

Identification and Characterization of Coal Containing High Rare Earth Element Concentrations - Rocky Mountain Basin

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Abstract

Tetra Tech, Inc. is conducting sampling and characterization of Rocky Mountain Basin coal and coal-related associated materials in search of high concentrations of Rare Earth Elements (REE) (minimum concentration of 300 parts per million (ppm)). Coal and coal-related materials are defined as run-of-mine coal; roof rock; overburden clays; shale interlayer formations; mine seam underclays; coal preparation plant refuse; etc.; and other coal-like materials as mined.

Based on previous REE work elevated REE coal and coal related lithologies have been recorded in the Colorado Raton Basin as well as near Florence, CO in the Canon City Embayment. In both cases, igneous material in or adjacent to the basins also exhibited high REE content, notably in lamprophyre dikes, igneous sills, and tonsteins associated with the coals of the Raton Basin. The eastern Uinta Basin of Colorado and Utah may hold similar potential as documented quasi-commercial REE deposits are present in the Iron Hill carbonatite complex near Powderhorn, CO which is just south of the Grand Mesa in Colorado and is near many of the mining districts in the basin, as well as reported REE-enriched pegmatites near Montrose, CO.

Background

Previous investigations by Tetra Tech of the North American craton (a part of the Earth's crust that has attained stability, and has been little deformed for a prolonged period) in the Rocky Mountain Region as well as in the Rocky Mountain forelands has shown that elevated Rare Earth Elements (REE) content exists in several coal basins where igneous activity associated with anatectic melting, emplacement of type-A (alkaline-anhydrous magma) granitoid intrusives, development of low-temperature SEDEX structures, and late-stage extrusive volcanic activity has occurred. While these features may not be in and of themselves sources for the elevated REE occurrences that have been previously noted in coal samples found in coal basins in Colorado, (Gray et al., 2015, Bryan et al, 2015¹, Bryan et al, 2015²) the proximity of rare earth-bearing lithologies within these coal basins suggests that these areas hold a higher potential for finding REE in concentrations of greater than 300 ppm than in more quiescent regions of the craton.

Figure 1.1 Three possible mechanisms for introducing REE into a Coal Basin

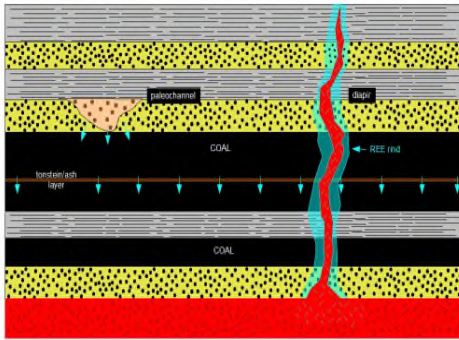
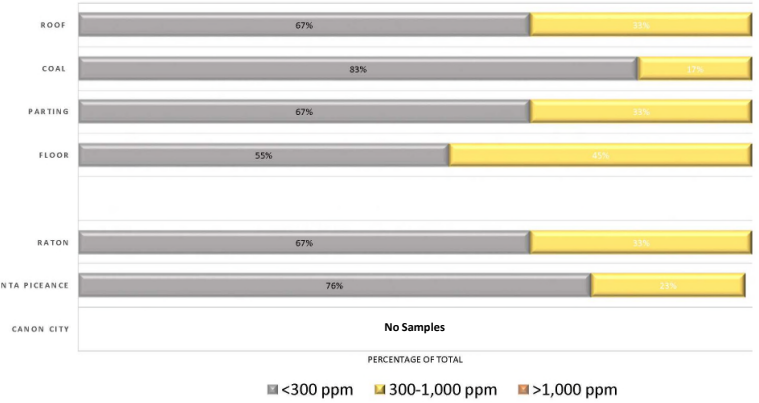


Figure 1.3 Tetra Tech team sampling in the Raton Basin



Results to Date

PRELIMINARY TOTAL REE CONCENTRATIONS SCREENING SAMPLES FROM SMALL DATA SET



Investigation Areas

Raton Basin

Earlier investigations of the Raton Basin identified coal and coal related lithologies that had REE contents greater than 300 ppm and in some instances exceeded 1000 ppm. Figure 1.2 shows the basin locality map of the Raton Basin, basin (Basin 1).

Canon City Embayment

The Canon City Embayment located near Florence, CO is also being investigated. Figure 1.2 shows the basin locality map of the Canon City Embayment (Basin 2).

Uinta Piceance Basin

The Uinta basin is thought to have potential to contain REE's since a larger REE-bearing carbonatite complex and numerous alkalic pegmatite dikes are found in and around the southeastern edge of the basin. Figure 1.2 is the basin locality map of the Uinta Basin (Basin 3).

Figure 1.2 Basin Locality Map



Next Steps

Upon receipt of all screening ICP-MS results Tetra Tech will identify target coal seams and counties for further investigation. Tetra Tech's team will then sample those areas and send them to the lab for detailed ICP-MS analysis.

References

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