UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Reply to:
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TO: Robert E. Browning, Director, Division of High-Level Waste Management, M/S 4-H-3

FROM: Paul T. Prestholt, Sr. On-Site Licensing Representative

DATE: June 5, 1989

SUBJECT: Letter from R. Loux to Carl Gertz dated May 30, 1989.

Please find enclosed the above-referenced letter.

The four page letter was "faxed" to you on Monday, June 5; this includes numerous attachments which were not "faxed".

PTP:nan
cc: John J. Linehan, M/S 4-H-3

STATE OF NEVADA

AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE

Capitol Complex
Carson City, Nevada 89710
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ACTION
CC: Newbill
CC: Gertz
CC: PC's
CC: Waldroup
CC: Robison
CC: Verlek/Wirdy-SAIC
CC: Smith/Benson-HQ
CC: West-CEA
CC: Bobbs-?
CC:
REC'D IN WMPO 6/1/89

May 30, 1989

Carl Gertz
Project Manager
Yucca Mountain Project Office
United States Department of Energy
Post Office Box 98518
Las Vegas, Nevada 89193-8518

Dear Mr. Gertz:

RE: STATE OF NEVADA PRELIMINARY COMMENTS ON THE SITE CHARACTERIZATION PLAN FOR THE YUCCA MOUNTAIN CANDIDATE HIGH-LEVEL NUCLEAR WASTE REPOSITORY SITE

The Nevada Agency for Nuclear Projects, Nuclear Waste Project Office, has completed its preliminary review of the exploratory shaft facility (ESF) components of the U.S. Department of Energy Site Characterization Plan for the Yucca Mountain candidate nuclear waste repository site. This preliminary review included portions of the DOE's Technical Assessment Review Design Acceptability Analysis and Exploratory Shaft Location Documentation Report, as well as numerous relevant references.

In accord with the DOE's request (FR / Vol. 53 No.251 / Dec. 20, 1988 / Pa. 53057, as modified on March 20, 1989) these preliminary comments focus on issues related to the start of the exploratory shaft facility, and are being submitted within the DOE's announced public review and comment period for the Site Characterization Plan (SCP). As the DOE has been notified, the balance of the State of Nevada's technical comments on the SCP will be forwarded to DOE not later than September 1, 1989.

The attached Preliminary Comments on the ESF describe Nevada's critical concerns over both the selected location of the ESF at Yucca Mountain and some aspects of the ESF Design at its current level of development. The summary conclusion that arises from the attached comments and concerns is that the DOE should not proceed with the initiation of site characterization and ESF

construction until certain fundamental ESF site location and design issues are resolved. Without such advance reconsideration and resolution, the potential consequences are twofold; first, that DOE's activities associated with ESF construction will preclude the future collection of data critical to a determination of Yucca Mountain site suitability, and second, that DOE's ESF construction activities will compromise the capability of the site to safely isolate waste, should it be developed as a repository.

The ESF location at Coyote Wash, was initially selected by DOE in mid-1982, with the selection process documented in a Sandia Report (SAND84-1003). The selection of this location was recently reviewed by the DOE, in December 1988, with that analysis, the Exploratory Shaft Location Documentation Report, confirming the earlier location decision. Nevada's review has revealed that neither the original Sandia Report nor the recent review by DOE acknowledges a 1982 United States Geological Survey report (USGS Open File Report 82-182) which contains strong evidence of a fault intersecting the selected ESF site, possibly between the two proposed exploratory shafts. The Location Documentation Report claims to have reviewed certain cited post-1982 reports of geophysical data relevant to the selected ESF site, with the conclusion that no adverse subsurface structures appear to be present at the selected Coyote Wash ESF site. However, the resistivity survey data documented in the 1982 U.S.G.S. report, and later summarized in a 1984 U.S.G.S. report were not included in the DOE's recent review even though the work was performed for the Yucca Mountain Project.

The known existence of a fault at the Coyote Wash ESF site would result in the disqualification of this proposed ESF site according to the criteria established in the 1982 Sandia ESF site screening report for setback from adverse subsurface geologic structures. Furthermore, placing the ESF in a fault-disturbed area casts into great question the representativeness of any site characterization data collected from the ESF. It also renders the ESF vulnerable to potential severe flooding from surface water infiltration along a preferred pathway, or from intersection of a perched groundwater zone during shaft or drift construction.

Aside from concerns about flooding of the ESF related to the probable fault as described above, the location of the two shaft openings at the proposed ESF in Coyote Wash is such that there is significant concern over potential surface water flooding of the ESF surface facility, the shafts, and underground drifts. The SCP acknowledges in numerous disclaimers that flood level predictions regarding washes in and around the Yucca Mountain area are speculative at best, and that there is essentially no site specific flood data for Coyote Wash. In addition, as Nevada has commented to DOE previously, the effect of proposed ESF surface modifications and structures on flood heights and velocities has

not been adequately analyzed, primarily due to a lack of site specific information. The consequences of flooding the ESF as a result of the lack of adequate shaft collar elevation and adequate surface flood protection structures, aside from the obvious risks to personnel, are such that the ESF may be rendered useless for collection of necessary in-situ site characterization data, and the abandoned damaged ESF itself may adversely impact the site's waste isolation capabilities.

From the design standpoint, the SCP and associated documents do not provide plans for sealing, or otherwise isolating from the remainder of the repository block, a failed shaft in the ESF, whether resulting from flooding or other causes, in order to assure that it will not adversely impact the waste isolation performance of a repository. This matter stands as one of the many unresolved design problems, which also include inadequate evaluation of environmental impacts of construction of the ESF.

An additional design issue involves the placement of planned boreholes associated with the ESF. Because of the known lack of quality borehole data at the proposed ESF site for use in shaft design, DOE has planned to drill at least two multipurpose boreholes on the ESF pad at Coyote Wash. The data from these boreholes will be necessary for further shaft design, yet if these holes are drilled as planned, and the DOE's criteria for distance to be maintained between boreholes and shafts at the ESF are honored, there is insufficient space to complete both activities. If some degree of borehole deviation during drilling is assumed (a realistic assumption), not only will the spacing criteria be violated, but there is a possibility that the shafts will intersect the previously drilled boreholes. With reference to the possibility of a proposed third multipurpose borehole, implementing the plan would result in the borehole intersecting a planned ESF drift at the underground test horizon. Further, the surface location of this hole would coincide with the planned location of the hoist house for the No. 2 exploratory shaft. In sum, the design and layout of the ESF cannot accommodate all the planned excavations and proposed construction while continuing to comply with the spacing criteria established by DOE for the ESF underground facility. The spacing criteria have their bases in assuring safety and preserving the ability to collect needed site characterization data that is representative of the site's undisturbed geohydrologic conditions.

The above comments constitute a set of fundamental concerns regarding the DOE's plans for developing and constructing an exploratory shaft facility at Yucca Mountain. Accompanying the attached State of Nevada Preliminary Comments are three letters in which we have previously detailed for DOE a number of the same concerns which are discussed in this letter and attached comments. It is Nevada's position that, without substantial resolution of these matters, it is both unsafe and imprudent to initiate site

characterization and ESF activities at the Yucca Mountain site.

If you have questions or comments regarding our concerns stated in this letter and the accompanying preliminary comment document please do not hesitate to contact me.

Sincerely,

Robert R. Loux
Executive Director

RRL:cs
attachment

STATE OF NEVADA
AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE

PRELIMINARY COMMENTS

REGARDING

THE

PROPOSED YUCCA MOUNTAIN

EXPLORATORY SHAFT FACILITY

MAY, 1989

INTRODUCTION

During the past several years, the State of Nevada has participated in the Exploratory Shaft Facility (ESF) program as part of its mandated oversight of the DOE high-level nuclear waste management and disposal program. From information gathered at meetings and field trips and from the review of the Site Characterization Plan (SCP), the Design Acceptability Analysis (DAA) and many other documents produced by DOE and its contractors, the State of Nevada has formulated a preliminary list of concerns regarding the ESF.

