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MEMORANDUM FOR: Regis G. Boyle, Group Coordinator
Institutional and Environmental
Concerns Review Group

THRU: John J. Surmeier, Section Leader
Policy Analysis Section

FROM: Rob MacDougall
Policy Analyst

SUBJECT: COMMENTS ON 18 NOVEMBER DRAFT SITE CHARACTERIZATION ANALYSIS OF BWIP SITE SCREENING PROCESS

I have reviewed the latest available draft of the attached document, and as requested have attached it with marginal notes, comments, and suggestions. In general, it appears a good deal stronger, but I believe the conclusions do not reflect the intent of 10 CFR 60. Overall, I recommend that we:

1. State at the outset that the purpose of this chapter of the SCA is to evaluate the extent to which the information in DOE's SCR fulfills the requirements of Section 60.11(a), subparagraphs (2) through (5), and cite these provisions in full to show their applicability to DOE's site selection process.

2. Conclude that since subparagraph (a)(2) requires a description of "the criteria used to arrive at the candidate area," and (a)(3) and (a)(5) require, respectively, a description of the "method" and the "decision process" by which the site was selected for characterization, much of the discussion of the site screening process within the Pasco basin is irrelevant to the criteria, method, and decision process by which the Pasco basin was selected as a candidate area in the first place. Indeed, the SCR itself says on page 2.0-2 that the "overall goal [of the site screening process carried out by BWIP] was to identify a reference repository location (i.e. preferred site) and an alternate repository location within the Hanford Site."

3. As the bottom line for this SCA chapter, tell DOE that without following the provisions of 10 CFR 60.11(a) for a comprehensive description of the site screening process, DOE is proceeding with BWIP site characterization at its own risk. It is therefore

OFC	:WMPI	:WMPI	:	:	:	:	:
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incumbent on DOE to provide at the earliest possible time all the required information on how it came to select the Hanford site, so that the States, tribes, and interested members of the public may comment.

Rob MacDougall
Policy Analyst

Enclosure: Markup of Draft SCA
Chapter 3.

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Memo to: Regis Boyle
Ron Ulrich
Rob MacDougall
Bob Striegel

From: Chris Pflum

Subj: Chapter 3 of the SCA: Site Screening Process used at BWIP (draft #3)

Date: 18 Nov '82

This version of chapter 3 includes the WMPI comments. Feel free to make any changes you like (I thrive on criticism) but make your changes on the document, rather than preparing a critique.

Document Name:
BWIP DSCA/CH 3/PFLU"

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Comments of Rob MacDougall, WMPI

I still think our analysis should more explicitly track compliance with 60.11(a), especially ¶'s (1) thru (5). An introductory paragraph stating this as the purpose of our analysis would be helpful.

3 SITE CHARACTERIZATION ANALYSIS: THE SITE SCREENING PROCESS USED AT THE BASALT WASTE ISOLATION PROJECT (BWIP)

Introduction

The Basalt Waste Isolation Project (BWIP) is considering the thick basalt sequence of the Columbia Plateau for siting a repository for radioactive wastes. The Columbia Plateau covers 78,000 mi², extending across southeast Washington and parts of Idaho and Oregon. In 1976, DOE began site feasibility studies in the Columbia Plateau to assess the hydrologic and geologic properties of basalt. The purpose of these investigations was: "...to provide geologic and hydrologic information necessary to identify areas beneath the Hanford Site that have a high probability of containing basaltic rock suitable for a nuclear waste repository." (Refs. 1,2)

From its beginning, BWIP had decided to locate the candidate repository site on the Hanford Reservation. This decision was consistent with a recommendation by the National Academy of Services (NAS) to consider the Rattlesnake Hills, at Hanford, as a possible storage site for nuclear wastes (Ref. 15). The NAS surmised that a nuclear waste repository could be excavated between the perched water table, high in the hills, and the main water table.

Do we need to say this? Sounds like we're flacking for DOE.

This rationale doesn't seem to track DOE's, at least on p. 2.0-2 of SCR.

In addition, DOE had its own reasons for selecting Hanford for a potential repository site. First, Hanford is owned by the federal government and has been committed to nuclear activities since 1943. Second, considerable geologic and hydrologic data has been gathered on the Pasco Basin. Much of this data is closely aligned with the objectives of finding a site for a nuclear waste repository (Refs. 2,3). And third, the Pasco Basin's nearly uniform physical characteristics and thick basalt flows make it an attractive site for a repository (Ref. 5).

in the view of DOE's contractors; we can't (& shouldn't) judge at this point.

