Located over 700 kilometres northeast of Saskatoon, AREVA’s McClean Lake site is comprised of several uranium mines and the newest, most technologically advanced uranium mill in the world—the only mill designed to process high-grade uranium ore.

AREVA has operated several open-pit uranium mines at the McClean Lake site, and is evaluating future mines at and near the site. The existing mill is undergoing a major expansion to enable it to process all of the ore from Cigar Lake, the world’s second-largest high-grade uranium mine of which AREVA holds 37% ownership.
Ownership

Denison Mines Inc.  22.5%

OURD Canada Co. Ltd.  7.5%

AREVA  70%
Expansion

The McClean Lake mill is undergoing a multimillion-dollar upgrade to double its annual capacity to 24 million pounds of uranium concentrate. Up to 75% of this capacity will be dedicated to processing Cigar Lake ore, with the remaining capacity reserved for processing other sources of ore.

The McClean Lake mill is the only facility in North America capable of processing high-grade uranium ore without diluting it, and increased capacity will enable the mill to process all of the ore from Cigar Lake, the world’s second-largest high-grade uranium mine. The McClean Lake site will be operational 365 days a year, functioning on a week-in/week-out rotation schedule for workers, a large portion of whom will be drawn from northern communities.
The McClean Lake mill is undergoing a multimillion dollar upgrade to double its annual capacity to 24 million pounds of uranium concentrate.
Ore Receiving & Grinding
The ore arrives from the mine, mixed with water in slurry form in specially designed containers and is unloaded. The slurry is discharged to air-agitated storage tanks called pachucas.

Leaching
Uranium and other metals are extracted from the ore by chemical dissolution. Oxygen and hydrogen peroxide oxidize the uranium mineralization into a soluble form, then sulphuric acid dissolves the oxidized uranium.

Counter-Current Decantation (CCD)
To separate the uranium solution from waste solids, the leach discharge slurry is washed with a low-uranium grade liquid and put through a series of thickeners. The waste solids, containing a very small amount of soluble uranium, are sent to the tailings preparation circuit.

Clarification
The uranium bearing solution from CCD is processed through a clarifier and sand filters to reduce the concentration of suspended solids in the solution.

Solvent Extraction (SX)
An organic solution extracts the uranium and an ammonium sulphate solution then strips the uranium from the organic solution. This creates a purified and more concentrated uranium solution.

Yellowcake Precipitation
Uranium is brought back out of the solution with ammonia. The ammonium diuranate product is thickened. This form of uranium concentrate is yellow, giving it the term “yellowcake.”
Drying/Calcining
Most of the remaining moisture is removed by a dryer/calciner that is heated to 800ºC. This product contains approximately 85% uranium and less than 0.5% moisture.

Yellowcake Packaging
The yellowcake is packaged into steel drums, which are filled, sealed, washed and weighed. Each drum weighs about 450 kilograms. The uranium concentrate is ultimately shipped to make fuel for nuclear power plants.

Ammonium Sulphate Crystallization Plant
McClean Lake produces ammonium sulphate as a byproduct of the uranium extraction process. After the moisture is removed, the ammonium sulfate crystals are sold to fertilizer companies.

Tailings Preparation
Waste from the process is collected and treated in the tailings circuit. After treatment, a thickener separates the solids from the liquids. Solids are pumped down to the Tailings Management Facility for long-term disposition.

Water Treatment
Dissolved metals and suspended solids are removed from contaminated water feeds. The treated water is discharged to the Effluent Management System.

Support Plants
Plants that produce sulphuric acid, oxygen and ferric sulphate support the uranium extraction process. Acid is produced from elemental sulphur, and the steam created is used for heat and other processes. Oxygen is used in leaching and in the ferric sulphate plants. Ferric sulphate is used in leaching, tailings preparation and water treatment.
Tailings are proposed waste products resulting from milling uranium ore. This waste is made up of leach residue solids, waste solutions and chemical precipitates that are carefully engineered for long-term disposal. The JEB TMF serves as the repository for all resulting tailings. This facility allows proper waste management, which minimizes potential adverse environmental impacts.

Mining projections to 2038 indicate that the McClean Lake mill will produce tailings in excess of the existing capacity of the TMF. After evaluating a number of options, AREVA has decided to pursue an expansion of this facility.

"The JEB TMF allows proper waste management, which minimizes potential adverse environmental impacts."
AREVA is developing the Surface Access Borehole Resource Extraction (SABRE) mining method, which uses a high-pressure water jet placed at the bottom of the drill hole to extract ore. AREVA has conducted a series of tests with this method, and is evaluating its potential for future mining operations.

AREVA is evaluating additional underground mining at the McClean Lake site. The McClean Lake Underground (MUG) mine could have a life expectancy of six to 10 years, and would feature ramp access starting at one of the former open-pit mines.

The proposed Midwest Project in the eastern Athabasca region received approval for its environmental assessment in August 2012. Ore from the proposed mine would be processed at the McClean Lake mill, 17 kilometres east of the Midwest site.
Protecting workers, the environment and neighbouring communities are fundamental principles guiding AREVA’s activities. We are committed to developing and maintaining a healthy and safe work environment by following world-class best practices that safeguard employees and the environment. McClean Lake has an excellent safety record with extremely low rates of lost-time accidents, a testament to the effectiveness of a wide range of safety-related programs and training.

- McClean Lake meets ISO 14001 standards for environmental management and OHSAS 18001 standards for occupational health and safety management.

- Extensive monitoring programs include regular sampling of air, water, land, plants and animals.

- Worker radiation doses are continually monitored and have been found to be well below the regulatory limit.

“We are committed to developing and maintaining a healthy and safe work environment by following world-class best practices that safeguard employees and the environment.”
AREVA strives to create employment opportunities for workers from northern Saskatchewan. The week-in/week-out rotation schedule enables employees and their families to remain in their home communities, which in turn benefit from an increased economic base and valuable trade and professional skills.

Charter flights collect workers from several communities and cities, making it convenient for them to travel to and from McClean Lake. Residence facilities ensure employees are comfortable; living quarters are equipped with games rooms, a fitness centre, a racquetball/squash court, musical instruments, a library and a computer lab, and all workers are treated to fantastic food. Employees also enjoy outdoor activities at McClean Lake such as swimming, fishing, skating and stargazing.
AREVA supplies solutions for power generation with less carbon. Its expertise and unwavering insistence on safety, security, transparency and ethics are setting the standard, and its responsible development is anchored in a process of continuous improvement.

Ranked first in the global nuclear power industry, AREVA’s unique integrated offering to utilities covers every stage of the fuel cycle, nuclear reactor design and construction and related services. The group is also expanding its operations to renewable energies – wind, solar, bioenergy, energy storage – to be one of the leaders in this sector worldwide.

With these two major offers, AREVA’s 47,000 employees are helping to supply ever safer, cleaner and more economical energy to the greatest number of people.

www.areva.com