

Humates Used as a Filtering Medium for Uranium

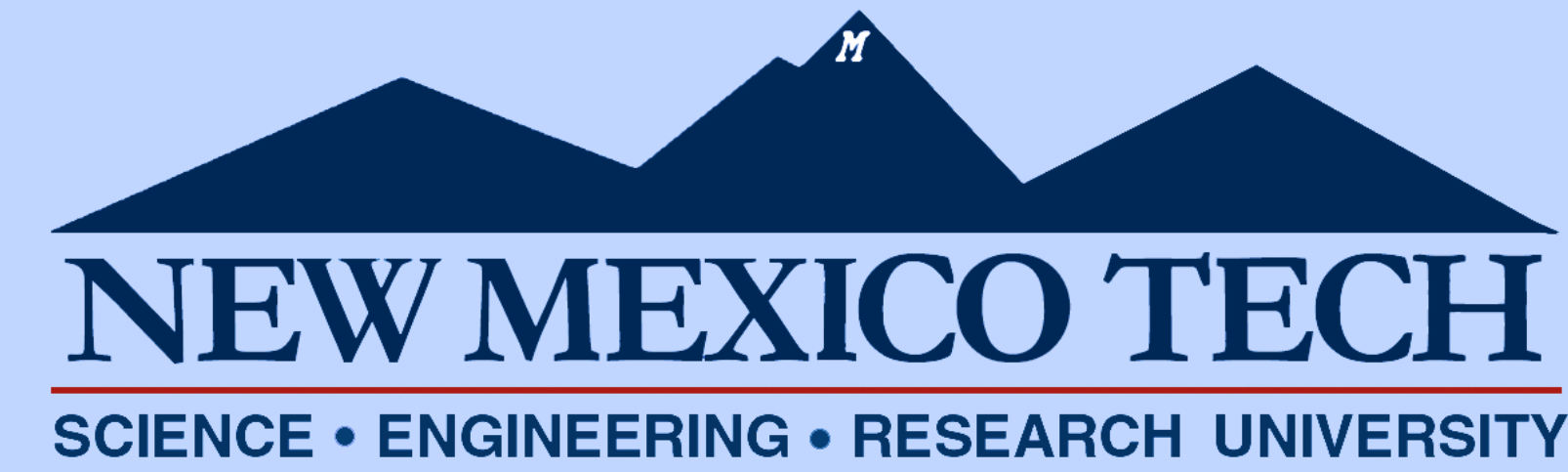
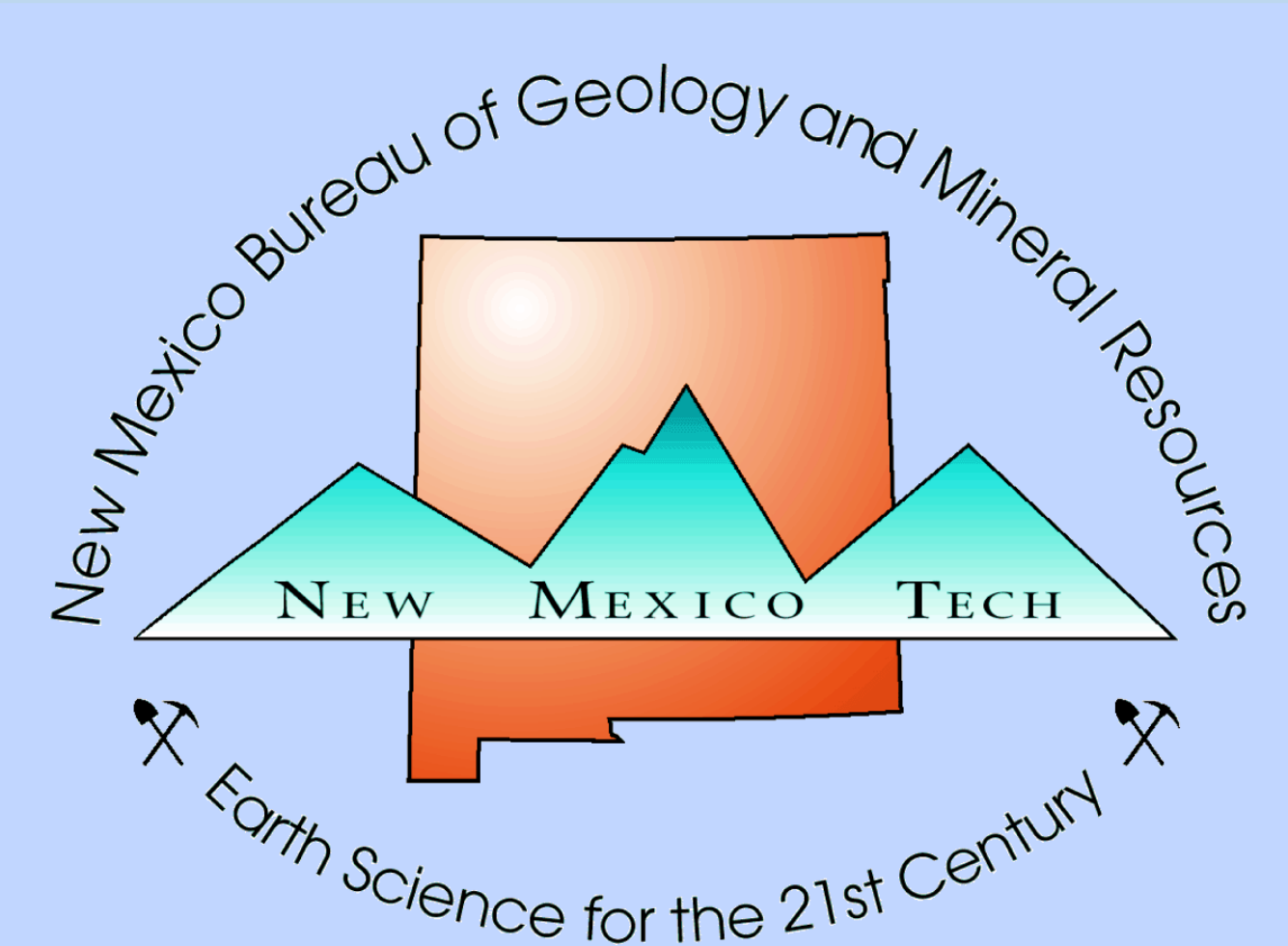
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Abstract

