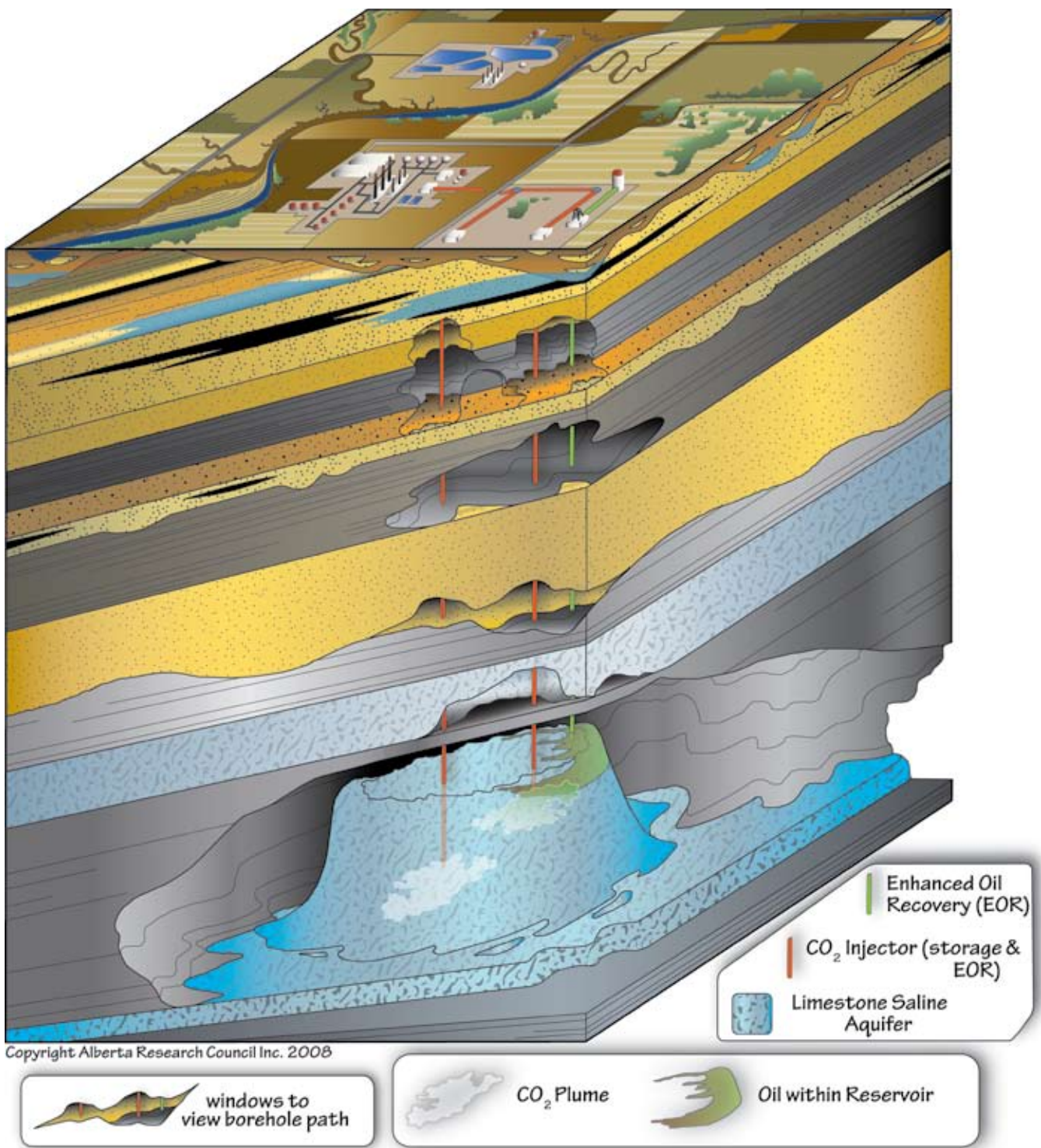




# Reef may hold key to large-scale carbon storage

*Reducing CO<sub>2</sub> emissions with emerging technology*

**ONE OF THE SOLUTIONS** to global warming may be just beneath our feet, northeast of Edmonton. The Heartland Area Redwater Project (HARP) could eventually see carbon dioxide (CO<sub>2</sub>) emissions stored deep underground. In addition to helping the environment, the carbon capture and storage technology would also allow oil and gas companies to recover more resources from depleted reservoirs.



