27-28
9b.	" " " " " Comm. Mbrs.		"
9c.	" " " " " NRC/Federline		"
10.	Lecture, Gold Mining-Nye Co., (Abstr), Weiss		5/27
11.	Withdrawn		
12.	Withdrawn		
13.	Withdrawn		
14.	NVO Meeting, Envir. Restor. & SM, NTS, Agenda		6/15
15.	NAS/NRC Bd. Radioactive WM Meeting, Agenda		6/24
16.	Yucca Mtn. Emergency Response Grid System		
17a.	TPO Meeting, Agenda		5/7
17b.	" " , Overview	Gertz	"
17c.	" " , ESF Status	Simecka	"
17d.	" " , SBT Status	Dyer	"
17e.	" " , Validation of Codes	Glassley	"
17f.	" " , Changing Water Levels	Flint	"
18a.	TPO Meeting, Agenda		6/11
18b.	" " Overview,	Gertz	"
18c.	" " ESF Status	Petrie	"
18d.	" " SBT-UG Testing Status,	Dyer	
19.	Appendix 7 Visit, Center Climatologists, Itinerary		6/29

cc w/enc.: C. Gertz, DOE
D. Shelor, DOE
T. Hickey, State Senator
W. Patrick, CNWRA
R. Loux, State Nuclear Waste Project Office

w/o enc.: C. Abrams, M/S 4 H 3
B. Youngblood, M/S 4 H 3
J. Linehan, M/S 4 H 3
R. Bernero, M/S 6 E 6
H. Thompson, M/S 17 G 21
S. Gagner, M/S 2 G 5
S. Schwartz, M/S 3 D 23
J. Fouchard, M/S 2 G 5
E. O'Donnell, M/S NLS 260
G. Cook, Region V
J. Martin, Region V
D. Kunihiro, Region V
S. Jones, DOE
R. Dyer, DOE
D. Foust, M&O
S. LeRoy, M&O
J. Russell, CNWRA
L. Reiter, NWTRB
D. Bechtel, Clark Co.
L. Bradshaw, Nye Co.

Inclosure in Binder

TPO MEETING

MGDS THERMAL LOADING SYSTEMS STUDY

PRESENTED BY

DR. STEVEN F. SATERLIE

MGDS THERMAL LOADING STUDY MANAGER

M&O/TRW

presented by Rick Menoy (?)

LAS VEGAS, NEVADA

JUNE 11, 1993

NWPO meeting attd. 7/21/93
93072801151 930721

ENCLOSURE 1

2.4

MGDS Thermal Loading Study
Outline

- Importance of thermal loading to licensing and design
- Current state of knowledge relative to thermal loading
- Issues that must be addressed to support thermal loading decision
- On-going thermal loading efforts
- Thermal loading system study overview
- Summary and conclusions

Thermal Loading

- 10 CFR 60.133(i) requires that "the underground facility shall be designed so that the performance objectives will be met taking into account the predicted, thermal and thermomechanical response of the host rock and surrounding strata, groundwater system"

- "Repository-Induced Thermal Loading of the host rock, surrounding strata and groundwater system may be one of the most important GROA (MGDS) design parameters" (NUREG 1466)

THERMAL REGIONS

AMBIENT	WARM	HOT	EXTENDED HOT	TOO HOT
Ambient Water Movement	Below Boiling *	Substantial * Boiling	Above Boiling * for more than 1,000 years	Exceeds Thermal Limits for Repository and/or Waste Package
Low AML	Thermally Perturbed	Waste Package Dry for less than 10,000 years	"Dry" Waste Package for more than 10,000 years	

SCP

* Estimates of the Repository Environment based on Numerical Modeling Predictions which are currently being evaluated.

LOADING2.129/5-5-93

Importance Of Thermal Loading To Design

- Licensing requires understanding Thermal Loading Effects
  - Must demonstrate confidence in predicting long-term postclosure performance
  - 10 CFR 60.133 (i) specifies that coupled Thermal-Mechanical Hydrologic-Chemical (TMHC) processes be understood
  - Adequate multiple barriers
- Thermal loading effects impact a number of issues
  - Repository size and design
  - Waste package size and design
  - Emplacement mode
  - Natural barrier performance

Importance Of Thermal Loading To Design

(Continued)

- Importance of Thermal Loading to repository design
  - Area of repository for emplacement
    - -- Higher thermal loads may require less area
    - -- Lower thermal loads may require more area to emplace 70,000 MTU
  - Operability
    - -- Increased temperatures may decrease mine opening stability
    - -- High thermal loads may require completely automated emplacement system
    - -- Increased ventilation requirements may be required
  - Radiation safety for emplacement and retrieval
    - -- Larger waste packages require additional shielding for worker safety

Current Thermal Loading State Of Knowledge

- Thermal Conduction likely dominates at early times
  - Conduction equations easier to solve and parameters better known
  - Reasonable confidence in predictions of the operating environment during emplacement period
- Total System Performance Assessment (TSPA) indicates gaseous C^{14} release will be most difficult to meet compliance
  - Ambient analysis only
  - Thermal effects may increase amount released under some conditions

• Buoyancy
• Oxidation of fuel

Failure: 1) birth defects
2) degradation (i.e. contact w/ water)
3) mechanical ?

Current Thermal Loading State Of Knowledge

(Continued)

- TSPA concluded that aqueous releases would be dominated by a few radionuclides
  - Tc99, I129, Se79 (all have very long half lives)
  - Aqueous releases met regulations but only ambient analysis done
- Validation of performance predictions requires large scale testing
  - Testing scale may be dependent on thermal loading
  - TSPA currently cannot address all credible features, events and processes

Current Thermal Loading State Of Knowledge

(Continued)

- A simple uniform disk heat source model does not adequately represent the repository (majority of models use this approach)
  - Heat source distributions and edge effects can significantly affect temperature distributions
  - Based on predictions and observations by SANDIA and Berkley
  - Actual waste characteristics are important
- Thermal loadings above the 57 kW/acre baseline can be accommodated in less than the current repository area being characterized
  - Assumes area found to be suitable
  - Conversely use of expansion areas will be required for lower thermal loading

Current Thermal Loading State Of Knowledge

(Continued)

- CRWMS can accommodate a wide range of thermal loadings
  - Waste streams and acceptance rates can be accommodated
  - MPC prefers large capacity waste package for economic and radiologic reasons
  - Limits ability to stay below boiling in near vicinity of waste package
    - Would not prevent the bulk repository temperature to be kept below boiling
    - Maximizes difference between peak and average temperatures
- Thermal loading and preclosure operations are related
  - Temperature environment
  - Radiation environment
  - Rock stability
  - Ventilation requirements
  - Emplacement mode

Questions That Must Be Addressed

- Can it be "demonstrated" (provide reasonable assurance) that the thermal option will achieve postclosure performance
  - Release limits
  - Ground water travel time from disturbed zone
  - FY93 thermal study will partially examine but full answers will require data
- What analytic models can be used to adequately predict postclosure performance
  - Model verification underway
  - Will require data from heated block, ESF and other tests for validation
  - FY93 systems study will not address; being worked by PA

?

Questions That Must Be Addressed

(Continued)

- Can the thermal option above be operated safely (preclosure)
  - Environmental (radiation dose and temperature)
  - Retrieval
  - Emplacement option
  - FY93 thermal study will address
- Does thermal option provide for adequate multiple barriers
  - Viable waste package
  - Engineered barriers
  - Host rock
  - FY93 System studies will start to address
- Does sufficient suitable area exist in Yucca Mountain to emplace waste at the thermal loading option

needs ESF

  - Will require subsurface data
  - FY93 Systems study will not address

Questions That Must Be Addressed

(Continued)

- Can uncertainties in hydro-thermal-mechanical-chemical properties of fractured tuff be reduced
  - Large heat load may not guarantee substantial dry out
  - Heat load may enhance fracture flow in some areas
  - Parameters more uncertain at elevated temperatures
  - Heat driven effects for cooler (than SCP) environments cannot be ignored
  - Amount of fracture and matrix flow not well known
  - * Test data is mandatory to resolve uncertainties
  - UNDERWAY FY93 systems study will attempt to identify uncertainties that are important to waste isolation

yields zone of saturation above repos at low T.

Ongoing Efforts To Assess Thermal Loading

- **MGDS Thermal Loading Study approved, funded by YMP and initiated by M&O**

Steve Sutcliffe, chmn

  - A systems analysis approach
  - Involves participation by National Laboratories and performance assessment, subsurface, surface and waste package groups
  - Evaluates postclosure performance as well as preclosure performance such as safety, operability and cost
  - Expect a recommendation to narrow Thermal Loading options by end of year What's too hot, what's too cold? [Goldilocks Decision]

- **Analytic Code verification initiated with an Expert Peer review**

Bill Nelson, chmn.

see Thermal Goals reevaluation - CRSY (next slide)

Ongoing Efforts To Assess Thermal Loading

(Continued)

- **Testing programs initiated**
  - Laboratory testing ongoing
  - Heated block tests funded and planning started
  - ESF heater test planning started

Est. at CASY-
USGS

- **Thermal goals are being re-evaluated**
  - YMPO sponsored assessment
  - Preliminary draft report completed May 31, 1993

Part of perf. allocation process.

[SCP goals still appropriate?]

Objectives Of The FY93 Thermal Loading Study

The MGDS Thermal Loading Study will utilize a "Systems Approach" to achieve the following objectives:

"Goldilocks Decision"

- Establish thermal bounds as to what is "too hot" and "too cold"
- Provide recommendations as to a range or ranges of thermal loading, which, it is currently believed, would be licensable
- Provide recommendations of direction future work should take to resolve uncertainties
  - Analysis or analytic code development
  - Testing

Study Approach

- Effects of Thermal Loading on performance must be considered to obtain a license
  - EBS and repository design have a profound impact on the natural barriers of Yucca Mountain
- An aggressive approach chosen to address problem
  - MGDS Thermal Loading Study underway
  - Integrated test planning begun
- The required approach will strive to:
  - Evaluate total system performance of Thermal Loading options
  - Maximize the benefit of EBS/repository design on achieving successful license of the Yucca Mountain repository
  - Address uncertainties in radiation dose standards
  - Maximize protection to the populace from release of radioactive waste
  - Intend to focus the range of Thermal Loading options
  - Provide recommendations to focus further study

MGDS Thermal Loading Study Overview

WP
Subsurface Design
Geotech

- Develop requirements and inputs
  - WP provides options
  - Subsurface provides layout designs
  - Rock properties, modeling parameters sources
    - RIB plus recent data
    - A by-product of model verification effort
  - Establish thermal goals - working group analysis completed, preliminary results done on ~~May~~ Jun 31
- Near-field thermal calculations - PA, SNL
  - Examine source effects and drift wall rock temperatures
  - Subsurface will use temperatures to examine operability issues
  - Examine rock mechanics effects
- Far-field thermal calculations - PA, LLNL
  - Parametric evaluation of thermal loading options
    - Temperature
    - Water saturation levels
- Geochemical evaluation by LANL

MGDS Thermal Loading Study Overview

(Continued)

- System performance evaluation - PA, Systems Analysis
  - Postclosure performance (TSPA)
  - Life cycle costs
  - Evaluate using multi-attribute utility analysis
  - Evaluate performance against thermal goals
  - Identifies favorable thermal loading options
- Identify additional effort needed to reduce uncertainties
  - Analytic work
  - Testing

M&O, Jerry Youker

Summary

- What do we expect the study will accomplish?
  - Establish thermal bounds as to what may be "too hot
  - Recommend a range or ranges of thermal loading, which, it is currently believed, would be licensable
  - Identify uncertainties that are affected by thermal loading and could impact waste isolation
  - Provide a reassessment of thermal goals and recommendations for updating as necessary
  - Identify system wide impacts of thermal loading
- Where do we go from here?
  - Coordinate with testing activities to insure that desired data with adequate accuracy is being collected
  - Develop an approach to reduced uncertainties
  - Update analysis (TSPA, operations, cost) as improved data and models become available
  - As information becomes available work toward a final thermal recommendation and initiate a baseline change as appropriate

