

# Deep Hydrogeological Research to Support Brine Management for Saskatchewan's Potash Industry

Deep hydrogeology is an emerging area of research in geology concerned with understanding the occurrence, use and functions of ground water found deep underground. Both fresh water and brine (water saturated with salts) are found in Saskatchewan due to aquifers and the presence of rich potash deposits across the province. Brine management is an issue for Saskatchewan potash producers. These companies must be able to manage any natural flows coming into the mine and also manage brine created during the potash production process.

Saskatchewan potash mines are very deep, offering a unique opportunity for researchers to be able to access and study deep water sources. Researchers in the Civil, Geological and Environmental Engineering Departments at the University of Saskatchewan developed a project called “**Deep Hydrogeological Research to Support Brine Management for Saskatchewan's Potash Industry**”. The project had two separate research areas. The first area aimed to develop a measurement technique to improve the understanding of how groundwater makes its way into underground potash mine workings. The second area of research was to determine the factors leading to high injection capacity in deep aquifers used by Saskatchewan's potash industry. It is an established process in the potash industry to inject excess brine (from natural and process sources) into underground aquifers using injection wells due to alternatives for brine management being cost prohibitive and potentially more damaging for the environment. As the mines grow, there is an added need to send more brine to injection wells – this objective of this project was to assess current injection wells for this capability.

The projects assessed the geochemistry and hydrogeology of one geologic age (Paleozoic strata) in the Western Canada Sedimentary Basin in Saskatchewan to understand the origin of brines around potash mines and injection well capacity. In developing a measurement technique to understand the pathways of underground aquifers, it was planned to use different isotopes to trace the aquifers' pathways. After testing, the project found that previous studies on isotope tracing in aquifers were not correct: the studies used limited measurements, did not account for the variability in the strata or the variety of brine sources possible. Future work on this project is continuing at the University of Saskatchewan (with other funding sources) to develop a complete understanding of the origin of underground brines in Saskatchewan.

Disposal (injection) well capacity was studied using data from the past fifty years from various Saskatchewan potash mines and other sources.

The project found that the ability of existing injection wells to take on more brine may be limited in southeastern Saskatchewan, south of the existing conventional underground potash mines.

#### Principal Researchers:

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**Project Cost: \$170k**