That's because finding a repository site was the purpose of these studies. Sounds like we're saying DOE has good reasons for selecting Hanford because it's "studied" so much, not because studies' conclusions so warranted.

At one point in the site screening process, DOE evaluated 4 subareas (each approximately 100 mi²) located outside the Hanford boundry but within the Pasco Basin. Three subareas were dropped because of "land use and hydrological conflicts." The remaining subarea was dropped because of "conflicts in land use, hydrology, bedrock dip and tectonic stability. DOE concluded from this evaluation: "Because no area of the Pasco Basin outside of the Hanford Site was found to be obviously superior to areas within the Hanford Site, further study to identify (repository) site localities was concentrated on the subareas of the Hanford site." (Ref. 4)

The DOE has given some good reasons for selecting Hanford as the geographic starting point for the BWIP site screening program. However, the National Plan for Siting High-Level Radioactive Waste Repositories (National Siting Plan, Ref. 7) does not elaborate on these reasons. Using the National Siting Plan, a screening program would pass through national and regional survey before reaching a candidate area stage; the point where the BWIP site-screening program begins. Because of its wider scope, the National Screening Plan uses different screening guidelines than BWIP. Consequently, the NRC will find it difficult to compare the Hanford Site to those which have benefited from National and Regional Surveys and were selected by a different set of screening guidelines (e.g. Paradox Basin and Permian Basin).

3.2 The BWIP Site Screening Process

The site screening process at Hanford was developed from three objectives:

- maximize public health and safety
- minimize adverse environmental and socioeconomic impacts
- minimize system costs

Before these objectives could be realized, some assumptions had to be made on how a repository would be constructed, how it would operate and what impacts it may have. These assumptions are listed in reference 5.

Having established their objectives and made their assumptions, DOE prepared screening guidelines. The guidelines where depicted on map overlays and applied in four steps to areas under study. Each step successively reduced the land area that would be considered in the following step. At the end of each step the following areas were defined:

Step 1 - candidate area (several hundred mi^2)
Step 2 - subarea (approximately 100 mi^2)
Step 3 - site locality (up to 50 mi^2)
Step 4 - candidate site (approximately 10 mi^2)

The overlay process ended with nine candidate sites. At this time the screening process discontinued using overlays and began to rank the candidate sites using a dominance analysis technique. This technique found that the candidate sites overlying the Cold Creek syncline were the most suitable for a repository.

The final phase of site-screening identified a reference repository location (RRL) within the Cold Creek syncline. Again, a ranking process compared and evaluated the candidate sites, but with the benefit of more detailed and recently acquired technical data. This enlarged data base is referred to as a Criteria Matrix (Ref. 5). Data collection for this final phase of site screening ended on May 16, 1980, although updates of specific information continues.

3.3 NRC Review of the BWIP Site Screening Process

The BWIP screening process can be divided into three phases: each distinguished by its screening criteria. In the first phase, screening guidelines - applied through map overlays - reduced the screening area from the Pasco Basin (1,600 mi^2) to nine candidate sites (each approximately 10 mi^2). In the second phase, ranking factors selected the Cold Creek syncline area through a comparative evaluation of the nine candidate sites. In the final phase a Criteria Matrix delineated the reference repository location. Each phase has its own set of screening criteria: phase 1; screening guidelines, phase 2; ranking factors, and phase 3; a Criteria Matrix. The staff's review of these screening criteria follows.

3.3.1 Screening Guidelines

Like repository programs in other media, BWIP follows the programs and objectives of the National Waste Terminal Storage Program (NWTS). NWTS has prepared site performance criteria which..."delineate characteristics a site must have to ensure that the disposal system will perform as required" (Ref. 12). The NWTS performance criteria are general, but, nevertheless, important. Unless each repository program builds their site-screening guidelines from the NWTS criteria, there can be no common basis for comparing alternative repository sites in different geologic media. Without a comparative analysis of alternative repository sites, NRC may be unable to prepare an Environmental Impact Statement (EIS) for its decision to authorize the construction of a geologic repository.