TPO MEETING

STATUS OF MPC STUDIES

PRESENTED BY

R.G. VAWTER
DEPUTY MANAGER
NEVADA SITE MANAGEMENT AND OPERATING CONTRACTOR

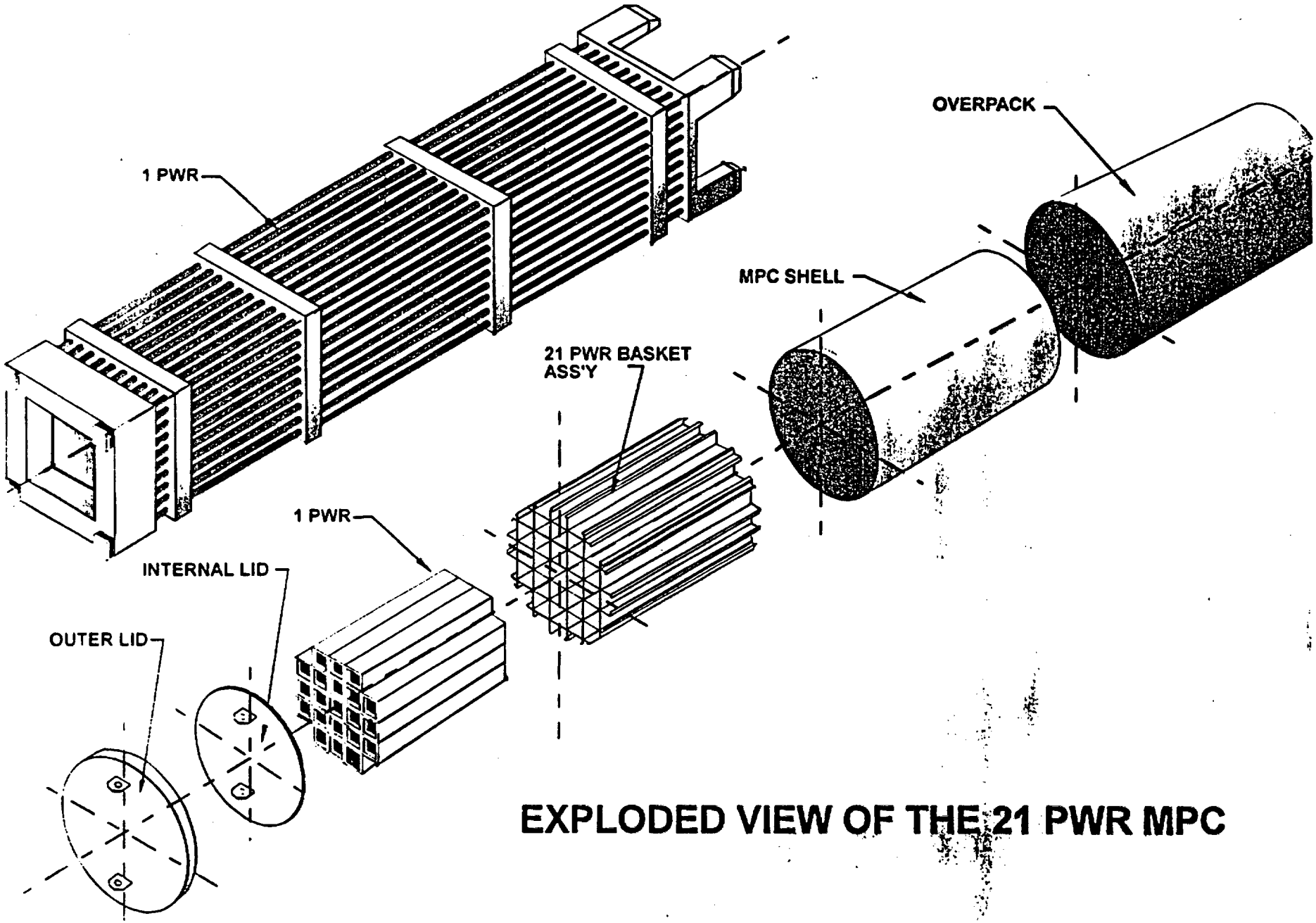
JUNE 11, 1993

ENCLOSURE 2

What Is An MPC?

- A multi-purpose canister (MPC) is a sealed container for spent fuel assemblies that can be used thoroughout the Civilian Radioactive Waste Management System (CRWMS)
- Separate overpacks would be used for storage, transportation, and disposal
- Could replace current approach of bare fuel handling at each step

IN CONCEPT : NEVER OPENED



EXPLODED VIEW OF THE 21 PWR MPC

21PWRMPC.122.CDR/6-1(

Why Current Interest In MPCs?

- MPC appears to offer system improvements
  - Fewer handlings of bare fuel
  - Less contamination and less radioactive waste (less LLW)
  - 1998 Waste Acceptance
  - At-Reactor Storage Option

Current MPC Activities

- Completion of Feasibility Study - JAN 1993
- Initiation of Implementation Study - FEB 1993
- Scheduled completion - SEP 1993
- Receipt of Industry Proposals - JAN 1993

MPC Feasibility Study Scenarios

- All bare fuel
- Large MPCs (21 PWR) at rail sites, bare fuel at truck sites
- All large MPCs
- All MPCs, mix of large and small (4 PWR) Suitable for Truck transp.
- All small MPCs Suitable for Cold Repos
- All MPUs (MPC in a single multi-purpose overpack) ≡ "UNIVERSAL CONTAINER"

MPC Feasibility Study Conclusions

- MPC concept is feasible
- The use of large MPCs would significantly reduce fuel assembly handlings
- Large MPCs would not be compatible with a low-thermal loading repository
- Extensive use of small MPCs very expensive

MPC Implementation Study
Objective

"Place the Department of Energy in a position to make a final decision regarding integration of MPCs into the system..."

MPC Implementation Study
Major Products

- Conceptual Designs and Specifications
  - Multi-Purpose Canister
  - Transportation Cask
  - Storage Mode
  - MRS and CMF
  - Utility Transfer System
- MGDS Design Considerations Report

MPC Implementation Study Schedule

• Communications Workshop	6/30
• WKSHOP CRYSTAL CITY MARRIOTT - Public Input	7/1-2
• Modified MRS Conceptual Design	7/15
• MPC Transportation Cask Conceptual Design	7/30
• Evaluation of Alternative Cask/Canister Study Results	7/30
• MPC Conceptual Design	8/15
• MGDS Design Considerations Report	8/15
• Complete Package to DOE	9/30

EEI/UWASTE Representatives

Bill Yario	New York Power Authority
Anton Fuierer	Rochester Gas & Electric
Darrell Williams	Entergy Operations-ANO
Marvin Smith	Virginia Power
John Closs	Northern States Power
Mick Buchheit	Yankee Atomic
Bob Rasmussen	Duke Power
Bob Lorenz	Pacific Gas & Electric
Jeanne Tortorelli	Commonwealth Edison
John Vincent	GPU Nuclear
Steve Stilwagen	Southern California Edison
Ray Lambert	Electric Power Research Institute
Eileen Supko	Energy Resources International
Julie Jordan	EEI/UWASTE

Primary Utility Considerations

- Package weight
- Wide variations in
  - Cask handling capabilities
  - Fuel dimensions
  - Age and burnup
  - Enrichment
- Package dimensions
- At-reactor storage
- Canister operations

Primary Storage Considerations

- Canister closure method
- Pre-emplacement design life
- Canister handling operations

Primary Transportation Considerations

- Structural design
- Criticality control
- Radiation shielding
- Package size and weight
- Basket inspection

Primary Disposal Considerations

- Criticality control
- Material selection
- Thermal limits/heat transfer
- Performance criteria
- Operating concept
- Weight/size/shielding
- Inspection requirements

MPC Initial Configurations

- 125 ton with/without burnup credit
- 75 ton with/without burnup credit

Summary

- MPC approach receiving high DOE priority
- Work is incorporating requirements for transportation, storage, and disposal
- SEP 1993 decision on proceeding to detail design and prototype testing
- Work receiving stakeholder input
- Current efforts geared to MPC availability in 1998

Status of Large Block Test

Dale G. Wilder
Lawrence Livermore National Laboratory

TPO Meeting
June 11, 1993

ENCLOSURE 3

Critical Issues

"A critical issue...DOE's theoretical, untested understanding of the magnitude and consequences of..evaporation and condensation...of moisture...adjacent to the emplaced waste,..."

Sixth Report to the U.S. Congress and The U.S. Secretary of Energy, Nuclear Waste Technical Review Board, Dec. 1992

Uncertainties or Challenges to Hydrologic Understanding

- Conditions where Conduction vs Convection dominate
- Extrapolation of single fracture to YM results
- Thermal homogenization approach
- ECM Approach
- Moisture movement (drainage)
- Volume averaging approach
- Significance of recharge vs condensate flux
- Geochemical coupling effects
- Geomechanics coupling

Test Strategy

Scale	Purpose
Lab Scale	
Core	Intact property measurements Healed or tight fracture properties (single fracture) Single fracture hydrothermal/geochemical/geomechanical responses
~ 1 ft blocks	Open fracture property measurements Fracture rock property measurements Open fracture hydrothermal/geochemical/geomechanical responses
Block Scale	
~ 1 m blocks	Multiple fracture property measurements Fractures rock mass property measurements Rock mass hydrothermal/geochemical/geomechanical responses
3 m large block	Fracture interconnectivity measurements Fracture network/rock mass hydrothermal/geochemical/ geomechanical responses Principle means of geochemical measurements
In Situ	
Abbr. (smaller scale)	Site characterization *In situ* hydrothermal/geochemical/geomechanical responses
Large scale	Scaling effects, natural heterogeneity impacts
Repository scale monitoring	Performance confirmation

***In situ* heater tests can resolve the following fundamental hypothesis tests:**

(1) whether heat conduction dominates heat flow,

(2) whether a region of above-boiling temperatures surrounding the repository corresponds to the absence of *mobile* liquid water at the WP environment,

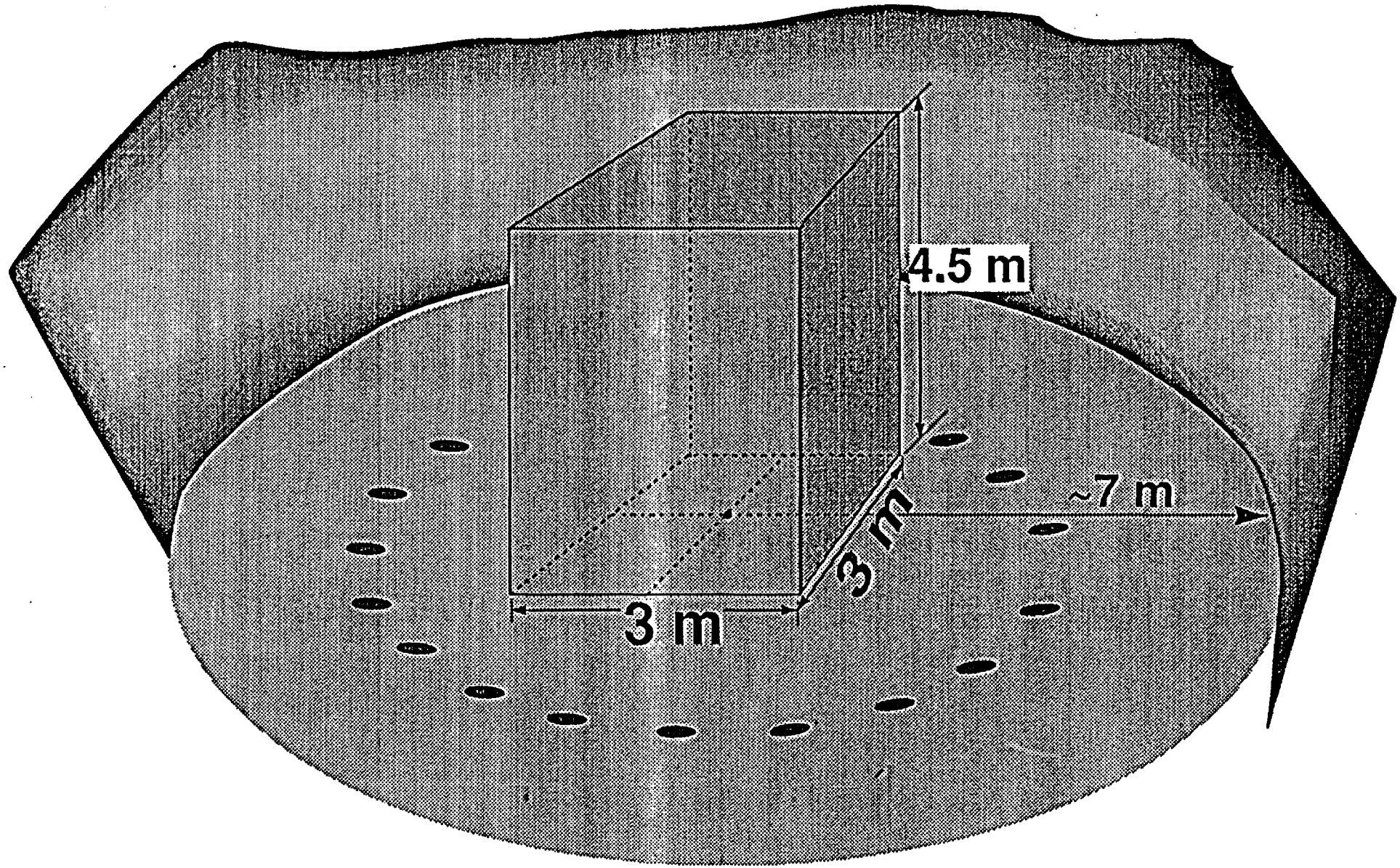
(3) whether fracture density and connectivity are sufficient to promote rock dry-out due to boiling and condensate shedding,

