AMERICAN RARE EARTHS

15 August 2025

SynBREE Consortium Produces Heavy & Light Rare Earths Oxide Concentrates using Halleck Creek Ore

Highlights

- **Mixed heavy and light rare earth oxide concentrates produced from Halleck Creek's allanite based ore as part of the US Department of Defense's ("DoD") on-going Defense Advanced Research Projects Agency ("DARPA") Environmental Microbes as a BioEngineering Resource ("EMBER") project.**
- Results include:
  - 97.1% pure Heavy Rare Earth Oxide ("HREO")
  - 96.4% pure Light Rare Earth Oxide ("LREO")
- **First production of Light Rare Earth Oxides ("LREO") and Heavy Rare Earth Oxides ("HREO") using Halleck Creek Ore**

American Rare Earths Limited (ASX: ARR | OTCQX: ARRNF | ADR: AMRRY) ("ARR" or "the Company") is pleased to announce that the University of Kentucky ("UK") produced a heavy rare earths oxide concentrate and light rare earths oxide concentrate from Halleck Creek's allanite based ore. These concentrates are precursors to separated rare earth element ("REE") oxides and this is the first time that have been produced from Halleck Creek ore.

American Rare Earths is a part of the US Department of Defenses' ongoing DARPA EMBER project. This project's goal is to develop a biotechnology-based separation and purification strategy for REEs. Since 2023, ARR has provided ~840kg of Halleck Creek ore to the project from approximately 36 drill holes (Figure 1 and Table 1), which UK, in collaboration with the Lawrence Livermore National Lab (i.e. US Department of Energy laboratory, "LLNL") and Penn State University, have processed into leachates for bio-recovery and traditional solvent extraction recovery of REEs. This consortium, known as SynBREE, led by LLNL scientists, has been working together to research and develop bio-recovery of rare earth elements using the Lanmodulin protein and its derivatives[1].

Why it matters? The production of this material provides a meaningful development for the Halleck Creek project as it demonstrates that rare earth oxides, of relatively high purity can be produced from Halleck Creek's allanite based ore. Encouragingly, the SynBREE consortium's biotechnology flowsheet, whilst at laboratory research stage and yet to be commercially proven, the method successfully extracts REE from allanite minerals, and could provide an alternate separation process to be considered in the future.

[1] See March 19, 2025 LLNL release (link here) for additional details and background to the objectives of the collaboration.

At this stage the SynBREE consortium's research is outside of the scope of the Company's on-going Pre-Feasibility Study ("PFS") mineral processing flow-sheet development. American Rare Earths is currently testing conventional mineral processing techniques and progressing the optimisation work announced to market on the 18 July 2025, while at the same time always reviewing the potential of new, innovative technology. [2]

Interim CEO, Joe Evers, commented, "Our collaboration with the SynBREE consortium continues to achieve some significant milestones. These results provide a very meaningful third-party validation that light and heavy rare earths oxides can be produced from the Halleck Creek allanite hosted ore body. Both these oxides are used in the production of permanent magnets."

Additional Technical Details

Plate 1 – LREO and HREO Products from UK Test Work

These results are part of ongoing research for the DARAPA EMBER project. The rare earth oxides produced by UK provide the feedstock LLNL uses to test separation columns using Lanmodulin. It should be noted that the oxides UK produced are not final products, they are a precursor to individual separated rare earth oxides. Furthermore, the research flowsheet used by UK differs from flowsheets being developed by Wyoming Rare (USA) Inc ("WRI"), the wholly owned subsidiary of ARR. As a part of the on-going Pre-Feasibility Study work, WRI is using conventional mineral processing techniques and equipment for the flow-sheet design[2].

UK created LREO powder and HREO powder using reverse circulation cuttings from drill holes across the Halleck Creek project area. UK created this material independently from ARR as part of the DARPA EMBER SynBREE project being led by Lawrence Livermore National Lab (LLNL), and Penn State University. The methods UK used to create this material are independent from any methods used by ARR for mineral processing and leaching.

[2] See ASX releases dated February 20, 2025, July 9, 2025, and July 18, 2025.

UK used heavy liquid separation to concentrate allanite in RC feedstock. UK used hydrochloric acid to leach the allanite ore. UK used sodium hydroxide to remove approximately 98% of iron, aluminum, and silica from the leachate solution. REE losses in impurity removal were approximately 15%.