The SCR states: "Siting criteria being applied to selecting a repository site within the Hanford site are comparable, however, to those resulting from the national screening process as discussed in Chapter 2." In chapter 2, the SCR states that reference 13, Comparison of NWTS-33(2) Criteria and Basalt Waste Isolation Project Screening Considerations, shows that the screening process used to identify the site of a proposed exploratory shaft (at Hanford) is compatible with the NWTS site qualification criteria for geologic repositories.

In reference 13, DOE compares the BWIP site screening guidelines with a draft version of the NWTS performance criteria (ONWI-33(2)) which differs from the final version (NWTS-33(2)). The staff finds that the BWIP site screening criteria differ from the final NWTS criteria in the following ways:

1. NWTS criteria for geohydrology states that the site will have characteristics:

   a. compatible with retrieval
   b. that will minize contact time between groundwater and wastes
   c. that will permit modeling to show that present and probable future conditions have no unacceptable impact on repository performance

BWIP has no site-screening criteria for the above concerns.

2. NWTS criteria for geochemistry states that the site:

a. will have characteristics compatible with retrieval

b. will be located so that chemical interactions between radionuclides, rocks, groundwater, or engineered components will not unacceptably affect system performance

BWIP has no site-screening criteria for the above concerns.

3. NWTS criteria for geologic characteristics states that the site will have characteristics compatible with retrieval.

The BWIP criteria do not.

4. NWTS criteria for human intrusion states that the site's resources, such as water, should be evaluated to assess the likelihood of human intrusion.

BWIP has similiar criteria for mineral resources but does not include water.

5. NWTS criteria for demography states that the site shall be located such that risk to the population from transportation of radioactive waste can be reduced below acceptable levels to the extent reasonably achievable.

BWIP did not consider transportation guidelines until the locality phase of site screening. The transportation guideline would exclude repository sites within 0.6 miles of highways, interstate highways, railroads and navigable waterways (Ref. 6). The NRC concurs that for safety reasons a repository should not be built along a transportation corridor. At the same time, however, a repository should be accessible to the sources of high-level radioactive waste (HLW).

At some point in the site screening process, DOE should have evaluated the impact of transporting HLW, across the nation, to Hanford, Washington. National transportation guidelines are or will be established for repository

programs investigating non-DOE land (Ref. 7). If BWIP does the same, perhaps in one of their semi-annual reports, NRC could compare Hanford's transportation impacts to those at other repository sites. The staff recommends that in the future, transportation impacts from construction and operation of a repository be given thorough consideration before the locality phase of the site-screening process, since transportation impacts will not be limited to the locality of the proposed site alone.

The NWTS National Siting Plan lists site-performance criteria ~~guidelines~~ which are ~~consistent with but~~ more comprehensive than the screening guidelines used at Hanford. The NRC staff found that the National Siting Plan has developed criteria in the following areas that were not included in the BWIP screening guidelines:

1. geohydrological regime
2. hydrological regime/shaft construction
3. subsurface rock dissolution
4. geochemical interactions with the waste package
5. engineering feasibility
6. uplift or subsidence rates
7. exploration history
8. subsurface hydrological system
9. meteorological concerns
10. human proximity
11. normal and extreme environmental conditions.

The differences between BWIP and NWTS does not mean the two are inconsistent. ~~The~~ Differences, however, will complicate the NRC's comparison of repository site-selection processes in different geologic media. Already, the Office of Nuclear Waste Isolation (ONWI), which is investigating domal salt for a potential repository site, is using different terminology than BWIP. For example reference 14, an ONWI document, calls each of seven salt domes a "candidate site" while the same term does not appear in the BWIP program until DOE was fairly certain where the repository would be located. Likewise, reference 14 refers to a "repository location" but does not define its size.

It does appear to mean that BWIP guidelines fail to encompass all the factors that could affect repository performance at a Hanford site.

are incomplete at this time, since they

Now we're saying there are inconsistencies elsewhere. Is there a special reason for the pt. in the 1st sentence?

Differences in scope between the two screening documents, if not rectified in future DOE submittals on BWIP, will make it difficult for NRC to make a timely

At BWIP a repository location can cover up to 50 mi (except for the reference repository location which covers 18 mi²).

DOE acknowledges that there will be variations in the screening process, depending upon where it is applied. The BWIP screening process begins at a greater level of detail than the National Siting Plan since two screening steps, National surveys and Regional surveys, were omitted in the BWIP program. Consequently a particular screening guideline which would be useful at a National or Regional level may not distinguish one site from another within Hanford's 620 mi². For example, the National Siting Plan has screening criteria for meteorological concerns but BWIP does not because the entire Pasco Basin has the same climate.

