

WM Record File  
106.2

WM Project 16  
Docket No. \_\_\_\_\_  
PDR   
LPDR

*See Pocket for  
Enclosure*

Distribution:  
REB JOB CFR RDM RJohnson  
MSB HJM DRM WKerr JLinahan  
(Return to WM, 623-SS) R. Trojanowski, II C2

WM DOCKET CONTROL  
CENTER

**DEPARTMENT OF ENERGY & TRANSPORTATION**

Watkins Building, 510 George Street  
Jackson, Mississippi 39202-3096  
601/961-4733

'84 NOV 28 A11:35

November 26, 1984

Mr. Roger W. Gale, Director  
Office of Policy, Integration and Outreach  
Office of Civilian Radioactive Waste Management  
U. S. Department of Energy  
Washington, D.C. 20585

Dear Mr. Gale:

Please find enclosed the comments of the State of Mississippi on Chapters three, four, five and six of the working papers Fourth Draft of the Environmental Assessments of the Richton and Cypress Creek Salt Domes. This document was reviewed by the staff of the Mississippi Mineral Resources Institute as a part of the Institutions of Higher Learning under contract to METB.

These comments were concurred in by both the Nuclear Waste Technical Review Committee and the Policy Advisory Council. They were approved by the Board of the Mississippi Department of Energy and Transportation for submittal at its regularly scheduled November meeting.

We appreciate the opportunity of commenting on these working papers and look forward to reviewing and commenting, officially, on the Public Draft, which we understand is to be released on December 20, 1984.

Very truly yours,

*Wilbur G. Ball*

Wilbur G. Ball  
Executive Director

WGB:gpf  
Enclosure

cy: Mr. Robert Browning w/ Enclosure  
Mr. Charlie Blalock w/o Enclosure  
Mr. Clyde Sellers w/o Enclosure

8501070460 841126  
PDR WASTE  
WM-16 PDR

792

*Enclosure to 11/26/84  
Memo from Ball  
to Gale*

**MMRI NUCLEAR WASTE ISOLATION TEAM  
COMMENTS ON THE FOURTH DRAFT OF  
THE ENVIRONMENTAL ASSESSMENTS  
OF THE RICHTON AND CYPRESS  
CREEK SALT DOMES**

**(E.A.'s Available for Comparison:  
Richton, Cypress Creek, Vacherie,  
Lavender Canyon, Swisher County,  
and Deaf Smith County)**

**October, 1984**

**COMMENTS ON THE FOURTH DRAFT OF  
THE ENVIRONMENTAL ASSESSMENTS  
OF THE RICHTON AND CYPRESS  
CREEK SALT DOMES**

**INTRODUCTION**

The following comments on the environmental assessments are presented on a chapter basis with each chapter being further divided into three classes. Class I comments cover high priority issues that should be thoroughly reviewed and commented on by DOE. Class II comments deal with less important geologic, ecologic, and engineering questions and with the unequal and often inadequate levels of information available for comparison of the Richton and Cypress Creek sites with other potential repository sites. Class III remarks cover lowest priority comments about the general quality of the E.A.'s.

The information available to us for comparison consisted of chapters three, four, five, and six of the Richton, Cypress Creek, Vacherie, Lavender Canyon, Swisher County, and Deaf Smith County E.A.'s.

Citations of the "Siting Guidelines" refer to the May 14, 1984, revision of the November 18, 1983, Siting Guidelines.

## CHAPTER THREE

### Class I

#### Comment #

#### 3.2.5.1 - Faulting

1. Faulting has been identified in the vicinities of all six sites. However, documentation of Quaternary movement along the faults has not been verified for any of the sites.

In the Gulf Interior Region, faults related to the deposition of salt have been identified. Although little relevant information is available, according to section 5.2.2.1 of the Mission Plan, some faults are "hypothesized to have had movement during the past 2 million years (the Quaternary Period".

#### 3.2.5.2 - Seismicity

2. The E.A.'s indicate low seismic activity in all the sites reviewed. However, the Cypress Creek and Richton E.A.'s state that "conclusive evidence to prove lack of movement has not been developed for some faults such as the Phillips, F-7 and F-9". These faults are particularly close to the Richton site, and the F-7 fault actually abuts Richton Dome. Since Quaternary movement on these faults has not been proven or disproven, this information will have to be obtained prior to repository selection.
3. The Richton and Cypress Creek E.A.'s also state that "No historical earthquake has had associated surface fault rupture." It seems relevant to note here that since the repository is to be located at least 200 meters beneath the surface, "surface fault rupture" is not necessary to produce serious problems in repository structures and waste isolation.

#### 3.2.5.4 - Uplift and Subsidence

4. The Richton and Cypress Creek E.A.'s state (in section 3.2.1):

"Since early Pleistocene (preglacial) time, the Mississippi Salt Basin has undergone uplift..." and is "situated in the uplifting margin of the Gulf Coast Geosyncline".

Various forms of geomorphic evidence indicate Quaternary uplift in the Richton and Cypress Creek areas. Recent studies report current uplift but are variable concerning the rate of movement involved. One such study indicates possible Quaternary uplift of up to 1312 feet which the Richton and Cypress Creek E.A.'s dismiss as being "well in excess of

uplift that could have occurred given the geologic conditions at Richton [Cypress Creek] Dome". We strongly recommend that Quaternary uplift at the Mississippi sites be thoroughly investigated prior to repository selection.

As a topographic high is located over the Richton Dome, it is particularly likely that this dome has undergone Quaternary uplift. According to Billings (1972, Structural Geology):

"Topographically expressed salt domes have probably been active in relatively recent times. Moreover, if Pleistocene or Recent gravels on the dome are uplifted relative to their position in the surrounding region, it is obvious that the salt has been active during the Quaternary."

#### 3.2.5.6 - Diapir Development

5. All of the salt dome sites are reported by the E.A.'s to be in "a postdiapiric stage of dome evolution". Site-specific studies will have to be done in order to determine rates of movement of salt in these domes. Even though sedimentation has ceased in the Gulf Interior Region, vertical pressure exerted by overlying sediments combined with the relatively low specific gravity of salt favors continued upward migration of the salt in existing domes.

#### 3.2.5.7 - Dissolution

6. Evidence for dissolution exists at all salt dome sites in the confirmed presence of caprock. Topographic lows over Vacherie and Cypress Creek Domes indicate that dissolution is progressing at a more rapid rate than vertical movement of the salt. This situation has been cited as evidence for cessation of diapiric movement in these domes. At the same time, the presence of a general topographic high over Richton Dome, as evidenced by radial drainage of the dome area, has been ignored in the E.A.'s as possible evidence for continued diapiric movement at Richton Dome. These conditions indicate that continued diapiric movement and active dissolution are occurring at all salt dome sites and that the impression received in geomorphic analysis of a given site reflects only the effects of the dominant process. The Siting Guidelines sections 960.4-2-6-c and d state:

##### "C. POTENTIALLY ADVERSE CONDITION

Evidence of significant dissolution within the geologic setting--such as breccia pipes, dissolution cavities, significant volumetric reduction of the host rock or surrounding strata, or any structural collapse--such that a hydraulic interconnection leading to a loss of waste isolation could occur.

##### D. DISQUALIFYING CONDITION

The site shall be DISQUALIFIED if it is likely that, during the first 10,000 years after closure, active

dissolution, as predicted on the basis of the geologic record, would result in a loss of waste isolation."

7. It should be emphasized that halokinesis can produce increased "hydraulic interconnection" through creation of groundwater short-circuiting via fractures.

### 3.2.8 - Mineral Resources

8. Richton and Cypress Creek Domes are both sites of potential salt resources due to their relative purity, shallow depths and large salt volumes. Brining is an economic activity not discussed in the E.A.'s but according to ONWI 169, brining potential is high at both Richton and Cypress Creek Domes. ONWI-169 reports low potential for hydrocarbon production at both Richton and Cypress Creek Dome sites; however, exploration of salt domes has been sparse. Karges (1975)\* reviews production possibilities from salt domes, reports 100 feet of oil sand on the flank of the Richton Dome beneath the caprock, and says that "with enough exploration, the flanks of a number of shallow domes in the eastern part of the [Interior Salt] basin should be found productive." Since so little is actually known of the hydrocarbon potential of salt domes, and since the Richton Dome shows promise as a new environment for hydrocarbon production, it appears unwise to irrevocably allocate these sites as permanent storage facilities prior to thorough economic evaluation.