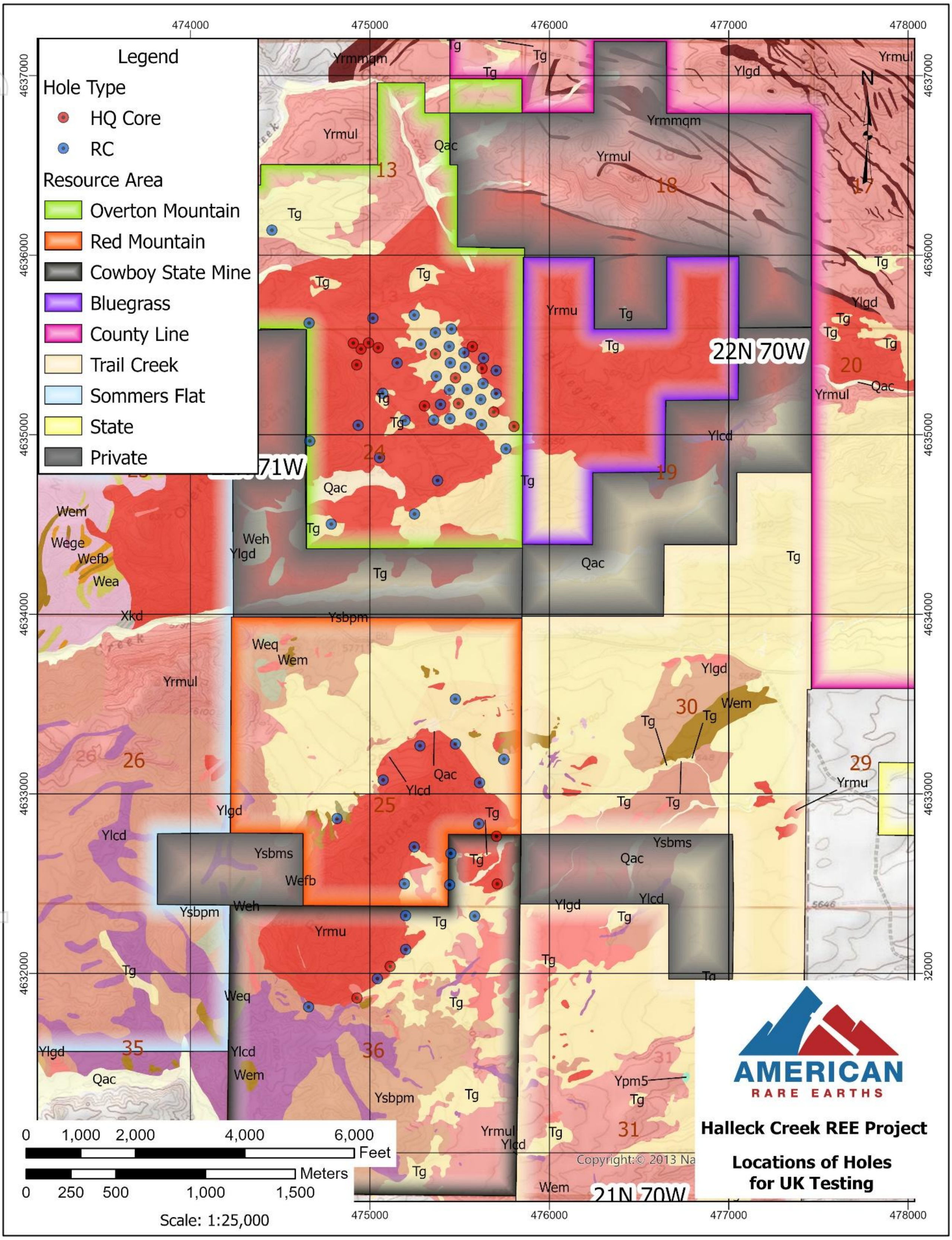
UK used D2EHPA and hydrochloric acid for solvent extraction to create LREE- and HREE-enriched solutions. UK used oxalic acid to create a LREE oxalate and an HREE oxalate powder. UK then calcined the oxalates to create a light rare earth oxide ("LREO") and a heavy rare earth oxide ("HREO"). UK recovered approximately 82% of total rare earths from the leachate solution. The LREO is approximately 96.4% pure and the HREO is approximately 97.1% pure.

