Strong Leach Recoveries and Low Impurities Drive Halleck Creek Closer to Unlocking Its Rare Earth Potential

written by Raj Shah | July 9, 2025

Highlights

- **High Light Rare Earths Leach Recoveries**
  - Praseodymium (“Pr”) leach recoveries of 85% at optimal conditions
  - Neodymium (“Nd”) leach recoveries of 84% at optimal conditions

- **Encouraging Heavy Rare Earths Leach Recoveries**
  - Terbium (“Tb”) leach recoveries of 52% at optimal conditions
  - Dysprosium (“Dy”) leach recoveries of 46% at optimal conditions

- **Significantly lower impurity elements of iron and aluminum**
  - Concentrations of iron and aluminum impurities post leach are approximately 5.0x and 2.9x, respectively, lower than the tests previously performed for the Scoping Study[1]

- **Atmospheric Tank Leach chosen as the preferred leach method**
  - Atmospheric tank leaching is typically more energy

and reagent efficient and less costly than other rare earth leaching methods, such as an acid-bake (i.e. cracking)

July 9, 2025 (Source) – American Rare Earths (**ASX: ARR | OTCQX: ARRNF | ADR: AMRRY) ("ARR"** or the **"Company"**) is pleased to announce the results of an extensive leach testing program undertaken on Cowboy State Mine ore, part of the Halleck Creek Rare Earths Project in Wyoming USA.

Twenty-five leach tests exploring various parameters and leach methods were completed at SGS's laboratory in Lakefield, Ontario, Canada.

Why it matters? The leach tests provide key data for the on-going metallurgical testing and mineral processing flow-sheet development for the Cowboy State Mine Pre-Feasibility Study. The tests represent a significant milestone in the technical de-risking of the project as the results have established the optimal leach conditions and preferred arrangement for the PFS flow-sheet. Test results demonstrate leach parameters which may achieve favorable processing outcomes such as lower energy consumption and front end impurity removal. This is a key step forward in producing rare earth magnet oxides from Halleck Creek ore.

Metallurgical Testing Next Step

- SGS is performing scoping impurity removal tests, the next step in the mineral processing flow-sheet design for the Pre-Feasibility Study.

Additional Technical Details

The completion of the extensive leach testing campaign of Cowboy State Mine ore marks a major milestone for the project. The testing was completed at the Lakefield Ontario Canada location of SGS. All testing in this current campaign was conducted using sulfuric acid as the lixiviant (leaching agent). Previous leach testing completed at Nagrom (under the direction of Wood), and Virginia Tech demonstrated that sulfuric acid was the ideal lixiviant when optimizing for recovery, reagent cost, and shipping/logistics.

Building on the previous leach testwork, SGS tested the following leaching types and arrangements during the recent trials:

- Atmospheric Tank Leach
- Acid-bake and Water Leach
- Counter-Current Leach

SGS conducted 18 atmospheric tank leach tests, 5 acid-bake/water leach tests and 2 counter-current leach tests. The atmospheric tank leach was chosen as the preferred arrangement with operating conditions providing the optimal revenue minus raw material cost.

The selected atmospheric leach ("AL") conditions for AL16 are shown in Table 1. The AL16 parameters represents the recommended feed for ongoing plant engineering and piloting trials. AL16 is composed of 80% Unaltered Concentrate that was created by gravity spiral separation followed by Induced Rolled Magnetic Separator ("IRMS"), and 20% of fines created during comminution and then concentrated using Wet High Intensity Separator ("WHIMS"). The combined feed was then processed through a regrind step for 100% passing 270 mesh (53 µm). It should also be noted that altered material (i.e. weather) is a minority

portion of the total ore body, as a result the main focus of the test work is on unaltered material. Two Atmospheric Leach Tests were performed on Altered Ore and leaching results were very similar to Unaltered Ore. Table 1 – Atmospheric Tank Leach Conditions and Results:

Leach Condition	**AL16**
Feed	80% Unaltered Conc 20% WHIMS of Fines
Regrind Particle Size	-53 µm
Acid Dosage	400 kg/t
Retention Time	8 hrs
Temperature	90°C
% Solids	10%
Leach Result	
La Extraction	88%
Pr Extraction	85%
Nd Extraction	84%
Tb Extraction	52%
Dy Extraction	46%
Fe Extraction	18%
Al Extraction	23%
Mg Extraction	28%
Ca Extraction	20%
Final Acidity	20 g/L

Leachate Concentration

The Scoping Study concentrate was generated using WHIMS. The current concentrate was produced using gravity spiral followed

by IRMS. The Scoping Study sulfuric acid tank leach test was performed at 250 kg/t and a 6 hr reaction time while the current spiral/IRMS concentrate was tested at 400 kg/t and a 8 hr reaction time.

Table 2 below compares the difference in leachate concentrate for the major impurity elements for the Scoping Study concentrate with the current concentrate. Concentrations of iron and aluminum impurities post leach are approximately 5.0x and 2.9x, respectively, lower than the tests previously performed for the Scoping Study.

It is theorized that the gravity spiral step removed some of the Fe and Al containing heavy minerals and the IRMS was able to separate out the highly magnetic minerals such as hematite and magnetite. These minerals were readily leached in the sulfuric acid tank leach tests for the WHIMS concentrate resulting in much higher impurity concentrations in the leachate. With greater proportions of Fe and Al removed from IRMS concentrate, downstream Impurity removal steps should use less reagent (i.e. potential for lower operating costs) and achieve lower concentrations of these elements in the leachate.

	Unit	**SGS Spiral/IRMS Conc (AL16)**	**Scoping Study WHIMS Conc**	**% Change**
Si	mg/L	1,250	3,627	-66%
Al	mg/L	1,300	3,748	-65%
Fe	mg/L	4,450	22,230	-80%
Mg	mg/L	74	210	-65%
Ca	mg/L	1,670	1,495	12%
Na	mg/L	92	292	-68%
K	mg/L	158	510	-69%
Ti	mg/L	231	562	-59%

P	mg/L	45	190	-76%
Mn	mg/L	111	541	-79%
Zn	mg/L	19	101	-81%

This release was authorized by the board of American Rare Earths.

Investors can follow the Company's progress at www.americanree.com

For the full press release with additional technical information and the updated JORC Table please see the full release here.

About American Rare Earths Limited:

American Rare Earths (ASX: ARR | OTCQX: ARRNF | ADR: AMRRY) is a critical minerals company at the forefront of reshaping the U.S. rare earths industry. Through its wholly owned subsidiary, Wyoming Rare (USA) Inc. ("WRI"), the company is advancing the Halleck Creek Project in Wyoming—a world-class rare earth deposit with the potential to secure America's critical mineral independence for generations. Located on Wyoming State land, the Cowboy State Mine within Halleck Creek offers cost-efficient open-pit mining methods and benefits from streamlined permitting processes in this mining-friendly state.

With plans for onsite mineral processing and separation facilities, Halleck Creek is strategically positioned to reduce U.S. reliance on imports—predominantly from China—while meeting the growing demand for rare earth elements essential to defense, advanced technologies, and economic security. As exploration progresses, the project's untapped potential on both State and Federal lands further reinforces its significance as a cornerstone of U.S. supply chain security. In addition to its resource potential, American Rare Earths is committed to environmentally responsible mining practices and continues to

collaborate with U.S. Government-supported R&D programs to develop innovative extraction and processing technologies for rare earth elements.

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[1] Refer ASX Announcement titled ‘Full Updated Scoping Study’ released 7 March 2025