Our preliminary concerns are related to two aspects of the ESF: 1) the location of the ESF; 2) the ESF design.

1. LOCATION

A. SITE SELECTION

The proposed ESF site is located in Coyote Wash in the northeastern corner of the repository block. Coyote Wash is a narrow wash lying on U.S. Air Force land just west of the NTS boundary. Nearby Drill hole USW G-4 was drilled in Coyote wash after the site was selected.

According to Sandia Report SAND84-1003 by Bertram, the site was selected in April and May of 1982. In a matter of only a few weeks the selection procedure was developed, screening done, and Coyote Wash selected. Drill hole USW G-4 was not started until August of 1982, so the nearest available drill hole data at the time of ESF site selection was from USW H-1, 3300 feet to the east. See letter of 09/22/1988, Loux to Gertz.

Concern: The ESF site was hastily selected based on drill hole data of questionable applicability.

Of the criteria used for screening of the five preferred sites considered, heavy emphasis was placed on setback from the repository block boundary and avoidance of adverse geologic conditions. As is pointed out below, the Coyote Wash site may well exhibit adverse geologic conditions.

The proposed repository block contains roughly 1520 acres. During the selection of the ESF site the following areas were summarily eliminated from consideration:

1. a) 500' wide buffer area east of Solitario Canyon Fault
   b) 1000' wide buffer area south of Drill Hole Wash
   c) 2000' wide buffer area along east side of block
   d) All land south of a line 4000 feet north of USW H-3

This eliminated 633 acres, or 42% of the repository block.
2. All lands less than 1000', but not more than 2000' from adverse geologic structure as identified by the USGS.
This eliminated another 812 acres or another 53% of the original block.
3. Areas identified as being"steep slopes". This eliminated another 52 acres of the block.

The remaining 23 acres, or 1.5% of the original repository block fell into five potentially suitable ESF sites from which the Coyote Wash was selected. However, in the published site rankings, Coyote Wash either tied or was out-ranked by other potential ESF sites in 8 of the 12 subcriteria applied to compare the five sites.

The recent DAA review of the Bertram Report evaluated only the five candidate sites identified by Bertram. It would seem prudent in any review of the site selection to re-evaluate the entire repository block for alternate sites.

Concern: Unrealistic and arbitrary criteria were used in screening, and 98% of the proposed repository block was eliminated without objective consideration.

B. FLOODING.

The Site Characterization Plan, U.S.G.S. Water Investigations report 83-4001 by Squires and Young, and other reports referenced in the SCP all contain numerous disclaimers that flooding predictions regarding the washes in and around Yucca Mountain are speculative at best. Historical records on streamflow, rainfall, runoff, recharge, flash floods, storms, infiltration, and debris movement range from sparse to nonexistent. Essentially no such data exist for Coyote Wash. The probable maximum flood configurations shown on project maps are based on generalized, regional data (Bullard, 1986) and do not appear to reflect how the proposed structures in Coyote Wash may impact future flood characteristics.

Separately, a visual inspection of the configuration of the lower drainage channel of Coyote Wash suggests that a change in slope which corresponds approximately with the proposed shaft collar elevation may be the erosional remanent of the highest flood runoff. That level is many feet above the maximum flood calculated by Bullard for Coyote Wash.
See attached letters of 09/19/88, Loux to Gertz and letter of 03/19/89 Loux to Valentine in which these matters are discussed in greater detail.

It must be recognized that even partial flooding of the ESF during the construction and testing period could have serious consequences. In addition to the risk of personnel injury or loss of life, flood waters would infiltrate the shaft and drift walls. This would render highly questionable the results of tests conducted to characterize hydrologic features of the rock mass such as groundwater travel times. The current ESF plans call for drifts to slope downward to pump installations. In the event of an exploratory drift intersecting a sizeable perched water reservoir or being flooded from the surface via the shafts, the pumping system may be engulfed or otherwise become inoperative. Such an event would likely render the ESF useless for further testing, and could affect the waste isolation capability of the proposed repository horizon.

The DAA (page 3-7) states that, " . . . significant concentrations of infiltration are more likely to occur in drainage channels, along ridge crests, and in localized depressions." This raises the question of why the ESF is proposed to be located at the mouth of a wash.

Based on the preliminary information provided, the 10 foot wide drainage channel around the north side of the main ESF pad appears to be inadequate for containing or diverting the slope and main pad runoff during a maximum flood. Although the shaft collars are elevated one foot above grade to avoid direct flow of surface water into the shafts, the blast fractured nature of the collar rock and the possibility of deterioration of collar construction materials during the 100 year life, require that surface water diversion be ample to avoid infiltration into the shaft.

> **Concern: The ESF site was selected without adequate flood potential data in the shaft collar areas, and ESF design has proceeded without sufficient evaluation of possible impacts to site characterization objectives resulting from ESF flooding.**

C. REPRESENTATIVENESS.

The underground test area of the ESF will cover about 15 acres, and the drifting to the projected fault locations will expose about 3 more acres, providing a total of 18 acres of underground excavations. Thus, of the 1520 acre repository block, a little over 1% of the underground area will be available to be characterized at the ESF. While the proposed location and configuration should give some insight into the faults in the area, hydrologic characteristics and in situ rock properties of the remaining 99% of the block will remain unknown.

Multiple intersections of adverse geologic structures (i.e. faults) should be planned to assure representativeness. The SCP is silent on plans to evaluate unknown adverse geologic features which may be present within the repository block.

> **Concern:** **The location and extent of the planned underground ESF severely limit the extent to which the collected data are representative of the in entire repository block.**

D. FAULTS

Major faults at Yucca Mountain have been mapped, described and discussed for several years; indeed, they form the boundaries of the proposed repository block, with the Solitario fault on the west, the suspected Drill Hole Wash fracture zone on the north, the Imbricate faults on the east, and the Abandoned Wash fault on the southeast.

DOE documents to date have described the repository block as relatively free of faults with the exception of the Ghost Dance Fault which trends north-south just west of the proposed ESF site. The SCP on page 1-128 acknowledges that the Ghost Dance Fault has as much as 38m of vertical offset and an accompanying breccia zone as wide as 20m. Characterization may give further insight into the significance of this fault to waste isolation.

Of particular importance to the ESF is another possible fault lying parallel to and east of the Ghost Dance Fault. This un-named fault identified by resistivity geophysical methods is discussed in USGS OFR 82-182 by Smith and Ross. Plate V of that report maps this fault 400m east of the Ghost Dance. Plotting the ES-1 and ES-2 shaft locations on plate V we find that the proposed fault lies between the proposed shafts. Smith and Ross (page 11) describe the block between the un-named fault and the Ghost Dance Fault as a horst, and suggest (on page 16) that this horst may be a spur of the main fracture zone that underlies Drill Hole Wash.

Verification of the presence of this un-named fault is supported by the geophysical identification by Smith and Ross of another fault subsequently mapped by Scott and Bonk as the Ghost Dance fault.

This fault is also shown on Fig 1-40 on page 1-121 of the SCP and in USGS OFR 84-792 on Fig 3 and discussed on page 50. This fault is not discussed in the SCP, but is described in the USGS report as a fault with at least 5m of displacement.