Table 1 – Samples used by UK for the SynBREE Project

Drill Hole	Northing	Easting	Elevation	Depth	kg	Samples
HC22-RM006	4,633,192.18	475,747.15	1,747.53	150	3.7	5
HC22-RM007	4,633,061.77	475,610.72	1,756.20	150	16.6	21
HC22-RM009	4,632,318.66	475,583.59	1,757.03	150	66.1	69
HC22-RM011	4,632,703.64	475,246.73	1,764.87	150	13.9	22
HC22-RM012	4,632,498.56	475,192.03	1,765.65	150	22.6	19
HC22-RM013	4,632,321.23	475,198.52	1,765.92	150	30.4	47
HC22-RM014	4,632,132.65	475,199.29	1,768.82	150	31.4	73
HC22-RM015	4,631,970.23	475,041.50	1,777.64	175.5	33.1	48
HC22-RM016	4,632,833.19	475,606.60	1,753.59	150	13.2	25
HC22-RM017	4,633,277.28	475,476.60	1,756.70	150	25.9	36
HC22-RM018	4,633,267.23	475,278.91	1,767.61	150	9.8	10
HC22-RM019	4,633,076.57	475,073.77	1,790.52	150	17.8	26
HC22-RM021	4,633,527.14	475,475.99	1,754.91	150	15.4	15
HC22-RM022	4,631,812.72	474,658.01	1,809.35	150	9.0	12
HC24-RM026	4,632,713.30	475,678.12	1,748.62	81	32.6	54
HC24-RM028	4,632,718.96	475,532.08	1,756.76	81	37.6	54
HC24-RM030	4,632,641.98	475,604.24	1,752.99	81	41.1	54
HC24-RM031	4,632,601.62	475,505.78	1,756.16	81	43.9	52
HC24-RM032	4,632,270.04	475,681.62	1,755.35	81	7.5	10
HC24-RM036	4,632,436.00	475,560.30	1,756.87	81	13.0	15
HC24-RM040	4,632,085.39	475,239.63	1,768.07	111	11.5	14
Total					**495.7**	**681**

Drill Hole	Northing	Easting	Elevation	Depth	kg	Samples
HC22-OM006	4,636,138.88	474,453.60	1,779.06	150	1.2	1
HC22-OM007	4,635,643.98	474,336.73	1,784.70	150	14.1	18
HC22-OM009	4,635,648.19	475,016.29	1,755.33	150	6.5	10
HC22-OM010	4,635,665.94	475,246.77	1,747.01	150	14.9	29
HC22-OM012	4,635,426.34	475,633.21	1,736.10	150	8.3	14
HC23-OM029	4,635,081.26	475,355.55	1,740.00	102	48.1	61
HC23-OM031	4,635,088.63	475,445.43	1,735.64	102	30.3	35
HC23-OM033	4,635,168.15	475,393.26	1,742.50	102	14.1	19
HC23-OM035	4,635,116.15	475,562.59	1,732.63	102	33.7	35
HC23-OM036	4,635,249.93	475,442.81	1,739.01	102	40.0	42
HC23-OM038	4,635,325.68	475,369.93	1,739.65	102	36.2	45
HC23-OM042	4,635,356.82	475,703.43	1,731.09	102	38.9	61
HC23-OM043	4,635,374.94	475,531.06	1,733.98	102	16.7	27
HC23-OM045	4,635,456.93	475,523.63	1,737.08	102	10.9	16
HC23-OM048	4,635,504.06	475,284.26	1,745.37	102	26.9	39
Total					**340.7**	**452**

Figure 1 – Locations of Holes used for UK Testing



This release was authorised by the Board of American Rare Earths.

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

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Competent Person(s) Statement:

Competent Persons Statement: The information in this document is based on information prepared by the University of Kentucky and reviewed by Mr. Dwight Kinnes. This work was reviewed and approved for release by Mr. Dwight Kinnes (Society of Mining Engineers #4063295RM) who is employed by American Rare Earths and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 JORC Code. Mr. Kinnes consents to the inclusion in the report of the matters based upon the information in the form and context in which it appears.