\*Karges, H.E., 1975, Petroleum Potential of Mississippi Shallow Salt Dome, Transactions-Gulf Coast Association of Geological Societies, Vol.25, pp.168-181.

## Class II

### General Remarks

9. Since no site-specific data were reported from any of the six localities reviewed, data available in various publications were used for analysis. Apparently there are many more data available for the Utah and Texas sites, primarily from United States Geological Survey (U.S.G.S.) studies, Texas Bureau of Economic Geology Studies, and from exploration. More detailed stratigraphic, structural, and rock mechanics data are presented in the E.A.'s for the Lavender Canyon, Swisher, and Deaf Smith sites than for the Gulf Interior Region sites.

### 3.2.2.1 - Physiography

10. The E.A.'s report the following elevations for the six sites reviewed:

|                    |                                     |
|--------------------|-------------------------------------|
| Richton Dome       | 160-290' above Mean Sea Level (MSL) |
| Cypress Creek Dome | 180-270' above MSL                  |
| Vacherie Dome      | 180-320' above MSL                  |
| Lavender Canyon    | 4240-7170' above MSL                |
| Deaf Smith County  | 4035-4110' above MSL                |
| Swisher County     | 3440-3505' above MSL                |

The Siting Guidelines, section 960.5-2-8, state as a potentially adverse condition: "Surface characteristics that could lead to the flooding of the surface or underground facilities...". There is presently a swamp over Cypress Creek Dome. These conditions combined with the low elevations and little topographic relief for all dome sites make the salt domes vulnerable to flooding.

### 3.2.2.3 - Paleoclimate

11. Potential rises in sea level of up to 360 feet above present MSL are predicted with the melting of glacial ice (ONWI-278). A change in sea level of this magnitude would result in inundation of all three dome sites. More moderate rises would affect drainages and possibly result in increased swamping and flooding of inland areas. A rise in sea level of as much as 150-200 feet above the present MSL would result in submergence of the present gulf coast shoreline. Coastal erosion could seriously threaten waste isolation.
12. Formation of glaciers resulting in lower sea levels would increase erosion in the Gulf Interior Region. The maximum decrease in sea level is predicted to be -525 feet, which would result in the removal of major portions of the strata overlying all three salt domes. ONWI-278 predicts that maximum erosion could result in the removal of all but 140 feet of overlying sediments at Richton Dome, 470 feet at Vacherie Dome and 660 feet at Cypress Creek Dome. The Siting Guidelines section 960.4-2-5-d Disqualifying Condition states: "The site shall be DISQUALIFIED if site conditions do not allow all portions of the underground facility to be situated at least 200 meters below the directly overlying ground surface," which could potentially disqualify all dome sites.

Sea level fluctuations associated with glacial formation and melting should have little direct effect on the Lavender Canyon, Deaf Smith, and Swisher sites due to the high elevations of these sites. Increased rainfall in these areas, resulting from climatic changes related to glacier formation, would probably result in increased vegetative cover, and thus no increases in erosion are predicted.

### 3.2.3 - Stratigraphy

13. Much more detailed information is presented for the Lavender, Deaf Smith, and Swisher sites than for the Richton, Cypress Creek and Vacherie sites. This discrepancy appears to be a result of varying amounts of available data, but may also reflect the degree of complication in the stratigraphic histories of the localities. Examples of information available are cross sections (all sites), stratigraphic columns (all sites), structure contour maps (Lavender, Deaf Smith and Swisher sites), and well log information (Deaf Smith and Swisher sites).

### 3.2.6 - Rock Characteristics

14. Since no site-specific data are available, all information in this section is approximate. Much more information is available for the Palo Duro Basin localities than for the other localities due to the intensive hydrocarbon exploration in this area. Information from the Lavender Canyon site is undergoing revision due to the acquisition of new data.

### 3.3.1.1 - Hydrology

15. The Cypress Creek E.A. refers to average annual runoff in the sub-basin, whereas the Richton E.A. refers to runoff in the general region. Because the lenticular nature of the sands and clays does not lend itself very well to regional assumptions, we suggest the use of the sub-basin as a working unit for this type of study in both domal areas.

### 3.3.2.1.1 - Geohydrologic Units

16. Less geohydrologic data are available for the Richton and Cypress Creek Dome sites than are available for other sites, particularly the Swisher County site. For example the Cypress Creek E.A. contains 10 pages of description of the aquifers in the region. The Swisher County E.A. contains 22 pages of aquifer description including regional as well as site analysis sections. There are no data available for Perry County, and in the Richton and Cypress Creek E.A.'s, porosity and storage capacity values have been derived from relatively remote localities in Rankin, Smith, and Madison counties. The Richton E.A. states: "Values of effective porosity will be determined during site characterization." If a dome site should be chosen for characterization, adequate time should be allocated to geohydrologic studies.

17. In both the Richton (page 3-88) and the Cypress Creek (page 3-89) E.A.'s, the description of the Lower Claiborne confining unit consists of two sentences. The first sentence states that the Lower Claiborne is a confining unit, but there is nothing to support this statement. Because the repository level at both sites will be at the same elevation as the Claiborne Group, more information is needed for the Upper Claiborne aquifer and is especially needed for the Lower Claiborne confining unit.

3.3.2.1.2 - Groundwater

- 18. This section lists a number of reasons for local variations in regional groundwater patterns. Local geologic structure should be added to the listing. The listing is found on page 3-90 in the Cypress Creek E.A. and page 3-89 in the Richton E.A.

3.3.2.2 - Modeling

- 19. This section should be expanded to include: 1) a discussion of the data base on which the model was built, and 2) a discussion of how the model predicts the groundwater flow near the salt dome sites. The entire model's "goodness of fit" should be discussed, especially in view of the complex stratigraphy near the domes and the model deficiencies discussed on pages 96-97 in ONWI-456.

It is stated that the model is "a good approximation of the regional hydrologic system". The number of calibration wells should be included; along with a map showing geographic locations.

3.3.2.3 - Groundwater Quality

- 20. The Cypress Creek (p. 3-100) and Richton (p. 3-97) E.A.'s state that the U.S.G.S. has analyzed water samples from "[an unspecified] number of wells". This section should be more specific and include the number of U.S.G.S. wells along with a map illustrating the geographic distribution of these wells.

3.3.3 - Water Supply

- 21. The regional information presented in this section lacks the type of water supply data needed for proper evaluation. The following studies should be undertaken: 1) water well inventories within a twelve mile radius of the Cypress Creek and Richton domes, 2) determination of the projected population growth of these areas as well as projected water needs, 3) determination of projected industrial growth and accompanying water needs, and 4) determination of the projected increase in the number of irrigation wells drilled per year. If a dome site should be characterized, these studies should be completed prior to the drilling of the site water supply wells.

3.4.1 - Land Use

- 22. E.A.'s for both Richton and Cypress Creek have virtually the same land-use tables. The data presented, although referenced as being site-specific, appear to be regional. If they were site-specific, it seems unlikely that both sites would exhibit identical land usages. Upon comparison of the E.A.'s with ONWI-193, it is evident that land usages within the specific domal areas do differ significantly (see ONWI-193, Figures 2.4-3 and 2.4-4).

#### 3.4.2.1 - Terrestrial Biota

23. No site-specific data are available; therefore, the E.A.'s depend on regional data previously compiled.
24. The Richton and Cypress Creek E.A.'s both refer the reader to ONWI-193 for supplementary information. This appears to be defeating the purpose of the E.A.'s, which is to present a concise, informative representation of the specific study area. Additionally, the section is padded with inferred faunal descriptions. The E.A.'s list communities of organisms that may be present because they are commonly associated with the particular vegetation communities. This indicates lack of site-specific data.

