Geophysical Research Abstracts, Vol. 7, 09431, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09431

Evaluating Nuclear Liquid Waste Disposal through Time-lapse Gamma Ray Logging.

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Over the last forty years the nuclear industry in the Former Soviet Union (FSU) has been disposing large volumes of liquid nuclear waste by injecting it into confined aquifers at several disposal sites across the country.

A large body of information was collected from these sites both from the original intensive site characterization program and the large subsequent geophysical and geochemical monitoring program. Most of there data were in analogue form and was in danger of being lost and was not amenable to being analysed.

During the last decade data from some of these disposal sites has been made available to the scientific community in the West. To facilitate the application and availability of the information, the European Commission co-funded a project under the Euratom Fifth Framework Programme. The project was entitled BORIS (Building confidence in deep disposal: the BORehole Injection Sites at Kranoyarsk-26 and Tomsk-7)

This database from Krasnoyarsk-26 and Tomsk-7 deep well injection sites provides

unique information about the interaction of radioactive aqueous solutions with the geological environment over time. It also provides an analogue for the later stages of evolution of a solid radioactive repository, where the engineered barriers have degraded and the radionuclides have been dissolved in water and carried away from the repository.

This project has studied the geophysical wireline logging data from the Krasnoyarsk-26 site to determine whether it is possible to detect any migration of the radionuclides from the sandstone aquifers into the mudstone confining beds.

Much of the wireline logging data are gamma ray logs that were collected periodically over the last 40 years. This repeated logging of the same monitoring wells over a period of time has produced a time-lapse aspect enabling the migration of the waste plume to be plotted through the geological formations.

Careful depth matching of these gamma ray curves against the lithology logs for different times enables any migration of the radioactive material from the sandstone aquifers into the confining mudstone aquicludes to be evaluated.