

COMPLIANCE DETERMINATION STRATEGY

RR2020 ADVERSE CONDITION -- DRILLING [10 CFR 60.122(c)(19)]

REGULATORY PRIMARY CITATION:

10 CFR 60.21(c)(1)(ii)(B)

PASS ID OF THE COMPLIANCE DETERMINATION STRATEGY:

RR2020/NS0001

TYPES OF REVIEW:Acceptance Review (Type 1)
Safety Review (Type 3)RATIONALE FOR TYPES OF REVIEW:Acceptance Review (Type 1) Rationale:

This regulatory requirement is License Application-related because, as specified in the License Application content requirements of 10 CFR 60.21 and the Format and Content Regulatory Guide (NRC, 1990), it must be addressed by DOE in its License Application. Therefore, the staff will conduct an Acceptance Review of the License Application for this regulatory requirement.

Safety Review (Type 3) Rationale:

This regulatory requirement is related to radiological safety and waste isolation. It is a requirement for which compliance is necessary to make a safety determination for construction authorization as defined in 10 CFR 60.31 (i.e., regulatory requirements in Subparts E, G, H, I and 10 CFR 60.21). Therefore, the staff will conduct a Safety Review of the License Application to determine compliance with the Regulatory Elements of Proof for this regulatory requirement.

This regulatory requirement, concerning a potentially adverse condition (PAC), focuses on the demonstration, through appropriate investigations, of the presence of (or conversely, the absence of) boreholes drilled for any purpose within the site. In addition, such investigations are to include the area outside of the site if the presence of the PAC could affect isolation within the controlled area. Safety implications potentially arising as a result of drillholes might include: (1) adverse effects on the groundwater flow system; (2) the creation of preferential pathways for infiltrating waters or for released gaseous radionuclides; and (3) the shortening of flow paths and potential radionuclide transport pathways through the unsaturated zone below the repository horizon. Pre-site characterization drillholes, as well as those drilled for site

characterization purposes, may be perceived by future explorationists as evidence of mineralization. Such drillholes constitute a post-closure consideration of the regulatory requirement for naturally occurring materials (10 CFR 60.122(c)(17)). This perception may result in natural resources-related exploration activities (including boreholes) that may affect isolation within the controlled area. Such effects would be evaluated under the regulatory requirement for the overall system performance objective after permanent closure (10 CFR 60.112).

The scope of this regulatory requirement is limited to the consideration of evidence supporting or negating existing (pre-site characterization) drilling for any purpose. This regulatory requirement does not include consideration of boreholes resulting from the DOE's site characterization activities. However, the staff recognizes that the presence of such boreholes may increase the likelihood that future explorationists will investigate the area for natural resources. Staff concerns that such site characterization excavations may become pathways possibly compromising the ability of the repository to meet the performance objectives are to be considered under the design criteria for the Geologic Repository Operations Area (see 10 CFR 60.134 -- Design of Seals for Shafts and Boreholes).

DOE is required to: (1) examine the proposed site (and the region beyond the site, as appropriate), to determine if drilling for any purpose has occurred there; and (2) examine appropriate documents (including mining claims, historical and other maps, and air photos) for suggestions of drilling locations.

This regulatory requirement will be reviewed by the staff as a Type 3 (Safety Review). Should future analyses and/or data arise such that this initial assessment is questioned, the type of review this regulatory requirement should receive will be reassessed in light of the additional information (CNWRA, 1992).

The Regulatory Element of Proof (REOP) identified on page five is considered to fall within the criteria for a Type 3 review because it represents a 10 CFR Part 60 citation which is related to radiological health and safety. There are no uncertainties identified in the regulatory language. For the REOP, the analysts drew the conclusion that a safety determination could be made by evaluating the technical information submitted by DOE in the License Application. Additionally, in the analysts' opinion, the information to be reviewed would be such that no additional analyses or tests (Types 4 or 5 review) would be required because sufficient easily required technical knowledge exists to allow for an adequate investigation and evaluation of the acquired information.

To summarize, the following statements and assumptions have been made in developing this CDS:

The proposed Yucca Mountain site is located in a natural resources-rich geologic setting that has included exploration/exploitation of precious metals and other valuable resources.

4

In addition to natural resources-related exploratory boreholes, this Regulatory Requirement is limited to the consideration of evidence for supporting or negating existing (pre-site characterization) holes drilled for any purpose, including those drilled for either scientific or military purposes.

Boreholes drilled for site characterization-related activities are to be considered by the staff under other Regulatory Requirements.

REVIEW STRATEGY:

Acceptance Review (Type 1):

In conducting the Acceptance Review of this potentially adverse condition (PAC) [drilling -- 10 CFR 60.122(c)(19)], the reviewer should determine if the information presented in the License Application and its references for demonstrating compliance with this potentially adverse condition requirement is complete in technical breadth and depth as identified in NRC, 1990. All appropriate information necessary for the staff to review the evidence supporting the absence of (or conversely, the presence of) existing drilling within the site and beyond the site (if considered necessary).