ARR confirms it is not aware of any new information or data that materially affects the information included in the original market announcement, and, in the case of estimates of Mineral Resources, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcements continue to apply and have not materially changed. ARR confirms that the form and context in which the Competent Person's findings presented have not been materially modified from the original market announcement.

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.

Appendix A – Halleck Creek JORC Table 1

Section 1 Sampling Techniques and Data		
(Criteria in this section apply to all succeeding sections.)		
Criteria	***JORC Code explanation***	**Commentary**
Sampling techniques	*Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.*	Composite samples for the SynBREE consortium were compiled 1,133 reverse circulation drill cutting samples weighing approximately 837 kg.
	Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.	Core and RC samples were processed and logged systematically. Quality control included inserting certified reference materials (CRMs), blanks, and duplicates into the sampling stream.
	Aspects of the determination of mineralisation that are Material to the Public Report.	The Red Mountain Pluton (RMP) of the Halleck Creek Rare Earths Project is a distinctly layered monzonitic to syenitic body which exhibits significant and widespread REE enrichment. Enrichment is dependent on allanite abundance, a sorosilicate of the epidote group. Allanite occurs in all three units of the RMP, the clinopyroxene quartz monzonite, the biotite-hornblende quartz syenite, and the fayalite monzonite, in variable abundances.
	In cases where 'industry standard' work has been done, this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems.	Reverse circulation rock chip samples were collected at 1.5-meter continuous intervals via rotary splitter. For each interval chip samples were placed in labelled sample bags weighing between 1-2kg. A 0.5-1kg sample was collected for reserve analysis and logging. Chip samples were also placed into chip trays with 20 slots for logging and XRF analysis.

Section 1 Sampling Techniques and Data		
(Criteria in this section apply to all succeeding sections.)		
Criteria	***JORC Code explanation***	**Commentary**
	Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	RC chip samples were sent to ALS labs in Twin Falls, ID for preparation and forwarded on to ALS labs in Vancouver, BC for ICP-MS analysis. ALS analysis: ME-MS81
Drilling techniques	*Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or another type, whether the core is oriented and if so, by what method, etc.).*	Rotary split RC drilling with a Schramm T455-GT rig..
Drill sample recovery	*Method of recording and assessing core and chip sample recoveries and results assessed.*	A continuous rotary sample splitter was used to collect the RC samples at 1.5m intervals.
	Measures are taken to maximise sample recovery and ensure the representative nature of the samples.	Reverse circulation rock chip samples were collected at 1.5-meter continuous intervals via rotary splitter. For each interval chip samples were placed in labelled sample bags weighing between 1-2kg. A 0.5-1kg sample was collected for reserve analysis and logging. Chip samples were also placed into chip trays with 20 slots for logging and XRF analysis. In 2024, acoustic televiewer surveys provided supplementary data on structural continuity. Natural gamma logs were also collected for each 2024 drill hole which correlate with TREO grades.
	Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	Recoveries were very high in competent rock. No loss or gain of grade or grade bias related to recovery

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	***JORC Code explanation***	**Commentary**
Logging	*Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.*	All RC samples were visually logged by ARR geologists from chip trays using 10x binocular microscopes. Samples at 25m intervals were photos and analysed using an Olympus Vanta handheld XRF analyser in triplicate. Lanthanum, Cerium, Neodymium, and Praseodymium were analysed via XRF.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	RC samples and logging is quantitative in nature. Chip samples are stored in secure sample trays. Chip samples were photographed and 25m intervals.
	The total length and percentage of the relevant intersections logged.	All RC samples were visually logged by ARR geologists for each 1.5-meter continuous sample.
Sub-sampling techniques and sample preparation	*If core, whether cut or sawn and whether quarter, half or all core taken.*	RC chip samples were not cut.
	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	Samples varied between wet and dry. The course crystalline nature of the deposit minimizes adverse effects of wet samples. Samples were rotary split during drilling and sample collection. ALS labs dried wet samples using their DRY-21 drying process.
	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	RC samples were taken from pulverize splits of up to 250 g to better than 85 % passing minus 75 microns. This sampling method is considered appropriate for the type of material collected and is considered industry standard.