In New Mexico, there were as many as 28 uranium mining districts that were active from 1951-1980 (McLemore, 2020). In these mining districts, there were many sites and areas that have been contaminated with uranium. Contamination at mine sites extends to soils, sediments, and water. The cost of remediation is well into the millions of dollars and can be a burden on the nearby communities. In this project we will be exploring the possibility of using a resource for filtration that is readily available around the world- humates. Humates are a byproduct of coal that is mostly comprised of plant material that is rich in minerals; commonly used in agriculture. Humates are abundant in coal mines around the world, and when not used in agricultural purposes, they tend to be cast aside for later.

Objectives

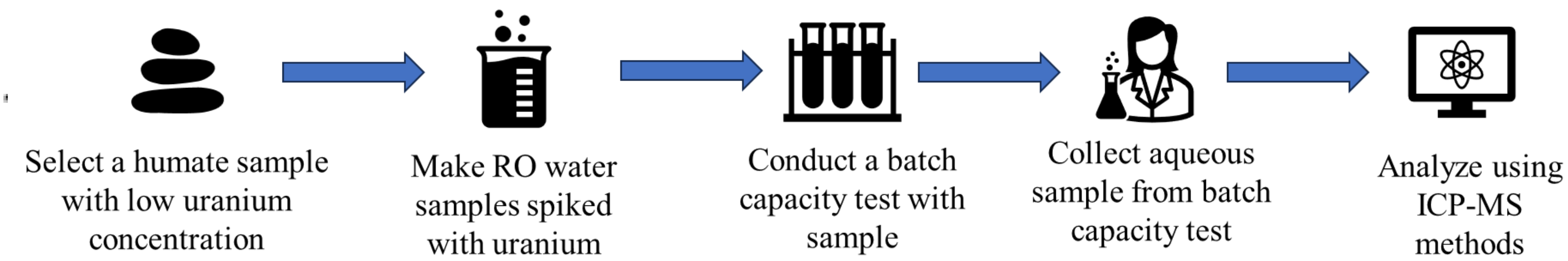
Objective 1

- Using the Bureau coal database, find a humate sample with low uranium content
- Using RO water and a concentrate of uranium, make spiked solutions at 50ppb, 30ppb and 15ppb
- Conduct a batch capacity test to observe the absorbance of the uranium
- Analyze results using the ICP-MS

Objective 2

- After initial testing, use humate sample as a filtrate medium and run spiked RO samples through the column
- Collect the samples from the column
- Analyze the ICP-MS and observe the data collected

Methods



- During pre-preparation process, all coal samples were ground down and sifted through a No. 10 (2.0mm) sieve
- Coal 42 and Coal 289 were homogenized and stored at room temperature in the lab
- During the batch capacity test, the samples were placed in the shaker for 24hrs at 150rpm
- The samples were then centrifuged at 500rpm, decanted off and then filtered through a 45µm Nylon filter

Results

- Initial data collected from the batch capacity test has demonstrated that the humates are bringing down the uranium concentration in the solution
- Since we are running low on Coal 42, another batch capacity test has been done with the new coal sample, Coal 289
- Coal 289 is showing the same promising results as well
- Issues with uranium being extracted out with the Nylon and Acetate filters has been occurring and is being resolved.