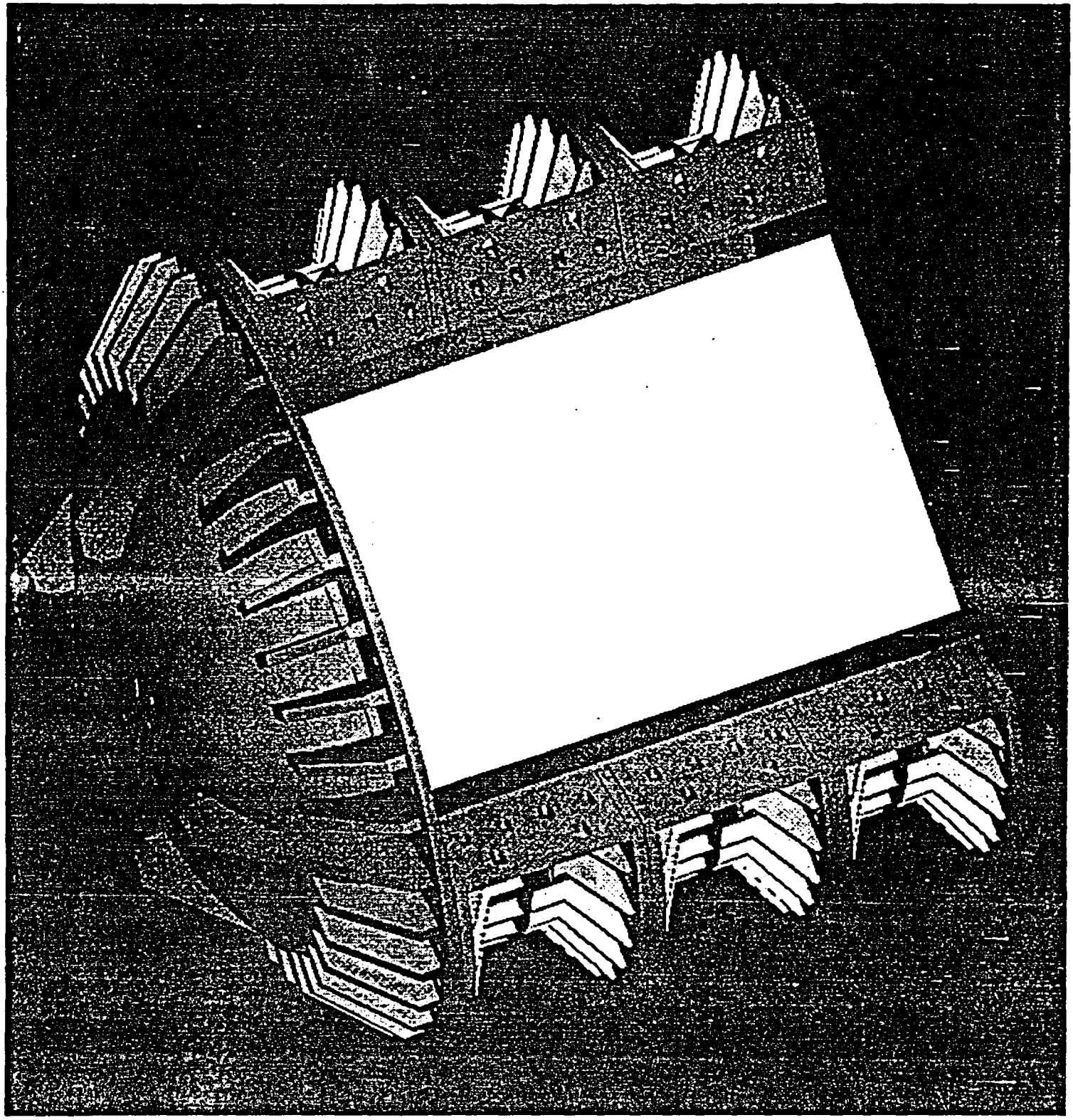
(4) whether re-wetting of the dry-out zone back to ambient saturation significantly lags behind the end of the boiling period, and

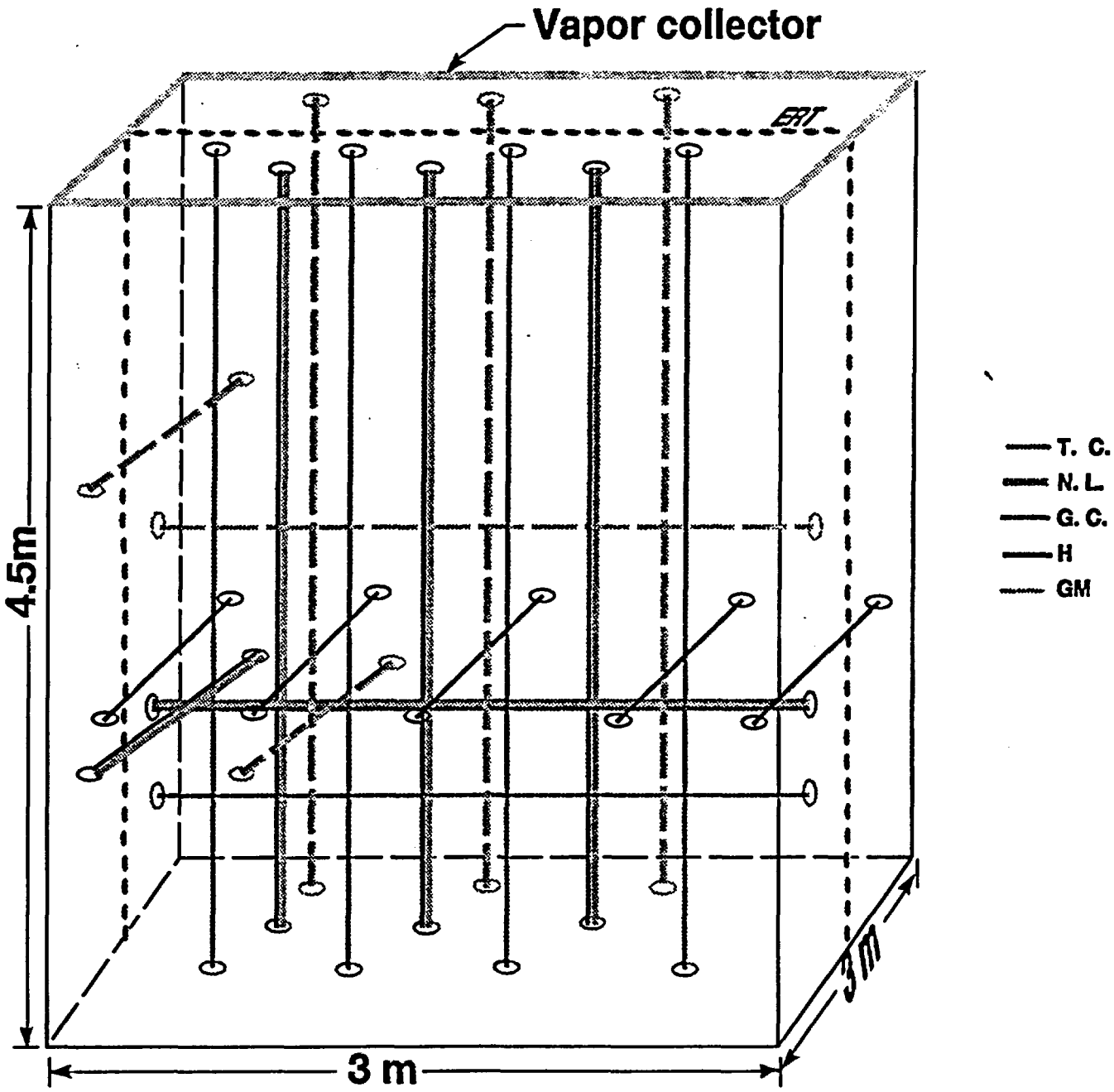
(5) whether large-scale, buoyant, gas-phase convection may eventually dominate moisture movement in the UZ

The large block test will provide valuable information pertaining to all five hypothesis tests, particularly hypotheses 2, 3, and 4

A Block Isolated From Outcrop





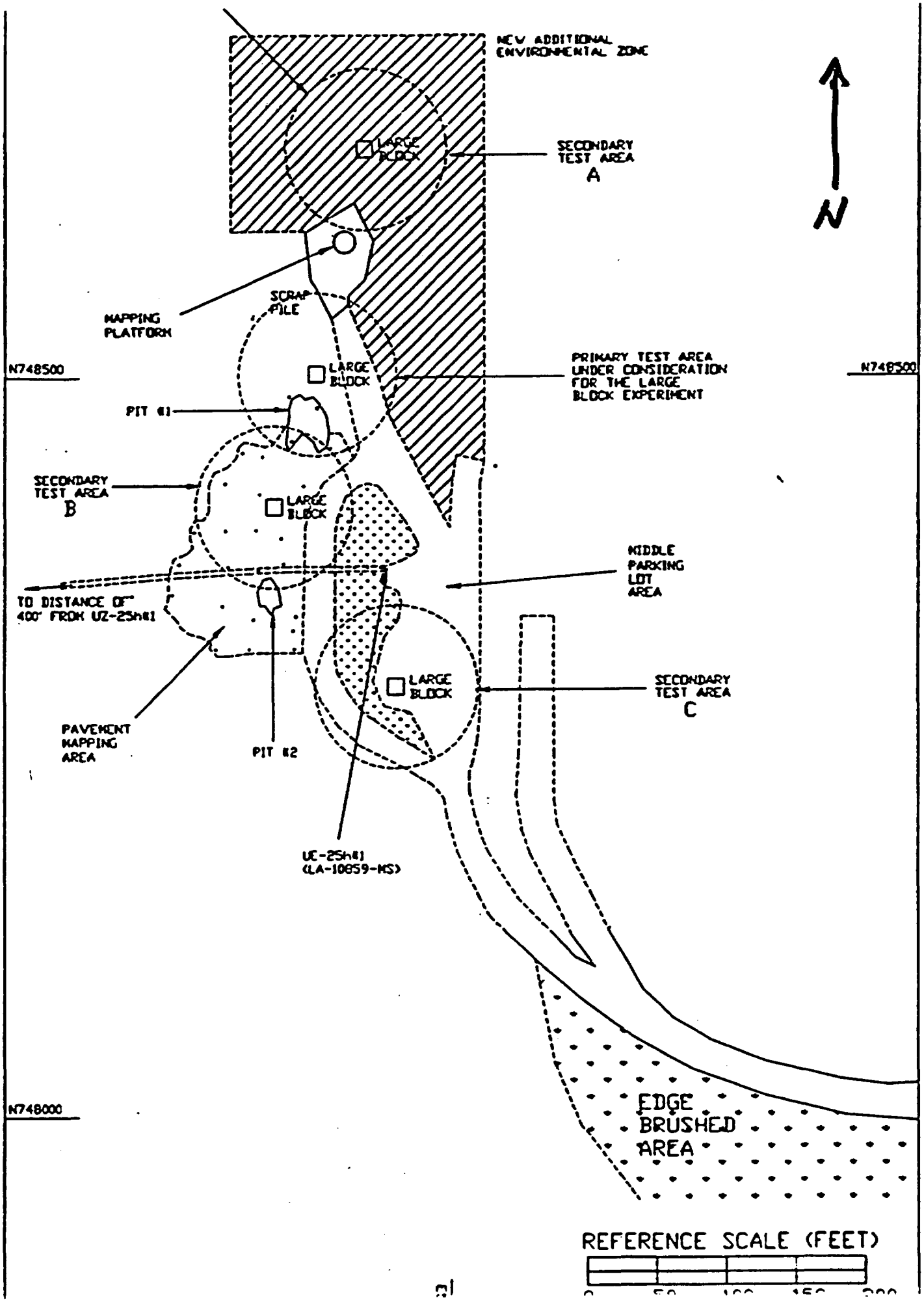


ES-07-09/93-DWG-01

Large Block Tests

Tests on the Large Block

- Temperatures
  - in matrix, fractures, near the surfaces
- Moisture Contents
  - point--resonant cavity, psychrometer, electro-optical
  - line--neutron logging
  - area--electrical resistivity tomography
- Mechanical Properties
  - acoustic emission, stress meters, strain gauges
- Geochemical Monitoring and Sampling
  - optical fibers for infra-red spectroscope
  - sampling tubing
  - pore pressure


NEW ADDITIONAL ENVIRONMENTAL ZONE
LARGE BLOCK
SECONDARY TEST AREA A
N
MAPPING PLATFORM
SCRAP PILE
N748500
LARGE BLOCK
PRIMARY TEST AREA UNDER CONSIDERATION FOR THE LARGE BLOCK EXPERIMENT
N748500
PIT #1
SECONDARY TEST AREA B
LARGE BLOCK
MIDDLE PARKING LOT AREA
TO DISTANCE OF 400' FROM UZ-25h#1
LARGE BLOCK
SECONDARY TEST AREA C
PAVEMENT MAPPING AREA
PIT #2
UE-25h#1 (LA-10859-MS)
N748000
EDGE BRUSHED AREA
REFERENCE SCALE (FEET)

Large Block Tests

Summary of Previous Brainstorming

- Do model concept validation tests on smaller blocks in the laboratory.
- Do integrated confirmation tests on larger block in the field
- Load the large block so that:
  - the block is mechanically constrained as in situ;
  - stress effect on rock-water interaction is similar to that in situ;
  - the block is supported;
  - the excavation effect on the block is reversed.
- Install moisture barrier on the sides.
- Constant temperature on the top and thermal insulation on the sides.
- Install vapor collector on the top.