Section 1 Sampling Techniques and Data		
(Criteria in this section apply to all succeeding sections.)		
Criteria	***JORC Code explanation***	**Commentary**
	Quality control procedures adopted for all sub-sampling stages to maximise the representivity of samples.	ARR submitted CRM sample blanks, CRM standard REE samples from CND Labs and duplicate samples for analysis. Each CRM blank, REE standard, and duplicate were rotated into both the RC and core sampling process every 20 samples.
	Measures are taken to ensure that the sampling is representative of the in situ material collected, including, for instance, results for field duplicate/second-half sampling.	RC samples were collected using a continuous feed rotary split sampler.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Allanite is generally well distributed across the core and the sample sizes are representative of the fine grain size of the Allanite.
Quality of assay data and laboratory tests	*The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.*	ALS uses a 5-acid digestion and 32 elements by lithium borate fusion and ICP-MS (ME-MS81). For quantitative results of all elements, including those encapsulated in resistive minerals. These assays include all rare earth elements.
	For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	Samples at 25m intervals were photographed and analysed using an Olympus Vanta handheld XRF analyser in triplicate. Lanthanum, Cerium, Neodymium, and Praseodymium were analysed. Simple average values of three XRF readings were calculated.

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	*JORC Code explanation*	Commentary
		DGI Geosciences, Salt Lake City, UT, performed logging in 2024. All tools were properly calibrated prior to logging.
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	For the 2024 drilling program, ARR submitted CRM sample blanks, CRM standard REE samples from CDN Labs, and duplicate samples for analysis. QA/QC samples, including CRM and blank samples, were inserted alternately at every 20th sample for both RC and core drilling. ALS Laboratories also incorporated their own QA/QC procedures to ensure analytical reliability. For the RC drilling, ARR submitted CRM sample blanks, CRM standard REE samples from CND Labs and duplicate samples for analysis. CRM and Blank samples were inserted alternately at 20 sample intervals. The same was done for the core drilling completed Fall 2023. ALS Laboratories additionally incorporated their own Qa/Qc procedure.
Verification of sampling and assaying	*The verification of significant intersections by either independent or alternative company personnel.*	RC chip samples have not yet been verified by independent personnel.
	The use of twinned holes.	No twinned holes were used.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Data entry was performed by ARR personnel and checked by ARR geologists. All field logs were scanned and uploaded to company file servers.

Section 1 Sampling Techniques and Data		
(Criteria in this section apply to all succeeding sections.)		
Criteria	***JORC Code explanation***	**Commentary**
		Assay data from the RC samples was imported into the database directly from electronic spreadsheets sent to ARR from ALS.
	Discuss any adjustment to assay data.	Assay data is stored in the database in elemental form. Reporting of oxide values are calculated in the database using the molar mass of the element and the oxide.
Location of data points	*Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.*	All drill hole collars were surveyed by a registered professional land surveyor. Deviation surveys were conducted post-drilling to confirm subsurface data accuracy.
	Specification of the grid system used.	The grid system used to compile data was NAD83 Zone 13N.
	Quality and adequacy of topographic control.	Topography control is +/- 10 ft (3 m).
Data spacing and distribution	*Data spacing for reporting of Exploration Results.*	Drill spacing varied between 100 and 300 m, with infill drilling conducted to refine the resource model and improve classification confidence.
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	Spacing supports classification into Indicated and Inferred categories based on geostatistical analysis and grade continuity confirmed through cross-sections and swath plots.