#### 3.4.2.2 - Aquatic Biota

25. Site-specific data are not available; therefore, generalizations are based on regional information and "commonly found" species. The Mississippi E.A.'s refer to ONWI-193 for specific information and make reference to other authors for complete species lists. This, again, defeats the purpose of the E.A.'s.

#### 3.4.2.3 - Endangered and Threatened Species

26. The Cypress Creek E.A. states that threatened and endangered species have been found in the general domal vicinity, but critical habitats are not known and no reported threatened and endangered species occur in the Richton dome area. It is suspected, however, that site-specific data have not been collected for either site.
27. Comparison of this section with ONWI-193 indicates that other species should be included in this section of the E.A.'s. Consideration should be given those species designated RARE - ie. a species that, "although not presently threatened with extinction, is in such small numbers throughout its range in Mississippi that it may be threatened or endangered if its environment worsens". Furthermore, ONWI-193 states: "Close watch of its status is necessary." In particular, notable rare species include the Swallowtail Kite (Elanoides forficatus) and the Chicken Turtle (Deirochelys reticularia), both of which are known to occur in Perry County and generally reside in swampy areas.
28. The Deaf Smith County and Swisher County E.A.'s consider Recreationally Important Species and Sensitive Areas - Critical/Unique Habitats. These topics should be treated in the Richton and Cypress Creek E.A.'s. Since both domal areas are virtually unexplored ecologically, future study may reveal the presence of critical or unique habitats. The swamp on top of Cypress Creek Dome may qualify as a Sensitive Area.

### 3.4.3 - Air Quality and Meteorology

29. Both Richton and Cypress Creek E.A.'s report on-site data are not available. Weather data for both E.A.'s come from the Hattiesburg and Jackson areas which are within 100 miles of the dome sites. It is questionable, however, that these data are representative of the domal sites, especially due to the fact that Jackson and Hattiesburg are both heavily populated, urban areas, while both Richton and Cypress Creek dome sites are located in predominantly rural areas.

#### 3.4.3.1 - Existing Air Quality

30. No data are available for sulfur dioxide or oxides of nitrogen in the immediate dome areas. Domal conditions are assumed based on data from Vicksburg, Pascagoula, Meridian, Jackson and Yazoo City. Data on total suspended particulate matter are derived from the Biloxi, Gulfport, Hattiesburg and Pascagoula areas. Again, it is questionable whether or not these data indicate true domal site conditions.

#### 3.4.3.6 - Severe Weather

31. The possibility of hurricane activity in the Gulf Coast area is discussed in the Richton and Cypress Creek E.A.'s but the topic is not sufficiently covered. Structural damage to buildings in the domal areas that have been affected by past hurricane activity should be evaluated, especially when considering repository design and construction. It might also be wise to consider hurricane effects on the domal area should there be a significant rise in sea level.
32. The probability of tornadoes occurring within the domal area is discussed. Statistically there is very little chance that the area would be adversely affected by tornadic conditions. However, ONWI-193 (page 49) states:

"The terrain around the Mississippi Study Area forms natural paths for tornadoes."

### 3.4.5 - Aesthetic Resources

33. The Richton and Cypress Creek E.A.'s both state that the Leaf River, which is 7 and 5 miles respectively from the domes, has been designated for study as a wild and scenic river. ONWI-193 states that Black Creek is being considered for this designation but makes no reference to the same for the Leaf River. This seems to be a major discrepancy among the 3 documents. In either case, what effect, if any, would designation of either of these rivers as a wild and scenic river have on further consideration of the Richton and Cypress Creek Dome sites for a nuclear waste repository? According to Section 960, 5-2-5c (1) of the Siting Guidelines, "proximity to, or projected significant adverse environmental impacts of the repository or its support facilities on, a component of the National Park System, the National Wildlife Refuge System, the National Wild and Scenic Rivers System, the National Wilderness Preservation System,

or National Forest Land" are potentially adverse conditions for site selection.

34. The Cypress Creek E.A. goes into detail rating the area aesthetically using VMS (Visual Management System) which provides: 1) a framework to inventory visual resources, and 2) measurable standards for managing visual resources. The Richton E.A. includes very little about this subject, saying "visually, the dome is not unique to the surrounding area".

#### 3.4.6 - Archaeological, Cultural, and Historical Resources

35. The Richton E.A. explains in detail the three basic archaeological eras. This could be eliminated in favor of further explanations of actual excavations in the area. Extensive excavations have been occurring along the Leaf River since 1976 and artifacts have been found. Geiger (1980)\* and Geiger and Brown (1983)\*\* both discuss archaeological sites along the Leaf River floodplain in Perry County, Mississippi and Geiger (1980) reports the artifacts found there to be older than any previously found in southern Mississippi, and further states that the Leaf River floodplain is a "prime area to study and evaluate earliest man in south Mississippi".

\*Geiger, C.L., 1980, Survey of Selected Sites in the Leaf River Floodplain, Perry County, Mississippi, Mississippi Archaeology, vol. 15, no. 2, pp. 8-25.

\*\*Geiger C.L. and Brown, T., 1983, Waller Hafted Scraper Knives from Southeast Mississippi, Mississippi Archaeology, vol. 18, no. 1, pp. 3-14.

#### 3.4.7 - Radiological Background

36. No site-specific data are available. Studies should be made to determine the uptake of naturally occurring radionuclides by crops and livestock and by terrestrial and aquatic biota.

### Class III

#### General Remarks

37. Many of the calculations and conversions in the E.A.'s are incorrect or approximate. They should be methodically reviewed and corrected. Numerous pages and figures are missing throughout the E.A.'s. There is not a one-to-one correspondence between bibliographies and references cited in the texts of the E.A.'s. We cite the following as examples:

In the Cypress Creek E.A., page 3-4 states:

"area of approximately 810 hectares (200 acres)",  
but should probably read  
"area of approximately 810 hectares (2000 acres)".

The Richton E.A., page 3-15, states:

"The sea level in the Gulf of Mexico fell approximately 100 to 130 meters (300 to 430 feet) below the existing datum."

while the Cypress Creek E.A., page 3-15, states:

"The sea level in the Gulf of Mexico fell approximately 100 to 120 meters (300 to 340 feet)".

The Cypress Creek E.A., page 3-26, contains the following erroneous conversions:

"between -300 and -610 meters (-1,000 and -2,000 feet)".

The Cypress Creek E.A. is missing pages 16, 20, 34 and Figure 3.6. The figure on page 55-56 is not numbered.

In the Richton E.A., sources for Figure 3-2 are given as U.S.G.S., 1964 a, b, c, d. None of these publications appear in the reference section. The source for Figure 3-1 is given as U.S.G.S., 1972, which is incompletely listed in the reference section.

#### 3.3.2.1.1 - Geohydrologic Units

38. On page 3-88 in the Cypress Creek E.A. and page 3-87 in the Richton E.A., the porosity and storage capacity of the upper aquifer is mentioned. To evaluate these data it would be necessary to consult four separate references. This information should be presented in a table with the references listed only as sources, should the reader require further information or desire to check their validity. Maps illustrating geographic locations for all data points are also needed.

#### 3.4.3.6 - Severe Weather

39. The following statements occur in the Richton and Cypress Creek E.A.'s:

"The National Weather Service at Jackson (U.S. Dept. of Commerce, 1981, p.2)..." (Richton - p. 3-126)

"The National Weather Service at Jackson (NOAA, 1981, p.2)..." (Cypress Creek - p. 3-127)

It can probably be assumed that these sentences came from the same source yet they are not referenced as such.

## CHAPTER FOUR

## Class I

## Comment #

General Remarks

40. The evaluations of oil test wells are not discussed in either the Richton or Cypress Creek E.A.'s. Oil test wells at both sites have total depths greater than the repository depth and may provide hydrologic connections with the repository level of the salt stock. For example, at Richton Dome, Shell 23-7 Masonite is illustrated in ONWI-120, vol. 6, Figure 13-43 as entering the salt stock and continuing in the salt stock to a total depth of 14,930 feet where it terminates in the anhydrite sheath. Examination of logs for this well reveal that the ONWI-120 illustration for this well is not accurate. According to the logs, the well entered the salt stock at approximately 1975 feet and continued in salt to a depth of approximately 2920 feet. From 2920 feet to total depth the well enters and exits salt several times. On file with the Mississippi Oil and Gas Board is a telegram from Shell Oil stating that they had a "severe problem in maintaining [a] straight hole". Because these wells may provide significant groundwater pathways to the proposed repository facility, these wells may disqualify the site according to Subpart C, section 960.4-2-8-1-d-1 of the Siting Guidelines.