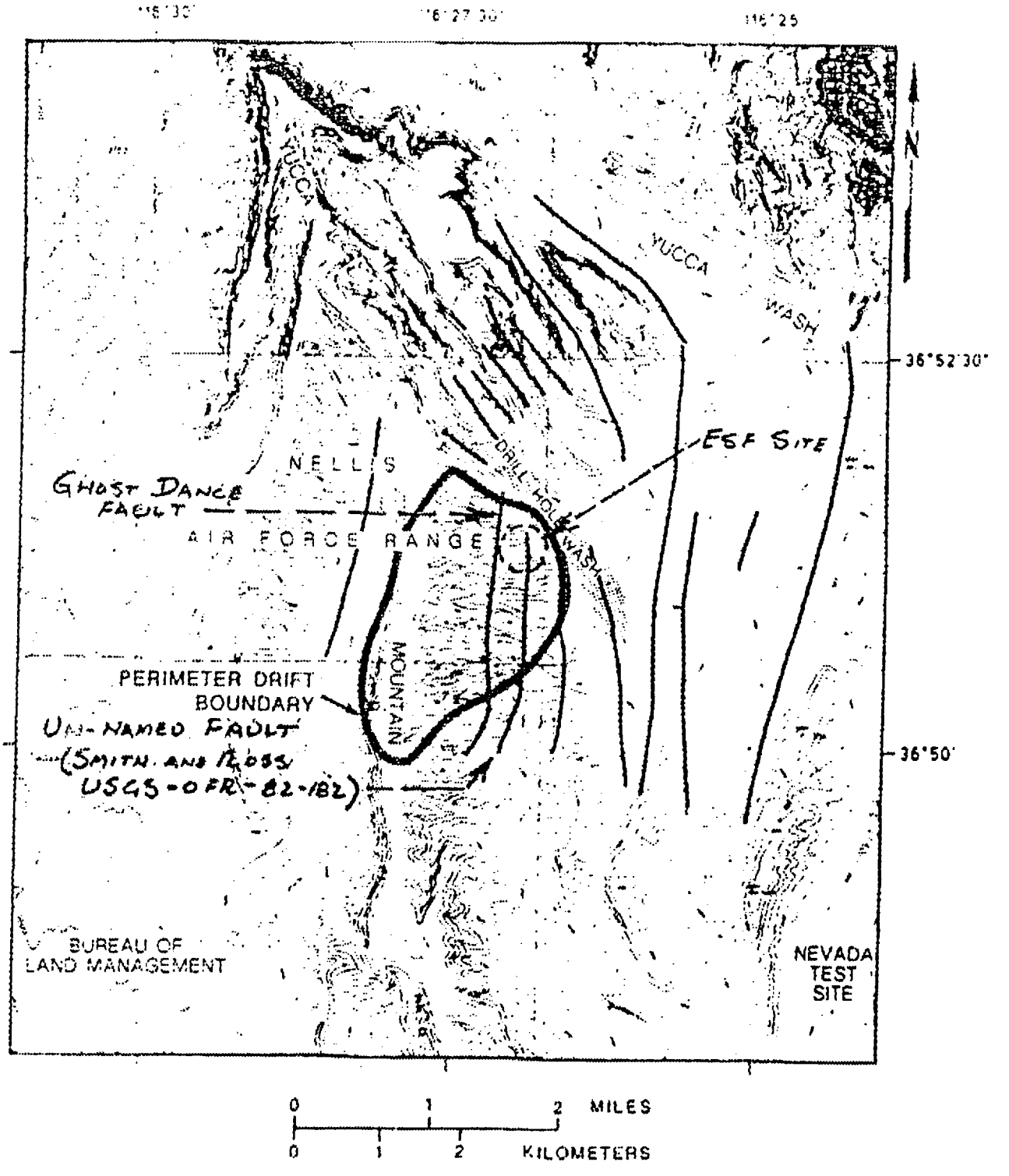
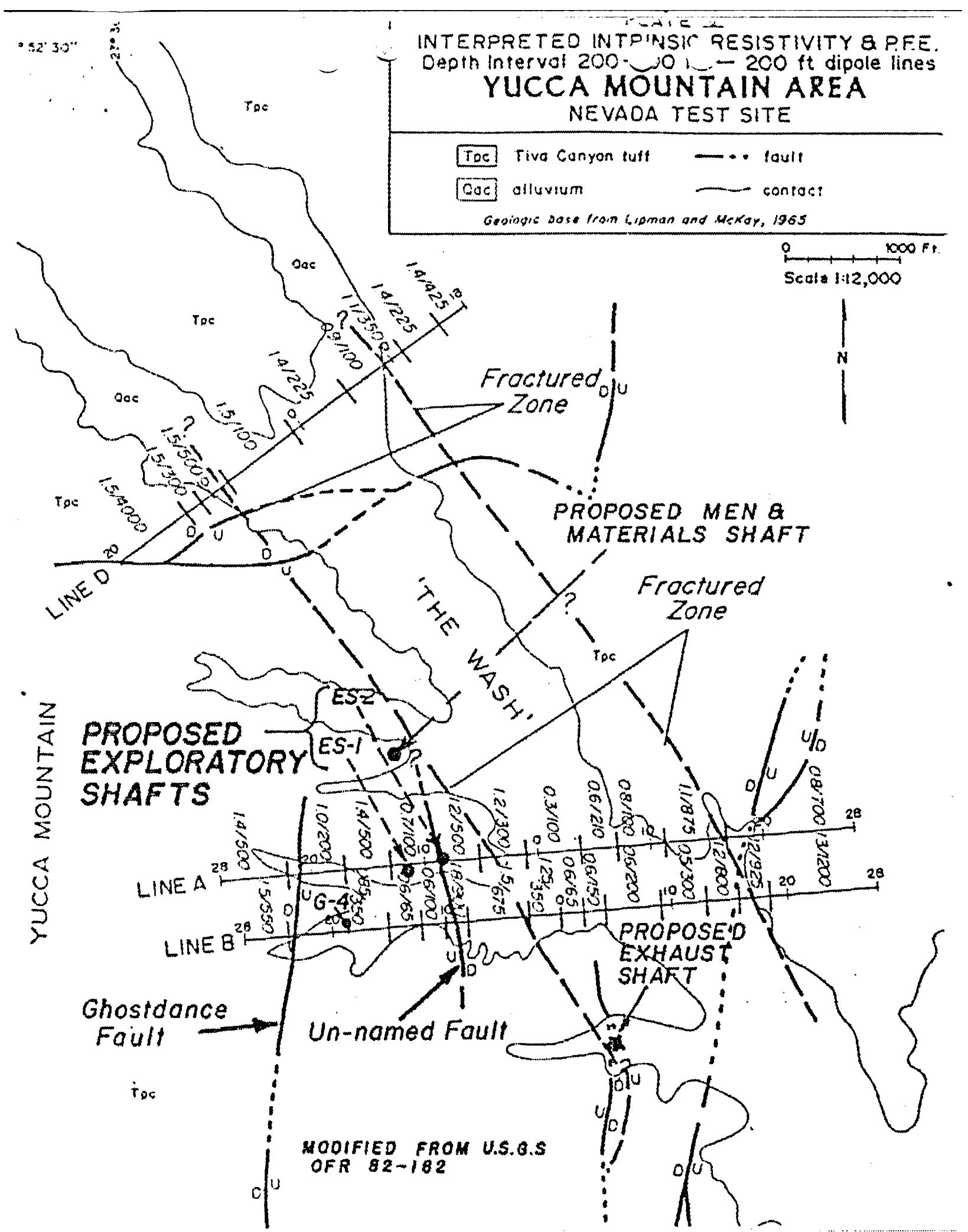


Figure 1-40. Faults and fractures at Yucca Mountain interpreted from electrical resistivity data. Stippling shows zone of inferred fracturing and faulting along Drill Hole Wash; fault trends appear to change abruptly across this zone. Modified from USGS (1984).

MODIFIED FROM DOE SITE CHARACTERIZATION PLAN



Reviewing the Bertram siting criteria (page 56) regarding setbacks we find two requirements: (1) "ES sites that would have subsurface facilities closer than 100 feet to a potentially adverse structure would be excluded." Either ES-1, ES-2, or the test drifts may well fall within 100 feet of (or intercept) the un-named fault; (2) "The shaft should be located far enough from potentially adverse structures within the block so that there would be a low likelihood that the shaft itself and the drifts would encounter fractures associated with those structures." ". . . A 1000-foot setback distance was judged to be sufficient to place the shaft outside the zones of fracturing associated with the structures." The Smith and Ross report (OFR 82-182) identifying the fault is dated "October, 1979" and therefore was available for the Bertram team in 1982.