Section 1 Sampling Techniques and Data		
(Criteria in this section apply to all succeeding sections.)		
Criteria	***JORC Code explanation***	**Commentary**
	Whether sample compositing has been applied.	UK combined all samples into a single composite sample for the SynBREE project
Orientation of data in relation to geological structure	*Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.*	Mineralization at Halleck Creek is a function of fractional crystallization of allanite in syenitic rocks of the Red Mountain Pluton. Mineralization is not structurally controlled and exploration drilling to date does not reveal any preferential mineralization related to geologic structures. Therefore, orientation of drilling does not bias sampling.
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	Orientation of drilling does not bias sampling.
Sample security	*The measures are taken to ensure sample security.*	All RC chip samples were collected from the drill rigs and stored in a secured, locked facility. Sample pallets were shipped weekly, by bonded carrier, directly to ALS labs in Twin Falls, ID. Chains of custody were maintained at all times.
Audits or reviews	*The results of any audits or reviews of sampling techniques and data.*	GeosynTek performed audit of the core, sampling techniques and data in May 2025.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	*Type, reference name/number, location and ownership, including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.*	ARR controls 364 unpatented federal lode claims and 4 Wyoming State mineral licenses covering 3,280 ha (8,108 acres).
	The security of the tenure held at the time of reporting and any known impediments to obtaining a licence to operate in the area.	No impediments to holding the claims exist. To maintain the claims an annual holding fee of $165/claim is payable to the BLM. To maintain the State leases minimum rental payments of $1/acre for 1-5 years; $2/acre for 6-10 years; and $3/acre if held for 10 years or longer.
Exploration done by other parties	*Acknowledgment and appraisal of exploration by other parties.*	Prior to sampling by WIM on behalf of Blackfire Minerals and Zenith there was no previous sampling by any other groups within the ARR claim and Wyoming State Lease blocks.
Geology	*Deposit type, geological setting and style of mineralisation.*	The REE's occur within Allanite which occurs as a variable constituent of the Red Mountain Pluton. The occurrence can be characterised as a disseminated rare earth deposit.
Drill hole Information	*A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:*	For the 2023 and 2024 exploration programs, FTE DRILLING USA INC. of Mount Uniacke, Nova Scotia used a Schraam T-450 track mounted rig to drill 15 reverse circulation drill holes. Drill hole depths for 37 holes was 102 m. FTE also utilized an enclosed Versa-Drilling diamond core rig to drill eight HQ-sized core holes. For the Fall 2022 program, FTE DRILLING USA INC. of Mount Uniacke, Nova Scotia used a Schraam T-450 track mounted rig to drill 37 reverse circulation drill holes. Drill hole depths for 37 holes was 150m and one hole at 175.5m

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
	easting and northing of the drill hole collar *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* *dip and azimuth of the hole* *downhole length and interception depth* *Hole length.*	Drilling information from the 2024 exploration program was published in the report "Technical Report of Exploration and Updated Resource Estimates at Red Mountain of the Halleck Creek Rare Earths Project", December 2024. Drilling information from the Fall 2023 campaign was published in the report "Summary of 2023 Infill Drilling at the Halleck Creek Project Area", November 2023 Drilling information from the Fall 2022 drilling campaign is presented in detail in the "Technical Report of Exploration and Maiden Resource Estimates of the Halleck Creek Rare Earths Project", March 2023.
	If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	No Drilling data has been excluded.
Data aggregation methods	*In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.*	For the SynBREE proejct, UK did not use a cut-off grade
	Where aggregate intercepts incorporate short lengths of high-grade results and longer lengths of low-grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.	Assays are representative of each 1.50 m, (~5 ft) sample interval.
	The assumptions used for any reporting of metal equivalent values should be clearly stated.	No metal equivalents used.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	***JORC Code explanation***	**Commentary**
Relationship between mineralisation widths and intercept lengths	*These relationships are particularly important in the reporting of Exploration Results.* *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* *If it is unknown and only the downhole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').*	Allanite mineralization observed at Halleck Creek occurs uniformly throughout the CQM and BHS rocks of within the Red Mountain Pluton. Therefore, the geometry of mineralisation does not vary with drill hole orientation or angle within homogeneous rock types.
Diagrams	*Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to, a plan view of drill hole collar locations and appropriate sectional views.*	Location information is presented in detail in the "Technical Report of Exploration and Updated Resource Estimates at Red Mountain of the Halleck Creek Rare Earths Project", December 2024.
Balanced reporting	*Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practised to avoid misleading reporting of Exploration Results.*	Reporting of the most recent exploration data is included in the "Technical Report of Exploration and Updated Resource Estimates at Red Mountain of the Halleck Creek Rare Earths Project", December 2024. Previous data is presented in the "Technical Report of Exploration and Maiden Resource Estimates of the Halleck Creek Rare Earths Project", March 2023, and in report "Summary of 2023 Infill Drilling at the Halleck Creek Project Area", November 2023.
Other substantive exploration data	*Other exploration data, if meaningful and material, should be reported, including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater,*	In hand specimen this rock is a red colored, hard and dense granite with areas of localized fracturing. The rock shows significant iron staining and deep weathering.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
	geotechnical and rock characteristics; potential deleterious or contaminating substances.	Microscopic description: In hand specimen the samples represent light colored, fairly coarse-grained granitic rock composed of visible secondary iron oxide, amphibole, opaques, clear quartz and pink to white colored feldspar. All of the specimens show moderate to strong weathering and fracturing. Allanite content is variable from trace to 2%. Rare Earths are found within the Allanite. Historical metallurgical testing consisted of concentrating the Allanite by both gravity and magnetic separation. The current program employs sequential gravity separation and magnetic separation to produce a concentrate suitable for downstream rare earth elements extraction.
Further work	*The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).*	Detailed geological mapping and channel sampling is planned to enhance further development drilling to increase confidence levels of resources.
	Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Geological mapping and channel sampling is planned for the Bluegrass and County Line project areas to potentially expand mineral resources beyond the Cowboy State Mine area.