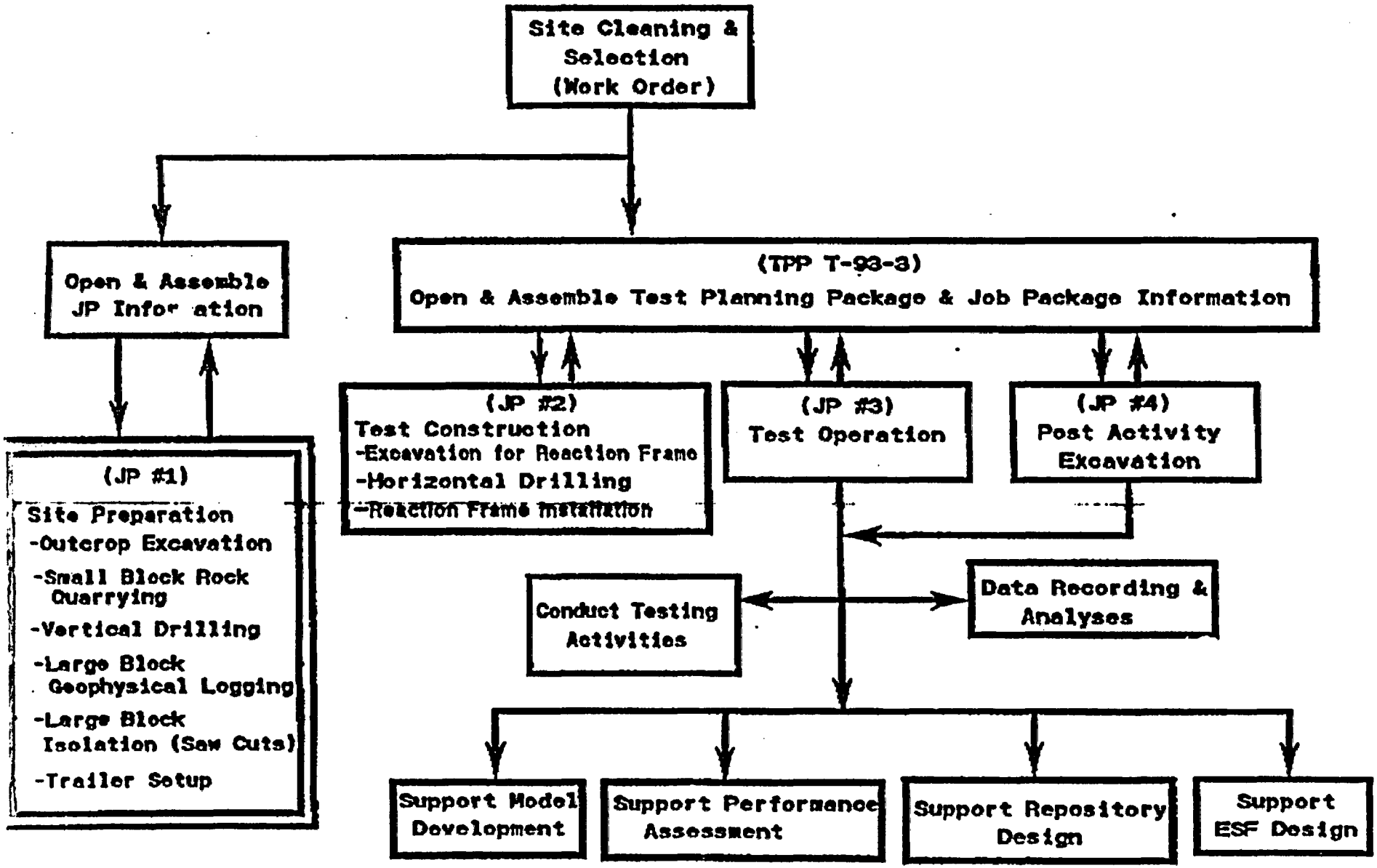
Large Block Tests

Current Status

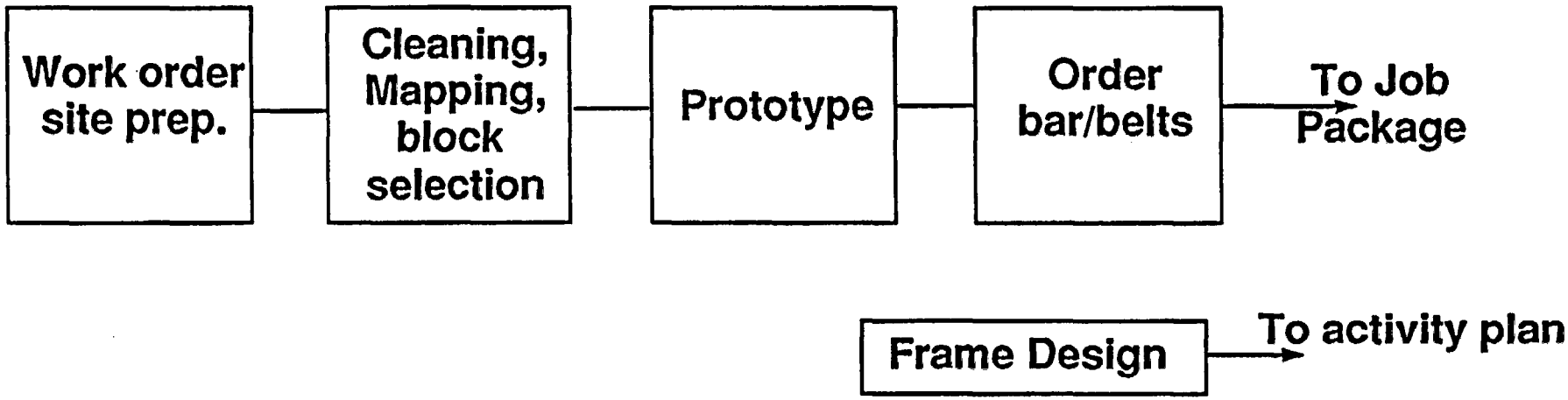
- A Load Retaining Frame has been designed; drawings are ready in this week.
- A procurement package will be sent to D. Peterson
- The site has been cleaned; some fracture mapping has been done.
- SIP has been reviewed by YMPO; the comments are being resolved.
- QA Grading completed
- initial moisture contents are estimated to be about 50 %.
- The SNL belt saw has been mobilized.
- Order for instruments
- Laboratory setup for characterization/small block tests

JOB PACKAGE AND TEST LOGIC DIAGRAM

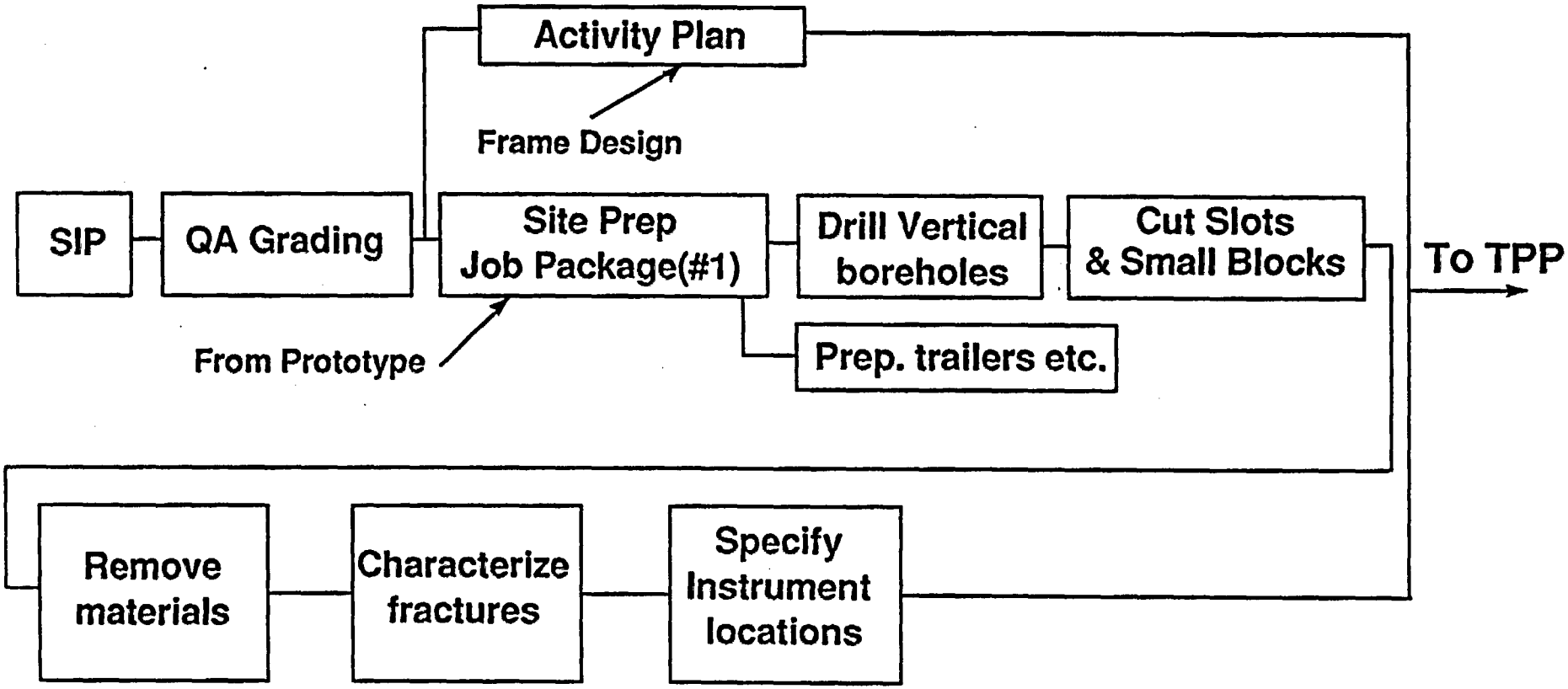
ENGINEERED BARRIER-LARGE BLOCK EXPERIMENT



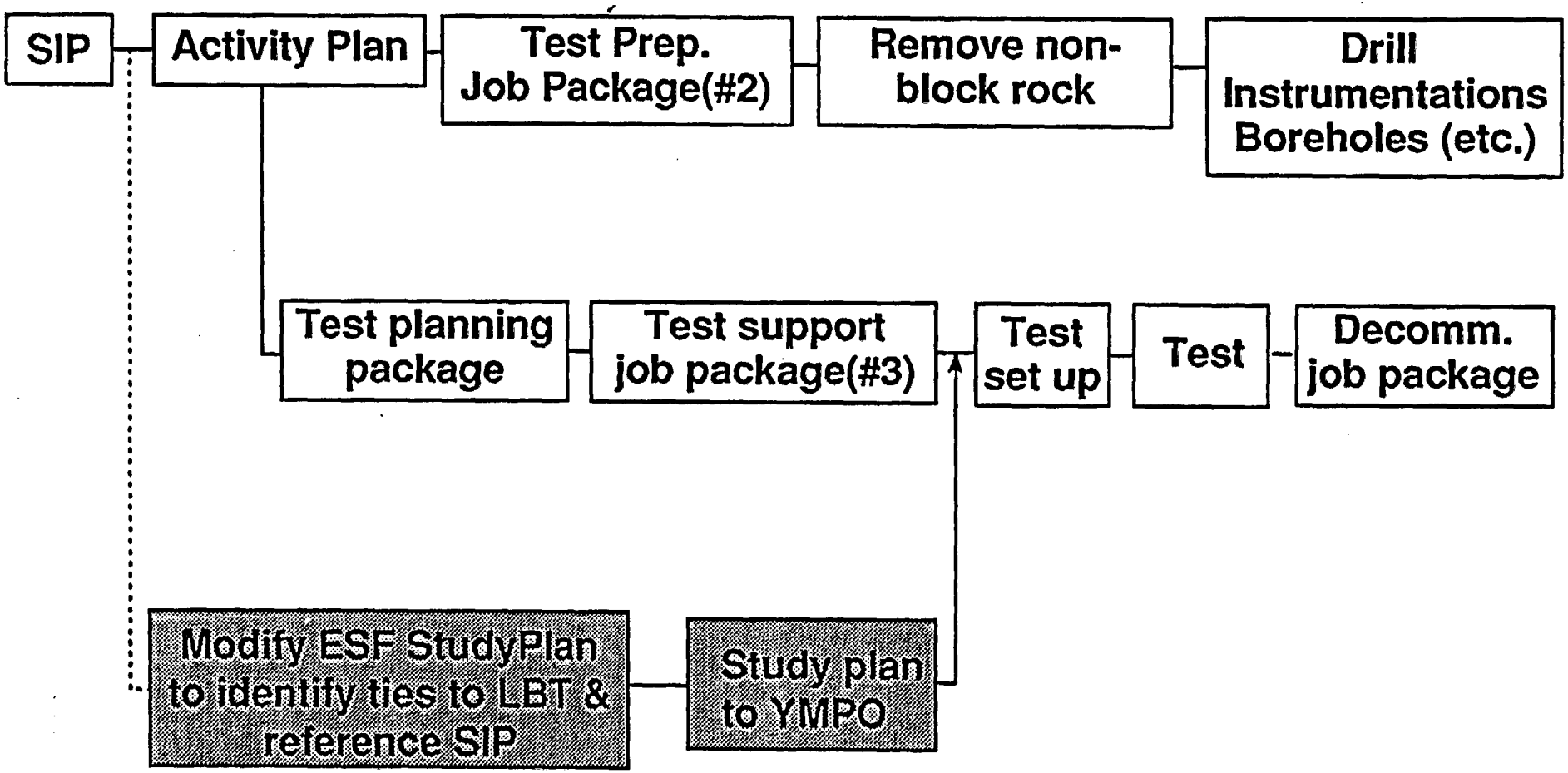
Large Block Test — Logic Chart (Initial Activities)



Large Block Test — Logic Chart (Block Cutting & Characterization)