> **Concern: Using the two setback requirements for potentially adverse structures developed by Bertram, the Coyote Wash site should have been excluded on both counts. The presence and extent of the fault identified at Coyote Wash must be confirmed and its potential impact on the ESF evaluated before the Coyote Wash ESF site can be considered acceptable.**

The DAA adopted the potential ESF sites of the Bertram Siting report and only reviewed faults at the Coyote Wash site interpreted from the geophysical data based on magnetic and gravity surveys. The resistivity surveys used by Smith and Ross to delineate the un-named fault were not referenced and apparently ignored by the DAA analysis.

> **Concern: Confirmation of the ESF site selection by the DAA has ignored existing information regarding adverse structures at the Coyote Wash ESF site and makes questionable the objectivity of the DAA analysis.**

The Design Acceptability Analysis (DAA) of the Technical Acceptability Review (TAR) (page 3) contains, without basis, an underlying assumption that any ESF location in the northeast part of the repository block will provide groundwater travel times from the repository horizon to the water table in excess of 10,000 years. This concept is presently speculative and may prove erroneous given the suspected highly fractured nature of the host rock in the Coyote Wash ESF area.

It is likely that the un-named fault delineated by Smith and Ross resistivity surveys is accompanied by a water-bearing fracture zone or even a perched water reservoir on one side of the fault. This could place any excavations near or through the fault area at risk from flooding due to perched water or rapid infiltration through the fracture zone.

Resistivity surveys identify structural anomalies by measuring differences in resistance within the rock mass. Usually a change in resistance indicates a change in water characteristics, either in water volume or in dissolved solids. The data from core holes on Yucca Mountain indicate a reasonably constant value for dissolved solids; therefore, anomalies identified by resistivity surveys would support a change in water content in the zone.

Concern: The selected ESF subsurface test area appears to lie in a highly fractured zone that could lead to water inflow and stability problems and may not provide data representative of the repository block.

Concern: Movement in the near-term along the un-named fault between the exploratory shafts could damage or disable the common hoist house and/or hoist foundations; damage or rupture buried service utilities (water, sewer, electrical, compressed air, and communications) lines in the main ESF pad; misalign conveyance guides in the shaft; damage or rupture the shaft liners and utilities in the shafts.

Concern: The un-named fault bisecting Coyote Wash, the main ESF pad and the underground test drifts will provide a pathway for surface water in Coyote Wash to enter the underground facility.

The SCP (page 1-209) discusses the effect on the repository block of underground nuclear weapons testing (UNEs) at the Nevada Test Site. Surface rupture and minor movements on faults have been observed locally at Yucca Flat and Pahute Mesa, current test shot areas. Mid Valley and Buckboard Mesa, both of which are closer to Yucca Mountain than current test areas, are potential sites for future weapons tests.

Concern: That future UNEs located at Mid Valley or Buckboard Mesa could trigger fault slippage movement at the ESF site.

2. DESIGN

A. INADEQUATE PLANNING

On page 3-68, Fig 3-26, the Integrated Data System (IDS) Block Diagram shows input from "Calico Hills Experiments". In the text on the following pages there is no mention of this experiment. The Title I design does not show the shafts sunk to the Calico Hills horizon. However, the SCP (page 6-179) states that, "Four shafts and two ramps are proposed to penetrate the underground horizon at Yucca Mountain. Only the exploratory shaft is planned to extend below the repository horizon into the zeolitized tuff of the Calico Hills." This is inconsistent with our understanding of the current ESF project, but if the Calico Hills formation is to be penetrated, major revisions in the design must be made to accommodate the additional shaft depth, hoisting system, etc.

If characterization of the Calico Hills from the exploratory shaft is not presently contemplated, then what studies does DOE plan to adequately characterize this unit that will not compromise site integrity, since the Calico Hills tuff is considered to be the primary natural barrier to radionuclide transport.

Concern: That a future decision to deepen the exploratory shafts will compromise the safety and structural integrity of the planned test area.

We find no contingency plans for sealing the underground ESF if one of the exploratory drifts encounters a structural or hydrologic feature that condemns the ESF and renders it unfit to be part of a possible repository.

Concern: There are no plans to isolate a failed ESF to assure the integrity and performance of the remainder of the repository block.

The Title I Design Summary Report and the TAR Review Record Memorandum list comments generated by reviewers of Title I design. Of the 1172 comments presented, 478 (41%) were deferred to Title II, assuming that any problems in Title I would be solved during Title II Design. NWPO understands that DOE proposes a phased approach to construction of the ESF.

Concern: **Unresolved conceptual problems from ESF Title I design remain unaddressed as Title II Design continues.**

Title I Design gave little consideration to environmental issues and possible ESF impacts upon the environment. This deficiency may be partly due to there being inadequate environmental baseline data prior to commencing design work. Items such as sewage, chemical and industrial wastes, air emissions, mine wastewater and concrete batch plant emissions have not been fully quantified to accommodate mitigation in the design. No consideration has been given in Title I Design for reclamation of the ESF, if the site proves unsuitable.

In a similar manner, during the site selection process, the environmental criteria, "surface disturbance", "reclamation", "archaeological", and "effluents and emissions" received the lowest weightings. As a group, these four items constituted only 15% of the total consideration. (Bertram Report, pg. 78)

Concern: **In addition to inadequate consideration being given to environmental issues in the site selection, design of the ESF continues without appropriate regard for possible environmental impacts related to the facility.**

The SCP states (page 8.3.1.2-310) that, "The two multipurpose boreholes will be located such that they do not penetrate within a distance of two shaft or drift diameters, as appropriate, of any underground opening." Using the drift widths shown on F&S drawing FS-GA-0162 Rev B from Title I Design drawings, the boreholes MP-1 and MP-2 as located on SCP page 8.3.1.2-311 cannot meet the setback requirements. In fact, there appears no location in either of the designated pillars that can meet the standoff criteria.

The SCP (page 8.3.1.2-312) states that a third multipurpose borehole may be drilled midway between ES-1 and ES-2. Again applying the "Two drift diameter standoff" rule, there is no ground between the shafts that can qualify. Further if this third hole were drilled plumb, it would intersect the north-south drift south of the demonstration breakout drift. This same hole would collar in the drum pit of ES-2 hoist in the surface hoist house.

It is also likely that these boreholes will deviate horizontally as they are drilled. USW G-4 deviated 26 feet to the southwest at 1000 feet of depth and 48 feet at 1250 feet of depth. (See Fig 3 of USGS OFR 84-789). This anticipated deviation must also be considered in locating boreholes and setting standoff requirements.

Concern: Consideration must be given to deviation and standoff requirements and possible borehole deviation in locating future boreholes around the ESF and failure to do so may compromise drift and shaft integrity.

Some TAR Committee members that reviewed the DAA as well as many of the DAA reviewers are members of the various organizations contracted and funded by DOE. This group determined that all of the NRC concerns were "judged to be adequately addressed in the Title I design." At least five reviewers or committee members participated in either ESF site screenings or Title I design, thus their independence is questioned. The intent of the TAR would have been better suited to have an independent, unbiased team perform the TAR.

Concern: Title II Design is proceeding because of the endorsement of Title I Design by a group not entirely independent.

Page 2-60 of the DAA discusses several of the known potential problems with repository performance as related to structural failure within the ESF. With this acknowledgment that ESF failure could jeopardize repository performance, retrieval, etc., prudence would demand that ample, reliable data pertaining to rock strength and other characteristics be available before proceeding with detail design.

Concern: The ESF design is based on unsubstantiated rock properties which may lead to failure in the ESF and have future impacts on the repository.

On page 8.5-48 of the SCP there is a listing of Site Characterization Study Plans. Fourteen programs are listed which incorporate 106 study plans. While SCP Chapter 8 contains brief descriptions of the study plans, the detail here is not sufficient to evaluate procedures and equipment involved. More important, it is difficult, if not impossible, to determine the interface impacts of each study on concurrent studies or on the simultaneous development of the ESF.

Concern: Detailed study plans will be developed too late to be used in the design process to insure test-to-test and test-to-ESF construction compatibility.

REFERENCES

DOE (U.S. Department of Energy) 1986. PMF Study, Memorandum: Bullard to Head, Flood Section.