4.1.1.1.11 - Regional Seismicity

41. Figure 4-8 (page 4-8 Richton; page 4-22 Cypress Creek) illustrates the proposed locations of the microseismic monitoring stations. In both the Richton and Cypress Creek E.A.'s the stations are placed more than 60 miles north of the sites, yet this network extends only approximately 20 miles to the south. The proposed locations do not adequately cover the area of the Wiggins Anticline. Wood and Walper (1974)\* illustrate the Wiggins as a major tectonic feature in the Gulf of Mexico region. Burnett and Schumm (1983)\*\* prove Quaternary uplift by using the following evidence:
- 1) resurveys by the National Geodetic Survey across the Wiggins which consistently show uplift,
  - 2) convexities of stream channel profiles,
  - 3) deformed Quaternary terraces, and
  - 4) stream patterns indicative of uplift.
- The conclusion of Burnett and Schumm supports earlier work done by Williams (1967)\*\*\* in George County, Mississippi. Williams indicates that the Citronelle Formation - Miocene contact reflects uplift along the Wiggins. Owen (1982),\*\*\*\* suggests that the Wiggins is caused by wrench faulting. His conclusion is based on a structural geomorphological analysis of modern stream channel orientations. All of these data strongly indicate Quaternary tectonism along the Wiggins and additional seismic

stations are needed in order to provide adequate coverage of this important tectonic feature.

\*Wood, M.L. and Walper, J.L., 1974, The Evolution of the Interior Mesozoic Basin and the Gulf of Mexico, Transactions - Gulf Coast Association of Geological Societies, volume 24, pp. 31-41.

\*\*Burnett, A.W. and Schumm, S.A., 1983, Alluvial - River Response to Neotectonic Deformation in Louisiana and Mississippi, Science, volume 222, no. 4619, pp. 49-50.

\*\*\*Williams, C.H., 1967, George County Geology and Mineral Resources, Mississippi Geological, Economic and Topographical Survey, Bulletin 108, pp. 79-87.

\*\*\*\*Owen, G.C., 1982, Regional Geomorphic Expressions of Subsurface Structure on Poorly Consolidated Surface Sediments, Coastal Mississippi, Master's thesis, University of Mississippi, Oxford, Mississippi, 65pp.

#### 4.1.3.1.1 - Land Use and Mineral Resources

42. Both the Richton and Cypress Creek E.A.'s state that additional specific mineral resource studies are not planned. According to Chapter 3, page 63 of the Richton E.A., there exists a sizable amount (100 feet) of heavy asphaltic oil-containing sand in Lower Cretaceous deposits on the eastern flank of the Richton Dome. This potential resource should be explored to the fullest extent possible in order to assess its potential commercial value.

#### 4.1.3.1.2 - Terrestrial and Aquatic Ecosystems

43. The Mississippi E.A.'s both call for terrestrial and aquatic studies to be conducted through two separate programs. The first program is a site reconnaissance for threatened and endangered species. It is specified that this survey shall be conducted prior to any land-disturbing activities that may be planned for site characterization. No time frame is given for this program, nor is consideration given to species which are not designated as being threatened or endangered.

It is specified that two biologists will be required for this study. The plans for this study should be expanded to include rare species and also those threatened, endangered and rare species that occur in surrounding environments and are likely to be affected by site characterization and repository development operations. Furthermore, it is doubtful that two biologists would be sufficient to get this job done.

The second proposed program is a 12-month ecological study designed to fully characterize the study area and areas of potential impact. Because so little is known about the ecology of the Mississippi site area (as is evidenced in Chapter 3, section 3.4.2 of the Richton and Cypress Creek

E.A.'s), it is doubtful that a thorough study could be done in a 12-month period. At best, a one-year study would allow for the collection of relatively small amounts of seasonal data which would hardly yield sufficient information on which to base such a major decision.

4.2.1.2 - Effects on Terrestrial and Aquatic Ecosystems

44. Our major concern with this section involves emphasizing the need to monitor daily on-site activities in order to minimize possible adverse environmental effects on adjacent environments caused by unexpected on-site problems and/or accidents. Additionally, we must stress the need for a thorough study of threatened, endangered and/or sensitive species within and surrounding the Mississippi study area. This study must be made prior to any land-disturbing activities.

Class II

4.1.1 - Field Studies

45. Table 4-2 (page 4-5 through 4-6a) in the Cypress Creek E.A. refers to the field activity associated with sulphur exploration wells. Sulphur test wells at Cypress Creek Dome are not documented in any of the ONWI reports nor are they discussed in the text of the E.A. If sulphur test wells exist on Cypress Creek Dome they should be discussed; if they do not, then the entry on the table should be deleted.
46. An examination of Figure 4-1 (page 4-5 Richton, page 4-7 Cypress Creek) and Table 4-2 (page 4-6 - 4-6b Richton, page 4-5 - 4-6a Cypress Creek) in the Richton and Cypress Creek E.A.'s gives identical time periods for field activities for both sites. Because of differences in geologic settings, dome size, depths of proposed wells, and over-dome topography, these data probably do not accurately reflect the time required to complete these tasks.

4.1.1 - Drilling and Geophysical Borehole Testing

47. When using auger or rotary drilling methods, it is possible that parts of the drill stem or auger flight may become permanently lodged in the well bore. In this event, how would the borehole be sealed to prevent a salt-groundwater "short circuit"?

4.1.1.1.4 - Monitoring and Sampling of Wells for Water

48. This section should provide a discussion of the types of analyses that are to be conducted. Because only one sentence is devoted to this subject, discussion of this topic should be expanded and perhaps should include a table.

49. 4.1.1.1.5 - Dome Area Hydrochemistry and Geochemistry  
This subject is a very important aspect of the groundwater systems near the dome sites, yet only two sentences are devoted to it. This section should be expanded to include the types of tests to be conducted and their interpretations.
50. 4.1.1.1.9 - Dome Area Stratigraphic Boreholes  
The reader is referred to section 4.1.1.1 for a description of hydrologic tests that will be performed. Section 4.1.1.1 does not contain said descriptions of proposed tests. Either section 4.1.1.1 should be expanded to include these descriptions, or they should be described in this section.
51. 4.1.2.1 - Land Requirements (Exploratory Shaft)  
The Richton E.A. does not consider the possibility that the local access road may require improvement to withstand increased loads during site characterization.
52. 4.1.2.2.2 - Shaft Drilling  
The Cypress Creek E.A. states: "Site-specific data regarding the location of the base of potable water may require modification of the shaft construction design to protect ground water resources." The Richton E.A. states: "Site-specific data regarding the location of the base of potable water supply will be protected by appropriate seals." The Richton E.A. differs from the E.A.'s of the other sites which use the same language as that found in the Cypress Creek E.A. The sentence appears to be incomplete and should illustrate that site specific data at Richton may require changes in the shaft design to protect the potable water supply.
53. The Cypress Creek E.A. mentions the periodic transport of the contents of the sanitary waste tank to a disposal facility; the Richton E.A. neglects the need to dispose of waste in an offsite facility.
54. The Cypress Creek E.A. uses the phrase "sanitary waste treatment facility", while the Richton E.A. uses "sanitary waste collection facility". These statements have different meanings, yet appear to be referring to the same thing.
55. 4.1.2.2.3 - Shaft Outfitting  
The Cypress Creek E.A. does not mention the need for resin cartridges whereas the other E.A.'s cite such a need for water control.
56. 4.1.3.1.1 - Land Use and Mineral Resources  
The Richton and Cypress Creek E.A.'s should consider problems associated with gaining access to the land on which the sites are to be located. The Cypress Creek Dome area is located entirely within the boundaries of the DeSoto National Forest and the Camp Shelby Military Reservation, while most of the land within the Richton Dome area is privately owned.