Large Block Test — Logic Chart

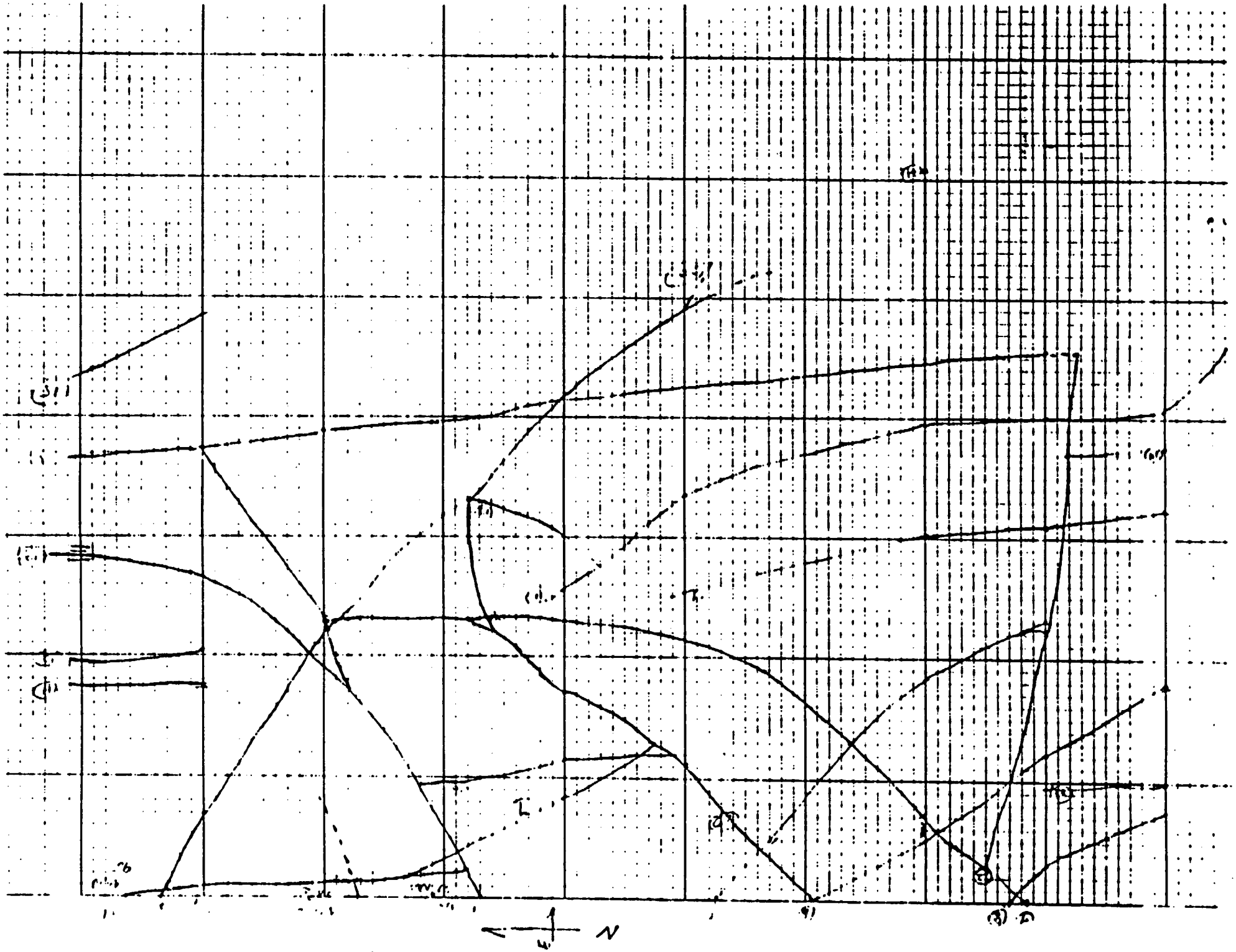


Plans from May 27, 1993 meeting

June 1-2, 1993	Outcrop inspection, general block selection W. Lin, D. Wilder, S. Blair
June 4, 1993	Define requirements and basis for scopes--identify participants and roles——R. Oliver, W. Lin, J. Blink
	Materials listing --W. Lin, SNL, R. Oliver
June 30, 1993	REECo estimates for scope of work under Job Package 1
July 7, 1993	Test Interference analyses
	Waste isolation evaluation
	Tracers, Fluids and Materials evaluations M&O PA, H. Kalia, R. Oliver
July 9, 1993	RSN design/surveying estimates and input, R. Oliver/RSN
July 11, 1993	PACS schedule--W. Lin, J. Blink, R. Oliver
July 23, 1993	Job Package 1 approved

High Level Milestones

7/27	Start Field Work
9/7	Finish Cutting Block
8/15	Ship small blocks
9/21	Complete LB isloation



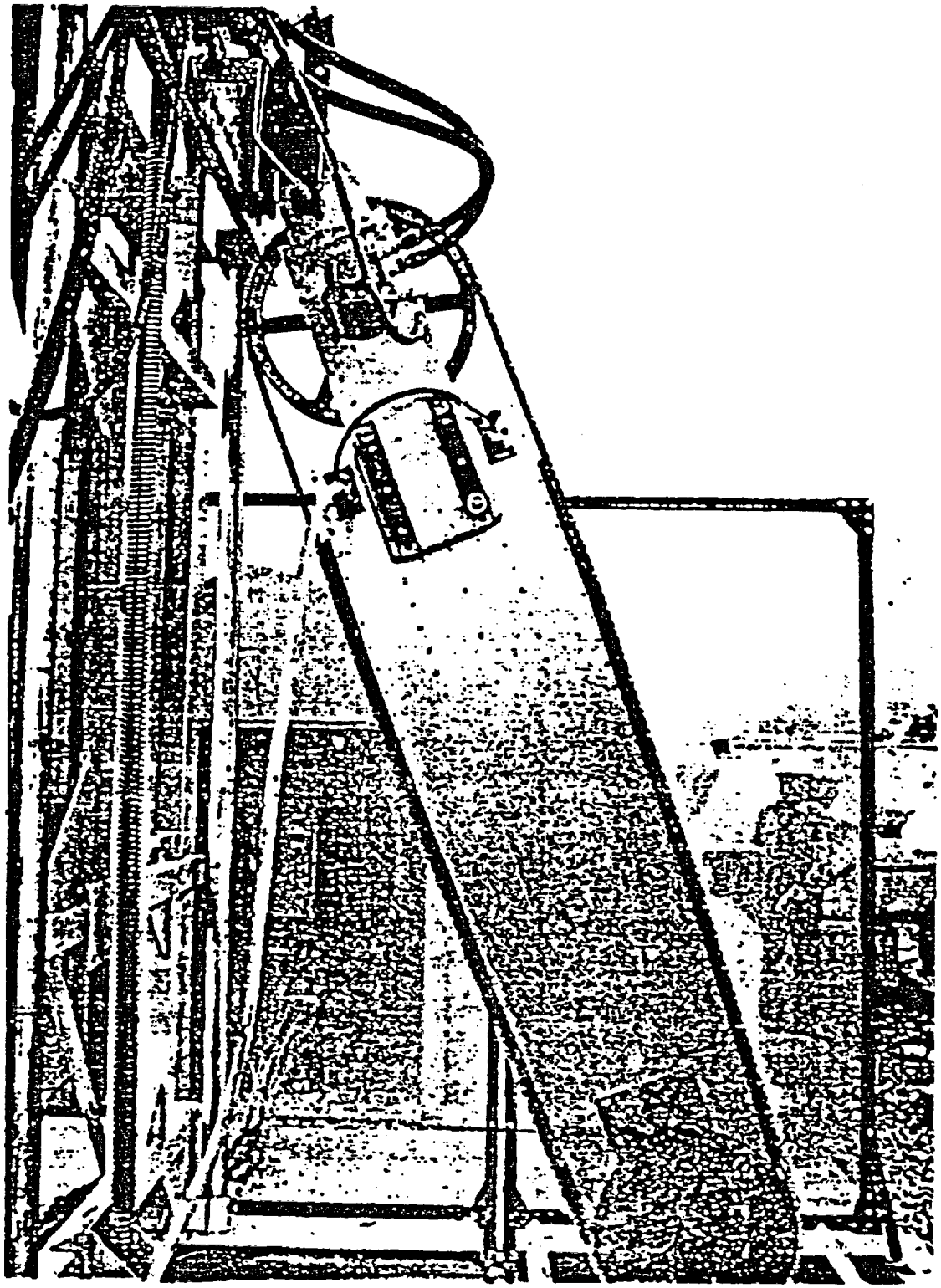
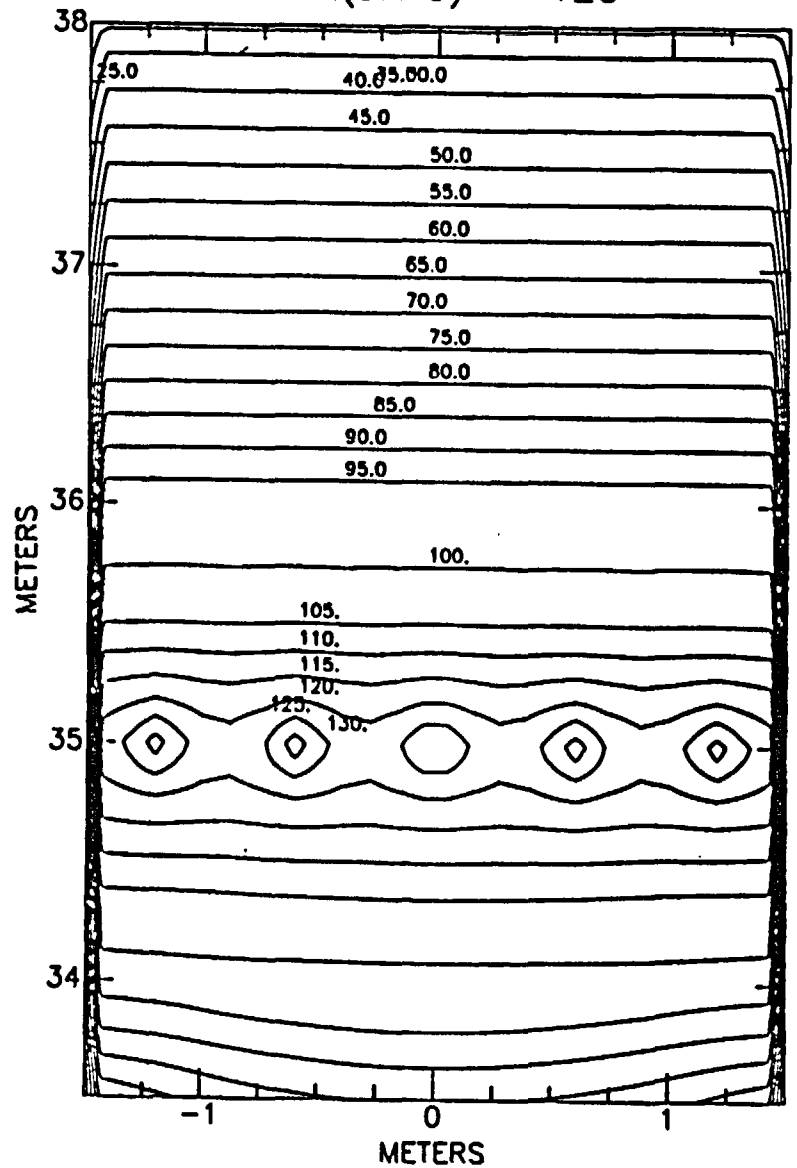


Figure 4-3. Photograph of the 2 m Belt Cutter Bar

*Large Block Test, Run No. 2, x-z Model, 5-23-93

TEMPERATURE (C)

