Water Resource Protection Strategy

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

Disposal Standards

- EPA ground water protection standards (40 CFR 192.02)
  - Effective for up to 1,000 years, to the extent reasonably achievable, and in any case for at least 200 years
  - Constituent in the uppermost aquifer must not exceed
    - (A) The background level of that constituent
      or
    - (B) The MCL

Ground Water Protection

Geologic isolation of mill tailings

- Strategy based on hydrogeologic characteristics, cell design, and geochemical attenuation
- No impact on uppermost (Dakota) aquifer
- No discharge to surface
- Protective of human health and the environment

Demonstration of Water Resource Protection (NRC 1993; SRP, page 54)

"The reviewer must ensure that DOE provides a clear and defensible compliance demonstration, if the proposed design does not rely on limiting infiltration in order to meet the standards. In these instances, the demonstration is usually based on:

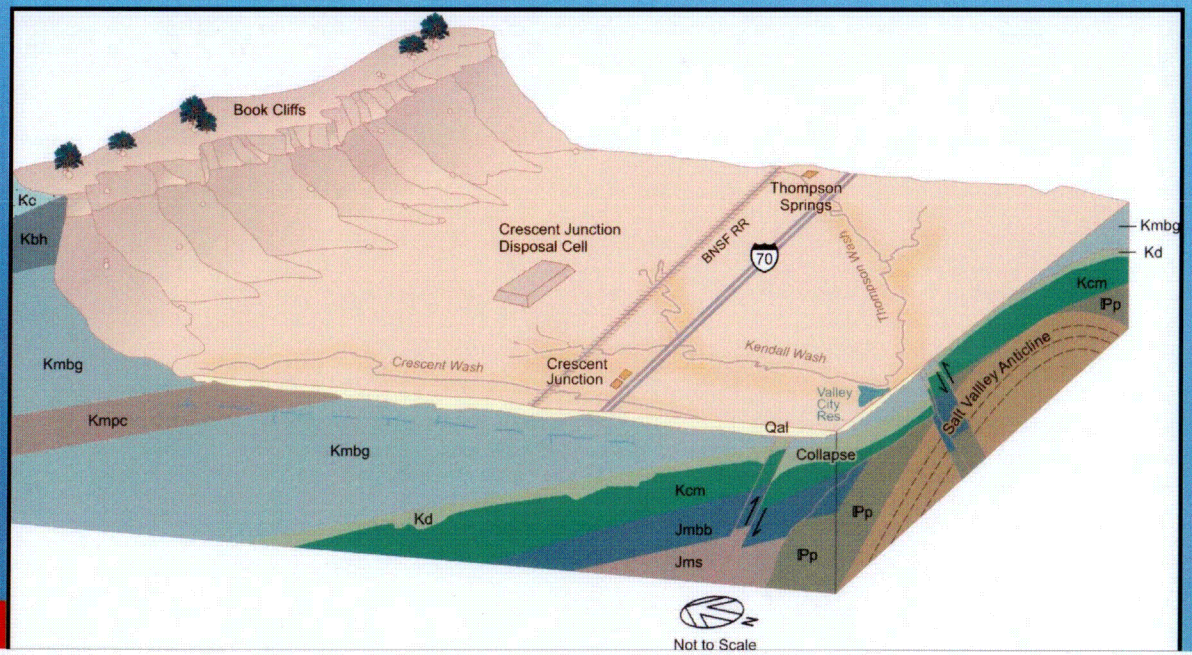
- Climatic considerations
- Hydraulic isolation of the uppermost aquifer
- Geochemical properties in the underlying materials"

Climatic Considerations

- 9.1 inches of precipitation annually
- Annual pan evaporation rate approximately 60 inches per year
- No evidence of saturation in any unconsolidated sample ("dry")

Hydraulic Isolation of the Uppermost Aquifer

- 2,300-foot confining layer of Mancos Shale above uppermost (Dakota) aquifer
- Travel time to uppermost (Dakota) aquifer 5,860 to 58,600 years