Instead of releasing CO<sub>2</sub> emissions into the atmosphere, carbon capture and storage involves injecting the CO<sub>2</sub> into secure geological formations, such as saline aquifers and depleted reservoirs of coal, oil and gas.

The Alberta Research Council is partnering with Calgary's ARC Resources Ltd. to advance the new technology at the Leduc Redwater Reef site. This site could well be one of the

world's largest commercial opportunities to reduce CO<sub>2</sub> emissions through carbon capture and storage. The project is capturing international attention and showcases Alberta as a leading authority on managing climate change.

#### Huge storage potential

"The Leduc Redwater Reef could potentially store as much as one billion tonnes of CO<sub>2</sub>," says Dr. Bill Gunter,

ARC's principal scientist for carbon capture and storage.

"That would allow permanent storage of up to 20 years worth of (current) cumulative CO<sub>2</sub> emissions from the oil sands or 200 years worth of emissions from one coal power plant."

Dr. Gunter calls carbon capture and storage a great 'sunset technology' for Alberta's oil and gas industry as reserves decline. "It would help prolong the life

of the industry because more oil and gas could be produced from depleted wells, while CO<sub>2</sub> emissions are reduced,” he says.

It is also a bridging technology that secures a reliable energy supply from traditional sources, while renewable energy technologies are developed and refined for large-scale use.

The initial targets for carbon capture and storage would be sites where trapped oil and gas can be recovered from depleted reservoirs, through Enhanced Oil Recovery (EOR) and Enhanced Gas Recovery (EGR). Oil reservoirs are currently considered depleted when about approximately 50 per cent of the oil has been extracted. However, what constitutes ‘depleted’ will likely change as EOR becomes more attractive to companies facing increasing restrictions on CO<sub>2</sub> emissions.

#### Basin rich in reservoirs

The Leduc Redwater Reef is both a large oil reservoir and a saline aquifer. The vastly thick sedimentary basin that contains the reef also hosts numerous other oil and gas reservoirs. This points to the potential of the area for carbon storage.

“If we can find other sites as large as Redwater, we will only need two or three to handle Alberta’s emissions for a long period of time,” says Dr. Gunter. “This would also provide concentrated areas of development which would be easier to monitor and regulate.”

#### Opportunities for new technology

The majority of oil wells in the areas around the reef were drilled in the late 1940s and early 1950s. The pilot project is evaluating the condition of the wells and clarifying the viability of long-term CO<sub>2</sub> storage in this part of the reef.

“There is still a lot of work to be done in developing remediation schemes to ensure that the wells penetrating the Redwater Reef remain tightly sealed in the future,” says Dr. Gunter. “This presents an opportunity for Alberta Research Council to



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develop good technology for fixing these wells so there are no weak points in the reservoir if carbon capture and storage becomes commercialized.”

#### Natural next step

The Alberta Research Council has spent more than 15 years advancing technologies and processes to store CO<sub>2</sub> in geological formations while enhancing resource recovery. The Leduc Redwater pilot is a natural next step in the evolution of this expertise and Albertans stand to benefit as the knowledge base of this emerging and important technology continues to grow in the province.

## LEDUC REDWATER REEF IN A PERFECT LOCATION

The Leduc Redwater Reef and the underlying Cooking Lake Aquifer together form an integrated system with unparalleled CO<sub>2</sub> storage opportunities. One of the largest of the Leduc reefs, the Redwater Reef is nearly 600 square kilometres in size, more than 1,000 meters deep and up to 275 metres thick. The reef contains the third largest oil reservoir in Canada and experiences a strong water drive from the highly-permeable Cooking Lake aquifer that lies underneath.

While the top of the reef offers potential for CO<sub>2</sub>-enhanced oil recovery, the rest of the reef offers a very large capacity for CO<sub>2</sub> storage. Preliminary storage capacity estimates for the aquifer are in the order of one gigatonne—or one billion tonnes of CO<sub>2</sub>.

With output from the oil sands expected to quadruple over the next 15 years, the area around Fort McMurray is likely to be the single largest source of growth in Canada’s greenhouse gas emissions. However, the Fort McMurray area holds no opportunities for the geological storage of CO<sub>2</sub> because the basin in that corner of the province is too shallow.

The Redwater Reef’s access point is located near the Heartland Industrial region, where refineries, petrochemical plants and oil sands upgraders continue to be expanded and it is also one of the closest large capacity sites for storage to Fort McMurray. This positions the reef as an ideal location for early demonstration of carbon capture and storage on a commercial scale.