DOE (U.S. Department of Energy) 1988. Yucca Mountain Project Exploratory Shaft Facility Title I 100 Percent Technical Assessment Review, YMP/88-19A.

DOE (U.S. Department of Energy) 1989. Exploratory Shaft Facility (ESF) Title I design Acceptability Analysis and Comparative Evaluation of Alternative ESF Locations, YMP/89-3.

DOE (U.S. Department of Energy) 1988. Site Characterization Plan, DOE/RW-0199.

Loux, R.R., 1988. Letter from Robert Loux (NWPO) to Carl Gertz (DOE) regarding flooding at the ESF site.

Loux, R.R., 1988. Letter from Robert Loux (NWPO) to Carl Gertz (DOE) regarding ESF site selection.

Loux, R.R., 1989. Letter from Robert Loux (NWPO) to Deborah Valentine (DOE) regarding determination of floodplain for Site Characterization.

Smith,C., and H.P. Ross, 1982. Interpretation of Resistivity and Induced Polarization Profiles with Severe Topographic Effects, Yucca Mountain Area, Nevada Test Site, Nevada, USGS-OFR-82-182, Open-File Report, U.S. Geological Survey.

Squires, R.R., and R.L. Young, 1984. Flood Potential of Fortymile Wash and Its Principal Southwestern Tributarties, Nevada Test Site, Southern Nevada, USGS-WRI-83-4001, Water Resources Investigations Report, U.S. Geological Survey.

USGS (U.S. Geological Survey) (Comp.), 1984. A Summary of Geological Studies Through January 1, 1983 of a Potential High-Level Radioactive Waste Repositorty Site at Yucca Mountain, Southern Nye County, Nevada, USGS-OFR-84-792, Open-File Report, U.S. Geological Survey.

LETTER
LOUX TO GERTZ

09/19/88

REGARDING ESF SITE FLOODING

RICHARD H. BRYAN
Governor

STATE OF NEVADA

ROBERT R. LOUX
Executive Director

AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE
Capitol Complex
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(702) 885-3744

September 19, 1988

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
U.S. Department of Energy
Nevada Operations Office
Phase 2, Suite 200
101 Convention Center Drive
Las Vegas, NV 89109

SUBJECT: ESF Locations

Dear Mr. Gertz:

During the past 5 years this office has observed with keen interest as the conceptual and preliminary designs for the Exploratory Shaft Facility evolved. While a few of our concerns regarding the planning, as expressed in my letter of 5/31/88, have been alleviated, most are still in limbo awaiting resolution in subsequent design processes or at some future discussion or review. This letter will discuss our continuing concern involving the location of the exploratory shafts and their related surface facilities.

In the early conceptual plans, the exploratory shaft collars were located close to midstream in Coyote Wash. At a DOE/ NRC/ State meeting held April 14 and 15, 1987 to discuss proposed changes to the ESF, DOE announced that the conceptual plans were being revised to relocate the shaft collars 440 feet to the northeast. The stated motivation for the relocation was NRC Staff concerns that the original locations were sited in the alluvial fill of Coyote Wash. The new location was said to minimize the likelihood of collar erosion because the shafts would now be collared in hard rock outside the flow channel of Coyote Wash.

At the ESF Title I 50 Percent Design Review meeting held in May of this year, the NRC Staff continued to express concerns related to collar erosion and possible shaft flooding resulting from flood flows in the adjacent Coyote Wash. It appeared that the shift to hardrock and retreat from the center of the wash did not entirely allay the NRC concerns.

The ESF Title One Design Review is currently nearing completion. Reviewing the latest release of Title I plans relating to the surface facilities in the subject area, we note minor revisions in the drainage plans for the Coyote Wash channels that are culverted under the road connecting the ESF pad and drill hole G-4 pad. This situation is in the State's view a bottleneck and will be addressed in future correspondence.

Of major concern with the ESF Design is the analyses and references used to develop the Probable Maximum Flood (PMF) levels. We note that the prime reference for the PMF predictions is a USGS Water-Resources Investigations report, #83-4001, Flood Potential of Fortymile Wash and Its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada. This report was prepared by Squires and Young. However, in reviewing the Consultation Draft of the Site Characterization Plan, Chapter 3, we get the impression that the DOE has little confidence in the flood prediction studies done to date.

Note the following excerpts from your Draft SCP:

Page 3-8. Regarding runoff:"--scanty data available for the region---". Later: "Quantitative data on rainfall, runoff, and evaporation for the area are not yet adequate to determine rainfall-runoff-recharge relations for individual storms, seasons, or years. Therefore, only general knowledge of runoff parameters is available.----- models can't be calibrated until more field data become available."

Page 3-12. Regarding streamflow at Yucca Mountain: "--- almost no streamflow data have been collected."

Regarding floods: "Flood analyses at Yucca Mountain are needed to provide flood data for design and performance considerations."

Page 3-13. Regarding future flooding: "Confidence in predictions of future flooding is lessened because of the sparse historical data, quantitative or qualitative, on streamflow or flooding throughout the region surrounding Yucca Mountain."

Page 3-14. Regarding long term flood predictions: "Predictions are especially difficult for drainages with minimal stream-flow records, such as those in the hydrologic study area."

Page 3-16. Regarding calculating probable maximum flood: "The sparse streamflow records, the availability of only minimal precipitation and storm data, and the absence of data on infiltration-runoff

characteristics for the drainage basins in the Yucca Mountain area requires that many speculations and assurptions would be needed to calculate the magnitude of probable maximum floods in complex drainages the size of Forty mile and Topopah washes. Also, the lack of storm and runoff data throughout the hydrologic study area prevents checking the validity of the various assumptions used."

Page 3-17. Regarding the drainage basins of Busted Butte Wash and Drill Hole Wash: " The regional maximum flood would inundate all central flat-fan areas in these two watersheds."

Page 3-19. Regarding erosion: "The extent of erosion and sediment movement caused by flood flow in Fortymile Wash and its tributaries that drain Yucca Mountain is not known quantitatively."

Regarding flood and debris hazard: "The sparseness of the historic data base on surface water hydrology, including the movement of both water and debris inhibits accurate prediction of flood and debris hazards for the immediate future. Likewise, a deficient understanding of the paleoclimates and the past geomorphic processes limits the ability to predict climatic changes and their probable effects on flood-and-debris-hazards potential over the next several thousands of years."

Page 3-20. Regarding hazard potential: "The minimal data on stream flow and insufficient knowledge of geomorphic parameters make predictions of flood and debris hazards very speculative."

In looking at the overall Yucca Mountain Project, we view the determination of the PMF or other major hydrologic event as major design uncertainties. Without substantiated hydrologic data on a given site, it is impossible to obtain a PMF at that particular site. Since it is clearly acknowledged in both the CD-SCP and the CDR that no site specific data exist for the Coyote Wash area, it becomes a question of conservatism as to the determination of the PMF.

The problem is that the design depends on the PMF determination and the PMF determination is likewise dependent upon the design. PMF is determined by considering hydrologic data, which is sparse, and the planned structures in the wash that will cause backwater effects, damming, etc. In a relatively narrow wash, such as Coyote Wash, the peak level of the PMF is

highly dependent on the existence of such obstructions.

In order to insure that the ESF shafts will be safe and free from the damage due to major hydrologic events, it is critical to place the shafts in a position and at an elevation that the engineering and scientific community as a whole agree as safe from the PMF. At their current locations, the shafts certainly do not meet this standard.

We certainly concur with the discussion contained in the Draft SCP: flood prediction at Yucca Mountain is indeed very speculative. Our obvious question is, therefore, how can you confidently site the ESF shafts that will technically be an integral part of the licensed repository in Coyote Wash considering the unfounded, admittedly deficient condition of the potential flood data? We might further point out that the other proposed shafts, the ramps and the surface facilities described in the CDR all may have a similar problem.

This office is prepared to discuss our concerns regarding the ESF location with your staff at any time.