Desired Concentration (ppb)	Measured Concentration (mg/L)		
	Stock Solution without Filtering	Acetate Filter	Nylon Filter
15	0.01400	0.00054	0.01019
30	0.03238	0.00103	0.02115
50	0.01510	0.00062	0.03843
500	0.46970	0.49935	0.56500

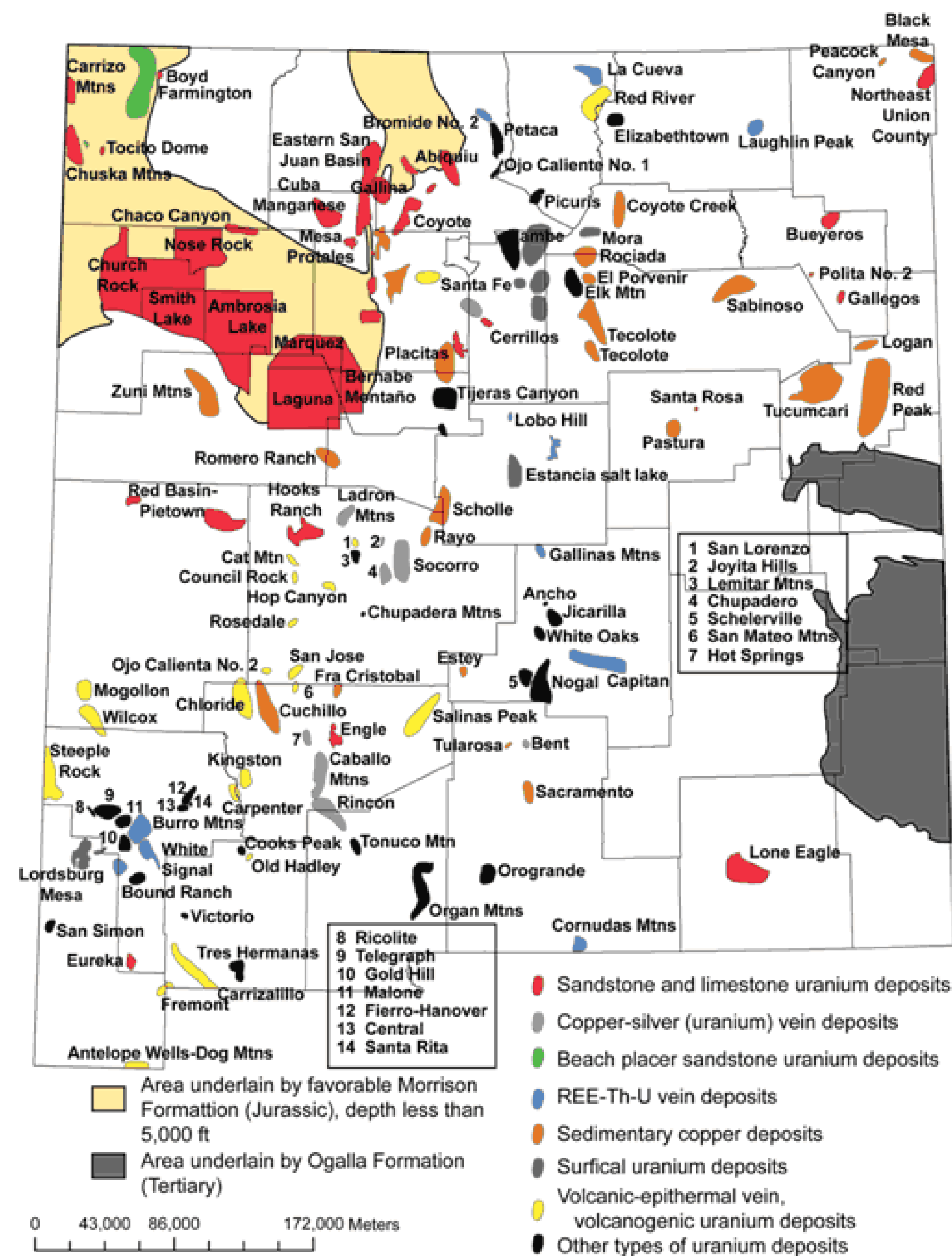
(Table 1) Comparison of the concentrations of the uranium in the aqueous solution. The first column is the stock solution without being filtered through any filters. The second column is the acetate filter, and the third column is the Nylon filter.

