

## Summary and Conclusion

Disposing of nuclear waste has been an ongoing problem since nuclear weapons were first developed in 1945. The United States government has claimed responsibility for disposing, transporting, and regulating all nuclear waste. Yucca Mountain will be the location for the country's first high-level nuclear waste, and in 2007, it is planned to begin accepting the waste. Also, in 2007, the government may once again begin investigations for a second nuclear waste repository that will be east of the Mississippi River for purposes of political equity. The Wisconsin Wolf River Batholith was considered as a Proposed Potentially Acceptable Site in the 1980's and it will probably be considered again in 2007.

Several federal agencies work on the high-level nuclear waste problem and form a system of checks and balances among themselves. The three main agencies include the Department of Energy, the Nuclear Regulatory Commission, and the Environmental Protection Agency. The Department of Energy is responsible for building and maintaining the waste repository, while the Nuclear Regulatory Commission authorizes licenses to the DOE according to Environmental Protection Agency's stipulations and guidelines.

The Wolf River Batholith is a crystalline rock composed mostly of granite. The batholith underlies an area of 9300 km<sup>2</sup> in northeastern Wisconsin. In this area the batholith is mostly covered by glacial deposits that act as the primary aquifer of the region. The upper 50 to 100 feet of the batholith consist of a heavily weathered and

fractured zone, and it too serves as an aquifer in limited circumstances, such as agriculture and domestic use.

The Department of Energy uses several screening variables when investigating a site for a high level nuclear waste facility. There are five immediate disqualifying factors and sixteen weighted screening variables. Some of these include deep mines and quarries, federally protected lands, population density, major groundwater discharge, and thickness of overburden. The Wolf River Batholith received a rating of 4.9 out of a total of 5 points. However, no location of the 12 sites considered in the 1980's received a score less than 3.3, and no sites were disqualified. The Wolf River appears to be the most favorable site of the 12; however, the area of this batholith contains elements the DOE cites as automatic grounds for disqualification. For example, this area contains federally protected lands, major groundwater discharge zones, and highly populated areas.

The Department of Energy considers the Wolf River Batholith to be devoid of water, when in fact it contains groundwater. The upper part of this batholith contains water within the fractures, which also allow for the movement of water. This poses a significant problem because groundwater is considered to be the number one source of transporting radionuclides to the accessible environment. Studies have concluded that water can be expected in crystalline rocks up to 2000 feet below the land surface.

The Wolf River Batholith lies between two groundwater divides. There is a western divide between the Wolf and Wisconsin River and a divide to the east between the Wolf and the Fox River. Most of the water that recharges groundwater in the area where the repository would be located discharges into the Wolf River. Water in the Wolf River flows south and joins the Fox River. The Fox River then travels through Lake

Winnebago and continues north through Green Bay and into Lake Michigan, which connects to other Great Lakes. Groundwater flow path analysis concluded that it would take the groundwater between 3,000 years and 300,000 years for radionuclides to travel from the repository to the Wolf River. The 300,000 year time period creates a comfortable buffer, but the other extreme, 3,000 years, does not meet EPA qualifications that radionuclides cannot reach the accessible environment for at least 10,000 years. Of course, engineered barriers would be constructed around the waste to prevent or delay leakage to the groundwater system. Much more extensive research needs to be conducted before the Wolf River Batholith site is seriously considered. It is crucial to remember that groundwater is present in the Wolf River Batholith.

Yucca Mountain has undergone extensive research and investigations since the decision to build the nation's nuclear waste facility there. So far, the natural barriers in the region alone will contain the high level nuclear waste for 10,000 years. The repository will be located in the unsaturated zone, which allows for less interaction with water since all the pore spaces between the rock grains are not filled with water. The facility will be located about 1,000 feet above the saturated zone and 1,000 feet below the surface. Nevada has a low amount of precipitation, and thus, infiltration into the bedrock is limited. The waste facility would be located in layered tuff, which also contains zeolites that have absorption characteristics. Both of these characteristics would minimize water seepage and infiltration. Yucca Mountain is a thought to be a relatively good location for a high level nuclear waste facility since its natural barriers alone extend beyond the EPA's qualification of 10,000 years before the radionuclides would reach the accessible environment.

This report is intended to provide the reader with a brief examination of the issues related to a potential siting of a geologic repository for high-level nuclear waste in Wisconsin. This report attempts to provide the reader with the pros and cons of such a repository in Wisconsin so they may reach their own conclusions and decisions regarding this controversial issue.