#### 4.1.3.1.3 - Air Quality and Meteorology

57. The following excerpts come from the Richton and Cypress Creek E.A.'s, pages 4-76 and 4-74 respectively.

"Joint wind and stability frequency data will be used as modeling input to estimate downwind concentrations of atmospheric contaminants emitted from repository construction and operation. Contaminants to be modeled will include suspended particulates from fugitive and combustion sources and various gaseous emissions discussed in Section 4.2.1.3."

Furthermore, the Richton E.A. states that "Hypothetical accidental radionuclides also will be modeled": while the Cypress Creek E.A. states that "They [modeling] also could include hypothetical accidental releases of radionuclides."

The Cypress Creek E.A. should be changed to read that these hypothetical releases will be modeled.

58. It is stated in the Richton and Cypress Creek E.A.'s that a one-year onsite study would be required to collect meteorological data necessary to address the conditions set forth by the Federal Prevention of Significant Deterioration Regulations. What amount of time is needed to estimate atmospheric contaminant concentrations regulated by the National Ambient Air Quality Standards and the Mississippi Air Pollution Control Regulations? The Deaf Smith County and Swisher County E.A.'s call for a one-year monitoring period with an additional two-year monitoring period prior to applying for a license from the NRC.

#### 4.1.3.1.4 - Water Quality and Hydrology

59. The Richton and Cypress Creek E.A.'s both state that detailed characterization of the hydrologic regime will take place, but should state that this characterization will take place prior to any land-disturbing activities. This is to ensure accurate monitoring after said activities have begun.

#### 4.1.3.1.10 - Transportation and Utilities

60. The Cypress Creek E.A. takes into consideration the current and predicted demand on electric power, natural gas, and water. The Richton E.A. mentions only the use of electric power and natural gas. Keeping in mind the proximity of the Richton site to the town of Richton, it is important to consider the ability of onsite and/or regional water supplies to meet the water demands for exploratory shaft construction and repository construction and operation.

#### 4.2.1 - Expected Effects on the Physical Environment

61. The content of this section is basically the same in the Richton and Cypress Creek E.A.'s; however, the land requirements for each activity mentioned differ for each

site. For example, the area required for field activities at Richton Dome is 520 acres, while at Cypress Creek the required area is 800 acres. Both sites expect the most significant land use effect to be due to the seismic surveys which will use 380 and 560 acres at Richton and Cypress Creek domes respectively. The differences in land use needs between the two sites are questionable considering the relative sizes of the domes and the sizes of the proposed repository facilities. Therefore, the figures presented should be justified.

62. Field activities other than the seismic surveys are expected to involve isolated parcels of land at Richton Dome totaling 150 acres. For Cypress Creek we know only that these parcels will utilize 1 to 1.2 acres each. The total acreage needed for "remaining field activities" at Cypress Creek is not mentioned. Furthermore, the field activities themselves are not identified. Specific field activities should be stated along with the total acreage required for their execution.
63. Richton and Cypress Creek E.A.'s both report that "small amounts of land will be used for other environmental studies; however, these are expected to have insignificant effects on land use in the area". These proposed studies should be itemized and potential environmental effects discussed.

#### 4.2.1.4.3 - Water Resources and Floodplain Management

64. The predicted water demands for site characterization activities at each dome are as follows:

|               |   |
|---------------|---|
| Cypress Creek | - 29.3 million gallons of potable water,<br>and 44.7 million gallons of brine<br>(Cypress Creek E.A., page 4-103) |
| Richton       | - 48.1 million gallons of fresh water<br>(Richton E.A., page 4-109)   |

What accounts for the differences in proposed water demands between the two sites, and why is the distinction made concerning the use of potable water and fresh water, and/or brine? Does all water to be used at Richton necessarily have to be fresh water?

#### 4.2.1.9 - Effects on Radiological Levels

65. Both E.A.'s state: "It is anticipated that radioactive wastes will not be used for testing; their thermal effects will be simulated using electric heaters." Will radioactive wastes be used for testing purposes, and if so, in what form and quantity?

## Class III

General Remarks

66. Throughout this chapter various measurements as well as their metric conversions are approximated. These approximations lead to wide variations and inaccuracies. The metric conversions should be exact. When the English measurements reflect a range of values, metric conversions should also reflect this range of values. Exact conversions will avoid the problem of "compounded approximations".

4.1.1.2.3 - Surface Facilities Foundation Boreholes

67. The Richton E.A. refers to the CPT test as a core penetrometer test. This should read "cone penetrometer test" (p. 4-27).

68. The CPT collects soil property data, not salt property data as is indicated on p. 4-27 of the Richton E.A.

4.1.2 - Exploratory Shaft

69. The Cypress Creek E.A. states that the exploratory shaft facility site and access will be located in Webster and Bienville Parishes, Louisiana, rather than in Perry County, Mississippi.

4.1.2.2 - Construction

70. The Cypress Creek E.A. omits the "Work Force Estimates" table which is referenced in the text.

4.1.2.2.2 - Shaft Drilling

71. The Richton E.A. should change 35,000 liters to 35,000,000 liters (p. 4-45).

4.1.3.1.6 - Noise

72. In general, sections 4.1.3.1.6 and 4.2.1.6 of both the Richton and Cypress Creek E.A.'s are disorganized. Some paragraphs are repeated in their entirety while others are repeated incorrectly. For example, page 4-79 of the Richton E.A. states:

"The major noises associated with site characterization would be present during a four-month period of exploratory shaft development when site preparation overlaps the exploratory shaft construction and outfitting."

Page 4-112 of the same states:

"The major noise associated with site characterization activities will be noticed during a six-month period when site preparation overlaps the exploratory shaft construction and outfitting."

Both sections should be carefully reviewed and rewritten.

4.2.1.4.2 - Ground Water

73. The Cypress Creek E.A. (p. 4-102) cites the "dilution of a water supply well and withdrawal of groundwater" as a potential threat to ground water quality. It can probably be assumed that this statement was supposed to say "drilling of a water supply well..." (see Richton E.A., p. 4-107).

4.2.1.5.1 - Soils

74. The following excerpts come from the Richton and Cypress Creek E.A.'s:

"The principal exploratory shaft and construction activities that will affect soils include clearing and grading a 30 hectare (75-acre) area for surface facilities, access roads, salt storage area and drilling mud and the salt-pile retention ponds," (Richton, p. 4-110).

"The principal exploratory shaft construction activities that will affect soils include clearing and grading a 37 hectare (90-acre) area for surface facilities and access roads, onsite storage of salt excavated during construction of the exploratory shaft and related subsurface facilities, and the excavation of a drilling mud pit and the salt-pile vegetation ponds," (Cypress Creek, p. 4-105).

These passages both contain errors which may have occurred during revision and/or transcription phases of previous E.A. drafts. Another example follows:

"It is a fair assumption that the residents in the Vacherie Dome [Cypress Creek] site vicinity would provide reactions similar to those predicted by the community noise indicator, CNR" (Cypress Creek, p. 4-108).

The E.A.'s in general should be carefully reviewed and edited.

4.3.1 - Alternate Exploratory Shaft Construction

75. The Cypress Creek E.A. uses "baseholes" instead of "blastholes" for the drill and blast method (p. 4-130).

4.4.1 - Summary of Site Characterization Activity

76. Site Characterization Activity Summary Tables are included in the Swisher and Deaf Smith E.A.'s but do not appear in the Richton and Cypress Creek E.A.'s.