Sample name	238 U [No Gas]	51 V [No Gas]
	Conc. [mg/L]	Conc. [mg/L]
50ppb U Blank	0.02742	-0.00002
50ppb U Humate	0.002	0.00358
30ppb U Blank	0.01352	-0.00003
30ppb U Humate	0.001	0.00418
15ppb U Blank	0.00661	-0.00004
15ppb U Humate	0.00048	0.00371
Humate Blank 289	0.00008	0.0041

(Table 2) Uranium concentrations after the batch capacity test and then filtered through the Nylon filters

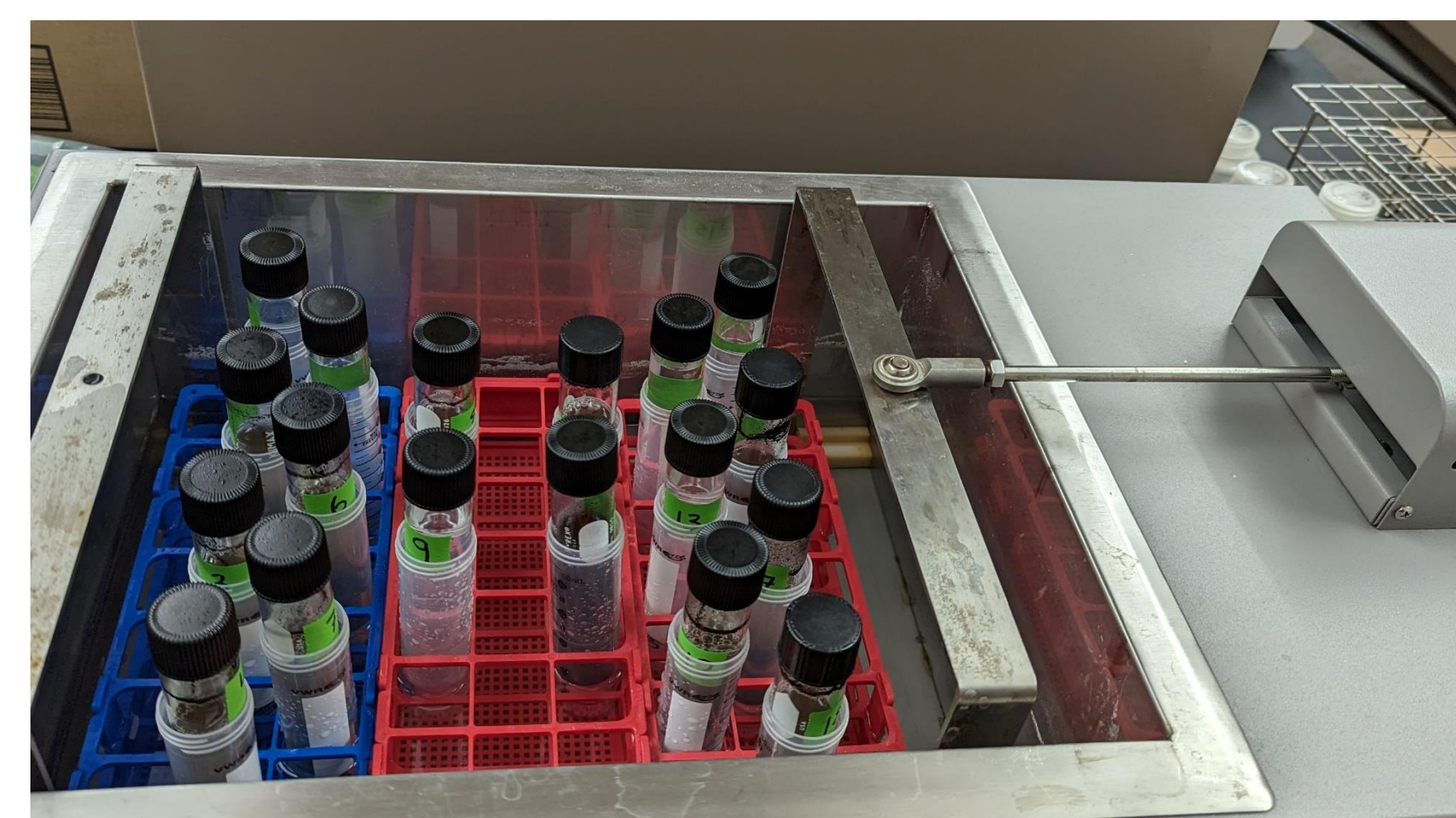
Conclusion and Future Directions

- The humates seem to be extracting uranium from the solution as expected
- However, issues with the filters being used will need to be replaced, to carry out the batch capacity test again
- Using another method of collection and filtration will be explored to get quality data