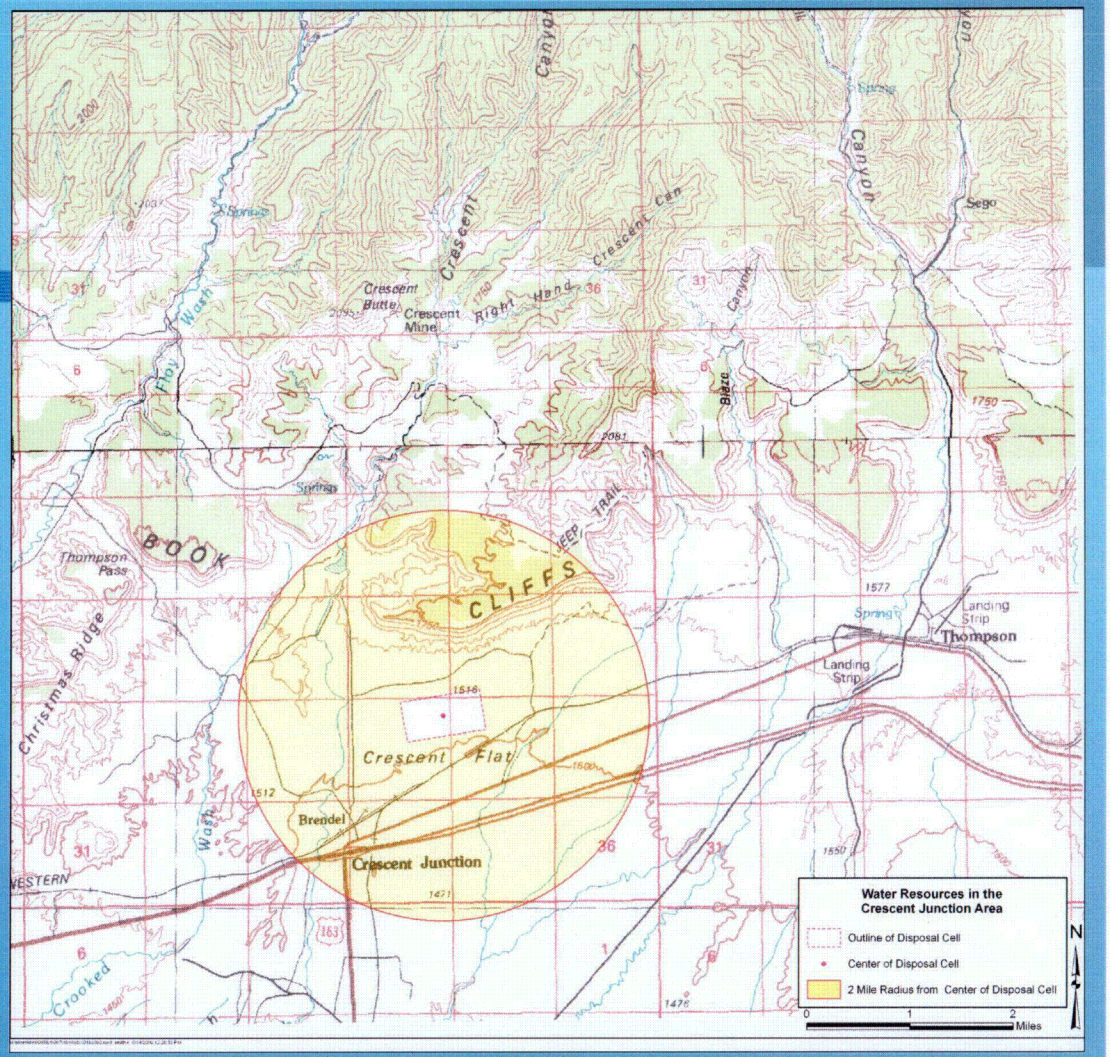
Geochemical Properties

Based on PHREEQC geochemical attenuation modeling calculated travel times for contaminant breakthrough to uppermost (Dakota) aquifer:

- Ammonia: 20,510 to 205,100 years
- Uranium: 5,860 to 58,600 years
  - Upper Mancos Shale
  - Total attenuation: reducing conditions in deeper Mancos Shale

Water Use

- No known ground water discharge points within 1 to 2 miles of the site
- Water users tap springs 7 miles upgradient of site (Mesaverde) at Thompson Springs
- No use of uppermost aquifer or the limited water in Mancos Shale in vicinity of site



Disposal Cell Design

- The radon/infiltration barrier and drainage layer are the most important design features affecting ground water resource protection
  - Cover design based on UMTRA "checklist" cover
  - Clean fill dike to prevent lateral migration
  - Hydraulic conductivity of radon barrier: 1×10^{-7} cm/s conservative; does not rely on limiting infiltration