TIME(DAYS) = 120



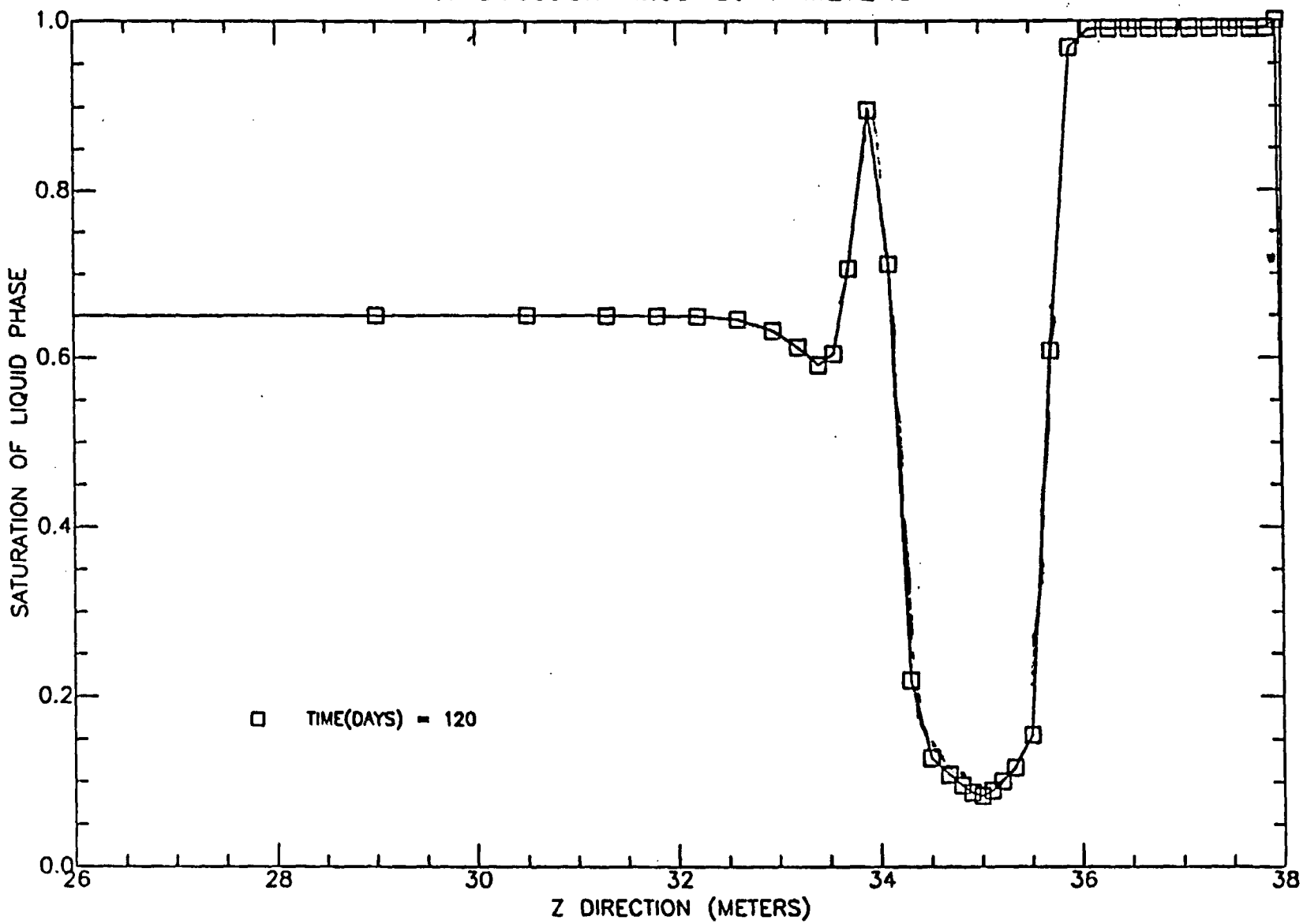
version: 5.1
/us/lee/tuff f001.sgf

Tue Jun 8 09:59:35 1993

*Large Block Test, Run No. 2, x-z Model, 5-23-93

SATURATION OF LIQUID PHASE row = Z, column = X, fixed index = 1

X direction fixed at 1 METERS



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loo /us/leo/tuff f001.sgf

Wed May 26 08:30:37 1993

Large Block Tests

Allocations

FTE	Name	Functions
0.1	Beatty	data acquisition, ERT programming
	Blink	Las Vegas
0.1	Bonner	acoustic emmission, acoustic tomog.
0.4	Blair	PI, mechanical attributes
0.2	Buscheck	PI, model calculations
0.1	Carlson	neutron logging
0.1	Chang	PI,load-retaining frame
	Chesnut	advisory
0.2	Daily	ERT, HFEM
0.5	Glass	material
0.2	Glassley	PI, geochemistry
0.5	Latorre	resonant cavity, TDR, FDCP, HFEM
	Lin	PI, hydrology, temp.
0.3	Lee	heater,tem.control,vapor collector,model
0.1	Nitao	model calculations
0.4	Ramirez	PI, ERT, HFEM
0.2	Rector	PI,instrumentation,data acquisition
0.4	Roberts	hydrological properties
0.3	Ueng	PI,block support,temp. control,vapor coll.
	Wilder	TAL
0.2	Wilt	ERT, self potential
0.2	(mech. tech)	
0.3	(coordinator)	

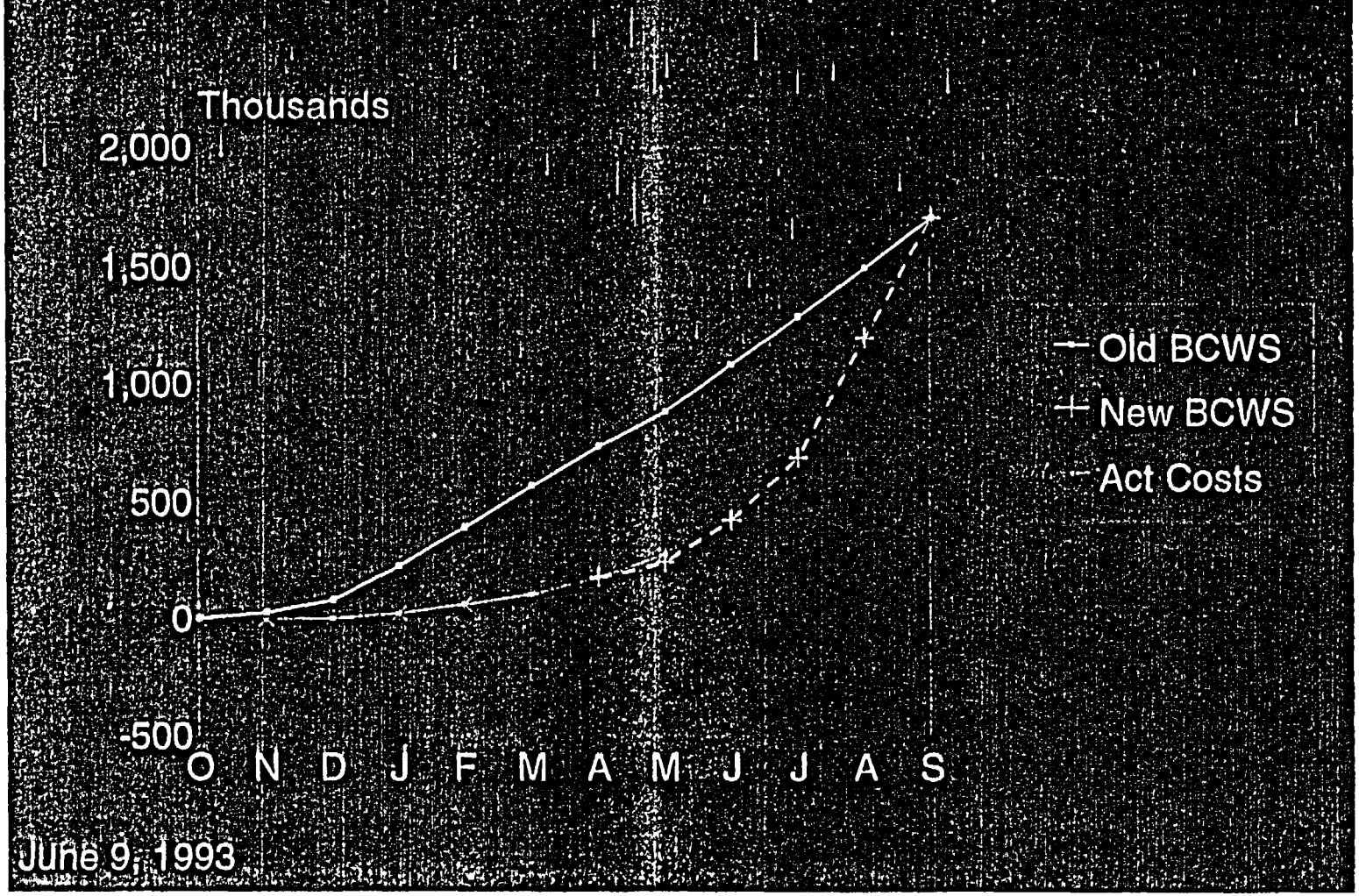
Large Block Tests

Near-future Activities

- Continue the fracture mapping on 6-10.
- R. Oliver and Jim Blink are preparing a Job Package.
- The site will be surveyed to generate a topomap
- An area of about 26'x36', including the block will be leveled to within 0.5'.
- SNL will do prototype cutting in June (?)
- We will flood the block site with water and tracer(?) to identify conducting fractures.
- R. Glass of SNL will do an infiltration test nearby to study fracture flow process
- SNL will start cutting in July (?)

LARGE BLOCK TEST

MODIFIED PLAN (5/24/93)



June 9, 1993

FY 1993	WBS 1.2.2.2.4	PRIME 6092	TITLE LARGE BLOCK TEST	Date Prepared: 5/24/93

OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP

5 12 19 26 2 9 16 23 30 7 14 21 28 4 11 18 25 1 8 15 22 1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28 5 12 19 26 2 9 16 23 30 6 13 20 27

512k						KGB PREP & QUARRY LRG & SMALL BLCKS Accts: 20					
							Hrs: 128 Nlbr: $2k	Hrs: 144 Nlbr: $2.3k	Hrs: 144 Nlbr: $2.3k Sub: $166k	Hrs: 160 Nlbr: $2.6k Sub: $167k	Hrs: 160 Nlbr: $2.6k Sub: $167k
505k		KGC				FRAME DESIGN & FABRICATION Accts: 14					
							Hrs: 80 Nlbr: $1.3k	Hrs: 80 Nlbr: $1.3k	Hrs: 80 Nlbr: $1.3k	Hrs: 32 Nlbr: $.5k Sub: $250k	Hrs: 32 Nlbr: $.5k Sub: $250k
400k						KGE PREP SAMPLES & CHARACTERIZE Accts: 10					
							Hrs: 60 Nlbr: $5k	Hrs: 144 Nlbr: $$9.3k	Hrs: 144 Nlbr: $25k	Hrs: 200 Nlbr: $25k	Hrs: 200 Nlbr: $15k
100k					KGD	MODEL CALCULATIONS Accts 12					
							Hrs: 144 Nlbr: $.3k	Hrs: 144 Nlbr: $.3k	Hrs: 144 Nlbr: $.3k	Hrs: 144 Nlbr: $0k	Hrs: 144 Nlbr: $.3k
100k		KGA		PREP PLNNG DOCS & RESOLVE COMMNTS Accts: 08							
							Hrs: 88 Nlbr: $1k	Hrs: 88 Nlbr: $1k	Hrs: 88 Nlbr: $1k	Hrs: 88 Nlbr: $1k	Hrs: 88 Nlbr: $1k
HXC	80k			MANAGEMENT & ADMINISTRATION Accts: 01, 05							
							Hrs: 24 Nlbr: $.4k	Hrs: 24 Nlbr: $.4k	Hrs: 24 Nlbr: $.4k	Hrs: 16 Nlbr: $.3	Hrs: 16 Nlbr: $.3
103k						CAPITAL EQUIPMENT					
								Equip: $103k			

1800

BCWS DETAIL

	LBR HRS	LBR $'s	ODC	SUB	CAP	TOTAL
OCT						
NOV						
DEC						
JAN						
FEB						
MAR						
APR						
MAY	524	55.7	10.0	0	0	65.7
JUN	624	66.3	14.5	0	103.0	183.8
JUL	624	66.3	30.2	166.0	0	262.5
AUG	640	68.0	29.3	417.0	0	514.3
SEP	640	68.0	19.6	417.0	0	504.6
TOT	3052	324.3	103.6	1000.0	103.0	1530.9

FY93 Budget: $1,710k
YTD costs: $178.5k
Balance: $1,531k

Large Block Tests

Alternative I

Shallow Tunnel Tests:

- Greater cost
- Timing: The mining crew may not be available.
- Boundary condition: enough overburden?
- Characterization: similar to ESF, not as good as LBT
- 3-Dimensional monitoring: limited
- Does not need a load retaining frame, flat jacks, supports of a block (but may need tunnel support)
- Different stress conditions

Large Block Tests

Alternative II

One-side Bench Outcrop:

- Less cost
- Shorter time required
- Boundary condition: worse than ESF, can not be controlled
- Characterization: may be better than ESF, not as good as LBT
- 3-Dimensional monitoring: limited
- Does not need a load retaining frame, flat jacks, supports of a block
- Stress condition is very different from that at the repository horizon

6/30/93

ENCLOSURE 4a

YMP Tracer Overview

Applications

- label construction fluids
- label drilling air and air injected for permeability tests
- transport experiments (K_d, matrix diffusion, etc.)
- environmental tracers can help establish recharge and gas circulation patterns

Approved Tracers as of June 1993

3 trifluoromethylbenzoate (benzoic acid)
pyridone
sodium chloride
lithium bromide
fluorescent microspheres (synthetic colloids)
polystyrene spheres (synthetic colloids)
sulfur hexafluoride
nitrogen
tetrafluoroethane ("SUVA" Cold-MP)

6/30/93

ENCLOSURE 4b

Rationale for Tracer Selection

Liquids

- conservative or non-conservative liquid tracers may be required for a specific application
- liquid tracers should be non-toxic, soluble or miscible in water with mimimal density effects, and detectable in trace quantities

Gases

- gas tracers should be non-toxic, insoluble in water, and detectable in trace quantities
- gas tracers should not decompose over time frames of interest (generally months to years)
- a range of molecular sizes should be available for diffusion studies
- gas tracer use should not contribute to global warming or ozone depletion

6/30/93

ENCLOSURE 4c

Controls on Tracer Use

- primary controls on underground tracer use are set forth in the Underground Injection Permit, issued by the Nevada Division of Environmental Protection

- potential impacts to site characterization and waste isolation are evaluated by the M&O

- a record of tracer use is maintained by the Tracers, Fluids, and Materials (TFM) Group of LANL