Sincerely,

Robert R. Loux
Executive Director

RRL/jrg

cc: Robert Browning, NRC

LETTER
LOUX TO GERTZ

09/22/88

REGARDING SITE SELECTION

RICHARD H. BRYAN
Governor

STATE OF NEVADA

ROBERT R. LOUX
Executive Director

AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE
Capitol Complex
Carson City, Nevada 89710
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September 22, 1988

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
U.S. Department of Energy
Nevada Operations Office
Phase 2, Suite 200
101 Convention Center Drive
Las Vegas, NV 89109

Dear Mr. Gertz:

At the July, 1988 DOE/NRC/State meeting in Rockville, MD, regarding NRC concerns about the Exploratory Shaft Facility (ESF), Joe Tillerson of Sandia gave a presentation that responded to NRC Objection No. 4, "Shaft Locations". Part of this presentation was a bit of history that attempted to defend the reasoning behind the selection of the present ESF shaft locations. Mr Tillerson cited two references: (1) "Detailed discussion with NRC in 8/85 meeting" and (2) "Selection process documented in SAND84-1003". The purpose of this letter is to discuss the latter.

SAND84-1003, NNWSI EXPLORATORY SHAFT SITE AND CONSTRUCTION METHOD RECOMMENDATION REPORT, was authored by Sharla G. Bertram of Sandia's Seabed Programs Division, and published in August of 1984. The abstract claims that the report documents the evaluation of alternate construction methods and the screening of potential exploratory shaft sites. The report concludes by recommending a vertical shaft, conventionally mined, in a dry canyon known as Coyote Wash.

What we find incredible is the brief, just three month, duration of this effort and the lack of documented data upon which to compare alternatives as a basis for the the selections. In fairness, we are aware that much has changed since these recommendations were made in the spring of 1982; however, unfortunately the results of this hasty, unreferenced evaluation survive and continue to be perpetuated by DOE.

According to the report, on March 29, 1982, a few months prior to passage of "The Nuclear Waste Policy Act", a working group was formed to develop procedures for evaluating ESF construction methods and screening sites. Thirty days later, on April 28th, the procedures were completed, approved by the senior project officers of all participating contractors in the NNWSI, and the working group became the AD Hoc TOC Committee. Their task was to refine criteria and implement the methodology. They were further charged with recommending the preferred construction method by May 10 and recommending the preferred site by June 1. This schedule allowed 11 calendar days (6 working days) to select a construction method and generously allowed 33 calenda· days (22 working days) to select a site. The method recommendation was presented and unanimously approved on May 12, two days late. No exact date is mentioned for the presentation of the site recommendation, but the report implies the work was completed in June.

On August 22, 1982 Drill Hole USW G-4 was started in Coyote Wash. Note that the shaft site was selected before G-4 was even started and therefore the evaluation criteria that addressed underground fractures, vertical thickness of units, and underground adverse conditions had to be based on the existing drill hole data from G-1, H-1, H-4, and UE25a-1 , the latter being the closest to the selected site, being 3300 feet to the east. The Committee stated that it used the most current information available; most data, including that from USGS, was preliminary and unpublished; and that the information was incorporated into the report without reference. Perhaps the rushed schedule was prompted by the stated assumption that shaft construction would begin March 31, 1983.

Before recommending a construction method, the committee considered 12 alternatives. Five of these were evaluated using merit analysis. Two of the five called for shafts extending through the Calico Hills Unit into the Bullfrog and Tram Units. Though somewhat unsophisticated and general in nature, the process seems to have resulted in the Committee somehow stumbling onto perhaps the best construction method.

The Committee next selected four categories of screening criteria for site selection: 1) Scientific, 2) Engineering, 3) Environmental, and 4) Nontechnical.

From this point the Committee proceeded to screen alternate repository block areas using boundary setbacks, and distance to potentially adverse geologic structures to develop acceptable areas for siting. In addition, all areas of steep slopes or adverse topography were eliminated. From this screening emerged five preferred areas: two on Yucca Ridge and three located in washes on the eastern flank of Yucca Mountain.

It should be noted here that perhaps the greatest flaw in the selection process was in the logic applied to this screening that selected the five preferred sites. Heavy emphasis was placed on two factors: setback from the repository boundaries and avoidance of adverse geologic structures.

In an effort to center the ESF on the block and insure typical representation, the following buffer criteria were applied and the border areas of the block were eliminated:

1. A 500 foot wide strip along the west side of the block, thus avoiding Solitario Canyon Fault zone.
2. A 1000 foot wide strip along the north side of the block, thus avoiding possible Drill Hole Wash faulting.
3. A. 2000 foot wide strip along the eastern side of the block, thus avoiding the imbricate faults.
4. All land lying south of a line 4000 feet north of H3, thus avoiding the numerous faults suspected in Abandoned Wash.

This exercise eliminated 633 acres (42%) of the 1520 acre block and left 887 acres as acceptable. If roughly 40 % of the block is unsatisfactory for the ESF, the question arises: should the block even be considered for a repository?.

Next, to avoid adverse geologic structures as identified by USGS, all lands less than 1000 feet and more than 2000 feet from an adverse structure were eliminated. The intent here seemed to be to maintain a 1000 foot buffer for safety but stay within a maximum of 2000 feet distance so that underground horizontal drilling to the structure could be accomplished. These criteria eliminated another 812 acres leaving 75 acceptable acres.

Finally, of the remaining 75 acres, 52 acres of steep slopes (term undefined) were eliminated. This left 23 acres or 1.5% of the original 1520 acre block that the Committee considered acceptable for an ESF site. These 23 acres were divided among 5 sites, three in washes and two on the ridge top.

Perhaps it made sense to avoid the perimeter boundary of the block and seek a central location. However, a program mandated to characterize the repository block, including its structures, should not have eliminated so much area in an effort to avoid the very geologic structures that were to be investigated. Sinking a shaft near a fault zone is not uncommon, using existing technology. Further, there is no assurance that the two ESF shafts or the Men & Materials and Exhaust shafts won't intercept currently unknown faults during sinking, however it seems assured that the proposed ramps will intersect several fault zones as they are driven. In addition, structures that were so carefully shunned in the screening were not all proven, many being only suspected by USGS, based on surface work.

In reviewing the maps that define the various areas discussed above, it is apparent that the nebulous "steep slope" factor was employed in to eliminate a 30 acre tract lying in the center of the block in the area of Antler Ridge. Construction of a road and the required utilities would have been comparatively more difficult here, but by no means restrictive.

The "Nontechnical Category" was discarded because all five sites were considered equal in this category. The remaining parameters were each assigned a weight, with flash flooding, reclamation and surface disturbance at the bottom of the list each with a maximum of 3.0% of the total score. Heading the list as most important to the site selection was "subsurface facilities located in good rock" at 16.5 % or 5.5 times more important than flash flooding.

There then followed in the report a brief discussion of the pro's and cons of each of the five sites. The two ridge top sites were suspect because building a mud pit for drilling effluents would be difficult; the muck piles would have to be at the heads of washes making reclamation difficult; a large area would have to be disturbed to gather enough material for the pads and berms; the long access road would require more control over off- road driving of heavy equipment; more road paving would be required; lack of topsoil would require hauling in topsoil for reclamation which would be dissimilar soil to that originally removed; and finally, vegetation recovery would be impeded by wind and water erosion. Needless to say, the ridge-top sites finished a distant 4th and 5th in the ranking.

The first of the wash-bottom sites was said to require some paving of the existing road. All other factors paralleled, but were rated slightly inferior to Coyote Wash. This site was ranked a close second.

The other runner-up wash-bottom site apparently was a throw-away early on. It was located in a "narrow, constricted, and steep wash". The report stated that flash flooding threatened to destroy mud pits, and wash away contained effluents and the muck pile. (We feel similar characteristics exist in Coyote Wash). Overhanging rock cliffs would have to be removed for safety during site preparation, and would be impossible to replace at reclamation. This site was ranked third.

The unanimous winner was, of course, the Coyote Wash site described as, "in a broad, open wash " providing "suitable areas for mud pit or muck pile construction without flash flood problems." The clincher was that road construction would be required for only a short distance. It is interesting to note that even with the skewed ratings, Coyote Wash was tied or outranked in 8 of the 12 subcriteria applied to compare the 5 sites.