## CHAPTER FIVE

## Class I

## Comment #

5.1.1.2 - Repository Shafts and Ventilation System

77. The Cypress Creek E.A. states that due to the limiting size of the dome, it will not be possible to use the offset shaft pillar design proposed for the other sites. A much smaller central shaft pillar designed to subside or lift with the other underground workings is proposed for Cypress Creek Dome. Evaluation of information from the Cypress Creek E.A. indicates the weight of the central shaft pillar on its base area may lead to a detrimental weight distribution problem. We request access to the design data of the central shaft pillar and proposed plans of its construction for further evaluation and comment. We would also appreciate access to future publications concerning this issue. After consideration of available information, we must express severe reservations concerning this type of pillar design. Unless the weight distribution problem and other questionable aspects of the central shaft pillar designs are justified in further evaluation, we must go on record as being adamantly opposed to such a design. Because the size of Cypress Creek Dome at the proposed repository depth excludes the use of an offset shaft pillar, and also because of problems in the central shaft pillar design, we suggest either another type of shaft pillar arrangement should be considered or Cypress Creek Dome should be excluded from further consideration as the repository site.

5.2.1 - Geologic Conditions

78. The Richton, Cypress Creek, and Vacherie E.A.'s all state that "salt dome growth in the Gulf Coast Interior essentially ceased several million years ago". As discussed previously (section 3.2.5.4 comments), there is evidence for Quaternary domal uplift in the Gulf Coast Interior, particularly at the Richton Dome. Therefore, this issue should be re-examined.

5.2.3 - Land Use

79. The Richton E.A. claims that there will be no significant adverse effects on the environment as a result of repository development, partially due to the fact that there are no "critical habitats" in the immediate site vicinity. Because site-specific studies have not been conducted, it cannot be said that these habitats do not exist. Furthermore, both E.A.'s state that the biota at both sites are characteristic of the region. Again, site specific studies have not been made; therefore, this too is an assumption.

## Class II

5.1.1 - Surface Facilities

80. The Vacherie E.A. states that the salt pile runoff collection pond is designed for a 100-year, 24-hour precipitation event. All of the other sites examined have the same storm design except for the Richton and Cypress Creek sites which use 25-year, 24-hour events. The average rainfall in Mississippi is greater than that of the other states examined (except Louisiana). The design should consider the maximum storm possible in a given area instead of being based on an average 25-year, 24-hour event.

5.1.2 - Repository Subsurface Facilities

81. The Richton E.A. gives a breakdown of proposed waste type panels and total panel lengths. This is found in the E.A.'s for all sites examined except Cypress Creek.

5.1.3.1.3 - Onsite Development

82. The Vacherie E.A. considers the major building dimensions, construction materials, and design base earthquake or tornado. This is found in the E.A.'s for all sites except Cypress Creek and Richton.

5.1.3.5 - Repository Operation Activities

83. The Vacherie E.A. lists possible options for permanent disposal of excess salt. The Deaf Smith, Swisher, and Lavender Canyon E.A.'s include detailed plans for salt disposal. Richton and Cypress Creek E.A.'s give no specific disposal options.

5.1.3.5 - Required Permits and Approvals

84. The Cypress Creek E.A. omits this section.

5.2.1.1.1 - Construction

85. The E.A.'s of several sites discuss disposal of excess salt and mention construction of off site brining facilities. No mention of brining facilities is made in either the Richton or Cypress Creek E.A.'s. This problem should be treated in more detail for all sites.

5.2.1.1.3 - Decommissioning and Closure

86. Potentially adverse effects of backfilling the shaft with salt that has been stored on site and exposed to various forms of contamination are not discussed in this section. This problem should be investigated.

5.2.2.1 - Surface Water

87. The Richton and Cypress Creek E.A.'s list channelization as an activity affecting surface water hydrology. On page 5-53 in the Cypress Creek E.A., and on page 5-47 in the Richton E.A., it is stated that channelization "may locally affect flow volumes and rates" (emphasis added). The channelization of streams causes an increase in gradient which may initiate

erosion and/or flooding downstream from the channelization site. Therefore, channelization may affect the entire fluvial system, not just the local site. This topic should be expanded to include a discussion of channelization effects on the entire fluvial system, as well as a discussion of possible mitigating measures that should be taken.

#### 5.2.2.1.1 - Construction

88. The second sentence of this section states that surface water will not be used, but no explanation is given. The use of surface water would avoid the effects of pumping from the aquifers and thereby avoid a potential problem. The E.A.'s should contain a discussion of the benefits of surface water use versus groundwater use.
89. Estimated water requirements for construction are presented in the Lavender Canyon (page 5-54) and Swisher County (page 5-45) E.A.'s, but not in the Richton and Cypress Creek E.A.'s. The estimated water requirement is an important statistic that should be included in the E.A.'s for the Mississippi sites.
90. The Lavender Canyon E.A. (page 5-58) states that during construction a monitoring system will be installed to detect possible contamination resulting from leakage from retention ponds and the salt storage area. Installation of a monitoring system is not mentioned in either the Cypress Creek or the Richton E.A.'s. Some type of groundwater monitoring system for the retention ponds and salt storage area should be included in the Mississippi E.A.'s

#### 5.2.3 - Land Use

91. Both Richton and Cypress Creek E.A.'s state the necessity of putting restrictions on land usage in the controlled area during and after repository development. Specifically, how will this be accomplished?
92. The following contradiction occurs on page 55 of the Richton E.A. (emphasis added):

"Terrestrial biota may be further affected during construction by the contamination of vegetation and wildlife habitat by wind- and water-borne salt. Salt-laden effluent from salt pile storage areas will be directed to onsite retention ponds for offsite disposal under applicable regulation. No direct impact to terrestrial biota are therefore expected from this source."

93. The Richton E.A. recognizes the cause for concern and discusses in detail possible effects of wind-borne salt on surrounding vegetation. The section is concluded by stating that impacts of wind-borne salt deposition would be examined in greater detail should the Richton site be selected for

site characterization. The Cypress Creek E.A. dismisses the subject entirely by stating "the impact will be kept to a minimum" by isolating and encrusting the salt pile and by directing pile runoff to a disposal site. This subject should be thoroughly covered in both the Richton and Cypress Creek E.A.'s as wind-borne salt deposition (as well as salt pile runoff) is a definite threat to neighboring plant and animal communities. Furthermore, damaging effects produced by disposal of the salt pile runoff should be examined and reported.

#### 5.3.1.1.1 - Regional Shipments

94. This subsection categorizes the different wastes which will be shipped. It is noted that throughout the Richton, Cypress Creek, Lavender Canyon, Deaf Smith, Swisher County, and Vacherie E.A.'s the same abbreviations for different systems and words are used. However, the Richton E.A. abbreviates "remote-handled transuranic waste" as "CH-TRU". In the other E.A.'s, the abbreviation for "remote-handled transuranic waste" is "RH-TRU" and the "CH-TRU" abbreviation is used to represent "contact-handled transuranic waste". The Richton E.A. does not mention "contact-handled transuranic waste". This difference in abbreviations by the Richton E.A. brings about a contradiction. The Richton E.A. says the remote-handled transuranic waste (CH-TRU) would be included in the category of waste that must be transported in heavy shielded (cask type) packagings. The E.A. then says the "CH-TRU" is assumed to be packaged in 55-gallon drums.

#### 5.3.1.2 - Radiological and Nonradiological Effects Associated with Nuclear Waste Transport

95. The Richton E.A. (page 5-98) says that over the 26-year operating lifetime of the repository, "injuries from traffic accidents range from 172 (rail) to 14 (truck); fatalities resulting from traffic accidents range from 14 (rail) to 1 (truck)". The numbers given for rail injuries and fatalities seem exorbitant, and conversely, the numbers given for truck injuries and fatalities are rather low, especially when compared to data from the Deaf Smith and Cypress Creek sites. The Deaf Smith E.A. (page 5-78) estimates injuries at 24 (rail) to 341 (truck) and fatalities ranging from 2 (rail) to 26 (truck). The Cypress Creek E.A. (page 5-101) estimates injuries at 14 (rail) to 213 (truck) and fatalities ranging from 1 (rail) to 16 (truck).

#### 5.3.3.1.1 - Construction

96. This subsection is under the section "Effects on Transportation Infrastructure in the Local Area and Region". This section produces figures for both injuries and fatalities resulting from vehicular accidents. The Richton E.A. (page 5-119) states that accident statistics show "12.5 to 13.8 additional traffic accidents per year and 0.4 to 0.5 additional fatalities per year". The Cypress Creek E.A. (page 5-121) shows 300 additional fatalities which may occur during

the 8-year construction period. An eight-year period averaging 13.8 accidents per year would include 100.4 accidents. This is a difference of almost 200 accidents between Richton and Cypress Creek for the 8-year construction period.