TPO MEETING

WATER LEVEL RESPONSE TO MAY 1993 EARTHQUAKES NEAR BISHOP, CALIFORNIA

PRESENTED BY

LARRY R, HAYES

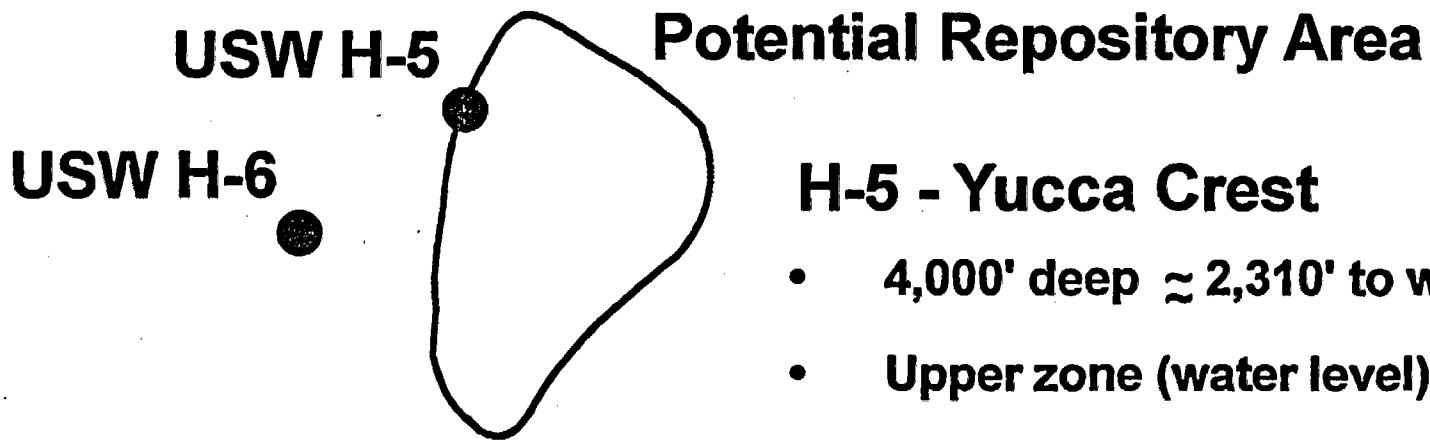
TECHNICAL PROJECT OFFICER
U.S. GEOLOGICAL SURVEY

JUNE 11, 1993

ENCLOSURE 5

86-8

EARTHQUAKES OCCURRED ABOUT 75 MILES WEST OF YUCCA MOUNTAIN, NEAR BISHOP, CALIFORNIA



H-5 - Yucca Crest

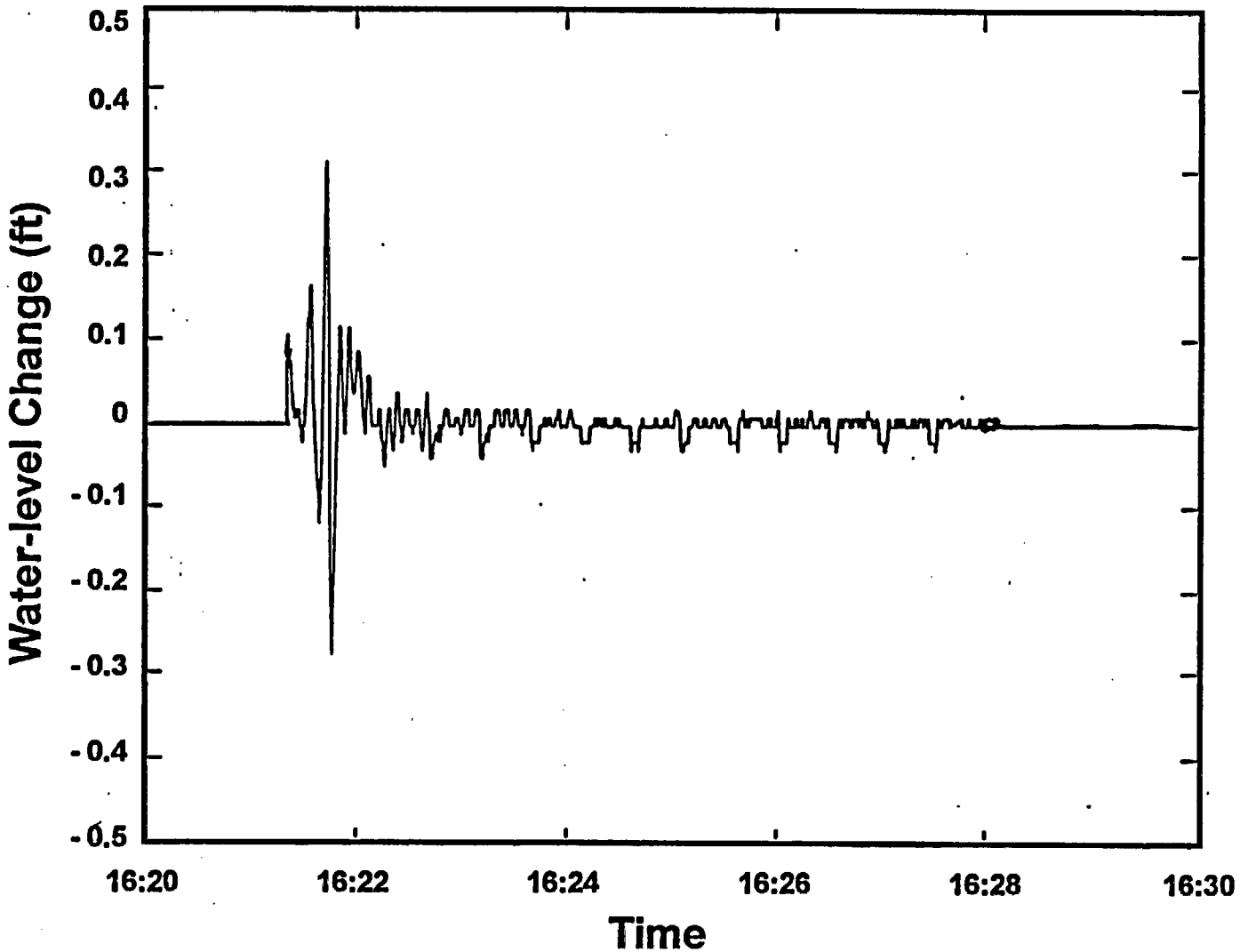
- 4,000' deep ≈ 2,310' to water table
- Upper zone (water level) 2,310' - 2,754'
- Lower zone (fluid pressure) 2,766' - 4,000'

H-6 - Solitario Canyon

- 4,002' deep ≈ 1,730' to water table
- Upper zone (water level) 1,730' - 2,468'
- Lower zone (fluid pressure) 2,468' - 4,002'

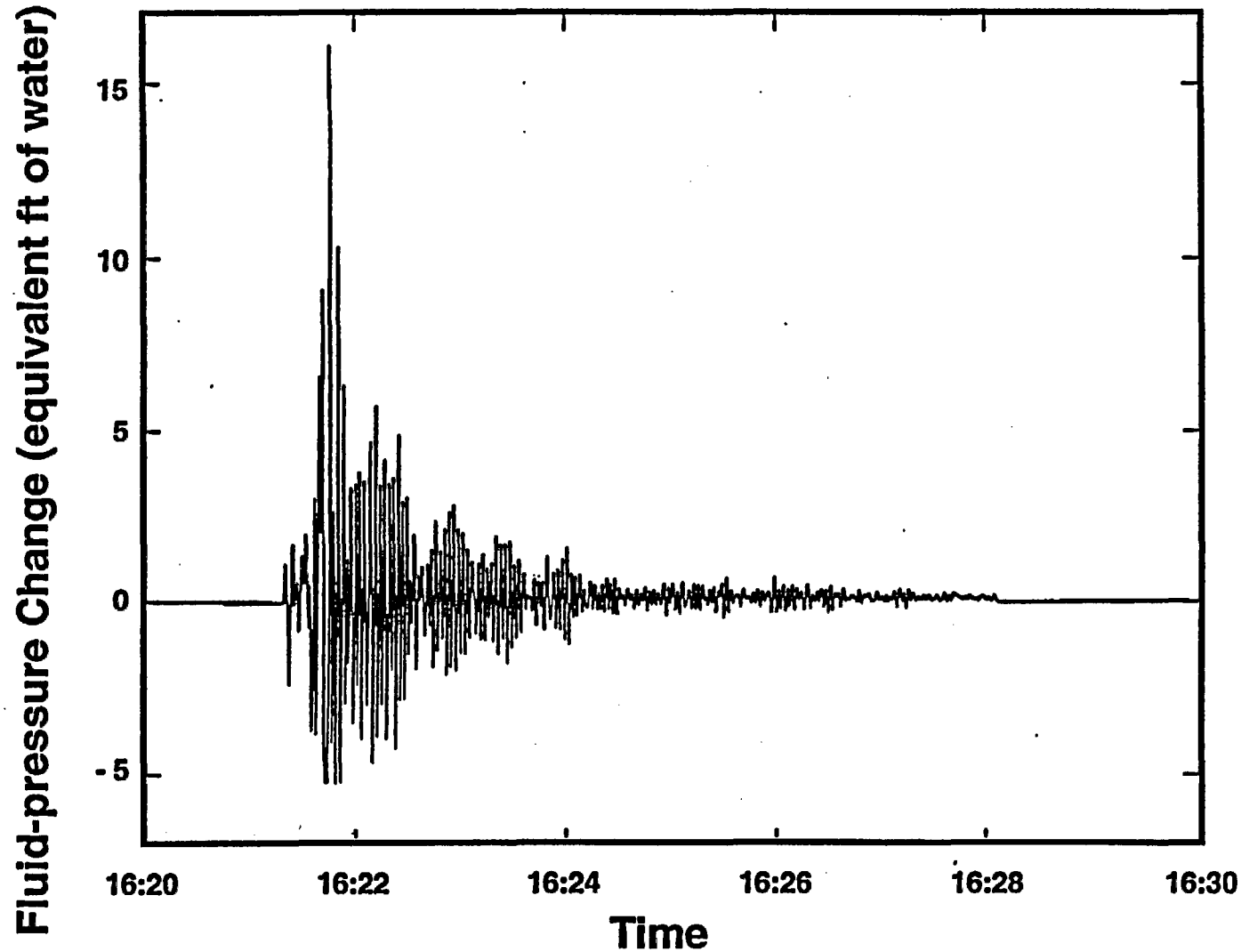
LHTPO.129/6-11-93

USW H-6, Upper Interval, Fluctuations start at 16:21:20.5 PDT, 05-17-93



LHTPO.129/6-11-93

USW H-6, Lower Interval, Fluctuations start at 16:21:20.5 PDT, 05-17-93



LHTPO.129/6-11-93

MAXIMUM WATER-LEVEL AND FLUID-PRESSURE RESPONSES TO MAY 1993 EARTHQUAKES, NEAR BISHOP, CALIFORNIA

Date PDT	Location	Magnitude	Maximum Water-Level Response* (ft)		Maximum Fluid-Pressure Response* (ft)	
May 17, 1993 16:20:49.2	Near Bishop, Ca.	6.0	H5 H6	ND 0.59	H5 H6	ND 21.2
May 17, 1993 18:03:06.4	Near Bishop, Ca.	4.5	H5 H6	ND 0.05	H5 H6	ND 0.95
May 18,1993 16:48:54.0	Near Bishop, Ca.	5.0	H5 H6	0.09 <0.03	H5 H6	0.96 1.49
May 18, 1993 16:57:40.6	Near Bishop, Ca.	4.3	H5 H6	0.03 0.0	H5 H6	0.19 0.29
May 19,1993 7:13:22.6	Near Bishop, Ca.	4.9	H5 H6	0.12 0.03	H5 H6	1.51 1.40

* Responses are double amplitude values, maximum increase to maximum decrease.
P.D.T. - Pacific Daylight Time

LHTPO.129/6-11-93

SLIDE LIBRARY CATEGORIES

AP	AERIALS /BACKGROUND - Any high altitude or oblique photo, and backgrounds, landscapes
ED	EDUCATION - Boy/Girl scouts, science fair, nuclear power plants and reactors
ET	ENVIRONMENTAL - Any Archaeological, wildlife, plant life, monitoring, sampling
FT	FIELD TRIPS/TOURS - Any group outings to ym (i.e., media, VIP)
FW	FIELD WORK - Any site activities, outside work
GE	GEOLOGICAL - Any trench 14, rock formation petroglyph, calcite silica
LM	LM 300 -
LW	LAB WORK - Any sample management, E-mad, laboratory work, site buildings
MP	MAPS - Any U.S., Nevada, topographical, etc.
MT	MEETINGS/MEDIA - Meetings, media, public update meetings, speakers bureau
NC	NEWS CLIPPINGS/COMPUTERS - Any newspaper articles, project documents, cartoon computer flow diagrams
OR	OUTREACH - Info office/exhibit displays
PD	PROTOTYPE DRILLING - TBM, drilling components, drill bits
SI	SCHEMATICS - Any line art and conceptual drawings of repository, cross sections and waste package
TP	TRANSPORTATION - Any road routes, hauling, cask transp., crash test, fuel assemblies
WP	WORD/PHOTOS - Any background or aerial with word burn-ins
17 VC	Volcanism