It is also noteworthy that the question of adequate available pad area was never addressed. In the recent Title I ESF Design Reviews, crowding of the facilities on the pad has been a recurring issue.

In the intervening years, as repository requirements and configurations were changed, as the NRC and State of Nevada repeatedly were critical of the Coyote Wash ESF location, and as the planned ESF was enlarged from one shaft to two and shaft depths changed, we saw no attempt to revisit the 1982 ESF selection decision. We therefore strongly recommend that the ESF Site selection decision be reviewed now, in the context of the existing information and consistent with the status of site characterization planning. We further recommend that, unlike the 1982 process, appropriate quality assurance procedures be applied to the evaluation and any resultant decisions and conclusions.

I look forward to hearing from you on this matter, and if you have any questions, please feel free to contact me.

Sincerely,

Robert R. Loux
Executive Director

RRL/jrg
cc: Robert Browning, NRC

LETTER
LOUX TO VALENTINE

03/31/89

REGARDING FLOOD PLAIN DETERMINATION

ROBERT MILLER
Governor

STATE OF NEVADA

ROBERT R. LOUX
Executive Director

AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE
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March 31, 1989

Ms. Deborah Valentine
United States Department of Energy
Office of Civilian Radioactive Waste Management
Mail Stop 7F-079, RW-333
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Ms. Valentine:

RE: Determination of Floodplain/Wetlands Involvement for Site Characterization at Yucca Mountain, Nevada (FR Vol.54, No. 26 / Thursday, February 9, 1989, p. 6818).

It has come to the attention of the Nevada Agency for Nuclear Projects, Nuclear Waste Project Office, that the subject Federal Register Notice of DOE's Determination of Floodplain/Wetlands Involvement was published on February 9, 1989. We discovered this Notice in March, 1989, and in fact, have never received direct notification of its publication from the U.S. Department of Energy despite the fact that Yucca Mountain, Nevada, is named in the Nuclear Waste Policy Amendments Act of 1987 as the location of the DOE's high-level nuclear waste candidate repository site characterization activities. Federal regulations for Compliance with Floodplain/Wetlands Environmental Review Requirements state, at 10 CFR Part 1022.14(b), that "DOE shall take appropriate steps to inform Federal, State, and local agencies and persons or groups known to be interested in or affected by the proposed floodplain/wetlands action." In view of the DOE's apparent oversight in providing direct notification of the subject Determination to the State of Nevada, please provide this Office with a description of the "appropriate steps" taken by DOE for notification of this Determination, and a list of those agencies, person, or groups (if any) that were individually informed of the DOE's February 9, 1989, Determination.

The Agency for Nuclear Projects has reviewed the subject FR Notice in accord with its duties as assigned by Nevada Statute and we are providing the following general observations and comments on the proposed action for consideration by the

Department of Energy. Additional specific comments are attached to this letter, and are intended to be incorporated as a portion of the comments of the State of Nevada.

1. In reviewing the subject FR Notice, its cited references, and additional information that is available from the DOE, it is apparent that these documents do not provide adequate and complete descriptions of the proposed specific actions and their locations for comprehensive analysis, nor do they provide adequate information on the delineations of the floodplains/wetlands and their natural environmental and ecological characteristics that are likely to be affected.

2. Although the subject FR Notice makes specific reference to Site Characterization activities as the proposed actions, it is unclear, based upon the cited references, whether the Determination is also intended to refer to repository surface facilities, should such facilities be constructed. This matter should be clarified.

3. Specific comparisons of alternative sites considered for proposed actions in floodplains/wetlands have not been discovered in the referenced materials, or other available information.

4. There is no specific discussion regarding the applicability and compliance requirements of Section 404 of the Clean Water Act relative to the proposed actions. Additional information should be provided regarding this matter.

5. The referenced materials and other available information are insufficient to permit calculations of the affects of structures proposed to be located in floodplains/wetlands on resultant flood heights and velocities.

Given the general lack of sufficient, and traditionally available, information to evaluate the proposed floodplain/ wetlands actions relative to the requirements of 10 CFR part 1022 and the relevant Executive Orders, I am requesting that the Floodplain/Wetlands Assessment, required to be prepared by DOE (10 CFR Part 1022.12), be issued in draft form for review and comment, prior to DOE's issuance of its Statement of Findings as required by 10 CFR Part 1022.15. This will enable Nevada to undertake a comprehensive evaluation of the proposed actions with respect to the requirements of 10 CFR Part 1022 and provide substantive comment to DOE in a timely and constructive manner. This request is in accord with the intent of the Regulation, as well as that of the Nevada's assigned review and oversight role pursuant to the Nuclear Waste Policy Act.

I look forward to the DOE's consideration of the comments and observations contained in this letter and its attachment. I also am awaiting your response to my above information request, and my request that a draft Floodplain/Wetlands Assessment be issued for review and comment.

Sincerely,

Robert R. Loux
Executive Director

RRL/SAF/sjc

Attachment

ATTACHMENT

NEVADA AGENCY FOR NUCLEAR PROJECTS

SPECIFIC COMMENTS

ON

DETERMINATION OF FLOODPLAIN/WETLANDS INVOLVEMENT FOR

SITE CHARACTERIZATION AT YUCCA MOUNTAIN

Facility Locations

The Nevada Agency for Nuclear Projects has reviewed plans and documents available for the design of the exploratory shaft facility and the repository surface facilities, focusing specifically on modifications to floodplains as required by 10 CFR 1022. Plans and documents reviewed included the Site Characterization Plan for Yucca Mountain, December 1988; Exploratory Shaft Facility Title I Design, December 21, 1988; and Site Characterization Plan - Conceptual Design Report, September 1987. Taken apart or together, these plans and documents provide insufficient information to ascertain the impacts of any flood event on the facilities proposed within the washes and the floodplains for either the ESF site or the repository surface facility site, and any alternative locations or designs which might minimize impacts to the washes and floodplains.

1. Referring to the ESF Title I Design, engineering drawings and design narrative do not describe the relationship between hydrologic events expected for the site and the region and the design of the facilities. Other literature presents several storm hydrographs for the Yucca Mountain area which relate to expected precipitation at the site in a general way. How these areal data affect the flood boundaries illustrated within the design drawings is not clear. Such data, if site-specific, also relate to expected flood elevations, volumes, and velocities.

   Originally, the Squires and Young Report (USGS Water Resources Investigations Report 83-4001, 1984) was to be the major tool by which the ESF location was justified and other ESF improvements were designed. The current site plans for the ESF conflict with the drawings within the Squires and Young Report in terms of flood boundaries. These differences may prove to be justified, but without specific data and calculations any alteration of the originally established flood boundaries cannot be accepted.

2. Throughout the ESF Title I drawings, channels, roads, culverts, and even buildings are depicted that may prove to have an adverse impact on the hydraulic characteristics of

the washes in the area. For example, on sheet C29, three 36-inch culverts are to be placed underneath H Road. Further up the wash, H Road enters the 100-Year Floodplain (see sheet C45 B). This illustrates that the wash does carry some significant flows as would be expected, but the impacts of placing the three culverts downstream have not been addressed, as is evident by the information presented. It is one thing to simply insure that all pad and roadway elevations are above the 100-Year Floodplain; but of concern is the impact that improvements downstream, which may not be in the floodplain, may have on the upstream improvements as a result of backwater effects.

3. Another concern that should be addressed is the affect of flood water velocities. Although the ESF site improvements proposed within the 100-Year Floodplain may be safe as far as elevation is concerned, the scour potential of flood events in the Yucca Mountain area is enormous. The borrow pit proposed is to be constructed as a channel within the floodway and the muck storage pad is to be placed adjacent to the channel at a bend. Scour at the bend not only can realign the channel, but can undermine the access road and muck storage area.