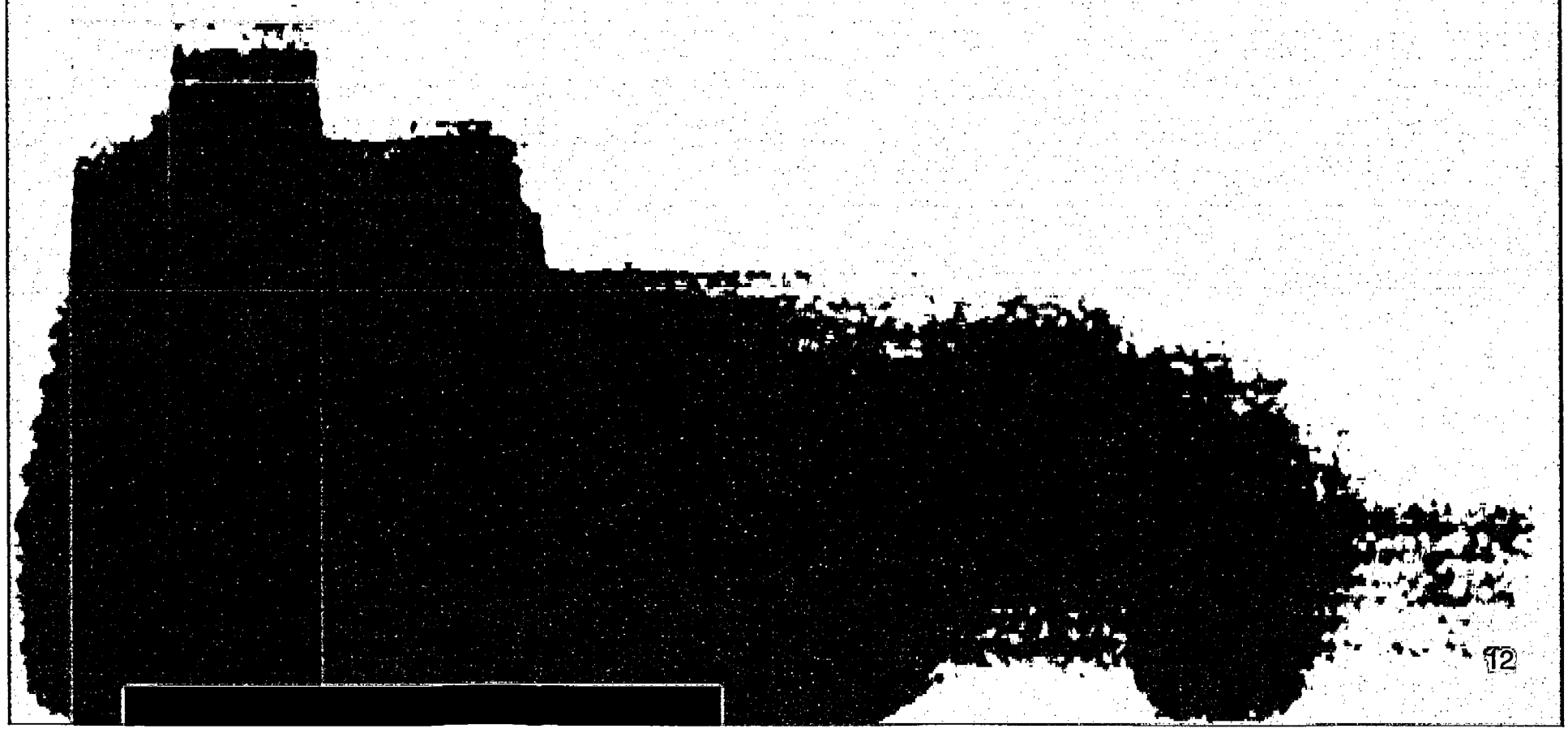
Summary

- Ideal site for ground water protection
  - 20 miles to nearest major water source
  - Hydrogeologic isolation of uppermost aquifer
- "Bathtubbing" prevented by higher hydraulic conductivity in weathered Mancos Shale than cover
- Effective for more than 1,000 years

Summary

No performance monitoring or point of compliance required:

- Seepage contained within Mancos Shale
- Geochemical attenuation
- No effect on uppermost aquifer
- No surface discharge
- Protective of human health and environment

Recommendation

- Abandon 10 monitor wells in Mancos Shale