ENCLOSURE 9a

NATIONAL RESEARCH COUNCIL

COMMISSION ON GEOSCIENCES, ENVIRONMENT, AND RESOURCES

2101 Constitution Avenue Washington, D.C. 20418

BOARD ON
RADIOACTIVE WASTE MANAGEMENT
(202) 334-3066 Fax: 334-2097

Office Location:
Milton Harris Building
Room 456
2001 Wisconsin Avenue, N.W. 20007

PRELIMINARY AGENDA

COMMITTEE ON TECHNICAL BASES FOR YUCCA MOUNTAIN STANDARDS

Alexis Park Resort Hotel
375 East Harmon Avenue
Las Vegas, NV

First Meeting
May 27-29, 1993

Thursday, 27 May 1993 — **OPEN SESSION**
Marketplace Room

2:00 pm — Introductions and Opening Remarks
Bob Fri, Committee Chairman
Myron Uman, Project Director

- Purposes of project and this meeting
- Consideration of NAS role in recommending approaches to the preparation of standards
- Introduction of committee members
- Description of the NAS process
- Operating procedures for this project
- Policies regarding public access and confidentiality
- Procedures for dealing with the news media
- Report review procedures
- General schedule of the project
- Discussion and approval of the agenda

3:00 pm — History of Radwaste Standards
Bill Gunter, U.S. EPA

3:20 pm — The Committee's Task

- U.S. Environmental Protection Agency
  Bill Gunter, Director
  Criteria and Standards Division

4:30 pm

- U.S. Nuclear Regulatory Commission
  Margaret Federline, Chief
  Hydrology and Systems Performance Branch
  High-Level Waste Management Division

Committee on Technical Bases for Yucca Mountain Standards

First Meeting

Friday, 28 May 1993
Marketplace Room

OPEN SESSION

9:00 am	The Committee's Task
	– U.S. Department of Energy Carl Gertz, Director Yucca Mountain Project Office Steve Brocoum, Director Analysis and Verification Division Russ Dyer, Director Regulatory and Site Evaluation Division Mike Voegele, Program Manager Science Applications International Corporation
10:30 am	– Nevada Nuclear Waste Project Office Bob Loux, Director
11:00 am	– A View From the Nuclear Electric Industry Andrew Kadak, Yankee Atomic Electric Company
11:45 am	– An Environmental View Arjun Makhajani, Institute for Energy and Environmental Research
12:30 pm	*Lunch Break*
2:00 pm	– Comments from Attendees William Barnard, U.S. Nuclear Waste Technical Review Board Les Bradshaw, Nye County, NV Nuclear Waste Repository Program
4:00 pm	Preparation of Literature Summaries – Health standards, Paul DeJonghe – Human intrusion (TBD) – Catastrophic natural phenomena (TBD)

Committee on Technical Bases for Yucca Mountain Standards

First Meeting

Saturday, 29 May 1993
Marketplace Room

EXECUTIVE SESSION

8:30 am

- Potential sources of bias/conflicts of interest
- Personnel issues (consultants, staff, additional members)
- Redirection of consultants
- Copyrights

OPEN SESSION

10:30 am Development of Work Plan

- Next steps (data gathering, briefings, site visits)
- Assignments, members and staff
- Schedule of meetings, etc.

12:00 pm Adjourn

Reports & EVENTS

National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council

2101 Constitution Avenue, NW
Washington, DC 20418

A GUIDE FOR THE NEWS MEDIA

Date: May 4, 1993
Contacts: Craig Hicks, Media Relations Associate
Richard Julian, Media Relations Assistant
(202) 334-2138

MEDIA ADVISORY

COMMITTEE TO EXAMINE TECHNICAL BASES OF EPA STANDARDS
FOR PROPOSED RADIOACTIVE WASTE SITE

In the Energy Policy Act of 1992, Congress asked the National Academy of Sciences to evaluate the technical bases of EPA's public health and safety standards for the proposed high-level radioactive waste repository at Yucca Mountain, Nev. The Academy's National Research Council will launch an 18-month study of these issues at a news conference on Thursday, May 27, from 10 a.m. - 11 a.m. PDT in the Monte Carlo 3 room of the St. Tropez hotel, 4503 Paradise Road, Las Vegas.

On hand to discuss the background, purpose and procedures of the study will be committee chair Robert W. Fri, president and senior fellow, Resources for the Future; and staff project leader Myron F. Uman of the National Research Council. Both will be available for interviews following the presentation.

The committee's first meeting will be held following the news conference. The meeting is open to the public. It will begin at 2 p.m. PDT Thursday, May 27, and end on Saturday, May 29, in the Marketplace room of the Alexis Park hotel, 375 East Harmon Avenue, Las Vegas. Most of this meeting will be devoted to discussions of the committee's task with federal and state government officials and representatives of environmental and industry groups. Time will be reserved for observers in the audience to present their views to the committee.

Reporters can obtain copies of the meeting's agenda at the Las Vegas news conference or from the Office of News and Public Information, (202) 334-2138.

The study is funded by the U.S. Environmental Protection Agency. A committee roster is overleaf.

# # #

ch: ym

NATIONAL RESEARCH COUNCIL

2101 CONSTITUTION AVENUE WASHINGTON, D.C. 20418

EXECUTIVE OFFICE

May 3, 1993

Mr. Stephan J. Brocoum
U.S. Department of Energy
OCRWM
Mail Stop RW-22
Washington, DC 20585

Dear Mr. Brocoum:

In keeping with the Energy Policy Act of 1992, the National Academy of Sciences (NAS) has embarked on a process aimed at providing findings and recommendations to the U.S. Environmental Protection Agency on the technical bases of public health and safety standards for a high-level nuclear waste repository at Yucca Mountain, Nevada.

The NAS project will be conducted by the Committee on Technical Bases for Yucca Mountain Standards. The chairman of the committee is Robert W. Fri, President of Resources for the Future. The list of current members of the committee is enclosed.

A statement of the committee's charge, drawn from the Act and its legislative history, is also enclosed. The committee's report is due by the end of calendar year 1994.

The committee's first meeting will be held on May 27-29, 1993, in Las Vegas at the Alexis Park Resort Hotel, 375 East Harmon Avenue, beginning at 2:00 p.m. on the 27th. The meeting will be open to the public. While a detailed agenda is not yet available, most of the sessions on the 27th and 28th will be devoted to discussions of the committee's task with federal and state officials and representatives of industrial and environmental groups. Time will also be reserved on the afternoon of the 28th for observers in the general audience to present their views to the committee. The central objective of this meeting is to obtain a broad spectrum of views on interpreting the committee's charge, factors to take into account, and issues to address.

If you plan to attend the meeting and particularly if you want to make an oral presentation to the committee, please let us know in advance so that we can provide sufficient space for everyone who wishes to attend. Write to Ms. Lisa Clendening; Board on Radioactive Waste Management; National Academy of Sciences; 2101 Constitution Avenue, NW; Washington, DC 20418. The telephone number for facsimile transmissions is (202) 334-3077. Persons who indicate that they plan to attend will receive copies of the detailed agenda as soon as it is made final.

Sincerely,

Myron Uman

Myron F. Uman
Assistant Executive Officer
Special Projects

Enclosures

NATIONAL RESEARCH COUNCIL

COMMISSION ON GEOSCIENCES, ENVIRONMENT, AND RESOURCES

2101 Constitution Avenue Washington, D.C. 20418

BOARD ON
RADIOACTIVE WASTE MANAGEMENT

Office Location:
Milton Harris Building
Room 456
2001 Wisconsin Avenue, N.W. 20007

Committee on Technical Bases for Yucca Mountain Standards

Chairman

Robert W. Fri, Resources for the Future

Engineering

Sol Burstein (NAE), Wisconsin Electric Power (ret.)
Charles Fairhurst, University of Minnesota

Environmental Sciences

Robert J. Budnitz, Future Resources Associates
Thomas H. Pigford, University of California, Berkeley
Gilbert H. White (NAS), Institute for Behavioral Sciences (emer.)

Geology

Jean M. Bahr, University of Wisconsin, Madison
Priscilla C. Grew, Minnesota Geological Survey
Fred M. Phillips, New Mexico Institute of Mining and Technology

Health

Melvin W. Carter, Georgia Institute of Technology
Arthur C. Upton (NAS, IOM), New York University (ret.)

Risk Assessment

Chris G. Whipple, ICF Kaiser Engineers
Susan D. Wiltshire, JK Research Associates

Risk Management

John F. Ahearne, Society of the Sigma Xi
R. Darryl Banks, World Resources Institute
Charles McCombie, (Swiss) National Cooperative for the Disposal of Radioactive Waste

Staff

Myron F. Uman, Project Leader
Raymond A. Wassel, Project Officer
Lisa J. Clendening, Project Administrator

April 26, 1993

NATIONAL RESEARCH COUNCIL
COMMISSION ON GEOSCIENCES, ENVIRONMENT, AND RESOURCES
2101 Constitution Avenue Washington, D.C. 20418

BOARD ON
RADIOACTIVE WASTE MANAGEMENT

Office Location:
Milton Harris Building
Room 456
2001 Wisconsin Avenue, N.W. 20007

Charge to the Committee on Technical Bases for Yucca Mountain Standards

The Energy Policy Act of 1992 (P.L. 102-486) requires the U.S. Environmental Protection Agency (EPA) to promulgate standards for protection of the public from releases of radioactive materials at a proposed repository at Yucca Mountain in Nevada. The Act also requests the National Academy of Sciences to provide findings and recommendations to EPA in this regard. In accordance with Section 801(a)(2) of the Act, the committee shall conduct a study to provide findings and recommendations on the technical bases for "reasonable standards for protection of the public health and safety, including--

> (A) whether a health-based standard based upon doses to individual members of the public from releases to the accessible environment ... will provide a reasonable standard for protection of the health and safety of the general public:
>
> (B) whether it is reasonable to assume that a system for post-closure oversight of the repository can be developed, based upon active institutional controls, that will prevent an unreasonable risk of breaching the repository's engineered or geologic barriers or increasing the exposure of individual members of the public to radiation beyond allowable limits; and
>
> (C) whether it is possible to make scientifically supportable predictions of the probability that the repository's engineered or geologic barriers will be breached as a result of human intrusion over a period of 10,000 years."

The legislative history of this provision indicates that the listing of these specific questions is not intended to preclude the committee from addressing additional questions or issues related to appropriate standards for radiation protection at Yucca Mountain. On the question of human intrusion, for example, the committee might also address issues related to predictions of the probability of natural events that could compromise a repository. On the question of a health standard based on dose to individual members of the public, the committee might also address the collective dose to the general population that could result from the adoption of such an approach.

In making its findings and recommendations, the committee shall provide expert scientific guidance on the issues involved in establishing standards, but the authority and responsibility to establish the standards remains with the EPA Administrator in accordance with law.

4/29/93

DRAFT AGENDA
DOE PRESENTATIONS TO THE NAS
ON EPA STANDARD
NAS MEETING, MAY 27-29, 1993

- Status of Site Characterization Program (15 mins) — C. Gertz
  - Surface-based testing
  - ESF Development
- DOE Vision Regarding EPA Standard (30 mins) — S. Brocoum
  - Health-risk-based standard which provides appropriate protection to the public during preclosure operations and the postclosure phase.
  - Standard to be based on risk that is consistent with other societal risks.
  - Standard should be generally applicable to any repository site and permit discrimination between acceptable and unacceptable sites
  - Standard must have a technically sound and justifiable basis.
- Key Issues to be considered: (60 mins.) — M. Lugo
  - What are appropriate bases for the development of a standard for the protection of the public?
  - To what extent should the development of the standard involve the international community?
  - What is a reasonable and technically defensible time frame for evaluation of performance?
  - What type of validation standards are appropriate?
  - What is a reasonable way to address the human intrusion issue?

NATIONAL RESEARCH COUNCIL

2101 CONSTITUTION AVENUE WASHINGTON, D.C. 20418

EXECUTIVE OFFICE

April 30, 1993

Mr. Lake Barrett, Acting Director
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Barrett:

The committee of the National Research Council that is charged with providing Environmental Protection Agency with findings and recommendations on the technical bases of standards at Yucca Mountain wishes to establish and maintain strong technical liaison with the Department of Energy.

To this end, I am writing to request that you assign a member of your staff the formal responsibilities of liaison representative to our newly formed Committee on Technical Bases for Yucca Mountain Standards. Under the Council's policies, a liaison representative attends and participates in committee meetings, except executive sessions, to assure that the committee has access to all of the pertinent technical information that the agency possesses. In addition, the liaison representative helps to assure that the agency has access to the technical information available to the committee from other sources.

From our telephone conversation, I understand that the Department intends to assign this responsibility to Dr. Stephan Brocoum, Director of the Analysis and Verification Division of the Office of Geologic Disposal. I have taken the liberty to discuss this matter with Dr. Brocoum. Based on that conversation, I am confident that he is fully aware of the responsibilities and obligations of liaison representation.

I hope that you will agree that the sustained participation of a designated technical liaison representative of DOE will substantially aid the committee in this challenging endeavor. We are also asking the Environmental Protection Agency, the Nuclear Regulatory Commission, and the Nevada State Nuclear Waste Projects Office each to designate an appropriate technical liaison representative.

If you have any questions about this request or any other aspect of the study, please do not hesitate to call me at (202) 334-1659.

Sincerely,

Myron F. Uman
Assistant Executive Officer
Special Projects

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