We must request an explanation of the definitions of "Local Area" and "Region". Exactly what are the outer limits of both?

#### 5.3.3.1.2 - Operation

97. In this section more accident figures are given that do not reflect any similarities between the Richton and Cypress Creek sites, even though both sites are in the same general area. The Richton E.A. (pages 5-119 and 5-120) states "Total accidents and fatalities during the 26 years of repository operation would be 390 and 6, respectively...". The Cypress Creek E.A. (page 5-122) shows 1,120 additional accidents and 5 additional fatalities for the 26 years. The Vacherie E.A. (page 5-122) estimates "total accidents and fatalities during the 26 years of operation would be 754 and 6.2, respectively". Note that the tables referred to in this section are found in section 4.2.1.10.1 and give the same data for Vacherie (Table 4-19), Cypress Creek (Table 4-19), and Richton (Table 4-189). The miles traveled for each repository will be different. An explanation is required for the large difference in the number of accidents for the different sites.

#### 5.3.3.2.2 - Operation

98. During repository operations salt must be disposed of, probably by rail. Both the Vacherie E.A. (page 5-123) and Cypress Creek E.A. (page 5-123) say that approximately 12 million tons of salt will be disposed of during repository operations. "If shipped over an 8 to 20 year period, in rail cars averaging 90 metric ton (100 ton) payloads, this quantity will amount to 300 to 100 rail cars (3 to 1 unit trains) per week, respectively." The Richton E.A. (page 5-120) says exactly the same thing but uses an "8 to 10 year period in rail cars...". Is almost half the time for repository operation being considered at Richton than the time estimated for Vacherie or Cypress Creek?

### Class III

#### 5.2.2.2 - Groundwater

99. The first sentence of this section in the Richton Dome E.A. (page 5-49) states: "The existing geohydrologic conditions in the Vacherie Dome vicinity are detailed...". Should "Vacherie Dome" be corrected to read "Richton Dome"?

5.3.1.1.1. - Regional Shipments

100. In obtaining bounding-type impact estimates for truck and rail transportation, several discrepancies are found. The Cypress Creek E.A. (page 5-97) says that required shipments of spent fuel will consist of 36,000 metric tons (39,600 tons). The Richton Dome E.A. gives a different conversion from metric to English; the Richton E.A. (page 5-94) says the required shipment of spent fuel will consist of 36,000 metric tons (32,400 tons). These figures represent 50% of the commercial waste capacity of the repository and must be consistent. Using the conversion factor of 2,204.6 lbs. per metric ton, a figure of 39,683 tons would be accurate.

5.3.1.3.1 - Highway Transport

101. Richton dome E.A. (page 5-104) says that a suburban density estimation was taken from populated regions in the "State of Louisiana". Using Louisiana to derive suburban density cannot reflect a proper density for Richton, Mississippi.

## CHAPTER SIX

## Class I

## Comment #

6.3.1.1.2 - Geohydrology - Evaluation Process

102. The Richton (page 6-89) and Cypress Creek (page 6-94) E.A.'s state that there are no data to suggest upward groundwater flow along the flanks of these domes. This statement is contradictory to several references that do suggest upward groundwater flow along the dome flanks. For example, Bentley (1983)\* suggests that upward groundwater flow along the dome flanks may cause the saline anomalies centered over the domes. In the Cypress Creek and Richton E.A.'s, pages 3-91 and 3-89 respectively, upward groundwater flow is indicated near both domes. Page 14-21, figure 14-5, and page 14-25, as well as figure 14-6 in ONWI-120 illustrate groundwater anomalies centered over Richton and Cypress Creek domes. These anomalies suggest the upward flow of groundwater along the dome flanks. Furthermore, Bentley (1983) notes solution cavities at the salt-caprock interface of both domes. The presence of these cavities supports the hypothesis of flow along this boundary in the domes. Therefore, the statement that there are no data to suggest upward groundwater flow along the dome flanks cannot be supported and should be changed or deleted.

\*(Bentley, 1983, Preliminary report of the geohydrology near Cypress Creek and Richton salt domes, Perry County, Mississippi, U.S.G.S. Water-Resources Inves. Rept. 83-4169, abstract, page 1)

6.3.1.1.3.(1) - Geohydrology - Analysis of Favorable Conditions

103. Table 6.3-1 in the Cypress Creek E.A. (page 6-99) states that potentially adverse condition #3 was not found. This condition involves the presence of geologic, stratigraphic, or structural features that contribute to difficulty in modeling the geohydrologic system. Bentley (1983, page 11) discusses vuggy zones in the caprock and a zone of loose anhydrite sand at the salt-caprock contact. Both of these zones may be difficult to work into a groundwater model. Cypress Creek also has a topographic depression occupied by a swamp located directly over the dome. This depression could be interpreted to be a dissolution feature, further complicating the modeling of the hydrologic system at Cypress Creek. In other words, with the present limited data available for Cypress Creek and the potential complications present, modeling of the groundwater system would be difficult. A favorable finding for this condition is premature at best.

- 6.3.1.6 - Dissolution  
 104. The Cypress Creek E.A. Table 6.3-6 states that a "Potentially adverse condition is expected." This is in reference to dissolution and structural collapse which might lead to "hydraulic interconnection between the host rock and an immediately surrounding geohydrologic unit". An opposite finding is predicted in the same table in the Richton Dome E.A. although identical DOE findings are listed. Dissolution is discussed in section 3.2.5.7. of this report.

- 6.3.1.7 - Tectonics  
 105. Concerns relevant to Quaternary tectonic movement in the Mississippi Salt Basin have been discussed in sections 3.2.5.1 (Faulting), 3.2.5.2 (Seismicity) and 3.2.5.4 (Uplift and Subsidence).

- 6.3.4.3.2 - Preclosure - Engineering Considerations  
 106. The location of Camp Shelby Field on the western side of Cypress Creek dome should be considered an adverse condition. Not only will the presence of the producing oil field restrict the size and construction of the repository, but there are also two producing oil wells penetrating the salt stock in the proposed repository area. Locating, isolating, and plugging these wells will most likely be costly and definitely should be considered in the cost estimation and the degree of difficulty of building the repository.

## Class II

- General Remarks  
 107. The finding of favorable conditions and the satisfying of qualifying conditions based upon so little data seem premature. Chapter 3 stated that no site-specific data have been gathered and that available data are used to estimate values of various site parameters. In chapter 6 some of these same data are referenced as being site-specific. This contradiction indicates a general inconsistency in the environmental assessments. Whether data are site-specific or not, however, it appears that little are available for any of the sites, particularly the salt dome sites. It is incongruous to find "qualifying conditions" based upon findings which are "estimated", "predicted", or "projected" from so little factual information. These "favorable findings" should be qualified as "expected" or "predicted" just as the information upon which they are based. This has been done in many instances but not in all for which it is appropriate.

- 6.2.1.4.1 - Meteorology  
 108. The Cypress Creek and Richton E.A.'s present meteorological

data from the weather service in Jackson, Mississippi. The weather information for the Texas sites was gathered from eight nearby stations. The Texas sites seem to have information based on a more extensive study area. Are the data obtained for the Richton and Cypress Creek areas from the Jackson area or from the Perry County area sub-stations? There is a regular difference in temperatures averaging approximately 2 degrees between the Jackson and Perry County areas.

6.2.1.4.2 - Meteorology

109. The Cypress Creek and Richton E.A.'s omit several subsections which are included in the Deaf Smith County and Swisher County E.A.'s. The subsections omitted by the Mississippi sites are Atmospheric Transport and Diffusion Conditions and Severe Weather Conditions.

6.2.1.4.4 - Meteorology - Analysis of Potentially Adverse Condition

110. The Perry County Central High School recently opened just outside of the New Augusta city limits. This increases the number of people in the New Augusta region and amplifies the effect of the potentially adverse condition of prevailing wind direction toward the city of New Augusta. Has DOE noted this increase in daily population for New Augusta?