- Building the columns to begin testing will be carried out within the next month
- Once the columns are built, we will be collecting water samples over a series of hours to days to see how well the humates extract the uranium

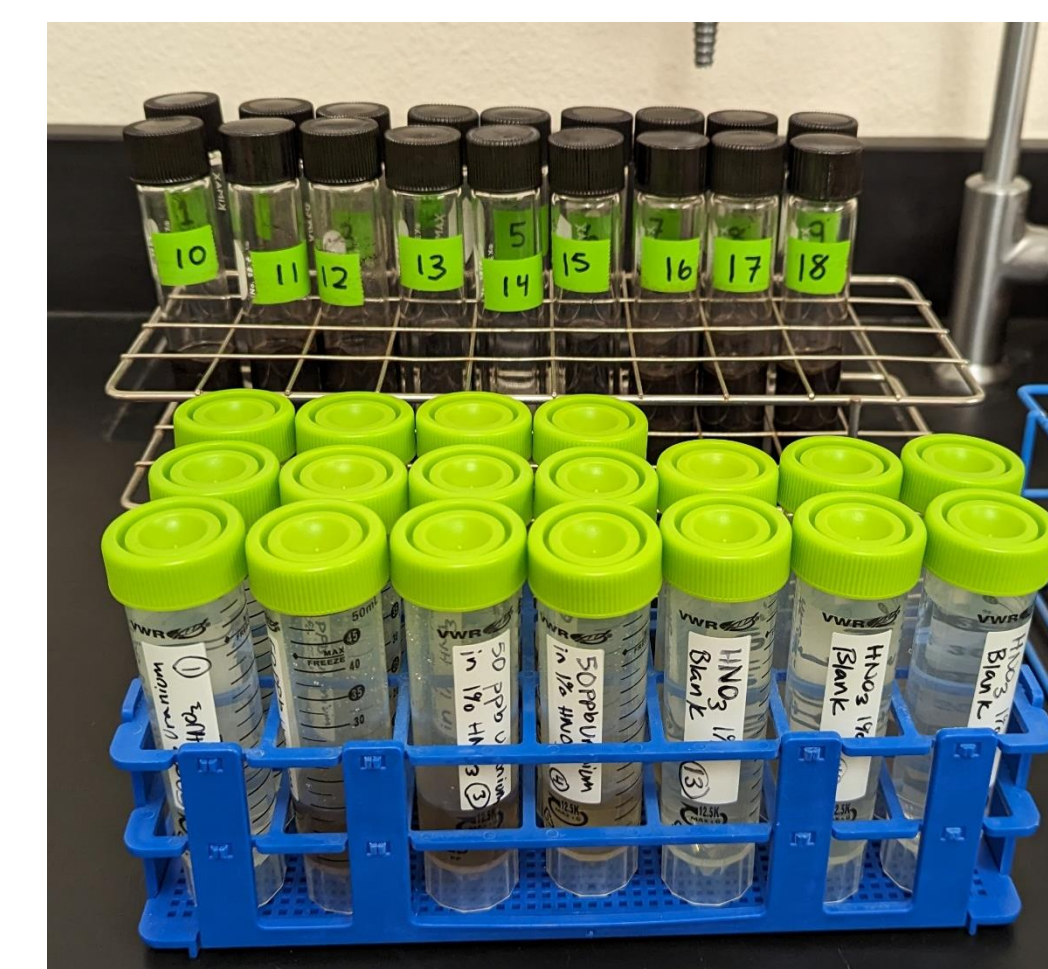


(Fig. 1)

The uranium mining districts throughout New Mexico (New Mexico Bureau of Geology and Mineral Resources)



Water shaker and humate samples during the batch capacity test



Processing of samples from the humate and RO mixture

Acknowledgements

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Any persons wishing to conduct geologic investigations on the Navajo Nation must first apply for and receive a permit from the Minerals Department, P.O. Box 1910, Window Rock, Arizona 6515 and telephone no. 928-871-6588