4. The ESF site improvements to the floodplain should be designed based on the expected flood conditions, and then the flood elevations recomputed based upon improvements within the floodways. From a review of the available literature, there is nothing to justify the 100-Year and PMF (500-Year) boundaries presented. It is likely the boundaries could be altered dramatically by the proposed improvements.

5. For the repository surface facilities site, no information is provided in the literature to evaluate the affects of sheet flooding on the proposed site or what floodplain modifications will be made to the site for site characterization activities and how such modifications might impact flood elevations.

6. The probability of flood damage to the structures located in the floodplain should not be discounted. Thus, it is deemed critical that a study be initiated to evaluate the impact of such a hydrological event on the performance of the proposed repository. Specifically, the study should outline the damage assessment in the event of surface support facilities' inundation on the total operation and performance of the repository.

7. The proposed barrow pit channel and the smaller channel below the ESF equipment storage area, both appear to outfall into the natural drainage ways. These drainage ways appear

to parallel and flow across the main haul road. As an alternative, the road could be built up above its natural grade, as appropriate, to keep it out of the 100-Year Floodplain, and a culvert crossing constructed (station 366+50?) to control the flow across the roadway.

8. On a project of this magnitude, where the consequences of failure are catastrophic, the elemental design cannot be based on an inadequate data base. A thorough investigation of all design parameters must be carried out, and all pertinent information gathering tools should be utilized to construct and build a sound data base for project-specific aerial distribution of rainfall, rainfall ground infiltration, and magnitude of stream channel losses. There should be a concerted effort to initiate a program to systematically collect long-term flood data within the project perimeter, so that more relevant rainfall-runoff models for the ESF site and the repository surface facility site can be studied.

9. For the ESF site, it is not clear what provisions have been made to contain spills and contaminants from flowing or being carried by storm water runoff into the floodplain from the compressor, generator building, and substation area.

10. The proposed measures of rerouting segments of several dry washes around critical facilities and straightening banks along several wash segments to "avoid adverse effects related to the location of surface facilities in the floodplain" do not address the effects of observed extensive erosion and deposition patterns characteristics of neighboring floodplains noted during field surveys. Erosion of, or deposition in channels and floodplains would be significant in the Yucca Mountain area during a 100-year flood event and could be severe during the 500-year and regional maximum floods. Ephemeral-channel systems generally undergo significant changes in depth, width, alignment, and stability with time, particularly during floods of long recurrence interval.

11. For the ESF site, considering the significant modifications proposed to be constructed in the floodway (not just the floodplain), it would seem appropriate to include the results of a backwater analysis (HEC-2) conducted on the site in the floodplain assessment. Such an analysis might assist determination of whether the improvements proposed have a positive or negative impact during flood occurrences.

12. For the ESF Title I Design, data were not issued in the Title I Design Report to allow review of specifications on "fill" areas such as allowable materials, compaction requirements, compactions techniques, and final acceptance

criteria. These are necessary considerations when considering effects of storm water.

13. ESF Title I Design drawings (DWR C-37) locate a buried fuel tank in a floodway and possibly the floodplain. The buried fuel tank for emergency generators must comply with Section 601 of the 1984 RCRA Amendments (Public Law 48-616), which provides requirements on buried fuel tanks for the protection of the environment, which were not addressed in the drawings issued.

14. According to ESF Title I Design drawing C-41, the leach field and sediment lagoon appear to be within the maximum regional floodplain boundary. If so, alternative locations should be considered, or precautions taken to minimize impacts.

15. A borrow pit is proposed (for a reason that is unclear-although it is assumed to be for site pad volumetrics) to be constructed in the form of a channel. This channel within the 100-Year Floodplain may prove to have high impacts on the ESF activities. High velocities within the channel can erode the southwestern face of the channel, causing destruction of the access roads and other facilities within Drill Hole Wash.

16. How will DOE meet the requirement in 10 CFR 1022.12 (a)(3) to address "alternative sites, actions, and no action" with respect to the Exploratory Shaft Facility. This is a crucial point of concern regarding the proposed location of the two shafts in the critical action (500-year) floodplain where, in accord with 10 CFR 1022 "even a slight chance of flooding would be too great." The Agency for Nuclear Projects as well as the Nuclear Regulatory Commission have discussed flooding hazards relative to the current shaft location with DOE in the past. In September 1988, the Agency issued a letter report to the DOE (R. Loux to C. Gertz, September 22, 1988) which documented the State's concerns with the process of exploratory shaft site selection used by the DOE. The report also discussed the concerns with respect to the flood hazard at the "preferred site location". From a review of the DOE selection process (NNWSI Exploratory Shaft Site and Construction Method Recommendation Report, SAND 84-1003), the criteria used to compare sites and the alternative locations considered did not address impacts to floodplains as contemplated by 10 CFR 1022.

Environmental Concerns

The Nevada Agency for Nuclear Projects reviewed the actions contemplated for floodplains in the Yucca Mountain area and the possible impacts on the environment of those floodplains. A site-specific literature base does not exist. Regional information is minimal and of little value in analyzing the floodplain environmental and ecological conditions and the impacts the proposed actions might present. In the absence of necessary environmental and ecological information, a series of questions are presented which should be addressed in the floodplain assessment.

1. Will a single floodplain assessment conducted in accord with 10 CFR 1022 address all affected floodplains at Yucca Mountain or will there be more than one such assessment that addresses different locations, proposed actions, and floodplains anticipated to be involved throughout the course of site characterization?

2. It is noted that the DOE Environmental Regulatory Compliance Plan (DOE/RW-0177, January 1988) for the Yucca Mountain Project states with respect to compliance with floodplain regulations that, "It is likely, however, that because no maps exist showing areas of flooding along those small washes, compliance with (10 CFR 1022) for these remote activities will not be required." The Agency would appreciate receiving from DOE an inventory of and maps for all the proposed floodplain actions at Yucca Mountain with an indication as to DOE's determination on an individual basis regarding the applicability of the regulations.

3. It would be appreciated if DOE could provide the Agency with a study plan for the floodplain assessment that describes the field studies to be undertaken, the analyses to be conducted, the alternative sites to be evaluated to avoid harm to floodplains, and the steps to be considered for minimizing floodplain damage, and for following-up of the action to verify that implementation of the selected alternative and any adopted mitigation measures proceed as described in the assessment.

4. Will the DOE Environmental Field Activity Plans (EFAPs) be revised to include field studies needed for the 10 CFR 1022 Floodplain Assessment? For example, the current ecosystems EFAP (DOE/NV-10576-14, August 1988) does not address comprehensive surveys of biota in floodplains. This consideration is important in light of some of the earlier work performed at Yucca Mountain for the DOE statutory environmental assessment which noted that unique assembledges of plants occur in floodplains and nowhere else at the site. No details on the nature of this floodplain

vegetation were provided. The assessment currently being planned by DOE should resolve that deficiency in information. The Agency's preliminary evaluation of this matter indicates that locations within the base (100-year) floodplains, e.g., the 50, 25, and 10-year floodplains frequently provide restricted favorable habitat for flora that is limited only to those specific floodplain areas by virtue of the unique soil and moisture conditions that occur there. Additionally, areas adjacent to floodplains often are underlain by shallow hardpans that have been eroded away in the floodplain itself. For this reason the desert tortoise and other important burrowing animals seek out floodplains for their burrows. The Agency's view is that field studies to be conducted by DOE in support of the floodplain assessment should address these and related issues.

5. Will the DOE Environmental Monitoring and Mitigation Plan (DOE/RW-0208, December 1988) be revised to reflect the follow-up procedures required by 10 CFR 1022.17 that will be evaluated and selected in the course of conducting the flood assessment. If not, where in the various pieces of the DOE environmental program plan will such measures be described in detail? Does DOE perhaps intend to issue a separate piece of its environmental program plan specifically to address floodplain actions and compliance procedures in light of the fact that the presently existing 15-plus pieces do not mention environmental measures associated with 10 CFR 1022?

6. Current DOE plans available to this Agency do not address the collection of soils information. 10 CFR 1022 requires that soil conditions in the floodplains be considered as part of the floodplain assessment. What soil studies are proposed for the floodplain assessment.