6.2.1.6.5 - Environmental Quality - Analysis of Disqualifying Condition

111. The Richton and Cypress Creek E.A.'s neglect several subsections which are included in the Deaf Smith County and Swisher County E.A.'s. The subsections omitted concern "Soils" and "Salt Management and Disposal".

6.2.2.1.3 - Pre-Closure Radiological Safety

112. The Deaf Smith County and Swisher County E.A.'s include tables of Pre-Closure Radiological Safety. The Cypress Creek and Richton E.A.'s do not include this information.

6.3.1.1.3.(1) - Geohydrology - Analysis of Favorable Conditions

113. This section describes groundwater travel time through the salt stock to the accessible environment. The 1.63 million year travel time is based on assumed data that may not be valid for Richton or Cypress Creek. The Richton E.A. states that no "site-specific data exist to accurately assess the movement of groundwater through the Richton Dome salt stock" (page 6-90). The Cypress Creek E.A. makes the same statement on page 6-95. Each dome represents a unique set of geologic conditions and valid travel times cannot be determined without site-specific data. Therefore, the determination of 1.63 million years travel time to the accessible environment is of doubtful validity and the finding of a favorable condition is premature.

6.3.1.2.4 - Geochemistry: Analysis of Potentially Adverse Conditions

114. Table 6-14 of the Richton Dome E.A., Table 6.3.1.2-1 in the Cypress Creek E.A. and Table 6-15 of the Vacherie E.A. all state: "In contact with unlimited and limited quantities of brine, waste package lifetime is 300 to 6,000 years and greater than 10,000 years, respectively." Section 6.3.1.2.4 of the Richton and Vacherie E.A.'s and section 6.3.1.2.3 of the Cypress Creek E.A. state that "...waste package lifetime is expected to be 6,000 years, with brine migration limited by availability. In the presence of unlimited brine, the waste package lifetime is expected to be 6,000 years." This second statement omits any reference to the lower limit of waste package lifetime. Discussion of this lower limit is required.

6.3.1.4 - Climatic Changes

115. DOE findings in the Richton and Cypress Creek E.A.'s include;

"The Paleoclimate record over the Quaternary Period indicates no dramatic changes of climate occurred in the geologic setting."

"Projection of climatic patterns suggest that future climatic conditions will not be likely to lead to radionuclide releases."

"The Paleoclimatic record suggests no dramatic changes in climate in the geologic setting will occur that would affect the surface-water system."

Comments on physiography (3.2.2.1) and paleoclimate (3.2.2.3) have covered major concerns related to climatic changes: sea level changes, flooding, erosion.

6.3.4.2.3 - Preclosure - Assumptions and Data Uncertainty

116. The non-gaseous condition assumed in this section for design planning should be changed to that of a gaseous condition. Gases are commonly found in salt domes and have been a problem in many salt mines. In making a cost estimation this condition should be considered, as it could be costly to use preventive measures to compensate for the gas present. Another problem in dealing with gas is the reaction with the salt heated by the high level waste canisters. This reaction will result in chlorine and nitrosyl chloride. Radiolytic reactions producing hydrogen and oxygen may also be present. These conditions should all be considered in cost estimation to allow for a more realistic cost comparison with the other repository sites.

6.4.2.1.1 - Postclosure Performance Assessments - Thermal Conditions

117. The maximum surface temperature of the waste package

predicted by the Richton E.A. is 292.2 degrees celsius. This is considerably higher than the maximum temperature predicted by the Cypress Creek E.A. of 266.3 degrees celsius. The Richton waste package (Figure 6.4-2, page 250) has a lower initial temperature and a lower temperature after 10,000 years of storage than the Cypress Creek waste package (Figure 6.4-2, page 259). The temperature curve of the Richton waste package increases at a much greater rate to its maximum temperature than any of the curves for the other sites. There should be an explanation for the Richton temperature variation.

### Class III

#### 6.2 - Suitability of the Richton Dome Site for Development as a Repository: Evaluation Against the Guidelines That Do Not Require Site Characterization

118. The Richton E.A. on page 6-7 says: "...suitability of the Vacherie Dome site... is discussed". Does the information contained in this section pertain to Vacherie Dome as the above sentence says? If so, where is the Richton Dome information?

#### 6.3.1.1.2 - Geohydrology - Evaluation Process

119. The Cypress Creek E.A. (page 6-92) refers to "... the geologic and geohydrologic settings in which Richton Dome resides..." to describe data supposedly gathered at Cypress Creek.

Addendum 1 - Comments concerning application and interpretation of the terms "accessible environment" and "controlled area". - Mississippi Bureau of Geology

Section 6.3.1.1.3

The concept of the "accessible environment" as defined in the DOE siting guidelines in conjunction with the term "controlled area," is ambiguous. When applied to a salt dome site, several problematical questions immediately arise; the diapir has a limited areal extent as compared to sites in bedded salt, basalt, or tuff. A significant discontinuity (the perimeter of the diapir) will be located a few hundred feet from the edge of the underground disposal area, supposedly within the controlled area (which may extend up to 10 kilometers out from the waste). Such a discontinuity in proximity to a bedded salt site, for example, may have called into question the licensability of the site. Would the caprock or a shale sheath, if present, be considered part of the host rock, or would the term "host rock" be limited to the salt stock? Will there be adequate characterization of the salt-caprock interface? Will there be adequate characterization of the diapir-sediment interface?

Concern about the definition of accessible environment is heightened by the fact that the boundary of the controlled area is not delineated in the Environmental Assessment. Subsection 6.3.1.1.3 of the 4th draft Environmental Assessment for Richton Dome states: "The accessible environment has not been defined specifically for this site." However, section 3.0 of the same draft states: "For the purposes of this EA, the outer boundary of the controlled area is the same as the outer boundary of the dome area." Although the sediments surrounding the dome are part of the environment "accessible" to effects from man's actions, the controlled area boundary should not coincide with the dome boundary but should be out some distance into undisturbed sediments.

Major uncertainties exist about the size, shape, and caprock characteristics of Richton Dome. The elimination of the northwestern extension of the dome by Earth Technology Corporation has significantly altered the mapped shape of the dome from that presented by Letco in the Area Characterization Report. A recent high-resolution seismic reflection study of Vacherie Dome (see ONWI-520) has indicated that that dome may be 20% smaller than expected from the Letco ACR information. Such work has not been done on Richton Dome, and its exact size and shape remain uncertain. The nature of the salt-caprock interface and the diapir-sediment interface are poorly known at Richton Dome, and very little is known about the presence of caprock or a shale sheath on the flanks of the dome at repository depth. Thus serious questions remain regarding geologic and hydrologic characterization of the dome, especially about possible short-circuit pathways and mechanisms for radionuclide transport or potential for salt dissolution.

Additional uncertainties are raised by possible effects from oil/gas exploration, solution mining, or extraction of ground water from sediments surrounding the dome. Such activities could affect the present geohydrologic system and conceivably endanger the integrity of the repository. The major concern is that the sediments surrounding the dome, both against the dome and out any given distance from it, are available (accessible) to be affected by persons beyond the control of DOE.

The area characterization studies looked at the geologic setting and derived little information about the dome itself in its entirety. The site characterization studies will concentrate on a site in part of the dome, but there is no certainty that the dome will be characterized in its entirety. Thus the question: Will the dome itself, in its entirety and in context with the surrounding geologic and hydrologic systems, ever be studied adequately?

Present laws and regulations require DOE to assure that radionuclide releases to the accessible environment (at the boundary of the controlled area) meet prescribed standards. DOE must assume responsibility for the characterization of uncertainties at the perimeter of the diapir by including the entire dome and its perimeter within the controlled area. Also, DOE must give assurance immediately that they intend to assume this responsibility; they may do this by presenting a reasonable depiction of the controlled area boundary in the Environmental Assessment. The entire controlled area should be subjected to detailed site characterization so that DOE can prove that the prescribed standards will be met in the accessible environment.

The concerns stated herein are of a technical nature and are entirely separate from the many concerns regarding land acquisition, socioeconomic issues, or public relations in the Richton area.