The information in the License Application should be presented in a manner such that the assumptions, data, and logic leading to a demonstration of compliance with the requirement are clear and do not require the reviewer to make extensive analyses and literature searches. The reviewer should also determine that controversial information and appropriate alternative interpretations and models have been adequately described and considered.

Finally, the reviewer should determine if DOE has either resolved all the NRC staff objections to the License Application that apply to this requirement or has provided all the information requested in Section 1.6 of NRC (1990) for unresolved objections. The reviewer should evaluate the effect of any unresolved objections, both individually and in combinations with others, on: (1) the reviewer's ability to conduct a meaningful and timely review; and (2) on the Commission's ability to make a decision regarding construction authorization within the three-year statutory period.

Safety Review (Type 3):

In conducting the Safety Review, the reviewer will, at a minimum, determine the adequacy of the data and analyses presented in the License Application to determine DOE's compliance with 10 CFR 60.122(c)(19). Specifically, DOE will need to: (1) provide information to determine whether and to what degree the potentially adverse condition is present; (2) provide information to determine to what degree the PAC is present, but undetected; (3) assure the sufficiency of the lateral and vertical extent of data collection; and (4) evaluate the information presented under items (1) and (2), with assumptions and analysis methods that

adequately describe the presence of the PAC and ranges or relevant parameters. The reviewer should determine that DOE's evaluations use: (1) analyses that are sensitive to the potentially adverse condition; and (2) assumptions which are not likely to underestimate its effects.

The Acceptance Review criteria are identified in section 3 of this review plan. If the License Application is found to be acceptable, those specific aspects of the License Application on which a reviewer will focus are discussed in NRC, 1987 and 1990.

In order to conduct an effective review, the staff reviewer will rely on his own expertise and independently-acquired knowledge, information, and data in addition to that which may be provided by DOE in its License Application. For example, historical mine location maps for Nevada (e.g., The Clayson Map Company (1907) and Nevada Bureau of Mines (1932)) are considered invaluable, and should be acquired by the staff. These maps show a mining camp on the eastern flank of Yucca Mountain. The presence of the mining camp could be perceived as an indication of the proximity of valuable mineral resources. If this is the case, it would not be unreasonable to assume that exploratory drillholes may have played a role in the location and subsequent development of the mining property. Therefore, it is incumbent upon the staff reviewer to have personally acquired a body of both drilling and mining-related knowledge in anticipation of conducting the Safety Review. The staff reviewer should have available specific documents (reports) bearing on this matter that were commissioned by the NRC - see Raney (1989), Raney (1990), and Raney and Wetzel (1990). Other relevant documents, such as Castor *et al.* (1990), Cornwall (1972), Cornwall and Norberg (1978), Fenske and Carhahan (1975), Garside, *et al.* (1988), Hess and Weimer-Purkey (1991), *Nevada Oil Reporter* (1991), Quade and Tingley (1983), Thordarson and Robinson (1971), Trexler *et al.* (Undated), State of Nevada/Department of Minerals (1990), and Science Application International Corporation/The Desert Research Institute (1990), that have been commissioned by DOE (and by others), and should also be acquired by the reviewer in anticipation of the submittal of the License Application.

Additional examples of specific review activities that will be required of the staff following receipt of DOE's License Application include: (1) confirmation that DOE has fully considered the most recent information regarding the existence of past drilling associated with mining-related activities as well as drilling for other purposes (such as groundwater, irrigation and scientific purposes) that are appropriate for the analysis; and (2) confirmation that DOE's regional investigations for past drilling activities, which have been limited to a 10-kilometer radius around the perimeter drift outline, is sufficient to assure that adequate information has been acquired to fully consider the impact (if any) of such drillholes (if such exist) on meeting the overall system performance objective (10 CFR 60.112). DOE indicates in its 1988 Site Characterization Plan (SCP) that it's investigations relative to this regulatory requirement are complete (DOE, 1988, p. 1-353). As such, DOE has determined that no additional investigations are planned to further address this subject.

6

However, in its SCP, DOE has not provided the bases underlying its decision to limit its existing drillholes investigations to the area within 10 kilometers of the perimeter drift outline. If the controlled area is defined by DOE at its maximum extent of 10 kilometers from the outer boundary of the underground facility, then DOE's investigations of drilling activities greater than 10 kilometers from the geologic repository operations area would have to be presented in order to satisfy the requirement that the PAC "outside the controlled area" be investigated only if it might affect waste isolation. The staff reviewer is to determine if such bases are included within the License Application and are appropriate in determinations of the effects of existing drilling on waste isolation at Yucca Mountain.

Contributing Analysts:

NRC Staff: Neil Coleman, Harold Lefevre, James Park

CNWRA Staff: Michael Miklas

Date of Analyses: July 17, 1992

RATIONALE FOR REVIEW STRATEGY (OPTIONAL):

Not applicable.