3.3.2 Ranking Factors

In phase II of the screening process, five ranking factors evaluated the nine candidate sites. The ranking factors are:

- distance to discharge
- structural geologic conditions
- site biological impacts
- distance to potentially hazardous facilities
- potential for repository expansion

Site attributes were listed under each ranking factor. The attributes correspond to conditions at the candidate sites. Each attribute was given a numerical value designating its importance. For example, under the ranking factor, "potential for repository expansion," a site attribute which would allow expansion for say 6 miles would be given a higher value than one which would allow expansion for 2 miles. The attribute values for each site were totalled and the sites with the highest score were considered the most suitable.

Numerical ranking was useful at Hanford because of the surface and subsurface variability among the candidate sites. However, assigning numerical values to

qualitative attributes, for example, wildlife habitat, can be subjective. Researchers in other repository programs may assign a different value to the same attribute creating inconsistencies in their respective screening programs.

3.3.3 Criteria Matrix

The final phase of the BWIP screening program continues the ranking process with more detailed and recent data. A Criteria Matrix assigned a numerical value to an expanded list of attributes for each candidate site. The Criteria Matrix was developed from assumptions on baseline repository conditions.

One of the baseline assumption states that liquid defense waste may be placed in the repository. This is inconsistent not only with draft 10 CFR 60.135(c)(1) (wastes shall be in solid form) but also with the HLW programs at Savannah River and West Valley. Both programs have prepared environmental impact statement for solidifying their liquid high-level waste (Refs. 8,9), and Savannah River has already selected borosilicate glass to be its waste form. (Ref. 10) The DOE should not assume that liquid HLW will be placed in a repository licensed by the NRC.

3.4 Conclusion

The staff concludes, from its analysis of the BWIP site-screening program, that the reference repository location is as good as any other site within the Pasco Basin. The staff found some differences between the BWIP and NWTS siting criteria. These differences can be attributed to the different geographic starting point for each screening process. The differences do not indicate that the NWTS and BWIP site-screening guidelines are inconsistent or that the BWIP guidelines were ineffective. The differences, however, will complicate a comparison between the BWIP site-screening process to those which have followed the NWTS guidelines more closely (eg. the Paradox and Permian Basin).

The NRC will be required to prepare an environmental impact statement (EIS) to support its decision to authorize the construction of a geologic repository.

Under the provisions of the National Environmental Policy Act (NEPA) and the NRC procedural rule (46 FR 13973), the alternative repository sites, presented in the EIS, must be among the best that can reasonably be found. Before the staff can affirm that the Hanford reference repository location is a reasonable alternative, the staff must find that alternative candidate areas throughout the U.S. are not obviously superior to Hanford.

The NRC procedural rule defines a candidate area as a "...geologic and hydrologic system within which a geologic repository may be located" (10 CFR 60.2(a)). Under this definition, the Pasco Basin would be a candidate area. The procedural rule further states that a site characterization report should include "...the criteria used to arrive at the candidate area" (10 CFR 60.11(a)(3)). The BWIP-SCR, however, does not adequately show why the Pasco Basin was selected for characterization over other candidate areas. Without knowing how the Pasco Basin compares with other candidate areas, the staff cannot state, at this time, that the Pasco Basin (i.e., the Hanford candidate area) is a reasonable alternative for a repository site.

The staff recommends that DOE ~~the BWIP semiannual reports~~ explain why the Pasco Basin was selected for ~~characterization over other~~ candidate areas. The staff recognizes that Hanford's dedication to nuclear activities gives it some institutional and land use advantages over sites that are not. But DOE owns land in South Carolina, Idaho, and New Mexico that is also dedicated to nuclear activities. The semiannual report should explain why these areas were not considered, with Hanford, as potential repository sites.

The staff also recommends that the National Siting Plan compare the advantages of building a repository on a nuclear reservation to the advantages realized through National, Regional, and Area surveys. Arguments can be made, for and against, concentrating nuclear activities at the same site. In a draft report (Ref. 16), DOE states: "Multiple regional repositories will distribute the risk and the environmental, socioeconomic, and potential burdens across the country rather than concentrating them in one region." The National Siting Plan should explain why colocating repositories would be a burden while siting a repository with some other nuclear facility would be an advantage.

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