Section 3 Estimation and Reporting of Mineral Resources		
(Criteria listed in the preceding section also apply to this section.)		
Criteria	***JORC Code explanation***	**Commentary**
Database integrity	*Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* *Data validation procedures used.*	Drill hole data header, lithologic data checked by field geologists and by visual examination on maps and drill hole striplogs. Assay and Qa/Qc data were imported into the database directly from electronic spreadsheets provided by laboratories. Histograms graphical logs were also prepared and reviewed by ARR geologists.
Site visits	*Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* *If no site visits have been undertaken indicate why this is the case.*	Mr. Dwight Kinnes visited the Halleck Creek site numerous times in 2024 and 2025. Mr. Patrick Sobecke and Mr. Erick Kennedy of Stantec visited the site on February 10, 2025. Mr. Alf Gillman of Odessa Resources and Mr. Kelton Smith of Tetra Tech visited the site on March 7, 2024.
Geological interpretation	*Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* *Nature of the data used and of any assumptions made.* *The effect, if any, of alternative interpretations on Mineral Resource estimation.* *The use of geology in guiding and controlling Mineral Resource estimation.* *The factors affecting continuity both of grade and geology.*	The Halleck Creek RE deposit is contained with rocks of the Red Mountain Pluton. These rocks consist primarily of clinopyroxene quartz monzonite (CQM), and biotite hornblende syenite (BHS). These two lithologies are difficult to visually distinguish. However, the concentration of rare earth elements is observable between lithologies. Rocks of the Elmers Rock Greenstone Belt (ERGB) and the Sybille (Syb) intrusion are easily distinguishable from rocks of the RMP. These rock units are essentially barren of rare earth elements. Therefore, the confidence in discerning rocks of the RMP from is high. The extent of the RMP relative to other units was outlined into modelling domains used for resource estimates. The distribution of allanite throughout CQM and BHS rocks of the RMP is generally uniform and is not structurally controlled. Potassic alternation

Section 3 Estimation and Reporting of Mineral Resources		
(Criteria listed in the preceding section also apply to this section.)		
Criteria	***JORC Code explanation***	**Commentary**
		observed does not appear to affect the grade of allanite throughout the deposit.
Dimensions	*The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	The Halleck Creek REE project currently contains two primary resource areas: the Red Mountain area and the Overton Mountain area. Resources also extend into the Bluegrass resource area. The Cowboy State Mine area is a subset of Red Mountain cover land minerals owned by the state of Wyoming, and under lease by WRI. The Red Mountain resource area is bounded to the west by the ERGB, and to the south by the Syb. Archean granites bound the Red Mountain area to the east. RC samples with TREO grades exceeding 1,500 ppm occurred at the base of 37 drill holes in the Red Mountain resource area extending down to depths of 150m with one hole extending to a depth of 175.5m. Therefore, ARR considers the Red Mountain resource area to be open at depth. The Overton Mountain resource area is bounded to the west by mineral claims, and therefore, remains open to the west. Lower grade BHS rocks occur at the northern end of Overton Mountain. Drilling data to the east and south indicate that the Overton Mountain resource area remains open across Bluegrass Creek. Like the Red Mountain drilling, RC samples at Overton Mountain contained TREO assay values exceeding 3,500 ppm to depths of 150m in 18 holes. One, 302m diamond core hole additionally exhibited grades exceeding 2,000 ppm to the bottom of the hole. Therefore, ARR considers the Overton Mountain resource area to be open at depth.
Estimation and modelling techniques	*The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and*	Geological models and grade estimates are not part of the SynBREE project

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(Criteria listed in the preceding section also apply to this section.)