APPLICABLE REGULATORY ELEMENT OF PROOF:

Type 3:

REOP

RR2020/EP0100

REFERENCES CITED:

- Castor, S.B., Feldman, S.C., and Tingley, J.V., "Mineral Evaluation of the Yucca Mountain Addition, Nye County, Nevada," Nevada Bureau of Mines and Geology. Open-File Report 90A, 1990. [Report prepared for the U.S. Department of Energy.]
- Center For Nuclear Waste Regulatory Analyses, "Development of Compliance Determination Strategies," Report to the U.S. Nuclear Regulatory Commission/Division of High-Level Waste Management, TOP-001-11 (Rev. 0), April 30, 1991, 35p.
- Cornwall, H.R., "Geology and Mineral Deposits of Southern Nye County, Nevada," Nevada Bureau of Mines and Geology and the Mackay School of Mines, Bulletin No. 77, 1972. [Report prepared cooperatively by the Nevada Bureau of Mines and Geology, the Mackay School of Mines, and the U.S. Geological Survey.]

7

Cornwall, H.R., and Norberg, J.R., "Mineral Resources of the Nellis Air Force Range and the Nellis Bombing and Gunnery Range, Clark, Lincoln and Nye Counties, Nevada," U.S. Geological Survey/U.S. Bureau of Mines, 1978. [Report prepared for the Department of the Air Force.]

The Clawson Map Company, "[Map of] Nevada and the Southeastern Portion of California," Denver, Colorado, 1907.

Fenske, P. R., and Carnahan, C.L., "Water Table and Related Maps for Nevada Test Site and Central Nevada Test Area," Water Resources Center/Desert Research Institute, University of Nevada-Reno, Report NVO-1253-9, 1975. [Prepared for the U.S. Energy Research and Development Administration, Nevada Operations Office.]

Garside, L.J., Hess, R.H., Fleming, K.L., and Weimer, B.S., "Oil and Gas Developments in Nevada," Nevada Bureau of Mines and Geology, University of Nevada-Reno, Bulletin No. 104, 1988.

Hess, R.H., and Weimer-Purkey, B., compilers, "Oil and Gas Wells Drilled in Nevada Since 1986," Nevada Bureau of Mines and Geology, University of Nevada-Reno, NBMG List L-8, 1991.

Nevada Bureau of Mines, "Prospectors' and Miners' Map of Nevada -- 1907," in "Map of Nevada Showing Locations of Mining Districts," University of Nevada-Reno, Pacific Coast Blueprint Company, San Francisco, California, Bulletin Volume XVI, No. 4 [Plate 1], 1932.

Nevada Oil Reporter, "Monthly summary of oil and gas activity in the State of Nevada," Ehní Enterprises, Inc., Carson City, Nevada, November 1991.

Nuclear Regulatory Commission/Office of Nuclear Regulatory Research, "Standard Format and Content of Site Characterization Plans for High-Level Waste Geological Repositories," Regulatory Guide 4.17 (Rev. 1), March 1987.

Nuclear Regulatory Commission/Office of Nuclear Regulatory Research, "Draft Regulatory Guide DG-3003 -- Format and Content For the License Application for the High-Level Waste Repository," Regulatory Guide DG-3003, November 1990.

State of Nevada/Department of Minerals, "Oil & Gas Permit Notices (Permit Numbers 605-607, issued December 14, 1990)," 1990.

Quade, J., and Tingley, J.V., "A Mineral Inventory of the Nevada Test Site, and Portions of Nellis Bombing and Gunnery Range, Southern Nye County," Nevada Bureau of Mines and Geology, University of Nevada-Reno, 1983. [Prepared for the U.S. Department of Energy.]

Raney, R.G., "Mines, Prospects, and Mineral Locations in Clark, Esmeralda, Lincoln, and Nye Counties, Nevada, Inyo County, California, and Portions of Mono and San Bernardino Counties, California," U.S. Bureau of Mines, 1989. [Report to the Nuclear Regulatory Commission.]

8/8

Raney, R.G., "Active Mines and Prospects Within a Thirty-Mile Radius of the Proposed High-level Repository Site at Yucca Mountain, Nye County, Nevada, Subsequent to January 1988 (As of July 1990)," U.S. Bureau of Mines, 1990. [Report to the Nuclear Regulatory Commission/Division of High-Level Waste Management.]

Raney, R.G., and Wetzell, N., "Natural Resources Assessment Methodologies for the Proposed High-Level Waste Repository at Yucca Mountain, Nye County, Nevada." U.S. Bureau of Mines, 1990. [Report to the Nuclear Regulatory Commission.]

Science Application International Corporation/The Desert Research Institute, "Nevada Draft Special Report," Report No. DE-AC08-88NV10715, 1990. [Report prepared for the Department of Defense.]

Thordarson, W., and Robinson, B.P., "Wells and Springs in California and Nevada within 100 Miles of the Point 37 deg. 15 min. N., 116 deg., 25 min. W., on Nevada Test Site," U.S. Geological Survey, USGS-474-85, 1971.

Trexler, D.T., Koenig, B.A., and Flynn, T., "Geothermal Resources of Nevada and Their Potential for Direct Utilization," Nevada Bureau of Mines and Geology, University of Nevada-Reno, Undated. [Prepared for the U.S. Department of Energy, Division of Geothermal Energy.]

U.S. Department of Energy, "Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," Office of Civilian Radioactive Waste Management, DOE/RW-0199, 9 Vols., December 1988.