Criteria	*JORC Code explanation*	Commentary
	maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used. *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* *The assumptions made regarding recovery of by-products.* *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* *Any assumptions behind modelling of selective mining units.* *Any assumptions about correlation between variables.* *Description of how the geological interpretation was used to control the resource estimates.* *Discussion of basis for using or not using grade cutting or capping.* *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	
Moisture	*Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	Moisture estimates are not part of the SynBREE project.

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(Criteria listed in the preceding section also apply to this section.)

Criteria	*JORC Code explanation*	**Commentary**
Cut-off parameters	*The basis of the adopted cut-off grade(s) or quality parameters applied.*	Cut=off grade estimates are not part of the SynBREE project
Mining factors or assumptions	*Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	Mining assumptions are not part of the SynBREE project.
Metallurgical factors or assumptions	*The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	**The University of Kentucky (UK) demonstrated that light rare earth oxide (LREO) powder and heavy rare earth oxide (HREO) powder can be extracted from allanite enriched feedstock from the Halleck Creek Rare Earths project.** UK created LREO powder and HREO powder from reverse circulation cuttings from drill holes across the Halleck Creek project area. UK created this material independently from ARR as part of the DARPA EMBER SynBREE project being led by Lawrence Livermore National Lab (LLNL), and Penn State University, The methods UK used to create this material are independent from any methods used by ARR for mineral processing and leaching. ARR is NOT incorporating these methods into flowsheets for the Cowboy State Mine.

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(Criteria listed in the preceding section also apply to this section.)		
Criteria	***JORC Code explanation***	**Commentary**
		UK used heavy liquid separation to concentrate allanite in RC feedstock. **UK Leaching conditions:** Acid: 37% HCl Solid ratio: 30% w/w Temperature: 75℃ Acid/Solidratio:0.3:1w/w Leaching duration: 2h **UK Impurity Removal:** Base: 5 mol/L NaOH solution Dosage of the oxidizer: 1.3 % v/v 50% H2O2 solution Temperature: 25℃ 98% of Fe, Al, and Si removed with an REE loss of approximately 15% **UK Solvent Extraction:** Extractant: 6% D2EHPA Modifier: 5% TBP Temperature: 25℃ A/O ratio:1:1 **UK Scrubbing & Stripping:** HCl solution with various concentrations were used to strip the REEs from the REE-loaded organic phase. 0.05mol/L, 1.0 ml/L, and 6 mol/L HCl were selected for scrubbing, LREE stripping, and HREE stripping, respectively **UK Oxalic acid precipitation** The 1 mol/L, and 6 mol/L stripped solutions were used as the LREE, and HREE-enriched solution for the oxalic acid precipitation, respectively.

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(Criteria listed in the preceding section also apply to this section.)		
Criteria	***JORC Code explanation***	**Commentary**
		Conditions: 1 mol/L oxalic acid solution 5 mol/L NaOH solution as the pH modifier The REE oxalate precipitate was collected and calcined to convert it into the corresponding oxidew.
Environmental factors or assumptions	*Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the*	Specific environmental impacts are not part of the SynBREE Project

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in the preceding section also apply to this section.)

Criteria	***JORC Code explanation***	**Commentary**
	mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.	
Bulk density	*Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	An average specific gravity of 2.70 represents the in-place ore material at Halleck Creek based on hydrostatic testing. Bulk density testing will be included during bulk sample collection currently being designed and permitted.
Classification	*The basis for the classification of the Mineral Resources into varying confidence categories.* *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* *Whether the result appropriately reflects the Competent Person's view of the deposit.*	Mineral resources are not part of the SynBREE Project

Section 3 Estimation and Reporting of Mineral Resources		
(Criteria listed in the preceding section also apply to this section.)		
Criteria	***JORC Code explanation***	**Commentary**
Audits or reviews	*The results of any audits or reviews of Mineral Resource estimates.*	Mineral resources are not part of the SynBREE Project
Discussion of relative accuracy/ confidence	*Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	Mineral resources are not part of the SynBREE Project

Section 4 Estimation and Reporting of Ore Reserves – Ore Reserves Are not Being Reported